

Procedure		Document No. 2663	
Document Title	Monitoring Program – Fauna		
Area	HSE	Issue Date	
Major Process	Environment	Sub Process	
Authoriser	Jacqui McGill – Asset President Olympic Dam	Version Number	19

1	SCOPE.....	2
1.1	Responsible ODC personnel.....	2
1.2	Review and modification	2
2	DETAILED PROCEDURE	3
2.1	Feral and abundant species	3
2.2	'At-risk' fauna – Category 1a.....	3
2.3	'At-risk' fauna – Categories 1b and 2.....	4
2.4	Fauna losses	5
3	COMMITMENTS	7
3.1	Reporting.....	7
3.2	Summary of commitments.....	7
4	DEFINITIONS AND REFERENCES.....	8
4.1	Definitions.....	8
4.2	References	8
4.3	Bibliography.....	8
5	APPENDIX A: CLASSIFICATION OF AT-RISK FAUNA SPECIES	12
6	APPENDIX B: AT-RISK FAUNA SPECIES LIST.....	13

1 SCOPE

The Fauna Monitoring Program (MP) describes the environmental monitoring activities that are undertaken by BHP Billiton Olympic Dam Corporation Pty Ltd (ODC) in relation to fauna at Olympic Dam and the surrounding areas that may be impacted by current mining, processing, or construction activities. The purpose of this MP is to set out the measures ODC uses to quantify any change in the extent or significance of impacts of its activities on fauna, assess the performance of control measures employed to limit these impacts, and to meet relevant legal and other requirements.

The Fauna MP addresses a number of distinct elements of fauna monitoring. For each element, the MP sets out background information, the purpose of the monitoring and the deliverables which are produced as a result of the monitoring. The MP also includes a description of the methods for measuring achievement of **compliance criteria** and the movement of trends towards **leading indicators** (where applicable).

This MP relates to fauna that is normally associated with open rangeland ecosystems and Great Artesian Basin (GAB) springs in the wellfield areas.

At-risk fauna species and feral and abundant species are monitored. Fauna losses associated with ODC are monitored to direct control efforts to avoid mortalities.

1.1 Responsible ODC personnel

The Olympic Dam Asset President is responsible for ensuring that all legal and other requirements described in this MP are met.

ODC employs an environmental scientist and sufficient other staff with experience and qualifications to fulfil the requirements of this MP.

1.2 Review and modification

The Fauna MP is reviewed annually. Major changes or amendments following the review are documented in the Annual EM Program Targets, Actions and Major Changes document.

It should be noted that as a result of operational activities or through optimisation of sample design some existing monitoring sites may be lost and others added (where possible) to maintain the integrity of the sampling program. Access restrictions can result in some sites occasionally being unable to be monitored.

2 DETAILED PROCEDURE

2.1 Feral and abundant species

2.1.1 Background

Kangaroos are native and commonly recorded within the region; however the presence of artificial water bodies and the lack of domestic grazing on the SML influence their abundance. Both kangaroo and rabbit numbers directly affect the condition of the vegetation on the mine and municipal leases. These herbivores also affect the success of rehabilitation measures and amenity plantings within the mine and municipal leases. Similarly, cat and fox numbers have the potential to increase in response to land management practices and have an impact on native vertebrate populations. Therefore, these species can potentially have an impact on the ecology of the region. For this reason, feral and abundant mammal populations are monitored regularly and controlled when necessary.

2.1.2 Purpose

- Manage feral and abundant species within the SML and surrounding areas.

2.1.3 Deliverable(s)

- An annual report of monitoring and control actions undertaken within the SML and surrounding areas.
- A triennial quantitative assessment of the abundance of specific feral and abundant species within the region.

2.1.4 Method

The focus of this program is the management of feral and abundant species based on control effectiveness, feasibility and alignment with current regional management priorities.

An annual risk assessment is undertaken to determine specific actions that are to be applied in the next 12 months and documented as a part of the EPMP review process. The risk assessment focuses on the feasibility of monitoring and management actions that can be undertaken to deliver boarder regional outcomes in line with NR SAAL conservation priorities.

The annual report will document all feral and abundant species management actions undertaken within the SML and surrounding areas for the financial year.

2.2 ‘At-risk’ fauna – Category 1a

A number of at-risk species have been recorded or regularly occur within the SML and the wellfields. At-risk species have been classified by ODC into three main categories – Category 1a, Category 1b and Category 2. Appendix A contains a flow chart detailing how priority species are identified (see Figure 6.1). All Category 1a species are those whose population as a whole is largely restricted to the impact area and therefore the species has a higher risk of being impacted. These species are all formally **listed species** under state, national and/or international conservation listings.

The extent of at-risk species monitoring depends largely on the category under which they fall. Monitoring of Category 1a is intensive in comparison to Category 1b and Category 2 (see section 2.6), which reflects the species’ reliance on the potential impact area. A list of all Category 1a, 1b and 2 fauna occurring in the impact zone is included in Appendix B. This includes invertebrates largely restricted to the GAB springs of the Lake Eyre South region in the vicinity of the wellfields.

2.2.1 Background

A diverse, endemic invertebrate fauna group occurs in springs associated with the GAB in South Australia and Queensland. As GAB springs are small aquatic habitats, widely separated in an arid environment, it has been found that localised groups of GAB springs support their own specific types of endemic invertebrates (Ponder 1986). Invertebrate populations in GAB springs within the Olympic Dam operational area of influence are classified as Category 1a species, and are the only Category 1a species listed.

GAB springs in the Lake Eyre South region support at least six species of Hydrobiid in two genera (*Trochidrobia* and *Fonscochlea*), a phreatoicid isopod (*Phreatomerus latipes*), an ostracod (*Ngarawa dirga*) and an amphipod (*Austrochiltonia* sp.). All these species are aquatic and are currently only

known to occur in GAB springs between Marree and Oodnadatta (the only known exception is a species of Hydrobiid recorded in low abundance from Coward Springs Railway Bore) (Ponder et al. 1989). All species of Hydrobiid present in these springs are currently recognised as internationally significant (IUCN Red List of Threatened Species 2013).

The persistence of GAB spring aquatic invertebrates is intimately linked to the availability and chemistry of free-flowing water at GAB springs. While the aquatic populations have been exposed to natural spring processes of emergence and decline over considerable time periods, it is likely that populations would be susceptible to any accelerated spring changes over comparatively short periods, which may be caused by excessive drawdown.

2.2.2 Purpose

- Qualify the level of population change that may be attributed to water extraction from the wellfields.

2.2.3 Deliverables

- Comparison of the abundance of Hydrobiid species against baseline data to quantify population change.
- Triennial qualitative comparison of GAB spring monitoring data incorporating GAB spring flow, GAB springs vegetated wetland area, 'at risk' flora – category 1a and 'at risk' fauna – Category 1a.

2.2.4 Method

Spring groups within the potential impact zones of the GAB are visited triennially and sampled for the presence/absence of endemic invertebrate species. Sampling and sorting analyses to be completed during the same year.

Previous research has shown that presence/absence data provides the same level of information as measures of abundance (Tyre and Possingham 2001). Therefore a large number of springs are visited and sampled for presence/absence, as opposed to visiting a small number of springs and providing a quantitative analysis. This enables a broader impression of current population status to be gained.

Substrate samples are taken at each of the designated springs using a standardised scoop and tray, and analysed for presence/absence of key fauna species/groups.

Time series data are summarised and inspected for long-term trends. Baseline data consists of samples collected during 1995–1996 with further additional sampling conducted in more recent years. The next round of monitoring is scheduled for the latter half of 2018 (FY19). Monitoring sites are grouped in zones for analysis based on predicted levels of impact listed in Appendix F of the Great Artesian Basin Monitoring Program (Document No. 2789).

2.3 'At-risk' fauna – Categories 1b and 2

2.3.1 Background

Category 1b comprises **species** for which **important populations** may be critically reliant on areas impacted by the operation and any future expansion developments. Category 1b species are those with local sedentary populations that are exposed to impact from the operations and have limited alternative habitat in the region. Also included are highly mobile species that travel in large numbers and are attracted to hazardous areas within the operation (e.g. the Banded Stilt).

Category 2 includes all other species known to occur in the region that are listed under state, national and/or international conservation listings, but can include other regionally or locally significant species that may be adversely impacted by operations (i.e. includes some resident unlisted species) (Appendix A). Populations of Category 2 at-risk species are not critically reliant on the area of impact, (i.e. only individuals of a species are likely to be impacted).

The 36 migratory shorebird species listed in the *EPBC Act 1999* Draft Policy Statement 3.21 were considered during the formation of this MP. Of the 36 species, 13 have been sighted through monitoring programs conducted at Olympic Dam and in the wellfields since 1986, and are included as Category 2 species within the 'At-Risk Fauna Species List'.

Impacts to Category 1b and 2 species are principally managed by the measures outlined in sections of the EMP addressing land disturbance, and via the implementation of ODC's internal Environmental

Disturbance Permit (EDP) process. In summary, this process requires the manager of the activity to seek a clearance permit for disturbance activities, which is reviewed by environmental personnel. A review against ODC's spatial database is undertaken to determine if any at-risk species are known to occur or utilise the habitats proposed for disturbance. If the disturbance cannot be avoided, targeted surveys are undertaken to determine if any at-risk species are present. If populations are shown to exist, the area is identified as a 'no-go' area and the manager of the activity is requested to avoid the area if possible. In rare circumstances where the activity cannot avoid the area, and if appropriate, the at-risk species are relocated.

Ninety-five bird species, eight mammal species and two reptile species have been identified in the Olympic Dam and wellfields region under Categories 1b and 2 (Appendix B).

2.3.2 Purpose

- Record the presence of Category 1b and Category 2 at-risk species in the SML, surrounding areas and wellfields region.

2.3.3 Deliverable(s)

- A quantitative assessment of the presence of Category 1b and Category 2 at-risk species in the SML, surrounding areas and wellfields region for internal records and annual EPMP reporting.
- A maintained and updated (where required) map of the known locations and important habitats for at-risk species, to assist the EDP process.
- A statement of impacts to, and measures undertaken to avoid, Category 1b at-risk species.

2.3.4 Method

Species lists are compiled monthly for all birds sighted in:

- The SML;
- The surrounding pastoral stations;
- The wellfields region.

Category 1b and Category 2 at-risk species observed through opportunistic observations.

A fauna assessment is undertaken in areas known or likely to support at-risk species prior to any significant land disturbance activities undertaken by or for ODC. Where threatened fauna or habitats considered important to threatened species (Category 1b or 2) are found, the Environmental Disturbance Permit (EDP) conditions flag 'no go' areas for those undertaking the disturbance activities, seek justification for disturbance in these areas, and in certain circumstances require relocation of affected species where disturbance is unavoidable.

2.4 Fauna losses

2.4.1 Background

Evaporation ponds and tailings storage facilities (which together form the Tailings Retention System – TRS) are sometimes visited by fauna, which can result in deaths (particularly wetland birds). ODC has trialled various measures to deter fauna from visiting the TRS, and is committed to ongoing improvement in this area.

A number of measures are used to minimise the risk of fauna losses, including intermittent deterrents, pond characteristics and fencing. Any future expansion of the operation may also allow ongoing optimisation of the operation's water balance potentially removing the requirement for new evaporation ponds. ODC also continues to research new measures to decrease the attractiveness of the TRS waterbodies to fauna.

2.4.2 Purpose

- Assess the performance of control measures that aim to minimise the risk of Category 1b and Category 2 fauna species interacting with the TRS and alert management when levels approach the **leading indicator**.

2.4.3 Deliverable(s)

- An assessment of fauna activity and losses within the TRS.
- An evaluation of the effectiveness of control measures in reducing the number of listed migratory birds lost within the TRS.

2.4.4 Method

Standardised monitoring of the TRS is conducted weekly to detect the presence of any fauna (dead or alive). This monitoring is conducted by trained staff members, and any fauna carcasses are removed when safe to do so. Opportunistic observations of fauna on the TRS are also made by trained staff and technicians. Analysis is conducted on the effectiveness of control measures and targets in reducing the number of **listed migratory bird** deaths within the TRS.

3 COMMITMENTS

3.1 Reporting

The results and a discussion of the results are presented in the annual EPMP Report, as outlined in the EMM. The monitoring results relating to fauna are made publicly available through the Annual EPMP Report.

3.2 Summary of commitments

Table 3.1: Summary of commitments

Action	Parameter	Frequency
Manage	Feral animal and kangaroo abundance	Ongoing
Monitor	Endemic invertebrate abundance (Category 1a species) in GAB springs	Triennially
Monitor	Presence of Category 1b, and 2 species within the SML, region and wellfields	Opportunistically
Monitor	Fauna presence and losses within the TRS	Weekly
Assess	Effectiveness of control measures and targets in reducing the number of listed migratory birds lost within the TRS	Annually
Employ	Environmental Scientist to undertake the requirements of the MP – Fauna	Ongoing
Report	Monitoring results in the Annual EPMP Report to the Indenture Minister and make fauna data publicly available through the Annual EPMP Report.	Annually
Review	The Fauna MP and modify as appropriate	Annually

4 DEFINITIONS AND REFERENCES

4.1 Definitions

Throughout the EPMP some terms are taken to have specific meaning. These are indicated in bold text in the documentation and are defined in the glossary in section 5 of the EMM. Defined terms have the same meaning wherever they appear in bold text. Some other terms and acronyms are also defined in the glossary, but do not appear in bold text.

4.2 References

BHP Billiton 2009, Draft Environmental Impact Statement 2009.

ICRP 2008, Environmental Protection: the Concept and Use of Reference Animals and Plants, ICRP Publication 108, Annals of the ICRP 38 (4–6).

IUCN 2013, 'IUCN Red List of Threatened Species', Version 2013.2.

Ponder, WF 1986, 'Mound Spring Snails of the Great Artesian Basin', in *Limnology in Australia*, eds DeDecker P & Williams WD, CSIRO Australia, Melbourne.

Ponder, WF, Hershler, R & Jenkins, B 1989, 'An endemic radiation of Hydrobiid Snails from artesian springs in Northern South Australia: their taxonomy, physiology, distribution and anatomy', *Malacologia* 31 (1): pp. 1–140.

Tyre, AJ & Possingham, HP 2001, 'Risk Management for ecologically sustainable development: predicting extinction and recolonisation in the Mound Springs of SA – Final Report', Unpublished report for WMC Olympic Dam, University of Queensland.

4.3 Bibliography

Andersen, AN, Fisher, A, Hoffman, BD & Read, JL 2004, 'Use of terrestrial invertebrates for biodiversity monitoring in Australian rangelands, with particular reference to ants', *Austral Ecology* 29, pp. 87–92.

Anon 1991, 'Environmental Assessment Wellfield A Extension'.

Australian Nature Conservation Agency 1996, 'A directory of important wetlands in Australia Second Edition', ANCA, Canberra.

Badman, FJ 1987, 'Birds & the bore drains of inland S.A.', Nature Conservation Society of South Australia.

Badman, FJ 1991, 'Birds', in 'A natural history of the Lake Eyre region: A visitors guide', pp. 29–38, eds Badman FJ, Arnold BK and Bell SL, NPWS Northern Consultative Committee, Port Augusta.

Badman, FJ 1991, 'Mound Springs', in 'A natural history of the Lake Eyre region: A visitors guide', pp. 51–58, eds Badman FJ, Arnold BK & Bell SL, NPWS Northern Consultative Committee, Port Augusta.

Bowen, ZE & Read, JL 1998, 'Factors influencing breeding and survivorship of rabbits in the Roxby Downs region', *Wildlife Research* 25, pp. 655–662.

Casperson, KC 1979, 'Mound Springs of South Australia. Part 1, Physical features, history, biota and conservation requirements', South Australian Department of Environment and Planning SADE 20, pp. 1–23.

Colgan, DJ & Ponder, WF 1994, 'The evolutionary consequence of restrictions in gene flow: examples from Hydrobiid snails', *Nautilus*, Supplement 4, pp. 25–43.

DeDecker, P 1979, 'Ostracods from the mound springs between Strangways and Curdimurka, South Australia', *Transactions of the Royal Society of South Australia* 103, pp. 155–168.

Dobrzinski, I 1994, 'Mound Springs in SA: Potential effects from aquifer drawdown to mining', Department of Mines and Energy South Australia, Adelaide.

Ferguson, D 1985, 'The mound springs: Lens on a Looming tragedy for Australia's desert lands', *Habitat* 13 (2), pp. 32–33.

GAB Consultative Council 1998, 'Draft Great Artesian Basin Strategic Management Plan', Great Artesian Basin Consultative Council, Fortitude Valley, Brisbane.

- GAB Consultative Council 1998, 'Great Artesian Basin resource document', Great Artesian Basin Consultative Council, Fortitude Valley, Brisbane.
- Gotch TB 2000, 'Wolf spider assemblages in the mound springs and bore drains of South Australia', unpublished honours thesis, University of Adelaide.
- Greenslade, J & Reeves, A 1985, 'South Australia's Mound Springs', Nature Conservation Society of South Australia Inc., Adelaide.
- Harris, CR 1981, 'Oasis in the desert: The mound springs of northern South Australia', *Proceedings of Royal Geographical Society of Australasia (South Australian Branch)* 81, pp. 26–39.
- Harris, CR 1992, 'Mound springs: South Australian conservation initiatives', *Australian Rangelands Journal* 14 (2), pp.157–73.
- IUCN 2012, 'IUCN Red List of Threatened Species', Version 2012.2.
- Kemper, CM & Read, JL 1991, 'Mammals', in 'A natural history of the Lake Eyre region: A visitors guide', pp. 39–43, eds Badman FJ, Arnold BK & Bell SL, NPWS Northern Consultative Committee, Port Augusta.
- Keane, D 1997, 'The sustainability of use of groundwater from the Great Artesian Basin, with particular reference to the south western edge of the basin and impact on the mound springs', unpublished thesis.
- Kinhill-Stearns Roger 1982, 'Olympic Dam Project draft environmental impact statement', Kinhill Stearns Roger Joint Venture, Adelaide.
- Kinhill Engineers 1994, 'Supplementary environmental studies Wellfield B, Mound Springs and meteorology desktop study', Kinhill Engineers Pty Ltd, Adelaide.
- Kinhill Engineers 1995, 'Survey and assessment report: Supplementary environmental studies, Borefield B development', Kinhill Engineers Pty Ltd, Adelaide.
- Kovac, KJ & Nijalke, DP 2004, 'Observation and breeding records of the Painted Finch *Emblema pictum* associated with artesian springs in South Australia', *South Australian Ornithologist* 34 (5), pp.181–182.
- Lamb, KJ 1998, 'Grazing impacts on mound spring spider communities', unpublished honours thesis, Flinders University of South Australia.
- McLaren, N, Wiltshire, D & Lesslie, R 1985, 'Biological assessment of South Australian mound springs', unpublished report prepared for South Australian Department of Environment and Planning.
- Moseby, KE & Read, JL 1999, 'Population dynamics and movement patterns of Bolam's mouse, *Pseudomys bolami*, at Roxby Downs', *Australian Mammalogy* 26, pp. 479–494.
- Moseby, KE & Read, JL 2001, 'Factors affecting pitfall capture rates of small ground invertebrates in arid SA. II. Optimum pitfall trapping effort', *Wildlife Research* 28, pp. 61–71.
- Mudd, GM 1998, 'The sustainability of mound springs in South Australia: Implications for Olympic Dam', International Association of Hydrogeologists, Commission on Mineral and Thermal Waters Meeting, Ballarat.
- Munro, NT, Kovac, K, Nijalke, D & Cunningham, RB 2009, 'The effect of a single burn event on the aquatic invertebrates in artesian springs', *Austral Ecology* 34 (8), pp. 837–847.
- Murphy, D 1985, 'Mound springs: threatened outback ecosystem', *Australian Conservation Foundation Newsletter* 17 (8), p. 8.
- Nijalke, DP 1998, 'Some notes on the fishes from mound springs between Marree and Oodnadatta in South Australia', *Australis*, January-March 1998, Newsletter of the SA Native Fish Group.
- Nijalke, DP 1998, 'Proceedings to the 2nd Mound Spring Researchers Forum and spring management workshop', November 24 at Kinhill Engineers, Adelaide.
- Noble, JC, Habermehl, MA, James, CD, Landsberg, J, Langston, AC & Morton, SR 1998, 'Biodiversity implications of water management in the Great Artesian Basin', *Rangeland Journal* 20 (2), pp. 275–300.
- Ponder, WF 1994, 'Australian freshwater Mollusca: Conservation priorities and indicator species', *Memoirs of the Queensland Museum* 36, pp. 191–196.

- Ponder, WF 1995, 'Mound spring snails of the Australian Great Artesian Basin', in 'The conservation biology of molluscs', Kay, EA (ed.), IUCN, Gland, Switzerland, pp. 13–18.
- Ponder, WF 1997, 'Conservation status, threats and habitat requirements of Australian terrestrial and freshwater Mollusca', *Memoirs of the Museum of Victoria* 56 (2), pp. 421–430.
- Ponder, WF 1997, 'Nomenclatural rectifications in Australian Hydrobiidae', *Molluscan Research* 18, pp. 67–68.
- Ponder, WF 1998, 'Conservation', in 'Mollusca: The Southern Synthesis', Vol. 5A, Beesley, PL, Ross, GJB & Wells, A (eds), CSIRO Publishing, Melbourne, pp. 105–115.
- Read, JL 1991, 'Reptiles and Amphibians', in A 'Natural history of the Lake Eyre region: A visitors guide, pp 44-50, eds Badman FJ, Arnold BK & Bell SL, NPWS Northern Consultative Committee, Port Augusta.
- Read, JL 1991, 'Range extensions for the Flock Pigeon in South Australia', *South Australian Ornithologist* 31, p. 72.
- Read, JL 1992, 'Influence of habitats, climate, grazing and mining on terrestrial vertebrates at Olympic Dam, South Australia', *The Rangeland Journal* 14 (2), pp. 143–56.
- Read, JL 1992, 'How Dr Doolittle can help the mining industry', WMC Group Environmental Conference, Olympic Dam, pp. 83–85.
- Read, JL 1994, 'A retrospective view of the quality of the fauna component of the Olympic Dam Project Environmental Impact Statement', *Journal of Environmental Management* 41, pp. 167–185.
- Read, JL 1995, 'First South Australian record of the Oriental Cuckoo, *Cuculus saturatus*', *South Australian Ornithologist*. 32, pp. 62–63.
- Read, JL 1995, 'Subhabitat variability: A key to the high reptile diversity in chenopod shrublands', *Australian Journal of Ecology* 20, pp. 494–501.
- Read, JL 1995, 'The ecology of the Grass Owl *Tyto capensis* south of Lake Eyre', *South Australian Ornithologist*. 32, pp. 62–63.
- Read, JL 1996, 'Use of ants to monitor environmental impacts of salt spray from a mine in arid Australia', *Biodiversity and Conservation* 5, pp. 1533–1543.
- Read, JL 1997, 'Comparative abnormality rates of the trilling frogs at Olympic Dam', *Herpetofauna* 27 (2), pp. 23-27.
- Read, JL 1998, 'The ecology of sympatric scincid lizards *Ctenotus* in arid South Australia', *Australian Journal of Zoology* 46, pp. 617–629.
- Read, JL 1999, 'Abundance and recruitment patterns of the trilling frog *Neobatrachus centralis* in the Aust. Arid zone', *Australian Journal of Zoology* 47, pp. 313–404.
- Read, JL 1999, 'A strategy for minimising waterfowl deaths on toxic ponds', *Journal of Applied Ecology* 36, pp. 345–350.
- Read, JL 1999, 'Bird colonisation of a remote arid settlement', *Australian Bird Watcher* 18 (2), pp. 59–67.
- Read, JL 1999, 'Diet and causes of mortality of the Trilling Frog *Neobatrachus centralis*', *Herpetofauna* 29 (1), pp. 13–18.
- Read, JL 1999, 'Longevity, reproductive effort and movements of three sympatric Australian arid zone gecko species', *Australian Journal of Zoology* 47, pp. 307–316.
- Read, JL 1999, 'The initial response of a chenopod shrubland plant and invertebrate community to two pulses of intensive cattle grazing', *Rangeland Journal* 21 (2), pp. 169–193.
- Read, JL 2002, 'Experimental trial of Australian arid zone reptiles as early warning indicators of over grazing by cattle', *Austral Ecology* 27, pp. 55–66.
- Read, JL 2003, 'Are miners the bunnies or the bilbies of the Rangelands?', *Rangelands Journal* 25 (2), pp. 172–182.
- Read, JL & Anderson, AN 2000, 'The value of ants as early warning bioindicators: Responses to pulsed cattle grazing at an the Australian arid zone locality', *Journal of Arid Environments* 45, pp. 231–251.

- Read, JL & Badman, FJ 1990, 'Reptile densities in chenopod shrubland at Olympic Dam, South Australia', *Herpetofauna* 20 (1), pp. 3–8.
- Read, JL & Badman FJ 1999, 'The birds of the Lake Eyre South region', Lake Eyre South Monograph Series, Volume 3, WJH Slaytor, Royal Geographical Society South Australia (eds).
- Read, JL & Bowen Z 2000, 'Population dynamics, diet and aspects of the biology of feral cats and foxes in arid SA', *Wildlife Research* 28, pp. 195–203.
- Read, JL, Copley P & Bird P 1999, 'The distribution, ecology and current status of *Pseudomys desertor* in SA', *Wildlife Research* 26, pp. 453–462.
- Read, JL, Ebdon FR & Donohoe P 2000, 'The terrestrial birds of the Roxby Downs area: a ten year history', *SA Ornithologist* 33, pp. 71–83.
- Read, JL & Moseby KE 2001, 'Factors affecting pitfall capture rates of small ground invertebrates in arid SA. I. The influence of weather and moon phase on capture rates of reptiles', *Wildlife Research* 28, pp. 53–60.
- Read, JL & Niejalke, D 1995, 'Brolgas: The storks of the mound springs', *Xanthopus* 13b, pp. 6–7.
- Read, JL & Pickering, R 1999, 'Ecological and toxicological effects of exposure to an acidic, radioactive tailings storage', *Environmental Monitoring and Assessment* 54, pp. 69–85.
- Read, JL & Tyler, MJ 1994, 'Natural levels of abnormalities in the Trilling Frog *Neobatrachus centralis* at the Olympic Dam Mine', *Bulletin of Environmental Contamination and Toxicology* 53, pp. 25–31.
- Read, JL & Wilson, D 2004, 'Scavengers and detritivores of kangaroo harvest offcuts in arid Australia', *Wildlife Research* 31, pp. 51–56.
- Stanger, M, Clayton, M, Schodde, R, Wombey, J & Mason, I 1998, 'CSIRO List of Australian Vertebrates: A reference with conservation status', CSIRO Publishing, Australia.
- Waterman, MH & Read, JL 1991, 'Breeding success of the Australian Pelican on Lake Eyre South in 1990', *Corella* 16, pp. 123–126.
- Wilson, D & Read, JL 2003, 'Kangaroo harvesters: fertilising the rangelands', *Rangelands Journal* 25 (1), pp. 47–55.

5 APPENDIX A: CLASSIFICATION OF AT-RISK FAUNA SPECIES

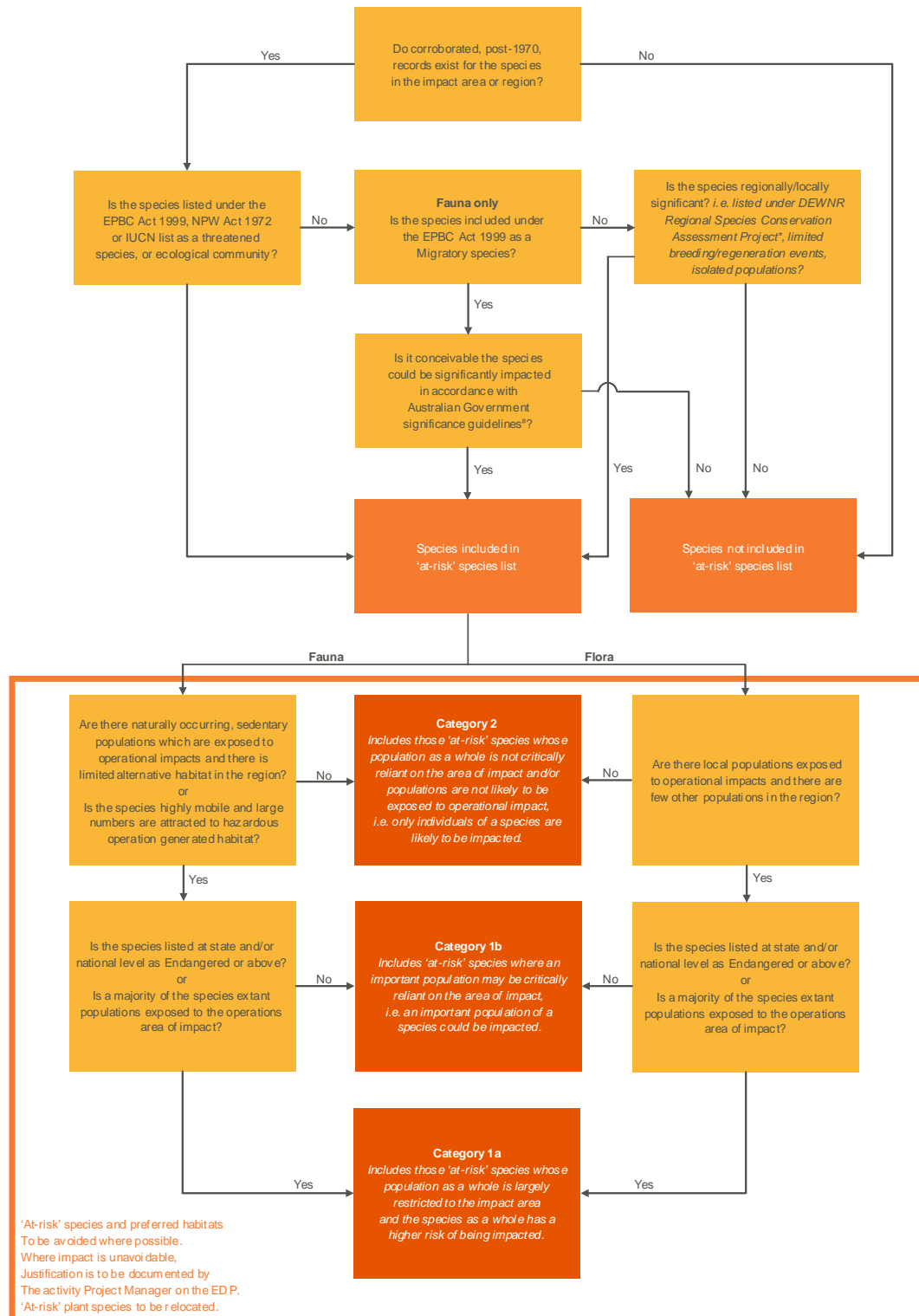


Figure 6.1: Classification of at-risk fauna species

6 APPENDIX B: AT-RISK FAUNA SPECIES LIST

Table 7.1: At-risk fauna species list

Common name	Scientific name	Well-fields	OD SML	OD region	Transmission line *	EPBC	IUCN	NPW (SA)	DEWNR Regional Species	Species category	Comments
Mammals											
Burrowing Bettong	<i>Bettongia lesueur lesueur</i>		✓	✓		V	NT	E	V	2	Species reintroduced into the Arid Recovery reserve, 4 km north of operations.
Ampurta (Crest-tailed Mulgara)	<i>Dasyercus hillieri</i>				?	V	LC	E	-	2	Recorded in north-eastern regions of South Australia and the Simpson Desert.
Greater Stick-nest Rat	<i>Leporillus conditor</i>		✓	✓		V	V	V	V	2	Species reintroduced into the Arid Recovery reserve, 4 km north of operations.
Greater Bilby	<i>Macrotis lagotis</i>		✓	✓		V	V	V	V	2	Species reintroduced into the Arid Recovery reserve, 4 km north of operations, and have also been released outside of the reserve.
Numbat	<i>Myrmecobius fasciatus</i>		✓	✓		V	E	E	-	2	Species reintroduced into the Arid Recovery reserve, 4 km north of operations.
Western Barred Bandicoot	<i>Perameles bougainville bougainville</i>		✓	✓		E	E	E	V	2	Species reintroduced into the Arid Recovery reserve, 4 km north of operations.
Plains Rat	<i>Pseudomys australis</i>	✓	✓			V	V	V	V	1B	Old record near Lake Eyre South; Recent records on Stuart Creek, Arid Recovery and Olympic Dam SML.
Birds											
Slender-billed Thornbill	<i>Acanthiza iredalei iredalei</i>				✓	-	LC	V	-	2	Recorded within transmission line corridor (BHP Billiton, 2009).

Common name	Scientific name	Well-fields	OD SML	OD region	Transmission line *	EPBC	IUCN	NPW (SA)	DEWNR Regional Species	Species category	Comments
Australian Reed Warbler	<i>Acrocephalus australis</i>					-	LC	-	R	2	Identified in the Roxby region by DEWNR.
Common Sandpiper	<i>Actitis hypoleucos</i>		✓	✓	✓	Mi	LC	R	R	2	Numerous records for SML, region and wellfields. Recorded mortality on TRS.
Thick-billed Grasswren	<i>Amytornis textilis modestus</i>	✓	?	✓		V	LC	-	R	1B	Numerous records from region and wellfields.
Chestnut Teal	<i>Anas castanea</i>					-	LC	-	R	2	Identified in the Roxby region by DEWNR.
Australasian Shoveler	<i>Anas rhynchos</i>	✓	✓	✓	✓	-	LC	R	R	2	Numerous records from SML, region and wellfields.
Darter	<i>Anhinga melanogaster</i>		✓	✓	✓	-	NT	R	R	2	Numerous records from SML, region and wellfields.
Great Egret	<i>Ardea alba</i>					-	-	-	R	2	Identified in the Roxby region by DEWNR.
Cattle Egret	<i>Ardea ibis</i>		✓		✓	-	LC	R	-	2	Multiple records from SML and region.
Intermediate Egret	<i>Ardea intermedia</i>		✓			-	LC	R	-	2	Two records from SML in 1997.
White-necked Heron	<i>Ardea pacifica</i>					-	LC	-	R	2	
Australian Bustard	<i>Ardeotis australis</i>	✓	✓	✓		-	LC	V	V	2	Numerous records from SML, region and wellfields.
Ruddy Turnstone	<i>Arenaria interpres</i>		✓	✓	✓	Mi	LC	R	-	2	Numerous records from SML, region and wellfields.
White-browed woodswallow	<i>Artamus superciliosus</i>					-	LC	-	NT	2	Identified in the Roxby region by DEWNR.
Chestnut-breasted Whiteface	<i>Aphelocephala pectoralis</i>					-	NT	R	R	2	Identified in the Roxby region by DEWNR.
Fork-tailed Swift	<i>Apus pacificus</i>					-	LC	-	NT	2	Identified in the Roxby region by DEWNR.

Common name	Scientific name	Well-fields	OD SML	OD region	Transmission line *	EPBC	IUCN	NPW (SA)	DEWNR Regional Species	Species category	Comments
Musk Duck	<i>Biziura lobata</i>	✓	✓	✓	✓	-	LC	R	R	2	Numerous records from SML, region and wellfields. Recorded mortality on TRS.
Bush Stone-curlew	<i>Burhinus grallarius</i>	✓				-	LC	R	-	2	Historical records from wellfields (Read and Badman, 1999).
Major Mitchell's Cockatoo	<i>Cacatua leadbeateri</i>		✓	✓	✓	-	LC	R	V	2	Multiple records from SML, region and wellfields.
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>		✓	✓	✓	Mi	LC	-	R	2	Recorded within SML, region and transmission line.
Red Knot	<i>Calidris canutus</i>		✓	✓	✓	Mi	LC	-	-	2	Recorded within SML, region and transmission line.
Curlew Sandpiper	<i>Calidris ferruginea</i>					-	LC	-	R	2	Identified in the Roxby region by DEWNR.
Red-necked Stint	<i>Calidris ruficollis</i>		✓	✓		Mi	LC	-	R	2	Recorded within SML and surrounding regions.
Black-eared Cuckoo	<i>Chalcites osculans</i>					-	LC	-	NT	2	Identified in the Roxby region by DEWNR.
Red-capped Plover	<i>Charadrius ruficapillus</i>					-	LC	-	NT	2	Identified in the Roxby region by DEWNR.
Oriental Plover	<i>Charadrius veredus</i>		✓	✓		Mi	LC	-	-	2	Recorded in SML and surrounding regions.
Whiskered Tern	<i>Chlidonias hybrida</i>		✓	✓		-	LC	-	R	2	Multiple records for SML, region. Recorded mortality on TRS.
Chestnut Quail-thrush	<i>Cinclosoma castanotus</i>				✓	-	LC	R	-	2	Recorded within transmission line corridor (BHP Billiton, 2009).
Banded Stilt	<i>Cladorhynchus leucocephalus</i>	✓	✓	✓	✓	-	LC	V	R	1B	Numerous records from SML, region and wellfields. Recorded mortality on TRS.
White-browed Treecreeper	<i>Climacteris affinis</i>				✓	-	LC	R	CR	2	Recorded within transmission line corridor (BHP Billiton, 2009).
Ground Cockoo-shrike	<i>Coracina maxima</i>					-	LC	-	NT	2	Identified in the Roxby region by DEWNR.

Common name	Scientific name	Well-fields	OD SML	OD region	Transmission line *	EPBC	IUCN	NPW (SA)	DEWNR Regional Species	Species category	Comments
Brown Quail	<i>Coturnix ypsilophora</i>					-	LC	V	R	2	Identified in the Roxby region by DEWNR.
Australian Black Swan	<i>Cygnus atratus</i>		✓	✓		-	LC	-	NT	2	Multiple records for SML, region. Recorded mortality on TRS.
Varied Sittella	<i>Daphoenositta chrysoptera</i>					-	LC	-	NT	2	Identified in the Roxby region by DEWNR.
Little Egret	<i>Egretta garzetta</i>		✓	✓	✓	-	LC	R	R	2	Multiple records for SML, region and wellfields. Recorded mortality on TRS.
Letter-winged Kite	<i>Elanus scriptus</i>	✓				-	NT	R	V	2	Several records from wellfields region.
Painted Finch	<i>Emblema pictum</i>	✓				-	LC	R	-	2	Recorded on numerous occasions at the Hermit Hill Spring group.
White-fronted Chat	<i>Epthianura albifrons</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Red-kneed Dotteral	<i>Erythronyctes cinctus</i>					-	LC	-	NT	2	Identified in the Roxby region by the DEWNR.
Grey Falcon	<i>Falco hypoleucos</i>	✓	✓		✓	-	V	R	E	2	One record from SML and several in the wellfields.
Peregrine Falcon	<i>Falco peregrinus</i>	✓	✓	✓		-	LC	R	V	2	Multiple records from SML, region and wellfields.
Black Falcon	<i>Falco subniger</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Eurasian Coot	<i>Fulica atra</i>					-	LC	-	NT	2	Identified in the Roxby region by the DEWNR.
Latham's Snipe	<i>Gallinago hardwickii</i>	✓	✓	✓		Mi	LC	R	R	2	Several records for SML and region.
Dusky Moorhen	<i>Gallinula tenebrosa</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.

Common name	Scientific name	Well-fields	OD SML	OD region	Transmission line *	EPBC	IUCN	NPW (SA)	DEWNR Regional Species	Species category	Comments
Buff-banded Rail	<i>Gallirallus philippensis</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Gull-billed Tern	<i>Gelochelidon nilotica</i>					-	LC	-	NT	2	Identified in the Roxby region by the DEWNR.
White-throated Gerygone	<i>Gerygone olivacea</i>	✓				-	LC	R	-	2	Two records from 1997 in SML.
Brolga	<i>Grus rubicundus</i>	✓		✓		-	LC	V	V	2	Regular observations at springs and boredrains.
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>	✓	✓	✓		-	LC	R	R	2	Multiple records from SML and wellfields.
Little eagle	<i>Hieraaetus morphnoides</i>					-	LC	-	NT	2	Identified in the Roxby region by the DEWNR.
Black-winged Stilt	<i>Himantopus himantopus</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Caspian Tern	<i>Hydroprogne caspia</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Black-tailed Godwit	<i>Limosa limosa</i>		✓	✓	✓	Mi	NT	R	R	2	Multiple records from SML and wellfields.
Splendid Fairy-wren	<i>Malurus splendens</i>	✓	✓			-	LC	-	-	2	Isolated populations within the SML and wider region.
Little Grassbird	<i>Megalurus gramineus</i>					-	LC	-	NT	2	Identified in the Roxby region by the DEWNR.
Hooded Robin	<i>Melanodryas cucullata</i>					-	LC	-	NT	2	Identified in the Roxby region by the DEWNR.
Restless Flycatcher	<i>Myiagra inquieta</i>		✓	✓	✓	-	LC	R	R	2	Several records from SML and region.
Little Pied Cormorant	<i>Microcarbo melanoleucos</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.

Common name	Scientific name	Well-fields	OD SML	OD region	Transmission line *	EPBC	IUCN	NPW (SA)	DEWNR Regional Species	Species category	Comments
Jacky Winter	<i>Microeca fascians</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Blue-winged Parrot	<i>Neophema chrysostoma</i>	✓	✓	✓		-	LC	V	V	2	Numerous records from SML, region and wellfields.
Elegant Parrot	<i>Neophema elegans</i>				✓	-	LC	R	R	2	Recorded within transmission line corridor (BHP Billiton, 2009).
Scarlet-chested Parrot	<i>Neophema splendida</i>		✓	✓	✓	-	LC	R	E	2	Several records from SML and region..
Eastern Curlew	<i>Numenius madagascariensis</i>		✓	✓	✓	Mi	V	V	-	2	Recorded on TRS and in regional lakes.
Nankeen Night-Heron	<i>Nycticorax caledonicus</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Blue-billed Duck	<i>Oxyura australis</i>	✓	✓	✓	✓	-	NT	R	R	2	Numerous records from SML, region and wellfields. Recorded mortality on TRS.
Gilbert's Whistler	<i>Pachycephala inornata</i>					-	LC	R	R	2	Identified in the Roxby region by the DEWNR.
Red-browed Pardalote	<i>Pardalotus rubricatus</i>					-	LC	-	NT	2	Identified in the Roxby region by the DEWNR.
Plains-wanderer	<i>Pedionomus torquatus</i>		✓			V	E	E	E	2	Single record from Roxby township in 1990.
Australian Pelican	<i>Pelecanus conspicillatus</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Great Cormorant	<i>Phalacrocorax carbo</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Pied Cormorant	<i>Phalacrocorax varius</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.

Common name	Scientific name	Well-fields	OD SML	OD region	Transmission line *	EPBC	IUCN	NPW (SA)	DEWNR Regional Species	Species category	Comments
Flock Bronzewing	<i>Phaps histrionica</i>	✓		✓		-	LC	R	R	2	Multiple records from region and wellfields.
Yellow-billed Spoonbill	<i>Platalea flavipes</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Royal Spoonbill	<i>Platalea regia</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Glossy Ibis	<i>Plegadis falcinellus</i>	✓	✓	✓	✓	-	LC	R	R	2	Numerous records from SML, region and wellfields.
Grey Plover	<i>Pluvialis squatarola</i>		✓	✓	✓	Mi	LC		-	2	Recorded within SML, region and transmission line.
Great Crested Grebe	<i>Podiceps cristatus</i>	✓	✓	✓	✓	-	LC	R	R	2	Several records from SML, region and wellfields. Recorded mortality on TRS.
Purple Swanmphen	<i>Porphyrio porphyrio</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Australian Spotted Crake	<i>Porzana fluminea</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Baillon's Crake	<i>Porzana pusilla</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Spotless Crake	<i>Porzana tabuensis</i>	?	✓	✓		-	LC	R	R	2	Multiple records from SML, region and wellfields.
Red-necked Avocet	<i>Recurvirostra novaehollandiae</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Grey Fantail	<i>Rhipidura albiscapa</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Black Honeyeater	<i>Sugomel nigrum</i>					-	-	-	NT	2	Identified in the Roxby region by the DEWNR.
Freckled Duck	<i>Stictonetta naevosa</i>	✓	✓	✓	✓	-	LC	V	R	2	Numerous records from SML, region and

Common name	Scientific name	Well-fields	OD SML	OD region	Transmission line *	EPBC	IUCN	NPW (SA)	DEWNR Regional Species	Species category	Comments
											wellfields. Recorded mortality on TRS.
Australian Shelduck	<i>Tadorna tadornoides</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Australian White Ibis	<i>Threskiornis molucca</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Straw-necked Ibis	<i>Threskiornis spinicollis</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Sacred Kingfisher	<i>Todiramphus sanctus</i>					-	LC	-	R	2	Identified in the Roxby region by the DEWNR.
Wood Sandpiper	<i>Tringa glareola</i>	✓	✓	✓	✓	Mi	LC	R	R	2	Numerous records from SML, region and wellfields.
Common Greenshank	<i>Tringa nebularia</i>		✓	✓	✓	Mi	LC		R	2	Recorded within SML, region and transmission line.
Marsh Sandpiper	<i>Tringa stagnatilis</i>		✓	✓	✓	Mi	LC		R	2	Recorded within SML, region and transmission line.
Eastern Grass Owl	<i>Tyto longimembris</i>	✓		✓		-	LC	R	CR	2	Several records from OD Region and Coward Springs bore drain in wellfields.
Reptiles											
Woma Python	<i>Aspidites ramsayi</i>	✓	✓	✓		-	E	R	-	2	Records from Roxby Downs Municipality, Borefield Road and wellfields.
Pernatty Knob-tailed Gecko	<i>Nephrurus deleani</i>				✓	-	E	R	-	2	Population restricted to an area near infrastructure corridor.
Ecological communities											
	The community of native species dependent on natural	✓					E (EC)			1a	Includes a number of species of endemic aquatic invertebrates.

Common name	Scientific name	Well-fields	OD SML	OD region	Transmission line *	EPBC	IUCN	NPW (SA)	DEWNR Regional Species	Species category	Comments
	discharge of groundwater from the Great Artesian Basin										

✓ = Species recorded from Olympic Dam or Wellfields region ? = Species that may occur in the Olympic Dam or Wellfields region

Letters under column EPBC, NPW (SA) and DEWNR regional species columns represent the category of threat listed in the Environment Protection and Biodiversity Conservation Act 1999, the National Parks and Wildlife Conservation Act 1972 (species listed as at 16/05/2013) and the Department of Environment, Water and Natural Resources Regional Species Conservation Assessment Project, Outback Region, Technical Report 2013.

CR = Critically Endangered

E = Endangered

V = Vulnerable

R = Rare

NT = Near Threatened

LC = Least Concern

EC = Threatened Ecological Community

Mi = Migratory

Note: Indications of species listed as Marine under the EPBC Act have not been included in the table.

**Records of species located within the transmission corridor between the Roxby Downs Municipality and the Davenport Substation at Port Augusta have been sourced from BHP Billiton (2009). Species include those that have been previously recorded within 5 km of the transmission line (DEIS)*