



Atacama Baseline Flora and Fauna Assessment - 2014

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Prepared by EBS Ecology for Iluka Resources Limited

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Front cover photo: *Eucalyptus oleosa* ssp. *oleosa* (Red Mallee), Mallee over *Triodia basedowii* (Hard Spinifex) and *Eremophila scoparia* (Broom Emubush) vegetation near site ATA003.

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The following EBS staff conducted the survey:

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- Brett Backhouse
- Erin Barber
- Andrew Sinel
- Rob Kelman
- Paul Drummond
- Luke Allen

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- Permit to Undertake Scientific Research, permit no: K25613-7.
- Wildlife Ethics Committee: Approval of a Project Involving Animals, app. no. 17/2011 M2.

GLOSSARY AND ABBREVIATION OF TERMS

BDBSA	Biological Database of South Australia
DEWNR	Department of Environment, Water and Natural Resources
DFS	Definitive Feasibility Stage
DSD	Department of State Development
DOE	Department of the Environment
EBS	EBS Ecology
EIA	Environmental Impact Assessment
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
J-A	Jacynth Ambrosia mine site
ML	Mining Lease
NPW Act	<i>National Parks and Wildlife Act 1972</i>
NRM	Natural Resources Management
NRM Act	<i>Natural Resources Management Act 2004</i>
NVC	Native Vegetation Council
PFS	Pre Feasibility Study
PEPR	Program for environment protection and rehabilitation
SA	South Australia
SEB	Significant Environmental Benefit
spp.	species (plural)
ssp.	subspecies

EXECUTIVE SUMMARY

This report presents the findings of a baseline flora and fauna assessment conducted by EBS Ecology on behalf of Iluka Resources Limited (Iluka) at the proposed Atacama mineral sands project site in Yellabinnia Regional Reserve, Far West South Australia. The study area is located in the eastern Eucla Basin, South Australia, approximately 200 km north-west of Ceduna. The Atacama deposit is located to the north east of Iluka's Jacinth Ambrosia Operation (J-A). The Atacama study area is within Iluka's Exploration Licence 5198.

Two field surveys were completed within the Atacama study area; a baseline flora and fauna survey from 23 September to 1 October 2014, and a targeted Southern Marsupial Mole (Itjaritjara) (*Notoryctes typhlops*) survey from 26 November to 4 December 2014.

The survey is the first conducted by EBS Ecology within the Atacama study area. The survey builds on flora and fauna data obtained from the nearby Sonoran and Typhoon study areas by EBS Ecology in 2012 (EBS 2013a & EBS2013b), J-A mine site by EBS Ecology (2007 to 2014), SKM (2006), and various surveys undertaken by the Department of Environment, Water and Natural Resources (DEWNR).

A desktop assessment of the Atacama study area was also completed. The Protected Matters Search Tool was used to identify Matters of National Environmental Significance (MNES) listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) that may occur or may have suitable habitat occurring within the study area. The Biological Database of South Australia (BDBSA) was used to identify flora and fauna species previously recorded within a 50 km buffer around the study area.

The EPBC Protected Matters Search and the BDBSA search identified the following threatened species as previously recorded within the study area, potentially occurring within the study area or having suitable habitat potentially occurring within the study area:

- One nationally and state threatened plant species:
 - *Hibbertia crispula* (Ooldea Guinea-flower) (Vulnerable under the EPBC Act and NPW Act).
- One nationally and state threatened bird species:
 - Malleefowl (*Leipoa ocellata*) (Vulnerable under the EPBC Act and NPW Act).
- Two nationally and state threatened mammal species:
 - Sandhill Dunnart (*Sminthopsis psammophila*) (Endangered under the EPBC Act and NPW Act).
 - Southern Marsupial Mole (*Notoryctes typhlops*) (Endangered under the EPBC Act and vulnerable under the NPW Act).
- Five migratory and/or marine bird species listed under the EPBC Act:
 - Fork-tailed Swift (*Apus pacificus*) (Marine and migratory under the EPBC Act).

- Cattle Egret (*Ardea alba*) (Marine and migratory under the EPBC Act).
- Oriental Plover, Oriental Dotterel (*Charadrius veredus*) (Marine and migratory under the EPBC Act).
- Rainbow Bee-eater (*Merops ornatus*) (Marine and migratory under the EPBC Act).
- Osprey (*Pandion haliaetus*) (Marine under the EPBC Act).
- 11 state threatened plants species:
 - *Alyogyne pinoniana* var. *microandra* (Vulnerable under the NPW Act).
 - *Austrostipa nullanulla* (Club Spear-grass) (Vulnerable under the NPW Act).
 - *Austrostipa vickeryana* (Vickery's Spear-grass) (Rare under the NPW Act).
 - *Corynotheca licrota* (Sand Lily) (Rare under the NPW Act).
 - *Daviesia benthamii* ssp. *humilis* (Mallee Bitter-pea) (Rare under the NPW Act).
 - *Eremophila hillii* (Hill's Emubush) (Rare under the NPW Act).
 - *Frankenia cinerea* (Rare under the NPW Act).
 - *Gratwickia monochaeta* (Rare under the NPW Act).
 - *Maireana suaedifolia* (Lax Bluebush) (Rare under the NPW Act).
 - *Melaleuca leiocarpa* (Pungent Honey-myrtle) (Rare under the NPW Act).
 - *Santalum spicatum* (Sandalwood) (Vulnerable under the NPW Act).
- Nine state threatened bird species:
 - Striated Grasswren (*Amytornis striatus*) (Rare under the NPW Act).
 - Australian Bustard (*Ardeotis australis*) (Vulnerable under the NPW Act).
 - Major Mitchell's Cockatoo (*Cacatua leadbeateri*) (Rare under the NPW Act).
 - White-browed Treecreeper (*Climacteris affinis*) (Rare under the NPW Act).
 - Malleefowl (*Leipoa ocellata*) (Vulnerable under the NPW Act).
 - Restless Flycatcher (*Myiagra inquieta*) (Rare under the NPW Act).
 - Scarlet-chested Parrot (*Neophema splendida*) (Rare under the NPW Act).
 - Gilbert's Whistler (*Pachycephala inornata*) (Rare under the NPW Act).
 - Osprey (*Pandion haliaetus*) (Endangered under the NPW Act).
- Three state threatened bird sub-species:
 - Slender-billed Thornbill (western ssp) (*Acanthiza iredalei* ssp. *iredalei*) (Rare under the NPW Act).
 - Chestnut Quail-thrush (eastern ssp) (*Cinclosoma castanotus* ssp. *castanotus*) (Rare under the NPW Act).
 - Naretha Bluebonnet (*Northiella haematogaster* ssp. *narethae*) (Rare under the NPW Act).
- Two state threatened reptile species:
 - Western Black-naped Snake (*Neelaps bimaculatus*) (Rare under the NPW Act).

- Short-tailed Pygmy Goanna (*Varanus brevicauda*) (Rare under the NPW Act). (note: This record is likely to have been an incorrect identification based on discussions with the South Australia Museum (M. Hutchinson, pers. comm., 2012).

The survey methodology was designed to maximise the recording of flora and fauna species that utilise the study area. A total of eight fauna trapping sites, 14 bird sites, 60 Southern Marsupial Mole trenches, six wildlife surveillance camera sites, four harp trap sites and five weed arc sites were surveyed within the study area. An aerial survey for Malleefowl mounds was also conducted. Flora survey methodology was approached in a manner to record the maximum number of flora species present, while also giving the best chance to locate species which have conservation rating under the EPBC Act or *National Parks and Wildlife Act 1972* (NPW Act). Vegetation associations were mapped and the condition assessed using the criteria for Significant Ecological Benefit (SEB), as described by the Native Vegetation Council (NVC) (DWLBC 2005).

A total of nine broad vegetation associations exist within the study area, including:

- *Eucalyptus* spp. / *Hakea francisiana* (Bottlebrush Hakea) / *Grevillea stenobotrya* (Rattle-pod Grevillea) Tall Open Shrubland
- *Acacia papyrocarpa* (Western Myall) Open Woodland +/- *Cratystylis conocephala* (Daisy Bluebush) and *Maireana sedifolia* (Bluebush)
- *Eucalyptus oleosa* ssp. Mixed Mallee over *Triodia* spp.
- *Eucalyptus yumbarrana* (Yumbarra Mallee) Mixed Mallee
- *Alectryon oleifolius* (Bullock Bush) Shrubland
- *Atriplex vesicaria* (Bladder Saltbush) Low Open Shrubland
- *Casuarina pauper* (Black Oak) +/- *Acacia papyrocarpa* (Western Myall) Woodland
- *Eucalyptus oleosa* ssp. (Red Mallee) / *Acacia papyrocarpa* (Western Myall) +/- *Myoporum platycarpum* (False Sandalwood) Open Woodland
- *Senna* spp. Open Shrubland.

The vegetation associations contained diverse vegetation with very little weed infestation. All nine vegetation associations were considered to resemble pre-European condition and were therefore given a SEB condition ratio of 10:1.

There were 136 flora species from 32 families observed within the study area, this included 133 native species and three weed species. Three species with a conservation rating of rare under the NPW act were recorded including *Gratwickia monochaeta*, *Melaleuca leiocarpa* (Pungent Honey-myrtle) and *Calotis lappulacea* (Yellow Burr-daisy). A database record (DEWNR 2014) for an individual *Santalum spicatum* (Sandalwood) shrub exists on the boundary of the study area; however, it was not relocated during the current survey. *Santalum spicatum* also has a vulnerable conservation rating under the NPW Act.

Five patches of the nationally vulnerable *Hibbertia crispula* (Ooldea Guinea-flower), totaling 283 individual plants, were recorded during the survey outside of the northern and eastern boundaries of the study area. The shrubs were observed opportunistically on the edge of a vehicle track whilst travelling to a Southern Marsupial Mole trenching site in the north of the study area. The closest patch was approximately 1.5 km from the northern boundary of the study area.

The three introduced flora species, *Acetosa vesicaria* (Rosy Dock), *Brassica tournefortii* (Wild Turnip) and *Carrichtera annua* (Ward's Weed), were observed in very low densities within the study area.

A total of 15 mammal species from nine families were detected during the 2014 surveys. Ten of these species were native and five were introduced. Two of the species detected, the Sandhill Dunnart (*Sminthopsis psammophila*) and the Southern Marsupial Mole (*Notoryctes typhlops*) have a conservation rating of Endangered under the EPBC act and vulnerable under the NPW Act. A total of four Sandhill Dunnart's were captured, one each at sites ATA001, ATA002, ATA004 and ATA005.

Southern Marsupial mole backfilled tunnels or 'moleholes' were detected at nine of the 20 trenching sites. Fourteen trenches out of possible 60 trenches contained moleholes. SMM012C, a trench site situated on the base of a dune recorded the most moleholes with 12 holes detected. A total of 35 moleholes were recorded on the reading faces (north facing) of the trenches. The average depth of the 35 moleholes from the surface was 379 mm, the average minimum diameter of the holes was 40 mm and the average maximum diameter was 48.5 mm.

Three micro bat species were positively identified from call recordings made on the Anabat Detectors. None of the bat species recorded are listed as being of National or State conservation significance. The Lesser Long-eared Bat (*Nyctophilus geoffroyi*) and Central Long-eared Bat (*Nyctophilus major*) were recorded at all eight fauna trapping sites with a total of 140 calls. Gould's Wattled Bat (*Chalinolobus gouldii*) was recorded at six sites with a total of 14 calls. One Lesser Long-eared Bat was captured in the harp trap at HARP1.

A total of 38 reptile species from nine families were recorded within the Atacama study area. Of the 38 species recorded there were three species, Sand Goanna (*Varanus gouldii*), Pygmy Mulga Goanna (*Varanus gilleni*), and Broad-banded Sandswimmer (*Eremiascincus richardsonii*) which were not captured in traps. These were only opportunistically observed and/or captured by hand.

Combined trapping methods resulted in a total of 209 reptiles from 35 species being captured from the eight fauna sites (Table 20). Pitfall traps resulted in 87.4 % of the total captures with 187 reptiles recorded. None of the reptile species recorded were of National or State conservation significance. One species with a conservation rating; the State rare Western Black-naped Snake (*Neelaps bimaculatus*), has been previously recorded at a trapping site within the Atacama study area during the J-A mine baseline survey (SKM 2006).

A total of 52 bird species were detected from 28 different families during the survey through point location observations, opportune observations and spotlighting. Point count surveys resulted in 497 observations from 37 species from 21 families across the 14 bird sites. The most abundant bird recorded during the point count surveys was the Budgerigar (*Melopsittacus undulates*) with a total of 74 observations. The Weebill (*Smicrornis brevirostris*) followed with 48 observations from seven out of the 14 sites. No introduced bird species were recorded during the survey; however, several bird species of conservation significance were recorded.

Two Malleefowl (*Leipoa ocellata*) mounds were located within the study area. The Malleefowl has a conservation rating of Vulnerable under the EPBC Act and NPW Act. Both mounds were considered to be quite old, with evidence that these mounds had not been used for many years. Both mounds had a well developed soil crust, lacked leaf litter and were very low in topography. These are all good indicators that the mounds have not been worked by Malleefowl for many years. Some old, very small egg shell fragments were also located at one mound indicating that it had been used previously for breeding.

The Australian Bustard (*Ardeotis australis*) which has a conservation rating of vulnerable under the NPW Act was recorded within the southern section of the study area in two locations. Three birds; the Peregrine Falcon (*Falco peregrines*), Restless Flycatcher (*Myiagra inquieta*) and the Scarlet-chested Parrot (*Neophema splendida*) which all have a conservation rating of rare under the NPW Act were also recorded within the study area.

One migratory species listed under the EPBC Act, the Rainbow Bee-eater (*Merops ornatus*) was also observed at site ATA003 and observed opportunistically.

The results of this survey, combined with the results from the nearby J-A mine site, Sonoran and Typhoon deposits and the background research undertaken as part of the project provides a comprehensive baseline of the flora and fauna species known to occur within or considered likely to occur within the Atacama study area.

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1 INTRODUCTION

EBS Ecology was contracted by Iluka Resources Limited (Iluka) to conduct a baseline flora and fauna assessment as part of a pre-feasibility study for the proposed Atacama mineral sands project, in the Far West of South Australia. A baseline flora and fauna survey was conducted during September and October 2014 and a targeted Southern Marsupial Mole survey was conducted during November and December 2014.

The overall objective of this assessment was to compile baseline information to characterise the flora and fauna of the study area. It is intended that this information will be a key component of an Environmental Impact Assessment, which will then support a Mining Lease (ML) Application or possibly an existing lease extension, to the Department of State Development (DSD). The extent of the ML is yet to be finalised but is assumed at this time to match the Atacama study area.

The objectives of this study were to:

- Describe the existing flora, fauna, migratory avifauna species and including bats and exotic/pest species and biological communities including those of regional and national significance that are found within the study area and the wider region.
- Map vegetation associations and determine the condition of vegetation strata within the study area to allow calculation of a Significant Environmental Benefit (SEB).
- Identify flora species of national weed significance.
- Undertake a desktop assessment to highlight species of economic benefit or indigenous conservation values in the wider region.

1.1 Study area and administrative boundaries

The study area is located in the eastern Eucla Basin, South Australia, approximately 200 km north-west of Ceduna. The Atacama deposit is located to the north east of Iluka's Jacinth Ambrosia Operation (J-A) as shown in Figure 1. The Atacama study area is within Iluka's Exploration Licence 5198.

The study area is located within the Yellabinnia Regional Reserve (RR), owned by the Crown (South Australian Minister for Environment) and managed by the South Australian Department of Environment, Water and Natural Resources (DEWNR). The NPW Act was amended in 1987 to create a regional reserve category. This allows for the development of multiple-use reserves with a conservation function. Any wildlife or the natural or historic features of the land can be conserved and at the same time, the natural resources of the land can be utilised. There are 7 regional reserves, including Yellabinnia, proclaimed under the Act.

Yellabinnia RR is a large reserve which conserves a contiguous area of mostly mallee vegetation with high wilderness values. The dominant land uses of the reserve are conservation of wildlife, landscape and historic features, mineral exploration and tourism (DEWNR 2012).

The area is not serviced by a local council; rather the management and governance authority for the area falls to the Outback Communities Authority, under The *Outback Communities (Administration and Management) Act 2009*. The study area falls within the Alinytjara Wilurara Natural Resources Management Board region.

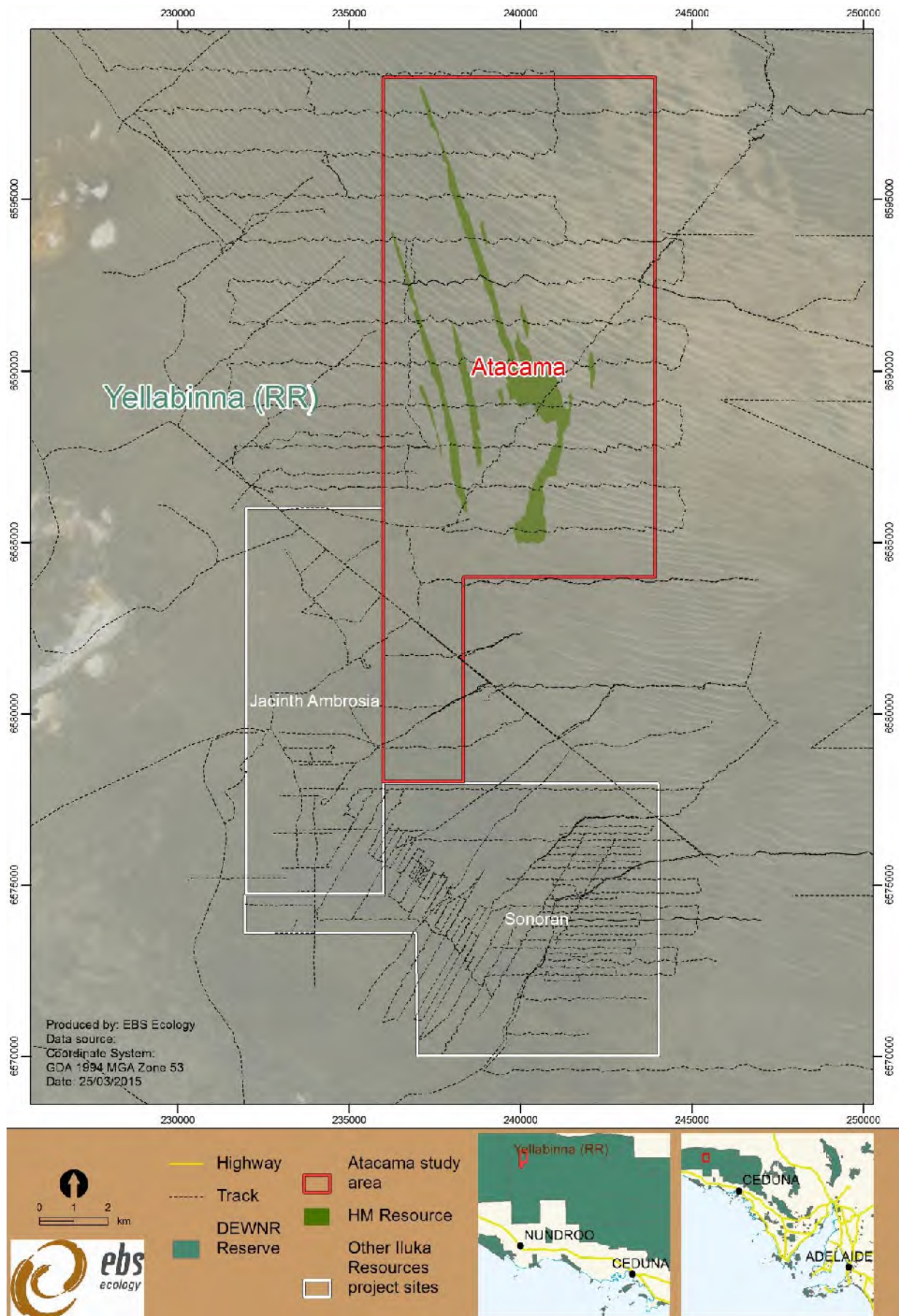


Figure 1. Location of Atacama study area.

2 COMPLIANCE AND LEGISLATIVE SUMMARY

A summary of key legislation relating to native vegetation and biodiversity and their relevance to the study area is provided in Table 1.

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides protection for matters of national environmental significance. Any action that has, will have or is likely to have a significant impact on matters of national environmental significance requires referral under the EPBC Act. To determine if an impact is likely to be significant, refer to the Significant Impact Guidelines (Commonwealth of Australia 2009).

Native vegetation within the study area is protected under the *Native Vegetation Act 1991* (NV Act). Any clearance of native vegetation in South Australia (unless exempt under the regulations) needs approval. For mining projects, the approvals process is administered by the DSD.

Native plants and animals in South Australia are protected under the *National Parks and Wildlife Act 1972* (NPW Act).

Table 1. Legislative summary.

Legislation	Summary	Relevance
Commonwealth		
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	<p>To protect 'matters of national environmental significance':</p> <ul style="list-style-type: none"> • World Heritage properties • National Heritage properties • wetlands of international importance (Ramsar wetlands) • listed threatened species and ecological communities • migratory species • Commonwealth marine areas • the Great Barrier Reef Marine Park • Nuclear actions (including uranium mining). <p>To determine whether an action is likely to have a significant impact on a matter of national environmental significance, refer to the Significant Impact Guidelines (Commonwealth of Australia 2009) at: http://www.environment.gov.au/epbc/publications/pubs/nes-guidelines.pdf.</p>	<p>Where an activity may trigger requirements of the EPBC Act, this legislation must be taken into account.</p> <p>Any action that has, will have, or is likely to have a significant impact on a matter of national environmental significance requires referral and approval. Significant penalties apply.</p>
South Australia		
<i>Native Vegetation Act 1991</i>	<p>To preserve, enhance and manage the State's native vegetation; provide a regulatory framework to control clearance of vegetation; and provide incentives and assistance to landowners to encourage them to preserve and enhance native vegetation.</p> <p>The Act protects all native vegetation that naturally occurs, i.e. vegetation which has not been planted. This includes all naturally occurring local native plants, from small ground covers and native grasses to mallee scrub and tall trees. It does not cover planted trees.</p>	<p>Approval is required under the Act for the clearance of native vegetation.</p> <p>Persons wanting to clear native vegetation must apply for a permit from the Native Vegetation Council (NVC) (ss.7, 14), unless exempt under the regulations. The NVC will take into account the impacts of the proposed clearance and may grant consent, refuse consent or grant consent subject to certain conditions (s.29). For mining projects, the approval process is managed by DMITRE. A net environment benefit is generally conditional on an approval being granted. Significant penalties apply if a person clears native</p>

Legislation	Summary	Relevance
	<p><i>Under the Act, clearance is defined as:</i></p> <ul style="list-style-type: none"> • the killing or destruction of native vegetation • the removal of native vegetation • the severing of branches, limbs, stems or trunks of native vegetation • the burning, poisoning and slashing of native vegetation • any other substantial damage to native vegetation including activities such as the draining for the reclamation of wetlands or flooding of land • Grazing land where stock has been excluded for more than ten years. 	<p>vegetation without the permission of the NVC (s.26). The NVC can also take civil enforcement proceedings in the District Court for an order that the native vegetation be re-instated (s.31).</p> <p>The Act also provides the opportunity for landholders to enter into voluntary "Heritage Agreement(s)" to ensure vegetation on private land is protected for perpetuity (s.23).</p>
National Parks and Wildlife Act 1972	<p>Allows for the protection of habitat and wildlife through the establishment of parks and reserves (both on land and in State waters); provides for the protection of native flora and fauna; identifies flora and fauna species considered to be of conservation significance (under Schedules 7, 8, and 9 of the Act); and provides for the use of approved wildlife through a system of permits allowing certain actions, i.e. keeping and selling (s.58), harvesting (s.60G), farming (s.60C), hunting (s.68A), releasing (s.55) and undertaking scientific research (s.53) on/of native fauna species, and for the taking of plants (s.49).</p>	<p>A person must not "take" a native plant, protected animal or the eggs of a protected animal without approval (s.48A). Maximum penalties of \$10 000 apply (\$100,000 in the case of a marine mammal). The most serious penalties apply where the plant or animal is of an endangered species.</p> <p>To take a native plant means to remove the plant or part of the plant, from the place in which it is growing; or to damage the plant. To take a protected animal means to remove, hunt, catch, restrain, kill or injure an animal, or attempt to do so.</p> <p>A person may take non-prescribed plant species from private land with the consent of the owner; however these species may also be covered under the Native Vegetation Act 1991.</p> <p>There are a number of non-complying activities in parks and reserves that result in penalty (parts 4-6).</p>
Natural Resources Management Act 2004	<p>To promote and facilitate integrated and sustainable management of all natural resources (water, soil, biodiversity etc); and to provide for arrangements to involve the community in the development and implementation of regional initiatives to improve the management of the natural resources.</p> <p>Key components include the establishment of regional Natural Resource Management (NRM) Boards and development of regional NRM Plans; the ability to control water use through prescription, allocations and restrictions; requirement to control pest plants and animals, and activities that might result in land degradation.</p> <p>A 'duty of care' is a fundamental component of this Act, i.e. ensuring one's environmental and civil obligation by taking reasonable steps to prevent land and water degradation. Persons can be prosecuted if they are considered negligent in meeting their obligations.</p> <p>Section 188(5) of the Act requires that the NRM Board must take into account any relevant provision of the regional NRM plan.</p>	<p>The NRM Board may appoint authorised officers to administer and enforce the Act. Authorised officers possess powers of entry, powers to give directions, powers to collect evidence and seize and remove animals and plants. An authorised officer may issue a protection order for the purpose of securing compliance with specified provisions of the Act:</p> <ul style="list-style-type: none"> - breach of the general statutory duty; - breach of the duty not to damage watercourses or lakes; - failure to take action to destroy or control certain animals or plants; - failure to comply with the terms of a management agreement entered into under the Act; and - Any other requirement imposed by the NRM Act or a repealed Act and which has been specified in the NRM Regulations. <p>An owner of land who is, or is likely to be, in breach of the general statutory duty under the Act resulting or likely to result in land degradation may be required to prepare an action plan. Failure to comply with a notice requiring preparation of an action plan is an offence. An NRM authority or a State authorised officer may issue a reparation order in certain circumstances where a person has caused harm to a natural resource and repair is necessary. Enforcement action in the ERD Court can be taken if necessary.</p>

Note: this summary is not intended to be a substitute for particular legal advice. It should be recognised that in the case of particular environmental issues precise legal opinion may be required. This summary does not address the legal implications of every set of circumstances and situations that may arise in the course of activities.

3 DESKTOP ASSESSMENT

3.1 Methods

3.1.1 Literature review

Existing information and literature relevant to the study area was reviewed, including:

- aerial imagery
- spatial datasets: DEWNR biological survey sites, IBRA, vegetation cover, fire history, protected areas
- online database and literature searches including EPBC Protected Matters Search and Atlas of Living Australia (ALA) website
- reports and plans, including:
 - Biological Survey Reports for the Yellabinnia Dunefield (Copley and Kemper 1992), Nullarbor Region (McKenzie and Robinson 1987) and Eyre Peninsula (Brandle 2010)
 - Baseline surveys of the Eucla Basin undertaken for the Jacinth Ambrosia Deposits (e.g. Badman 2006a, 2006b, 2007; EBS 2007, 2008a, 2009c, 2013a; 2013b, SKM 2006)
 - Threatened species reports and recovery plans.

This information was used to assess:

- native vegetation cover within the study area and immediate surrounds
- previous survey effort in the area
- vegetation associations present (including associations of conservation significance)
- flora and fauna species, particularly those of conservation significance, known or likely to occur in the area
- key threatening processes (e.g. weeds, pest animals) that may require specific management.

3.1.2 Database searches

The online Protected Matters Search Tool was used to determine matters of national environmental significance under the Commonwealth EPBC Act that may occur or may have suitable habitat occurring within the study area (DOE 2013b). A search was completed based on the centre point of the study area with a 10 km buffer applied.

A search of the Biological Database of South Australia (BDBSA) was obtained from the Department of Environment, Water and Natural Resources (DEWNR) in October 2014, to identify flora and fauna species previously recorded within a 50 km buffer around the study area (DEWNR 2014). The BDBSA is comprised of an integrated collection of corporate databases which meet DEWNR standards for data quality, integrity and maintenance. In addition to DEWNR biological data the BDBSA also includes data from partner organisations (Birds Australia, Birds SA, Australasian Wader Study Group, SA Museum,

and other State Government Agencies). This data is included under agreement with the partner organisation for ease of distribution but they remain owners of the data and should be contacted directly for further information.

3.1.3 Limitations

The desktop assessment is based on existing datasets and references from a range of sources. EBS Ecology has not attempted to verify the accuracy of any such information, other than previously generated EBS information (such as survey results from the nearby J-A mine site). The findings and conclusions expressed by EBS Ecology are based solely upon information in existence at the time of the assessment.

3.2 Landscape setting

Interim Biogeographical Regionalisation of Australia (IBRA) is a landscape based approach to classify the land surface across a range of environmental attributes, which is used to assess and plan for the protection of biodiversity (DOE 2013a). IBRA establishes a hierarchy of ecosystem classification for which the physical, climatic and biological characteristics are described. Bioregions are continental scale ecosystems distinguished from adjacent regions by their broad physical and biological characteristics. They may include more than 30 landforms and 50 vegetation associations. Sub-regions are sub-continental scale ecosystems occurring within bioregions and may include up to 15 landforms and 30 vegetation associations. Environmental associations are local scale ecosystems occurring within subregions.

The study area falls within the Yellabinnia IBRA environmental association, within the Yellabinnia IBRA sub-region and Great Victoria Desert IBRA bioregion. A summary description of the bioregions, subregions and associations is provided in Table 2 and a map of the IBRA boundaries is provided in Figure 2.

3.3 Fire history

An area of approximately 3,253 ha, or 25.1 % of the total study area was burnt by wildfire in 2002. (DEWNR 2011) (Figure 3). The most recent fire within close proximity to the study area was during 2012. The boundary of the 2012 wildfire was within 2 km of the northern and eastern extent of the study area. Fire has played an integral part in the ecology of the Australian landscape for millions of years. While fires can cause death of flora and fauna species, it is also responsible the regeneration of habitat for other species. For example, Churchill (2001a) notes that Sandhill Dunnarts preferred habitat of *Triodia* sp. is between 10 and 30 years post fire.

Table 2. IBRA Region, sub-region, and environmental association environmental landscape summary.

Great Victoria Desert IBRA bioregion	
Arid active sand-ridge desert of deep Quaternary aeolian sands overlying Permian and Mesozoic strata of the Officer Basin. Tree steppe of <i>Eucalyptus gongylocarpa</i> , Mulga and <i>E. youngiana</i> over hummock grassland dominated by <i>Triodia basedowii</i> . Arid, with summer and winter rain.	
Yellabinna IBRA sub-region	
This subregion comprises essentially the field of regular parallel dunes of the Great Victoria Desert and tracts of salt lakes. The dune field mantles erosional plain and low outcrops of granite or volcanics form inselbergs or tors within the dune field. The dunes consist mainly of sand derived from the Western Australian Shield, with a gradual colour change southward to where white sands derived from the coast predominate. Interdunal areas support <i>Eucalyptus socialis</i> / <i>E. gracilis</i> open scrub on red calcareous earths, while dunes support <i>E. socialis</i> / <i>Triodia irritans</i> open scrub on reddish siliceous sands. A chenopod shrubland of <i>Halosarcia</i> spp. and <i>Sclerostegia tenuis</i> occurs on the black calcareous loams of the depressions.	
Remnant vegetation	Approximately 99 % (4,457,950 ha) of the subregion is mapped as remnant native vegetation, of which 56 % (2,511,703 ha) is formally conserved.
Landform	Stable NW-SE longitudinal dunes, locally broken by granite hills and ridges of metamorphic rocks. Dunes closely spaced.
Geology	Vast dune sand and inter-dune corridors of clay, silt and very fine sand; evaporite deposits in numerous salt lakes (gypsum, halite); kopi ridges and dunes; some silcrete and calcrete (rare).
Soil	Sand soils with weak pedologic development, red calcareous earths, and red siliceous sands.
Vegetation	Mallee heath and shrublands.
Yellabinna IBRA association	
Remnant vegetation	Approximately 99 % (4,416,228 ha) of the association is mapped as remnant native vegetation, of which 57 % (2,503,966 ha) is formally conserved.
Landform	Plains with closely spaced easterly trending dunes and occasional rock outcrops.
Geology	Sand, alluvium, granite and silcrete.
Soil	Red calcareous earths, reddish siliceous sands and crusty red duplex soils.
Vegetation	Open scrub of beaked red mallee and yorrell and open scrub of beaked red mallee and Spinifex.

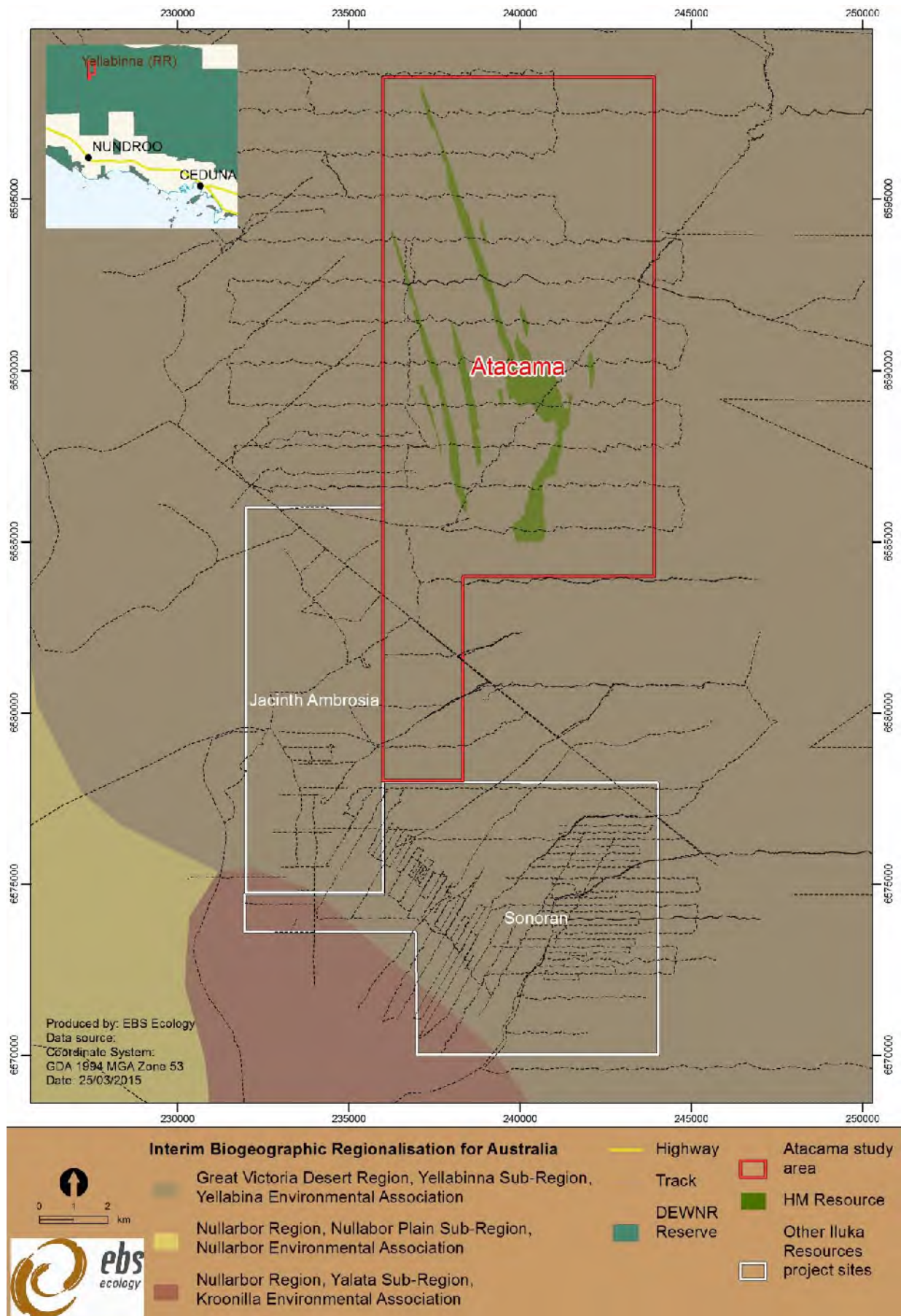


Figure 2. IBRA regions and environmental associations.

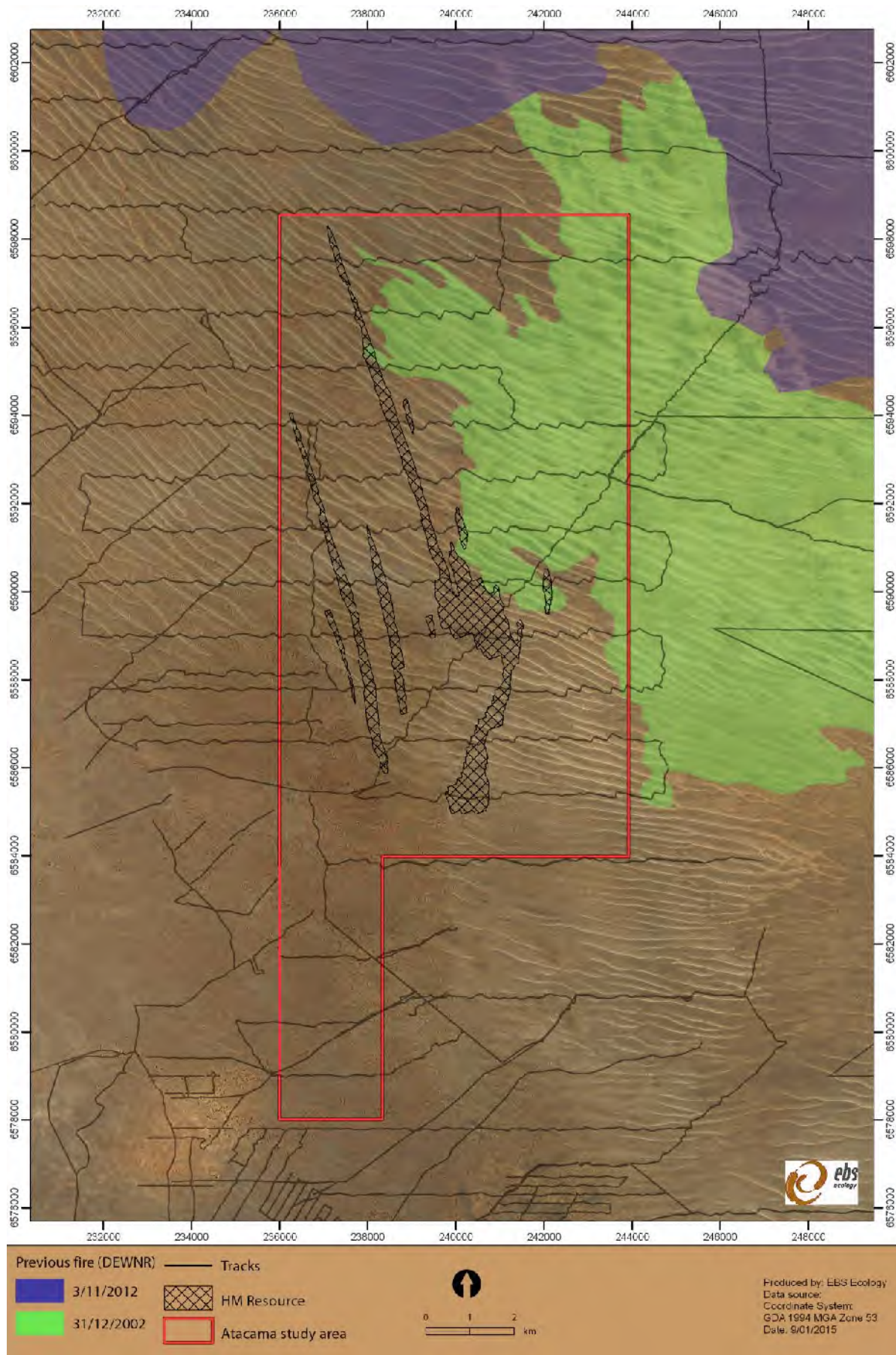


Figure 3. Fire history mapping.

3.4 Climate

The closest (BOM) weather stations to the study area are located at Maralinga and Tarcoola. Maralinga is located approximately north-west, and Tarcoola is located approximately 218 km to the east of the study area. Given the distance of these weather stations from the study area, and differences in physical and environmental factors, the data presented in Figure 4 and Figure 5 should be used as an indication only of the climate likely to be experienced within the study area.

The mean annual rainfall at the Maralinga BOM site is 224.5 mm and 179.5 mm at the Tarcoola Aero BOM site (Commonwealth of Australia 2015).

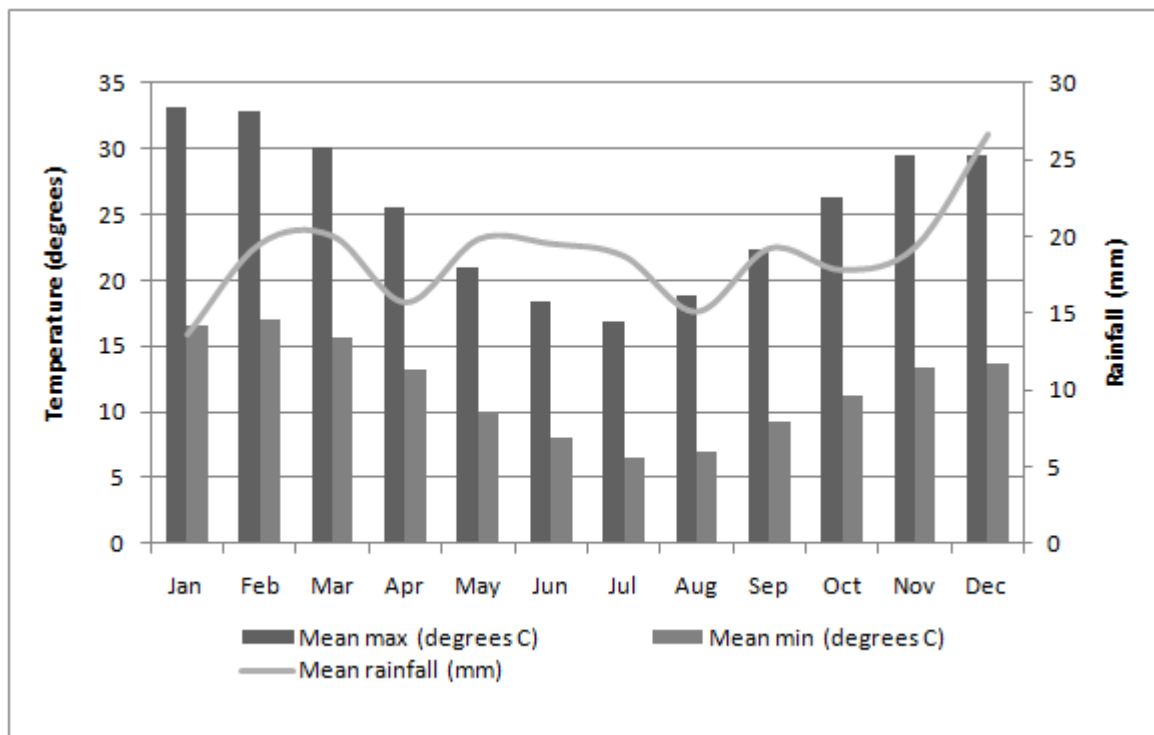


Figure 4. Average monthly rainfall and temperature data for Maralinga weather station 018114.

Data source: Bureau of Meteorology (Commonwealth of Australia 2015).

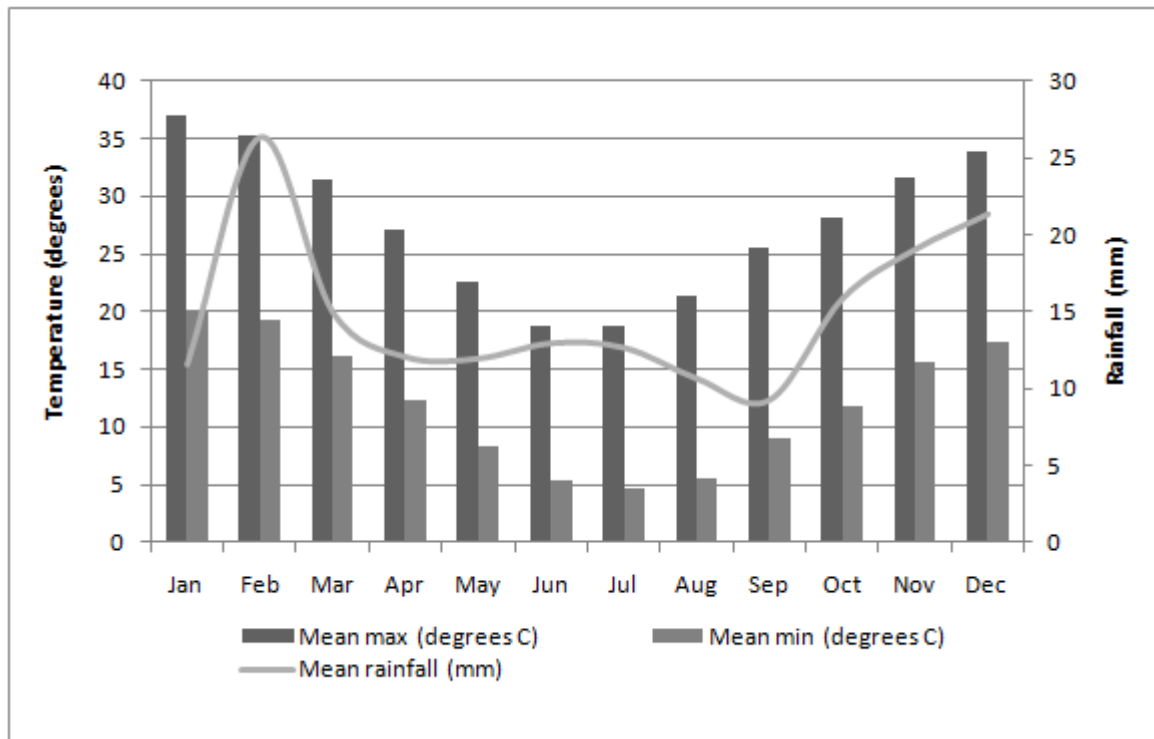


Figure 5. Average monthly rainfall and temperature data for Tarcoola Aero weather station 016098.

Data source: Bureau of Meteorology (Commonwealth of Australia 2015).

3.5 Previous surveys conducted

Biological Surveys conducted by the South Australian Government in the wider area include:

- A Biological Survey of the Nullarbor Region in the South and Western Australia (McKenzie and Robinson 1987)
- A Biological Survey of Yumbarra Conservation Park in South Australia (Owens et al. 1995)
- A Biological Survey of the Yellabinna Region of South Australia (Copley and Kemper 1992)
- A Biological Survey of the Eyre Peninsula, South Australia (Brandle 2010).

These biological surveys typically follow standard methodology detailed in the Guidelines for Vertebrate Surveys in South Australia (Owens 2000) and Guidelines for Vegetation Surveys in South Australia (Heard and Channon 1997).

A number of surveys have been conducted in the Eucla Basin over the last eight years in relation to Iluka's exploration activities and the J-A mining operation.

Flora studies include:

- Sonoran Baseline Flora and Fauna Assessment (EBS 2013a)
- Jacinth Ambrosia Vegetation Monitoring (EBS 2010b, 2010c, 2011, 2012a, 2014a, 2015a)
- Sonoran Pest Plant Survey (EBS 2013b)

- Eucla Basin Baseline Vegetation Survey Jacinth and Ambrosia Deposits, Infrastructure Corridor, Fowlers Bay (Badman 2006a).
- Eucla Basin Baseline Vegetation Survey Jacinth and Ambrosia Deposits (Badman 2006b).
- Jacinth-Ambrosia Project: A Vegetation Survey of the Jacinth – Ambrosia Wellfield and Pipeline Corridor (Badman 2007).
- Vegetation Mapping and Data Recording for the Jacinth Ambrosia Mine (EBS 2008a).

Fauna studies include:

- Sonoran Baseline Flora and Fauna Assessment (EBS 2013a).
- Jacinth-Ambrosia Fauna Monitoring (EBS 2008b, 2009a, 2010e, 2012b, 2014b, 2015a).
- Marsupial Mole Survey of Yellabinna and Yumbarra Conservation Reserves, Lower Great Victoria Desert, SA (Benshemesh 2005b).
- Report on Fauna Survey 2005: Part I - Iluka Resources Ltd Mineral Deposit Area, Yellabinna Regional Reserve, South Australia (SKM 2006) conducted in 2005.
- Fauna Monitoring of Dominion Exploration Area, Yumbarra Conservation Park, December 2001 (Ecological Horizons 2001).
- Sandhill Dunnart Survey, Barton Regional Exploration Program (EBS Ecology 2009c).
- Predator Activity Monitoring, Barton Mineral Sands Drilling Program (EBS Ecology 2010a, 2010b).
- Sandhill Dunnart Fire Age Survey (Moseby 2012).

Two baseline DEWNR flora sites and one baseline SKM fauna site (SKM 2006) have previously been surveyed within the southern section of the Atacama study area. A bird and flora monitoring site are also located within the southern section of the study area (Figure 6). These two sites are monitored on an annual basis as part of the overall monitoring program for the J-A mine site.

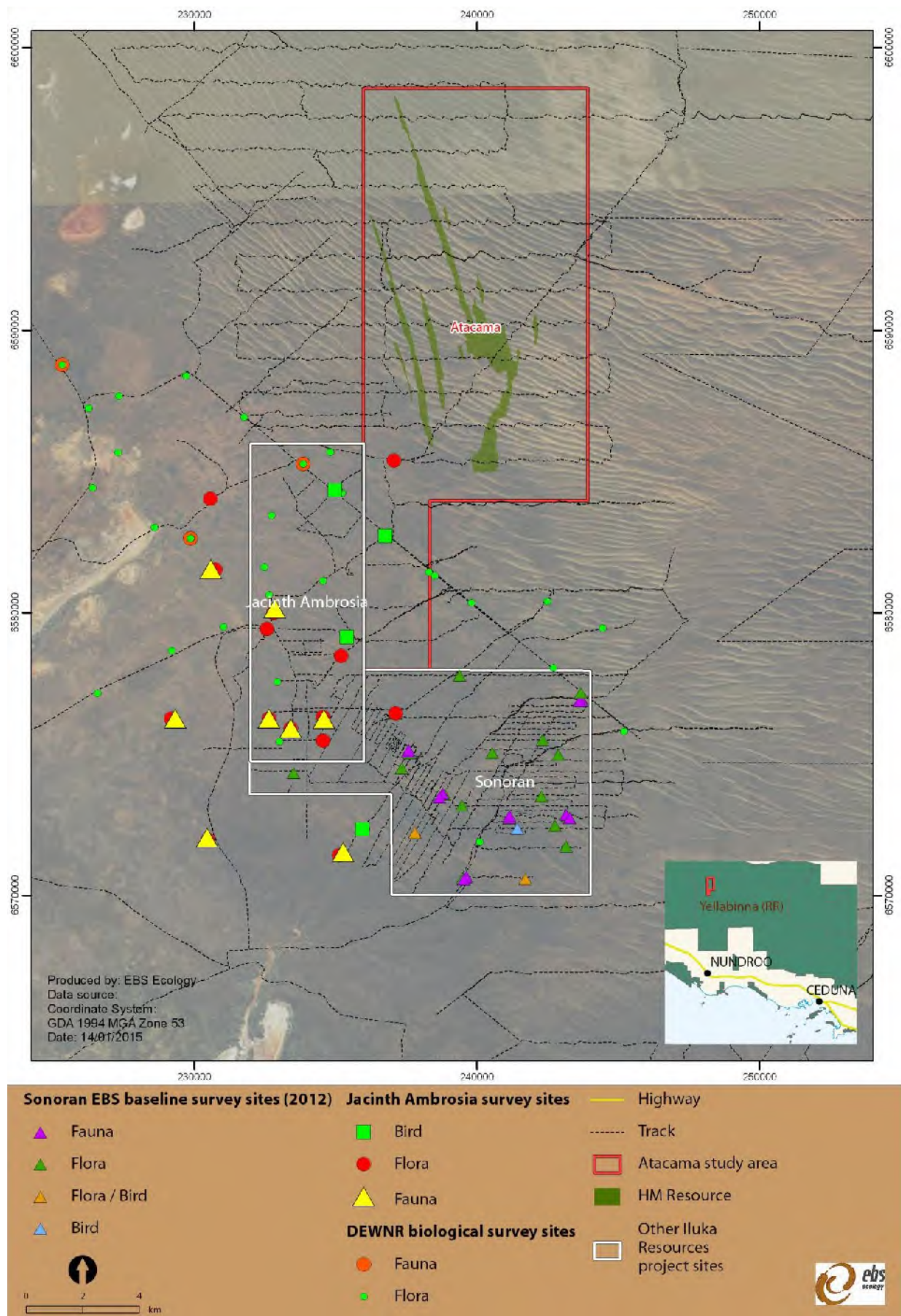


Figure 6. Previous surveys conducted within proximity to the study area.

3.6 Database search results

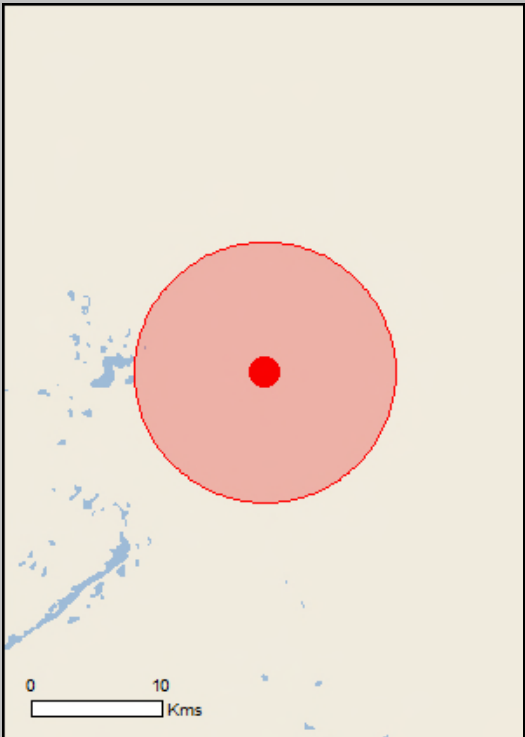
3.6.1 Matters of national environmental significance

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search highlighted the following matters of national environmental significance protected under the EPBC Act that may be relevant for the study area (Table 3).

Four threatened species and four migratory species were highlighted in the Protected Matters Search as potentially occurring or having suitable habitat potentially occurring within proximity to the study area, these species are discussed further in Table 4 and sections 9.1.3 and 9.2.3. Listed marine species are included in the table but are not relevant to the study area being located away from the coastal zone.

Six invasive species were highlighted in the Protected Matters Search as potentially occurring in the study area. These include one flora species, *Carrichtera annua* (Wards Weed) and five fauna species; One-humped Camel (*Camelus dromedarius*), Cat (*Felis catus*), House Mouse (*Mus musculus*), Rabbit (*Oryctolagus cuniculus*) and Fox (*Vulpes vulpes*).

Table 3. Summary of the results of the EPBC Act Protected Matters Search.

Search area (10 km buffer)	Matters of National significance under the EPBC Act 1999	Identified within the search area
	World Heritage Properties	None
	National Heritage Properties	None
	Wetlands of International Significance	None
	Great Barrier Reef Marine Park	None
	Commonwealth Marine Areas	None
	Threatened Ecological Communities	None
	Threatened Species	4
	Migratory Species	4
	Commonwealth Lands	None
	Commonwealth Heritage Places	None
	Listed Marine Species	5
	Whales and other Cetaceans	None
	Critical Habitats	None
	Commonwealth Reserves	None
	Places on the Register of the National Estate	2 (Yellabinna area and Yellabinna region)
	State and Territory Reserves	1 (Yellabinna, South Australia)
	Regional Forest Agreements	None
	Invasive Species	6
	Nationally Important Wetlands	None
	Key Ecological Features (Marine)	None

3.6.2 Threatened and migratory species

The conservation status of flora and fauna species is specified under legislation at the National (EPBC Act) and State (NPW Act) level.

The EPBC Protected Matters Search and the BDBSA search identified the following threatened species as potentially occurring or having suitable habitat potentially occurring within the study area (Table 4):

- One nationally and state threatened plant species
- One nationally and state threatened bird species
- Two nationally and state threatened mammal species
- Five migratory and/or marine bird species listed under the EPBC Act
- 11 state threatened plants species
- 9 state threatened bird species
- Three state threatened bird sub-species (note: it is uncertain whether the records are of the threatened or non-threatened sub-species due to range overlaps between sub-species)
- Two state threatened reptile species (note: one species record, Short-tailed Pygmy Goanna (*Varanus brevicauda*), is likely to have been an incorrect identification based on discussions with the South Australia Museum (M. Hutchinson, pers. comm., 2012).

Migratory species are not necessarily considered threatened, but benefit from a nationally coordinated approach to conservation. Their occurrence within the study area would generally be as an opportunistic visitor (e.g. to utilise seasonal resources and surface water) or as a fly-over species. Apart from the Malleefowl (*Leipoa ocellata*), it is unlikely that the identified migratory bird species would be totally reliant on habitat within the study area. Five migratory species such as the Oriental Plover (*Charadrius veredus*) are also listed as marine species. As with other migratory species mentioned above, these listed marine species would either fly over or use the survey area opportunistically if suitable conditions are present.

A likelihood of occurrence rating of 'Highly Likely', 'Likely', 'Possible' or 'Unlikely' has been assigned to each threatened species highlighted from these searches using the following criteria:

- date of the most recent record (taking into consideration the date of the last surveys conducted in the area)
- proximity of the records (distance to the study area)
- landscape location of the records, vegetation remnancy and vegetation type of the record location (taking into consideration the landscape, remnancy and vegetation type of the study area, with higher likelihood assigned to species that were found in similar locations/condition/vegetation associations)
- knowledge of the species habitat preferences, causes of its decline, and local population trends.

The likelihood of occurrence rating within the study area is considered conservative (Refer to Limitations, Section 3.1.3).

Threatened flora species recorded in the BDBSA within a 50 km radius of the study area are shown in Figure 7. Threatened fauna species recorded in the BDBSA within a 50 km radius of the study area are shown in Figure 8 (DEWNR 2014).

Table 4. Threatened and migratory species identified as potentially occurring within the study area based on database searches.

Scientific name	Common name	Conservation status		Last BDBSA sighting	BDBSA (50 km buffer)	EPBC Protected Matters Search	Location/habitat preference	Species detected within the study area during the 2014 survey	Likelihood of occurrence within study area
		Aus	SA						
Plants									
<i>Alyogyne pinoniana</i> var. <i>microandra</i>			V	09/10/1987	✓		Red Brown dunes with limestone underbase, slopes of dunes and upper swales.	No	Unlikely
<i>Austrostipa nullanulla</i>	Club Spear-grass		V	08/08/2006	✓		Across the north of SA it is restricted to gypsum soils surrounding saline lakes. The habitat varies from chenopod shrubland, and mixed-species grassland, through to grassland dominated by <i>Austrostipa nullanulla</i> . On the Eyre Peninsula, it has been recorded growing in association with <i>Acacia rigens</i> (Nealie), <i>Allocasuarina helmsii</i> (Helm's Oak-bush) and an understorey of <i>Zygophyllum auranthiacum</i> (Shrubby Twinleaf), <i>Enneapogon</i> sp. (Bottle-washers) and small Compositae sp. It has been recorded by Badman (2006) in the J-A area.	No	Unlikely
<i>Austrostipa vickeryana</i>	Vickery's Spear-grass		R	10/10/1998	✓		Occurs within the Nullarbor and Gairdner-Torrens Basin regions, within inland saline areas.	No	Unlikely
<i>Corynotheca licrota</i>	Sand Lily		R	9/10/1987	✓		Grows on sand ridges in association with <i>Triodia</i> and mallee communities. Stems emerge annually from tuberous rootstock	No	Possible

Scientific name	Common name	Conservation status		Last BDBSA sighting	BDBSA (50 km buffer)	EPBC Protected Matters Search	Location/habitat preference	Species detected within the study area during the 2014 survey	Likelihood of occurrence within study area
		Aus	SA						
<i>Daviesia benthamii</i> ssp. <i>humilis</i>	Mallee Bitter-pea		R	05/10/1987	✓		Dune swales, associated with mallee habitats	No	Unlikely
<i>Eremophila hillii</i>	Hill's Emubush		R	30/09/1987	✓		Red Brown dunes with limestone under base, slopes of dunes and upper swales	No	Possible
<i>Frankenia cinerea</i>			R	23/08/2005	✓		Saltpans and adjacent areas Recorded by Badman (2006) in J-A area	No	Unlikely
<i>Gratwickia monochaeta</i>			R	08/08/2006	✓		Found on various sites but usually in sand; apparently uncommon. Recorded by Badman (2006) in J-A area.	Yes	Present
<i>Hibbertia crispula</i>	Ooldea Guinea-flower	VU	V	09/10/1987	✓	✓	Known from only two disjunct locations, the Lake Everard region and the Ooldea region of South Australia. EBS has previously recorded this species south of Ooldea on the top of large dune crests amongst Acacia shrubs and Spinifex, with Mallee and Spinifex in the surrounding swales.	No	Likely
<i>Maireana suaedifolia</i>	Lax Bluebush		R	28/05/2010	✓		Sand dunes and swales adjacent to saltpans	No	Possible
<i>Melaleuca leiocarpa</i>	Pungent Honey-myrtle		R	09/09/2005	✓		Sand dunes in association with <i>Eucalyptus yumbarrana</i> , Spinifex and Dodonaea.	Yes	Present
<i>Santalum spicatum</i>	Sandalwood		V	11/04/2012	✓		A root parasite on many species, commonly <i>Acacia</i> species such as <i>A. acuminata</i> (Jam) and <i>A. aneura</i> (Mulga). It grows on a wide range	No (However, known to be present	Present

Scientific name	Common name	Conservation status		Last BDBSA sighting	BDBSA (50 km buffer)	EPBC Protected Matters Search	Location/habitat preference	Species detected within the study area during the 2014 survey	Likelihood of occurrence within study area
		Aus	SA						
							of soils including calcareous and solonised types in drier parts of its range. Scattered around the study area. Recorded by Badman (2006) in the JA area.	from previous records)	
Birds									
<i>Acanthiza iredalei</i> ssp. <i>iredalei</i>	Slender-billed Thornbill (western ssp)		^R	24/09/1984	✓	✓	Prefers chenopod shrublands dominated by Samphire or <i>Maireana</i> spp. (Bluebush) and <i>Atriplex</i> spp. (Saltbush).	No	Possible
<i>Amytornis striatus</i>	Striated Grasswren		R	26/03/1909	✓		Confined to areas with mature spinifex (<i>Triodia</i> sp.), usually in association with mallee eucalypts and sandy soils. Usually occupies vegetation with a post fire age of 6 to 30 years	No	Possible
<i>Apus pacificus</i>	Fork-tailed Swift	Mi, Ma				✓	Mostly occurring over inland plains but sometimes above foothills or in coastal areas. These tend to be being dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh treeless grassland and sand plains covered with Spinifex, open farmland and inland and coastal sand-dunes	No	Possible – fly over
<i>Ardea alba</i>	Cattle Egret	Mi, Ma	R			✓	Grasslands, woodlands and wetlands with a preference for moist areas with tall grass, or shallow open wetlands, and wetland margins.	No	Unlikely

Scientific name	Common name	Conservation status		Last BDBSA sighting	BDBSA (50 km buffer)	EPBC Protected Matters Search	Location/habitat preference	Species detected within the study area during the 2014 survey	Likelihood of occurrence within study area
		Aus	SA						
<i>Ardeotis australis</i>	Australian Bustard		V	10/04/2012	✓		Found on dry plains, grasslands and in open woodland. The species is highly nomadic and apparently moves in response to rainfall.	Yes	Present
<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo		R	16/04/2009	✓		Sporadically distributed across the arid and semi-arid interior of Australia, in a wide range of habitats including grassland, gibber, saltbush, mulga, casuarinas, and mallee woodlands, as well as tree-lined watercourses. Will use artificial water sources.	No	Likely
<i>Charadrius veredus</i>	Oriental Plover, Oriental Dotterel	Mi, Ma				✓	In non-breeding grounds, they prefer coastal habitats such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands.	No	Unlikely
<i>Cinclosoma castanotus</i> ssp. <i>castanotus</i>	Chestnut Quail-thrush (eastern ssp)		^R	24/09/2009	✓		Suitable Chenopod/habitats available in survey area; confirmed previous observations at Ooldea (SKM 2006).	No	Unlikely
<i>Climacteris affinis</i>	White-browed Treecreeper		R	10/03/2005	✓		Occurring mostly in tall shrubland and low woodland dominated by acacias, such as Mulga, Western Myall and Gidgee, or Casuarinas, and Callitris.	No	Highly likely
<i>Leipoa ocellata</i>	Malleefowl	VU	V	27/09/2009	✓	✓	Occupies shrublands and low woodlands dominated by mallee vegetation. Habitat type includes Eucalypt or native pine Callitris	Yes	Possible (old mounds located within study)

Scientific name	Common name	Conservation status		Last BDBSA sighting	BDBSA (50 km buffer)	EPBC Protected Matters Search	Location/habitat preference	Species detected within the study area during the 2014 survey	Likelihood of occurrence within study area
		Aus	SA						
							woodlands, Acacia shrublands, Melaleuca uncinata vegetation or coastal heathlands. Active Malleefowl nests known from east of the study area (Moseby 2012).		area)
<i>Merops ornatus</i>	Rainbow Bee-eater	Mi, Ma		01/05/2011	✓	✓	Open woodlands and shrublands, including mallee, and in open forests that are usually dominated by eucalypts. It also occurs in grasslands, especially in arid or semi-arid areas, in riparian, floodplain or wetland vegetation assemblages. Widespread, transient and highly mobile.	Yes	Present
<i>Myiagra inquieta</i>	Restless Flycatcher		R	27/07/2000	✓		Open forests, woodlands, farmland and inland scrub. They can inhabit <i>Eucalyptus camaldulensis</i> , <i>E. leucoxylon</i> and box woodlands, and in open mallee (<i>E. oleosa</i> , <i>E. gracilis</i>) low woodland-low open forests.	Yes	Present
<i>Neophema splendida</i>	Scarlet-chested Parrot		R	1/08/2007	✓		Inhabits semi-arid areas with mallee and mulga scrublands/open woodlands with spinifex and saltbush ground covers. Occurs in both recently burnt and older growth mallee. Forages on or near the ground for seeds of grasses, including spinifex, herbs and acacias	Yes	Present

Scientific name	Common name	Conservation status		Last BDBSA sighting	BDBSA (50 km buffer)	EPBC Protected Matters Search	Location/habitat preference	Species detected within the study area during the 2014 survey	Likelihood of occurrence within study area
		Aus	SA						
<i>Northiella haematogaster</i> ssp. <i>narethae</i>	Naretha Bluebonnet		^R	06/04/2006	✓		Usually found in or within sight of Casuarina and Acacia woodland, and usually near Chenopod shrubland. They are often far from water. They nest in tree hollows, and eat the seeds of both native and exotic plants	No	Unlikely
<i>Pachycephala inornata</i>	Gilbert's Whistler		R	15/04/2009	✓		Occurs in ranges, plains and foothills in arid and semi-arid timbered habitats. Generally found in Mallee shrublands, often in association with an understorey of spinifex and low shrubs including acacias, hakeas and Senna. Forages on or near the ground.	No	Possible
<i>Pandion haliaetus</i>	Osprey	Ma	E			✓	Occurs in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes.	No	Unlikely
Mammals									
<i>Notoryctes typhlops</i>	Southern Marsupial Mole (Itjaritjari)	EN	V	03/04/2001	✓	✓	Often recorded in sandy dunes, mulga, saltbush and spinifex on sand ridge desert and with various	Yes	Present

Scientific name	Common name	Conservation status		Last BDBSA sighting	BDBSA (50 km buffer)	EPBC Protected Matters Search	Location/habitat preference	Species detected within the study area during the 2014 survey	Likelihood of occurrence within study area
		Aus	SA						
							Acacias and other shrubs (EBS 2009d).		
<i>Sminthopsis psammophila</i>	Sandhill Dunnart	EN	E	27/05/2012	✓	✓	Prefers semi-arid habitats characterised by parallel sand dunes with associations of open mallee with a diverse shrub layer and Spinifex (<i>Triodia</i> spp.).	Yes	Present
Reptiles									
<i>Neelaps bimaculatus</i>	Western Black-naped Snake		R	08/11/2005	✓		Prefers leaf litter within Mallee and Mallee/Myall sand dune associations. Two <i>N. bimaculatus</i> were recorded at a fauna site in 2005. The fauna trapping site was located within the southern section of the study area in 2005 (SKM 2005).	No (However, known to be present from previous records)	Present
<i>Varanus brevicauda</i>	Short-tailed Pygmy Goanna		R	02/06/2010	✓		Desert sand plains and dunes with spinifex. Shelters in burrows at the base of Spinifex hummocks. Restricted to the northern section of the Great Victorian Desert towards the WA border. <i>Note: The 2010 record from near Ooldea is highly likely to have been an incorrect identification based on discussions with the South Australia Museum (M. Hutchinson, pers. comm., 2012)</i>	No	Not likely

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). **SA:** South Australia (*National Parks and Wildlife Act 1972*). **Conservation Codes:** **CE:** Critically Endangered. **EN/E:** Endangered. **VU/V:** Vulnerable. **R:** Rare. **Mi:** Migratory. **Ma:** Marine.

^ It is uncertain whether these records are of the threatened sub-species due to range overlaps.

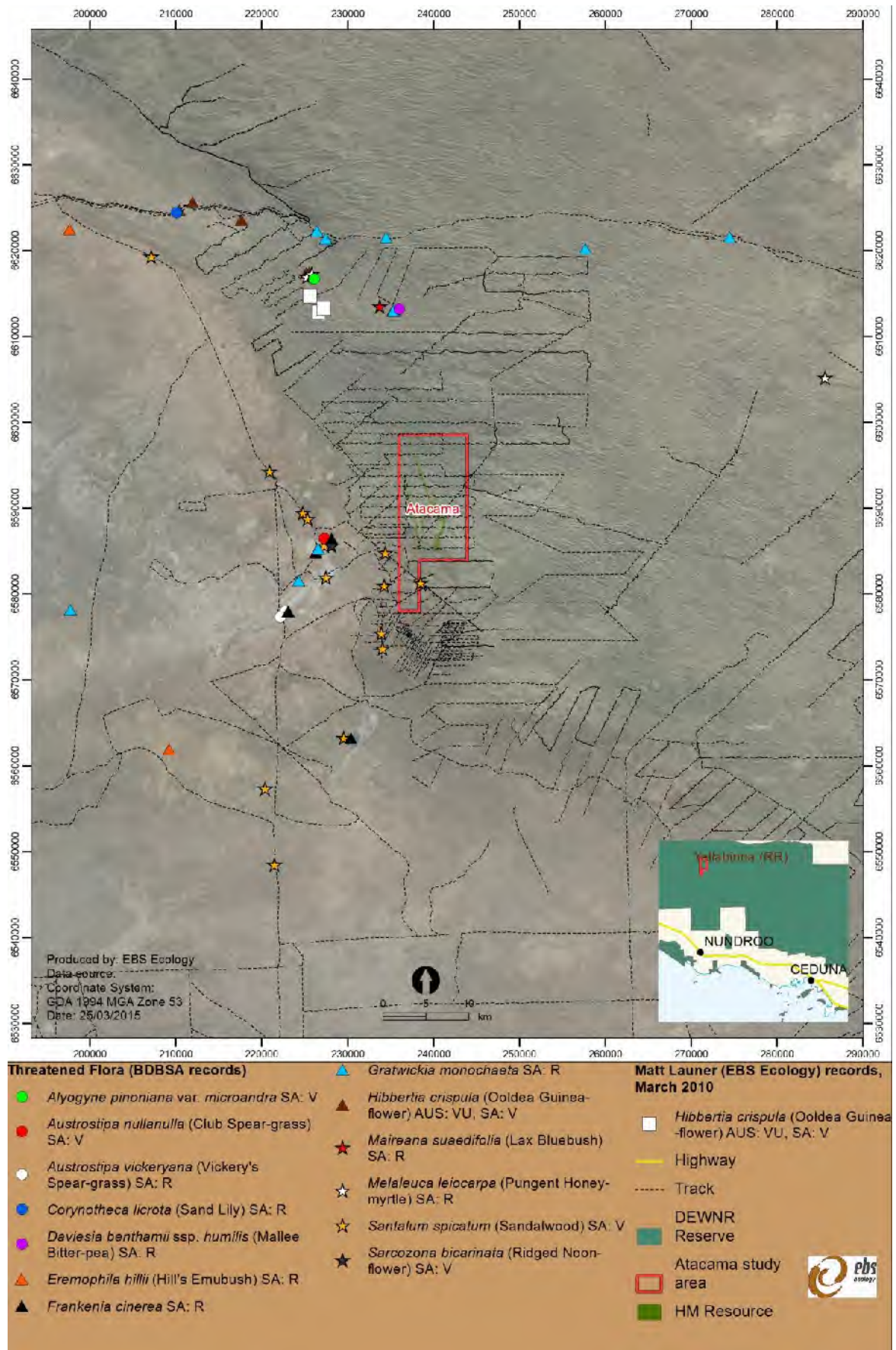


Figure 7. Threatened flora records within a 50 km radius of the study area (DEWNR 2014).

Note: The figure only includes past records from the BDBSA and known surveys prior to the 2014 EBS survey.

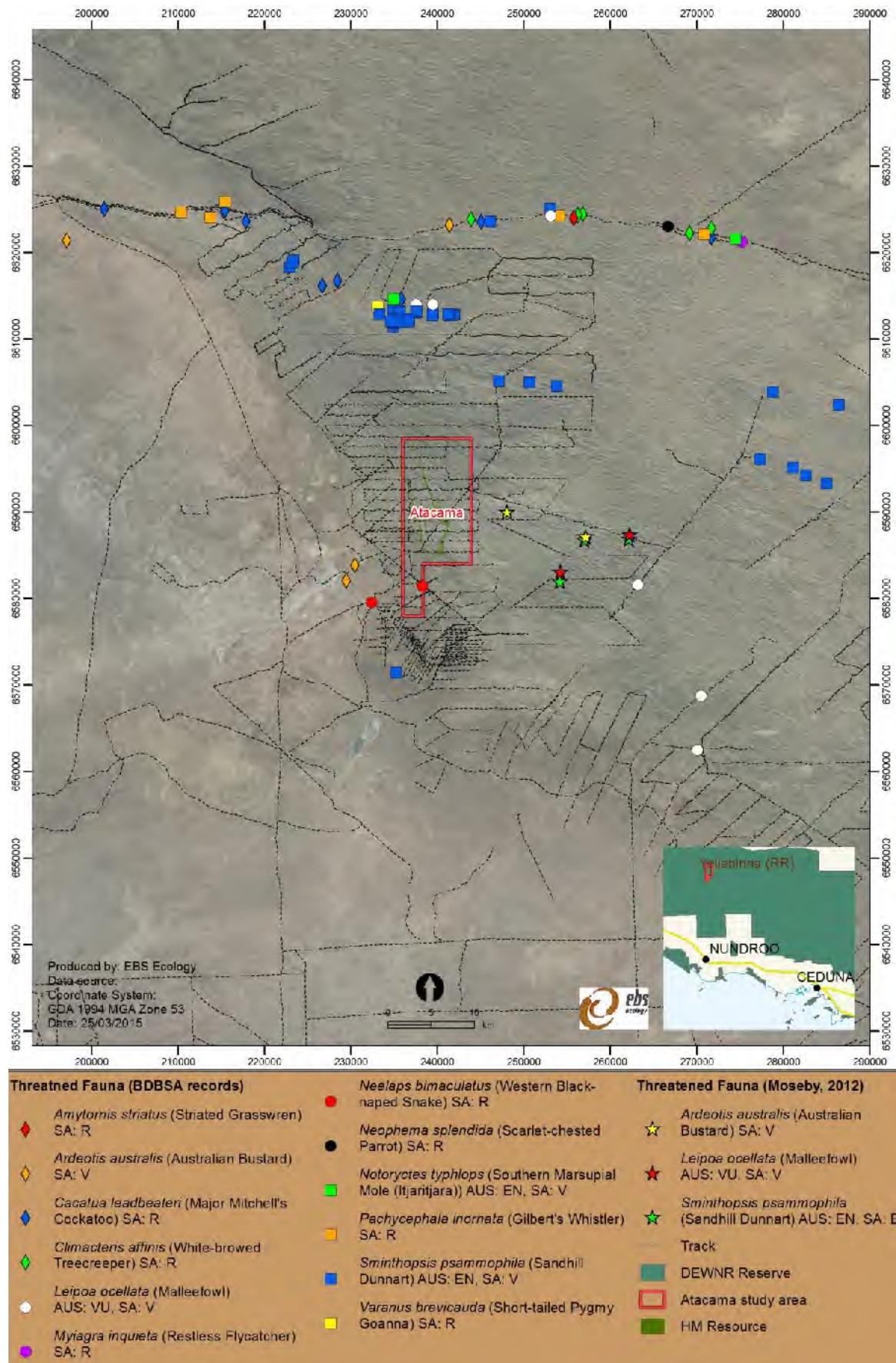


Figure 8. Threatened fauna records within a 50 km radius of the study area (DEWNR 2014).

Note: The figure only includes past records from the BDBSA and known surveys prior to the 2014 EBS survey.

3.6.3 Threatened ecological communities

Threatened ecological communities are recognised under the EPBC Act. Based on the EPBC Protected Matters Search results (DOE 2013b) no nationally threatened ecological communities are known to occur within the study area.

3.7 Economic and cultural significance

One flora species of economic significance was recorded during the field survey; *Santalum spicatum* (Sandalwood). The monetary value of this species is increasing; in 2014 Sandalwood oil was valued at \$4,500 per kilogram (ABC 2014) while the timber was trading at \$16,000 per metric tonne (WA Sandalwood Plantation 2014). The value of this species is driven by the versatility of its products as well as by its present scarcity and regulatory controls on its removal (Bonney 1997).

There were several plants identified during the field survey that possess cultural significance (Table 5). The significance of these species lies in their use by indigenous people within the arid region (Latz 1995).

Table 5. Culturally significant plants identified during the survey.

Species name	Common name	Use
<i>Acacia ligulata</i>	Umbrella Bush	Ash, medicine, mythology. Portion used for food – seeds, grubs and gum.
<i>Acacia oswaldii</i>	Umbrella Wattle	Artifacts. Portion used for food – seeds.
<i>Cynanchum floribundum</i>	Desert Cynanchum	Portion used for food – fruit and greens.
<i>Dodonaea viscosa</i> ssp. <i>angustissima</i>	Narrow-leaf Hop-bush	Medicine.
<i>Enchylaena tomentosa</i> var.	Ruby Saltbush	Decoration. Portion used for food – fruit.
<i>Eremophila alternifolia</i>	Narrow-leaf Emubush	Medicine.
<i>Eremophila paisleyi</i> ssp. <i>paisleyi</i>		Medicine.
<i>Grevillea juncifolia</i> ssp. <i>juncifolia</i>	Honeysuckle Grevillea	Medicine. Portion used for food – honey.
<i>Grevillea stenobotrya</i>	Rattle-pod Grevillea	Ash, medicine, miscellaneous. Portion used for food – seeds.
<i>Nicotiana velutina</i>	Velvet Tobacco	Narcotic.
<i>Pimelea microcephala</i> ssp.	Shrubby Riceflower	Medicine.
<i>Santalum acuminatum</i>	Quandong	Artefact, mythology, water. Portion used for food – fruit and seeds.
<i>Senna artemisioides</i> ssp.		Medicine
<i>Solanum coactiliferum</i>	Tomato-bush	Portion used for food – fruit. Mythology.
<i>Thysanotus exiliflorus</i>	Inland Fringe-lily	Decoration, medicine, water.
<i>Triodia basedowii</i>	Hard Spinifex	Adhesive, medicine, miscellaneous, shelter construction.
<i>Zygophyllum</i> sp.	Twingleaf	Portion used for food – grubs. Cooking.

4 FIELD SURVEY OBJECTIVES

The objectives of the field survey for the Atacama project were to:

- confirm the type and condition of vegetation associations and habitats present
- obtain a more comprehensive and finer scale baseline of flora and fauna present, including conservation significant species and declared weeds
- assess known issues of conservation significance and habitat suitability for threatened species
- assess areas potentially qualifying as a threatened ecological community
- identify potential issues for the project (e.g. impact on matters of national significance; vegetation clearance seriously at variance with the Principles of the *Native Vegetation Act 1991*), identify the need for targeted survey of particular species/vegetation communities at risk
- collate additional information to support a referral under the *Environment Protection and Biodiversity Conservation Act 1999*.

The information gained in the Pre Feasibility Study (PFS) baseline investigation will be used to inform project development and further studies as may be required during the Definitive Feasibility Stage (DFS).

5 FIELD SURVEY METHODS

5.1 Flora survey

5.1.1 Vegetation association and condition mapping

General observations of vegetation associations present within the site were recorded and mapped during the survey. Changes in vegetation associations were recorded along the main access tracks using a GPS. The condition (SEB ratio) of the vegetation associations were recorded based on the criteria set out in Table 6. A complete species list was compiled for each separate vegetation association. Representative photos were taken of each vegetation association.

5.1.2 Ramble survey

Flora survey methodology was approached in a manner to record the maximum number of flora species present while also giving the best chance to locate species which are listed as threatened or protected under relevant state and federal legislation. This survey used a ramble methodology whereby driving along the maximum number of exploration tracks within the study area gives the best chance of encountering all vascular plant species.

This methodology requires that surveyors are particularly skilled in observing flora species whilst moving through an area and have the ability to discern the variation in communities present. This method also relies on the desktop background assessment of the survey area in order to target communities for specific habitats required by target species.

5.1.3 Weed arc survey

Set points for surveys were determined during the survey which can be used as baseline / control points in the future. These were undertaken as points where a 50 m 'weed arc' was searched on each side of the track from the centre point. This essentially provides a full circle with the point in the centre and a 50 m radius. Weeds recorded within these arcs were recorded as a number of individuals or as a cover/abundance estimate. Sites were selected to give a good spatial sample of the study area.

Table 6. SEB ratios used to rate condition of vegetation communities.

Condition	SEB ratio	% total indigenous cover	Overstorey condition description	Understorey condition description	Indicators	NVC Interim Policy (1.2.11)
Very Poor	0:1	<10%	No overstorey stratum remaining.	Complete destruction of indigenous understorey* (by grazing &/or introduced plants).	Vegetation structure no longer intact (e.g. removal of one or more vegetation strata). Scope for regeneration, but not to a state approaching good condition without intensive management. Dominated by very aggressive weeds. Partial or extensive clearing (> 50% of area). Evidence of heavy grazing (tracks, browse lines, species changes, complete depletion of soil surface crust).	Where proposed clearance is considered to be minor and of limited biodiversity impact, e.g. lopping of overhanging limbs only or minor clearance of shrubs in areas otherwise considered as highly disturbed.
	1:1	10-19%	Scattered trees in poor health and/or representing an immature stand.	Almost complete destruction of indigenous understorey* (by grazing &/or introduced plants) - reduced to scattered clumps and individual plants.		Where proposed clearance is in areas dominated by introduced species, the area of native vegetation is largely reduced to scattered trees, indigenous understorey reduced to scattered clumps and individual plants.
	2:1	20-29%	Scattered trees either immature in good health, or mature in poor/moderate health. Alternatively, the dominant overstorey stratum is largely intact and an immature stand (or regrowth), and is generally in poor health.			
Poor	3:1	30-39%	Dominant overstorey stratum is largely intact and a moderately healthy mature stand.	Heavy loss of native plant species (by grazing &/or introduced plants). The understorey* consists predominately of alien species, although a small number of natives persist.	Vegetation structure substantially altered (e.g. one or more vegetation strata depleted). Retains basic vegetation structure or the ability to regenerate it. Very obvious signs of long-term or severe disturbance. Weed dominated with some very aggressive weeds. Partial clearing (10 – 50% of area). Evidence of moderate grazing (tracks, browse lines, soil surface crust extensively broken).	Where the proposed clearance is of mostly intact overstorey vegetation but there is still considerable weed infestation amongst the understorey flora
	4:1	40-49%	Dominant overstorey stratum is largely intact and is a healthy mature stand with high wildlife habitat value (e.g. hollows).			
Moderate	5:1	50-59%	Dominant overstorey stratum is largely intact – any condition+	Moderate loss of native understorey diversity. Weed-free areas small. Substantial invasion of aliens resulting in significant competition, but native understorey* persists; for example, may be a low proportion of native species and a high native cover, or a high proportion of native species and low native cover.	Vegetation structure altered (e.g. one or more vegetation strata depleted). Most seed sources available to regenerate original structure. Obvious signs of disturbance (e.g. tracks, bare ground). Minor clearing (<10% of area). Considerable weed infestation with some aggressive	

Condition	SEB ratio	% total indigenous cover	Overstorey condition description	Understorey condition description	Indicators	NVC Interim Policy (1.2.11)
	6:1	60-69%	Dominant overstorey stratum is largely intact – any condition+	Moderate but not severe weed infestation amongst the understorey flora.	weeds. Evidence of some grazing (tracks, soil surface crust patchy).	Where the proposed clearance is of mostly intact overstorey vegetation with moderate but not severe weed infestation amongst the understorey flora. Clearance is not seriously at variance with the Principles.
Good	7:1	70-79%	Original overstorey stratum is still dominant and intact – any condition+	Understorey only slightly modified. High proportion of native species and native cover in the understorey*; reasonable representation of probable pre-European vegetation.	Vegetation structure intact (e.g. all strata intact). Disturbance minor, only affecting individual species. Only non-aggressive weeds present. Some litter build-up.	
	8:1	80-89%	Original overstorey stratum is still dominant and intact – any condition+	Understorey only slightly modified. High proportion of native species and native cover in the understorey*; reasonable representation of probable pre-European vegetation.		Where the proposed clearance is of mostly intact overstorey and understorey vegetation, weed infestation is moderate to low, but the original vegetation is still dominant. Clearance is assessed by the Native Vegetation Council to be at variance with the Principles.
Excellent	9:1	> 89%	Original vegetation is still dominant and intact. Overstorey individuals in good condition and represent a mature stand.	Diverse vegetation with very little weed infestation. Understorey largely undisturbed, minimal loss of plant species diversity. Very little or no sign of alien vegetation in the understorey*; resembles probable pre-European condition.	All strata intact and botanical composition close to original. Little or no signs of disturbance. Little or no weed infestation. Soil surface crust intact. Substantial litter cover.	
	10:1		Original vegetation is still dominant and intact. Overstorey individuals in good condition and represent a mature stand, with high habitat value (e.g. hollows).			Where the proposed clearance is of diverse vegetation with very little weed infestation. Clearance is assessed by the Native Vegetation Council to be seriously at variance with the Principles.

*Or all strata if the upper and lower strata are difficult to distinguish

+ Ratio assessment will largely depend upon condition of understorey associated with an intact overstorey stratum.

Adapted from *Guide to Roadside Vegetation Survey Methodology for South Australia* (Stokes et al. 1998) and *Guidelines for Native Vegetation Significant Environmental Benefit Policy* (DWLBC 2005).

5.2 Fauna

Eight fauna trapping sites were established to record small mammal, reptile and frog diversity. Each individual site consisted of two lines of six pitfall traps, four funnel traps per line, 15 Elliott traps per line and two cage traps per line. The two individual lines were separated by approximately 100 m but were located within the same vegetation association and landscape. All traps were removed after the trapping period. Detailed descriptions of each trapping method are provided below.

5.2.1 Pitfall trapping

Pitfall trapping was conducted using the method outlined in *Guidelines for Vertebrate Surveys in South Australia* (Owens 2000). Each trap line consisted of two lines of six pitfall traps (225 mm diameter, 600 mm deep), placed at 10 m intervals. Pitfalls were buried vertically so that the upper lip was level with the ground surface (Figure 9). The large size pitfalls were used to prevent larger mammal species such as the Sandhill Dunnart (*Sminthopsis psammophila*) and Mitchell's Hopping-mouse (*Notomys mitchellii*) from escaping.

Each pitfall was connected by a continuous 400 mm high aluminium screen mesh fence with the bottom edge buried to a depth of approximately 100 mm to deter animals from digging to pass under, and to encourage ground-dwelling fauna to move along the drift fence and fall into the pitfalls. Two cardboard toilet rolls and approximately 40 mm of sand were placed in bottom of each of the pitfalls to offer protection and warmth to trapped fauna. The drift fence was held upright with the aid of metal pins, and was maintained morning and night to repair any damage caused by strong winds or other disturbance. The pitfall traps were left open for five nights at each site. All traps were checked each day, in the early morning and in the late afternoon before sunset.



Figure 9. Pitfall trap with drift fence.

5.2.2 Elliot trapping

Fifteen Elliott traps (Elliott Scientific, Upwey Vic.; type A, 330 mm long, 100 mm high, 90 mm wide, treadle plate operated) (Figure 10) were placed at approximately 10 m intervals forming a line on the side of each pitfall trapline. A small bolus of bait (mixture of peanut butter and rolled oats) was placed in the rear end of all Elliott traps behind the treadle plate to attract animals to enter. Elliott traps were left open for five nights at each site. All Elliott traps were closed during the day, to prevent deaths in traps and/or heat exhaustion on any possible fauna captured during the hottest part of the day.



Figure 10. Elliot trap.

5.2.3 Cage trapping

Each trap line had one cage trap (Sheffield Wire Products, Welshpool, Western Australia, 550 mm long, 220 mm wide, 220 mm high, trip plate mechanism) (see Figure 11) placed approximately 10 m from each end (two cage traps per line). All cages were baited with rolled oats and peanut butter, where possible placed next to shrubs, and had a hessian bag placed over the back-third to provide additional shade. Cage traps were left open for five nights at each site. All cage traps were closed during the day, to prevent deaths in traps and/or heat exhaustion on any possible fauna captured during the hottest part of the day.



Figure 11. Cage trap.

5.2.4 Funnel trapping

Eight funnel traps (WA Poultry, Sheffield, Western Australia; 770 mm long, 170 mm wide, 170 mm high) were used at each fauna trapping site. Two funnel traps were placed along the drift fence, approximately 5 m from the ends of the outer pitfall lines (Figure 12). Funnel traps were not baited. Two hessian bags were placed over the funnel traps to provide protection to trapped animals.



Figure 12. Funnel traps.

5.2.5 Bat call recording

A passive bat survey was conducted using AnaBat units (Titley Electronics, Ballina NSW) to record bat ultrasonic echolocation calls (Figure 13). A single AnaBat detector was set up at each of the eight fauna trapping sites for one night.

Recorded bat echolocation calls were analysed by Dennis Matthews (sub-consultant) using Ana view software. Dennis viewed the unique pulse rates and frequency characteristics, and used his extensive knowledge of the bats of South Australia to identify the calls to species level where possible.



Figure 13. AnaBat unit.

5.2.6 Harp net trapping

A three bank harp trap (Figure 14) was set up at four locations, HARP1, HARP2, HARP3 and HARP4. Each site was trapped for one night. A harp trap is a device used to capture bats. The bats fly into the trap strings and drop unharmed into a large collection bag. The harp trap was set in locations across suitable bat flyways in wooded areas and at suitable roost entrances (small hollows in mallee trees). The harp trap was set up on dusk and checked for bats before first light the following mornings.



Figure 14. Harp trap.

5.2.7 Southern Marsupial Mole trenching

Twenty sites (60 trenches) were surveyed for the presence of the Southern Marsupial Mole using the trench survey technique developed by Joe Benshemesh (Benshemesh 2005a). Surveying for Southern Marsupial Moles involves digging trenches to expose a vertical wall of sand, allowing the wall to thoroughly dry, and then inspecting the wall for old tunnels of the moles. These tunnels or 'moleholes' are backfilled with sand and appear as circular or oval shaped outlines. Joe Benshemesh was consulted prior to the targeted Southern Marsupial Mole survey to assist in the survey design and to ensure that the survey effort was adequate based on the location and size of the study area.

Trench preparation and drying time

Each site consisted of three separate trenches. One trench was placed at three levels on a dune: near the crest (within 10m); midslope (about a third to half way down from crest); and base of dune (where the vegetation changes and the slope levels off). Trenches were placed with their longest side facing north in order to maximise sunlight on their most southern side (i.e. the north facing wall). The minimum size of each trench was 1200 mm long by 800 mm deep and 500 mm wide. Each trench was excavated using

shovels. The surface on the southern (north facing) wall was made vertical and as smooth as possible by using a combination of rubbing by hand and a wooden trowel. A fauna escape ramp was then excavated on the northern wall (Figure 15). The excavation of the ramp also aided in increasing sunlight onto the southern wall of the trench.

Trenches were left to dry for a minimum of 4 days before they were inspected for signs of backfilled tunnels. Benshemesh (2005a) recommends that trenches are to dry for 3-5 days prior to inspection. This timeframe is dependent on soil moisture and ambient conditions. Refer to Appendix 6 for individual trench drying times.

Detecting and measuring backfilled tunnels

Each north facing wall was carefully inspected for back filled tunnels. This involved lightly rubbing the surface and using handfuls of dry sand to lightly cover the face of the wall. A series of measurements were recorded when backfilled tunnels were located, they included:

- The minimum and maximum diameter of each molehole.
- The angle of the long axis of the molehole from the vertical.
- Depth of the molehole, measured from the surface to the middle of the molehole.
- The distance from the left edge of the trench face to the molehole. This measure is useful for statistical reasons.

A series of subjective scores was also recorded for each molehole including hole clarity, approximate age, surveyor confidence and tap test (lightly tapping the sand near the molehole and tapping the sand within the molehole to assess the difference of soil compaction between the two). All trenches were carefully backfilled once the surveyor had finished the inspection and measurements. Benshemesh (2005a) provides further details on the trenching methodology used by EBS Ecology.



Figure 15. Trench (note: vertical wall in background and fauna escape ramp in foreground).

5.2.8 Bird survey

A total of 14 bird surveys were undertaken, with eight surveys conducted at the fauna trapping sites as well as six additional sites. Bird surveys were undertaken using a point-count technique for 30 minutes per site in the morning and 30 minutes per site in the afternoon. This methodology was used to obtain an understanding of types of birds using the study area at different times of the day. The use of a portable hand-held MP3 player and speaker to encourage species to call back to the observer, were used where practical, to allow for confirmed identification.

5.2.9 Aerial survey

Aerial surveys for existence of Malleefowl or their breeding mounds within the study area were undertaken over a two day period in September 2014. Transects were flown in north-west to south-east trajectory using a helicopter with up to five spotters on each day (Figure 18). The characteristic linear dune system was used as a method of reference for the direction of the flight, due to their prominence in the landscape, allowing for ease in navigation and limiting any cross over points. Handheld Garmin GPSmap 62s were used to track the flight, as well as maintaining the survey within the project boundary. Dunes were traversed along the top spine, which offered a clear view of the tops of the dunes as well as providing views into the adjoining swales. Flight data obtained from GPS units indicated that speeds during the survey were at an average of 132 km/h at an average altitude of 98 m. The two flights resulted in over 278 linear kilometres within the study area being covered. Mounds spotted from the helicopter were then marked with a GPS as well as a photograph taken. Mounds were then visited on foot to attain confirmation of a mound being a Malleefowl mound, as well as its status (active or not active).

5.2.10 Wildlife surveillance camera

Two surveillance cameras were employed at six targeted sites within the study area in an effort of photographing elusive fauna species which may not be detected by conventional trapping methods. Cameras were installed on star pickets or tree trunks at a height between 0.3 m and 1.2 m. Cameras were installed at sites for a minimum of a 48 hour period, allowing for diurnal and nocturnal species to be observed. All photographs obtained were examined for species identification.



Figure 16. Surveillance camera at WSC5.

5.2.11 Spotlighting

Spotlighting was conducted at two locations, near sites HARP2 and ATA005, on two separate nights during the survey. The location of the sites is shown in Figure 17. Five observers walked the areas using hand-held spotlights and head torches. Each survey began approximately one hour after sunset and generally lasted two hours. Species and number of individuals observed was recorded.

5.2.12 Active searching

A minimum of two hours of active searching was undertaken at each of the eight fauna trapping sites. This involved at least two surveyors scanning the site for signs of animals (e.g. tracks, nests, scats, diggings and burrows) and for species not readily trapped such as Southern Marsupial Mole and the introduced Cat and Fox.

5.2.13 Opportunistic observations

The recording of opportunistic observations was generally restricted to threatened species, species not readily trapped or species not frequently observed within the study area such as Red Kangaroos (*Macropus rufus*) and Western Grey Kangaroos (*Macropus fuliginosus*). A GPS coordinate was taken for each opportunistic record.

6 GENERAL RESULTS

6.1 Weather observations

Weather data was obtained from the Tarcoola Aero, an official Bureau of Meteorology site which provided temperature, rainfall, relative humidity, wind direction and wind speed for the duration of the survey (Commonwealth of Australia 2014). Weather data recorded at Tarcoola during the biological survey (23 September to 1 October 2014) is provided in Table 7 and data for the duration of the targeted Southern Marsupial Mole survey (26 November to 4 December 2014) is provided in Table 8.

Daytime temperatures ranged from 22.1°C to 34.9°C during the biological survey, with overnight temperatures of between 6.9°C to 21.6°C. The wind was quite variable for the extent of the survey and was generally moderate to strong. No rainfall was recorded during the biological survey.

Daytime temperatures ranged from 30.9°C to 38.9°C during the targeted Southern Marsupial Mole survey, with overnight temperatures of between 11.8°C to 25.1°C. Winds were moderate to strong and predominantly from the north for the extent of the targeted Southern Marsupial Mole survey. There was rain recorded at Tarcoola on 3 December and 4 December, however no rain was recorded at the Atacama study area during those days.

Table 7. Weather data recorded at Tarcoola Aero weather station during the biological survey period.

Date	Min temp.	Max temp	Rain	Time	Temp.	Rel. Humid.	Wind direction	Wind speed
	°C		mm		°C	%		Km/h
23/09/2014	14.5	28.3	0	9am	22.2	30	NE	31
				3pm	24.1	22	NW	28
24/09/2014	10.3	27	0	9am	16	71	SW	22
				3pm	25.1	28	SW	24
25/09/2014	11.1	22.1	0	9am	13.8	69	SSW	17
				3pm	20.8	35	SW	20
26/09/2014	9.1	29	0	9am	17.3	44	ENE	17
				3pm	27.6	19	WNW	17
27/09/2014	11.4	34.9	0	9am	24.8	22	NNE	28
				3pm	33.5	9	N	26
28/09/2014	21.6	33.3	0	9am	26.9	13	NNW	39
				3pm	33.1	15	WSW	26
29/09/2014	8.5	29.5	0	9am	17.3	56	ENE	17
				3pm	27.9	14	W	15
30/09/2014	10.7	29.9	0	9am	24.1	21	SSW	20
				3pm	28.7	21	SSW	28
1/10/2014	6.9	24.7	0	9am	16.1	52	SE	28
				3pm	23.7	22	SE	17

Table 8. Weather data recorded at Tarcoola Aero weather station during the targeted Southern Marsupial Mole survey period.

Date	Min temp.	Max temp	Rain	Time	Temp.	Rel. Humid.	Wind direction	Wind speed
	°C		mm		°C	%		Km/h
26/11/2014	11.8	32	0	9am	20.5	44	ESE	22
				3pm	30.4	15	SE	17
27/11/2014	18.3	34	0	9am	21.1	42	ESE	24
				3pm	31.6	13	S	9
28/11/2014	18.2	36.9	0	9am	25.2	31	E	24
				3pm	35.6	10	ESE	15
29/11/2014	25.1	38.5	0	9am	29.8	13	NE	22
				3pm	37.8	10	NW	24
30/11/2014	20.3	36.9	0	9am	22.9	64	WSW	13
				3pm	34.8	19	W	22
1/12/2014	13	36.4	0	9am	20.3	60	SSE	13
				3pm	33.2	14	NE	11
2/12/2014	19.8	38.9	0	9am	30.2	14	NE	24
				3pm	34.1	25	NE	28
3/12/2014	18.2	30.9	3.6	9am	19.9	77	WSW	28
				3pm	28.3	40	SW	20
4/12/2014	13.3	34.4	0.2	9am	18.3	63	SSE	15
				3pm	31.6	12	SW	20

6.2 Site locations

A total of eight fauna sites, 14 bird sites, 60 Southern Marsupial Mole trenches, six wildlife surveillance camera sites, four harp trap sites and five weed arc sites were selected within the study area. Sites were chosen to provide a cross section of the large spatial area; however the main priority of the placement of sites was to focus on the mineral deposits of Atacama. The locations of fauna sites and Southern Marsupial Mole trenches were also selected to gain an understanding of the distribution of Sandhill Dunnarts and Southern Marsupial Moles within the Atacama study area. Fauna site, bird survey, wildlife surveillance camera and harp trap locations are provided in Table 9 fauna site photographs are provided in Appendix 5.

Locations of the Southern Marsupial Mole trenches are provided in Table 10. All site locations are mapped in Figure 17.

Table 9. Locations of fauna and bird survey sites.

Location ID	Activity	Zone	Easting	Northing
ATA001a	Fauna site, bird survey	53J	241026	6598384
ATA001b	Fauna site, bird survey	53J	240966	6598375
ATA002a	Fauna site, bird survey	53J	236220	6597491
ATA002b	Fauna site, bird survey	53J	236234	6597308
ATA003a	Fauna site, bird survey	53J	237609	6596344
ATA003b	Fauna site, bird survey	53J	237582	6596275
ATA004a	Fauna site, bird survey	53J	239334	6595122
ATA004b	Fauna site, bird survey	53J	239258	6595073
ATA005a	Fauna site, bird survey	53J	241726	6591458
ATA005b	Fauna site, bird survey	53J	241609	6591480
ATA006a	Fauna site, bird survey	53J	239592	6590313
ATA006b	Fauna site, bird survey	53J	239512	6590263
ATA007a	Fauna site, bird survey	53J	239799	6587974
ATA007b	Fauna site, bird survey	53J	239853	6587933
ATA008a	Fauna site, bird survey	53J	237794	6586183
ATA008b	Fauna site, bird survey	53J	237819	6586121
ATA009	Bird survey	53J	240364	6586544
ATA010	Bird survey	53J	237926	6588937
ATA011	Bird survey	53J	236751	6589949
ATA012	Bird survey	53J	238995	6592667
ATA013	Bird survey	53J	240920	6589845
ATA014	Bird survey	53J	237077	6591381
WSC1	Wildlife surveillance camera	53J	239520	6587925
WSC2	Wildlife surveillance camera	53J	237794	6586183
WSC3	Wildlife surveillance camera	53J	241026	6598384
WSC4	Wildlife surveillance camera	53J	237117	6585400
WSC5	Wildlife surveillance camera	53J	241726	6591458
WSC6	Wildlife surveillance camera	53J	239592	6590313
HARP1	Bat survey	53J	241566	6591410
HARP2	Bat survey	53J	240554	6589040
HARP3	Bat survey	53J	237387	6588560
HARP4	Bat survey	53J	239810	6585380

Table 10. Locations of trench survey sites.

Location ID	Activity	Zone	Easting	Northing
SMM001a	Southern Marsupial Mole trenching	53J	240975	6598381
SMM001b	Southern Marsupial Mole trenching	53J	240964	6598423
SMM001c	Southern Marsupial Mole trenching	53J	240933	6598454
SMM002a	Southern Marsupial Mole trenching	53J	236076	6597414
SMM002b	Southern Marsupial Mole trenching	53J	236085	6597438
SMM002c	Southern Marsupial Mole trenching	53J	236105	6597469
SMM003a	Southern Marsupial Mole trenching	53J	240739	6596442
SMM003b	Southern Marsupial Mole trenching	53J	240739	6596458
SMM003c	Southern Marsupial Mole trenching	53J	240750	6596483

Location ID	Activity	Zone	Easting	Northing
SMM004a	Southern Marsupial Mole trenching	53J	237502	6596209
SMM004b	Southern Marsupial Mole trenching	53J	237538	6596230
SMM004c	Southern Marsupial Mole trenching	53J	237542	6596257
SMM005a	Southern Marsupial Mole trenching	53J	239432	6594971
SMM005b	Southern Marsupial Mole trenching	53J	239433	6595005
SMM005c	Southern Marsupial Mole trenching	53J	239437	6595041
SMM006a	Southern Marsupial Mole trenching	53J	243559	6592767
SMM006b	Southern Marsupial Mole trenching	53J	243537	6592675
SMM006c	Southern Marsupial Mole trenching	53J	243515	6592628
SMM007a	Southern Marsupial Mole trenching	53J	241248	6593760
SMM007b	Southern Marsupial Mole trenching	53J	241244	6593794
SMM007c	Southern Marsupial Mole trenching	53J	241250	6593833
SMM008a	Southern Marsupial Mole trenching	53J	238642	6593603
SMM008b	Southern Marsupial Mole trenching	53J	238660	6593613
SMM008c	Southern Marsupial Mole trenching	53J	238660	6593637
SMM009a	Southern Marsupial Mole trenching	53J	236621	6592936
SMM009b	Southern Marsupial Mole trenching	53J	236614	6592954
SMM009c	Southern Marsupial Mole trenching	53J	236604	6592974
SMM010a	Southern Marsupial Mole trenching	53J	241853	6591502
SMM010b	Southern Marsupial Mole trenching	53J	241832	6591485
SMM010c	Southern Marsupial Mole trenching	53J	241836	6591439
SMM011a	Southern Marsupial Mole trenching	53J	242074	6590163
SMM011b	Southern Marsupial Mole trenching	53J	242084	6590167
SMM011c	Southern Marsupial Mole trenching	53J	242095	6590188
SMM012a	Southern Marsupial Mole trenching	53J	240701	6589234
SMM012b	Southern Marsupial Mole trenching	53J	240701	6589246
SMM012c	Southern Marsupial Mole trenching	53J	240710	6589256
SMM013a	Southern Marsupial Mole trenching	53J	239602	6590319
SMM013b	Southern Marsupial Mole trenching	53J	239582	6590305
SMM013c	Southern Marsupial Mole trenching	53J	239575	6590284
SMM014a	Southern Marsupial Mole trenching	53J	237322	6590176
SMM014b	Southern Marsupial Mole trenching	53J	237336	6590192
SMM014c	Southern Marsupial Mole trenching	53J	237339	6590192
SMM015a	Southern Marsupial Mole trenching	53J	238645	6589084
SMM015b	Southern Marsupial Mole trenching	53J	238666	6589075
SMM015c	Southern Marsupial Mole trenching	53J	238668	6589089
SMM016a	Southern Marsupial Mole trenching	53J	239788	6587988
SMM016b	Southern Marsupial Mole trenching	53J	239788	6587969
SMM016c	Southern Marsupial Mole trenching	53J	239791	6587951
SMM017a	Southern Marsupial Mole trenching	53J	237968	6587765
SMM017b	Southern Marsupial Mole trenching	53J	237977	6587774
SMM017c	Southern Marsupial Mole trenching	53J	237980	6587778
SMM018a	Southern Marsupial Mole trenching	53J	242463	6587739
SMM018b	Southern Marsupial Mole trenching	53J	242481	6587749
SMM018c	Southern Marsupial Mole trenching	53J	242480	6587738

Location ID	Activity	Zone	Easting	Northing
SMM019a	Southern Marsupial Mole trenching	53J	240759	6586924
SMM019b	Southern Marsupial Mole trenching	53J	240755	6586908
SMM019c	Southern Marsupial Mole trenching	53J	240737	6586898
SMM020a	Southern Marsupial Mole trenching	53J	238157	6585966
SMM020b	Southern Marsupial Mole trenching	53J	238189	6585943
SMM020c	Southern Marsupial Mole trenching	53J	238218	6585942

Table 11. Location of weed arc surveys.

Location ID	Activity	Zone	Easting	Northing
Weed1	Weed arc survey	53J	241934	6592716
Weed2	Weed arc survey	53J	239180	6592587
Weed3	Weed arc survey	53J	243219	6589097
Weed4	Weed arc survey	53J	240601	6589035
Weed5	Weed arc survey	53J	238580	6586479

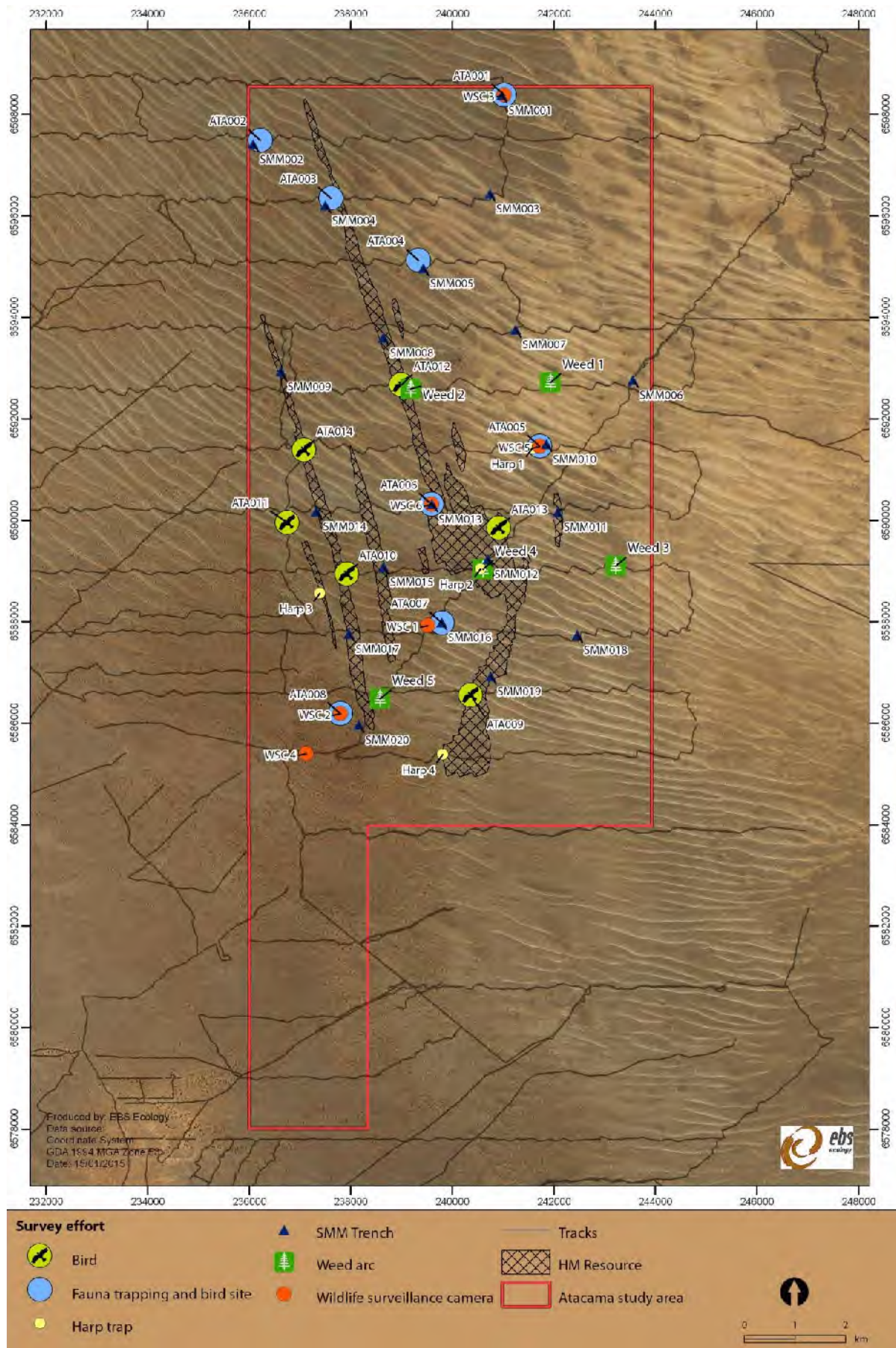


Figure 17. Locations of survey sites.

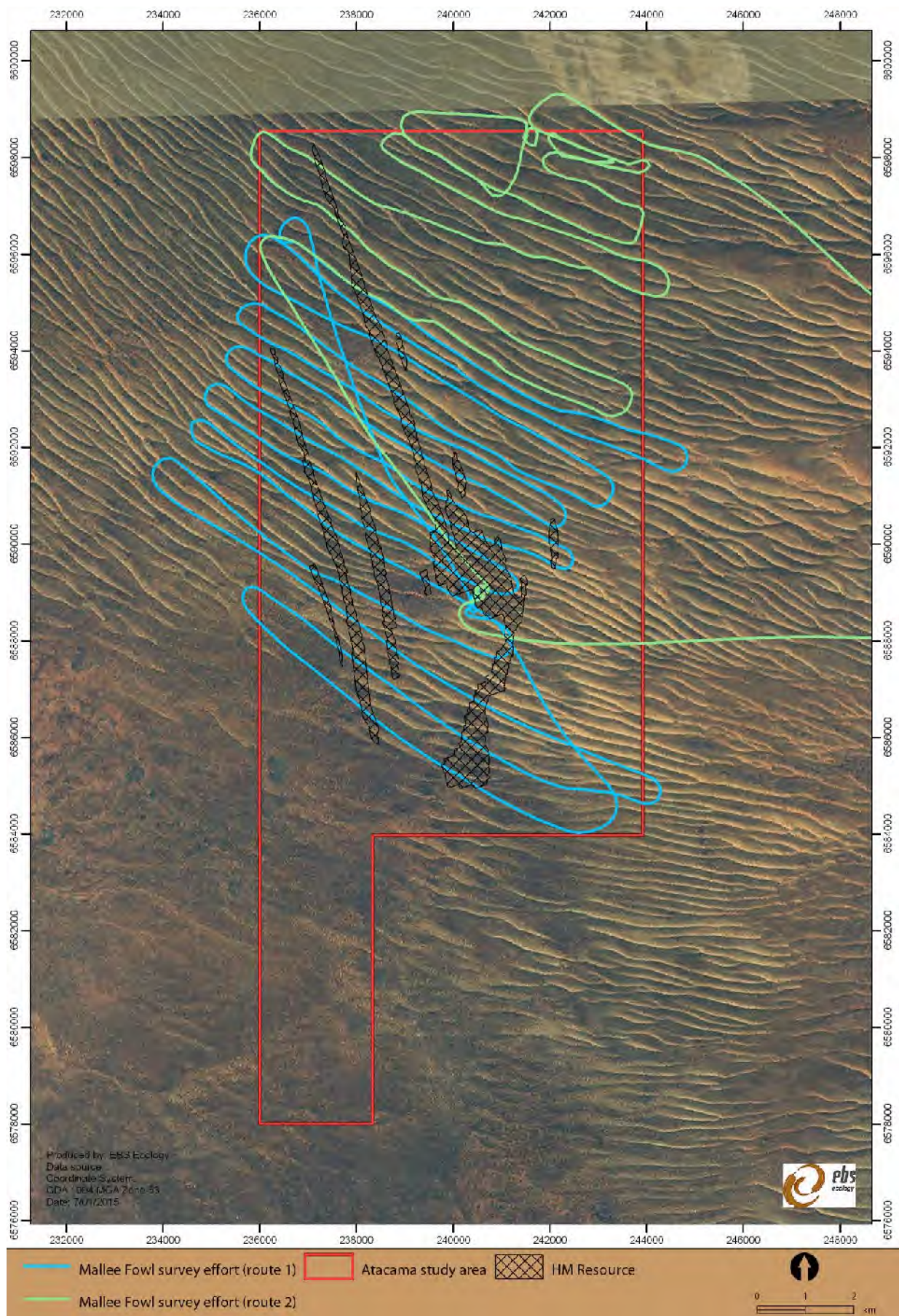


Figure 18. Aerial survey routes.

6.3 Survey effort

A total of 1710 trap nights (one trap night equates to one trap opened for one night) were completed at the eight fauna sites during the survey (Table 12). All sites were trapped for five consecutive nights, and trap effort was consistent across all sites.

Table 12. Survey effort.

Site	Total number of trap nights							Hours		
	Pitfall traps	Elliot traps	Cage traps	Funnel traps	Anabat detector	Harp trap	Wildlife surveillance camera	Bird survey (am/pm)	Active search	Spotlight
ATA001	60	150	20	40	1			1	2	
ATA002	60	150	20	40	1			1	2	
ATA003	60	150	20	40	1			1	2	
ATA004	60	150	20	40	1			1	2	
ATA005	60	150	20	40	1			1	2	
ATA006	60	150	20	40	1			1	2	
ATA007	60	150	20	40	1			1	2	
ATA008	60	150	20	40	1			1	2	
ATA009								1		
ATA010								1		
ATA011								1		
ATA012								1		
ATA013								1		
ATA014								1		
WSC1							4			
WSC2							4			
WSC3							4			
WSC4							4			
WSC5							4			
WSC6							4			
HARP1						1				
HARP2						1				10
HARP3						1				
HARP4						1				
Totals	480	750	160	320	8	4	24	14	16	

7 FLORA RESULTS

7.1 General results

The results of the survey culminated with over 235 individual points recorded. These were a combination of weed species points, threatened species observations, vegetation association ground truthing points and other points of interest such as priority habitat zones.

There were a total of 136 flora species from 32 families observed within the study area, this included 133 native species and three weed species (Appendix 3). Some of these were recorded as individual occurrences only and others were exceptionally common and widespread. Very few additional species were observed after the first three days of the survey with new occurrences becoming less frequent as the survey continued.

7.2 Vegetation associations and condition

Vegetation associations were defined by the soil and substrate which was available within the study area. Soils varied dependent on the landform and these consisted of clay loams in the lowest elevation zones thorough to deep white/orange sands on the dune crests. In between these zones, available niches consisted of limestone/calcrete outcrops and low rolling red sand dunes. A total of nine broad vegetation associations existed within the landform types (Table 13 and Figure 22). Representative photos of the vegetation associations are provided in Appendix 4.

The vegetation associations contained diverse vegetation with very little weed infestation. The understorey was largely undisturbed with minimal loss of plant species diversity. All nine vegetation associations were considered to resemble pre-European condition and were therefore given a SEB condition ratio of 10:1.

Table 13. Broad vegetation communities present within the study area.

#	Vegetation association	Area (ha)	Condition (SEB ratio)
1	<i>Eucalyptus</i> spp. / <i>Hakea francisiana</i> (Bottlebrush Hakea) / <i>Grevillea stenobotrya</i> (Rattle-pod Grevillea) Tall Open Shrubland	882.61	10:1
2	<i>Acacia papyrocarpa</i> (Western Myall) Open Woodland +/- <i>Cratystylis conocephala</i> (Daisy Bluebush) and <i>Maireana sedifolia</i> (Bluebush)	2952.41	10:1
3	<i>Eucalyptus oleosa</i> ssp. Mixed Mallee over <i>Triodia</i> spp.	2669.45	10:1
4	<i>Eucalyptus yumbarrana</i> (Yumbarra Mallee) Mixed Mallee	4511.5	10:1
5	<i>Alectryon oleifolius</i> (Bullock Bush) Shrubland	3.31	10:1
6	<i>Atriplex vesicaria</i> (Bladder Saltbush) Low Open Shrubland	54.30	10:1
7	<i>Casuarina pauper</i> (Black Oak) +/- <i>Acacia papyrocarpa</i> (Western Myall) Woodland	128.16	10:1
8	<i>Eucalyptus oleosa</i> ssp. (Red Mallee) / <i>Acacia papyrocarpa</i> (Western Myall) +/- <i>Myoporum platycarpum</i> (False Sandalwood) Open Woodland	1692.53	10:1
9	<i>Senna</i> spp. Open Shrubland	88.45	10:1

7.2.1 Low elevation clay loams

These would typically be comprised of Myall woodlands (Association 2) which occupied any areas where bright orange clay loams were present and they comprised of fine silts. Variations of this were observed with limestone pebble strewn on the surface which supported understorey of *Maireana sedifolia* (Bluebush) and *Cratystylis conocephala* (Daisy Bluebush). Alternatively, some areas had been inundated historically which has resulted in the loss of Myall woodlands and regeneration of low chenopod species such as *Atriplex vesicaria* (Bladder Saltbush) (Association 6), *Senna* spp. (Association 9) and were very often fringed with *Alectryon oleifolius* (Bullock Bush) (Association 5).

7.2.2 Low rolling red sand dunes

This landform is typically a transitional zone where Myall Woodland intergrades with *Eucalyptus oleosa* ssp. (Association 8) and a range of shrub species such as *Eremophila scoparia* (Coccid Emu-bush), *Acacia oswaldii* (Wattle) and a wide range of chenopod shrub species which rarely dominate extensive areas as monocultures. These often form the areas that fringe the dune fields.

7.2.3 Calcareous outcrops

These were dominated by *Casuarina pauper* (Black Oak) woodlands (Association 7) and often intergraded with Myall Woodlands on the fringes of the outcrops. Soil surface texture was often highlighted by the presence of small limestone gravel and stones present across the surface with sand loams and soil crusts widespread throughout.

7.2.4 Dunes at bases of ridges and ridges or swales

This substrate has a vegetation structure that is highly variable and therefore the association present in these areas is moderately generic in being *Eucalyptus* spp. Mixed Mallee over *Triodia* as *Triodia* is a constant but the *Eucalyptus* species overstorey mix varies greatly. *Eucalyptus* species are typically stands of *Eucalyptus oleosa* and *E. yumbarrana* (Association 3 and 4) either as a single dominant or mixed with some areas in the tallest dune sections having vast stands of *E. pimpliniana*, primarily noted on the north facing dune slopes most often but not exclusively. Many areas where this association dominated had been burnt in 2002 which also changed the composition of the communities. Understorey species usually consisted of lower shrub species such as *Eremophila alternifolia*, *Dianella revoluta* var. *divaricata*, chenopod shrubs and various *Acacia* species. These zones often had a higher diversity of small ephemeral herbaceous species. This substrate provided the highest number of threatened flora species observed but is also the most represented community substrate on the study area.

7.2.5 White sand dune ridges

These communities were restricted to the ridge tops and consisted of specific species tolerant of the difficult growing conditions (Association 1). Species such as *Hakea francisiana* (Bottlebrush Hakea), *Grevillea stenobotrya* (Rattle-pod Grevillea), *Bossiaea walkeri* (Cactus Pea) and *Callitris verrucosa*

(Scrub Cypress Pine) dominate the crests. *Eucalyptus capitanea* (Desert Ridge-fruited Mallee) was present on some dunes and is at the edge of its known distribution. This is the community that was targeted for the presence of the nationally Vulnerable *Hibbertia crispula* (Ooldea Guinea Flower) which prefers the habitat along the deepest sand dune ridges.

7.3 Threatened flora species

Three species with a conservation rating of rare under the NPW act were recorded within the study area; *Calotis lappulacea* (Yellow Burr-daisy), *Gratwickia monochaeta* and *Melaleuca leiocarpa* (Pungent Honey-myrtle). A database record (DEWNR 2014) for an individual *Santalum spicatum* (Sandalwood) shrub exists on the boundary of the study area (Figure 7), however no *Santalum spicatum* were recorded in the current survey. *Santalum spicatum* has a conservation rating of vulnerable under the NPW Act.

Calotis lappulacea was very common and widespread on dune crests within the northern section of the study area (Figure 19). Several patches of *Gratwickia monochaeta*, often consisting of 30-100 individuals were recorded. Interestingly these small herb species were commonly recorded growing in areas of minor soil disturbance such as the rolled pads for the helicopter and track rehabilitation. *Melaleuca leiocarpa* was recorded in areas adjacent to low dune crests and was generally recorded as single to few individuals.

Five patches of the nationally Vulnerable *Hibbertia crispula* (Ooldea Guinea-flower) (Figure 21), with a total of 283 individual plants, were recorded opportunistically during the survey outside of the northern and eastern boundaries of the study area. The closest patch was approximately 1.5 km from the northern boundary of the study area (Figure 23).



Figure 19. *Calotis lappulacea* (Yellow Burr-daisy).



Figure 20. *Gratwickia monochaeta*.



Figure 21. *Hibbertia crispula* (Ooldea Guinea Flower).

7.4 Weed species

Three introduced flora species, *Acetosa vesicaria* (Rosy Dock), *Brassica tournefortii* (Wild Turnip) and *Carrichtera annua* (Ward's Weed), were observed in very low densities within the study area (refer to Figure 24). *Acetosa vesicaria* was recorded as individual plants or very small groups and was generally located in areas which would collect water after large rainfall events such as ephemeral drainage lines, swales and the edges of some vehicle tracks.

Brassica tournefortii was the most commonly recorded introduced species within the study area, fringing or, on the crests and sides of dune rises, either as individual plants or small sparse groups. *Brassica tournefortii* was recorded in a range of land form types but mostly on sandier sites.

Carrichtera annua was uncommon within the study area. Generally growing in small dense patches and most commonly observed around dead trees in areas subject to inundation.

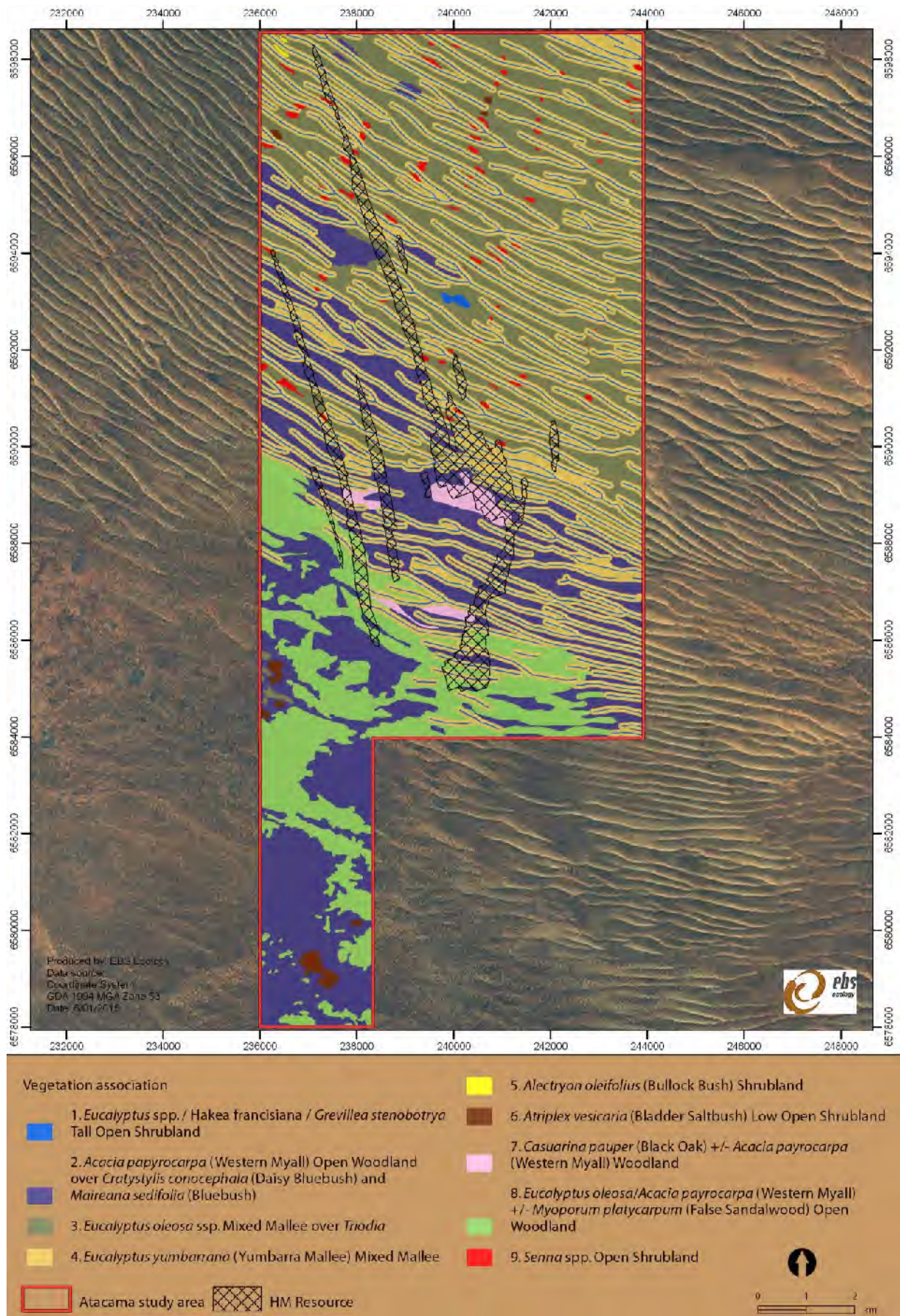


Figure 22. Vegetation association mapping.

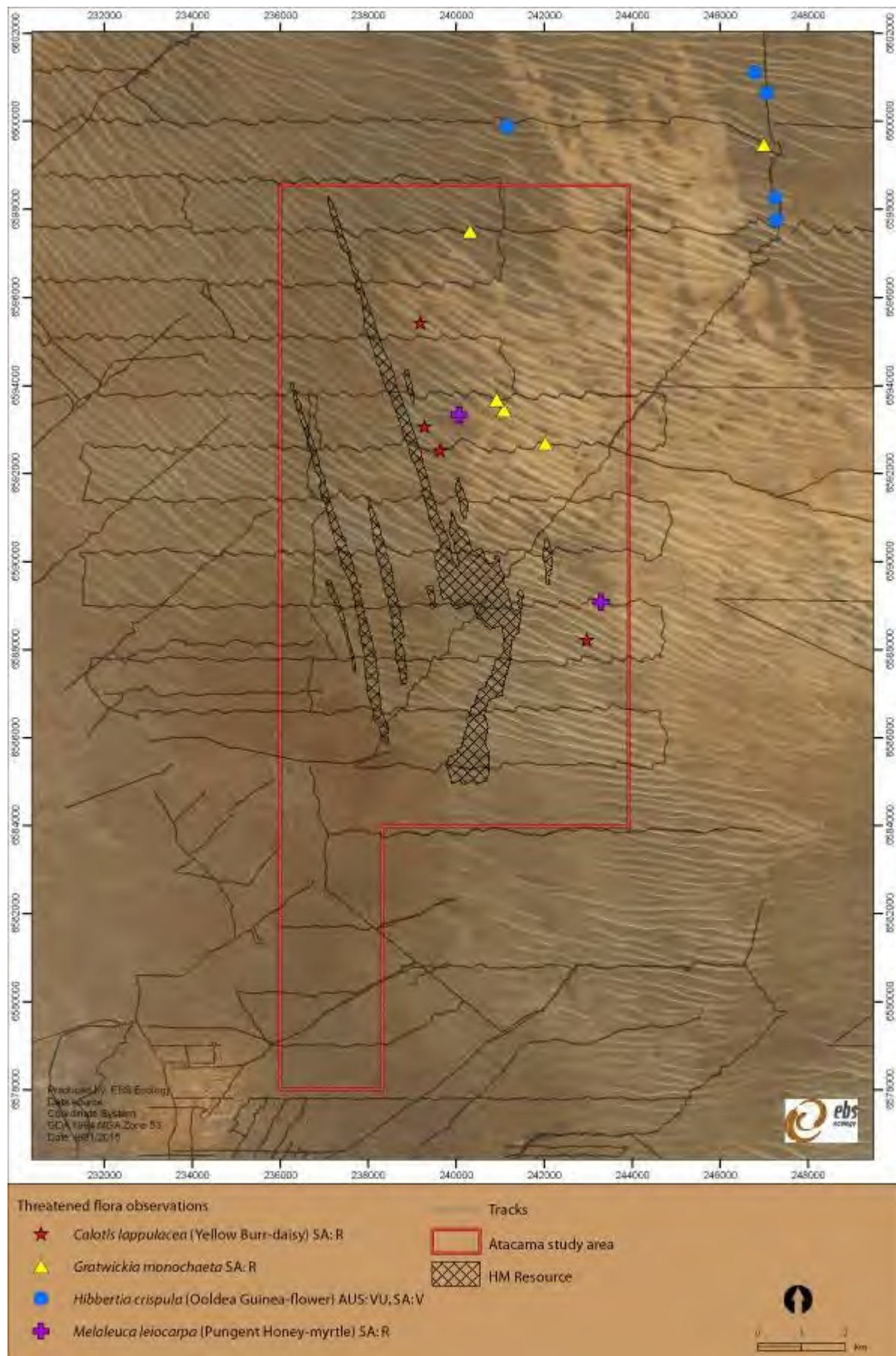


Figure 23. Threatened flora species recorded during the 2014 study.

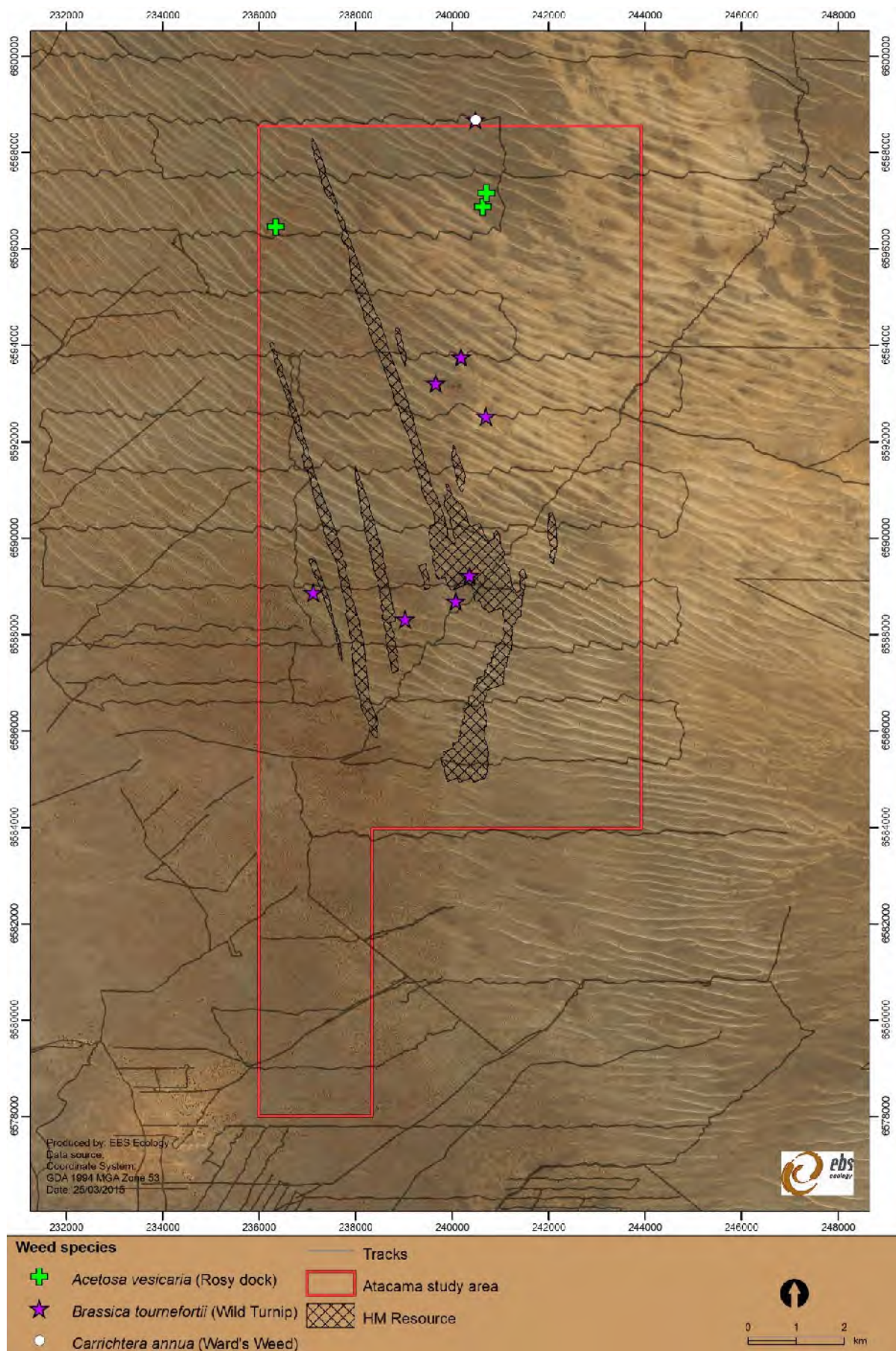


Figure 24. Weed species recorded during the 2014 study.

8 FAUNA RESULTS

8.1 Terrestrial mammals

8.1.1 Species detected

A total of 15 mammal species from nine families were detected during the 2014 surveys (Table 14). Ten of these species were native and five were introduced. Ten of the 15 species were recorded through trap captures or direct observations. The Dingo (*Canis lupus*), Fox (*Vulpes vulpes*) and Feral Cat (*Felis catus*) were only recorded through observation of fresh tracks and the Southern Marsupial Mole (*Notoryctes typhlops*) was only recorded from observations of backfilled tunnels within trenches. Rabbit (*Oryctolagus cuniculus*) buckheaps, tracks and diggings were observed at low densities but were quite widespread throughout the study area.

Two of the species detected, the Sandhill Dunnart (Figure 27) and the Southern Marsupial Mole (*Notoryctes typhlops*) have a conservation rating of Endangered under the EPBC Act and vulnerable under the NPW Act. The Sandhill Dunnart is discussed further in Section 8.1.2 and the Southern Marsupial Mole is discussed further in Section 8.2.

Dingo and Fox tracks were commonly recorded on vehicle exploration tracks during the early morning trap checks. Only one Western Grey Kangaroo (*Macropus fuliginosus*) and two Red Kangaroos (*Macropus rufus*) were observed for the extent of the survey. Old *Macropus* sp. tracks were commonly recorded throughout the study area. A herd of 10 One-humped Camels (*Camelus dromedarius*) were observed browsing in a swale area in near fauna site ATA004 (Figure 28). Fresh and old Camel tracks were also commonly sighted throughout the study area.

One Western Pygmy-possum (*Cercartetus concinnus*) was observed in a small tree whilst spotlighting and an image of one *Macropus* sp. was captured on the surveillance camera at site WSC3.

Table 14. Terrestrial mammals detected within the study area.

Family	Species name	Common name	Conservation status	
			Aus	SA
BURRAMYIDAE	<i>Cercartetus concinnus</i>	Western Pygmy-possum		
CAMELIDAE	* <i>Camelus dromedarius</i>	One-humped Camel		
CANIDAE	<i>Canis lupus</i>	Dingo, Feral Dog		
	* <i>Vulpes vulpes</i>	Fox (Red Fox)		
DASYURIDAE	<i>Ningaui yvonneae</i>	Southern Ningau		
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart		
	<i>Sminthopsis psammophila</i>	Sandhill Dunnart	EN	V
FELIDAE	* <i>Felis catus</i>	Domestic Cat (Feral Cat)		
LEPORIDAE	* <i>Oryctolagus cuniculus</i>	Rabbit (European Rabbit)		
MACROPODIDAE	<i>Macropus fuliginosus</i>	Western Grey Kangaroo		
	<i>Macropus rufus</i>	Red Kangaroo		

Family	Species name	Common name	Conservation status	
			Aus	SA
MURIDAE	* <i>Mus musculus</i>	House Mouse		
	<i>Notomys mitchellii</i>	Mitchell's Hopping-mouse		
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse		
NOTORYCTIDAE	<i>Notoryctes typhlops</i>	Southern Marsupial Mole (Itjaritjari)	EN	V

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). **SA:** South Australia (*National Parks and Wildlife Act 1972*). **Conservation Codes:** **CE:** Critically Endangered. **ENE:** Endangered. **VU/V:** Vulnerable. **R:** Rare.

* Denotes introduced species.

8.1.2 Abundance

Combined trapping methods resulted in a total of 58 small mammals being captured from the eight fauna sites. Seven mammal species from three families were recorded, this included six native species and one introduced species; the House Mouse (*Mus musculus*) (Table 15). Pitfall traps equated for 94 % of the total captures with 53 individuals recorded. Four mammals were captured in Elliot traps and one, Mitchell's Hopping-mouse (*Notomys mitchellii*) was captured in a cage trap.

A total of four Sandhill Dunnart's were captured, one each at sites ATA001, ATA002, ATA004 and ATA005. Of the four Dunnart's, two were male and two were female. All four of the Dunnart's were considered to be sub-adults to adults with weights ranging from 30 to 37 gm.

Site ATA002 recorded the highest small mammal diversity and species abundance with 11 individuals from six families being captured. Just two Southern Ningau (Ningau *yvonneae*) were captured during the survey and these were also caught at site ATA002.

The introduced House Mouse was the most abundant and commonly captured species with a total of 23 individual captures across seven trapping sites.

Interestingly, there were no recaptures of small mammals during the survey.

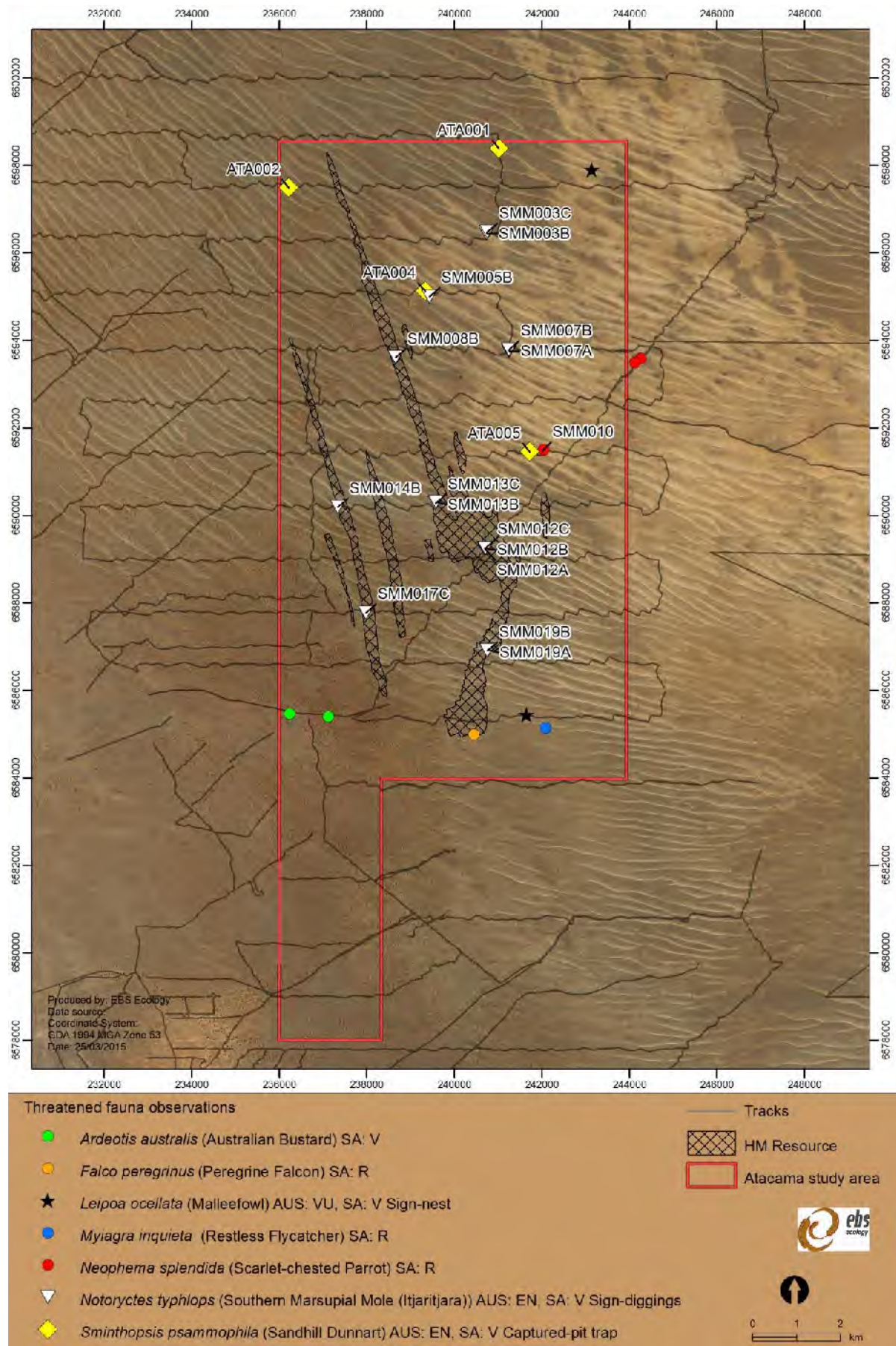


Figure 25. Threatened fauna species recorded during the 2014 study.

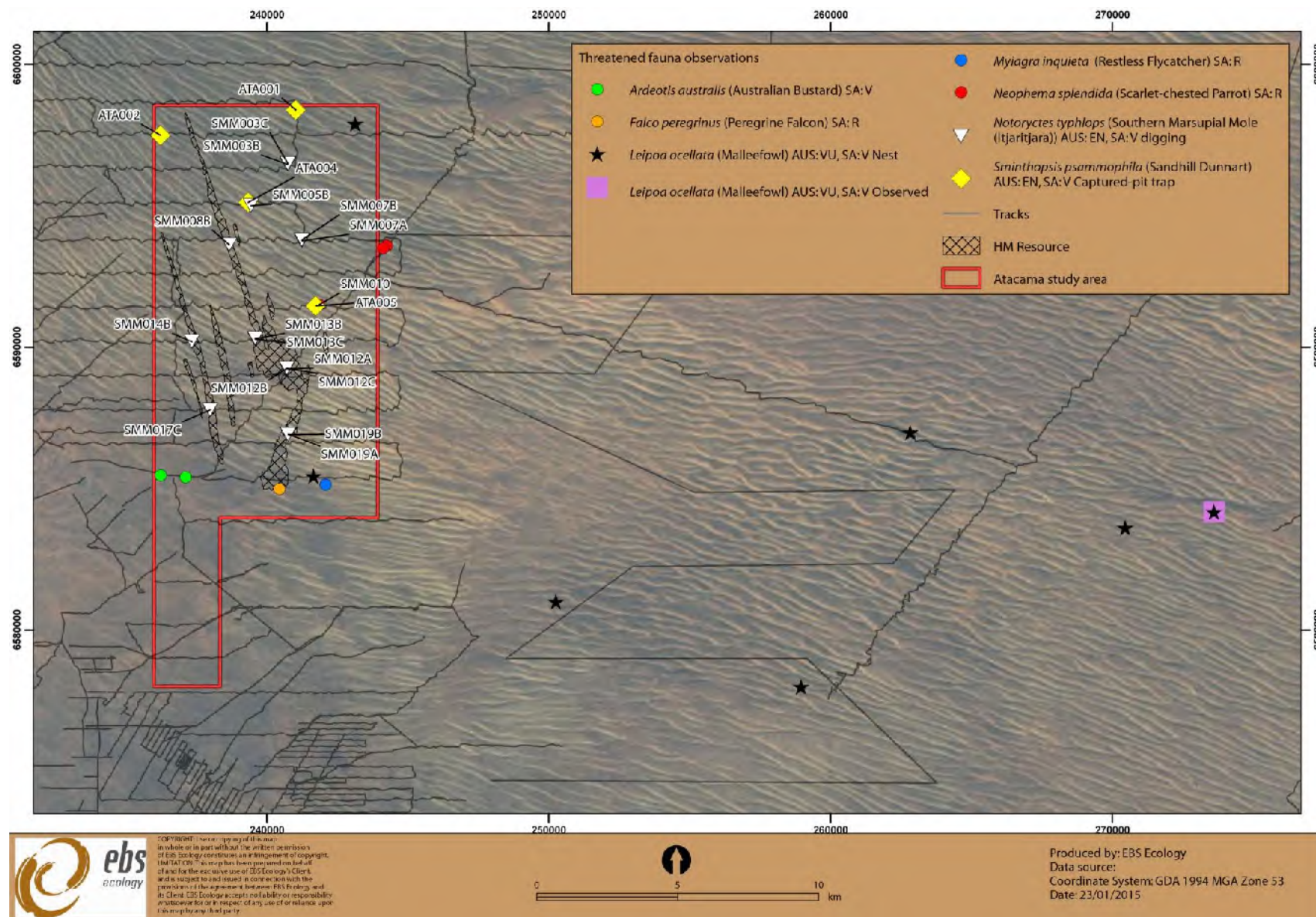


Figure 26. Threatened fauna species recorded during the 2014 study – wider view including Malleefowl records.



Figure 27. Sandhill Dunnart.



Figure 28. Herd of One-humped Camels.

Table 15. Mammal capture results from fauna trapping sites ATA001-ATA008.

Family	Species name	Common name	Conservation status		ATA 001	ATA 002	ATA 003	ATA 004	ATA 005	ATA 006	ATA 007	ATA 008	Total
			Aus	SA									
BURRAMYIDAE	<i>Cercartetus concinnus</i>	Western Pygmy-possum			2	2	1	1				1	7
DASYURIDAE	<i>Ningui yvonneae</i>	Southern Ningui				2							2
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart				3		2	4		1		10
	<i>Sminthopsis psammophila</i>	Sandhill Dunnart	EN	V	1	1		1	1				4
MURIDAE	* <i>Mus musculus</i>	House Mouse			2	2	3	5	3	2	6		23
	<i>Notomys mitchellii</i>	Mitchell's Hopping-mouse				1					1	1	3
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse			5		1	1			1	1	9
Total abundance					10	11	5	10	8	2	9	3	58
Total diversity					4	6	3	5	3	1	4	3	7

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). **SA:** South Australia (*National Parks and Wildlife Act 1972*). **Conservation Codes:** **CE:** Critically Endangered. **EN/E:** Endangered. **VU/V:** Vulnerable. **R:** Rare.

* Denotes introduced species.

8.2 Southern Marsupial Mole

Southern Marsupial Mole backfilled tunnels or 'moleholes' were detected at nine of the 20 trenching sites (Table 17). A summary of all trenching sites, SMM001 to SMM020 is provided in Appendix 6. The summary includes trench locations, dominant vegetation at the trench sites, trench installation dates and trench drying times. EBS engaged Joe Benshemesh to review the results from the Southern Marsupial Mole survey given his immense experience with the species.

Fourteen trenches out of possible 60 trenches contained moleholes. Of the 14 trenches which contained moleholes, six were located at the base of the dunes, five were located on the mid slope of the dunes and three were located near the dune crests. SMM012C, a trench site situated on the base of a dune recorded the most moleholes with 12 holes detected (Figure 29).

A total of 35 moleholes were recorded on the reading faces (north facing) of the trenches. The average depth of the 35 moleholes from the surface was 379 mm, the average minimum diameter of the holes was 40 mm and the average maximum diameter was 48.5 mm (Table 16).

Seven additional moleholes were recorded in trench side walls and one longitudinal section of a molehole was recorded on the reading face at SMM019B (Figure 30).

Table 16. Statistical summary for the 35 moleholes recorded.

	Molehole minimum diameter (mm)	Molehole maximum diameter (mm)	Depth of molehole from the surface (mm)
Mean	40.0	48.5	379.0
Standard Error	1.0	1.6	27.5
Median	40	47	335
Mode	38	45	245
Minimum	28	30	150
Maximum	52	75	770



Figure 29. Southern Marsupial Mole back filled tunnels (cross section) on trench face at SMM012C.



Figure 30. Southern Marsupial Mole tunnel (longitudinal section) on trench face at SMM019B.

Table 17. Southern Marsupial Mole trench site and tunnel results.

Location ID	Location of trench	Dominant vegetation	Number of backfilled tunnels 'moleholes' recorded
SMM003B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Callitris verrucosa</i> (Scrub Cypress Pine), <i>Leptospermum coriaceum</i> (Dune Tea-tree), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	2
SMM003C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Callitris verrucosa</i> (Scrub Cypress Pine), <i>Leptospermum coriaceum</i> (Dune Tea-tree), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	2
SMM005B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	1
SMM007A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	2 (1 also in side wall)
SMM007B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	1
SMM008B	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Bossiaea walkeri</i> (Cactus Pea)	2 (1 also in side wall)
SMM012A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Dodonaea viscosa</i> ssp. <i>angustissima</i> (Narrow-leaf Hop-bush), <i>Thryptomene elliottii</i>	5 (2 also in side wall)
SMM012B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Dodonaea viscosa</i> ssp. <i>angustissima</i> (Narrow-leaf Hop-bush), <i>Thryptomene elliottii</i>	4
SMM012C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Dodonaea viscosa</i> ssp. <i>angustissima</i> (Narrow-leaf Hop-bush), <i>Thryptomene elliottii</i>	12
SMM013B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Hakea francisiana</i> (Bottlebrush Hakea), <i>Grevillea huegelii</i> (Comb Grevillea), <i>Thryptomene elliottii</i>	2
SMM013C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Hakea francisiana</i> (Bottlebrush Hakea), <i>Grevillea huegelii</i> (Comb Grevillea), <i>Thryptomene elliottii</i>	1
SMM017C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Acacia ligulata</i> (Umbrella Bush), <i>Triodia basedowii</i> (Hard Spinifex), <i>Bossiaea walkeri</i> (Cactus Pea)	(1 in side wall)
SMM019A	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Grevillea huegelii</i> (Comb Grevillea)	1

Location ID	Location of trench	Dominant vegetation	Number of backfilled tunnels 'moleholes' recorded
SMM019B	Base of dune	<i>Eucalyptus oleosa ssp. oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Grevillea huegelii</i> (Comb Grevillea)	1 longitudinal section (2 also in side wall)

8.3 Bats

Three micro bat species were positively identified from calls recorded on Anabat Detectors (Table 18). Two other calls were identified to four possible species. Two microbat families were represented with calls from the Vespertilionidae and Molossidae families being recorded.

None of the bat species recorded was of National or State conservation significance. The Lesser Long-eared Bat (*Nyctophilus geoffroyi*) or Central Long-eared Bat (*Nyctophilus major*) was recorded at all eight fauna trapping sites with a total of 140 calls. Gould's Wattled Bat (*Chalinolobus gouldii*) was recorded at six sites with a total of 14 calls.

One adult male Lesser Long-eared Bat was captured in the harp trap at HARP1 (Figure 31). No other bats were captured during the survey.

Table 18. Number of bat call files recorded at each fauna site.

Family	Species name	Common name	ATA 001	ATA 002	ATA 003	ATA 004	ATA 005	ATA 006	ATA 007	ATA 008
VESPERTILIONIDAE	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat		3	4	2		3	1	1
	<i>Vespadelus regulus</i>	Southern Forest Bat					1			
	# <i>Nyctophilus geoffroyi</i> / <i>Nyctophilus major</i>	Lesser Long-eared Bat / Central Long-eared Bat	6	23	23	43	4	19	20	2
MOLOSSIDAE	<i>Austronomus australis</i>	White-striped Free-tailed Bat					1	1		
	# <i>Mormopterus species</i> 3 or 4	Inland Free-tailed Bat			2	1		1		

= Species not identified with certainty.



Figure 31. Lesser Long-eared Bat.

8.4 Reptiles

8.4.1 Species detected

A total of 38 reptile species from nine families were recorded within the Atacama study area (Table 19). Of the 38 species recorded there were three species, Sand Goanna (*Varanus gouldii*), Pygmy Mulga Goanna (*Varanus gilleni*) and Broad-banded Sandswimmer (*Eremiascincus richardsonii*) which were only opportunistically observed and/or captured by hand.

Four reptiles were observed during the two spotlighting events. These were the Thorny Devil (*Moloch horridus*), Dwarf Bearded Dragon (*Pogona minor*), Starred Knob-tailed Gecko (*Nephrurus stellatus*), and Southern Sandplain Gecko (*Lucasium bungabinna*).

The Scincidae family recorded the greatest number of species with 12 representatives. No reptile species with a National or State conservation rating were recorded during the survey.

8.4.2 Abundance

Combined trapping methods resulted in a total of 209 reptiles from 35 species being captured from the eight fauna sites (Table 20). Pitfall traps resulted in 87.4 % of the total captures with 187 reptiles recorded. Twenty-three reptiles were captured in funnel traps, one (Dwarf Bearded Dragon) in an Elliot trap and three were captured by hand.

Southern Spinifex Ctenotus (*Ctenotus atlas*) was the most commonly recorded species with a total of 28 captures from seven trapping sites. The Starred Knob-tailed Gecko (*Nephrurus stellatus*) was recorded at all eight trapping sites with a total of 17 captures.

Site ATA003 recorded the highest diversity and abundance with 34 reptiles from 19 families. Site ATA007 recorded the lowest diversity and abundance with just 16 reptiles from nine families.

Table 19. Reptiles detected within the study area.

Family	Species name	Common name
AGAMIDAE	<i>Ctenophorus cristatus</i>	Crested Dragon
	<i>Ctenophorus fordi</i>	Mallee Dragon
	<i>Ctenophorus isolepis</i>	Military Dragon
	<i>Diporiphora lingua</i>	Linga Dragon
	<i>Moloch horridus</i>	Thorny Devil
	<i>Pogona minor</i>	Dwarf Bearded Dragon
CARPHODACTYLIDAE	<i>Nephrurus laevis</i>	Pale Knob-tailed Gecko
	<i>Nephrurus stellatus</i>	Starred Knob-tailed Gecko
DIPODACTYLIDAE	<i>Diplodactylus wiru</i>	Desert Wood Gecko
	<i>Lucasium bungabinna</i>	Southern Sandplain Gecko
	<i>Lucasium damaeum</i>	Beaded Gecko
	<i>Strophurus assimilis</i>	Thorn-tailed Gecko
	<i>Strophurus elderi</i>	Jewelled Gecko

Family	Species name	Common name
ELAPIDAE	<i>Brachyuropsis fasciolatus</i>	Narrow-banded Snake
	<i>Brachyuropsis semifasciatus</i>	Half-girdled Snake
	<i>Demansia reticulata</i>	Desert Whipsnake
	<i>Pseudonaja modesta</i>	Five-ringed Snake
GEKKONIDAE	<i>Gehyra purpurascens</i>	Purple Dtella
	<i>Gehyra variegata</i>	Tree Dtella
PYGOPODIDAE	<i>Delma butleri</i>	Spinifex Snake-lizard
	<i>Delma petersoni</i>	Painted Snake-lizard
	<i>Lialis burtonis</i>	Burton's Legless Lizard
SCINCIDAE	<i>Ctenotus atlas</i>	Southern Spinifex Ctenotus
	<i>Ctenotus schomburgkii</i>	Sandplain Ctenotus
	<i>Ctenotus taeniatus</i>	Eyrean Ctenotus
	<i>Cyclodomorphus melanops</i>	Spinifex Slender Bluetongue
	<i>Eremiascincus richardsonii</i>	Broad-banded Sandswimmer
	<i>Lerista desertorum</i>	Great Desert Slider
	<i>Lerista labialis</i>	Eastern Two-toed Slider
	<i>Lerista taeniata</i>	Ribbon Slider
	<i>Lerista terdigitata</i>	Southern Three-toed Slider
	<i>Lerista timida</i>	Dwarf Three-toed Slider
	<i>Liopholis inornata</i>	Desert Skink
	<i>Morethia butleri</i>	Butler's Snake-eye
TYPHLOPIDAE	<i>Ramphotyphlops bicolor</i>	Southern Blind Snake
VARANIDAE	<i>Varanus eremius</i>	Desert Pygmy Goanna
	<i>Varanus gilleni</i>	Pygmy Mulga Goanna
	<i>Varanus gouldii</i>	Sand Goanna



Figure 32. Painted Snake-lizard (*Delma petersoni*).

Table 20. Reptile capture results from fauna trapping sites ATA001-ATA008.

Family	Species name	Common name	ATA 001	ATA 002	ATA 003	ATA 004	ATA 005	ATA 006	ATA 007	ATA 008	Total
AGAMIDAE	<i>Ctenophorus cristatus</i>	Crested Dragon			2						2
	<i>Ctenophorus fordi</i>	Mallee Dragon			1	1		1		1	4
	<i>Ctenophorus isolepis</i>	Military Dragon	6 (1)			1		1			8
	<i>Diporiphora lingua</i>	Linga Dragon		3	3	4		1	1		12
	<i>Moloch horridus</i>	Thorny Devil	1	1	1 (1)	1					4
	<i>Pogona minor</i>	Dwarf Bearded Dragon		1	1	3	3			1	9
CARPHODACTYLIDAE	<i>Nephurus laevis</i>	Pale Knob-tailed Gecko	1	2							3
	<i>Nephurus stellatus</i>	Starred Knob-tailed Gecko	2 (1)	2	3	2	3	3	1	1 (8)	17
DIPLODACTYLIDAE	<i>Diplodactylus wiru</i>	Desert Wood Gecko	2	1	1		1	1	1	1	8
	<i>Lucasium bungabinna</i>	Southern Sandplain Gecko				2	2		2		6
	<i>Lucasium damaeum</i>	Beaded Gecko						2		9	11
	<i>Strophurus assimilis</i>	Thorn-tailed Gecko					2				2
	<i>Strophurus elderi</i>	Jewelled Gecko			1	2					3
ELAPIDAE	<i>Brachyurophis fasciolatus</i>	Narrow-banded Snake	1			1					2
	<i>Brachyurophis semifasciatus</i>	Half-girdled Snake			1			1		3	5
	<i>Demansia reticulata</i>	Desert Whipsnake						1			1
	<i>Pseudonaja modesta</i>	Five-ringed Snake				1					1
GEKKONIDAE	<i>Gehyra purpurascens</i>	Purple Dtella		1	1	2	1			1	6
	<i>Gehyra variegata</i>	Tree Dtella	1	1						2	4
PYGOPODIDAE	<i>Delma butleri</i>	Spinifex Snake-lizard	2								2
	<i>Delma petersoni</i>	Painted Snake-lizard		2	1						3
	<i>Lialis burtonis</i>	Burton's Legless Lizard			2	1	1				4
SCINCIDAE	<i>Ctenopus atlas</i>	Southern Spinifex Ctenopus	7	5	2	5	2	5	2		28
	<i>Ctenopus schomburgkii</i>	Sandplain Ctenopus	2	3	7		2			1 (1)	15
	<i>Ctenopus taeniatus</i>	Eyrean Ctenopus						1			1
	<i>Cyclodomorphus melanops</i>	Spinifex Slender Bluetongue	1		1	2		5	2		10
	<i>Lerista desertorum</i>	Great Desert Slider			1						1

Family	Species name	Common name	ATA 001	ATA 002	ATA 003	ATA 004	ATA 005	ATA 006	ATA 007	ATA 008	Total
	<i>Lerista labialis</i>	Eastern Two-toed Slider	1			1	1		3	3	9
	<i>Lerista taeniata</i>	Ribbon Slider	1	1	1						3
	<i>Lerista terdigitata</i>	Southern Three-toed Slider		1							1
	<i>Lerista timida</i>	Dwarf Three-toed Slider		1				1	1		3
	<i>Liopholis inornata</i>	Desert Skink			3		3				6
	<i>Morethia butleri</i>	Butler's Snake-eye		3	1				3		7
TYPHLOPIDAE	<i>Ramphotyphlops bicolor</i>	Southern Blind Snake					2	2			4
VARANIDAE	<i>Varanus eremius</i>	Desert Pygmy Goanna		1		1	2				4
Total abundance			28	29	34	30	25	25	16	23	209
Total diversity			13	16	19	16	13	13	9	10	35

Note: Recaptured reptiles are highlighted in parenthesis and are not included in the totals.

8.5 Birds

8.5.1 Species detected

A total of 52 bird species were detected from 28 different families during the survey through point location observations, opportune observations, and spotlighting (Table 21). The Meliphagidae family (Honeyeaters) recorded the highest number of species with six representatives detected within the study area.

Two Malleefowl (*Leipoa ocellata*) mounds were located within the study area (Figure 25). The Malleefowl has a conservation rating of Vulnerable under the EPBC Act and NPW Act. The mound in the north-eastern section of the study was observed during the aerial survey and also inspected from the ground (Figure 33). The mound in the south-east of the study area was observed opportunistically during the vegetation survey (Figure 34).

Both mounds were considered to be quite old, with evidence that these mounds had not been used for many years. Both mounds had a well developed soil crust, lacked leaf litter and were very low in topography. These are all good indicators that the mounds have not been worked by Malleefowl for many years. Some old, very small egg shell fragments were also located at one mound indicating that it had been used previously for breeding.

Five Malleefowl mounds were also investigated outside of the study area by helicopter (Figure 26). The mounds were initially recorded by the Iluka exploration team during aerial work in the wider Yellabinnia RR area during early November 2014. Four of the five mounds were located, and all appeared to be quite old and disused. Unfortunately, the fifth mound which is approximately 30 km east of the study area could not be located during the aerial search. Two Malleefowl birds were seen fleeing this particular mound by Iluka Exploration technician Grant Hoffrichter during a helicopter flight early in November 2014 (G. Hoffrichter, pers. comm., November 2014).

The Australian Bustard (*Ardeotis australis*) which has a conservation rating of vulnerable under the NPW Act was recorded three times within the southern section of the study area. The Australian Bustard was recorded foraging with the open habitat provided by the *Atriplex vesicaria* (Bladder Saltbush) Low Open Shrubland and *Acacia papyrocarpa* (Western Myall) Open Woodland (Figure 35).

Three birds; the Peregrine Falcon (*Falco peregrines*), Restless Flycatcher (*Myiagra inquieta*) and the Scarlet-chested Parrot (*Neophema splendida*) which all have a conservation rating of rare under the NPW Act were also recorded within the study area.

The Restless flycatcher and Peregrine Falcon were both recorded once during the survey, whereas the Scarlet-chested Parrots were recorded at three separate locations with a total of 23 individuals. Two of these locations were just outside of the survey boundary area, but one pair was also observed within the survey boundary near SMM010. All observations of the Scarlet-chested Parrot were in regenerating

Eucalyptus oleosa ssp. Mixed Mallee over *Triodia* spp. which was burnt during the 2002 wildfire (Figure 36).

One migratory species listed under the EPBC Act, the Rainbow Bee-eater (*Merops ornatus*) was observed at site ATA003 (4 birds) and also observed opportunistically (2 birds).

Table 21. Birds detected within the study area.

Family	Species name	Common name	Conservation status	
			Aus	SA
ACANTHIZIDAE	<i>Acanthiza apicalis</i>	Inland Thornbill		
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill		
	<i>Smicromis brevirostris</i>	Weebill		
ACCIPITRIDAE	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk		
	<i>Circus assimilis</i>	Spotted Harrier		
	<i>Hieraaetus morphnoides</i>	Little Eagle		
AEGOTHELIDAE	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar		
ALCEDINIDAE	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher		
ARTAMIDAE	<i>Artamus cinereus</i>	Black-faced Woodswallow		
	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow		
	<i>Artamus personatus</i>	Masked Woodswallow		
	<i>Cracticus torquatus</i>	Grey Butcherbird		
	<i>Gymnorhina tibicen</i>	Australian Magpie		
CACATUIDAE	<i>Nymphicus hollandicus</i>	Cockatiel		
CAMPEPHAGIDAE	<i>Coracina maxima</i>	Ground Cuckooshrike		
	<i>Coracina novaehollandiae</i>	Black-faced Cuckooshrike		
	<i>Lalage tricolor</i>	White-winged Triller		
COLUMBIDAE	<i>Phaps chalcoptera</i>	Common Bronzewing		
CUCULIDAE	<i>Cacomantis pallidus</i>	Pallid Cuckoo		
	<i>Chalcites basal</i>	Horsfield's Bronze Cuckoo		
	<i>Chalcites osculans</i>	Black-eared Cuckoo		
DICAEIDAE	<i>Dicaeum hirundinaceum</i>	Mistletoebird		
FALCONIDAE	<i>Falco berigora</i>	Brown Falcon		
	<i>Falco peregrinus</i>	Peregrine Falcon		R
HIRUNDINIDAE	<i>Petrochelidon nigricans</i>	Tree Martin		
MALURIDAE	<i>Malurus splendens</i>	Splendid Fairywren		
MEGAPODIIDAE	<i>#Leipoa ocellata</i>	Malleefowl	VU	V
MELIPHAGIDAE	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater		
	<i>Certhionyx variegatus</i>	Pied Honeyeater		
	<i>Epthianura tricolor</i>	Crimson Chat		
	<i>Manorina flavigula</i>	Yellow-throated Miner		
	<i>Ptilotula ornata</i>	Yellow-plumed Honeyeater		
	<i>Purnella albifrons</i>	White-fronted Honeyeater		
MEROPIDAE	<i>Merops ornatus</i>	Rainbow Bee-eater		
MONARCHIDAE	<i>Myiagra inquieta</i>	Restless Flycatcher		R
NEOSITTIDAE	<i>Daphoenositta chrysoptera</i>	Varied Sittella		
OREICIDAE	<i>Oreica gutturalis</i>	Crested Bellbird		
OTIDIDAE	<i>Ardeotis australis</i>	Australian Bustard		V
PACHYCEPHALIDAE	<i>Colluricincla harmonica</i>	Grey Shrike-thrush		
	<i>Pachycephala rufiventris</i>	Rufous Whistler		
PARDALOTIDAE	<i>Pardalotus striatus</i>	Striated Pardalote		

Family	Species name	Common name	Conservation status	
			Aus	SA
PETROICIDAE	<i>Melanodryas cucullata</i>	Hooded Robin		
	<i>Microeca fascinans</i>	Jacky Winter		
	<i>Petroica goodenovii</i>	Red-capped Robin		
PODARGIDAE	<i>Podargus strigoides</i>	Tawny Frogmouth		
POMATOSTOMIDAE	<i>Pomatostomus superciliosus</i>	White-browed Babbler		
PSITTACIDAE	<i>Barnardius zonarius</i>	Australian Ringneck		
	<i>Melopsittacus undulatus</i>	Budgerigar		
	<i>Neophema splendida</i>	Scarlet-chested Parrot		R
	<i>Psephotus varius</i>	Mulga Parrot		
RHIPIDURIDAE	<i>Rhipidura leucophrys</i>	Willie Wagtail		
TURNICIDAE	<i>Turnix velox</i>	Little Buttonquail		

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). **SA:** South Australia (*National Parks and Wildlife Act 1972*). **Conservation Codes:** **CE:** Critically Endangered. **EN/E:** Endangered. **VU/V:** Vulnerable. **R:** Rare.

= Disused mound only.

8.5.2 Abundance

Point count surveys resulted in 497 observations from 37 species from 21 families across the 14 sites.

The most abundant bird recorded during the point count surveys was the Budgerigar (*Melopsittacus undulatus*) with a total of 74 observations. The Weebill (*Smicrornis brevirostris*) followed with 48 observations from seven out of the 14 sites. There were five species that were only recorded once during point count surveys, these were:

- Little Eagle (*Hieraaetus morphnoides*)
- Australian Owlet-nightjar (*Aegotheles cristatus*)
- Common Bronzewing (*Phaps chalcoptera*)
- Splendid Fairywren (*Malurus splendens*)
- Little Buttonquail (*Turnix velox*).

Site ATA003 recorded the highest abundance of birds with 66 individuals (11 species) and site ATA004 followed with 63 individuals (18 species). The lowest abundance was recorded at site ATA009 with only seven individual's recorded (three species).



Figure 33. Disused Malleefowl mound in the north-east of the study area.
Note: Photo taken from above in Helicopter.



Figure 34. Disused Malleefowl mound in the south-east of the study area.



Figure 35. Australian Bustard (*Ardeotis australis*).



Figure 36. Female Scarlet-chested Parrot (*Neophema splendida*).

Table 22. Birds recorded during point count surveys at sites ATA001-ATA014.

Family	Species name	Common name	ATA001	ATA002	ATA003	ATA004	ATA005	ATA006	ATA007	ATA008	ATA009	ATA010	ATA011	ATA012	ATA013	ATA014	Total
ACANTHIZIDAE	<i>Acanthiza apicalis</i>	Inland Thornbill	4			4	10										18
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill				4			10								14
	<i>Smicrornis brevirostris</i>	Weebill	2	7	11	6	2	7		3	4		2			4	48
ACCIPITRIDAE	<i>Hieraaetus morphnoides</i>	Little Eagle							1								1
AEGOTHELIDAE	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar						1									1
ALCEDINIDAE	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher										2					2
ARTAMIDAE	<i>Artamus cinereus</i>	Black-faced Woodswallow				2	2									2	6
	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow							4								4
	<i>Artamus personatus</i>	Masked Woodswallow			17		4		2	7		6			2	2	40
	<i>Cracticus torquatus</i>	Grey Butcherbird				2	1										3
	<i>Gymnorhina tibicen</i>	Australian Magpie													2	2	4
CAMPEPHAGIDAE	<i>Coracina novaehollandiae</i>	Black-faced Cuckooshrike													2		2
	<i>Lalage tricolor</i>	White-winged Triller							2								2
COLUMBIDAE	<i>Phaps chalcoptera</i>	Common Bronzewing	1														1
CUCULIDAE	<i>Cacomantis pallidus</i>	Pallid Cuckoo				1	1	1				2					5
	<i>Chalcites basalis</i>	Horsfield's Bronze Cuckoo				1				1	1	1					4
FALCONIDAE	<i>Falco berigora</i>	Brown Falcon				1		1		1							3
HIRUNDINIDAE	<i>Petrochelidon nigricans</i>	Tree Martin										15			6		21
MALURIDAE	<i>Malurus splendens</i>	Splendid Fairywren											1				1
MELIPHAGIDAE	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater		4		5						2					11
	<i>Certhionyx variegatus</i>	Pied Honeyeater				2											2
	<i>Epthianura tricolor</i>	Crimson Chat										7			2		9
	<i>Manorina flavigula</i>	Yellow-throated Miner		2	4	13						4		4			27
	<i>Ptilotula ornata</i>	Yellow-plumed Honeyeater	4	10	12	2	7	6				2					43
	<i>Purnella albifrons</i>	White-fronted Honeyeater	12	7	3	4	8	2	2					6			44

Family	Species name	Common name	ATA001	ATA002	ATA003	ATA004	ATA005	ATA006	ATA007	ATA008	ATA009	ATA010	ATA011	ATA012	ATA013	ATA014	Total
MEROPIDAE	<i>Merops ornatus</i>	Rainbow Bee-eater			4												4
NEOSITTIDAE	<i>Daphoenositta chrysoptera</i>	Varied Sittella				7											7
OREOICIDAE	<i>Oreoica gutturalis</i>	Crested Bellbird		2	1		1		1				1	1	1		8
PACHYCEPHALIDAE	<i>Colluricincla harmonica</i>	Grey Shrikethrush	2		2	1		1									6
	<i>Pachycephala rufiventris</i>	Rufous Whistler	1	3	4		1										9
PARDALOTIDAE	<i>Pardalotus striatus</i>	Striated Pardalote	2	4	2	4		1		2			2		2		19
PETROICIDAE	<i>Microeca fascinans</i>	Jacky Winter	6	2			6								4		18
	<i>Petroica goodenovii</i>	Red-capped Robin				2						2					4
POMATOSTOMIDAE	<i>Pomatostomus superciliosus</i>	White-browed Babbler	4				13		4								21
PSITTACIDAE	<i>Melopsittacus undulatus</i>	Budgerigar	6		6				17	12		21	12				74
	<i>Psephotus varius</i>	Mulga Parrot				2			2	2	2					2	10
TURNICIDAE	<i>Turnix velox</i>	Little Buttonquail					1										1
Total abundance			44	41	66	63	57	20	45	28	7	64	18	11	21	12	497
Total diversity			11	9	11	18	13	8	10	7	3	11	5	3	8	5	37

9 DISCUSSION

9.1 Flora

9.1.1 Survey timing and effort

The flora survey timing was the most appropriate in which to observe the widest range of flora taxa available, as well as having features which makes these more able to be identified to species level. Spring is the period, assuming acceptable levels of winter rainfall, in which many threatened species will flower due to the availability of pollinator functions which may include insect activity, bird species and dynamic drivers such as wind, as well as being prior to dry periods in which plant energy resources will be put into survival.

9.1.2 Vegetation associations and condition

Nine broad vegetation associations were present within the study area. The vegetation mapping provides in accurate detail, the extent and range of the vegetation structures present within the study area. These are widely considered to fulfil what can only be described as intact native vegetation largely in pre-European condition. This is illustrated as habitat bearing intact strata with little to no weed infestation. This is accurate for all areas assessed within the baseline survey and therefore the study area was given an overarching SEB condition rating of 10:1.

No ecological communities listed as threatened under the EPBC Act were recorded within the study area.

9.1.3 Conservation significant species

Species with a conservation rating under the EPBC Act or NPW Act which potentially occur or do occur within the study area are discussed further below:

Ooldea Guinea-flower (*Hibbertia crispula*) – Vulnerable under the EPBC Act and vulnerable under the NPW Act

Five patches *Hibbertia crispula* totaling 283 individual shrubs were recorded during the survey outside of the northern and eastern boundaries of the study area. Additional *Hibbertia crispula* shrubs are likely to be present on the dunecrests further from where the plants were initially recorded. The closest recorded patch of *Hibbertia crispula* was approximately 1.5 km from the northern boundary of the study area.

The shrubs were growing on the dune crests in *Eucalyptus* spp. / *Hakea francisiana* (Bottlebrush Hakea) / *Grevillea stenobotrya* (Rattle-pod Grevillea) Tall Open Shrubland vegetation. Some of the dune vegetation, including the *Hibbertia crispula*, had been burnt by the 2002 and 2012 wildfire. Juvenile *Hibbertia crispula* shrubs were commonly recorded in-between mature shrubs in areas which had been recently burnt. The majority of the mature shrubs were in flower.

Hibbertia crispula is a small wiry, glabrous shrub growing up to 50 cm high. It is characterized by yellow flowers (8-15 mm in diameter) which are found in the axils of the leaves, usually lacking a stalk but occasionally on a very short stalk. The leaves are alternate, cylindrical and can be up to 45 mm long and 1 mm wide (DOE 2008). Current records suggest that the species is known only from two disjunct locations; the Lake Everard region and the Ooldea region of South Australia (DOE 2008). Notes on herbarium collections give insufficient detail to accurately locate all the previous collection localities (PB & Iluka 2008).

Three patches of mature *Hibbertia crispula* (totalling 51 shrubs) were recorded in March 2010 approximately 18 km north-west of the study area (Personal obs., Matt Launer 2010) (Figure 7). The records were lodged with South Australian Herbarium but have not yet been added to the BDBSA. The shrubs were growing on the crests of the dunes in similar vegetation structures as that recorded during the current survey. Notably, these shrubs were also in flower at the time of the survey.

The distribution of *Hibbertia crispula* is likely to be more widespread within the Yellabinna Environmental Association than current records indicate. This is likely to be due to the lack of survey effort in the area because of remoteness, lack of vehicular access and large sand dune terrain.

It is considered that *Hibbertia crispula* could possibly occur within the study area. The shrub would most likely occur on dune crests within the *Eucalyptus* spp. / *Hakea francisiana* (Bottlebrush Hakea) / *Grevillea stenobotrya* (Rattle-pod Grevillea) Tall Open Shrubland, *Eucalyptus oleosa* ssp. Mixed Mallee over *Triodia* spp. and *Eucalyptus yumbarrana* (Yumbarra Mallee) Mixed Mallee vegetation, particularly in the northern section of the study area.

Sandalwood (*Santalum spicatum*) - Vulnerable under the NPW Act

A database record (DEWNR 2014) for an individual *Santalum spicatum* (Sandalwood) shrub exists on the boundary of the study area. The shrub is located within *Acacia papyrocarpa* (Western Myall) Open Woodland vegetation. No additional shrubs were recorded during the survey. Numerous records for *Santalum spicatum* occur within and within close proximity to the J-A minesite in *Acacia papyrocarpa* (Western Myall) Open Woodland vegetation.

Santalum spicatum (Sandalwood) is found within semi-arid pastoral areas in the North-western, Gairdner-Torrens, Flinders Ranges, Eastern and Eyre Peninsula Herbarium regions of South Australia (DEWNR 2007). It also occurs in Western Australia. This species has previously been recorded in association with Tall *Acacia* Woodland, Low *Callitris* Woodland, Chenopod Shrubland and Semi-arid Mallee Communities (DEWNR 2007).

Santalum spicatum (Sandalwood) grows between 3-8 metres high and has stiff branchlets with spreading, opposite dark green leaves. Leaves are glaucous, waxy and lanceolate to oblanceolate. Flowers are fragrant and the fruits are globular and reddish-brown (DEWNR 2007).

It is likely that other *Santalum spicatum* shrubs exist within the southern section of the study area in *Acacia papyrocarpa* (Western Myall) Open Woodland +/- *Cratystylis conocephala* (Daisy Bluebush) and *Maireana sedifolia* (Bluebush) or *Eucalyptus oleosa* ssp. (Red Mallee) / *Acacia papyrocarpa* (Western Myall) +/- *Myoporum platycarpum* (False Sandalwood) Open Woodland vegetation. The shrubs are likely to be widely dispersed and growing in small groups (<5) or more commonly as individuals. This is typical of the shrubs located around the J-A minesite and Sonoran exploration lease.

***Calotis lappulacea* (Yellow Burr-daisy) - Rare under the NPW Act**

Calotis lappulacea was very common and extremely widespread on dune crests within the northern section of the study area. Interestingly, these are the first records within the Yellabinna Environmental Association. Given the distribution of records during the survey it is expected that *Calotis lappulacea* would be located elsewhere within the study area.

Despite being listed as rare under the NPW Act, *Calotis lappulacea* (Yellow Burr-daisy) is a widespread species, occurring on a range of soil types within Sclerophyll Woodlands, pastures and grasslands in all mainland states. Within South Australia, this species has previously been recorded in the Flinders Ranges, Eastern, Eyre Peninsula and Murray SA Herbarium regions. This perennial herb grows to 20-50 cm high with erect, wiry stems (DEWNR 2007).

Sand Lily (Corynotheca licrota) - Rare under the NPW Act

Corynotheca licrota was not recorded during the survey. *Corynotheca licrota* is a tufted herbaceous plant that occurs in low-rainfall areas of inland, temperate Australia (Flora of NSW 1993 & Flora of Australia 1987). It is usually found growing on sand dunes or in sandy soil on plains. In South Australia it has previously been recorded in the North-western, Nullarbor, Gairdner-Torrens, Eyre Peninsula and South-eastern Herbarium regions.

Given the availability of preferred habitat; sand dunes and sandy soils, it is considered possible that *Corynotheca licrota* could exist within the study area.

Hill's Emubush (Eremophila hillii) - Rare under the NPW Act

Eremophila hillii was not recorded during the survey. *Eremophila hillii* (Hill's Emubush) is a small intricate shrub growing between 0.3-1 metres tall (DEWNR 2007). It has previously been recorded in the Nullarbor Herbarium region of South Australia as well as within Western Australia. *Eremophila hillii* grows in sand hill environments. Given the availability of preferred habitat; sand dunes, it is considered possible that *Eremophila hillii* could exist within the study area.

***Gratwickia monochaeta* - Rare under the NPW Act**

Several patches of *Gratwickia monochaeta*, often consisting of 30-100 individuals were recorded during the survey. Interestingly the small herbs were commonly recorded growing in areas of minor soil disturbance such as the rolled pads for the helicopter and track rehabilitation.

Gratwickia monochaeta has previously been recorded in the Lake Eyre, Nullarbor, Gairdner-Torrens, Eastern and Eyre Peninsula herbarium regions of South Australia (DEWNR 2007). *Gratwickia monochaeta* is an annual herb growing 2-18 cm tall and up to 10 cm in diameter with bright, golden-yellow flowers (DEWNR 2007).

Given the distribution of records during the survey it is expected that *Gratwickia monochaeta* would be located elsewhere within the study area.

Lax Bluebush (Maireana suaedifolia) - Rare under the NPW Act

Maireana suaedifolia was not recorded during the survey. *Maireana suaedifolia* has been previously recorded in the Nullarbor, Gairdner-Torrens and Eyre Peninsula herbarium regions of South Australia (DEWNR 2007). A subpopulation of this species is located between Cowell-Kimba and Whyalla (DEWNR 2007). *Maireana suaedifolia* (Lax Bluebush) has been recorded growing in association with mallee and chenopod low open woodland vegetation associations. This species is also known to occur on raised areas around salt lakes.

Maireana suaedifolia has been observed growing from clumps of *Triodia* sp. on the lower slopes of dunes and in dune swales in the Southern Middleback Ranges and Barton (Yellabinnia RR). The small plants were sparsely located and growing as single to few individuals in both regions (Personal obs., Matt Launer). Given the availability of preferred habitat it is considered possible that *Maireana suaedifolia* could exist within the study area.

Pungent Honey-myrtle (Melaleuca leiocarpa) - Rare under the NPW Act

Melaleuca leiocarpa was recorded during the survey in areas adjacent to low dune crests. The shrub was generally recorded as single to few individuals.

Melaleuca leiocarpa (Pungent Honey-myrtle) is a shrub growing to 1-3 m high with dark green alternate leaves. This species has previously been recorded in the Nullarbor, Gairdner-Torrens and Eyre Peninsula herbarium regions of South Australia. It has been known to occur in sand dunes with mixed open mallee over sparse shrubs and mid to dense *Triodia* sp. (DEWNR 2007). It was recorded during the field survey within *Eucalyptus* spp. / *Hakea francisiana* (Bottlebrush Hakea) / *Grevillea stenobotrya* (Rattle-pod Grevillea) Tall Open Shrubland.

Given the distribution of records during the survey and availability of preferred habitat, it is expected that *Melaleuca leiocarpa* would be located elsewhere within the study area.

9.1.4 Weed species

Three introduced species, *Acetosa vesicaria*, *Brassica tournefortii* and *Carrichtera annua* were observed in very low densities within the study area.

These species are all widespread and naturalized within the arid region and control for these species is not viable without a region wide effort. *Acetosa vesicaria*, *Brassica tournefortii* and *Carrichtera annua* are listed as naturalised in South Australia (E-Flora SA 2013) which is described in Kloot (1987) as “a naturalised species is one that is growing spontaneously, i.e. without, or in spite of, human intervention”. These species are low priority in the regional context and are not listed as declared under the *Natural Resources Management Act 2004*. Therefore, these species are not considered to pose a serious threat to biodiversity values.

Acetosa vesicaria is particularly common in the semi-arid and arid of parts of central Australia. It is widely naturalised in Western Australia, South Australia, Queensland, New South Wales and the Northern Territory. It is thought that this species was introduced into Australia along with camels, either deliberately for feed or accidentally in saddles or packing (i.e. the soft fruit was used for padding in camel saddles). This species reproduces entirely by seed, which are known to form a persistent seed bank. This species is thought to be an important part of the diet of wild camels in central Australia, and it may also be dispersed by these feral and other animals (Weeds of Australia 2014).

Brassica tournefortii is a widespread aggressive weed established in a wide range of habitats from the coast to semi-arid inland regions. *Brassica tournefortii* is an annual herb, erect, to 60 cm tall. A prolific seeding species, it is hard to eradicate when flowering commences due to the transportability of seed resources. It is not reasonably controllable in good seasons, but small outbreaks following smaller germination events may be targeted along access tracks and disturbed areas. *Brassica tournefortii* appears to be self-compatible or autogamous, as there is virtually 100 percent fruit set on most plants. A well-developed plant produces between 750 and 9,000 seeds (Sanders and Minnich, 2000).

Carrichtera annua is an erect Herb, erect, 5-40 cm tall, weed of semi-arid to arid regions. *Carrichtera annua* is a native of northern Africa, Asia and southern Europe. Dispersal is by seed, ballistically released from dry seedpods up to 25 cm from the parent plant. Wet seeds are adhesive further aiding spread.

There is potential for mining activities to introduce new weed species to the area and spread existing weed species. This can be caused by vehicle movements, water run-off associated with tracks, and the introduction of plant seeds and materials via vehicles, machinery, clothing, in food scraps and other sources. Weed species are a common issue in areas that have sustained disturbance (i.e. due to construction).

9.2 Fauna

9.2.1 General fauna

Two field surveys were completed within the Atacama study area; a baseline flora and fauna survey from 23 September to 1 October 2014, and a targeted Southern Marsupial Mole survey from 26 November to 4 December 2014.

The weather during the baseline fauna survey was considered to be excellent for detecting mammal, reptile and bird species. Daytime temperatures ranged from 22.1°C to 34.9°C with overnight temperatures of between 6.9°C to 21.6°C. The mild to warm temperatures resulted in both diurnal and nocturnal species being active, and therefore observed or captured for the extent of the survey.

Daytime temperatures ranged from 30.9°C to 38.9°C during the targeted Southern Marsupial Mole survey, with overnight temperatures of between 11.8°C to 25.1°C. Winds were moderate to strong and predominantly from the north for the extent of the targeted Southern Marsupial Mole survey. The warm to hot conditions and north winds experienced during the survey assisted in drying out the Southern Marsupial Mole trenches.

The survey design and effort was deemed adequate in establishing a comprehensive inventory of the fauna species present within the study area. All mammal, reptile and bird species recorded during the survey were expected based on the available habitat within the study area.

The results of this survey, combined with the results from the nearby J-A mine site, Sonoran exploration lease and the background research undertaken as part of the project provides a comprehensive baseline of the fauna species known to occur within or considered likely to occur within the Atacama study area.

9.2.2 Overview of expected species not detected during the survey

A number of fauna species which are known to occur within the vicinity of the study area (J-A mine site and Sonoran) were not detected during the current survey. A comparative fauna species list for the J-A mine site monitoring surveys (2008-2014), Sonoran baseline survey and the current Atacama baseline survey is provided in Appendix 7.

Mammals

Based on the results from the results from the nearby J-A mine site and Sonoran study area and the available habitat within the Atacama study area it is possible that an additional seven mammal species could occur.

It would be expected that Fat-tailed Dunnart (*Sminthopsis crassicaudata*), Spinifex Hopping-mouse (*Notomys alexis*), Chocolate Wattled Bat (*Chalinolobus morio*), Inland Broad-nosed Bat (*Scotorepens balstoni*) and Inland Forest Bat (*Vespadelus baverstocki*) would be present within the study area and are likely to be recorded in future surveys.

The Southern Hairy-nosed Wombat may occasionally forage in the southern section of the study area, particularly in the *Casuarina pauper* (Black Oak) +/- *Acacia papyrocarpa* (Western Myall) Woodland, *Atriplex vesicaria* (Bladder Saltbush) Low Open Shrubland, *Acacia papyrocarpa* (Western Myall) Open and *Senna* spp. Open Shrubland vegetation associations.

The large burrows of the Southern Hairy-nosed Wombat have been previously recorded within the J-A mine-site (SKM 2006) and Sonoran study area (EBS 2013a). No burrows were recorded within the Atacama study area.

The Short-Beaked Echidna (*Tachyglossus aculeatus*) is also likely to occur within the study area. Short-Beaked Echidna tracks were recorded during the baseline survey for the J-A mine site (SKM 2006) and an individual was observed opportunistically during a predator activity monitoring survey approximately 15 km north-east of Atacama (EBS 2010a).

The total mammal species (excluding bats) known to occur and possibly occurring within the study area is 19 (15 recorded / 4 possibly occurring). Five out of the 15 species recorded during the survey were introduced. This brings the total of native mammal species (excluding bats) known to, and possibly occurring to 14 (10 recorded / 4 possibly occurring).

The total bat species known to occur and possibly occurring within the study area is eight (5 recorded / 3 possibly occurring).

Reptiles

Based on the results from the nearby J-A mine site and Sonoran study area and the available habitat within the Atacama study area it is possible that an additional 24 reptile species could occur (Table 23). Twenty-one of these are considered likely to be present within the study area and may be recorded in future surveys.

The Central Netted Dragon (*Ctenophorus nuchalis*), Mallee Black-headed Snake (*Parasuta spectabilis*), Spotted Ctenotus (*Ctenotus orientalis*) may possibly occur.

Other reptile species which are likely to occur but have not been recorded at J-A mine-site or Sonoran study area include; Sandhill Ctenotus (*Ctenotus brooksi*), Centralian Coppertail (*Ctenotus leae*), Leopard Skink (*Ctenotus pantherinus*), Mallee Snake-eye (*Morethia obscura*) and Western Bluetongue (*Tiliqua occipitalis*).

The total reptile species known to occur and possibly occurring within the study area is 67 (38 recorded / 29 possibly occurring).

Table 23. Reptile species not detected during the current survey but possibly exist based on nearby records (J-A mine site and Sonoran study area).

Family	Species name	Common name	Conservation status		Likelihood of occurrence within study area
			Aus	SA	
AGAMIDAE	<i>Ctenophorus nuchalis</i>	Central Netted Dragon			Possible
	<i>Ctenophorus pictus</i>	Painted Dragon			Likely
CARPHODACTYLIDAE	<i>Nephurus levis</i>	Smooth Knob-tailed Gecko			Likely
	<i>Underwoodisaurus milii</i>	Barking Gecko			Likely
DIPLODACTYLIDAE	<i>Strophurus intermedius</i>	Southern Spiny-tailed Gecko			Likely
ELAPIDAE	<i>Neelaps bimaculatus</i>	Western Black-naped Snake		R	Likely / Present
	<i>Parasuta spectabilis</i>	Mallee Black-headed Snake			Possible
	<i>Pseudechis australis</i>	Mulga Snake			Likely
	<i>Pseudonaja aspidorhyncha</i>	Patch-nosed Brown Snake			Likely
	<i>Pseudonaja mengdeni</i>	Gwardar			Likely
	<i>Simoselaps bertholdi</i>	Desert Banded Snake			Likely
GEKKONIDAE	<i>Heteronotia binoei</i>	Bynoe's Gecko			Likely
PYGOPODIDAE	<i>Pygopus nigriceps</i>	Black-headed Scaly-foot			Likely
SCINCIDAE	<i>Cryptoblepharus australis</i>	Desert Wall Skink			Likely
	<i>Ctenotus orientalis</i>	Spotted Ctenotus			Possible
	<i>Ctenotus regius</i>	Eastern Desert Ctenotus			Likely
	<i>Lerista bipes</i>	Western Two-toed Slider			Likely
	<i>Lerista dorsalis</i>	Southern Four-toed Slider			Likely
	<i>Lerista edwardsae</i>	Myall Slider			Likely
	<i>Menetia greyii</i>	Dwarf Skink			Likely
	<i>Morethia adalaidensis</i>	Adelaide Snake-eye			Likely
	<i>Tiliqua rugosa</i>	Sleepy Lizard			Likely
TYPHLOPIDAE	<i>Ramphotyphlops bituberculatus</i>	Rough-nosed Blind Snake			Likely
	<i>Ramphotyphlops endoterus</i>	Centralian Blind Snake			Likely

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). **SA:** South Australia (*National Parks and Wildlife Act 1972*). **Conservation Codes:** **CE:** Critically Endangered. **ENE:** Endangered. **VU/V:** Vulnerable. **R:** Rare.

Birds

Based on the results from the results from the nearby J-A mine site and Sonoran study area and the available habitat within the Atacama study area it is possible that an additional 40 bird species could occur (Table 23). Thirty-four of these are considered likely to be present within the study area and may be recorded in future surveys.

The total bird species known to occur and possibly occurring within the study area is 92 (52 recorded / 40 possibly occurring).

Table 24. Bird species not detected during the current survey but possibly exist based on nearby records (J-A mine site and Sonoran study area).

Family	Species name	Common name	Conservation status		Likelihood of occurrence within study area
			Aus	SA	
ACANTHIZIDAE	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill			Likely
	<i>Acanthiza iredalei iredalei</i>	Slender-billed Thornbill (western ssp)		R	Possible
	<i>Aphelocephala leucopsis</i>	Southern Whiteface			Likely
	<i>Calamanthus (Calamanthus) campestris</i>	Rufous Fieldwren			Likely
	<i>Pyrrholaemus brunneus</i>	Redthroat			Possible
ACCIPITRIDAE	<i>Accipiter fasciatus</i>	Brown Goshawk			Likely
	<i>Aquila audax</i>	Wedge-tailed Eagle			Likely
	<i>Elanus axillaris</i>	Black-shouldered Kite			Likely
	<i>Haliastur sphenurus</i>	Whistling Kite			Likely
	<i>Todiramphus sanctus</i>	Sacred Kingfisher			Likely
ARTAMIDAE	<i>Artamus cyanopterus</i>	Dusky Woodswallow			Likely
	<i>Artamus superciliosus</i>	White-browed Woodswallow			Likely
	<i>Strepera versicolor</i>	Grey Currawong			Likely
CACATUIDAE	<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo		R	Likely
	<i>Eolophus roseicapilla</i>	Galah			Likely
CAPRIMULGIDAE	<i>Eurostopodus argus</i>	Spotted Nightjar			Likely
CHARADRIIDAE	<i>Vanellus miles</i>	Masked Lapwing			Possible
CINCLOSOMATIDAE	<i>Cinclosoma cinnamomeum</i>	Cinnamon Quailthrush			Likely
CORVIDAE	<i>Corvus coronoides</i>	Australian Raven			Likely
	<i>Corvus mellori</i>	Little Raven			Likely
ESTRILDIDAE	<i>Taeniopygia guttata</i>	Zebra Finch			Likely
FALCONIDAE	<i>Falco cenchroides</i>	Nankeen Kestrel			Likely
	<i>Falco longipennis</i>	Australian Hobby			Likely
HIRUNDINIDAE	<i>Cheramoeca leucosterna</i>	White-backed Swallow			Likely
	<i>Hirundo neoxena</i>	Welcome Swallow			Likely
LOCUSTELLIDAE	<i>Cincloramphus cruralis</i>	Brown Songlark			Likely
	<i>Cincloramphus mathewsi</i>	Rufous Songlark			Likely
MALURIDAE	<i>Malurus lamberti</i>	Variegated Fairywren			Likely
	<i>Malurus leucopterus</i>	White-winged Fairywren			Likely
MELIPHAGIDAE	<i>Anthochaera carunculata</i>	Red Wattlebird			Likely
	<i>Epthianura aurifrons</i>	Orange Chat			Possible
	<i>Gavicalis virescens</i>	Singing Honeyeater			Likely
	<i>Ptilotula penicillata</i>	White-plumed Honeyeater			Likely
	<i>Ptilotula plumulus</i>	Grey-fronted Honeyeater			Likely
	<i>Sugomel niger</i>	Black Honeyeater			Possible

Family	Species name	Common name	Conservation status		Likelihood of occurrence within study area
			Aus	SA	
MONARCHIDAE	<i>Grallina cyanoleuca</i>	Magpielark			Likely
PACHYCEPHALIDAE	<i>Pachycephala inornata</i>	Gilbert's Whistler		R	Possible
PHASIANIDAE	<i>Coturnix pectoralis</i>	Stubble Quail			Likely
PSITTACIDAE	<i>Northiella haematogaster</i>	Bluebonnet			Likely
TYTONIDAE	<i>Tyto delicatula</i>	Eastern Barn Owl			Likely

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). **SA:** South Australia (*National Parks and Wildlife Act 1972*). **Conservation Codes:** **CE:** Critically Endangered. **ENE:** Endangered. **VU/V:** Vulnerable. **R:** Rare.

9.2.3 Conservation significant species

Species with a conservation rating under the EPBC Act or NPW Act which potentially occur or do occur within the study area are discussed further below:

Sandhill Dunnart (*Sminthopsis psammophila*) - Endangered under the EPBC Act and NPW Act

A total of four Sandhill Dunnart's were captured in pitfall traps during the survey, one each at sites ATA001, ATA002, ATA004 and ATA005. Of the four Dunnart's captured within the Atacama study area, two were male and two were female. All four of the Dunnart's were considered to be sub-adults to adults. All four trapping sites contained an overstorey of Mallee species and mixed shrubs and an understorey of *Triodia* sp.. Site ATA005 was within habitat which was burnt by wildfire in 2002. Churchill (2001a) suggests that Sandhill Dunnarts preferred habitat is between 10 and 30 years post fire.

Existing knowledge on the Sandhill Dunnart, its ecology and habitat preferences is relatively limited. Several studies have been undertaken previously (Churchill 2001a and b) and DEWNR have been undertaking a monitoring study near Ooldea since 2008 (Ward *et al.* 2008). Historical records of the Sandhill Dunnart suggest there are disjointed populations across South Australia and Western Australia. Within South Australia, current populations occur on Eyre Peninsula and within the Great Victorian Desert (Ward *et al.* 2008). Within the Ooldea area, the species has been recorded at several locations including near Ooldea, Yarle Lakes, and Mt Christie (Copley and Kemper 1992; Churchill 2001b; Ward *et al.* 2008). Relatively recent Sandhill Dunnart records from EBS Ecology (2009a), EBS Ecology (2009b) and Moseby (2012) have assisted in mapping the known distribution of the species.

The Sandhill Dunnart is a carnivorous marsupial which occurs in Spinifex (*Triodia* spp.) hummock grasslands on sandy flats and sand dunes in arid and semi-arid environments. The most consistent feature of the habitat is the presence of Spinifex hummock grass (*Triodia* spp.) and sand dunes (Churchill 2001a). Mallee Woodland with a diverse open shrubby understorey, *Eucalyptus gongylocarpa* (Marble Gum) often with *Callitris verrucosa* (Scrub Cypress Pine) and an associated complex shrub understorey (Pearson & Robinson 1989) are commonly associated with the Sandhill Dunnart.

A distinctive feature of the Sandhill Dunnart is the crest of stiff black hairs along the ventral surface of the distal portion of its tail (Archer 1981), which assist the animal when digging. The Sandhill Dunnart is most noticeably different from other dunnarts due to its larger size range of 30-55 g in weight (Churchill 2001a). Sandhill Dunnarts are generalists feeders and are largely opportunistic; therefore they will eat the majority of their prey types in proportions similar to their availability (Churchill 2001a). Information regarding the reproductive patterns of the Sandhill Dunnart is scarce. Female Sandhill Dunnarts have been observed to carry up to five young. Mating appears to occur within September and young born in September/October, with pouch young weaned in December/January. It is expected that Sandhill Dunnarts produce a single litter annually; however, during good seasons they may be able to vary, or extend their timing of reproduction, or maybe produce another litter (Churchill 2001a).

An individual Sandhill Dunnart was captured in a pitfall trap during a J-A mine site monitoring survey in April 2009 (EBS 2009b). The specimen was captured approximately 5 km south of the Atacama study area. Interestingly, the specimen was captured within *Acacia papyrocarpa* (Western Myall) Woodland habitat which lacked *Triodia* sp.. The adult male was considered to be a transient animal from a population in the nearby dune system to the east of the monitoring site.

EBS Ecology captured Sandhill Dunnarts in two locations within Yellabinna RR during a baseline survey for Iluka Resources in October 2009 (EBS 2009c). The closest location is approximately 10 km north-east of the Atacama study area where a total of seven Sandhill Dunnarts were captured from three sites. The other location is approximately 30 km east of the study area where a total of 12 Sandhill Dunnarts were captured from seven sites.

Moseby (2012) captured a total of three Sandhill Dunnarts from three baseline fauna sites in the sand dunes of Yellabinna RR during May 2012. The location is approximately 11 km to the east of the Atacama study area.

It is highly likely that Sandhill Dunnarts would be widespread in the areas containing *Triodia* sp. within the Atacama study area. The *Eucalyptus* spp. / *Hakea francisiana* (Bottlebrush Hakea) / *Grevillea stenobotrya* (Rattle-pod Grevillea) Tall Open Shrubland, *Eucalyptus oleosa* ssp. Mixed Mallee over *Triodia* spp. and *Eucalyptus yumbarrana* (Yumbarra Mallee) Mixed Mallee vegetation associations all support *Triodia* sp.. These vegetation associations total an area of 8,064 ha from a possible 12,983 ha (total size of the study area).

Southern Marsupial Mole (Notoryctes typhlops) - Endangered under the EPBC Act and vulnerable under the NPW Act

The presence of the subterranean Southern Marsupial Mole was confirmed within the Atacama study area with 'moleholes' being detected at nine of the 20 trenching sites. The trenching method developed by Benshemesh (2005a) proved to be effective in detecting Southern Marsupial Moles.

A comparison of detection methods is discussed in Benshemesh (2005a), 'in the dunes in the Walalkara and Watarru IPAs, there is about a 70% chance of detecting moleholes in a single trench that may take

20 minutes to excavate. In contrast, we encounter marsupial moles signs on average about every 20 km or so of tracking (5-8 hours walking), and in about 1-2% of predator scats (involving at least 10 hours collection for 100 scats)'.

Existing knowledge on the ecology of the Southern Marsupial Mole is limited. It is so poorly known that the EPBC Endangered listing is a precautionary measure as their status is described as unknown, but probably common (Benshemesh 2008). Little is known about the Marsupial Mole behaviour; however, they appear to spend most of their time underground where they move about by burrowing and backfilling through the sand. As indicated by distinctive tracks, Marsupial Moles move on the surface by using the spade-like front claws to drag the body in an undulatory motion. Three parallel furrows are typically left behind in loose sand, with the two outside tracks formed by its legs and the inner solid furrow formed by the tail. As indicated by the few tracks encountered, even within areas of known relatively high abundance, very little time seems to be spent on the surface.

Approximately 30 Southern Marsupial Mole specimens have been collected near Ooldea some 30 km kilometres north of the study area (most between 1920 and 1952, and possibly one in 1992), and several have been collected east of Ooldea as far as Lake Everard on the eastern edge of Yellabinna Regional Reserve (Benshemesh 2004).

A survey completed by Benshemesh (2005b) within Yellabinna and Yumburra Conservation Reserves and the lower Great Victorian Desert confirms the subsistence of Southern Marsupial Moles at Ooldea and Tarcoola along the Trans-Australian Railway track, whereby six of the seven sites visited supported evidence of Southern Marsupial Moles underground. Evidence of Southern Marsupial Moles were also detected along the northern half of Goog's Track within the Yellabinna dunefields at relatively high densities, despite no records being known from this region prior to the 2005 survey.

Fourteen trenches out of possible 60 trenches within the Atacama study area contained moleholes. Of the 14 trenches which contained moleholes, six were located at the base of the dunes, five were located on the mid slope of the dunes and three were located near the dune crests.

A total of 35 moleholes were recorded on the reading faces (north facing) of the trenches. The average depth of the 35 moleholes from the surface was 379 mm, the average minimum diameter of the holes was 40 mm and the average maximum diameter was 48.5 mm. Each of the 35 moleholes was assigned an approximate age category based on the guides given below (Benshemesh 2005):

- Fresh: Loose sand pours out of the molehole with little or no provocation.
- Recent: Clear and typically sharp edged, sand inside the molehole very soft but not free flowing.
- Oldish: Moleholes neither recent nor highly degraded.
- Old: Molehole quite faint and easily missed, sand inside molehole appears firm but is actually softer than surrounding sand.
- Very old: Very faint and very easily missed, but often made apparent by flinging sand.

Four moleholes were considered to be 'recent', 20 were considered to be 'oldish', five were considered to be 'old' and 4 were considered to be 'very old'. Benshemesh (2005a), states that signs of underground moleholes generally persist for several years. The survey effort was adequate for confirming the presence of the species within the study area. Additional survey trenches would be required to gain a better understanding of the Southern Marsupial Mole distribution within the study area.

It is likely that Southern Marsupial Moles would be widespread in the areas containing sand dunes and swales within the Atacama study area. These areas support three distinct vegetations; *Eucalyptus* spp. / *Hakea francisiana* (Bottlebrush Hakea) / *Grevillea stenobotrya* (Rattle-pod Grevillea) Tall Open Shrubland, *Eucalyptus oleosa* ssp. Mixed Mallee over *Triodia* spp. and *Eucalyptus yumbarrana* (Yumbarra Mallee) Mixed Mallee. These vegetation associations total an area of 8,064 ha from a possible 12,983 ha within the study area.

The distribution of Southern Marsupial Moles is likely to be much more widespread within the Yellabinna Environmental Association (approximately 4,416,228 ha) than current records indicate. This is likely to be due to the lack of survey effort in the area.

Malleefowl (Leipoa ocellata) - Vulnerable under the EPBC Act and vulnerable under the NPW Act

The Malleefowl is found in scattered locations through semi-arid rangelands and dry-land cropping zones in the south east of South Australia, and the Eyre Peninsula (Garnett and Crowley, 2000). They are principally found in Mallee woodland and scrub as well as dry forest dominated by other Eucalypts, Mulga, and other Acacia sp. (Benshemesh, 2007). They feed on seeds and herbage, and build nest mounds in sandy substrates with leaf litter (Frith, 1962). Clearance of native woodland and grasslands for agriculture has removed and fragmented much of the Malleefowl's habitat, resulting in localised extinctions and fragmented populations (Garnett and Crowley, 2000).

An extensive aerial survey was undertaken by use of helicopter across the Atacama study area. The use of helicopter surveying has proven to be the most cost and time effective method available to accurately survey large areas of habitat that may be suitable for Malleefowl (Lewis 2011), allowing for the presence of nesting Malleefowl to be observed. The current survey covered around 278 linear kilometres, with up to 50 m per side (100 m combined) assessed in only two days. This resulted in approximately 2780 ha of suitable mallee habitat being surveyed in detail. Research by Lewis (2011) has shown that effort by on-ground surveys with three surveyors would cover approximately 80 ha a week, resulting in this particular fine scale survey taking around 34 weeks.

Survey effort resulted in two mounds being located within the study area, both of which were quite old, with evidence that these mounds had not been used for many years. This was due to both having a well developed soil crust, as well as no leaf litter and the mounds being quite degraded and low in topography (National Heritage Trust 2007). These are all good indicators that these have not been worked by Malleefowl for many years. Some old, very small egg shell fragments were also located at the north-eastern mound indicating that it had been used previously for breeding.

Despite the extensive aerial survey and on ground observations, the presence of additional Malleefowl mounds within the study area cannot be entirely ruled out. It is possible that the study area may be used by Malleefowl in the future, however due to the large fire scar that surrounds the area it is unclear how long it may take, and if the species will traverse back into the area. Malleefowl rarely move large distances over open ground, preferring woodland corridors (Benshemesh 2007), which in this case have been removed by fire. Mallee habitat recovers quickly from fire, which may then facilitate movement of the species back into the study area at some stage in the near future.

The *Eucalyptus* spp. / *Hakea francisiana* (Bottlebrush Hakea) / *Grevillea stenobotrya* (Rattle-pod Grevillea) Tall Open Shrubland, *Eucalyptus oleosa* ssp. Mixed Mallee over *Triodia* spp. and *Eucalyptus yumbarrana* (Yumbarra Mallee) Mixed Mallee vegetation associations provide suitable habitat for Malleefowl. These vegetation associations total an area of 8,064 ha from a possible 12,983 ha (total size of the study area).

Australian Bustard (*Ardeotis australis*) - Vulnerable under the NPW Act

The Australian Bustard was recorded within the southern section of the study area on three occasions. The adult bird was recorded foraging with the open habitat provided by the *Atriplex vesicaria* (Bladder Saltbush) Low Open Shrubland and *Acacia papyrocarpa* (Western Myall) Open Woodland.

A species that is generally found in open dry plains, grasslands and in open woodland, this species is highly nomadic and apparently moves in response to rainfall. They are a large, unmistakable species, mainly terrestrial, but are adept at flying and can cover large distances when required. The diet of the Bustard is varied, and can be classed as catholic in taste, feeding on a variety of invertebrates, lizards, and small birds to vegetative matter including leaves, seeds and fruit (Marchant and Higgins 1993). The species is wide spread around the entire continent of Australia, however, like other species of Bustard around the world is on a decline in range and population.

Australian Bustard's are frequently observed within proximity to the J-A minesite in open habitat such as *Atriplex vesicaria* (Bladder Saltbush) Low Open Shrubland and *Acacia papyrocarpa* (Western Myall) Open Woodland. The majority of the observations are of one to two birds at one time.

Western Black-naped Snake (*Neelaps bimaculatus*) - Rare under the NPW Act

No Western Black-naped Snakes were recorded during the survey; however the presence of the species has been confirmed within the Atacama study area (SKM 2006). One of three specimens was captured within the study area during the SKM J-A minesite baseline survey in 2005 in (SKM 2006). One individual was captured in Mallee sand dune habitat and two others were captured in Myall-Mallee habitat.

One Western Black-naped Snake was also captured during the Sonoran Baseline survey in November 2012 (EBS 2013). The snake was captured in low dunes supporting *Eucalyptus oleosa* ssp. *oleosa*, +/- *Myoporum platycarpum* +/- *Acacia papyrocarpa* +/- *Alectryon oleifolius* Woodland vegetation.

Prior to the 2005 (SKM 2006) and 2012 (EBS 2013a) captures the species had only been detected twice in South Australia; from Kingoonya (1930-1940's), Ooldea (1930-1940's). Another specimen was captured near Maralinga in 2005 (SKM 2006).

The species is well-known from the semi-arid southwest of Western Australia. Mark Hutchinson (Senior Researcher, Herpetology, South Australian Museum) suggests that the species appears likely to be limited in occurrence in South Australia to Woodland on soft sand, and possibly climatically to an intermediate area between the cooler Eyre Peninsula and the arid Great Victorian Desert (SKM 2006).

Slender-billed Thornbill (western ssp.) (Acanthiza iredalei ssp. iredalei) - Rare under the NPW Act

The Slender-billed Thornbill (western ssp.) was not recorded during the survey. The Slender-billed Thornbill generally occur in open habitat such as chenopod shrubland dominated by Samphire, Bluebush and Saltbush associations (Higgins *et al* 2002). While Slender-billed thornbills have been recorded in the nearby J-A mine site, suitable chenopod shrubland habitat is much more patchily distributed in the Atacama study area. Available habitat would be restricted to the 54.3 ha of *Atriplex vesicaria* (Bladder Saltbush) Low Open Shrubland.

Though it is a very small proportion of the Atacama study area, it is still considered capable of hosting a very small and fragmented population of this species.

Striated Grasswren (Amytornis striatus) - Rare under the NPW Act

The Striated Grasswren was not recorded during the survey. This species is sedentary in nature, with local movements in the non-breeding season. They are secretive species, principally terrestrial in character, and live as singles, in pairs or small groups of up to five individuals. Territories of about 1ha are maintained by breeding pairs during the breeding season. They are capable of breeding in fragmented Spinifex (*Triodia* sp.) habitats of less than 1ha in area (Higgins *et al*. 2001).

The Striated Grasswren inhabits dense, tall (mature) Spinifex with or without a shrub overstorey. This overstorey generally consists of Mallee, *Acacia*, *Grevillea* and/or *Hakea* spp. and tends to occupy vegetation with a post fire age of 6 to 30 years (Garnett *et al* 2011).

The species was not observed within the study area; however suitable habitat types were present within the area. This species was also recorded within 50 km of the site in the BDBSA, however the record dates back to 1909 (DEWNR 2014).

Major Mitchell's Cockatoo (Cacatua leadbeateri) - Rare under the NPW Act

The Major-Mitchell's Cockatoo was not recorded during the survey. The Major-Mitchell's Cockatoo is distributed across the arid and semi-arid interior of Australia, where they are sporadically distributed. They occur in a wide range of habitats including grassland, gibber, saltbush, mulga, casuarinas, and mallee woodlands, as well as tree-lined watercourses with river red gums, black box and coolabahs (Rowley and Chapman 1991). The Major Mitchell's Cockatoo feeds on seeds, nuts, fruits and roots of

saltbush, *Acacias*, and *Callitris* pines (Garnett et al 2000). It is usually found in pairs or small groups, sometimes in the company of other cockatoos, galahs, or corellas.

The recovery of this species is hampered by their fussy breeding habitats, as pairs vigorously defend large territories, up to several kilometres from their nest. This means that they are generally scarce, occurring in low densities even throughout their preferred habitat. Major-Mitchell's Cockatoo's are often sedentary near good supplies of water; otherwise they are locally nomadic, following water availability (Higgins 1999).

This species was noted during monitoring surveys at the J-A mine in 2008 (EBS 2009a), as well as within 15 km of the study area by BDBSA searches. As they have numerous habitat types, there is a strong likelihood that they will occur within the study area on an infrequent basis.

White-browed Treecreeper (Climacteris affinis) - Rare under the NPW Act

The White-browed Treecreeper was not recorded during the survey. White-browed Treecreepers mostly occur in tall shrubland and low woodland dominated by *Acacias*, such as Mulga, Western Myall and Gidgee, or casuarinas, such as Buloke and Belah, or woodlands dominated by cypress-pines *Callitris*.

This species was not recorded during the survey at Sonoran (EBS 2013a), and has not been noted during any monitoring surveys at the EBS 2008-2014 J-A mine site either (EBS 2008-2014). BDBSA records indicate that they have been recorded within 50 km of the site in 2005 (DEWNR 2014). As the area contains suitable habitat which is in good condition, the species is highly likely to be located in the future.

Restless Flycatcher (Myiagra inquieta) - Rare under the NPW Act

One Restless Flycatcher was recorded in the south of the study area in an area dominated by *Eucalyptus oleosa* ssp. (Red Mallee) / *Acacia papyrocarpa* (Western Myall) +/- *Myoporum platycarpum* (False Sandalwood) Open Woodland.

The Restless Flycatcher is often found in the same habitats as the similarly sized Willie Wagtail (*Rhipidura leucophrys*), occurring in open forests, woodlands, farmland, and inland scrub. They can inhabit *Eucalyptus camaldulensis*, *E. leucoxylon* and box woodlands, and in open mallee (*E. oleosa*, *E. gracilis*) low woodland-low open forests. South-eastern populations disperse widely during winter, move north, and commonly into more open farmland areas.

The Restless Flycatcher feed on insects, as well as other invertebrates such as spiders and centipedes and usually feeds alone or in a pair (DEWNR 2008).

Peregrine Falcon (Falco peregrines) - Rare under the NPW Act

One Peregrine Falcon was observed flying over the study area. It is not known if the bird was foraging in, or just passing over the study area.

Peregrine Falcons live in a wide variety of landscapes and vegetation types and are found in many parts of the world. The Peregrine Falcon is wide spread in Australian but tends to be rare and not commonly found in any region around the continent. The Peregrine Falcon is the fastest bird in the world, reaching speeds of up to 300 km per hour and is also an exceptionally agile aerial hunter. It is a species which is well adapted to change and can survive well in urban environments. In fact cities have become an important habitat for these birds, with skyscrapers and transmission masts mimicking the cliff faces that they often roost and nest on. This includes old quarries and mines and has often been observed utilising these artificial cliffs around the world for roosting, hunting vantage points and as breeding platforms.

However, even with its biological strengths to adapt to anthropogenic changes, they are still faced with the threat of extinction. The Peregrine Falcon, like other birds of prey, is relatively long lived, with low reproductive rates and low population density. These factors combined with the fact that they are at the top of the food chain and limited by prey availability makes them particularly vulnerable to human impact.

The study area does not offer any typical Peregrine Falcon suitable roosting or nesting sites, however the birds have been known to nest in trees. Infrastructure such as radio towers and tanks at the J-A mine site and the Transcontinental railway line (approximately 13 north of the study area) would provide roosting or nesting sites.

Scarlet-chested Parrot (Neophema splendida) - Rare under the NPW Act

Scarlet-chested Parrots were recorded at three separate locations with a total of 23 individuals. Two of these locations were just outside of the survey boundary area, but one pair was also observed within the survey boundary near SMM010. All observations of the Scarlet-chested Parrot were in regenerating *Eucalyptus oleosa* ssp. Mixed Mallee over *Triodia* spp. which was burnt during the 2002 wildfire.

The Scarlet-chested Parrot is a small (19-21 cm), brightly coloured parrot. The male has a scarlet chest; both sexes have a cobalt blue head and deep yellow underbody. Despite their colourfulness this species is often overlooked in their natural habitat. Calls are soft, they feed on the ground and they fly low keeping close to cover (Office of Environment and Heritage 2014b).

The species occurs in the semi-arid inland of southern Australia. However, the exact nature of its movements and patterns of abundance are not clearly understood. Most records are from the Great Victoria Desert with a small population, apparently resident, on Gluepot Station in eastern South Australia (BirdLife International 2015).

The Scarlet-chested Parrot inhabits semi-arid areas with mallee and mulga scrublands/open woodlands with spinifex and saltbush ground covers. Occurs in both recently burnt and older growth mallee. Usually nests close to the ground (but may be as high as 8 m) within small mallee eucalypt or Mulga trees, the eggs being laid onto decayed debris and leaves within vertical spouts or other hollows. Frequently found far from water, thus thought to be able to obtain sufficient moisture by drinking dew or chewing water-storing plants. Usually occurs in small groups of up to 20 birds, but occasionally recorded in larger flocks.

Movements are poorly known, though may be in response to rainfall and availability of food (Office of Environment and Heritage 2014b).

Gilbert's Whistler (Pachycephala inornata) - Rare under the NPW Act

No Gilberts Whistlers were observed during the survey. This species is widely recorded in mallee in association with an understorey of spinifex and low shrubs including *Acacia sp.*, *Hakea sp.* and *Senna sp.* One of the key factors appears to be the density of the understory shrub layers.

The distribution of the species is sparsely spread from New South Wales west into the Western Australian Wheat belt. Its range has greatly diminished, principally through land clearing and alteration of its habitat (Office of Environment and Heritage 2014a). The Gilberts Whistler forages on or near the ground, in close proximity to vegetative cover, primarily eating a variety of invertebrates, as well as occasionally eating seeds or nuts. The species is not known to be migratory, and it is believed that they occupy and defend small territories throughout the year (Higgins and Peters 2002).

No Gilberts Whistlers were observed during the survey at Sonoran in 2012 (EBS 2013a). One bird was recorded at the nearby J-A mine site during monitoring survey in 2013 (EBS 2014b). BDBSA records also indicate that the species was last recorded with 50 km of the site in 2009 (DEWNR 2014). Due to their widespread range and suitable habitat found with the study area, they cannot be discounted from possibly being present.

10 SUMMARY OF FINDINGS

The Atacama study area, located in the southern Great Victorian Desert is dominated by regular parallel dunes, typical of the Yellabinna sub-region. The area of approximately 13,000 ha supports a rich diversity of flora and fauna species.

Nine broad vegetation associations were recorded during the survey. The vegetation associations contained diverse vegetation with very little weed infestation. The understorey was largely undisturbed. All nine vegetation associations were considered to resemble pre-European condition and were therefore given a SEB condition ratio of 10:1.

There were a total of 136 flora species from 32 families observed within the study area, this included 133 native species and three weed species. The three weed species were observed in very low densities within the study area, they included:

- *Acetosa vesicaria* (Rosy Dock).
- *Brassica tournefortii* (Wild Turnip).
- *Carrichtera annua* (Ward's Weed).

Flora species with a conservation rating recorded during the 2014 survey included:

- *Calotis lappulacea* (Yellow Burr-daisy) - Rare under the NPW Act.
- *Gratwickia monochaeta* - Rare under the NPW Act.
- *Melaleuca leiocarpa* (Pungent Honey-myrtle) - Rare under the NPW Act.

Santalum spicatum (Sandalwood) (Vulnerable under the NPW Act) is also known to exist in the study area from a previous record.

Flora species with a conservation rating under the EPBC Act or NPW Act which potentially occur within the study area include:

- *Hibbertia crispula* (Ooldea Guinea-flower) – Vulnerable under the EPBC Act and vulnerable under the NPW Act.
- *Corynotheca licrota* (Sand Lily) - Rare under the NPW Act.
- *Eremophila hillii* (Hill's Emubush) - Rare under the NPW Act.
- *Maireana suaedifolia* (Lax Bluebush) - Rare under the NPW Act.

A total of 15 mammal species (excluding bats) from nine families were detected during the 2014 survey. Ten of these species were native and five were introduced. The introduced species included:

- One-humped Camel (*Camelus dromedarius*).
- Feral Cat (*Felis catus*).
- Fox (*Vulpes vulpes*).

- House Mouse (*Mus musculus*).
- Rabbit (*Oryctolagus cuniculus*).

Two of the mammal species detected during the 2014 survey have a conservation rating, they include:

- Sandhill Dunnart (*Sminthopsis psammophila*) - Endangered under the EPBC Act and vulnerable under the NPW Act.
- Southern Marsupial Mole (*Notoryctes typhlops*) - Endangered under the EPBC Act and vulnerable under the NPW Act.

It is likely that an additional four mammals would occur in the study area bringing the total of native species to 14.

Five micro bat species were recorded and it is likely that an additional three species would occur. None of these micro bat species are of National or State conservation significance.

A total of 38 reptile species from nine families were recorded within the Atacama study area. None of the reptile species recorded were of National or State conservation significance. One species with a conservation rating; the State rare Western Black-naped Snake (*Neelaps bimaculatus*), has been previously recorded within the Atacama study area.

It is possible that an additional 29 reptiles could occur in the study area bringing the total of reptile species to 67.

A total of 52 bird species were detected from 28 different families during the survey. Six of the birds detected have a conservation rating and one is listed as migratory under the EPBC Act:

- Malleefowl (*Leipoa ocellata*) - Vulnerable under the and vulnerable under the NPW Act
- Rainbow Bee-eater (*Merops ornatus*) – Migratory under the EPBC Act.
- Australian Bustard (*Ardeotis australis*) - Vulnerable under the NPW Act.
- Restless Flycatcher (*Myiagra inquieta*) - Rare under the NPW Act.
- Peregrine Falcon (*Falco peregrines*) - Rare under the NPW Act.
- Scarlet-chested Parrot (*Neophema splendida*) - Rare under the NPW Act.

Based on the results from the results from the nearby J-A mine site and Sonoran study area and the available habitat within the Atacama study area it is possible that an additional 40 bird species could occur. The total bird species occurring in the study could possibly be as high as 92. Five of the 40 additional bird species have a conservation rating:

- Slender-billed Thornbill (western ssp.) (*Acanthiza iredalei ssp. iredalei*) - Rare under the NPW Act.
- Striated Grasswren (*Amytornis striatus*) - Rare under the NPW Act.

- Major Mitchell's Cockatoo (*Cacatua leadbeateri*) - Rare under the NPW Act.
- White-browed Treecreeper (*Climacteris affinis*) - Rare under the NPW Act.
- Gilbert's Whistler (*Pachycephala inornata*) - Rare under the NPW Act.

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12 APPENDICES

Appendix 1. Flora species recorded in the BDBSA within 50 km of the study area (DEWNR 2014).

Class name	Species name	Common name	Conservation status		Most recent record
			Aus	SA	
ADIANTACEAE	<i>Cheilanthes lasiophylla</i>	Woolly Cloak-fern			30/08/1972
AIZOACEAE	<i>Disphyma crassifolium</i> ssp. <i>clavellatum</i>	Round-leaf Pigface			8/10/1954
	<i>Gunniopsis quadrifida</i>	Sturt's Pigface			6/10/1919
	<i>Gunniopsis septifraga</i>	Green Pigface			10/10/1998
	<i>*Mesembryanthemum aitonis</i>	Angled Iceplant			8/10/1987
	<i>Sarcozona bicarinata</i>	Ridged Noon-flower		V	8/08/2006
	<i>Sarcozona praecox</i>	Sarcozona			23/09/1960
	<i>Tetragonia eremaea</i>	Desert Spinach			13/11/2001
AMARANTHACEAE	<i>Hemichroa diandra</i>	Mallee Hemichroa			25/08/2005
	<i>Ptilotus exaltatus</i> var. (NC)	Pink Mulla Mulla			13/08/2006
	<i>Ptilotus incanus/obovatus</i>	Silver Mulla Mulla			15/08/2006
	<i>Ptilotus obovatus</i>				9/04/2012
	<i>Ptilotus polystachyus</i>	Long-tails			28/05/1989
ANACARDIACEAE	<i>*Schinus molle</i>	Pepper-tree			8/10/1987
APOCYNACEAE	<i>Alyxia buxifolia</i>	Sea Box			9/10/1987
ASCLEPIADACEAE	<i>Marsdenia australis</i>	Native Pear			21/10/2005
	<i>Rhyncharhena linearis</i>	Bush Bean			28/05/1989
	<i>Sarcostemma viminalis</i> ssp. <i>australe</i>	Caustic Bush			7/09/1963
BORAGINACEAE	<i>*Echium plantagineum</i>	Salvation Jane			19/09/1920
	<i>Halganina cyanea</i>	Rough Blue-flower			29/05/2010
	<i>*Neatostema apulum</i>	Hairy Sheepweed			20/08/2005
	<i>Omphalolappula concava</i>	Burr Stickseed			22/09/1984
CACTACEAE	<i>*Opuntia ficus-indica</i>	Indian Fig			29/10/1984
	<i>*Opuntia robusta</i>	Wheel Pear			1/02/2010
CAMPANULACEAE	<i>Wahlenbergia tumidifruta</i>	Swollen-fruit Bluebell			17/09/1920
CASUARINACEAE	<i>Casuarina pauper</i>	Black Oak			11/08/2006
CHENOPODIACEAE	<i>Atriplex acutibractea</i> ssp. <i>acutibractea</i>	Pointed Saltbush			21/09/1984
	<i>Atriplex acutibractea</i> ssp. <i>karoniensis</i>	Pointed Saltbush			25/05/1985
	<i>Atriplex cryptocarpa</i>				13/11/2001
	<i>Atriplex holocarpa</i>	Pop Saltbush			22/10/1983
	<i>Atriplex spongiosa</i>	Pop Saltbush			1/09/1920
	<i>Atriplex stipitata</i>	Bitter Saltbush			11/04/2012
	<i>Atriplex vesicaria</i>	Bladder Saltbush			10/04/2012
	<i>Chenopodium curvispicatum</i>	Cottony Goosefoot			15/08/2006
	<i>Chenopodium desertorum</i> ssp. <i>anidiophyllum</i>	Mallee Goosefoot			9/10/1987
	<i>Chenopodium desertorum</i> ssp. <i>desertorum</i>	Frosted Goosefoot			15/08/2006

Class name	Species name	Common name	Conservation status		Most recent record
			Aus	SA	
	<i>Chenopodium gaudichaudianum</i>	Scrambling Goosefoot			22/09/1960
	<i>Dissocarpus paradoxus</i>	Ball Bindyi			13/11/2001
	<i>Dysphania cristata</i>	Crested Crumbweed			20/09/1920
	<i>Enchylaena tomentosa</i> var.	Ruby Saltbush			14/08/2006
	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>	Ruby Saltbush			10/04/2012
	<i>Eriochiton sclerolaenoides</i>	Woolly-fruit Bluebush			11/04/2012
	<i>Maireana appressa</i>	Pale-fruit Bluebush			23/08/2005
	<i>Maireana brevifolia</i>	Short-leaf Bluebush			8/10/1987
	<i>Maireana erioclada</i>	Rosy Bluebush			11/04/2012
	<i>Maireana erioclada/pentatropis</i>				10/04/2012
	<i>Maireana georgei</i>	Satiny Bluebush			14/08/2006
	<i>Maireana georgei/turbinata</i>	Satiny Bluebush			11/04/2012
	<i>Maireana integra</i>	Entire-wing Bluebush			10/04/2012
	<i>Maireana lobiflora</i>	Lobed Bluebush			0/01/1900
	<i>Maireana oppositifolia</i>	Salt Bluebush			28/05/1989
	<i>Maireana pentatropis</i>	Erect Mallee Bluebush			11/04/2012
	<i>Maireana planifolia</i>	Flat-leaf Bluebush			10/08/2006
	<i>Maireana radiata</i>	Radiate Bluebush			11/04/2012
	<i>Maireana sedifolia</i>	Bluebush			10/04/2012
	<i>Maireana suaedifolia</i>	Lax Bluebush		R	28/05/2010
	<i>Maireana trichoptera</i>	Hairy-fruit Bluebush			11/04/2012
	<i>Maireana turbinata</i>	Top-fruit Bluebush			22/09/1984
	<i>Maireana villosa</i>	Silky Bluebush			7/08/2006
	<i>Osteocarpum acropterum</i> var. <i>acropterum</i>	Tuberculate Bonefruit			31/08/2006
	<i>Osteocarpum salsuginosum</i>	Inland Bonefruit			28/07/1969
	<i>Rhagodia candolleana</i> ssp.	Sea-berry Saltbush			10/08/2006
	<i>Rhagodia candolleana</i> ssp. <i>argentea</i>	Silver Sea-berry Saltbush			11/04/2012
	<i>Rhagodia crassifolia</i>	Fleshy Saltbush			25/08/2005
	<i>Rhagodia parabolica</i>	Mealy Saltbush			31/08/1980
	<i>Rhagodia preissii</i> ssp. <i>preissii</i>	Mallee Saltbush			21/10/2005
	<i>Rhagodia spinescens</i>	Spiny Saltbush			10/04/2012
	<i>Rhagodia ulicina</i>	Intricate Saltbush			11/08/2006
	<i>Salsola australis</i>	Buckbush			10/04/2012
	<i>Sclerolaena brevifolia</i>	Small-leaf Bindyi			11/04/2012
	<i>Sclerolaena constricta</i>				11/08/2006
	<i>Sclerolaena decurrens</i>	Green Bindyi			9/08/2006
	<i>Sclerolaena diacantha</i>	Grey Bindyi			11/04/2012
	<i>Sclerolaena holtiana</i>	Holt's Bindyi			8/08/2006
	<i>Sclerolaena obliquicuspis</i>	Oblique-spined Bindyi			11/04/2012
	<i>Sclerolaena parviflora</i>	Small-flower Bindyi			21/10/2005

Class name	Species name	Common name	Conservation status		Most recent record
			Aus	SA	
	<i>Sclerolaena patenticuspis</i>	Spear-fruit Bindyi			10/04/2012
	<i>Sclerolaena uniflora</i>	Small-spine Bindyi			8/04/2012
	<i>Tecticornia disarticulata</i>				25/08/2005
	<i>Tecticornia halocnemoides</i> ssp.	Grey Samphire			13/08/2006
	<i>Tecticornia halocnemoides</i> ssp. <i>halocnemoides</i>	Grey Samphire			22/10/1983
	<i>Tecticornia indica</i> ssp. <i>leiostachya</i>	Brown-head Samphire			24/08/1939
	<i>Tecticornia lylei</i>	Wiry Samphire			22/10/1983
	<i>Tecticornia pruinosa</i>	Bluish Samphire			23/08/2005
CHLOANTHACEAE	<i>Dicrastylis beveridgei</i> var. <i>beveridgei</i>	Sand-sage			27/09/1976
	<i>Dicrastylis beveridgei</i> var. <i>lanata</i>	Woolly Sand-sage			9/10/1987
	<i>Dicrastylis lewellinii</i>	Purple Sand-sage			9/10/1987
COMPOSITAE	<i>Actinobole uliginosum</i>	Flannel Cudweed			9/10/1987
	<i>Angianthus conocephalus</i>				21/09/1984
	<i>Brachyscome ciliaris</i> var. <i>ciliaris</i>	Variable Daisy			1/09/2006
	<i>Brachyscome iberidifolia</i>	Swan River Daisy			9/10/1987
	<i>Brachyscome trachycarpa</i>	Smooth Daisy			11/08/2006
	<i>Calotis cymbacantha</i>	Showy Burr-daisy			1/09/1920
	<i>Calotis erinacea</i>	Tangled Burr-daisy			21/10/2005
	<i>Calotis hispidula</i>	Hairy Burr-daisy			6/10/1987
	<i>Centaurea melitensis</i>	Malta Thistle			30/10/1989
	<i>Cephalopterum drummondii</i>	Pompom Head			18/09/2007
	<i>Chrysocephalum apiculatum</i>	Common Everlasting			5/10/1987
	<i>Chrysocephalum eremaeum</i>	Sand Button-bush			21/10/2005
	<i>Chrysocephalum pterochaetum</i>	Shrub Everlasting			8/10/1987
	<i>Chthonocephalus pseudevax</i>	Ground-heads			28/05/1989
	<i>Cratystylis conocephala</i>	Bluebush Daisy			10/04/2012
	<i>Dimorphocoma minutula</i>				1/10/2004
	<i>Erymophyllum ramosum</i> ssp. <i>ramosum</i>				1/10/2004
	<i>Gnephosis tenuissima</i>	Dwarf Golden-tip			18/08/2005
	<i>Gratwickia monochaeta</i>			R	8/08/2006
	<i>Hyalosperma semisterile</i>	Orange Sunray			28/05/1989
	<i>Isoetopsis graminifolia</i>	Grass Cushion			28/05/1989
	<i>Kippistia suaedifolia</i>	Fleshy Kippistia			1/10/2004
	<i>Lawrencella davenportii</i>	Davenport Daisy			28/05/1989
	<i>Leiocarpa websteri</i>	Narrow Plover-daisy			21/09/1984
	<i>Leptorhynchos waitzia</i>	Button Immortelle			1/10/2004
	<i>Leucochrysum fitzgibbonii</i>	Fitzgibbon's Daisy			22/09/1984
	<i>Millotia greevesii</i> ssp. <i>helmsii</i>				31/08/1980

Class name	Species name	Common name	Conservation status		Most recent record
			Aus	SA	
	<i>Millotia myosotidifolia</i>	Broad-leaf Millotia			1/09/1980
	<i>Minuria cunninghamii</i>	Bush Minuria			8/08/2007
	<i>Minuria leptophylla</i>	Minnie Daisy			9/10/1987
	<i>Olearia calcarea</i>	Crinkle-leaf Daisy-bush			11/08/2006
	<i>Olearia decurrens</i>	Winged Daisy-bush			5/10/1987
	<i>Olearia exiguiifolia</i>	Lobed-leaf Daisy-bush			13/08/2006
	<i>Olearia muelleri</i>	Mueller's Daisy-bush			15/08/2006
	<i>Olearia subspicata</i>	Spiked Daisy-bush			1/10/1987
	<i>Podolepis capillaris</i>	Wiry Podolepis			13/08/2006
	<i>Podolepis rugata</i> var. <i>rugata</i>	Pleated Copper-wire Daisy			1/10/2004
	<i>Polycalymma stuartii</i>	Poached-egg Daisy			1/08/1939
	<i>Pycnosorus pleiocephalus</i>	Soft Billy-buttons			21/09/1984
	<i>*Reichardia tingitana</i>	False Sowthistle			31/08/2006
	<i>Rhodanthe chlorocephala</i> ssp. <i>rosea</i>	Western Sunray			1/09/1980
	<i>Rhodanthe floribunda</i>	White Everlasting			9/10/2007
	<i>Rhodanthe haigii</i>	Haig's Everlasting			22/09/1984
	<i>Rhodanthe moschata</i>	Musk Daisy			9/10/1987
	<i>Rhodanthe pygmaea</i>	Pigmy Daisy			6/10/1987
	<i>Rhodanthe tietkensii</i>	Tietken's Daisy			22/10/1983
	<i>Schoenia cassiniana</i>	Pink Everlasting			1/09/1980
	<i>Senecio glossanthus</i>	Annual Groundsel			12/08/2006
	<i>Senecio gregorii</i>	Fleshy Groundsel			9/10/1987
	<i>Senecio lacustrinus</i>				8/08/2006
	<i>Senecio pinnatifolius</i> (NC)	Variable Groundsel			22/09/1984
	<i>Sonchus oleraceus</i>	Common Sow-thistle			13/11/2001
	<i>Trichanthodium skirrophorum</i>	Woolly Yellow-heads			25/08/2005
	<i>Vittadinia cervicularis</i> var. <i>cervicularis</i>	Waisted New Holland Daisy			10/04/2012
	<i>Vittadinia dissecta</i> var. <i>hirta</i>	Dissected New Holland Daisy			5/10/1987
	<i>Vittadinia eremaea</i>	Desert New Holland Daisy			1/09/2006
	<i>Vittadinia gracilis</i>	Woolly New Holland Daisy			8/04/2012
	<i>Waitzia acuminata</i> var. <i>acuminata</i>	Orange Immortelle			1/09/1980
CONVOLVULACEAE	<i>Convolvulus clementii</i>				28/05/1989
	<i>Convolvulus eyreanus</i> (NC)	Silver Bindweed			28/05/1989
	<i>Convolvulus recurvatus</i> ssp. <i>nullarborensis</i>				22/08/1955
CRASSULACEAE	<i>Crassula colligata</i> ssp. <i>lamprosperma</i>				8/08/2006
	<i>Crassula colorata</i> var. <i>acuminata</i>	Dense Crassula			22/09/1984
	<i>Crassula colorata</i> var. <i>colorata</i>	Dense Crassula			10/08/2006
	<i>Crassula sieberiana</i> ssp. <i>tetramera</i> (NC)	Australian Stonecrop			22/09/1984

Class name	Species name	Common name	Conservation status		Most recent record
			Aus	SA	
CRUCIFERAE	<i>Arabidella filifolia</i>	Thread-leaf Cress			21/09/1984
	<i>Arabidella trisecta</i>	Shrubby Cress			8/04/2012
	<i>*Brassica tournefortii</i>	Wild Turnip			11/04/2012
	<i>*Carrichtera annua</i>	Ward's Weed			10/04/2012
	<i>Cruciferae sp.</i>	Cress Family			8/08/2006
	<i>Lepidium oxytrichum</i>	Green Peppergrass			28/05/1989
	<i>Lepidium phlebopetalum</i>	Veined Peppergrass			8/04/2012
	<i>Phlegmatospermum cochlearinum</i>	Downy Cress			22/09/1984
	<i>*Sisymbrium sp.</i>	Wild Mustard			24/08/2005
	<i>Stenopetalum lineare</i>	Narrow Thread-petal			8/10/2007
	<i>Stenopetalum nutans</i>	Nodding Thread-petal			24/08/1922
	<i>Stenopetalum sphaerocarpum</i>	Round-fruit Thread-petal			11/08/2006
CUCURBITACEAE	<i>*Cucumis myriocarpus</i>	Paddy Melon			22/10/1983
CUPRESSACEAE	<i>Callitris glaucophylla</i>	White Cypress-pine			22/10/1983
	<i>Callitris verrucosa</i>	Scrub Cypress Pine			9/10/1987
DILLENIACEAE	<i>Hibbertia crispula</i>	Ooldea Guinea-flower	VU	V	9/10/1987
EUPHORBIACEAE	<i>Adriana tomentosa var. hookeri</i>	Mallee Bitter-bush			9/10/1987
	<i>Beyeria opaca</i>	Dark Turpentine Bush			9/10/1987
	<i>Chamaesyce drummondii</i> (NC)	Caustic Weed			8/10/1987
	<i>Euphorbia drummondii</i>				10/04/2012
	<i>Euphorbia tannensis ssp. eremophila</i>	Desert Spurge			10/04/2012
	<i>Poranthera leiosperma</i>	Small Poranthera			6/10/1987
	<i>Poranthera microphylla</i> (NC)	Small Poranthera			5/10/1987
FRANKENIACEAE	<i>Frankenia cinerea</i>			R	23/08/2005
	<i>Frankenia cordata</i>				8/08/2006
	<i>Frankenia serpyllifolia</i>	Thyme Sea-heath			10/04/2012
GERANIACEAE	<i>*Erodium aureum</i>				13/08/2006
	<i>*Erodium cicutarium</i>	Cut-leaf Heron's-bill			11/08/2006
	<i>Erodium crinitum</i>	Blue Heron's-bill			28/05/1989
	<i>Erodium cygnorum</i>	Blue Heron's-bill			14/08/2006
	<i>*Erodium moschatum</i>	Musky Herons-bill			22/09/1984
GOODENIACEAE	<i>Cooperhookia strophilata</i>	Sticky Cooperhookia			4/11/2009
	<i>Dampiera lanceolata var. lanceolata</i>	Grooved Dampiera			27/09/1976
	<i>Goodenia occidentalis</i>				1/09/1980
	<i>Goodenia pinnatifida</i>	Cut-leaf Goodenia			7/08/2006
	<i>Lechenaultia striata</i>	Striate Lechenaultia			27/06/1967
	<i>Scaevola depauperata</i>	Skeleton Fanflower			30/05/2010
	<i>Scaevola spinescens</i>	Spiny Fanflower			10/04/2012
	<i>Velleia sp.</i>	Velleia			21/09/1984
GRAMINEAE	<i>Amphipogon caricinus var. caricinus</i>	Long Grey-beard Grass			5/10/1987

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			Aus	SA	
	<i>Aristida contorta</i>	Curly Wire-grass			25/08/2005
	<i>Aristida holathera</i> var. <i>holathera</i>	Tall Kerosene Grass			10/08/2006
	<i>Austrostipa drummondii</i>	Cottony Spear-grass			1/10/2004
	<i>Austrostipa elegantissima</i>	Feather Spear-grass			11/08/2006
	<i>Austrostipa eremophila</i>	Rusty Spear-grass			31/08/2006
	<i>Austrostipa nitida</i>	Balcarra Spear-grass			11/04/2012
	<i>Austrostipa nullanulla</i>	Club Spear-grass		V	8/08/2006
	<i>Austrostipa platychaeta</i>	Flat-awn Spear-grass			11/08/2006
	<i>Austrostipa vickeryana</i>	Vickery's Spear-grass		R	10/10/1998
	<i>Enneapogon avenaceus</i>	Common Bottle-washers			11/04/2012
	<i>Enneapogon caeruleus</i>	Blue Bottle-washers			10/04/2012
	<i>Enneapogon cylindricus</i>	Jointed Bottle-washers			8/04/2012
	<i>Enneapogon polyphyllus</i>	Leafy Bottle-washers			7/08/2006
	<i>Eragrostis falcata</i>	Sickle Love-grass			0/01/1900
	<i>Eragrostis setifolia</i>	Bristly Love-grass			13/08/2006
	<i>Eragrostis xerophila</i>	Knotty-butt Neverfail			23/08/2005
	* <i>Rostraria pumila</i>	Tiny Bristle-grass			11/08/2006
	<i>Rytidosperma caespitosum</i>	Common Wallaby-grass			9/04/2012
	* <i>Schismus arabicus</i>	Arabian Grass			21/09/1984
	* <i>Schismus barbatus</i>	Arabian Grass			13/11/2001
	<i>Setaria constricta</i>	Knotty-butt Paspalidium			18/09/1920
	<i>Triodia compacta</i>	Spinifex			17/08/2005
	<i>Triodia lanata</i>	Woolly Spinifex			28/05/1989
	<i>Triodia scariosa</i>	Spinifex			13/08/2006
	<i>Triraphis mollis</i>	Purple Plume Grass			22/10/1983
GYROSTEMONACEAE	<i>Codonocarpus cotinifolius</i>	Desert Poplar			20/08/1926
	<i>Gyrostemon ramulosus</i>	Bushy Wheel-fruit			21/10/2005
JUNCAGINACEAE	<i>Triglochin nana</i>	Dwarf Arrowgrass			23/08/2005
LABIATAE	<i>Prostanthera althoferi</i> ssp. <i>longifolia</i>				13/08/2006
	<i>Prostanthera sericea</i>	Silky Mintbush			1/05/2008
	<i>Prostanthera wilkieana</i>				13/08/2006
	<i>Westringia eremicola</i>	Slender Westringia			21/10/2005
	<i>Westringia rigida</i>	Stiff Westringia			13/08/2006
LAURACEAE	<i>Cassytha melantha</i>	Coarse Dodder-laurel			10/08/2006
LEGUMINOSAE	<i>Acacia acanthoclada</i> ssp. <i>acanthoclada</i>	Harrow Wattle			10/08/2006
	<i>Acacia aneura</i> var. <i>intermedia</i>	Broad-leaf Mulga			24/08/2005
	<i>Acacia ayersiana</i>	Blue Mulga			14/09/1970
	<i>Acacia brachystachya</i>	Turpentine Mulga			30/09/1987
	<i>Acacia burkittii</i>	Pin-bush Wattle			24/08/2005
	<i>Acacia clelandii</i>	Turpentine Mulga			18/09/1920

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			Aus	SA	
	<i>Acacia colletioides</i>	Veined Wait-a-while			21/10/2005
	<i>Acacia gilesiana</i>	Giles' Wattle			1/10/1987
	<i>Acacia kempeana</i>	Witchetty Bush			1/08/1926
	<i>Acacia ligulata</i>	Umbrella Bush			11/04/2012
	<i>Acacia nyssophylla</i>	Spine Bush			11/04/2012
	<i>Acacia oswaldii</i>	Umbrella Wattle			11/04/2012
	<i>Acacia papyrocarpa</i>	Western Myall			10/04/2012
	<i>Acacia prainii</i>	Prain's Wattle			28/05/1989
	<i>Acacia ramulosa</i> var. <i>linophylla</i>	Horse Mulga			24/04/2008
	<i>Acacia ramulosa</i> var. <i>ramulosa</i>	Horse Mulga			24/08/1997
	<i>Acacia rigens</i>	Nealie			9/09/2005
	<i>Acacia sibirica</i>	Bastard Mulga			28/05/1989
	<i>Acacia tetragonophylla</i>	Dead Finish			25/08/2005
	<i>Bossiaea walkeri</i>	Cactus Pea			1/05/2008
	<i>Cassia sturtii</i> (NC)	Grey Cassia			22/09/1984
	<i>Cullen discolor</i>	Prostrate Scurf-pea			1/09/1980
	<i>Daviesia benthamii</i> ssp. <i>acanthoclona</i>	Dryland Bitter-pea			21/10/2005
	<i>Daviesia benthamii</i> ssp. <i>humilis</i>	Mallee Bitter-pea		R	5/10/1987
	<i>Daviesia ulicifolia</i> ssp. <i>aridicola</i>	Gorse Bitter-pea			30/05/2010
	<i>Glycine canescens</i>	Silky Glycine			
	<i>Lotus cruentus</i>	Red-flower Lotus			13/11/2001
	<i>*Medicago polymorpha</i> var. <i>polymorpha</i>	Burr-medic			19/09/1920
	<i>Senna artemisioides</i> ssp. <i>petiolaris</i>				9/04/2012
	<i>Senna artemisioides</i> ssp. <i>X artemisioides</i>	Silver Senna			9/08/2006
	<i>Senna artemisioides</i> ssp. <i>X coriacea</i>	Broad-leaf Desert Senna			11/04/2012
	<i>Senna artemisioides</i> ssp. <i>X sturtii</i>	Grey Senna			10/04/2012
	<i>Senna cardiosperma</i> ssp.	Curved-leaf Senna			21/10/2005
	<i>Senna cardiosperma</i> ssp. <i>gawlerensis</i>	Gawler Ranges Senna			11/04/2012
	<i>Senna pleurocarpa</i> var. <i>pleurocarpa</i>	Stripe-pod Senna			6/10/1987
	<i>Swainsona acuticarinata</i>	Burke's Swainson-pea			30/05/2010
	<i>Swainsona campestris</i>				31/08/1980
	<i>Swainsona flavicarinata</i>	Yellow-keel Swainson-pea			0/01/1900
	<i>Swainsona formosa</i>	Sturt Pea			26/09/1955
	<i>Swainsona oliveri</i>				28/05/1989
	<i>Swainsona reticulata</i>				0/01/1900
	<i>Swainsona villosa</i>	Villous Swainson-pea			22/10/1983
	<i>Templetonia incrassata</i>	Thick-stemmed Broombush Templetonia			18/08/2005

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			Aus	SA	
LILIACEAE	<i>Corynotheca licrota</i>	Sand Lily		R	9/10/1987
	<i>Dianella brevicaulis/revoluta</i> var.	Black-anther Flax-lily			5/10/1987
	<i>Dianella revoluta</i> var. <i>divaricata</i>	Broad-leaf Flax-lily			10/08/2006
	<i>Lomandra leucocephala</i> ssp. <i>robusta</i>	Woolly Mat-rush			9/10/1987
	<i>Thysanotus baueri</i>	Mallee Fringe-lily			22/10/1983
LOGANIACEAE	<i>Logania nuda</i>	Leafless Logania			9/10/1987
LORANTHACEAE	<i>Amyema miquelii</i>	Box Mistletoe			6/10/1987
	<i>Amyema miraculosa</i> ssp. <i>boormanii</i>	Fleshy Mistletoe			8/10/1987
	<i>Amyema preissii</i>	Wire-leaf Mistletoe			25/08/2005
	<i>Amyema quandang</i> var. <i>quandang</i>	Grey Mistletoe			11/04/2012
	<i>Lysiana exocarpi</i> ssp. <i>exocarpi</i>	Harlequin Mistletoe			10/04/2012
	<i>Lysiana murrayi</i>	Mulga Mistletoe			13/07/1972
MALVACEAE	<i>Abutilon otocarpum</i>	Desert Lantern-bush			28/05/1989
	<i>Alyogyne pinoniana</i> var. <i>microandra</i>			V	9/10/1987
	<i>Alyogyne pinoniana</i> var. <i>pinoniana</i>	Sand Hibiscus			9/10/1987
	<i>Hibiscus krichauffianus</i>	Velvet-leaf Hibiscus			22/09/1960
	<i>Lawrencia glomerata</i>	Clustered Lawrencia			13/08/2006
	<i>Lawrencia squamata</i>	Thorny Lawrencia			5/04/2006
	<i>Malva preissiana</i>	Australian Hollyhock			22/10/1983
	<i>Sida ammophila</i>	Sand Sida			23/08/2005
	<i>Sida calyxhymenia</i>	Tall Sida			22/10/1983
	<i>Sida corrugata</i> var. <i>corrugata</i>	Corrugated Sida			24/08/1922
	<i>Sida fibulifera</i>	Pin Sida			8/10/1987
	<i>Sida intricata</i>	Twiggy Sida			8/08/2006
	<i>Sida petrophila</i>	Rock Sida			13/08/2006
	<i>Sida spodochroma</i>				11/04/2012
MYOPORACEAE	<i>Eremophila alternifolia</i>	Narrow-leaf Emubush			11/08/2006
	<i>Eremophila arachnoides</i> ssp. <i>tenera</i>	Spider Emubush			17/09/1926
	<i>Eremophila arenaria</i>				8/10/1987
	<i>Eremophila decipiens</i> ssp. <i>decipiens</i>	Long-stalk Tar-bush			29/09/1975
	<i>Eremophila decussata</i>				30/09/1987
	<i>Eremophila deserti</i>	Turkey-bush			18/08/2005
	<i>Eremophila fallax</i>				9/10/1987
	<i>Eremophila gibsonii</i>	Gibson's Emubush			4/11/2009
	<i>Eremophila glabra</i> ssp.	Tar Bush			10/08/2006
	<i>Eremophila glabra</i> ssp. <i>glabra</i>	Tar Bush			21/10/2005
	<i>Eremophila hillii</i>	Hill's Emubush		R	30/09/1987
	<i>Eremophila latrobei</i> ssp.	Crimson Emubush			18/08/2005

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			Aus	SA	
	<i>Eremophila latrobei</i> ssp. <i>glabra</i>	Crimson Emubush			13/08/2006
	<i>Eremophila longifolia</i>	Weeping Emubush			11/04/2012
	<i>Eremophila paisleyi</i> ssp. <i>paisleyi</i>				4/11/2009
	<i>Eremophila platythamnus</i> ssp.	Munyun#pa			10/08/2006
	<i>Eremophila platythamnus</i> ssp. <i>platythamnus</i>				11/08/2006
	<i>Eremophila scoparia</i>	Broom Emubush			10/04/2012
	<i>Eremophila</i> sp.	Emubush/Turkey-bush			9/09/2005
	<i>Eremophila verrucosa</i> ssp. <i>brevistellata</i>	Warty Emubush			30/09/1987
	<i>Eremophila willsii</i> ssp. <i>integrifolia</i>	Will's Emubush			21/10/2005
	<i>Myoporum platycarpum</i> ssp.	False Sandalwood			9/04/2012
	<i>Myoporum platycarpum</i> ssp. <i>platycarpum</i>	False Sandalwood			10/04/2012
MYRTACEAE	<i>Darwinia salina</i>	Salt Darwinia			17/09/2001
	<i>Eucalyptus brachycalyx</i>	Gilja			15/08/2006
	<i>Eucalyptus calcareana</i>	Nundroo Mallee			10/08/2006
	<i>Eucalyptus concinna</i>	Victoria Desert Mallee			8/04/2012
	<i>Eucalyptus eremicola</i> ssp. <i>eremicola</i>	Vokes Hill Mallee			24/04/1998
	<i>Eucalyptus eremicola</i> ssp. <i>peeneri</i>	Peeneri Mallee			21/05/1986
	<i>Eucalyptus foecunda</i> (NC)	Narrow-leaved Mallee			9/10/1987
	<i>Eucalyptus gracilis</i>	Yorrell			13/08/2006
	<i>Eucalyptus gypsophila</i>	Kopi Mallee			18/09/1920
	<i>Eucalyptus leptophylla</i>	Narrow-leaf Red Mallee			8/10/1987
	<i>Eucalyptus leptophylla</i> (NC)	Narrow-leaf Red Mallee			9/09/2005
	<i>Eucalyptus oleosa</i> (NC)	Red Mallee			28/05/1989
	<i>Eucalyptus oleosa</i> ssp.				12/08/2006
	<i>Eucalyptus oleosa</i> ssp. <i>ampliata</i>	Red Mallee			11/04/2012
	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i>	Red Mallee			25/08/2005
	<i>Eucalyptus pimpiniana</i>	Pimpin Mallee			4/11/2009
	<i>Eucalyptus socialis</i> ssp.				9/09/2005
	<i>Eucalyptus socialis</i> ssp. <i>eucentrica</i>				24/04/1998
	<i>Eucalyptus socialis</i> ssp. <i>victoriensis</i>				21/10/2005
	<i>Eucalyptus</i> sp.				8/04/2012
	<i>Eucalyptus striatocalyx</i> (NC)	Kopi Mallee			6/10/1987
	<i>Eucalyptus yumbarrana</i>	Yumbarra Mallee			18/08/2005
	<i>Homoranthus wilhelmii</i>	Wilhelm's Homoranthus			22/10/1983
	<i>Leptospermum coriaceum</i>	Dune Tea-tree			8/04/2012
	<i>Melaleuca eleuterostachya</i>	Hummock Honey-myrtle			8/04/2012
	<i>Melaleuca interioris</i>	Broombush			8/04/2012

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			Aus	SA	
	<i>Melaleuca lanceolata</i>	Dryland Tea-tree			24/04/2008
	<i>Melaleuca leiocarpa</i>	Pungent Honey-myrtle		R	9/09/2005
	<i>Melaleuca uncinata</i>	Broombush			24/04/2008
	<i>Melaleuca xerophila</i>	Boree			11/08/2006
	<i>Thryptomene elliottii</i>				1/10/1987
	<i>Thryptomene maisonneuvei</i> (NC)	Desert Thryptomene			28/05/1989
OXALIDACEAE	<i>Oxalis perennans</i>	Native Sorrel			22/09/1960
PITTOSPORACEAE	<i>Pittosporum angustifolium</i>	Native Apricot			10/08/2006
PLANTAGINACEAE	<i>Plantago drummondii</i>	Dark Plantain			12/08/2006
POLYGONACEAE	* <i>Acetosa vesicaria</i>	Rosy Dock			13/11/2001
PORTULACACEAE	<i>Calandrinia eremaea</i>	Dryland Purslane			14/08/2006
	<i>Calandrinia polyandra</i> var. <i>polyandra</i>	Parakeelya			9/10/1987
PRIMULACEAE	* <i>Anagallis arvensis</i>	Pimpernel			1/09/1920
PROTEACEAE	<i>Grevillea huegelii</i>	Comb Grevillea			8/04/2012
	<i>Grevillea juncifolia</i> ssp. <i>juncifolia</i>	Honeysuckle Grevillea			5/10/1987
	<i>Grevillea nematophylla</i> ssp. <i>nematophylla</i>	Water Bush			1/12/1985
	<i>Grevillea pterosperma</i>	Dune Grevillea			8/10/1987
	<i>Grevillea stenobotrya</i>	Rattle-pod Grevillea			21/10/2005
	<i>Hakea francisiana</i>	Bottlebrush Hakea			8/04/2012
	<i>Hakea leucoptera</i> ssp. <i>leucoptera</i>	Silver Needlewood			8/08/2006
RHAMNACEAE	<i>Cryptandra propinqua</i>	Silky Cryptandra			29/09/1975
RUBIACEAE	<i>Pomax umbellata</i>	Pomax			4/11/2009
RUTACEAE	<i>Boronia coerulescens</i> ssp. <i>coerulescens</i>	Blue Boronia			21/10/2005
	<i>Geijera linearifolia</i>	Sheep Bush			11/08/2006
SANTALACEAE	<i>Exocarpos aphyllus</i>	Leafless Cherry			11/08/2006
	<i>Santalum acuminatum</i>	Quandong			10/04/2012
	<i>Santalum spicatum</i>	Sandalwood		V	11/04/2012
SAPINDACEAE	<i>Alectryon oleifolius</i> ssp. <i>canescens</i>	Bullock Bush			10/04/2012
	<i>Dodonaea microzyga</i> var. <i>microzyga</i>	Brilliant Hop-bush			31/08/1980
	<i>Dodonaea stenozyga</i>	Desert Hop-bush			9/10/1987
	<i>Dodonaea viscosa</i> ssp. <i>angustissima</i>	Narrow-leaf Hop-bush			15/08/2006
SOLANACEAE	<i>Duboisia hopwoodii</i>	Pituri			17/09/1926
	<i>Grammosolen truncatus</i>	Shrubby Ray-flower			21/10/2005
	<i>Lycium australe</i>	Australian Boxthorn			10/04/2012
	<i>Nicotiana goodspeedii</i>	Small-flower Tobacco			28/05/1989
	<i>Nicotiana simulans</i>	Native Tobacco			24/08/1939
	<i>Solanum coactiliferum</i>	Tomato-bush			21/10/2005
	<i>Solanum ellipticum</i>	Velvet Potato-bush			1/08/1922

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			Aus	SA	
	<i>Solanum hystrix</i>	Afghan Thistle			20/04/1966
	* <i>Solanum nigrum</i>	Black Nightshade			13/11/2001
STACKHOUSIACEAE	<i>Stackhousia megaloptera</i>	Dune Candles			9/10/1987
THYMELAEACEAE	<i>Pimelea microcephala</i> ssp.	Shrubby Riceflower			28/05/1989
	<i>Pimelea microcephala</i> ssp. <i>microcephala</i>	Shrubby Riceflower			21/10/2005
	<i>Pimelea simplex</i> ssp. <i>simplex</i>	Desert Riceflower			2/10/1975
UMBELLIFERAE	<i>Trachymene glaucifolia</i>	Blue Parsnip			17/09/1920
URTICACEAE	<i>Parietaria debilis</i>	Smooth-nettle			7/09/1963
ZYGOPHYLLACEAE	<i>Nitraria billardieri</i>	Nitre-bush			25/08/2005
	<i>Zygophyllum angustifolium</i>	Scrambling Twinleaf			11/08/2006
	<i>Zygophyllum apiculatum</i>	Pointed Twinleaf			30/10/2007
	<i>Zygophyllum aurantiacum</i> ssp.				15/08/2006
	<i>Zygophyllum aurantiacum</i> ssp. <i>aurantiacum</i>	Shrubby Twinleaf			10/04/2012
	<i>Zygophyllum aurantiacum</i> ssp. <i>simplicifolium</i>				2/10/1975
	<i>Zygophyllum aurantiacum/eremaeum</i>	Shrubby Twinleaf			11/04/2012
	<i>Zygophyllum compressum</i>	Rabbit-ears Twinleaf			28/07/1969
	<i>Zygophyllum eremaeum</i>				14/08/2006
	<i>Zygophyllum glaucum</i>	Pale Twinleaf			1/05/1946
	<i>Zygophyllum ovatum</i>	Dwarf Twinleaf			31/08/2006
	<i>Zygophyllum simile</i>	White Twinleaf			5/10/1987

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). **SA:** South Australia (*National Parks and Wildlife Act 1972*). **Conservation Codes:** **CE:** Critically Endangered. **EN/E:** Endangered. **VU/V:** Vulnerable. **R:** Rare.

* Denotes introduced species.

Appendix 2. Fauna species recorded in the BDBSA within 50 km of the study area (DEWNR 2014).

Class name	Species name	Common name	Conservation status		Most recent record
			Aus	SA	
AVES	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater			12/04/2012
	<i>Acanthiza apicalis</i>	Inland Thornbill			11/04/2012
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill			10/04/2012
	<i>Acanthiza iredalei</i>	Slender-billed Thornbill	ssp	ssp	11/04/2012
	<i>Acanthiza iredalei iredalei</i>	Slender-billed Thornbill (western ssp)		R	24/09/1984
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill			11/04/2012
	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk			22/04/2003
	<i>Accipiter fasciatus</i>	Brown Goshawk			7/09/2005
	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar			7/04/2012
	<i>Amytornis striatus</i>	Striated Grasswren		R	26/03/1909
	<i>Anthochaera carunculata</i>	Red Wattlebird			29/07/2005
	<i>Anthus australis</i>	Australian Pipit			11/04/2012
	<i>Aphelocephala leucopsis</i>	Southern Whiteface			11/04/2012
	<i>Aquila audax</i>	Wedge-tailed Eagle			11/04/2012
	<i>Ardeotis australis</i>	Australian Bustard		V	10/04/2012
	<i>Artamus cinereus</i>	Black-faced Woodswallow			11/04/2012
	<i>Artamus cyanopterus</i>	Dusky Woodswallow			9/04/2012
	<i>Artamus personatus</i>	Masked Woodswallow			8/10/1987
	<i>Barnardius zonarius</i>	Australian Ringneck			10/04/2012
	<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo		R	16/04/2009
	<i>Cacomantis pallidus</i>	Pallid Cuckoo			25/05/2009
	<i>Calamanthus (campestris)</i>	Rufous Fieldwren			11/04/2012
	<i>Certhionyx variegatus</i>	Pied Honeyeater			19/08/2004
	<i>Chalcites basal</i>	Horsfield's Bronze Cuckoo			16/04/2009
	<i>Chalcites osculans</i>	Black-eared Cuckoo			19/08/2004
	<i>Cheramoeca leucosterna</i>	White-backed Swallow			19/08/2004
	<i>Cincloramphus cruralis</i>	Brown Songlark			15/08/2004
	<i>Cincloramphus mathewsi</i>	Rufous Songlark			14/08/2004
	<i>Cinclosoma alisteri</i>	Nullarbor Quailthrush			11/04/2012
	<i>Cinclosoma castanotum</i>	Chestnut-backed Quailthrush		ssp	1/08/2007
	<i>Cinclosoma castanotus castanotus</i>	Chestnut Quail-thrush (eastern ssp)		R	24/09/2009
	<i>Climacteris affinis</i>	White-browed Treecreeper		R	10/03/2005
	<i>Colluricincla harmonica</i>	Grey Shrikethrush			11/04/2012
	<i>Coracina maxima</i>	Ground Cuckooshrike			11/04/2012
	<i>Coracina novaehollandiae</i>	Black-faced Cuckooshrike			22/04/2003
	<i>Corvus bennetti</i>	Little Crow			15/04/2009
	<i>Corvus coronoides</i>	Australian Raven			12/04/2012
	<i>Coturnix pectoralis</i>	Stubble Quail			20/09/1984
	<i>Cracticus torquatus</i>	Grey Butcherbird			11/04/2012
	<i>Daphoenositta chrysoptera</i>	Varied Sittella			11/04/2012
	<i>Dicaeum hirundinaceum</i>	Mistletoebird			16/04/2009

Class name	Species name	Common name	Conservation status		Most recent record
			Aus	SA	
	<i>Dromaius novaehollandiae</i>	Emu			2/06/1999
	<i>Drymodes brunneopygia</i>	Southern Scrub Robin			9/01/1909
	<i>Eolophus roseicapilla</i>	Galah			8/04/2012
	<i>Epthianura albigula</i>	White-fronted Chat			5/04/2006
	<i>Epthianura aurifrons</i>	Orange Chat			15/08/2004
	<i>Epthianura tricolor</i>	Crimson Chat			15/08/2004
	<i>Eurostopodus argus</i>	Spotted Nightjar			6/10/1987
	<i>Falco berigora</i>	Brown Falcon			11/04/2012
	<i>Falco cenchroides</i>	Nankeen Kestrel			10/04/2012
	<i>Gavicalis virescens</i>	Singing Honeyeater			11/04/2012
	<i>Grallina cyanoleuca</i>	Magpielark			9/04/2012
	<i>Gymnorhina tibicen</i>	Australian Magpie			10/04/2012
	<i>Hirundo neoxena</i>	Welcome Swallow			12/04/2012
	<i>Lalage tricolor</i>	White-winged Triller			15/08/2004
	<i>Leipoa ocellata</i>	Malleefowl	VU	V	27/09/2009
	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck			7/05/2001
	<i>Malurus lamberti</i>	Variegated Fairywren			11/04/2012
	<i>Malurus leucopterus</i>	White-winged Fairywren			11/04/2012
	<i>Malurus splendens</i>	Splendid Fairywren			9/04/2012
	<i>Manorina flavigula</i>	Yellow-throated Miner			11/04/2012
	<i>Melanodryas cucullata</i>	Hooded Robin		ssp	11/04/2012
	<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater			14/07/1991
	<i>Melopsittacus undulatus</i>	Budgerigar			7/10/1987
	<i>Merops ornatus</i>	Rainbow Bee-eater			1/05/2001
	<i>Microeca fascians</i>	Jacky Winter		ssp	10/04/2012
	<i>Myiagra inquieta</i>	Restless Flycatcher		R	27/07/2000
	<i>Neophema splendida</i>	Scarlet-chested Parrot		R	1/08/2007
	<i>Nesoptilotis leucotis</i>	White-eared Honeyeater			11/04/2012
	<i>Ninox boobook</i>	Southern Boobook			22/04/2003
	<i>Northiella haematogaster</i>	Bluebonnet		ssp	6/04/2006
	<i>Nymphicus hollandicus</i>	Cockatiel			22/04/2003
	<i>Oreoica gutturalis</i>	Crested Bellbird			10/04/2012
	<i>Pachycephala inornata</i>	Gilbert's Whistler		R	15/04/2009
	<i>Pachycephala rufiventris</i>	Rufous Whistler			10/04/2012
	<i>Pardalotus punctatus</i>	Spotted Pardalote			2/06/1999
	<i>Pardalotus striatus</i>	Striated Pardalote			11/04/2012
	<i>Peltohyas australis</i>	Inland Dotterel			1/01/1900
	<i>Petrochelidon nigricans</i>	Tree Martin			11/04/2012
	<i>Petroica goodenovii</i>	Red-capped Robin			11/04/2012
	<i>Phaps chalcoptera</i>	Common Bronzewing			26/08/2002
	<i>Podargus strigoides</i>	Tawny Frogmouth			25/05/2009

Class name	Species name	Common name	Conservation status		Most recent record
			Aus	SA	
	<i>Pomatostomus superciliosus</i>	White-browed Babbler			11/04/2012
	<i>Psephotus varius</i>	Mulga Parrot			11/04/2012
	<i>Ptilotula ornata</i>	Yellow-plumed Honeyeater			11/04/2012
	<i>Ptilotula plumula</i>	Grey-fronted Honeyeater			15/08/2011
	<i>Purnella albifrons</i>	White-fronted Honeyeater			9/04/2012
	<i>Pyrrholaemus brunneus</i>	Redthroat			2/06/1999
	<i>Rhipidura leucophrys</i>	Willie Wagtail			11/04/2012
	<i>Smicromis brevirostris</i>	Weebill			11/04/2012
	<i>Strepera versicolor</i>	Grey Currawong		ssp	15/05/2000
	<i>Taeniopygia guttata</i>	Zebra Finch			10/04/2012
	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher			8/10/1987
	<i>Turnix velox</i>	Little Buttonquail			14/08/2004
MAMMALIA	* <i>Camelus dromedarius</i>	One-humped Camel			11/04/2012
	<i>Canis lupus dingo</i>	Dingo			10/04/2012
	<i>Cercartetus concinnus</i>	Western Pygmy-possum			27/05/2012
	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat			19/04/2009
	<i>Dasycercus cristicauda</i> (NC)	Mulgara			1/01/1923
	* <i>Felis catus</i>	Domestic Cat (Feral Cat)			11/04/2012
	<i>Lasiornis latifrons</i>	Southern Hairy-nosed Wombat			1/04/1985
	<i>Macropus fuliginosus</i>	Western Grey Kangaroo			25/08/2011
	<i>Macropus rufus</i>	Red Kangaroo			9/04/2012
	* <i>Mus musculus</i>	House Mouse			27/05/2012
	<i>Ningauia ridei</i>	Wongai ningauia			27/05/2009
	<i>Ningauia yvonneae</i>	Southern Ningauia			27/05/2012
	<i>Notomys alexis</i>	Spinifex Hopping-mouse			10/04/2012
	<i>Notomys mitchellii</i>	Mitchell's Hopping-mouse			27/05/2012
	<i>Notoryctes typhlops</i>	Southern Marsupial Mole (Itjaritjara)	EN	V	3/04/2001
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat			12/04/2012
	<i>Nyctophilus major</i>	Central Long-eared Bat			19/04/2009
	* <i>Oryctolagus cuniculus</i>	Rabbit (European Rabbit)			11/04/2012
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse			26/05/2012
	<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart			11/04/2012
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart			27/05/2012
	<i>Sminthopsis ooldea</i>	Ooldea Dunnart			22/05/2011
	<i>Sminthopsis psammophila</i>	Sandhill Dunnart	EN	V	27/05/2012
	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna			25/06/2011
	<i>Vespadelus baverstocki</i>	Inland Forest Bat			12/04/2012
	* <i>Vulpes vulpes</i>	Fox (Red Fox)			25/08/2011
REPTILIA	<i>Cryptoblepharus australis</i>	Desert Wall skink			8/10/1987
	<i>Ctenophorus cristatus</i>	Crested Dragon			12/04/2012
	<i>Ctenophorus fordi</i>	Mallee Dragon			22/05/2011

Class name	Species name	Common name	Conservation status		Most recent record
			Aus	SA	
	<i>Ctenophorus isolepis</i>	Military Dragon			20/05/2011
	<i>Ctenophorus pictus</i>	Painted Dragon			12/04/2012
	<i>Ctenotus atlas</i>	Southern Spinifex Ctenotus			25/05/2012
	<i>Ctenotus brooksi</i>	Sandhill Ctenotus			31/05/2010
	<i>Ctenotus euclae</i>	Bight Coast Ctenotus			25/05/2012
	<i>Ctenotus leae</i>	Centralian Coppertail			25/05/2012
	<i>Ctenotus orientalis</i>	Spotted Ctenotus			12/04/2012
	<i>Ctenotus pantherinus</i>	Leopard Skink			20/05/2011
	<i>Ctenotus regius</i>	Eastern Desert Ctenotus			11/04/2012
	<i>Ctenotus schomburgkii</i>	Sandplain Ctenotus			12/04/2012
	<i>Cyclodomorphus melanops</i>	Spinifex Slender Bluetongue			23/05/2012
	<i>Delma butleri</i>	Spinifex Snake-lizard			21/05/2011
	<i>Delma petersoni</i>	Painted Snake-lizard			7/11/1975
	<i>Demansia psammophis</i>	Yellow-faced Whipsnake			24/09/2009
	<i>Diplodactylus calcicolus</i>	South Coast Gecko			18/04/1984
	<i>Diplodactylus conspicillatus</i>	Fat-tailed Gecko			10/10/1987
	<i>Diplodactylus wiru</i>	Desert Wood Gecko			2/10/2009
	<i>Diporiphora lingua</i>	Linga Dragon			22/05/2011
	<i>Eremiascincus richardsonii</i>	Broad-banded Sandswimmer			8/10/1987
	<i>Gehyra purpurascens</i>	Purple Dtella			30/09/2009
	<i>Gehyra variegata</i>	Tree Dtella			11/04/2012
	<i>Heteronotia binoei</i>	Bynoe's Gecko			9/04/2012
	<i>Lerista bipes</i>	Western Two-toed Slider			23/05/2012
	<i>Lerista desertorum</i>	Great Desert Slider			9/10/1987
	<i>Lerista dorsalis</i>	Southern Four-toed Slider			8/04/2012
	<i>Lerista edwardsae</i>	Myall Slider			22/05/2011
	<i>Lerista labialis</i>	Eastern Two-toed Slider			30/09/1988
	<i>Lerista taeniata</i>	Ribbon Slider			22/05/2011
	<i>Lerista timida</i>	Dwarf Three-toed Slider			11/04/2012
	<i>Lialis burtonis</i>	Burton's Legless Lizard			9/10/1987
	<i>Liopholis inornata</i>	Desert Skink			20/05/2011
	<i>Lucasium bungabinna</i>	Southern Sandplain Gecko			10/11/2005
	<i>Lucasium damaeum</i>	Beaded Gecko			26/05/2012
	<i>Menetia greyii</i>	Dwarf Skink			9/04/2012
	<i>Moloch horridus</i>	Thorny Devil			19/05/2011
	<i>Morethia adalaidensis</i>	Adelaide Snake-eye			11/04/2012
	<i>Morethia butleri</i>	Butler's Snake-eye			28/09/2009
	<i>Morethia obscura</i>	Mallee Snake-eye			16/08/1980
	<i>Neelaps bimaculatus</i>	Western Black-naped Snake		R	8/11/2005
	<i>Nephurus laevis</i>	Pale Knob-tailed Gecko			22/05/2011
	<i>Nephurus levis</i>	Smooth Knob-tailed Gecko			5/10/1987

Class name	Species name	Common name	Conservation status		Most recent record
			Aus	SA	
	<i>Nephurus stellatus</i>	Starred Knob-tailed Gecko			18/04/1984
	<i>Pogona minor</i>	Dwarf Bearded Dragon			12/04/2012
	<i>Pseudechis australis</i>	Mulga Snake			2/10/2009
	<i>Pseudonaja modesta</i>	Five-ringed Snake			11/04/2012
	<i>Rhynchoedura ornata</i>	Beaked Gecko			30/09/2009
	<i>Simoselaps bertholdi</i>	Desert Banded Snake			1/01/1950
	<i>Strophurus assimilis</i>	Thorn-tailed Gecko			29/09/2009
	<i>Strophurus elderi</i>	Jewelled Gecko			9/10/1987
	<i>Strophurus intermedius</i>	Southern Spiny-tailed Gecko			22/09/1984
	<i>Tiliqua occipitalis</i>	Western Bluetongue			24/09/1984
	<i>Tiliqua rugosa</i>	Sleepy Lizard			9/04/2012
	<i>Tympanocryptis houstoni</i>	Nullarbor Earless Dragon			12/04/2012
	<i>Underwoodisaurus milii</i>	Barking Gecko			9/04/2012
	<i>Varanus brevicauda</i>	Short-tailed Pygmy Goanna		R	2/06/2010
	<i>Varanus eremius</i>	Desert Pygmy Goanna			21/05/2011
	<i>Varanus gilleni</i>	Pygmy Mulga Goanna			29/09/2009
	<i>Varanus gouldii</i>	Sand Goanna			10/04/2012

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). **SA:** South Australia (*National Parks and Wildlife Act 1972*). **Conservation Codes:** **CE:** Critically Endangered. **EN/E:** Endangered. **VU/V:** Vulnerable. **R:** Rare.

* Denotes introduced species.

Appendix 3. Flora species recorded within the study area.

Family	Species name	Common name	Conservation status		Vegetation association								
			Aus	SA	1	2	3	4	5	6	7	8	9
AIZOACEAE	<i>Sarcocolla praecox</i>	Sarcocolla				✓	✓					✓	
AMARANTHACEAE	<i>Ptilotus incanus/obovatus</i>	Silver Mulla Mulla				✓	✓	✓	✓		✓	✓	✓
	<i>Ptilotus nobilis ssp. nobilis</i>	Yellow-tails					✓	✓					
	<i>Ptilotus polystachyus</i>	Long-tails									✓	✓	
ASCLEPIADACEAE	<i>Cynanchum floribundum</i>	Desert Cynanchum					✓					✓	
BORAGINACEAE	<i>Halgania andromedifolia</i>	Scented Blue-flower			✓		✓						
CHENOPODIACEAE	<i>Atriplex vesicaria</i>	Bladder Saltbush				✓	✓		✓	✓	✓	✓	✓
	<i>Enchylaena tomentosa var.</i>	Ruby Saltbush				✓	✓		✓		✓	✓	
	<i>Eriochiton sclerolaenoides</i>	Woolly-fruit Bluebush				✓				✓	✓	✓	✓
	<i>Maireana pentatropis</i>	Erect Mallee Bluebush				✓	✓		✓		✓	✓	
	<i>Maireana radiata</i>	Radiate Bluebush				✓	✓		✓		✓	✓	
	<i>Maireana sedifolia</i>	Bluebush				✓						✓	
	<i>Maireana trichoptera</i>	Hairy-fruit Bluebush				✓			✓	✓		✓	
	<i>Maireana villosa</i>	Silky Bluebush										✓	
	<i>Rhagodia candolleana ssp. argentea</i>	Silver Sea-berry Saltbush				✓						✓	
	<i>Rhagodia crassifolia</i>	Fleshy Saltbush				✓						✓	
	<i>Rhagodia preissii ssp. preissii</i>	Mallee Saltbush				✓						✓	
	<i>Rhagodia spinescens</i>	Spiny Saltbush				✓	✓		✓		✓	✓	
	<i>Rhagodia ulicina</i>	Intricate Saltbush								✓			
	<i>Salsola australis</i>	Buckbush			✓	✓	✓		✓	✓	✓	✓	✓
	<i>Sclerolaena diacantha</i>	Grey Bindyi				✓				✓		✓	✓
	<i>Sclerolaena parviflora</i>	Small-flower Bindyi					✓	✓					
	<i>Sclerolaena patentiusculis</i>	Spear-fruit Bindyi				✓				✓			
CHLOANTHACEAE	<i>Dicrastylis beveridgei var. lanata</i>	Woolly Sand-sage			✓		✓	✓					
	<i>Dicrastylis lewellinii</i>	Purple Sand-sage			✓		✓	✓					

Family	Species name	Common name	Conservation status		Vegetation association								
			Aus	SA	1	2	3	4	5	6	7	8	9
	<i>Dicrastylis verticillata</i>	Whorled Sand-sage			✓		✓	✓					
	<i>Newcastelia bracteosa</i>				✓		✓	✓					
COMPOSITAE	<i>Brachyscome</i> sp.	Native Daisy					✓						
	<i>Calotis lappulacea</i>	Yellow Burr-daisy		R	✓		✓	✓					
	<i>Cephalopterum drummondii</i>	Pompom Head				✓				✓			
	<i>Chrysocephalum apiculatum</i>	Common Everlasting			✓	✓	✓	✓				✓	
	<i>Cratystylis conocephala</i>	Bluebush Daisy				✓						✓	
	<i>Eriochlamys behrii</i>	Woolly Mantle								✓			
	<i>Gnephosis tenuissima</i>	Dwarf Golden-tip								✓			
	<i>Gratwickia monochaeta</i>			R			✓						
	<i>Minuria leptophylla</i>	Minnie Daisy					✓						
	<i>Olearia exiguifolia</i>	Lobed-leaf Daisy-bush						✓					
	<i>Olearia lepidophylla</i>	Clubmoss Daisy-bush			✓		✓	✓					
	<i>Olearia muelleri</i>	Mueller's Daisy-bush				✓	✓	✓					
	<i>Olearia pimeleoides</i>	Pimelea Daisy-bush					✓	✓					
	<i>Podolepis capillaris</i>	Wiry Podolepis				✓	✓	✓				✓	
	<i>Rhodanthe floribunda</i>	White Everlasting				✓				✓	✓		
	<i>Senecio gregorii</i>	Fleshy Groundsel				✓							
	<i>Vittadinia dissecta</i> var. <i>hirta</i>	Dissected New Holland Daisy					✓	✓					
	<i>Xerochrysum bracteatum</i>	Golden Everlasting					✓	✓					
CRUCIFERAE	* <i>Brassica tournefortii</i>	Wild Turnip			✓	✓	✓	✓	✓		✓	✓	
	* <i>Carrichtera annua</i>	Ward's Weed				✓	✓					✓	
CUPRESSACEAE	<i>Callitris verrucosa</i>	Scrub Cypress Pine			✓			✓					
CYPERACEAE	<i>Schoenus subaphyllus</i>	Desert Bog-rush					✓						
EUPHORBIACEAE	<i>Adriana tomentosa</i> var. <i>hookeri</i>	Mallee Bitter-bush			✓		✓	✓					
	<i>Beyeria opaca</i>	Dark Turpentine Bush					✓	✓				✓	

Family	Species name	Common name	Conservation status		Vegetation association								
			Aus	SA	1	2	3	4	5	6	7	8	9
FRANKENIACEAE	<i>Frankenia serpyllifolia</i>	Thyme Sea-heath				✓							
GOODENIACEAE	<i>Cooperhookia strophiolata</i>	Sticky Cooperhookia			✓		✓	✓					
	<i>Dampiera dysantha</i>	Shrubby Dampiera			✓		✓	✓					
	<i>Dampiera lanceolata</i> var. <i>lanceolata</i>	Grooved Dampiera			✓		✓	✓					
	<i>Goodenia glauca</i>	Pale Goodenia					✓						
	<i>Goodenia havilandii</i>	Hill Goodenia					✓	✓					
	<i>Goodenia varia</i>	Sticky Goodenia					✓						
	<i>Scaevola depauperata</i>	Skeleton Fanflower			✓			✓					
	<i>Scaevola humilis</i>	Inland Fanflower					✓						
	<i>Scaevola spinescens</i>	Spiny Fanflower				✓	✓	✓			✓		
	<i>Velleia connata</i>	Cup Velleia					✓						
GRAMINEAE	<i>Amphipogon caricinus</i> var. <i>caricinus</i>	Long Grey-beard Grass					✓	✓					
	<i>Aristida contorta</i>	Curly Wire-grass				✓					✓	✓	✓
	<i>Austrostipa nitida</i>	Balcarra Spear-grass				✓					✓	✓	
	<i>Austrostipa platychaeta</i>	Flat-awn Spear-grass					✓	✓					
	<i>Triodia basedowii</i>	Hard Spinifex			✓		✓	✓					
	<i>Triodia lanata</i>	Woolly Spinifex			✓		✓	✓					
GYROSTEMONACEAE	<i>Codonocarpus cotinifolius</i>	Desert Poplar			✓		✓	✓					
	<i>Gyrostemon thesioides</i>	Broom Wheel-fruit			✓			✓					
HALORAGACEAE	<i>Glischrocaryon behrii</i>	Golden Pennants					✓	✓					
	<i>Haloragis gossei</i>	Gosse's Raspwort			✓		✓	✓					
LABIATAE	<i>Prostanthera striatiflora</i>	Striated Mintbush					✓	✓				✓	
	<i>Westringia rigida</i>	Stiff Westringia					✓	✓				✓	
LEGUMINOSAE	<i>Acacia acanthoclada</i> ssp. <i>acanthoclada</i>	Harrow Wattle					✓						
	<i>Acacia ligulata</i>	Umbrella Bush			✓			✓					
	<i>Acacia nyssophylla</i>	Spine Bush				✓	✓	✓	✓		✓	✓	

Family	Species name	Common name	Conservation status		Vegetation association								
			Aus	SA	1	2	3	4	5	6	7	8	9
	<i>Acacia oswaldii</i>	Umbrella Wattle				✓	✓		✓		✓	✓	✓
	<i>Acacia papyrocarpa</i>	Western Myall				✓	✓		✓		✓	✓	✓
	<i>Acacia rigens</i>	Nealie					✓		✓				✓
	<i>Bossiaea walkeri</i>	Cactus Pea			✓			✓					
	<i>Daviesia ulicifolia</i> ssp.				✓			✓					
	<i>Dillwynia uncinata</i>	Silky Parrot-pea			✓								
	<i>Senna artemisioides</i> ssp. <i>artemisioides</i> x ssp. <i>coriacea</i>	Desert Senna				✓	✓	✓		✓	✓	✓	✓
	<i>Senna artemisioides</i> ssp. <i>petiolaris</i>					✓	✓			✓	✓	✓	✓
	<i>Senna cardiosperma</i> ssp. <i>gawlerensis</i>	Gawler Ranges Senna									✓		✓
	<i>Senna pleurocarpa</i> var. <i>pleurocarpa</i>	Stripe-pod Senna					✓						
	<i>Swainsona</i> sp.	Swainson-pea					✓						
	<i>Templetonia egena</i>	Broombush Templetonia					✓					✓	
LILIACEAE	<i>Dianella revoluta</i> var. <i>divaricata</i>	Broad-leaf Flax-lily					✓	✓				✓	
	<i>Lomandra collina</i>	Sand Mat-rush					✓						
	<i>Lomandra leucocephala</i> ssp. <i>robusta</i>	Woolly Mat-rush			✓		✓	✓					
	<i>Thysanotus exiliflorus</i>	Inland Fringe-lily			✓		✓	✓					
LOGANIACEAE	<i>Logania nuda</i>	Leafless Logania			✓			✓					
MALVACEAE	<i>Alyogyne pinoniana</i> var. <i>pinoniana</i>	Sand Hibiscus					✓					✓	
MYOPORACEAE	<i>Eremophila alternifolia</i>	Narrow-leaf Emubush					✓					✓	
	<i>Eremophila crassifolia</i>	Thick-leaf Emubush			✓		✓					✓	
	<i>Eremophila gibsonii</i>	Gibson's Emubush					✓	✓					
	<i>Eremophila glabra</i> ssp.	Tar Bush					✓					✓	
	<i>Eremophila macdonnellii</i>	Macdonnell's Emubush			✓		✓	✓					
	<i>Eremophila maculata</i> ssp.	Spotted Emubush											
	<i>Eremophila paisleyi</i> ssp. <i>paisleyi</i>							✓					

Family	Species name	Common name	Conservation status		Vegetation association								
			Aus	SA	1	2	3	4	5	6	7	8	9
	<i>Eremophila scoparia</i>	Coccid Emu-bush				✓	✓	✓			✓	✓	✓
	<i>Myoporum platycarpum</i> ssp. <i>platycarpum</i>	False Sandalwood				✓					✓	✓	
MYRTACEAE	<i>Calytrix</i> sp.	Fringe-myrtle			✓		✓	✓					
	<i>Eucalyptus brachycalyx</i>	Gilja				✓						✓	
	<i>Eucalyptus capitanea</i>	Desert Ridge-fruited Mallee			✓								
	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i>	Red Mallee				✓	✓					✓	
	<i>Eucalyptus pimpiniana</i>	Pimpin Mallee					✓	✓					
	<i>Eucalyptus yumbarrana</i>	Yumbarra Mallee			✓		✓	✓					
	<i>Leptospermum coriaceum</i>	Dune Tea-tree			✓			✓					
	<i>Melaleuca eleuterostachya</i>	Hummock Honey-myrtle			✓		✓	✓					
	<i>Melaleuca leiocarpa</i>	Pungent Honey-myrtle		R	✓			✓					
	<i>Thryptomene elliottii</i>						✓	✓					
PITTOSPORACEAE	<i>Billardiera cymosa</i> ssp.					✓	✓						
	<i>Pittosporum angustifolium</i>	Native Apricot			✓	✓			✓	✓	✓	✓	✓
POLYGONACEAE	* <i>Acetosa vesicaria</i>	Rosy Dock								✓			
PROTEACEAE	<i>Grevillea huegelii</i>	Comb Grevillea					✓	✓					
	<i>Grevillea juncifolia</i> ssp. <i>juncifolia</i>	Honeysuckle Grevillea					✓	✓					
	<i>Grevillea stenobotrya</i>	Rattle-pod Grevillea			✓			✓					
	<i>Hakea francisiana</i>	Bottlebrush Hakea			✓			✓					
RUTACEAE	<i>Boronia coerulescens</i> ssp. <i>coerulescens</i>	Blue Boronia					✓	✓				✓	
	<i>Geijera linearifolia</i>	Sheep bush			✓	✓	✓						
SANTALACEAE	<i>Exocarpos sparteus</i>	Slender Cherry					✓					✓	
	<i>Santalum acuminatum</i>	Quandong				✓	✓				✓	✓	
	<i>Santalum spicatum</i>	Sandalwood		V		✓							
SAPINDACEAE	<i>Dodonaea stenozyga</i>	Desert Hop-bush					✓	✓					
	<i>Dodonaea viscosa</i> ssp. <i>angustissima</i>	Narrow-leaf Hop-bush				✓			✓				

Family	Species name	Common name	Conservation status		Vegetation association								
			Aus	SA	1	2	3	4	5	6	7	8	9
SOLANACEAE	<i>Grammosolen truncatus</i>	Shrubby Ray-flower					✓	✓				✓	
	<i>Lycium australe</i>	Australian Boxthorn				✓			✓				
	<i>Nicotiana velutina</i>	Velvet Tobacco				✓							✓
	<i>Solanum coactiliferum</i>	Tomato-bush			✓		✓	✓					
THYMELAEACEAE	<i>Pimelea microcephala</i> ssp.	Shrubby Riceflower					✓					✓	
	<i>Pimelea trichostachya</i>	Spiked Riceflower					✓						
ZYGOPHYLLACEAE	<i>Zygophyllum apiculatum</i>	Pointed Twinleaf				✓	✓					✓	
	<i>Zygophyllum aurantiacum</i> ssp.					✓	✓		✓		✓	✓	✓

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). **SA:** South Australia (*National Parks and Wildlife Act 1972*). **Conservation Codes:** **CE:** Critically Endangered. **ENE:** Endangered. **VUV:** Vulnerable. **R:** Rare.

* Denotes introduced species.

Vegetation associations

1. *Eucalyptus* spp. / *Hakea francisiana* (Bottlebrush Hakea) / *Grevillea stenobotrya* (Rattle-pod Grevillea) Tall Open Shrubland.
2. *Acacia papyrocarpa* (Western Myall) Open Woodland +/- *Cratystylis conocephala* (Daisy Bluebush) and *Maireana sedifolia* (Bluebush).
3. *Eucalyptus oleosa* ssp. Mixed Mallee over *Triodia* sp.
4. *Eucalyptus yumbarrana* (Yumbarrana Mallee) Mixed Mallee
5. *Alectryon oleifolius* (Bullock Bush) Shrubland.
6. *Atriplex vesicaria* (Bladder Saltbush) Low Open Shrubland.
7. *Casuarina pauper* (Black Oak) +/- *Acacia papyrocarpa* (Western Myall) Woodland.
8. *Eucalyptus oleosa* ssp. (Red Mallee) / *Acacia papyrocarpa* (Western Myall) +/- *Myoporum platycarpum* (False Sandalwood) Open Woodland.
9. *Senna* spp. Open Shrubland.

Appendix 4. Representative photographs of vegetation associations.



Vegetation association 1.



Vegetation association 2.



Vegetation association 3 (unburnt).



Vegetation association 3 (burnt in 2002.).



Vegetation association 4.



Vegetation association 5.



Vegetation association 6.



Vegetation association 7.



Vegetation association 8.



Vegetation association 9.

Appendix 5. Fauna trapping site photographs.



ATA001a.



ATA001b.



ATA002a.



ATA002b.



ATA003a.



ATA003b.



ATA004a.



ATA004b.



ATA005a.



ATA005b.



ATA006a.



ATA006b.



ATA007a.



ATA007b.



ATA008a.



ATA008b.

Appendix 6. Summary of Southern Marsupial Mole trench sites.

Location ID	Location of trench	Dominant vegetation	Trench installation date	Trench drying time (hrs)	Number of backfilled tunnels recorded
SMM001A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex)	27/11/2014	124	
SMM001B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex)	27/11/2014	124	
SMM001C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex)	27/11/2014	124	
SMM002A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	27/11/2014	124	
SMM002B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	27/11/2014	124	
SMM002C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	27/11/2014	124	
SMM003A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Callitris verrucosa</i> (Scrub Cypress Pine), <i>Leptospermum coriaceum</i> (Dune Tea-tree), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	27/11/2014	124	
SMM003B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Callitris verrucosa</i> (Scrub Cypress Pine), <i>Leptospermum coriaceum</i> (Dune Tea-tree), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	27/11/2014	124	2
SMM003C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Callitris verrucosa</i> (Scrub Cypress Pine), <i>Leptospermum coriaceum</i> (Dune Tea-tree), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	27/11/2014	124	2
SMM004A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Callitris verrucosa</i> (Scrub Cypress Pine), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	27/11/2014	124	

Location ID	Location of trench	Dominant vegetation	Trench installation date	Trench drying time (hrs)	Number of backfilled tunnels recorded
SMM004B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Callitris verrucosa</i> (Scrub Cypress Pine), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	27/11/2014	124	
SMM004C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Callitris verrucosa</i> (Scrub Cypress Pine), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	27/11/2014	124	
SMM005A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	27/11/2014	123	
SMM005B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	27/11/2014	123	1
SMM005C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	27/11/2014	123	
SMM006A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush)	28/11/2014	120	
SMM006B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush)	28/11/2014	120	
SMM006C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush)	28/11/2014	120	
SMM007A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	28/11/2014	121	2 (1 also in side wall)
SMM007B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	28/11/2014	121	1

Location ID	Location of trench	Dominant vegetation	Trench installation date	Trench drying time (hrs)	Number of backfilled tunnels recorded
SMM007C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	28/11/2014	121	
SMM008A	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Bossiaea walkeri</i> (Cactus Pea)	28/11/2014	120	
SMM008B	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Bossiaea walkeri</i> (Cactus Pea)	28/11/2014	120	2 (1 also in side wall)
SMM008C	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Eucalyptus pimpiniana</i> (Pimpin Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Bossiaea walkeri</i> (Cactus Pea)	28/11/2014	120	
SMM009A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Eremophila scoparia</i> (Broom Emubush)	28/11/2014	120	
SMM009B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Eremophila scoparia</i> (Broom Emubush)	28/11/2014	120	
SMM009C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Eremophila scoparia</i> (Broom Emubush)	28/11/2014	120	
SMM010A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Hakea francisiana</i> (Bottlebrush Hakea)	28/11/2014	119	
SMM010B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Hakea francisiana</i> (Bottlebrush Hakea)	28/11/2014	119	
SMM010C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Hakea francisiana</i> (Bottlebrush Hakea)	28/11/2014	119	
SMM011A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Hakea francisiana</i> (Bottlebrush Hakea), <i>Exocarpos sparteus</i> (Slender Cherry), <i>Daviesia ulicifolia</i> ssp.	29/11/2014	101	
SMM011B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Hakea francisiana</i> (Bottlebrush Hakea), <i>Exocarpos sparteus</i> (Slender Cherry), <i>Daviesia ulicifolia</i> ssp.	29/11/2014	101	

Location ID	Location of trench	Dominant vegetation	Trench installation date	Trench drying time (hrs)	Number of backfilled tunnels recorded
SMM011C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Hakea francisiana</i> (Bottlebrush Hakea), <i>Exocarpos sparteus</i> (Slender Cherry), <i>Daviesia ulicifolia</i> ssp.	29/11/2014	101	
SMM012A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Dodonaea viscosa</i> ssp. <i>angustissima</i> (Narrow-leaf Hop-bush), <i>Thryptomene elliottii</i>	29/11/2014	103	5 (2 also in side wall)
SMM012B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Dodonaea viscosa</i> ssp. <i>angustissima</i> (Narrow-leaf Hop-bush), <i>Thryptomene elliottii</i>	29/11/2014	103	4
SMM012C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Dodonaea viscosa</i> ssp. <i>angustissima</i> (Narrow-leaf Hop-bush), <i>Thryptomene elliottii</i>	29/11/2014	103	12
SMM013A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Hakea francisiana</i> (Bottlebrush Hakea), <i>Grevillea huegelii</i> (Comb Grevillea), <i>Thryptomene elliottii</i>	29/11/2014	99	
SMM013B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Hakea francisiana</i> (Bottlebrush Hakea), <i>Grevillea huegelii</i> (Comb Grevillea), <i>Thryptomene elliottii</i>	29/11/2014	99	2
SMM013C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Hakea francisiana</i> (Bottlebrush Hakea), <i>Grevillea huegelii</i> (Comb Grevillea), <i>Thryptomene elliottii</i>	29/11/2014	99	1
SMM014A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Callitris verrucosa</i> (Scrub Cypress Pine), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush), <i>Bossiaea walkeri</i> (Cactus Pea)	29/11/2014	99	
SMM014B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Callitris verrucosa</i> (Scrub Cypress Pine), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush), <i>Bossiaea walkeri</i> (Cactus Pea)	29/11/2014	99	
SMM014C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Callitris verrucosa</i> (Scrub Cypress Pine), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush), <i>Bossiaea walkeri</i> (Cactus Pea)	29/11/2014	99	

Location ID	Location of trench	Dominant vegetation	Trench installation date	Trench drying time (hrs)	Number of backfilled tunnels recorded
SMM015A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Acacia papyrocarpa</i> (Western Myall), <i>Acacia ligulata</i> (Umbrella Bush), <i>Dodonaea viscosa</i> ssp. <i>angustissima</i> (Narrow-leaf Hop-bush), <i>Bossiaea walkeri</i> (Cactus Pea)	29/11/2014	99	
SMM015B	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Acacia papyrocarpa</i> (Western Myall), <i>Acacia ligulata</i> (Umbrella Bush), <i>Dodonaea viscosa</i> ssp. <i>angustissima</i> (Narrow-leaf Hop-bush), <i>Bossiaea walkeri</i> (Cactus Pea)	29/11/2014	99	
SMM015C	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Acacia papyrocarpa</i> (Western Myall), <i>Acacia ligulata</i> (Umbrella Bush), <i>Dodonaea viscosa</i> ssp. <i>angustissima</i> (Narrow-leaf Hop-bush), <i>Bossiaea walkeri</i> (Cactus Pea)	29/11/2014	99	
SMM016A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Callitris verrucosa</i> (Scrub Cypress Pine), <i>Leptospermum coriaceum</i> (Dune Tea-tree), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	26/11/2014	192	
SMM016B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Callitris verrucosa</i> (Scrub Cypress Pine), <i>Leptospermum coriaceum</i> (Dune Tea-tree), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	26/11/2014	192	
SMM016C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Callitris verrucosa</i> (Scrub Cypress Pine), <i>Leptospermum coriaceum</i> (Dune Tea-tree), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Eremophila scoparia</i> (Broom Emubush)	26/11/2014	192	
SMM017A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Acacia ligulata</i> (Umbrella Bush), <i>Triodia basedowii</i> (Hard Spinifex), <i>Bossiaea walkeri</i> (Cactus Pea)	30/11/2014	97	
SMM017B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Acacia ligulata</i> (Umbrella Bush), <i>Triodia basedowii</i> (Hard Spinifex), <i>Bossiaea walkeri</i> (Cactus Pea)	30/11/2014	97	
SMM017C	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Acacia ligulata</i> (Umbrella Bush), <i>Triodia basedowii</i> (Hard Spinifex), <i>Bossiaea walkeri</i> (Cactus Pea)	30/11/2014	97	1
SMM018A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Leptospermum coriaceum</i> (Dune Tea-tree), <i>Triodia basedowii</i> (Hard Spinifex)	30/11/2014	95	
SMM018B	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Leptospermum coriaceum</i> (Dune Tea-tree), <i>Triodia basedowii</i> (Hard Spinifex)	30/11/2014	95	

Location ID	Location of trench	Dominant vegetation	Trench installation date	Trench drying time (hrs)	Number of backfilled tunnels recorded
SMM018C	Mid slope	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Leptospermum coriaceum</i> (Dune Tea-tree), <i>Triodia basedowii</i> (Hard Spinifex)	30/11/2014	95	
SMM019A	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Grevillea huegelii</i> (Comb Grevillea)	30/11/2014	95	1
SMM019B	Base of dune	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Grevillea huegelii</i> (Comb Grevillea)	30/11/2014	95	1 (2 also in side wall)
SMM019C	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Triodia basedowii</i> (Hard Spinifex), <i>Acacia ligulata</i> (Umbrella Bush), <i>Grevillea huegelii</i> (Comb Grevillea)	30/11/2014	95	
SMM020A	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Acacia papyrocarpa</i> (Western Myall), <i>Acacia ligulata</i> (Umbrella Bush), <i>Dodonaea viscosa</i> ssp. <i>angustissima</i> (Narrow-leaf Hop-bush), <i>Eremophila scoparia</i> (Broom Emubush)	30/11/2014	95	
SMM020B	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Acacia papyrocarpa</i> (Western Myall), <i>Acacia ligulata</i> (Umbrella Bush), <i>Dodonaea viscosa</i> ssp. <i>angustissima</i> (Narrow-leaf Hop-bush), <i>Eremophila scoparia</i> (Broom Emubush)	30/11/2014	95	
SMM020C	Near dune crest	<i>Eucalyptus oleosa</i> ssp. <i>oleosa</i> (Red Mallee), <i>Acacia papyrocarpa</i> (Western Myall), <i>Acacia ligulata</i> (Umbrella Bush), <i>Dodonaea viscosa</i> ssp. <i>angustissima</i> (Narrow-leaf Hop-bush), <i>Eremophila scoparia</i> (Broom Emubush)	30/11/2014	95	

Appendix 7. Fauna species recorded by EBS during the J-A monitoring surveys (2008-2014), Sonoran baseline survey 2012 and Atacama baseline survey 2014.

Family	Species name	Common name	Conservation status		J-A monitoring surveys 2008-2014	Sonoran baseline survey 2012	Atacama baseline survey 2014
			Aus	SA			
Mammals							
BURRAMYIDAE	<i>Cercartetus concinnus</i>	Western Pygmy-possum			✓	✓	✓
CAMELIDAE	<i>*Camelus dromedarius</i>	One-humped Camel			✓	✓	✓
CANIDAE	<i>Canis lupus dingo</i>	Dingo			✓	✓	✓
	<i>*Vulpes vulpes</i>	Fox (Red Fox)			✓	✓	✓
DASYURIDAE	<i>Ningauia yvonneae</i>	Southern Ningauia					✓
	<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart			✓	✓	Likely
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart			✓		✓
	<i>Sminthopsis psammophila</i>	Sandhill Dunnart	EN	V	✓		✓
FELIDAE	<i>*Felis catus</i>	Feral Cat			✓	✓	✓
LEPORIDAE	<i>*Oryctolagus cuniculus</i>	Rabbit			✓	✓	✓
MACROPODIDAE	<i>Macropus fuliginosus</i>	Western Grey Kangaroo				✓	✓
	<i>Macropus rufus</i>	Red Kangaroo			✓	✓	✓
MURIDAE	<i>*Mus musculus</i>	House Mouse			✓		✓
MOLOSSIDAE	<i>Austronomus australis</i>	White-Striped Free-tail Bat			✓	✓	✓
	<i>Mormopterus sp.3 or sp. 4.</i>	Inland or Southern Free-tail Bat			✓	✓	✓
	<i>Mormopterus sp 4.</i>	Southern Free-tail Bat			✓		Likely
MURIDAE	<i>Notomys alexis</i>	Spinifex Hopping-mouse			✓		Likely
	<i>Notomys mitchellii</i>	Mitchell's Hopping-mouse			✓	✓	✓
	<i>Pseudomys hermannsburgensis</i>	Sandy-inland Mouse			✓		✓
NOTORYCTIDAE	<i>Notoryctes typhlops</i>	Southern Marsupial Mole (Itjaritjara)	EN	V			✓
VESPERTILIONIDAE	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat			✓	✓	✓

Family	Species name	Common name	Conservation status		J-A monitoring surveys 2008-2014	Sonoran baseline survey 2012	Atacama baseline survey 2014
			Aus	SA			
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat			?		Likely
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat			✓		✓
	<i>Nyctophilus major tor</i>	Western Long-eared Bat			✓	✓	✓
	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat			?		Likely
	<i>Vespadelus baverstocki</i>	Inland Forest Bat			✓	✓	Likely
	<i>Vespadelus regulus</i>	Southern Forest Bat			✓	✓	✓
VOMBATIDAE	<i>Lasiiorhinus latifrons</i>	Southern Hairy-nosed Wombat			✓		Possible
Reptiles							
AGAMIDAE	<i>Ctenophorus cristatus</i>	Crested Dragon			✓	✓	✓
	<i>Ctenophorus fordi</i>	Mallee Dragon			✓		✓
	<i>Ctenophorus isolepis</i>	Military Dragon					✓
	<i>Ctenophorus nuchalis</i>	Central Netted Dragon			✓		Possible
	<i>Ctenophorus pictus</i>	Painted Dragon			✓		Likely
	<i>Diporiphora linga</i>	Linga Dragon				✓	✓
	<i>Moloch horridus</i>	Thorny Devil			✓	✓	✓
	<i>Pogona minor</i>	Dwarf Bearded Dragon			✓	✓	✓
	<i>Pogona nullarbor</i>	Nullarbor Bearded Dragon			✓		Not likely
	<i>Tympanocryptis houstoni</i>	Nullarbor Earless Dragon			✓		Not likely
CARPHODACTYLIDAE	<i>Nephurus laevis</i>	Pale Knob-tailed Gecko					✓
	<i>Nephurus levis</i>	Smooth Knob-tailed Gecko			✓	✓	Likely
	<i>Nephurus stellatus</i>	Starred Knob-tailed Gecko				✓	✓
	<i>Underwoodisaurus milii</i>	Barking Gecko			✓		Likely
DIPLODACTYLIDAE	<i>Diplodactylus calcicolus</i>	South Coast Gecko			✓		Not likely

Family	Species name	Common name	Conservation status		J-A monitoring surveys 2008-2014	Sonoran baseline survey 2012	Atacama baseline survey 2014
			Aus	SA			
	<i>Diplodactylus wiru</i>	Desert Wood Gecko			✓	✓	✓
	<i>Lucasium bungabinnia</i>	Southern Sandplain Gecko			✓		✓
	<i>Lucasium damaeum</i>	Beaded Gecko			✓	✓	✓
	<i>Strophurus assimilis</i>	Thorn-tailed Gecko					✓
	<i>Strophurus elderi</i>	Jewelled Gecko					✓
	<i>Strophurus intermedius</i>	Southern Spiny-tailed Gecko			✓		Likely
ELAPIDAE	<i>Brachyuropsis fasciolatus</i>	Narrow-banded Snake			✓		✓
	<i>Brachyuropsis semifasciatus</i>	Half-girdled Snake			✓		✓
	<i>Demansia reticulata</i>	Desert Whipsnake			✓		✓
	<i>Neelaps bimaculatus</i>	Western Black-naped Snake		R		✓	Likely
	<i>Parasuta spectabilis</i>	Mallee Black-headed Snake			✓		Possible
	<i>Pseudechis australis</i>	Mulga Snake				✓	Likely
	<i>Pseudonaja aspidorhyncha</i>	Patch-nosed Brown Snake			✓		Likely
	<i>Pseudonaja mengdeni</i>	Gwardar			✓		Likely
	<i>Pseudonaja modesta</i>	Five-ringed Snake			✓		✓
	<i>Simoselaps bertholdi</i>	Desert Banded Snake			✓	✓	Likely
GEKKONIDAE	<i>Gehyra purpurascens</i>	Purple Dtella			✓	✓	✓
	<i>Gehyra variegata</i>	Tree Dtella			✓		✓
	<i>Heteronotia binoei</i>	Bynoe's Gecko			✓	✓	Likely
PYGOPODIDAE	<i>Delma butleri</i>	Spinifex Snake-lizard					✓
	<i>Delma petersoni</i>	Painted Snake-lizard					✓
	<i>Lialis burtonis</i>	Burton's Legless Lizard					✓
	<i>Pygopus nigriceps</i>	Black-headed Scaly-foot			✓	✓	Likely

Family	Species name	Common name	Conservation status		J-A monitoring surveys 2008-2014	Sonoran baseline survey 2012	Atacama baseline survey 2014
			Aus	SA			
SCINCIDAE	<i>Cryptoblepharus australis</i>	Desert Wall Skink			✓	✓	Likely
	<i>Ctenotus atlas</i>	Southern Spinifex Ctenotus				✓	✓
	<i>Ctenotus orientalis</i>	Spotted Ctenotus			✓		Possible
	<i>Ctenotus regius</i>	Eastern Desert Ctenotus			✓		Likely
	<i>Ctenotus schomburgkii</i>	Sandplain Ctenotus			✓	✓	✓
	<i>Ctenotus taeniatus</i>	Eyrean Ctenotus					✓
	<i>Cyclodomorphus melanops</i>	Spinifex Slender Bluetongue					✓
	<i>Eremiascincus richardsonii</i>	Broad-banded Sandswimmer					✓
	<i>Hemiergis initialis</i>	Western Earless Skink			✓		Not likely
	<i>Lerista bipes</i>	Western Two-toed Slider			✓		Likely
	<i>Lerista desertorum</i>	Great Desert Slider			✓	✓	✓
	<i>Lerista dorsalis</i>	Southern Four-toed Slider			✓		Likely
	<i>Lerista edwardsae</i>	Myall Slider			✓	✓	Likely
	<i>Lerista labialis</i>	Eastern Two-toed Slider			✓	✓	✓
	<i>Lerista taeniata</i>	Ribbon Slider					✓
	<i>Lerista terdigitata</i>	Southern Three-toed Slider			✓	✓	✓
	<i>Lerista timida</i>	Dwarf Three-toed Slider			✓	✓	✓
	<i>Liopholis inornata</i>	Desert Skink			✓	✓	✓
	<i>Menetia greyii</i>	Dwarf Skink			✓	✓	Likely
	<i>Morethia adelaidensis</i>	Adelaide Snake-eye			✓		Likely
	<i>Morethia butleri</i>	Butler's Snake-eye				✓	✓
	<i>Tiliqua rugosa</i>	Sleepy Lizard			✓	✓	Likely
TYPHLOPIDAE	<i>Ramphotyphlops bicolor</i>	Southern Blind Snake					✓

Family	Species name	Common name	Conservation status		J-A monitoring surveys 2008-2014	Sonoran baseline survey 2012	Atacama baseline survey 2014
			Aus	SA			
	<i>Ramphotyphlops bituberculatus</i>	Rough-nosed Blind Snake			✓		Likely
	<i>Ramphotyphlops endoterus</i>	Centralian Blind Snake			✓		Likely
VARANIDAE	<i>Varanus eremius</i>	Desert Pygmy Goanna					✓
	<i>Varanus gilleni</i>	Pygmy Mulga Goanna			✓		✓
	<i>Varanus gouldii</i>	Sand Goanna			✓	✓	✓
Birds							
ACANTHIZIDAE	<i>Acanthiza apicalis</i>	Inland Thornbill			✓	✓	✓
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill			✓	✓	Likely
	<i>Acanthiza iredalei iredalei</i>	Slender-billed Thornbill (western ssp)		R	✓		Possible
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill			✓	✓	✓
	<i>Aphelocephala leucopsis</i>	Southern Whiteface			✓	✓	Likely
	<i>Calamanthus (Calamanthus) campestris</i>	Rufous Fieldwren			✓		Likely
	<i>Pyrholaemus brunneus</i>	Redthroat			✓		Possible
	<i>Smicronis brevirostris</i>	Weebill			✓	✓	✓
ACCIPITRIDAE	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk			✓		✓
	<i>Accipiter fasciatus</i>	Brown Goshawk			✓		Likely
	<i>Aquila audax</i>	Wedge-tailed Eagle			✓	✓	Likely
	<i>Circus assimilis</i>	Spotted Harrier			✓		✓
	<i>Elanus axillaris</i>	Black-shouldered Kite			✓		Likely
	<i>Haliastur sphenurus</i>	Whistling Kite			✓		Likely
	<i>Hieraaetus morphnoides</i>	Little Eagle			✓	✓	✓
AEGOTHELIDAE	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar					✓

Family	Species name	Common name	Conservation status		J-A monitoring surveys 2008-2014	Sonoran baseline survey 2012	Atacama baseline survey 2014
			Aus	SA			
ALCEDINIDAE	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher			✓	✓	✓
	<i>Todiramphus sanctus</i>	Sacred Kingfisher			✓		Likely
ANATIDAE	<i>Anas gracilis</i>	Grey Teal			✓		Unlikely
ARTAMIDAE	<i>Artamus cinereus</i>	Black-faced Woodswallow			✓		✓
	<i>Artamus cyanopterus</i>	Dusky Woodswallow			✓	✓	Likely
	<i>Artamus personatus</i>	Masked Woodswallow			✓		✓
	<i>Artamus superciliosus</i>	White-browed Woodswallow			✓		Likely
	<i>Cracticus torquatus</i>	Grey Butcherbird			✓	✓	✓
	<i>Gymnorhina tibicen</i>	Australian Magpie			✓	✓	✓
	<i>Strepera versicolor</i>	Grey Currawong			✓	✓	Likely
CACATUIDAE	<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo		R	✓		Likely
	<i>Eolophus roseicapilla</i>	Galah			✓		Likely
	<i>Nymphicus hollandicus</i>	Cockatiel			✓		✓
CAMPEPHAGIDAE	<i>Coracina maxima</i>	Ground Cuckooshrike			✓	✓	✓
	<i>Coracina novaehollandiae</i>	Black-faced Cuckooshrike			✓	✓	✓
	<i>Lalage tricolor</i>	White-winged Triller			✓		✓
CAPRIMULGIDAE	<i>Eurostopodus argus</i>	Spotted Nightjar				✓	Likely
CHARADRIIDAE	<i>Vanellus miles</i>	Masked Lapwing			✓		Possible
CINCLOSOMATIDAE	<i>Cinclosoma cinnamomeum</i>	Cinnamon Quailthrush			✓		Likely
COLUMBIDAE	<i>Phaps chalcoptera</i>	Common Bronzewing					✓
CORVIDAE	<i>Corvus coronoides</i>	Australian Raven			✓		Likely
	<i>Corvus mellori</i>	Little Raven			✓		Likely
CUCULIDAE	<i>Cacomantis pallidus</i>	Pallid Cuckoo			✓		✓

Family	Species name	Common name	Conservation status		J-A monitoring surveys 2008-2014	Sonoran baseline survey 2012	Atacama baseline survey 2014
			Aus	SA			
	<i>Chalcites basal</i>	Horsfield's Bronze Cuckoo					✓
	<i>Chalcites osculans</i>	Black-eared Cuckoo			✓		✓
DICAEIDAE	<i>Dicaeum hirundinaceum</i>	Mistletoebird			✓		✓
ESTRILDIDAE	<i>Taeniopygia guttata</i>	Zebra Finch			✓		Likely
FALCONIDAE	<i>Falco berigora</i>	Brown Falcon			✓	✓	✓
	<i>Falco cenchroides</i>	Nankeen Kestrel			✓	✓	Likely
	<i>Falco longipennis</i>	Australian Hobby			✓		Likely
	<i>Falco peregrinus</i>	Peregrine Falcon		R	✓		✓
HIRUNDINIDAE	<i>Cheramoeca leucosterna</i>	White-backed Swallow			✓	✓	Likely
	<i>Hirundo neoxena</i>	Welcome Swallow			✓		Likely
	<i>Petrochelidon nigricans</i>	Tree Martin			✓	✓	✓
LARIDAE	<i>Chlidonias hybrida</i>	Whiskered Tern			✓		Unlikely
LOCUSTELLIDAE	<i>Cincloramphus cruralis</i>	Brown Songlark			✓	✓	Likely
	<i>Cincloramphus mathewsi</i>	Rufous Songlark			✓		Likely
MALURIDAE	<i>Malurus lamberti</i>	Variegated Fairywren			✓	✓	Likely
	<i>Malurus leucopterus</i>	White-winged Fairywren			✓	✓	Likely
	<i>Malurus splendens</i>	Splendid Fairywren					✓
MEGAPODIIDAE	<i>Leipoa ocellata</i>	Malleefowl	VU	V			✓
MELIPHAGIDAE	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater			✓	✓	✓
	<i>Anthochaera carunculata</i>	Red Wattlebird			✓		Likely
	<i>Certhionyx variegatus</i>	Pied Honeyeater					✓
	<i>Epthianura aurifrons</i>	Orange Chat			✓		Possible
	<i>Epthianura tricolor</i>	Crimson Chat			✓		✓

Family	Species name	Common name	Conservation status		J-A monitoring surveys 2008-2014	Sonoran baseline survey 2012	Atacama baseline survey 2014
			Aus	SA			
	<i>Gavicalis virescens</i>	Singing Honeyeater			✓	✓	Likely
	<i>Manorina flavigula</i>	Yellow-throated Miner			✓	✓	✓
	<i>Ptilotula ornata</i>	Yellow-plumed Honeyeater			✓	✓	✓
	<i>Ptilotula penicillata</i>	White-plumed Honeyeater			✓	✓	Likely
	<i>Ptilotula plumulus</i>	Grey-fronted Honeyeater				✓	Likely
	<i>Purnella albifrons</i>	White-fronted Honeyeater			✓		✓
	<i>Sugomel niger</i>	Black Honeyeater			✓		Possible
MEROPIDAE	<i>Merops ornatus</i>	Rainbow Bee-eater			✓	✓	✓
MONARCHIDAE	<i>Grallina cyanoleuca</i>	Magpielark			✓		Likely
	<i>Myiagra inquieta</i>	Restless Flycatcher		R		✓	✓
MOTACILLIDAE	<i>Anthus australis</i>	Australian Pipit			✓	✓	✓
NEOSITTIDAE	<i>Daphoenositta chrysoptera</i>	Varied Sittella			✓	✓	✓
OREOICIDAE	<i>Oreoica gutturalis</i>	Crested Bellbird			✓	✓	✓
OTIDIDAE	<i>Ardeotis australis</i>	Australian Bustard		V	✓		✓
PACHYCEPHALIDAE	<i>Colluricincla harmonica</i>	Grey Shrikethrush			✓	✓	✓
	<i>Pachycephala inornata</i>	Gilbert's Whistler		R	✓		Possible
	<i>Pachycephala rufiventris</i>	Rufous Whistler			✓	✓	✓
PARDALOTIDAE	<i>Pardalotus striatus</i>	Striated Pardalote			✓	✓	✓
PETROICIDAE	<i>Melanodryas cucullata</i>	Hooded Robin			✓		✓
	<i>Microeca fascinans</i>	Jacky Winter			✓	✓	✓
	<i>Petroica goodenovii</i>	Red-capped Robin			✓	✓	✓
PHALACROCORACIDAE	<i>Phalacrocorax carbo</i>	Great Cormorant			✓		Unlikely
PHASIANIDAE	<i>Coturnix pectoralis</i>	Stubble Quail			✓		Likely

Family	Species name	Common name	Conservation status		J-A monitoring surveys 2008-2014	Sonoran baseline survey 2012	Atacama baseline survey 2014
			Aus	SA			
PODARGIDAE	<i>Podargus strigoides</i>	Tawny Frogmouth			✓	✓	✓
PODICIPEDIDAE	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe			✓		Unlikely
POMATOSTOMIDAE	<i>Pomatostomus superciliosus</i>	White-browed Babbler			✓	✓	✓
PSITTACIDAE	<i>Barnardius zonarius</i>	Australian Ringneck			✓	✓	✓
	<i>Melopsittacus undulatus</i>	Budgerigar			✓		✓
	<i>Neophema splendida</i>	Scarlet-chested Parrot		R			✓
	<i>Northiella haematogaster</i>	Bluebonnet			✓	✓	Likely
	<i>Psephotus varius</i>	Mulga Parrot			✓	✓	✓
RALLIDAE	<i>Fulica atra</i>	Eurasian Coot			✓		Unlikely
RHIPIDURIDAE	<i>Rhipidura leucophrys</i>	Willie Wagtail			✓	✓	✓
SCOLOPACIDAE	<i>Tringa glareola</i>	Wood Sandpiper		R	✓		Unlikely
TURNICIDAE	<i>Turnix velox</i>	Little Buttonquail			✓		✓
TYTONIDAE	<i>Tyto delicatula</i>	Eastern Barn Owl			✓		Likely

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). **SA:** South Australia (*National Parks and Wildlife Act 1972*). **Conservation Codes:** **CE:** Critically Endangered. **EN/E:** Endangered. **VU/V:** Vulnerable. **R:** Rare.

* Denotes introduced species.



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