Vertebrate Fauna Risk Assessment for the Granny Smith Solar Power Farm Project

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DISCLAIMER

Front Cover: Fauna habitat in the project area

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EXECUTIVE SUMMARY

Granny Smith Mining Company Pty Ltd (GSM) requested a vertebrate fauna risk assessment to support the preparation of environmental approval applications (mining proposal and clearing permit) for the proposed Solar Power Farm project (i.e. project area). The project is located adjacent to the existing Wallaby to Granny Smith haul road.

The total assessed area was approximately 150ha but only about 30ha of this area will be disturbed. There are four broad fauna habitats in the project area:

- Open mulga woodland over scattered low shrubs and grasses of varying densities on a stony sandy-clay or sandy-clay substrate;
- Open chenopod shrubland over grasses of varying densities on a stony sandy-clay or sandy-clay substrate;
- Chenopod and mulga shrubland over scattered grasses of varying densities on a stony sandy-clay or sandy-clay substrate; and
- Banded ironstone rocky ridgeline with scattered Mulga and shrubs.

The density of trees and shrubs in the relatively undisturbed areas varied across the project area but was mostly sparse. The fauna habitat varies from degraded to good; the more degraded areas are due to historical and recent exploration activity and cattle grazing. There are a few access tracks in the area, but these are narrow and mostly only wheel tracks on a stony red sand-clay substrate.

The area has been grazed by cattle with many areas showing obvious degradation (i.e. cattle tracks, chewed bushes and shrubs, etc). There was extensive evidence of rabbits and other feral fauna in the area.

The banded ironstone formation habitat type is significant for Long-tailed Dunnarts in the region. Therefore this habitat type should be avoided where practical and linkage corridors between this habitat type maintained, to facilitate the movement of these dunnarts between rocky outcrops. Clearing native vegetation in other habitat types is likely to result in the loss of small vertebrate fauna on-site that are unable to move away during the clearing process. The few larger animals, such as kangaroos and large goannas and snakes, and most of the birds will move into adjacent areas once clearing commences. Construction of a solar farm will have a minimal impact on the fauna in areas adjacent to those that will be cleared. There will be an on-going loss of small native fauna to vehicle strikes on access tracks but this will be very low. Migrants increase competition for resources, which may result in the subsequent loss of migrants or local individuals. Individuals shifted out of their established activity areas are also vulnerable to predation until they have become established in their new areas.

Impacts on vertebrate fauna associated with clearing vegetation in the project area in a landscape or bioregional context are likely to be low as there are vast tracts of similar habitat in adjacent areas.

The proposed project is unlikely to significantly impact on a conservation significant species, so a referral under the *EPBC Act* is not required.

It is recommended that:

- an induction program that includes a component on managing fauna is a mandatory component of working on the Petra project;
- the impact of dust on adjacent vegetation and fauna habitat is managed and monitored against appropriate KPIs;
- any development avoids impacting on the banded ironstone habitat and linkage between these habitat type (i.e. rocky hills) are maintained;
- if the banded ironstone habitat or linkages between the rocky areas will be impacted an assessment on the regional abundance and distribution of the Long-tailed Dunnart should be undertaken to provide a context for the potential impacts;
- implement a feral cat control program; and
- investigate options for management of rabbits in the area.

1 INTRODUCTION

1.1 Background

Granny Smith Mining Company Pty Ltd (Granny Smith) is an Australian mineral exploration and gold producing company with major tenements in the eastern Goldfields of Western Australia.

Granny Smith requested a vertebrate fauna risk assessment to support the preparation of environmental approvals (mining proposal and clearing permit) for the proposed Solar Power Farm project (i.e. project area). The assessed area was approximately 150ha; however, the anticipated disturbance footprint is only approximately 30ha.

1.2 Project objectives and scope of works

Terrestrial Ecosystems was commissioned by Granny Smith to undertake a Level 1 vertebrate fauna risk assessment development of the solar farm project. The purpose of this Level 1 fauna risk assessment was to provide information to the Department of Mines, Industry Regulation and Safety (DMIRS) regarding the potential impacts on the vertebrate fauna assemblage in the project area to enable the proposed development to be adequately assessed. The methodology broadly follows that described in the Environmental Protection Authority (EPA; 2016) *Technical Guidance Terrestrial Fauna Surveys*.

A typical Level 1 fauna risk assessment involves undertaking a desktop review and site visit. The objectives of this fauna risk assessment were to:

- provide an indication of the vertebrate fauna assemblage (reptiles, amphibians, mammals and birds) on and near the project area, so that potential impacts on the fauna and fauna assemblage might be adequately assessed;
- identify the presence and/or potential risk of impacts on species of conservation significance that are present or likely to be present in the project area;
- assess the impact and environmental risks associated with the proposed development on the fauna assemblage;
- determine if any additional surveys are required to assess the potential impact on fauna assemblages in the project area including impacts on species of conservation significance; and
- make recommendations that avoid, mitigate or minimise potential impacts on resident fauna.

To achieve these objectives, Terrestrial Ecosystems:

- reviewed Terrestrial Ecosystems' database [includes Atlas of Living Australia and Department of Biodiversity, Conservation and Attractions (DBCA) records in NatureMap] to identify potential vertebrate fauna within the area;
- searched the DBCA's NatureMap for Threatened and Priority Species;
- searched the Commonwealth Governments database of fauna of national environmental significance to identify species potentially occurring within the area that are protected under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* or international migratory bird agreements (JAMBA/CAMBA);
- undertook a site reconnaissance survey;
- reviewed previous fauna surveys conducted near the project area;
- undertook an assessment of the potential risks to the fauna associated with clearing additional areas of native vegetation;
- discussed the likelihood of *EPBC Act 1999* and *Wildlife Conservation Act 1950* listed species being present in the project area; and
- provided management recommendations to avoid, mitigate and minimise potential impacts on the fauna in the project area.

2 EXISTING ENVIRONMENT

2.1 Location of project area

The project area is in the Murchison 1 (MUR1 – East Murchison subregion) IBRA bioregion. Cowan (2003) described the subregion as mostly dominated by mulga woodlands that are often rich in ephemerals; hummock grasslands, salt bush shrub lands and haloscarcia shrub lands. Cowan (2003) recorded no threatened ecological communities in the vicinity of the project areas. Threatening process for conservation significant fauna were listed by Cowan (2003) as foxes and cats.

2.2 Land use history

The dominant land uses for the bioregion are native pasture to support grazing and crown land reserves, and to a lesser extent mining. The area surrounding the Granny Smith project area has been extensively explored for minerals and there are many operational and non-operational mining projects.

Mt Weld Station continues to graze cattle near the project area. An active haul road runs through the project area from east to west (Figure 2).

2.3 Climate

The project area is characterised as semi-arid. Laverton, 23km to the north, has an annual rainfall of approximately 235mm, although this varies considerably from year-to-year. The highest mean maximum and minimum temperatures in Laverton are in January with an average of 35.8°C and 20.5ºC, respectively (Bureau of Meteorology, 2017). The lowest mean daily maximum and minimum temperatures occur in July (Chart 1). Average monthly rainfall is heaviest in January - March.

Summer rain is unpredictable and often results from thunderstorms coming from the north and the west or decaying cyclonic activity as low-pressure cells move from the Pilbara through the Goldfields.

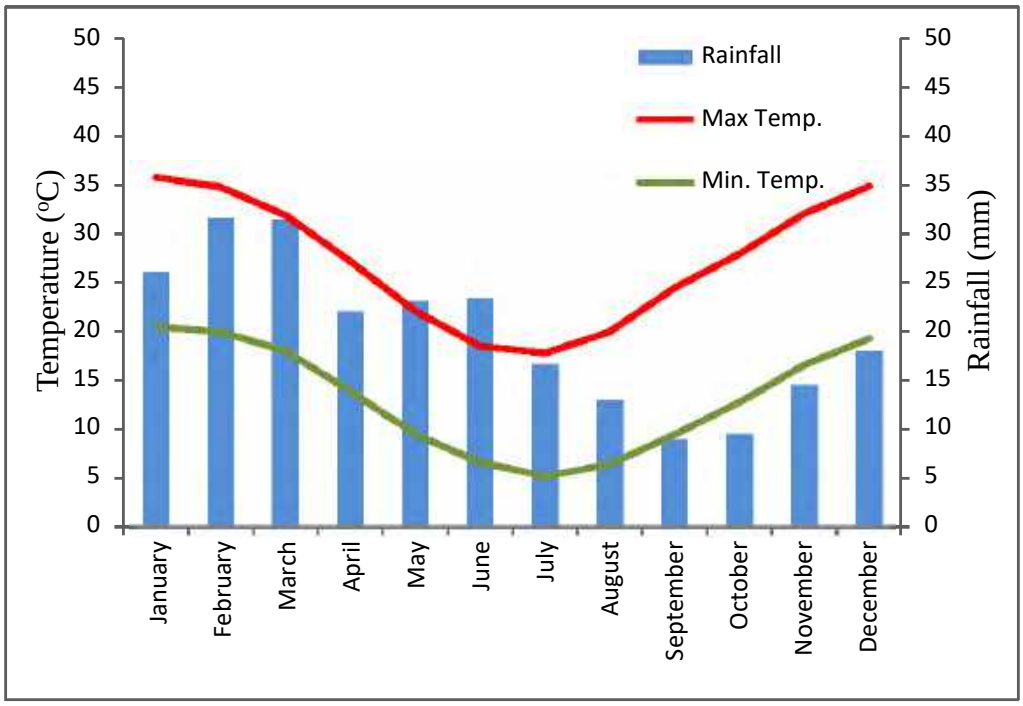

Chart 1. Climate averages for Laverton
(downloaded in May 2017)

2.4 Regional biological fauna context of project area

Numerous fauna surveys and assessments have been undertaken near the project area and in similar habitats in the region. These include:

- Bamford Consulting Ecologists (2007) *Fauna Assessment and Targeted Mulgara Search of the Fish Deposit*, Laverton Gold Project.
- Bell, D. T., Bell, R. C. and Loneragan, W. A. (2007) Winter bird assemblages across an arid gradient in south-west Western Australia. *Journal of the Royal Society of Western Australia* 90, 219-227.
- Biota Environmental Sciences (2004) *Cosmos Nickel Mine Extension Fauna Survey*. Unpublished report for Sir Samuel Mines NL and URS, Perth.
- Biota Environmental Sciences (2007) *Bannockburn Fauna Habitat and Assemblage Survey*. Unpublished report for Jubilee Mines NL, Perth.
- Coffey Environments (2007) *Level 1 Fauna Assessment, Leinster Nickel Operations*, Perth.
- Coffey Environments (2008c) *Level 2 Fauna Assessment for Moolart Well, Dogbolter and Erlistoun*. Unpublished report for Regis Resources, Ltd, Perth.
- Craig, M. D. and Chapman, A. (2003) Effects of short-term drought on the avifauna of Wanjarri Nature Reserve: What do they tell us about drought refugia. *Journal of the Royal Society of Western Australia* 86: 133-137.
- Dell, J. and How, R. A. (1988) Vertebrate fauna. In: The biological survey of the Eastern Goldfields of Western Australia, Part 5, Edjudina - Menzies Study Area. *Records of the Western Australian Museum*, Supplement No 31, 38-77.
- Dell, J., How, R. A. and Milewski, A. V. (1992) The biological survey of the Eastern Goldfields, Part 6, Youanmi-Leonora Study Area. *Records of the Western Australian Museum*, Supplement No 40, 131.
- Donarto Environmental Services (2005) *Leinster Nickel Operations Tailing Storage Facility and Water Storage Areas*: Wildlife Interactions and Assessment of Risks, Perth.
- Dunlop, J. N. (1990) The small vertebrate ground fauna of Mulga habitats near Wiluna, Western Australia. *Mulga Research Centre Journal*, 10, 19-27.
- ENV Australia (2008) *Agnew Prospects Fauna Assessment*. Unpublished report for Agnew Gold Mining Company Pty Limited, Perth.
- Halpern Glick Maunsell, (1998) *Rosemont Gold Project Biological Assessment Survey*, Perth.
- Halpern Glick Maunsell, (1999) *Rosemont Gold Project Biological Assessment Survey - Phases 1 & 2*. Unpublished report for Johnson's Well Mining NL, Perth.
- Hall, N.J, McKenzie, N.L. and Keighery, B.J. (1994) The Biological Survey of the Eastern Goldfields of Western Australia Part 10. Sandstone-Sir Samuel and Laverton-Leonara Study Areas. *Records of the Western Australian Museum*. Supplement No. 47.
- Harewood, G (2011) *Terrestrial Fauna Survey (Level 1) of the West Laverton Area (P38/3717, P38/3718, P38/3491, P38/3492, P38/3314, P38/3490, P38/3315, M38/0046, M38/0049, M38/0040, M38/0358, M38/0048, M38/0101, M38/0364, M38/0342, M38/0345, L38/0179, L38/0177, L38/0178, L38/0153, L38/0092, E38/1930, E38/2347, E38/2084 & E38/1966).* Unpublished report for Crescent Gold Limited.
- Hart, Simpson and Associates (2000) *Anaconda Nickel Ltd, Cawse Expansion Project, Fauna Survey*. Unpublished report for Anaconda Nickel Ltd, Perth.
- How, R. A. and Dell, J. (1992) Vertebrate fauna. In: The Biological Survey of the Eastern Goldfields of Western Australia Part 7. Duketon - Sir Samuel Study Area. *Records of the Western Australian Museum*; Supplement 40, 90-109.
- McKenzie, N. L., Rolfe, J. K. and Youngson, W. K. (1992) Vertebrate fauna. In: The Biological Survey of the Eastern Goldfields of Western Australia; Part 8; Kurnalpi - Kalgoorlie Study Area. *Records of the Western Australian Museum*, Supplement No 41, 37-65.
- McKenzie, N. L., Rolfe, J. K. and Youngson, W. K. (1994) Vertebrate fauna. In: The Biological Survey of the Eastern Goldfields of Western Australia Part 10, Sandstone-Sir Samuel and Laverton-Leonora Study Areas. *Records of the Western Australian Museum*, Supplement No 47, pp. 51-85.
- MBS Environmental (2004) *Vegetation and Habitat Assessment of the Euro, Sickle and Admiral Hill Project Areas, Laverton*. Unpublished report for Crescent Gold Limited.
- Moriarty; T. K. (1972) Birds of Wanjarri; WA (27º; 25'S; 120º 40'E) *The Emu*, 72, 1-7.
- Murphy, D. (1994) *Vertebrate fauna species of the North-eastern Goldfields*. Report to Western Mining's Leinster Nickel and Mount Keith Operations, Perth.
- Ninox Wildlife Consulting (1998) *A Vertebrate Fauna Survey of the Murrin Expansion Project*. Unpublished report for Anaconda Nickel Ltd, Perth.

- Ninox Wildlife Consulting (2005) *Vertebrate Fauna Habitat Assessment of the Proposed Expansions to the Cosmos Nickel Mine, near Leinster, Western Australia*. Unpublished report for URS Australia Pty Ltd, Perth.
- Onus, M. L., Rolfe, J.K., and Algar, D. (2011) Assessment of feral cat abundance and control options at Barrick, Granny Smith. Perth.
- Terrestrial Ecosystems (2010b) *Level 2 Fauna Risk Assessment for the Garden Well Project Area*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2011a) Investigation of Short-Range Endemic Invertebrates for the Granny Deeps Project Area. Perth.
- Terrestrial Ecosystems (2011b) *Level 2 Fauna Risk Assessment for Granny Deeps Project Area*. Unpublished report for Barrick Gold Corporation, Perth.
- Terrestrial Ecosystems (2011c) Targeted Survey for Long-tailed Dunnarts for the Granny Deeps Project Area. Perth.
- Terrestrial Ecosystems (2012a) *Level 1 Fauna Risk Assessment for the Anchor Project.* Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2012b) *Level 1 Fauna Risk Assessment for the Moolart Well to Garden Well Access Road on M38/354, M38/302, M38/303 and L38/216*. Perth.
- Terrestrial Ecosystems (2012c) *Level 1 Fauna Risk Assessment for the Petra Project*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2012d) *Level 1 Fauna Risk Assessment for the Reichelt Project*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2012e) *Level 1 Fauna Risk Assessment for the Rosemont Project Area*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2012f) *Level 1 Fauna Risk Assessment for the Russell Find Project*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2012g) *Level 1 Vertebrate Fauna Risk Assessment for the Proposed Exploration Areas around the Granny Open Pit Project Area*. Perth.
- Terrestrial Ecosystems (2012h) *Level 1 Vertebrate Fauna Risk Assessment for the Proposed Mining Areas around the Granny Open Pit Project Area*. Perth.
- Terrestrial Ecosystems (2013) *Level 1 Fauna Risk Assessment for Two Waste Dumps either side of the proposed Rosemont Project Area (G38/29, G38/30, G38/31, G38/32) and a Slurry Pipeline from the Rosemont mine to the Garden Well processing plant (L38/219)*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2015b) *Level 1 Fauna Risk Assessment for the Gloster Project and haul road*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2016a) *Level 1 Fauna Risk Assessment for the Anchor Project Area*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2016b) *Level 1 Fauna Risk Assessment for the Baneygo Project*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2016c) *Level 1 Fauna Risk Assessment for the Dogbolter-Coopers Project Area.* Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2016c) *Level 1 Fauna Risk Assessment for the Petra Project Area*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2016d) *Level 1 Fauna Risk Assessment for the Tooheys Project Area*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2017b) *Level 1 Fauna Risk Assessment for the proposal Haul Road to the Baneygo Project Area*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2017c) *Level 1 Fauna Risk Assessment for the proposal Haul Road to the proposed Petra Mining area*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2018a) *Level 1 Fauna Risk Assessment for the proposal Haul Road to the proposed Petra Mining area*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2018b) *Vertebrate Fauna Risk Assessment for the Petra Mining Project*, Perth.
- Volschenk, E. S. (2011) *Granny Deeps Scorpion Identification Report*. Perth.
- Whisson, C. and Slack-Smith, S. (2011) *Land Snails from the area of Laverton*, Western Australia (Granny Deeps Project), Perth.

In addition, there are individual records for fauna contained in the Atlas of Living Australia, Western Australian Museum collection and in NatureMap's records that have also been accessed.

The most relevant and useful data are those from the two Terrestrial Ecosystems' (2011b, c) surveys in the area. These two surveys were undertaken in 2011 and were undertaken in similar habitat and in areas adjacent to the project areas. These surveys included pit trapping, funnel traps, echolocation bat detection surveys, avifauna surveys and short-range invertebrate surveys. One of Terrestrial Ecosystems surveys was a Level 2 fauna assessment and the other was an extensive targeted trapping program for Long-tailed Dunnarts (*Sminthopsis longicaudata*). Terrestrial Ecosystems has also complete multiple Level 1 fauna risk assessments in adjacent areas for Granny Smith (Terrestrial Ecosystems 2014, 2015a, 2017a).

Western Australian Museum (WAM) regional eastern goldfields biological surveys were undertaken in the Duketon-Sir Samuel, Sandstone–Sir Samuel and Laverton areas (How et al. 1992, McKenzie et al. 1994). These surveys were to the north of the project area. HGM (1999) undertook a terrestrial fauna assessment for the Rosemont Gold Project, which is also located to the north of the project area. A survey was undertaken by Terrestrial Ecosystems staff for the Moolart Well area (Coffey Environments 2008a) in the summer of 2007/08 and Terrestrial Ecosystems (2010b) surveyed the Garden Well mine; both of these surveys included habitat similar to the project area. The WAM bioregional surveys of the Edjudina – Menzies and the Kurnalpi - Kalgoorlie areas (Dell et al. 1988, McKenzie and Hall 1992) and Terrestrial Ecosystems unpublished data for around Ora Banda are for areas to the south of the project area. The Murrin Murrin Expansion project fauna survey is for an area to the west of the project area (Ninox Wildlife Consulting 1998).

These fauna surveys, when considered together, provide a near complete list of the vertebrate species likely to be found in the project area. The composition of vertebrate fauna assemblages varies from habitat-to-habitat and site-to-site within the bioregion, but the survey data contained in the attached appendices provide a good indication of the vertebrate fauna assemblage that is likely to be found in the project area. These data therefore provide a good regional context and indicate the extent of fauna assemblage variation that might be anticipated from site-to-site and temporally.

2.4.1 Fauna species at risk

Cowan (2003) reported the fauna species at risk in the East Murchison subregion as Bilby (*Macrotis lagotis*), Marsupial Mole (*Notoryctes typhlops*), Mulgara (*Dasycercus cristicauda / blythi*), Malleefowl (*Leipoa ocellata*), Princess Parrot (*Polytelis alexandrae*), Slender-billed Thornbill (*Acanthiza iredalei iredalei*), Giant Desert Skink (*Liopholis kintorei*) and Peregrine Falcon (*Falco peregrinus*). This report assesses the potential for these species to be found in the project area and the potential impact that the proposed development might have on these species, and other conservation significant fauna.

3 METHODOLOGY

3.1 Database searches

A review of the *EPBC* list of protected species was undertaken to identify species of conservation interest to the Commonwealth Government. The search circle had a radius of 50km around a centre point coordinate of -28.85252ºS and 122.35785ºE (Appendix A). In addition, a desktop search of the Terrestrial Ecosystems' fauna survey database was used to develop an appreciation of the vertebrate fauna assemblages in relevant sections of the bioregion near the project area. The DBCA threatened and priority species database was searched via the records in NatureMap.

Other more general texts were also used to provide supplementary information on vertebrates in the bioregion, including Tyler *et al.* (2000) for frogs; Storr *et al.* (1983, 1990, 1999a, 2002) and Thompson and Thompson (2010) for reptiles; Johnstone and Storr (1998, 2004) for birds; and Van Dyck and Strahan (2008) for mammals.

Collectively these sources of information were used to create lists of species expected to utilise the project area and broader bioregion. It should be noted that these lists will include species that have been recorded in the general region but are possibly vagrants and they will not generally be found in the project area due to a lack of suitable habitat (e.g. water and shore birds). Vagrants can be recorded almost anywhere. Many of the records are historical and the species is no longer present in the area (e.g. Malleefowl, Bilby). Many of the bird, mammal, reptile and amphibian species have specific habitat requirements that may be present in the general area but not in the project area. Also, the ecology of many of these species is often not well understood and it can sometimes be difficult to indicate those species whose specific habitat requirements are not present in the project area. Therefore, many species will be included in the lists produced from database searches but will not be present in the actual project area.

There are errors in most databases, including NatureMap, Atlas of Living Australia and the WAM collection. These errors occur because of a misidentification of individuals, taxonomic name changes and incorrect coordinates being entered into the database. Terrestrial Ecosystems was unable to verify the primary records, so it has used the information provided. Readers should therefore appreciate that species lists and fauna surveys reported in the appendices may include these errors.

3.2 Site Inspection and fauna habitat assessment

A site visit was undertaken on 22 October 2018 to assess fauna habitat types and condition in the project area. This fauna habitat assessment methodology required the assessor to stop at multiple locations within the project area and to assess a suite of data about the fauna habitat and its condition. This information included a description of the habitat structure, habitat condition, landform, soils and vegetation and time since last fire.

The fauna habitat assessment was undertaken for the majority of the project area. A small area could not be accessed due to heritage constraints. This field assessment had two foci:

- assessing fauna habitat types and their condition; and
- assessing the possible presence of and recording evidence of conservation significant fauna so that mitigation and management strategies might be implemented to reduce potential impacts.

Dr Scott Thompson, who undertook the site assessment, stopped at multiple locations within the project area and recorded a suite of data about the fauna habitat and its condition. This information included a description of the habitat structure, habitat condition, landform, soils and vegetation and time since last fire. The following data were recorded at each location as part of the habitat assessment:

Observer's name
Coordinates of the location as UTM (WGS 84)
Fire history – options
> 5 years
1-5 years
< 1 year
Landform – options

Beach	Lake / lake edge
Clay plain	Lower slope
Cliff	Mid slope

Creek line	Ridge
Dam	River
Drainage line	Rocky outcrop / breakaway
Dune crest	Salt lake
Dune slope	Sand dune
Dune swale	Sand plain
Escarpment	Stony plain
Flat	Swamp
Gorge	Undulating
Gully	Upper slope
Intertidal / mangrove	Wetland
	Water hole

Habitat quality – options

- *High quality fauna habitat* – These areas closely approximate the vegetation mix and quality that would have been in the area prior to any disturbance. The habitat has connectivity with other habitats and is likely to contain the most natural vertebrate fauna assemblage.
- *Very good fauna habitat* - These areas show minimal signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) and generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be minimally effected by disturbance.
- *Good fauna habitat* – These areas showed signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be affected by disturbance.
- *Disturbed fauna habitat*– These areas showed signs of significant disturbance. Many of the trees, shrubs and undergrowth are cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, containing weeds or have been damaged by vehicle or machinery. Habitats are fragmented or have limited connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.
- *Highly degraded fauna habitat* – These areas often have a significant loss of vegetation, an abundance of weeds, and a large number of vehicle tracks or are completely cleared. Limited or no fauna habitat connectivity. Fauna assemblages in these areas are likely to be significantly different to what might have been in the area pre-disturbance.

*Habitat structur*e - options

Upper stratum

Tall open woodland	Scattered tall trees
Tall woodland	Scattered trees
Open woodland	Scattered low trees
Woodland	Low closed forest
Open forest	Low open forest
Closed forest	Low woodland
Tall closed forest	Low open woodland
Tall open forest	

Middle stratum

Shrubland	Open heath
Tall shrubland	Low closed heath
Tall open shrubland	Low open heath
Low shrubland	Tall closed scrub
Scattered low shrubs	Tall open scrub
Low open shrubland	Scattered tall shrubs
Scattered tall shrubs	Open shrubland
Closed heath	Scattered shrubs

Lower stratum

Closed hummock grassland	Closed tussock grassland / sedgeland / herbland
Mid-dense hummock grassland	Tussock grass land / sedgeland / herbland
Hummock grassland	Open tussock grassland / sedgeland / herbland
Open hummock grassland	Scattered tussock / grasses / sedges / herbs
Scattered hummock grassland	Very open tussock grassland / herbland

Soil Type – options

- Sand
- Loamy sand
- Clayey sand
- Sandy loam
- Loam
- Silty loam
- Sandy clay loam
- Clay loam
- Silty clay loam
- Clay
- Rock
- Peat / organic
- Stony

Soil Colour –options

- Black
- Brown
- Grey
- Orange
- Red
- White
- Yellow

Surface stones - options

- None
- Pebbles (0-50mm)
- Cobbles (51-250mm)
- Boulders (>250mm)
- Rocks

Potential for conservation significant species to be found in the area

- Yes
- No

Impact of clearing on conservation significant species – options

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Extreme

3.3 Survey and reporting staff

Dr Scott Thompson undertook the site investigation and fauna habitat assessment and searched the site for Malleefowl and their mounds. The field work was completed with the assistance of Eren Reid from Native Vegetation Solutions. Dr Scott Thompson prepared this report and Dr Graham Thompson reviewed the report before it was sent to the client. Both senior scientists have appropriate relevant post-graduate qualifications, extensive experience in conducting fauna assessments in the Goldfields, have published research articles on biodiversity, fauna assemblages, conservation significant species, trapping techniques and temporal variations in trapped fauna assemblages based on Goldfields surveys and are therefore appropriately trained and experienced for the task of preparing this assessment. Both Scott and Graham have undertaken multiple assessments at Granny Smith and are familiar with the site and habitat in the project area.

3.4 Taxonomy and nomenclature

Taxonomy and nomenclature for fauna species used in this report are generally based on the WA Museum species list except for bats, which follow (Churchill 2008) and birds which follow Christidis and Boles (2008). Terrestrial Ecosystems has presumed that the identifications referred to in the appendices or in reports used to provide local and regional comparative data were correct and we have only corrected obvious records where the nomenclature was known to be incorrect.

3.5 Limitations

This Level 1 fauna risk assessment is based on information contained in the Commonwealth Government database and other published and unpublished fauna survey data for the bioregion and a site visit. It is acknowledged that multiple surveys conducted in different seasons, repeated over several years are necessary to fully appreciate the fauna assemblage in the project area.

The EPA (2016) *Technical Guidance Terrestrial Fauna Surveys* suggested that fauna surveys may be limited by many variables. Limitations associated with each of these variables are assessed in Table 1.

Table 1. Fauna survey limitations and constraints

Possible limitations	Constraint (yes/no); significant, moderate or negligible	Comment
Competency and experience of the consultant carrying out this assessment	No	The environmental scientists that undertook the site assessment, drafted and reviewed this report are familiar with the vertebrate fauna of this bioregion.
Scope	No	All aspects of the scope of works have been addressed.
Proportion of fauna identified, recorded and/or collected	No	Not applicable.
Accuracy of previous survey work	Yes, negligible	Terrestrial Ecosystems has reported fauna survey data recorded by various authors but is not able to vouch for the accuracy of this information. It is acknowledged that the taxonomy of Western Australian vertebrates is continually being revised and the nomenclature of some of the species listed in the appendices may have changed since publication by the authors.
Sources of information	Yes, negligible	Vertebrate fauna information was available from an on-line database and unpublished and published reports of surveys conducted in the bioregion in a variety of habitat types. Many of these surveys employed a low level of trapping effort which significantly impacts on the capacity of these data to represent the fauna assemblages in the areas surveyed.
Proportion of the task achieved	No	All tasks completed.
Timing/weather/ season/ cycle	N/A	Weather was fine during the site visit.
Disturbances which affected results of the survey	No	Minor disturbances in the project area have been factored into this assessment.
Intensity of survey effort	N/A	
Completeness	No	All aspects of this assessment have been completed.
Resources	No	Adequate resources were available.
Remoteness and/or access problems	Yes, negligible	A small section of the project area could not be accessed due to aboriginal heritage constraints; however, this did not impact on the ability to assess the habitat types.
Availability of contextual information on the region	No	Fauna survey data are available for the general area and specifically fauna habitats accessed in the project area.

4 RESULTS

4.1 Fauna habitat

There are four broad fauna habitats in the project area:

- Open mulga woodland over scattered low shrubs and grasses of varying densities on a stony sandy-clay or sandy-clay substrate (Plates 1-2);
- Open chenopod shrubland over grasses of varying densities on a stony sandy-clay or sandy-clay substrate (Plates 3-4);
- Chenopod and mulga shrubland over scattered grasses of varying densities on a stony sandy-clay or sandy-clay substrate (Plates 5-6); and
- Banded ironstone rocky ridgeline with scattered Mulga and shrubs (Plates 7-8).

The density of trees and shrubs in the relatively undisturbed areas varied across the project area but was mostly sparse. The fauna habitat varies from degraded to good; the more degraded areas are due to historical and recent exploration activity and cattle grazing. There are a few access tracks in the area, but these are narrow and mostly only wheel tracks of a stony red sand-clay substrate.

The area has been grazed by cattle with many areas showing obvious degradation (i.e. cattle tracks, chewed bushes and shrubs, etc). There was extensive evidence of rabbits and other feral fauna in the area.

Plate 1. Open mulga woodland over scattered low shrubs and grasses

Plate 2. Open mulga woodland over scattered low shrubs and grasses

Plate 3. Open chenopod shrubland over grasses

Plate 4. Open chenopod shrubland over grasses

Plate 5. Chenopod and mulga shrubland over scattered grasses

Plate 6. Chenopod and mulga shrubland over scattered grasses

Plate 7. Banded ironstone rocky ridgeline with scattered Mulga and shrubs

Plate 8. Banded ironstone rocky ridgeline with scattered Mulga and shrubs

4.2 Fauna assemblage

In 2011, Terrestrial Ecosystems (2011b) undertook a Level 2 vertebrate fauna survey for adjacent areas at Granny Smith. This survey area supported one broad fauna habitat type – open mulga woodland and the density of trees and shrubs and understorey varied across the project area. Thirteen survey sites were trapped between 6-12 January 2011, which was optimal for reptiles and suitable for mammals. All pit-traps and drift fences were dug in prior to the field assessment and closed until the start of the trapping program. Each survey site contained four trap lines. Each trap line contained three 20L PVC buckets, three 150mm by 500mm deep PVC pipes as pit-traps and three pair of funnel traps evenly spaced along a 30m fly-wire drift fence. Trap lines were arranged approximately 50m apart. The trapping effort was 1,092 bucket pit-trap nights, 1,092 pipe pit-trap nights and 2,184 funnel trap nights.

An avian survey was undertaken concurrently with the trapping program. The avian surveys were conducted from sunrise for approximately four hours and again each afternoon for approximately four hours. The search protocol was for a 20-minute active walking transect search of approximately 3ha before moving to another area. Seventy sites were surveyed, which equated to approximately 1,400 minutes of survey effort. All birds were identified by their call or direct observation. Birds were also recorded opportunistically during the survey period by all field survey staff.

Bat echolocation calls were recorded using an Anabat system. Two Anabat recorders were left standing vertically all night (10-12 hours) on three occasions (8, 9 and 11 January 2011), and included representative habitat types and other locations likely to attract bats.

Table 2 indicates the small mammals, reptiles and amphibians caught during the 2011 survey. The reptile, mammal and amphibian assemblage recorded is like that recorded in other patches of open mulga woodland in this part of the Goldfields, except for the capture of three Long-tailed Dunnarts. As indicated in the follow up targeted survey

report for Long-tailed Dunnarts (Terrestrial Ecosystems 2011c), it was unexpected to record Long-tailed Dunnarts in this area and this record was more than 200km south-easterly of the previous known records.

Four species of bats were recorded during the 2011 survey (*Chalinolobus gouldii* - Gould's Wattled bat; *Mormopterus* sp. (sp. 3) - Inland free-tailed bat; *Scotorepens balstoni* - Inland broad-nosed bat; and *Vespadelus finlaysoni* - Finlayson's cave bat). All these species are commonly recorded throughout the Goldfields.

Table 2. Mammals, reptiles and amphibians caught at various trapping sites at Granny Smith (Terrestrial Ecosystems 2011b)

			Sites												
Taxa	**Family**	**Species**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Mammal	Dasyuridae	*Antechinomys laniger*	2	1			3	3	3	2		2			1
		Sminthopsis dolichura	1	1	3	7	5	4	13	3	5	3		1	1
		Sminthopsis hirtipes				1									
		Sminthopsis longicaudata					1	1							1
		Sminthopsis macroura	2	3		2	1	1	1	1	1	5	5	3	2
	Muridae	*Notomys alexis*	3												
		Pseudomys hermannsburgensis	1	1	1	3					1	2	2	5	6
		Mus musculus						1					5		
Amphibian	Hylidae	*Cyclorana maini*		1							11	5	1		
		Cyclorana platycephala		1	1						5	2		1	1
	Limnodynastidae	*Neobatrachus kunapalari*									1				
		Neobatrachus sutor	8	2	5	3	1			1	13	2		1	
Reptile	Agamidae	*Diporiphora amphiboluroides*				2	1	1							
		Tympanocryptis cephalus				2	3	1		1					
	Elapidae	*Parasuta monachus*						1		1					
	Gekkonidae	*Diplodactylus granariensis*										1			
		Diplodactylus pulcher	2			1	4	3	1			2	1		1
		Gehyra variegata		3	2	4		1		3		2	1	2	
		Heteronotia binoei	2				1					1	2	1	5
		Rhynchoedura ornata	3					2			1				
		Strophurus wellingtonae	4	2											1
	Scincidae	*Ctenotus leonhardii*	2	2					1		5	9	7	16	27
		Egernia depressa		1	1	2	2	3	9	6		1			
		Eremiascincus richardsonii				2									1
		Lerista desertorum													2
		Lerista distinguenda													1
		Menetia greyii											1		
		Morethia butleri		1		1		2			6	1		3	
		Tiliqua multifasciata	1												
	Typhlopidae	*Anilios australis*								1	1				
		Anilios bicolor			1										
	Varanidae	*Varanus caudolineatus*		2		1	3	1	1			1		2	
		Varanus panoptes	4		7		3	2	2			4	2		6

The bird surveys recorded 820 individuals from 60 species across 70 survey sites and an additional 495 birds were opportunistically observed (Table 3). A proportion of these species are seldom seen in the north-eastern Goldfields. These are mostly the 'water birds' in the list (e.g. Musk Duck, Australian Wood Duck, Pink-eared Duck, Pacific Black Duck, Hardhead, stilts and White-faced Heron). Some of these birds will occasionally be seen in water contained in disused mining pits during the non-rainy period, however, it was the presence of the heavy rain that resulted in their presence in the area. No Malleefowl nests or tracks were observed in the project area.

Table 3. Birds detected at Granny Smith (Terrestrial Ecosystems 2011b)

Family	Species	Common Name	No
Accipitridae	*Aquila audax*	Wedge-tailed Eagle	3
Anatidae	*Biziura lobata*	Musk Duck	2
	Chenonetta jubata	Australian Wood Duck	81
	Malacorhynchus membranaceus	Pink-eared Duck	5
	Anas gracilis	Grey Teal	74
	Anas superciliosa	Pacific Black Duck	13
	Aythya australis	Hardhead	2
Casuariidae	*Dromaius novaehollandiae*	Emu	4
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel	4
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	5
	Cladorhynchus leucocephalus	Banded Stilt	14
Ardeidae	*Egretta novaehollandiae*	White-faced Heron	2
Columbidae	*Phaps chalcoptera*	Common Bronzewing	6
	Ocyphaps lophotes	Crested Pigeon	21
Alcedinidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher	1
Cuculidae	*Heteroscenes pallidus*	Pallid Cuckoo	3
Falconidae	*Falco cenchroides*	Nankeen Kestrel	2
	Falco berigora	Brown Falcon	2
Rallidae	*Fulica atra*	Eurasian Coot	21
Acanthizidae	*Acanthiza robustirostris*	Slaty-backed Thornbill	68
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill	1
	Acanthiza apicalis	Inland Thornbill	12
	Aphelocephala leucopsis	Southern Whiteface	13
Artamidae	*Artamus personatus*	Masked Woodswallow	27
	Artamus cinereus	Black-faced Woodswallow	6
	Artamus minor	Little Woodswallow	2
	Cracticus torquatus	Grey Butcherbird	9
	Cracticus nigrogularis	Pied Butcherbird	5
	Gymnorhina tibicen	Australian Magpie	1
Campephagidae	*Coracina maxima*	Ground Cuckoo-Shrike	7
	Coracina novaehollandiae	Black-faced Cuckoo-Shrike	7
	Lalage tricolor	White-winged Triller	4
Corvidae	*Corvus bennetti*	Little Crow	5
	Corvus orru	Torresian Crow	2
Estrildidae	*Taeniopygia guttata*	Zebra Finch	2
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow	6
	Hirundo neoxena	Welcome Swallow	6
	Petrochelidon nigricans	Tree Martin	10
Maluridae	*Malurus splendens*	Splendid Fairy-wren	12
	Malurus leucopterus	White-winged Fairy-wren	4
Meliphagidae	*Certhionyx variegatus*	Pied Honeyeater	2
	Gavicalis virescens	Singing Honeyeater	40
	Manorina flavigula	Yellow-throated Miner	41
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater	44
	Epthianura tricolor	Crimson Chat	4
Monarchidae	*Grallina cyanoleuca*	Magpie-Lark	17
Motacilidae	*Anthus novaeseelandiae*	Australasian Pipit	8
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird	4
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	22
	Colluricincla harmonica	Grey Shrike-thrush	3
	Oreoica gutturalis	Crested Bellbird	46
Pardalotidae	*Pardalotus striatus*	Striated Pardalote	1
Petroicidae	*Petroica goodenovii*	Red-capped Robin	10
	Melanodryas cucullata	Hooded Robin	7
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler	14
Ptilonorhynchidae	*Ptilonorhynchus guttatus*	Western Bowerbird	7
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	10
Podicipedidae	*Poliocephalus poliocephalus*	Hoary-headed Grebe	30
Psittacidae	*Barnardius zonarius*	Australian Ringneck	6
	Psephotus varius	Mulga Parrot	20
		Total Individuals	**810**
		Total Species	**60**

4.3 Bioregional vertebrate fauna

Appendix B provides a summary of the fauna survey data that are available near the project area. There are appreciable differences in the recorded fauna assemblages within and among fauna surveys shown in Appendix B. These differences are partially due to the low survey effort deployed by some of the surveys and they also reflect variations in soils and vegetation as well as temporal variations in the fauna assemblages.

Tables 4-7 provide a list of vertebrate species potentially found near the project area that have been compiled based on the fauna survey report results shown in Appendix B.

Table 4. Birds potentially found near the project area

Family	Species	Common Name
Casuariidae	*Dromaius novaehollandiae*	Emu
Anatidae	*Biziura lobata*	Musk Duck
	Tadorna tadornoides	Australian Shelduck
	Chenonetta jubata	Australian Wood Duck
	Malacorhynchus membranaceus	Pink-eared Duck
	Anas gracilis	Grey Teal
	Anas superciliosa	Pacific Black Duck
	Aythya australis	Hardhead
Podicipedidae	*Poliocephalus poliocephalus*	Hoary-headed Grebe
Columbidae	*Phaps chalcoptera*	Common Bronzewing
	Phaps histrionica	Flock Bronzewing
	Ocyphaps lophotes	Crested Pigeon
	Geopelia placida	Diamond Dove
Podargidae	*Podargus strigoides*	Tawny Frogmouth
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar
Apodidae	*Apus pacificus*	Fork-tailed Swift
Otididae	*Ardeotis australis*	Australian Bustard
Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant
Ardeidae	*Ardea pacifica*	White-necked Heron
	Egretta novaehollandiae	White-faced Heron
Accipitridae	*Haliastur sphenurus*	Whistling Kite
	Accipiter fasciatus	Brown Goshawk
	Accipiter cirrocephalus	Collared Sparrowhawk
	Circus assimilis	Spotted Harrier
	Aquila audax	Wedge-tailed Eagle
	Hieraaetus morphnoides	Little Eagle
Falconidae	*Falco cenchroides*	Nankeen Kestrel
Falconidae	*Falco berigora*	Brown Falcon
	Falco longipennis	Australian Hobby
	Falco peregrinus	Peregrine Falcon
Rallidae	*Tribonyx ventralis*	Black-tailed Native-hen
	Fulica atra	Eurasian Coot
Recurvirostridae	*Himantopus leucocephalus*	Pied Stilt
Recurvirostridae	*Cladorhynchus leucocephalus*	Banded Stilt
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover
	Elseyornis melanops	Black-fronted Dotterel
	Vanellus tricolor	Banded Lapwing
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper
Turnicidae	*Turnix velox*	Little Button-quail
Cacatuidae	*Eolophus roseicapillus*	Galah
	Nymphicus hollandicus	Cockatiel
Psittacidae	*Barnardius zonarius*	Australian Ringneck
	Psephotus varius	Mulga Parrot
	Melopsittacus undulatus	Budgerigar
	Neopsephotus bourkii	Bourke's Parrot
	Neophema splendida	Scarlet-chested Parrot
Cuculidae	*Chalcites basalis*	Horsfield's Bronze-cuckoo
	Chalcites osculans	Black-eared Cuckoo
	Heteroscenes pallidus	Pallid Cuckoo
Halcyonidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher
Meropidae	*Merops ornatus*	Rainbow Bee-eater
Climacteridae	*Climacteris affinis*	White-browed Treecreeper
	Climacteris rufa	Rufous Treecreeper
Ptilonorhynchidae	*Ptilonorhynchus maculatus*	Spotted Bowerbird
	Ptilonorhynchus guttatus	Western Bowerbird
Maluridae	*Malurus splendens*	Splendid Fairy-wren
	Malurus leucopterus	White-winged Fairy-wren
	Malurus lamberti	Variegated Fairy-wren
Acanthizidae	*Calamanthus fuliginosus*	Striated Fieldwren
	Pyrrholaemus brunneus	Redthroat
	Smicrornis brevirostris	Weebill
	Gerygone fusca	Western Gerygone
	Acanthiza robustirostris	Slaty-backed Thornbill
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill
	Acanthiza uropygialis	Chestnut-rumped Thornbill
	Acanthiza apicalis	Inland Thornbill
	Aphelocephala leucopsis	Southern Whiteface
Pardalotidae	*Pardalotus striatus*	Striated Pardalote
Meliphagidae	*Certhionyx variegatus*	Pied Honeyeater
	Gavicalis virescens	Singing Honeyeater
	Lichenostomus ornatus	Yellow-plumed Honeyeater
	Lichenostomus plumulus	Grey-fronted Honeyeater
	Purnella albifrons	White-fronted Honeyeater
	Manorina flavigula	Yellow-throated Miner
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater
	Epthianura tricolor	Crimson Chat
	Epthianura aurifrons	Orange Chat
	Sugomel niger	Black Honeyeater
	Lichmera indistincta	Brown Honeyeater
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler
Psophodidae	*Cinclosoma castaneothorax*	Chestnut-breasted Quail-thrush
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella
Campephagidae	*Coracina maxima*	Ground Cuckoo-shrike
	Coracina novaehollandiae	Black-faced Cuckoo-shrike
	Lalage tricolor	White-winged Triller
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler
	Colluricincla harmonica	Grey Shrike-thrush
	Oreoica gutturalis	Crested Bellbird
Artamidae	*Artamus personatus*	Masked Woodswallow
	Artamus cinereus	Black-faced Woodswallow
	Artamus minor	Little Woodswallow
	Cracticus torquatus	Grey Butcherbird
	Cracticus nigrogularis	Pied Butcherbird
	Gymnorhina tibicen	Australian Magpie
	Strepera versicolor	Grey Currawong
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail
	Rhipidura leucophrys	Willie Wagtail

Family	Species	Common Name
Corvidae	*Corvus coronoides*	Australian Raven
	Corvus bennetti	Little Crow
	Corvus orru	Torresian Crow
Monarchidae	*Grallina cyanoleuca*	Magpie-lark
Petroicidae	*Microeca fascinans*	Jacky Winter
	Petroica goodenovii	Red-capped Robin
	Melanodryas cucullata	Hooded Robin
Megaluridae	*Cincloramphus mathewsi*	Rufous Songlark
	Cincloramphus cruralis	Brown Songlark
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow
	Hirundo neoxena	Welcome Swallow
	Petrochelidon ariel	Fairy Martin
	Petrochelidon nigricans	Tree Martin
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird
Motacillidae	Anthus novaeseelandiae	Australasian Pipit

Table 5. Amphibians potentially found near the project area

Family	Species	Common Name
Hylidae	*Cyclorana maini*	Sheep Frog
	Cyclorana platycephala	Water-holding Frog
Limnodynastidae	*Neobatrachus aquilonius*	Northern Burrowing Frog
	Neobatrachus kunapalari	Kunapalari Frog
	Neobatrachus sudelli	Sudell's Frog
	Neobatrachus sutor	Shoemaker Frog
	Neobatrachus wilsmorei	Goldfields Bullfrog
	Platyplectrum spenceri	Spencer's Burrowing Frog

Table 6. Mammals potentially found near the project area

Family	Species	Common Name
Bovidae	*Bos taurus*	Cow
	Capra hircus	Goat
	Ovis aries	Sheep
Camelidae	*Camelus dromedarius*	Dromedary
Canidae	*Canis lupus*	Dingo/dog
	Vulpes vulpes	Red Fox
Felidae	*Felis catus*	House Cat
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheath-tail Bat
Molossidae	*Austronomus australis*	White-striped Free-tail Bat
	Mormopterus planiceps	Southern Free-tail Bat
Pteropodidae	*Syconycteris australis*	Common Blossom-bat
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat
	Chalinolobus morio	Chocolate Wattled Bat
	Nyctophilus geoffroyi	Lesser Long-eared Bat
	Scotorepens balstoni	Inland Broad-nosed Bat
	Scotorepens greyii	Little Broad-nosed Bat
	Vespadelus regulus	Southern Forest Bat
Dasyuridae	*Antechinomys laniger*	Kultarr
	Dasycercus cristicauda/blythi	Mulgara
	Ningaui ridei	Wongai Ningaui
	Sminthopsis crassicaudata	Fat-tailed Dunnart
	Sminthopsis dolichura	Little Long-tailed Dunnart
	Sminthopsis hirtipes	Hairy-footed Dunnart
	Sminthopsis longicaudata	Long-tailed Dunnart
	Sminthopsis macroura	Stripe-faced Dunnart
	Sminthopsis ooldea	Ooldea Dunnart
Macropodidae	*Osphranter robustus*	Euro
	Osphranter rufus	Red Kangaroo
Leporidae	*Oryctolagus cuniculus*	European Rabbit
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna
	Equus caballus	Domestic Horse
Equidae	*Mus musculus*	House Mouse
Muridae	*Notomys alexis*	Spinifex Hopping Mouse
	Pseudomys desertor	Desert Mouse
	Pseudomys hermannsburgensis	Sandy Inland Mouse

Table 7. Reptiles potentially found near the project area

Family	Species	Common Name
Agamidae	*Ctenophorus caudicinctus*	Ring-tailed Dragon
	Ctenophorus fordi	Mallee Dragon
	Ctenophorus inermis	Military Dragon
	Ctenophorus isolepis	Crested Dragon
	Ctenophorus maculatus	Spotted Dragon
	Ctenophorus nuchalis	Central Netted Dragon
	Ctenophorus reticulatus	Western Netted Dragon
	Ctenophorus salinarum	Saltpan Dragon
	Ctenophorus scutulatus	Lozenge-marked Dragon
	Diporiphora amphiboluroides	Mulga Dragon
	Moloch horridus	Thorny Devil
	Pogona minor	Western Bearded Dragon
	Tympanocryptis cephalus	Pebble Dragon
Boidae	*Antaresia stimsoni*	Stimson's Python
Carphodactylidae	*Nephrurus levis*	Three-lined Knob-tail
	Nephrurus vertebralis	Midline Knob-tail
	Nephrurus wheeleri	Banded Knob-tail
	Underwoodisaurus milii	Barking Gecko
Diplodactylidae	*Diplodactylus conspicillatus*	Fat-tailed Diplodactylus
	Diplodactylus granariensis	Wheat-belt Stone Gecko
	Diplodactylus pulcher	Fine-faced Gecko
	Lucasium damaeum	Beaded Gecko
	Lucasium squarrosum	Mottled Ground Gecko
	Strophurus assimilis	Goldfields Spiny-tailed Gecko
	Strophurus elderi	Jewelled Gecko
	Strophurus strophurus	Western Spiny-tailed Gecko
	Strophurus wellingtonae	Spiny-tailed Gecko
Elapidae	*Brachyurophis fasciolata*	Narrow-banded Burrowing Snake
	Brachyurophis semifasciata	Half-girdlerd Snake
	Furina ornata	Orange-naped Snake
	Parasuta monachus	Monk Snake
	Pseudechis australis	Mulga Snake
	Pseudechis butleri	Spotted Mulga Snake
	Pseudonaja mengdeni	Gwardar
	Pseudonaja modesta	Ringed Brown Snake
	Simoselaps bertholdi	Jan's Banded Snake
	Suta fasciata	Rosen's Snake
Gekkonidae	*Gehyra purpurascens*	Purplish Dtella
	Gehyra variegata	Tree Dtella
	Gehyra xenopus	Crocodile-faced Dtella
	Heteronotia binoei	Bynoe's Prickly Gecko
	Rhynchoedura ornata	Western Beaked Gecko
Pygopodidae	*Aprasia picturata*	Black-headed Worm-lizard
	Delma butleri	Unbanded Delma
	Delma nasuta	Sharp-snouted Delma

Family	Species	Common Name
	Lialis burtonis	Burton's Snake-lizard
	Pygopus nigriceps	Western Hooded Scaly-foot
Scincidae	*Cryptoblepharus australis*	Inland Snake-eyed Skink
	Cryptoblepharus buchananii	Buchanan's Snake-eyed Skink
	Ctenotus ariadnae	Ariadna's Ctenotus
	Ctenotus atlas	Southern Mallee Ctenotus
	Ctenotus dux	Fine Side-lined Ctenotus
	Ctenotus grandis	Grand Ctenotus
	Ctenotus greeri	Spotted-necked Ctenotus
	Ctenotus hanloni	Nimbel Ctenotus
	Ctenotus helenae	Clay-soil Ctenotus
	Ctenotus leonhardii	Leonhardi's Ctenotus
	Ctenotus pantherinus	Leopard Skink
	Ctenotus piankai	Coarse Sands Ctenotus
	Ctenotus quattuordecimlineatus	Fourteen-lined Ctenotus
	Ctenotus schomburgkii	Schomburgk's Ctenotus
	Ctenotus severus	Stern Ctenotus
	Ctenotus uber	Spotted Ctenotus
	Egernia depressa	Pygmy Spiny-tailed Skink
	Egernia formosa	Goldfields Crevice-skink
	Eremiascincus richardsonii	Broad-banded Sand Swimmer
	Lerista bipes	North-western Sandslider
	Lerista desertorum	Central Desert Robust Slider
	Lerista distinguenda	South-western Orange-tailed Slider
	Lerista kingi	King's Slider
	Lerista timida	Timid Slider
	Liopholis inornata	Desert Skink
	Liopholis striata	Nocturnal Desert Skink
	Menetia greyii	Common Dwarf Skink
	Morethia butleri	Woodland Morethia Skink
	Tiliqua multifasciata	Centralian Blue-tongued Lizard
	Tiliqua occipitalis	Western Blue-tongued Lizard
Typhlopidae	*Anilios australis*	Austral Blind Snake
	Anilios bicolor	Dark-spined Blind Snake
	Anilios endoterus	Interior Blind Snake
	Anilios hamatus	Pale-headed Blind Snake
	Anilios waitii	Waite's Blind Snake
Varanidae	*Varanus brevicauda*	Short-tailed Pygmy Monitor
	Varanus caudolineatus	Stripe-tailed Monitor
	Varanus eremius	Pygmy Desert Monitor
	Varanus giganteus	Perentie
	Varanus gouldii	Gould's Goanna
	Varanus panoptes	Yellow-spotted Monitor
	Varanus tristis	Black-headed Monitor
Cheluidae	*Chelodina steindachneri*	Steindachner's Snake-necked Turtle

4.4 Conservation significant fauna

Conservation significant fauna are protected by the Commonwealth *Environment Protection and Biodiversity Conservation* (*EPBC*) *Act 1999*, and this list includes species covered by international treaties such as the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA) and the Western Australia (WA) *Wildlife Conservation Act 1950*. The WA *Wildlife Conservation Act 1950* provides for the publishing of the *Wildlife Conservation (Specially Protected Fauna) Notice* that lists species under multiple categories. In addition, the DBCA maintains a list of fauna that require monitoring under four priorities based on the current knowledge of their distribution, abundance and threatening processes. The *EPBC Act 1999* and *Wildlife Conservation Act 1950* imply legislative requirements for the management of anthropogenic impacts to minimise the effects of disturbances on species and their habitats. Priority species have no statutory protection, other than the DBCA wishes to monitor potential impacts on these species. Environmental consultants and proponents of developments are encouraged to avoid and minimise impacts on these species. Definitions of the significant fauna under the *WA Wildlife Conservation Act* are provided in Appendix C.

Six threatened species of fauna and four migratory/marine species of birds identified under the *EPBC Act 1999* potentially occur in the project area. Shore birds and waders have been excluded from this list due to a lack of suitable habitat near the project area (e.g. *Actitis hypoleucos*, *Calidris acuminata*, *Calidris acuminata* and *Tringa nebularia*). There are 10 Schedule species listed under the WA *Wildlife Conservation Act 1950* and three species listed on the DBCA's Priority Fauna List that potentially occur in the project area. The following is an assessment of the likelihood of each of the species listed in Table 8 being found in the project area.

Table 8. Assessment of the potential impact on conservation significant fauna that could occur in the bioregion

Species	DBCA Schedule / Priority	Status under Commonwealth *EPBC Act*	Comment
Night Parrot (*Pezoporus occidentalis*)	Critically Endangered	Endangered	Unlikely to be in the project area, due to a lack of suitable habitat. The potential for impacting on this species is therefore low.
Sandhill Dunnart (*Sminthopsis psammophilia*)	Endangered	Endangered	Highly unlikely to be in the project area due to a lack of suitable habitat. The potential for impacting on this species is therefore low.
Malleefowl (*Leipoa ocellata*)	Vulnerable	Vulnerable	Unlikely to be in the project area due to a lack of suitable habitat and high density of feral fauna. The potential for impacting on this species is therefore low.
Giant Desert Skink (*Liopholis kintorei*)	Vulnerable	Vulnerable	Highly unlikely to be in the project area due to a lack of suitable habitat. The potential for impacting on this species is therefore low.
Princess Parrot (*Polytelis alexandrae*)	Priority 4	Vulnerable	May infrequently be seen in the area, however, clearing vegetation is unlikely to impact on this species.
Mulgara (*Dasycercus blythi*)	Priority 4		Unlikely to be in the project area due to a lack of suitable habitat. The potential for impacting on this species is therefore low.
Oriental Plover (*Charadrius veredus*)	IA	Migratory	Unlikely to be in the project area due to a lack of suitable habitat. The potential for impacting on this species is therefore low.
Fork-tailed Swift (*Apus pacificus*)	IA	Migratory	May very infrequently be seen in the area, however, clearing vegetation is unlikely to impact on this aerial species.
Grey Wagtail (*Motacilla cinereal)*	IA	Migratory	Highly unlikely to be present in the project area. The potential for impacting on this species is therefore low.
Yellow Wagtail (*Motacilla flava)*	IA	Migratory	Highly unlikely to be present in the project area. The potential for impacting on this species is therefore low.
Peregrine Falcon (*Falco peregrinus*)	OS		May infrequently be seen in the area, however, clearing vegetation is unlikely to impact on this species.
Branchinella apophysata	Priority 1		Unlikely to be in the project area, so the potential for impact on this species is low.
Long-tailed Dunnart (*Sminthopsis longicaudata*)	Priority 4		Caught in the Granny Smith area and has potential to be recorded in the rocky areas. Clearing or fragmenting the banded ironstone rock habitat would impact on this species.

IA Migratory birds protected under international agreements; OS Other specially protected fauna

Night Parrot (*Pezoporus occidentalis*) – Critically Endangered under the WA *Wildlife Conservation Act 1950*; Endangered under the *EPBC Act 1999*

The Night Parrot was probably originally distributed over much of the semi-arid and arid Australia (Garnett et al. 2011, Threatened Species Scientific Committee 2016). Sightings in north-west Queensland in the early 1990s were in a broad cross section of the habitats available (Garnett et al. 1993). There have been recent sightings in the Pilbara in 1980, 2005 and 2017, central WA in 1979, north-eastern South Australia in 1979, western Queensland (including Pullen-Pullen-Mt Windsor-Diamantina population) in 1980, 1990, 1993, 2006 and 2013-17 (Davis and Metcalf 2008, Garnett et al. 2011, Palaszxzuk and Miles 2017), Pilbara in 2017 (Jones 2017) and near Lake Eyre in 2017 (McCarthy 2017). Garnett et al. (2011) suggested that there were between 50-250 mature individuals in less than 5% of its previous range.

Wilson's (1937) summary of observations provided information on the early records of Night Parrots' preferred habitat and breeding sites. Recent information indicates its preferred habitat appears to be in *Triodia* grasslands, chenopod shrublands, shrubby samphire and floristically diverse habitats dominated by large-seeded species (Threatened Species Scientific Committee 2016, McCarthy 2017, Murphy et al. 2017b). It nests under *Triodia* and has a runway and a tunnel entrance with an apron of dead *Triodia* sp. leaves. It has clutches of two to four sub-elliptical, white eggs with a lustrous appearance (Murphy et al. 2017a). Breeding followed significant rains in March for the observations in Pullen-Pullen Reserve, but it is thought that breeding generally occurs between April and October (Murphy et al. 2017a).

The Night Parrot has not been recorded near the project area, and the habitat in the project area is not suitable for nesting and roosting sites, so there is a very low probability that it is in the project area. It is therefore unlikely to be impacted by the proposed development.

Sandhill Dunnart (*Sminthopsis psammophilia*) – Critically Endangered under the WA *Wildlife Conservation Act 1950*; Endangered under the *EPBC Act 1999*

The Sandhill Dunnart is a small (30-45g) arid adapted dasyurid that is found in the eastern part of the Western Australian section of the Great Victoria Desert and the western and southern parts of South Australia. Recent surveys undertaken for the Great Victoria Desert Trust have increased their geographic range in the Great Victoria Desert. The habitat in the project area is not suitable for this Dunnart and there are no records of the Sandhill Dunnart near the project area in the Atlas of Living Australia, so it is highly unlikely that they are present in the project area.

Malleefowl (*Leipoa ocellata*) – Schedule 3 species under the WA *Wildlife Conservation Act 1950*; Vulnerable under the *EPBC Act 1999*

Malleefowl have been found in mallee regions of southern Australia from approximately the 26th parallel of latitude southwards. Malleefowl are now only found throughout these regions in fragmented patches due to clearing of habitat for agriculture, increased fire frequency, competition with exotic herbivores (sheep, rabbits, cattle, goats) and kangaroos, predation by foxes and cats, inbreeding as a result of fragmentation and possibly hunting for food. DBCA records show the only recorded observation was near Leonora in 1998.

Some very old disused Malleefowl mounds were recorded in other regional surveys, however, the vegetation in the project area is generally too sparse to support Malleefowl. Terrestrial Ecosystems' assessment is that the Malleefowl is unlikely to occur in the project area.

Giant Desert Skink (*Liopholis kintorei*) - Vulnerable under the *EPBC Act 1999* and Schedule 3 species under the WA *Wildlife Conservation Act 1950*

Liopholis kintorei is a large skink found in the sandy desert regions of Western Australia, Northern Territory and South Australia. It is found on sand-flats and clay-based or loamy soils vegetated with spinifex. It lives in a multi-entranced communal burrow system and uses shared defecation sites. Storr *et al*. (1999b) recorded them as being in the Wanjarri area of the Great Victoria Desert, and the DBCA Threatened species database records them in Laverton in 1967. The Giant Desert Skink prefers sandy soils vegetated with spinifex. This habitat is not present in the project area. Terrestrial Ecosystems' assessment is that *Liopholis kintorei* is very unlikely be found in the project area due to a lack of suitable habitat.

Princess Parrot (*Polytelis alexandrae*) - Vulnerable species under the *EPBC Act 1999;* and as a Priority 4 species with DBCA

Very little is known about the Princess Parrot; even the exact extent of its geographical distribution. It is thought to be nomadic within the central desert regions of Australia, occupying arid shrub lands, particularly those dominated by Mulga, Desert Oak and spinifex. Due to the paucity of information on the species, accurate estimates of its conservation significance are difficult to make, however, this species is probably threatened by habitat loss to agricultural practices and changes in fire regimes.

Dr S. Thompson sighted this parrot in a survey near the Wanjarri Nature Reserve in 2006 and Moriarty (1972) also reported it in the same area, so it may occasionally be seen in the general area. The proposed vegetation clearing is unlikely to significantly impact on this species as it will move away to other areas if it is disturbed.

Brush-tailed Mulgara (*Dasycercus blythi*) - Priority 4 with the DBCA

Woolley (2005) recognises two species of 'Mulgara'; *Dasycercus blythi* and *D. cristicauda*. *Dasycercus blythi* has a non-crested tail, two upper premolars and six nipples; *D. cristicauda* has a crested tail, three upper premolars and eight nipples. Both species potentially have overlapping distributions in arid Australia, but it is thought that D. cristicauda does not currently exist in Western Australia, although there are old records indicating its presence. Woolley (2005) suggested the common names for these two species be Brush-tailed Mulgara for *D. blythi* and Crest-tailed Mulgara for *D. cristicauda*. These two species can be sympatric in places, but probably utilise different parts of the habitat on a local scale when they are recorded in the same area. Currently, there are insufficient data to separate the spatial ecology, burrows and reproductive biology of these two species. Information that follows is based on what is known for 'Mulgara' without distinguishing between the species.

The reported distribution of Mulgara includes much of the inland spinifex covered sandy desert and spinifex vegetated areas in the Pilbara and northern goldfields. Within these areas their distribution is patchy and it is most frequently confined to mature spinifex dominated habitat (Gibson and Cole 1992, Masters 2003, Masters et al. 2003, Thompson and Thompson 2008). In some areas, their relative abundance is positively associated with rainfall in the previous 12 to 24 months (Gibson and Cole 1992, Masters 1998, Dickman et al. 2001, Letnic and Dickman 2005) and recent burning of the spinifex does not seem to be sufficient to shift Mulgara out of an area (Thompson and Thompson 2007). Mulgara are generally sedentary in contrast with some other small dasyurids and have high site fidelity and a low propensity for dispersal once a home range has been established (Masters 1998, Dickman et al. 2001).

Fauna habitat in the project area is not suitable for Mulgara. It is therefore Terrestrial Ecosystems' view that they are unlikely of be found in the project area.

Oriental Plover (*Charadrius veredus*) - Migratory species under the *EPBC Act 1999* and Schedule 5 species under the WA *Wildlife Conservation Act 1950*

A migrant species with patchy distribution in Australia, the Oriental Plover is sparsely distributed across arid and semi-arid Australia, but avoids truly desert regions. Its preferred habitat is dry plains. It was not recorded in other fauna surveys undertaken near the project area. The species is under threat because of habitat reduction due to agriculture and changing fire regimes. This plover has not been recorded in the general area in any of the other regional surveys.

Terrestrial Ecosystems' assessment is that the Oriental Plover is unlikely to be seen in the project area.

Fork-tailed Swift (*Apus pacificus*) - Migratory species under the *EPBC Act 1999* and Schedule 5 species under the WA *Wildlife Conservation Act 1950*

This species breeds in the northeast and mid-east Asia and winters in Australia and southern New Guinea. It is a visitor to most parts of Western Australia, beginning to arrive in the Kimberley in late September, in the Pilbara in November and in the southwest land division in mid-December, and leaving by late April. The Fork-tailed swift is an almost exclusively an aerial species, foraging and sleeping on the wing. It rarely comes to earth, usually only for breeding. It is common in the Kimberley, uncommon to moderately common near northwest, west and southeast coasts and rare to scarce elsewhere. It is rarely seen in the Goldfields.

Terrestrial Ecosystems' assessment is that the Fork-tailed Swift may infrequently be seen in the project area. However, the proposed vegetation clearing is unlikely to significantly impact on this species as it will move away to other areas if it is disturbed.

Grey Wagtail (*Motacilla cinerea*) - Migratory under the *EPBC Act 1999* under the *Wildlife Conservation Act 1950*

The Grey Wagtail is a small yellow breasted bird with a grey back and head. Johnstone and Storr (2004) reported this migratory species as breeding in Palearctic from western Europe and north-west Africa to eastern Asia and wintering in Africa, south-east Asia, Indonesia, the Philippines, New Guinea and Australia. Its preferred habitat in Australia is banks and rocks in fast-running fresh water including rivers, streams and creeks where it feeds on insects.

The Atlas of Living Australia records two sightings on the south-coast of Western Australia and none around the project area. It is highly unlikely to be seen in the project area due to a lack of suitable habitat.

Yellow Wagtail (*Motacilla flava*) - Migratory under the *EPBC Act 1999* under the *Wildlife Conservation Act 1950*

The Yellow Wagtail is found it the millions in the norther hemisphere and the Atlas of Living Australia records multiple records of this bird in Australia in the coastal areas. There are no records for this species in inland Western Australia near the project area, therefore it is highly unlikely to be impacted by the proposed development.

Peregrine Falcon (*Falco peregrinus*) – Schedule 7 species under the WA *Wildlife Conservation Act 1950*

The Peregrine Falcon is uncommon, although widespread throughout much of Australia excluding the extremely dry areas and has a wide and patchy distribution. It shows habitat preference for areas near cliffs along coastlines, rivers and ranges and within woodlands along watercourses and around lakes. Nesting sites include ledges along cliffs, granite outcrops and quarries, hollow trees near wetlands and old nests of other large bird species. There is no evidence to suggest any change in status in the last 50 years. The Peregrine Falcon has been seen in the Wanjarri Nature Reserve (Moriarty 1972, Ninox Wildlife Consulting 1994), at Honeymoon Well (Ninox Wildlife Consulting 1994) and Mileura (Tingay 1977), so they could infrequently be seen in the general area.

Terrestrial Ecosystems' assessment is that the Peregrine Falcon may infrequently be seen in the project area. However, the proposed developments are unlikely to significantly impact on this species as it will move away to other areas if it is disturbed.

***Branchinella apophysata* –** Priority 1 species with DBCA

Notes from DBCA indicate that this fairy shrimp is known from a single location near Mt Magnet, but nothing is known of its habits or ecological requirements. As there are no salt lakes near the project area, it is Terrestrial Ecosystems' assessment that *B. apophysata* is unlikely to be impacted by the proposed development.

Long-tailed Dunnart (*Sminthopsis longicaudata*) – Priority 4 species with DEC.

Burbidge et al. (2008) summarised the Long-tailed Dunnart distribution as widely scattered in arid zone where it inhabits rugged rocky areas. They went on to suggest that its striated foot-pads, long tail and behaviour in captivity indicated that it was an active and capable climber. Specimens have been recorded in several rocky ranges in the Gibson Desert, West MacDonnell National Park, Murchison, Carnarvon Basin and the Pilbara. All previous capture sites for Long-tailed Dunnarts are within rugged rocky landscapes that support a low open woodland or shrubland of Acacias (especially mulga) with an understorey of spinifex hummocks, and (occasionally) also perennial grasses and cassias.

Three adult Long-tailed Dunnarts were caught in the Granny Smith Level 2 fauna survey (Terrestrial Ecosystems 2011b) and a single individual was caught in the follow up targeted survey (Terrestrial Ecosystems 2011c). Subsequently, Long-tailed Dunnarts have been caught at Mt Ida and Bottle Creek, which are about 200km to the west of Granny Smith mine. This Dunnart is likely to be recorded in the Banded Ironstone rocky habitats that are present in the project area. Clearing or fragmenting this habitat could impact on the Long-tailed Dunnart.

5 DISCUSSION

5.1 Adequacy of the fauna survey data for fauna habitats represented in the project area

The EPA's (2016) *Technical Guidance on Terrestrial Fauna* indicated that a Level 2 fauna assessment is required for a disturbance area of in excess of 75ha in this bioregion. The project area is greater than 75ha, so the disturbance exceeds one of the criterion to require a Level 2 survey in the Murchison 1 IBRA bioregion, however, in this instance, the earlier surveys of the Granny Smith area (Terrestrial Ecosystems 2011a, c, b, 2012g) in particular the Level 2 survey in similar habitat by Terrestrial Ecosystems (2011b) provide information on the fauna assemblages potentially in the project area. It is unlikely that a Level 2 vertebrate fauna survey in the project area will provide new species not previously identified for this area that would alter the assessment of potential impacts. However, as with all surveys, until it is completed the outcome is unknown.

Terrestrial Ecosystems undertook a Level 2 vertebrate fauna assessment in January 2011. A single survey was deemed adequate as there was already substantial fauna survey data for open mulga woodlands for this part of the eastern Goldfields. These fauna trapping sites, the avian surveys and Long-tailed Dunnart survey sites are near the project area. The single survey was used to confirm the vertebrate fauna assemblage was as would be predicted based on the available survey data. The 2011 survey provided two notable observations, namely the presence of Long-tailed Dunnarts and the abundance of Kultarr. Long-tailed Dunnarts were not expected as the habitat was not as indicated in the available texts and this population is about 200km further south east of other reported populations. Subsequent surveys of other areas have recorded Long-tailed Dunnarts 200km to the west at Mt Ida and Bottle Creek in rocky terrain which is more typical of their preferred habitat. Other similar surveys in the eastern Goldfields would often record one or two Kultarr. Terrestrial Ecosystems' capture of 17 in the 2011 survey indicated an unusually high abundance. It is unknown whether the trapped number of Kultarr accurately reflects their abundance, or whether they are particularly trap shy or jump out of pit-traps and are not subsequently recorded.

The fauna habitat in the 2011 survey was predominantly open mulga woodland over mixed scattered shrubs. The density of trees and shrubs varied considerably across the site. The Terrestrial Ecosystems (2011b, c) surveys of the area provide an adequate representation of the trappable vertebrate fauna in the open mulga woodlands in the vicinity of the Solar Farm project.

5.1.1 Amphibians

Frogs are normally only detected immediately after rainfall or around semi-permanent pools. It is likely that *Cyclorana maini, Pseudophryne occidentalis, Neobatrachus kunapalari* and *Neobatrachus wilsmorei* would be found in the general area. These species, other than *P. occidentalis,* burrow into the ground and aestivate between rainfall events. *Pseudophryne occidentalis* find shelter under rocks and in crevices during the dry periods and enter temporary ponds to breed after major rainfall events. All four species have a wide-spread distribution and are abundant. Clearing vegetation is likely to result in a loss of individuals within the disturbed area, however, is unlikely to have a significant impact on these species when assessed in a regional context.

5.1.2 Reptiles

Typically, between 25 and 35 species of reptiles are caught in open mulga woodland(Coffey Environments 2008b, Terrestrial Ecosystems 2010b, 2011b, 2012i). None of the species likely to be in the project area, are of conservation significance. There were no characteristics of the reptile assemblage surveyed in 2011 that indicated the fauna habitat present in the project area was of conservation significance or different to that in the neighbouring areas, and given that there were large expanses of similar habitat in adjacent areas, clearing of the vegetation is unlikely to have significant impact on reptiles when assessed in a regional context.

Terrestrial Ecosystems' view is that the proposed clearing of the project area is unlikely to significantly impact on the reptile fauna of the bioregion.

5.1.3 Birds

The number of birds and bird species in the northern Goldfields fluctuates based on seasons and recent rainfall. Semi-arid and arid areas of inland Australia support a diverse range of transient and nomadic species that move through large areas in search of available resources. Heavy rain that is followed by flowering and seeding of many plant species is often sufficient to draw a large number of these nomadic species to the general area. These species move on to other areas once the resource is depleted or better resources are available in adjacent areas.

The project area is likely to support a similar assemblage to that present in the adjacent areas. Birds of conservation significance potentially found in the area include the Peregrine Falcon and Princess Parrot. The Princess Parrot is nomadic and moves around the arid interior often in search of water and resources and the Peregrine Falcon will normally have a very large home range and clearing a small section of vegetation in the project area, particularly when similar habitat exists in the adjacent areas, is unlikely to significantly impact on this species. All birds will readily shift to other areas when there is a disturbance.

Terrestrial Ecosystems' view is that the proposed clearing for the access road is unlikely to significantly impact on the avian fauna of the bioregion.

5.1.4 Mammals

The diversity of small terrestrial mammals potentially caught in the project area would be low due the sparsely vegetated and degraded habitat. The capture of Long-tailed Dunnarts (Terrestrial Ecosystems 2011c, b) was unexpected as they are rarely caught, not normally caught this far south and not normally caught in open, flat, mulga woodland with no spinifex, low shrubs and little ground cover. It is highly probable that if Long-tailed Dunnarts are present in the project area they will be inhabiting the banded ironstone rocky ridges. Avoiding impacts to this habitat or fragmenting the ridges from each other will significantly reduce any potential impacts on the Long-tailed Dunnart.

Other than the Long-tailed Dunnart, there are no other mammals of conservation significance likely to be in the project area.

5.2 Biodiversity value

From a fauna perspective, the project area has been heavily grazed resulting in degradation to the mulga and shrublands. The habitat types identified in the project area are also abundant in adjacent areas, indicating that any localised impacts will not be significant in a regional context.

5.2.1 Ecological functional value at the ecosystem level

Vertebrate species potentially in the project area are wide-ranging and have been recorded in various other fauna surveys in the bioregion (Appendix B). There is likely to be a relatively low abundance of reptiles and mammals caught in the project area because of the sparseness of the vegetation, lack of leaf litter on the ground in many areas and degradation by cattle and feral fauna.

The development of the Solar Farm Project will increase the existing impact in the area. Except for the banded ironstone ridges, the habitat types in the project area are well represented across the bioregion. Assuming that the banded ironstone habitat is not impacted and these habitat areas are not fragmented from each other, the project area does not have high ecological value, nor does it support conservation significant fauna or a conservation significant ecosystem.

5.2.2 Maintenance of threatened ecological communities

No threatened ecological fauna communities were identified in the project area.

5.2.3 Condition of fauna habitat

Some of the project area has been disturbed due to historical development activity (i.e. tracks, water pipeline and fences). There is also extensive evidence of disturbance by cattle and the presence of rabbits and cats. The uncleared fauna habitat present in the project area is similar to many square kilometres of adjacent habitat; the clearing of vegetation is therefore unlikely to have a significant impact on the vertebrate fauna when considered in a bioregional context.

5.2.4 Ecological linkages

The project area does not provide an important ecological linkage or fauna movement corridors; however it does contain a banded ironstone ridge habitat type which is significant for Long-tailed Dunnarts. Maintaining a native vegetation and undisturbed corridor between the ridges is important for maintaining Long-tailed Dunnarts in the project area and broader Granny Smith mine.

5.2.5 Size and scale of the proposed disturbance

The project area is a very small proportion of similar habitat found in the adjacent area and region. Given the available fauna survey data for these habitat types, no additional surveys are warranted.

5.2.6 Abundance and distribution of similar habitat in the adjacent areas

Fauna habitats present in the project area are abundant in adjacent areas. It is therefore likely that the fauna assemblage in the project area is similar to the many square kilometres of similar habitat in adjacent areas and the bioregion.

5.2.7 Potential impacts on ecosystem function

Clearing native vegetation is likely to result in the loss of small vertebrate fauna on site that are unable to move away during the clearing process. The few larger animals, such as kangaroos and large goannas, and most of the birds will move into adjacent areas once clearing commences. Shifting animals into adjacent areas will increase the pressure on resources in those areas and it is likely that there will be some disruption to the ecosystems in these areas for a period until a balance is restored.

Impacts associated with clearing vegetation in the project area in a landscape or bioregional context on the vertebrate fauna are likely to be low as the proposed disturbance area is very small relative to the quantity of similar habitat in the bioregion.

5.3 Potential environmental impacts

Clearing of vegetation will potentially affect vertebrate fauna in numerous ways, including death/injury of fauna during clearing, grading and impacts with vehicles and the loss of habitat.

Although there are anticipated short term impacts on fauna, they are not considered to result in significant impacts on fauna habitat and fauna assemblages in the long term. The overall impact on fauna species and species of conservation significance will be minimal provided the recommended management procedures are implemented and adhered to.

5.3.1 Direct impacts

Clearing vegetation and activities associated with the development will result in the loss of small fauna that retreat to burrows, such as reptiles and mammals. Nocturnal species are unlikely to be active when most of the land clearing and construction work is taking place which may result in these individuals being adversely impacted when they attempt to escape. This loss of vegetation is unlikely to have a significant impact when considered in a bioregional context.

Clearing linear corridors and other large areas increases fauna habitat edges. Small mammals can respond both positively and negatively to edges depending on their ecological traits (Laurance 1991, 1994, Goosem and Marsh 1997, Goosem 2000). Edge and disturbance effects can lead to altered and most often higher levels of predation, restricting or increasing fauna movements and altering assemblage structure (Oxley et al. 1974, Paton 1994, Baker et al. 1998, Temple 1998, Luck et al. 1999, Goosem et al. 2001). Goldingay and Whelan (1997) and Clarke and Oldland (2007) reported that edge effects can extend up to 150-200m from the edge for some species, meaning the impact area on vertebrate fauna is likely to be larger than the cleared footprint.

Edge effects can lead to the disruption of ecological processes such as predation and dispersal, animal movements and can change assemblage structure. The consequence is that the impact area will always be much larger than the cleared area.

5.3.2 Secondary impacts

Increased human activity is often associated with an altered fire regime, increased dust or fauna deaths on access tracks, which lead to a degradation of natural ecosystems. Fire has been identified as one of the threatening processes for some conservation significant species as a number of small mammal and bird species rely on long unburnt vegetation. Fires are unlikely to be a significant threat to native fauna species near the project area due to the sparseness of the vegetation.

Introduced plant species can successfully and rapidly invade areas of cleared native vegetation or otherwise disturbed by humans. Introduced plant species may replace native species that provide shelter or foraging areas for native fauna. Major changes to the structure of vegetation will alter the fauna habitat and consequently may influence fauna species composition. Preparing and implementing a weed management plan will largely reduce their threat to native fauna species.

5.3.3 Anthropogenic activity

Unnatural noises, vibrations, artificial light sources, and vehicle and human movement in an area may be sufficient to force individuals or fauna species to move from adjacent areas or alter their activity periods. This form of disturbance is likely to occur during the vegetation clearing and when development activity commences. The overall impact is likely to be confined to a relatively small proportion of very similar habitat elsewhere in the bioregion.

5.3.4 Rehabilitation of cleared areas

To minimise the long-term potential impacts, rehabilitation programs should be progressively implemented and evaluated. An emphasis should be placed on the establishment of near-natural, self-sustaining, functional ecosystems in rehabilitation planning, and this should be one of the focal criteria for assessing the success of rehabilitation programs.

5.3.5 Dust

Dust generated from shifting top soil and spoil and vehicle traffic can potentially degrade surrounding vegetation, reducing its ability to absorb sunlight and influencing photosynthetic rates. Degradation of these areas may potentially render habitat unsuitable for fauna. As there is unlikely to be significant vehicle traffic once the solar farm is developed this is likely to only be an issue during construction. Dust suppression and management programs are an essential component of minimising impacts on fauna in areas adjacent to the haul road. An effective dust management and monitoring program is required.

5.4 Risk assessment

Fauna surveys to support Environmental Impact Assessments (EIA) are part of the environmental risk assessment undertaken to consider what potential impacts a development might have on the biodiversity on a particular area and region. Potential impacts on fauna from the proposed development are identified and briefly described above. Tables 9, 10 and 11 provide a summary of the risk assessment associated with this project.

Table 9. Fauna impact risk assessment descriptors

Any risk assessment is a product of the likelihood of an impact occurring and the consequences of that impact. Likelihood and consequences are categorised and described below. The assessed risk level (likelihood x consequences) is then calculated as the overall risk for the development. This is followed by an assessment of the acceptability of the risk associated with each of the impacts. Disturbances and vegetation clearing have an impact on the fauna at multiple scales – site, local, landscape and regional. Each of these is considered in the risk assessment. This assessment should be considered in the context of the summary in Table 9.

Likelihood		
Level	Description	Criteria
A	Rare	The environmental event may occur, or one or more conservation significant species may be present in exceptional circumstances.
B	Unlikely	The environmental event could occur, or one or more conservation significant species could be present at some time.
C	Moderate	The environmental event should occur, or one or more conservation significant species should be present at some time.
D	Likely	The environmental event will probably occur, or one or more conservation significant species will be present in most circumstances.
E	Almost certain	The environmental event is expected to occur, or one or more conservation significant species is expected be present in most circumstances.
Consequences		
Level	Description	Criteria
1	Insignificant	Insignificant impact on fauna of conservation significance or regional biodiversity, and the loss of individuals will be insignificant in the context of the availability of similar fauna or fauna assemblages in the area.
2	Minor	Impact on fauna localised and no significant impact on species of conservation significance in the project area. Loss of species at the local scale.
3	Moderate	An appreciable loss of fauna in a regional context or a limited impact on species of conservation significance in the project area.
4	Major	Significant impact on conservation significant fauna or their habitat in the project area and/or regional biodiversity and/or a significant loss in the biodiversity at the landscape scale.
5	Catastrophic	Loss of species at the regional scale and/or a significant loss of species categorised as ‘vulnerable’ or ‘endangered’ under the *EPBC Act (1999)* at a regional scale.
Acceptability of Risk		
Level of risk	Management Action Required	
Low	No action required.	
Moderate	Avoid if possible, routine management with internal audit and review of monitoring results annually.	
High	Externally approved management plan to reduce risks, monitor major risks annually with external audit and review of management plan outcomes annually. May a referral to the Commonwealth under the *EPBC Act 1999*.	
Extreme	Unacceptable, project should be redesigned or not proceed.	

Table 10. Levels of acceptable risk

		Likelihood				
		Rare or very low (A)	Unlikely or low (B)	Moderate (C)	Likely (D)	Almost certain (E)
Consequences	Insignificant (1)	Low	Low	Low	Low	Low
	Minor (2)	Low	Low	Low	Moderate	Moderate
	Moderate (3)	Low	Moderate	Moderate	High	High
	Major (4)	Moderate	Moderate	High	High	Extreme
	Catastrophic (5)	Moderate	High	High	Extreme	Extreme

Table 11. A risk assessment of the impact of ground disturbance activity on fauna

			Before Management				With Management		
Factor	Potential Impact		Inherent Risk			Risk Controls / Management	Residual Risk		
			Likelihood	Consequence	Significance		Likelihood	Consequence	Significance
Fauna survey data	Inadequate survey data to adequately assess the risks	Unknown loss of fauna, fauna of conservation significance, and fauna assemblages, and an incomplete fauna assessment.	B	2	Low				
	Inadequacy of comparative data	Limits on the availability of comparative data reduced the capacity to assess the uniqueness of the fauna assemblages in the project area.	B	2	Low				
Clearing vegetation	Loss of fauna habitat – local scale	Loss of terrestrial fauna in the project area.	E	2	Mod.				
	Loss of fauna habitat – landscape scale	Loss of some fauna during vegetation clearing.	B	1	Low				
	Loss of fauna habitat – regional scale	Small loss of some fauna from the region.	B	1	Low				
	Loss of a threatened ecological fauna community	Loss of an undetected threatened ecological fauna community.	A	3	Low				
	Habitat fragmentation	Fauna movement restricted resulting in the death of fauna and a loss of biodiversity.	A	2	Low				
	Loss of a unique terrestrial fauna ecosystem	Loss of an ecosystem containing fauna with high species richness, high abundance and numerous top of the food chain predators.	A	2	Low				
Death or loss of conservation significant fauna	Malleefowl (*Leipoa ocellata*)	Death or the reduced viability of Malleefowl.	A	3	Low				
	Peregrine Falcon (*Falco peregrinus*)	Death or the reduced viability of the Peregrine Falcon.	A	2	Low				
	Fork-tailed Swift (*Apus pacificus*)	Death or the reduced viability of Fork-tailed Swift.	A	2	Low				
	Long-tailed Dunnart (*Sminthopsis longicaudata*)	Death or the reduced viability of the Long-tailed Dunnart	C	3	Mod.	Don't impact banded iron formation or fragment this habitat linkage	A	3	Low
Human impacts	Spread of weeds	Changed vegetation and a resulting loss of fauna habitat.	E	2	Mod.	Implementation of a weed management plan.	D	2	Low
	Road kills	Animals being killed as they cross roads by vehicles	E	1	Low	Limiting speeds	E	1	Low
	Increase in feral mammals, specifically the dog and cat	Increased predation on the native fauna	C	2	Low	Management of waste and not-feeding feral animals.	B	2	Low

5.5 Native vegetation clearing principles as they pertain to vertebrate fauna

The *Environmental Protection Act (1986)* outlines 10 principles that are to be used in the assessment of native vegetation clearing permit applications which are also applicable for other assessments and approvals (Table 12). Where possible, native vegetation should not be cleared if any of the following principles are comprised.

Table 12. Assessment of impact using the native vegetation clearing principles

Principle	Response
It comprises a high level of biological diversity.	Clearing vegetation will not comprise a high level of biodiversity.
It comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	Clearing the vegetation will not result in the loss of significant habitat for indigenous fauna.
It includes, or is necessary for the continued existence or, rare flora.	N/A
It comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.	The area does not contain a threatened ecological fauna community.
It is significant as a remnant of native vegetation in an area that has been extensively cleared.	The area is not a remnant.
It is growing in, or in association with, an environment associated with a watercourses or wetland.	The area does not contain a wetland.
The clearing of the vegetation is likely to cause appreciable land degradation.	N/A
The clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	Clearing of vegetation is unlikely to impact on the environmental values of the bioregion.
The clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	N/A
The clearing of the vegetation is likely to cause, or exacerbate the incidence of flooding.	N/A

5.6 Referral under the EPBC Act

The proposed project is unlikely to significantly impact on a conservation significant vertebrate fauna species, so a referral under the *EPBC Act* is not required.

6 SUMMARY

The total assessed area is 150ha but the development area is likely to be only 30ha. There are four broad fauna habitats in the project area:

- Open mulga woodland over scattered low shrubs and grasses of varying densities on a stony sandy-clay or sandy-clay substrate;
- Open chenopod shrubland over grasses of varying densities on a stony sandy-clay or sandy-clay substrate;
- Chenopod and mulga shrubland over scattered grasses of varying densities on a stony sandy-clay or sandy-clay substrate; and
- Banded Ironstone rocky ridgeline with scattered Mulga and shrubs.

The density of trees and shrubs in the relatively undisturbed areas varied across the project area but was mostly sparse. The fauna habitat varies from degraded to good; the more degraded areas are due to historical and recent exploration activity and cattle grazing. There are a few access tracks in the area, but these are narrow and mostly only wheel tracks of a stony red sand-clay substrate.

The area has been grazed by cattle with many areas showing obvious degradation (i.e. cattle tracks, chewed bushes and shrubs, etc). There was extensive evidence of rabbits and other feral fauna in the area.

The banded ironstone formation habitat type is significant for Long-tailed Dunnarts in the region. This habitat type should be avoided and linkage corridors between these habitat areas maintained. Clearing native vegetation in other habitat types is likely to result in the loss of small vertebrate fauna on-site that are unable to move away during the clearing process. The few larger animals, such as kangaroos and large goannas and snakes, and most of the birds will move into adjacent areas once clearing commences.

Construction of a solar farm will have a minimal impact on the fauna in areas adjacent to those that will be cleared. There will be a small loss of native fauna to vehicle strikes on access tracks, but this will be very low. Migrants increase competition for resources, which may result in the subsequent loss of migrants or local individuals. Individuals shifted out of their established activity areas are also vulnerable to predation until they have become established in their new areas.

Impacts associated with clearing vegetation in the project area in a landscape or bioregional context on the vertebrate fauna are likely to be low as there are vast tracts of similar habitat in adjacent areas.

The proposed project is unlikely to significantly impact on a conservation significant species, so a referral under the *EPBC Act* is not required.

7 MANAGEMENT STRATEGIES

7.1 Induction and awareness

All contractors and people involved in construction of solar farm should be made aware of the possible presence and issues associated with terrestrial fauna in the area through the induction process.

Recommendation 1: An induction program that includes a component on managing fauna is a mandatory component of working on the solar farm project.

7.2 Dust

Dust generated from the construction of the solar farm could potentially degrade surrounding vegetation, reducing its ability to absorb sunlight and influencing photosynthetic rates. Degradation of these areas will potentially render habitat unsuitable for fauna. Dust suppression and management programs are an essential component of minimising mining impacts on fauna during the construction program.

Recommendation 2: The impact of dust on adjacent vegetation and fauna habitat is managed and monitored against appropriate KPIs.

7.3 Long-tailed Dunnarts

Long-tailed Dunnarts were recorded during the 2011 Level 2 fauna trapping surveys in adjacent areas. They are therefore potentially present in the banded ironstone formations in the eastern portions of the project area. To reduce the potential impacts on the Long-tailed Dunnart this habitat type should not be impacted and linkage habitat between the rocky ridges maintained.

If the banded ironstone habitat and habitat linkages cannot be retained an assessment of the regional abundance of this dunnart in surrounding areas should be undertaken to demonstrate the consequential impact on this species of a vegetation clearing program. This survey should include all other available rocky hill habitats.

Recommendation 3: Avoid impacting on the banded ironstone habitat and linkage habitats between the rocky hills.

Recommendation 4: If the banded ironstone habitat or linkages between the rocky areas will be impacted, an assessment on the regional abundance and distribution of the Long-tailed Dunnart is undertaken to demonstrate the consequential impact on this species of a vegetation clearing program.

7.4 Feral fauna

Based on feral cat tracks and scats recorded in the project area, the success of an earlier feral cat trapping program (Onus et al. 2011) and the lack of any subsequent follow up program, it is highly probable that the Granny Smith mining area currently supports a significant population of feral cats. Rabbits were also present in the project area. Reducing the impacts of feral cats and rabbits will reduce the stress on fauna and fauna assemblages in the area.

Recommendation 5: Implement a feral cat control program.

Recommendation 6: Investigate options for management of rabbits in the area.

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Figures

Vertebrate Fauna Assessment – Granny Smith Solar Power Farm Project

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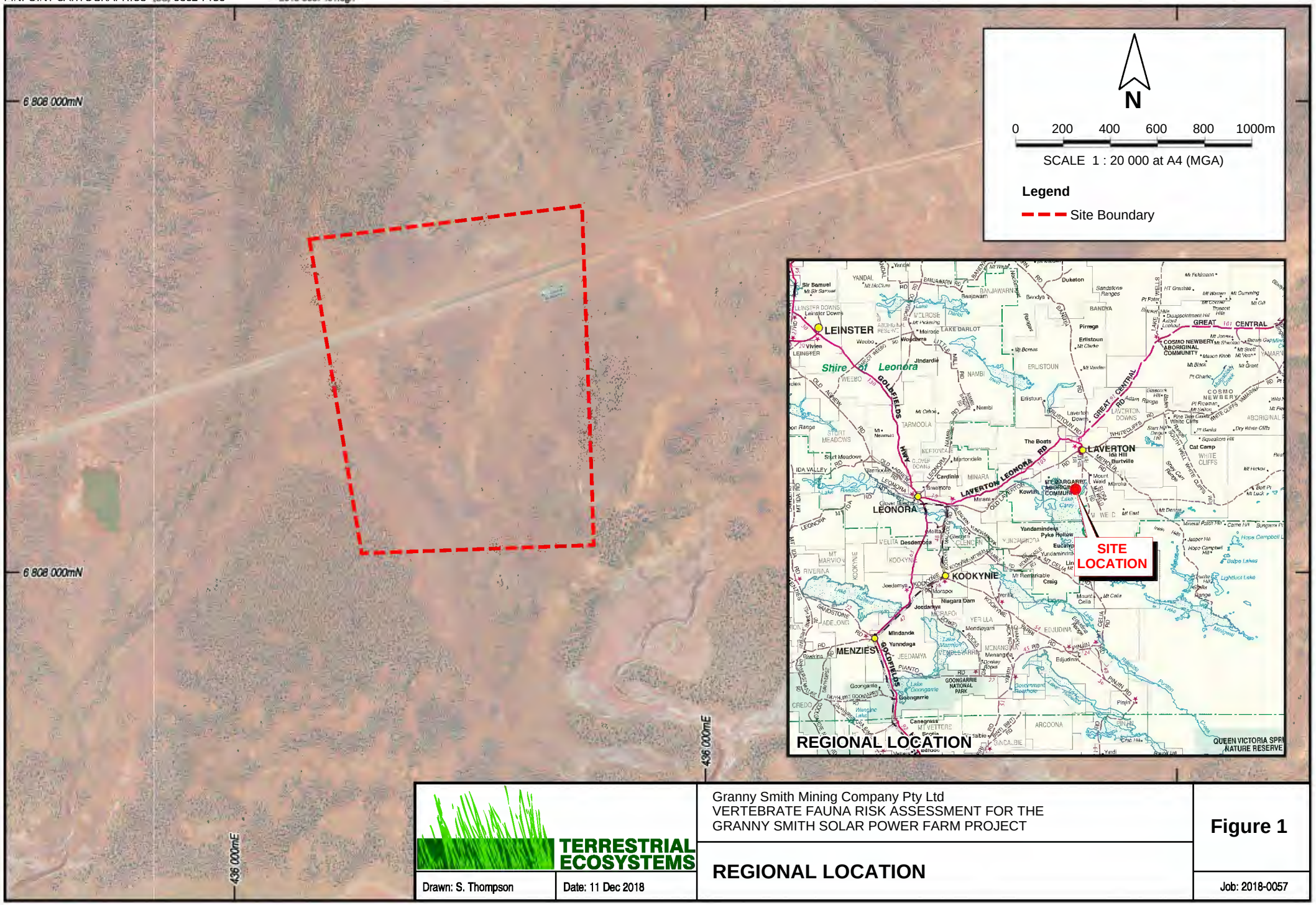

TERRESTRIAL ECOSYSTEMS

Drawn: S. Thompson | Date: 11 Dec 2018

Granny Smith Mining Company Pty Ltd
VERTEBRATE FAUNA RISK ASSESSMENT FOR THE
GRANNY SMITH SOLAR POWER FARM PROJECT

REGIONAL LOCATION

Figure 1

Job: 2018-0057

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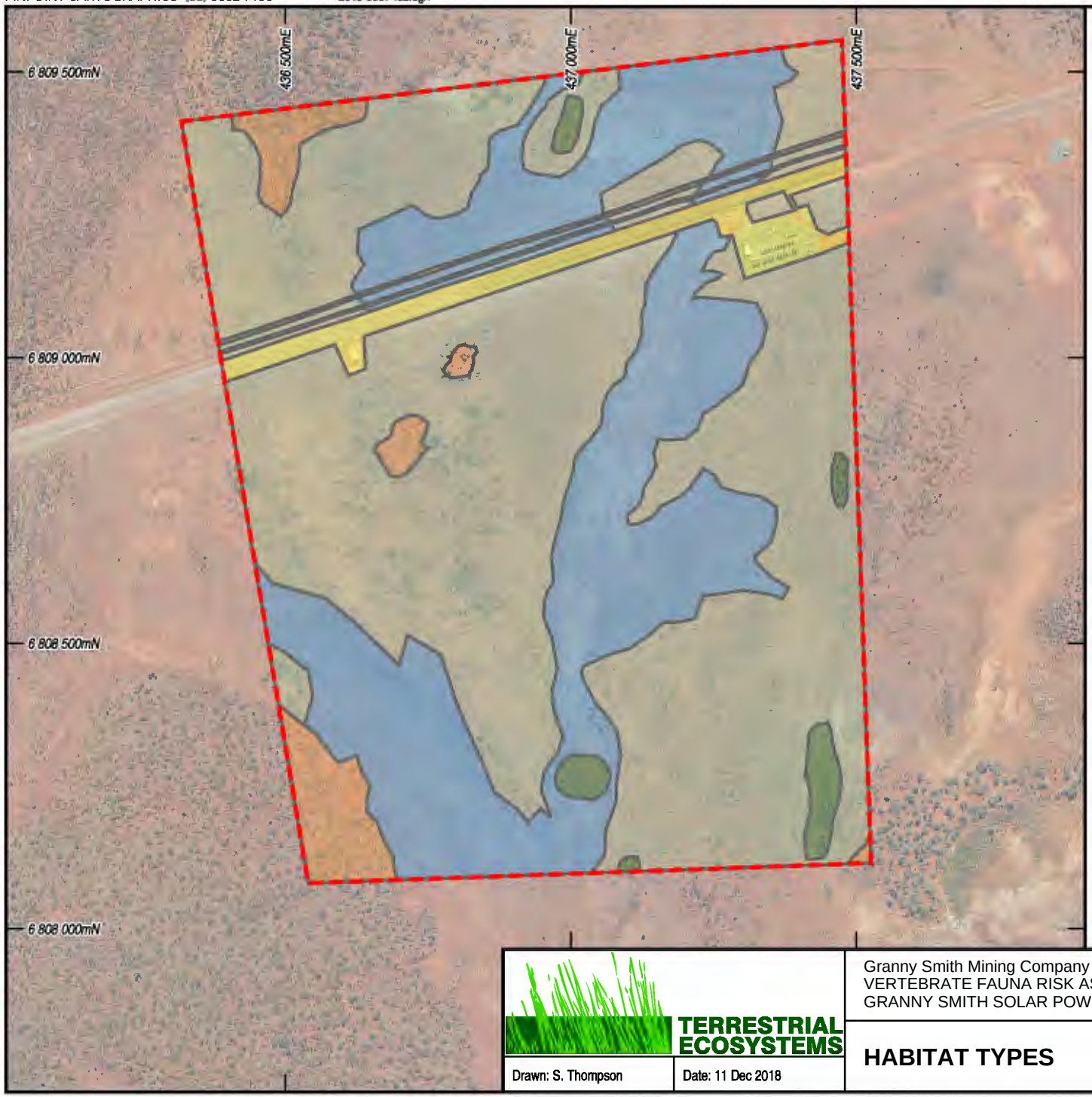

N

0 100 200 300 400 500m

SCALE 1 : 10 000 at A4 (MGA)

Legend

Site Boundary

Habitat Types

- Open mulga woodland over scattered low shrubs and grasses of varying densities on a stony sandy-clay or sandy-clay substrate
- Open chenopod shrubland over grasses of varying densities on a stony sandy-clay or sandy-clay substrate
- Chenopod and mulga shrubland over scattered grasses of varying densities on a stony sandy-clay or sandy-clay substrate
- Banded ironstone rocky ridgeline with scattered Mulga and shrubs
- Existing disturbance

TERRESTRIAL ECOSYSTEMS

Drawn: S. Thompson | Date: 11 Dec 2018

Granny Smith Mining Company Pty Ltd
VERTEBRATE FAUNA RISK ASSESSMENT FOR THE
GRANNY SMITH SOLAR POWER FARM PROJECT

HABITAT TYPES

Figure 2

Job: 2018-0057

Appendix A
Results of the *EPBC Act* Protected Matters Search

Vertebrate Fauna Assessment – Granny Smith Solar Power Farm Project

Australian Government

Department of the Environment and Energy

EPBC Act Protected Matters Report

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

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

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

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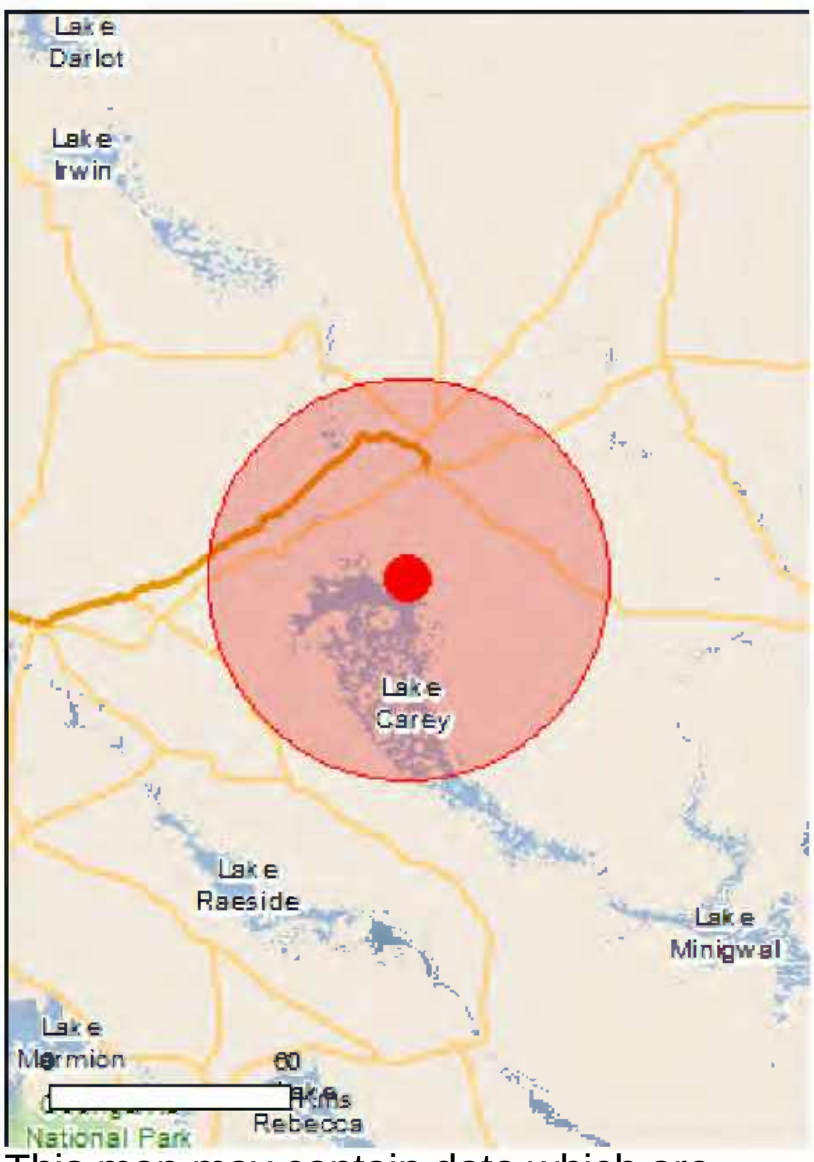

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

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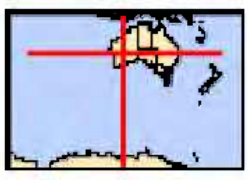

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	4
Listed Migratory Species:	8

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	11
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	13
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Chrysococcyx osculans		
Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Mammals		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Plants		
Carrichtera annua Ward's Weed [9511]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-28.84252 122.3578

Acknowledgements

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

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

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

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

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Appendix B
Vertebrate Fauna Recorded in Biological Surveys in the Region

Vertebrate Fauna Assessment – Granny Smith Solar Power Farm Project

Appendix B(1) Vertebrate Fauna Recorded in Biological Surveys in the Region

		Surveys	A																								B										
Family	**Species**	**Common Name**	**Site 1E**	**Site 1W**	**Site SS18**	**Site SS21**	**Site SS1**	**Site 1W08**	**Site LL4**	**Site LL5**	**Site SS19**	**Site SS20**	**Site LL3**	**Site LL6**	**Site SS22**	**Site LL1**	**Site LL2**	**Site SS23**	**Site 2**	**Site 3**	**Site 6**	**Site 7**	**Site 8**	**Site 1**	**Site 4**	**Site 5**	**Pundin**	**Wells**	**Site 2**	**Site 10**	**Site 21**	**Site 18**	**Site 21a**	**Site 9**	**Weebo**	**Site 17**	**Opportunistic**
Frogs																																					
Hylidae	*Cyclorana maini*	Sheep Frog	4	1	2	1																					1	2	4	1	2						
Limnodynastidae	*Neobatrachus kunapalari*	Kunapalari Frog	6	5	7		1	2	1	2	1	4																			1						
	Neobatrachus wilsmorei	Goldfields Bullfrog																												1	8	5	2				
	Platyplectrum spenceri	Spencer's Burrowing Frog																										3		6							
Reptiles																																					
Agamidae	*Ctenophorus caudicinctus*	Ring-tailed Dragon		2			3																				8										
	Ctenophorus fordi	Mallee Dragon	5																											14			19				
	Ctenophorus inermis	Military Dragon	2	6		1					1	1	1															5	1	2			2		1		
	Ctenophorus isolepis	Crested Dragon	7	2		3		1	4					1	3																	4				1	
	Ctenophorus reticulatus	Western Netted Dragon	2	2							2																										
	Ctenophorus salinarum	Saltpan Dragon	3	1												1	5										1							6			
	Ctenophorus scutulatus	Lozenge-marked Dragon	1										1																								
	Diporiphora amphiboluroides	Mulga Dragon		1			1																														
	Moloch horridus	Thorny Devil	3												1															1	1	2	1				
	Pogona minor	Dwarf Bearded Dragon	2	2					2	1			1																2	1							
Carphodactylidae	*Nephrurus vertebralis*	Midline Knob-tail																											1								
	Underwoodisaurus milii	Barking Gecko	1																																		
Diplodactylidae	*Diplodactylus pulcher*	Fine-faced Gecko			1	2																					2										
	Lucasium squarrosum	Mottled Ground Gecko	1													1																		18			
	Strophurus elderi	Jewelled Gecko											1																			1	10				
	Strophurus strophurus	Western Spiny-tailed Gecko	1					1																													
	Strophurus wellingtonae	Shield Spiny-tailed Gecko	1	1	1	1	1																														
Elapidae	*Brachyurophis semifasciata*	Half-girdlerd Snake																											1		1						
	Furina ornata	Orange-naped Snake	2																																		
	Pseudechis australis	Mulga Snake	1																																		
	Pseudonaja mengdeni	Gwardar		1																											1						
	Pseudonaja modesta	Ringed Brown Snake																														1					
	Simoselaps bertholdi	Jan's Banded Snake	1																																		
Gekkonidae	*Gehyra purpurascens*	Purplish Dtella	1							1																		10								3	
	Gehyra variegata	Tree Dtella	2 5	2		1	8			1			1			1											5	7	3		3	2	1	3		1	
	Heteronotia binoei	Bynoe's Prickly Gecko	5	2			2																					3	1			1					
	Rhynchoedura ornata	Western Beaked Gecko	2	1			4																						2	2	6	3				1	
Pygopodidae	*Delma butleri*	Unbanded Delma			1				1																							1	1				
	Delma nasuta	Sharp-snouted Delma							1				1	3	1			1																			

		Surveys	A																								B										
Family	Species	Common Name	Site 1E	Site 1W	Site SS18	Site SS21	Site SS1	Site 1W08	Site LL4	Site LL5	Site SS19	Site SS20	Site LL3	Site LL6	Site SS22	Site LL1	Site LL2	Site SS23	Site 2	Site 3	Site 6	Site 7	Site 8	Site 1	Site 4	Site 5	Pundin	Wells	Site 2	Site 10	Site 21	Site 18	Site 21a	Site 9	Weebo	Site 17	Opportunistic
	Lialis burtonis	Burton's Snake-lizard	1																												1	2	1			1	
	Pygopus nigriceps	Western Hooded Scaly-foot																														1					
Scincidae	*Cryptoblepharus buchananii*	Buchanan's Snake-eyed Skink	3													1																					
	Ctenotus ariadnae	Ariadna's Ctenotus				4																															
	Ctenotus atlas	Southern Mallee Ctenotus																												1							
	Ctenotus calurus	Blue-tailed Finesnout Ctenotus				1																															
	Ctenotus grandis	Grand Ctenotus		1																												1				1	
	Ctenotus greeri	Spotted-necked Ctenotus							2																												
	Ctenotus helenae	Clay-soil Ctenotus	3	1		2			3																					6		4	1				
	Ctenotus leonhardii	Leonhardi's Ctenotus		2	5	1					2																2		1	5	16	1	1	2			
	Ctenotus pantherinus	Leopard Skink						1	6				1					1																			
	Ctenotus quattuordecimlineatus	Fourteen-lined Ctenotus						2							1															1		5					
	Ctenotus schevilli	Scheville's Ctenotus						2							1																						
	Ctenotus schomburgkii	Schomburgk's Ctenotus							3																						3						
	Egernia depressa	Pygmy Spiny-tailed Skink		1	6	2			3		3	1																2									
	Egernia formosa	Goldfields Crevice-skink		2								1																							2		
	Eremiascincus richardsonii	Broad-banded Sand Swimmer					2																														
	Lerista bipes	North-western Sandslider					1																														
	Lerista desertorum	Central Desert Robust Slider	1							1		1	1			1												4	2				2			5	
	Lerista sp.		4								1	1				1	1										1	4	2					2		1	
	Liopholis inornata	Desert Skink																													1	1					
	Liopholis striata	Nocturnal Desert Skink																													1						
	Menetia greyii	Common Dwarf Skink	2										1			1																	1				
	Morethia butleri	Woodland Morethia Skink	2	3	1		3																												1		
	Tiliqua multifasciata	Centralian Blue-tongued Lizard		2																																	
	Tiliqua occipitalis	Western Blue-tongued Lizard	2			1																															
Typhlopidae	*Anilios hamatus*	Pale-headed Blind Snake					1						1																	1	1	1	1	2			
	Anilios waitii	Waite's Blind Snake																												2							
Varanidae	*Varanus brevicauda*	Short-tailed Pygmy Monitor							1								1																				
	Varanus caudolineatus	Stripe-tailed Monitor	1		2					1		3																			2		1				
	Varanus eremius	Pygmy Desert Monitor																														4					
	Varanus giganteus	Perentie																										1									
	Varanus gouldii	Gould's Goanna	1																											1	1						
	Varanus panoptes	Yellow-spotted Monitor					1																					1									
	Varanus tristis	Black-headed Monitor																											1								
Cheluidae	*Chelodina steindachneri*	Steindachner's Turtle																											1								

		Surveys	A																								B										
Family	Species	Common Name	Site 1E	Site 1W	Site SS18	Site SS21	Site SS1	Site 1W08	Site LL4	Site LL5	Site SS19	Site SS20	Site LL3	Site LL6	Site SS22	Site LL1	Site LL2	Site SS23	Site 2	Site 3	Site 6	Site 7	Site 8	Site 1	Site 4	Site 5	Pundin	Wells	Site 2	Site 10	Site 21	Site 18	Site 21a	Site 9	Weebo	Site 17	Opportunistic
Birds																																					
Casuariidae	*Dromaius novaehollandiae*	Emu				1						2				1																				1
Anatidae	*Tadorna tadornoides*	Australian Shelduck	1	1																								1	1				7			
	Chenonetta jubata	Australian Wood Duck	1																									37								
	Malacorhynchus membranaceus	Pink-eared Duck	1																																	
	Anas gracilis	Grey Teal	1	1																								41								
	Anas superciliosa	Pacific Black Duck	1																																	
Podicipedidae	*Poliocephalus poliocephalus*	Hoary-headed Grebe	1																									2								
Columbidae	*Phaps chalcoptera*	Common Bronzewing					3			4																					4					54
	Phaps histrionica	Flock Bronzewing																										22		38	21				33	1
	Ocyphaps lophotes	Crested Pigeon		11	5		17		5	4	2					2																				
	Geopelia cuneata	Diamond Dove								8																										
Podargidae	*Podargus strigoides*	Tawny Frogmouth	1																											2					
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar																											1	2						
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar	1								1																			7	2				1	1
Otididae	*Ardeotis australis*	Australian Bustard	1																																	
Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant	1																																	
Ardeidae	*Ardea pacifica*	White-necked Heron	1	1																																1
	Egretta novaehollandiae	White-faced Heron	1																									1								1
Accipitridae	*Haliastur sphenurus*	Whistling Kite																										6	1							
	Accipiter cirrocephalus	Collared Sparrowhawk					2																					5								
	Circus assimilis	Spotted Harrier	1																																	
	Aquila audax	Wedge-tailed Eagle					2						4			8	3											1			1					1
	Hieraaetus morphnoides	Little Eagle	1																									3								
Falconidae	*Falco cenchroides*	Nankeen Kestrel				3	3			1	1	2				1	2												1				1		1	
	Falco berigora	Brown Falcon			4		2				3		1																				1			
	Falco longipennis	Australian Hobby	1																									2								
	Falco peregrinus	Peregrine Falcon																										1								
Rallidae	*Tribonyx ventralis*	Black-tailed Native-hen	1																																	
	Fulica atra	Eurasian Coot	1																																	
Burhinidae	*Burhinus grallarius*	Bush Stone-curlew		1																																
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	1																																	
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover	1																																	
	Elseyornis melanops	Black-fronted Dotterel	1																																	
	Vanellus tricolor	Banded Lapwing	1				2																					1								1
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	1																																	

		Surveys	A																										B										
Family	Species	Common Name	Site 1E	Site 1W	Site SS18	Site SS21	Site SS1	Site 1W08	Site LL4	Site LL5	Site SS19	Site SS20	Site LL3	Site LL6	Site SS22	Site LL1	Site LL2	Site SS23	Site 2	Site 3	Site 6	Site 7	Site 8	Site 1	Site 4	Site 5	Pundin	Wells	Site 2	Site 10	Site 21	Site 18	Site 21a	Site 9	Weebo	Site 17	Opportunistic
Turnicidae	*Turnix velox*	Little Button-quail																													1		1				
Cacatuidae	*Eolophus roseicapillus*	Galah					124		26	4	19					10													1	1		9				1	1
	Nymphicus hollandicus	Cockatiel				21	4		15	12						20													9	1	1	1		1			1
Psittacidae	*Barnardius zonarius*	Australian Ringneck			2		5		3	4	2	2	3			2													115		7	13				1	1
	Psephotus varius	Mulga Parrot				4				9																											1
	Melopsittacus undulatus	Budgerigar			16	18	5		6	9	5	29	6			5	8												1	1	1	1	1	1		1	1
	Neopsephotus bourkii	Bourke's Parrot			2		3			6																					9						1
Cuculidae	*Chalcites basalis*	Horsfield's Bronze-cuckoo			2	3	1			1																			1	5		1		5			1
	Heteroscenes pallidus	Pallid Cuckoo	1			1					1																		1		3						2
Halcyonidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher	1			1																															1
Climacteridae	*Climacteris affinis*	White-browed Treecreeper	1		9																										3	13				2	
Ptilonorhynchidae	*Ptilonorhynchus maculatus*	Spotted Bowerbird					2																								4					4	1
Maluridae	*Malurus leucopterus*	White-winged Fairy-wren										2	69				57													143				142			1
	Malurus lamberti	Variegated Fairy-wren								2																											
Acanthizidae	*Smicrornis brevirostris*	Weebill					10		8	6																			350			5				71	
	Gerygone fusca	Western Gerygone																											17							1	
	Acanthiza robustirostris	Slaty-backed Thornbill					10																														
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill			11		1			3																			30		2	1					1
	Acanthiza uropygialis	Chestnut-rumped Thornbill		1	40	22	19		3	20	8		3																		37					2	1
	Acanthiza apicalis	Inland Thornbill								8																					2						
	Aphelocephala leucopsis	Southern Whiteface			17		2			9	12																										
Pardalotidae	*Pardalotus striatus*	Striated Pardalote		1												2													188			1				4	
Meliphagidae	*Certhionyx variegatus*	Pied Honeyeater			1	3			2	4	1	1																			23	7				20	1
	Gavicalis virescens	Singing Honeyeater			4	4	3			20	1	13	1																1	1		2				6	1
	Lichenostomus penicillatus	White-plumed Honeyeater		1																																	
	Purnella albifrons	White-fronted Honeyeater			2	8	2		33	17		6	40			81	99													1	3	3				2	
	Manorina flavigula	Yellow-throated Miner																											216		9	17				32	1
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater			34	1	11		5	32	2	1	12																1		24	8				23	
	Epthianura tricolor	Crimson Chat				3				11	28	55	43			20														1	47	4		44		1	1
	Epthianura aurifrons	Orange Chat																												8				14			
	Sugomel niger	Black Honeyeater	1																																		
	Lichmera indistincta	Brown Honeyeater		1						1																											
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler					34			22		2																			4						
Psophodidae	*Cinclosoma cinnamomeum*	Cinnamon Quail-thrush					1					2																									
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella				12																															
Campephagidae	*Coracina maxima*	Ground Cuckoo-shrike															3																				1

		Surveys	A																								B										
Family	Species	Common Name	Site 1E	Site 1W	Site SS18	Site SS21	Site SS1	Site 1W08	Site LL4	Site LL5	Site SS19	Site SS20	Site LL3	Site LL6	Site SS22	Site LL1	Site LL2	Site SS23	Site 2	Site 3	Site 6	Site 7	Site 8	Site 1	Site 4	Site 5	Pundin	Wells	Site 2	Site 10	Site 21	Site 18	Site 21a	Site 9	Weebo	Site 17	Opportunistic
	Coracina novaehollandiae	Black-faced Cuckoo-shrike			1	1							1			2	2												20		12	1				9	1
	Lalage tricolor	White-winged Triller			2	7				1	1	7	11																								
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler			7	11	1		1	18																			7		12	2	2			6	
	Colluricincla harmonica	Grey Shrike-thrush				1	4			1		1																									
	Oreoica gutturalis	Crested Bellbird			3	8	6		2	18	7	1	17																		15	6				7	
Artamidae	*Artamus personatus*	Masked Woodswallow			99	21	43			1		119																		1	2			20		10	
	Artamus superciliosus	White-browed Woodswallow		1																																	
	Artamus cinereus	Black-faced Woodswallow			3	5			1	1	16	9	23			43	1												1	8	37	27		5		18	1
	Cracticus torquatus	Grey Butcherbird							1																				2		1	6		2		1	1
	Cracticus nigrogularis	Pied Butcherbird			1		5		1	3			15			5	2												55	1		2		3		28	1
	Gymnorhina tibicen	Australian Magpie	1																										31								1
	Strepera versicolor	Grey Currawong	1				1																														
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail			1	7	4		1	7	2	1	3			2														5	2	2			2	1
Corvidae	*Corvus bennetti*	Little Crow			7		2										10												231	15	48	14		34		46	1
	Corvus orru	Torresian Crow																											1			1		1			
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	1																										17								1
Petroicidae	*Microeca fascinans*	Jacky Winter								3			1																								
	Petroica goodenovii	Red-capped Robin			18	8	11			33	2		12																4	4	22	7		1		4	
	Melanodryas cucullata	Hooded Robin			3	4	3			5	9	6	3																	1	7					4	
Megaluridae	*Cincloramphus mathewsi*	Rufous Songlark	1									1																									
	Cincloramphus cruralis	Brown Songlark	1									1																		23				18			1
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow	1																																		
	Petrochelidon nigricans	Tree Martin	1																																		1
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird				3	1		4	7																			1		1	4				1	
Estrildidae	*Taeniopygia guttata*	Zebra Finch			12		99			22	2	4																	27		16	8		8		6	1
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit			1					2	1	7	5				4													9				43			1
Mammals																																					
Bovidae	*Bos taurus*	Cow		4																								1						1			
	Capra hircus	Goat																									1	1	1	1	1	1	1	1			
	Ovis aries	Sheep		10																							1	1	1	1	1	1	1	1		1	
Camelidae	*Camelus dromedarius*	Dromedary	1		1						1					1																					
Felidae	*Felis catus*	House Cat	2																													1		1			
Molossidae	*Austronomus australis*	White-striped Free-tail Bat																	1	1	1	1	1														
	Ozimops planiceps	Southern Free-tail Bat	2	3															1		1	1		1													
Pteropodidae	*Syconycteris australis*	Common Blossom-bat	2	9																																	
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	5	14			1				1								1	1	1		1	1	1	1	2			5					1		

		Surveys	A																								B									
Family	Species	Common Name	Site 1E	Site 1W	Site SS18	Site SS21	Site SS1	Site 1W08	Site LL4	Site LL5	Site SS19	Site SS20	Site LL3	Site LL6	Site SS22	Site LL1	Site LL2	Site SS23	Site 2	Site 3	Site 6	Site 7	Site 8	Site 1	Site 4	Site 5	Pundin	Wells	Site 2	Site 10	Site 21	Site 18	Site 21a	Site 9	Weebo	Site 17	Opportunistic
	Nyctophilus geoffroyi	Lesser Long-eared Bat	5	13						4									1	1	1		1	1			2 8			4							
	Scotorepens balstoni	Inland Broad-nosed Bat	6	21			1												1	1	1		1	1	1	1											
	Scotorepens greyii	Little Broad-nosed Bat																									1 0										
	Vespadelus finlaysoni	Finlayson's Cave Bat		3			1													1	1				1												
	Vespadelus regulus	Southern Forest Bat																									2										
Dasyuridae	*Antechinomys laniger*	Kultarr		2	6	3					2	3																						1			
	Ningaui ridei	Wongai Ningaui		1	2	3	1		5		1	1		1	7															7	2	8	2	4			
	Pseudantechinus woolleyae	Woolley's False Antechinus					1																														
	Sminthopsis crassicaudata	Fat-tailed Dunnart											1			4	7													3							
	Sminthopsis dolichura	Little Long-tailed Dunnart																											1			1					
	Sminthopsis hirtipes	Hairy-footed Dunnart												2	8			1												1			1				
	Sminthopsis macroura	Stripe-faced Dunnart			10					3	7	10	2				1														2			1			
	Sminthopsis ooldea	Ooldea Dunnart				2	2		2		2		1			1													1		2						
Macropodidae	*Osphranter robustus*	Euro	3	12	1		7				1	1			1												1	1			1	1		1			
	Osphranter rufus	Red Kangaroo	3 8	24	4					1	1	1	2		1	4											1	1			1	1		1	1	1	
Leporidae	*Oryctolagus cuniculus*	European Rabbit	3													1													1							
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna	1				1																														
Equidae	*Equus caballus*	Domestic Horse									1																										
Muridae	*Mus musculus*	House Mouse							2	3		1	3			3	8												2	3				2			
	Notomys alexis	Spinifex Hopping Mouse				1		1			3			1	9			2													1	1					
	Pseudomys hermannsburgensis	Sandy Inland Mouse	1	1	5	6	2		8	1	14	9	6	1	2	1														7	3		3			7	

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Appendix B (2) Vertebrate Fauna Recorded in Biological Surveys in the Region

		Surveys	A										B															C					
Family	Species	Common Name	MME1	MME2	MME3	MME4	MME5	MME6	MME7	MME8	MME9	Opportunistic	Site 11	Site 11a	Site 14	Site 14a	Site 14b	Site 17a	Site 19	Site 1a	Site 20a	Site 21	Site 21a	Site 5a	Site 8	Site 9	Site 9a	CM001	CM002	CM003	CM004	CM005	Opportunistic
Frogs																																		
Hylidae	*Cyclorana maini*	Sheep Frog										1																						
Limnodynastidae	*Neobatrachus sutor*	Shoemaker Frog	1	1																						5	10							
	Neobatrachus wilsmorei	Goldfields Bullfrog																				2				11					3			
	Platyplectrum spenceri	Spencer's Burrowing Frog														8																		
Myobatrachidae	*Pseudophryne occidentalis*	Orange-crowned Toadlet																						2										
Reptiles																																		
Agamidae	*Ctenophorus caudicinctus*	Ring-tailed Dragon																		12														
	Ctenophorus fordi	Mallee Dragon																				2												
	Ctenophorus inermis	Military Dragon																1																
	Ctenophorus isolepis	Crested Dragon	1																															
	Ctenophorus reticulatus	Western Netted Dragon		1	1		1		3	1		1			2	1		2			4		4	13		2	1							
	Ctenophorus salinarum	Saltpan Dragon											5	1										1	2									
	Ctenophorus vadnappa	Red-barred Dragon																			1	7	2			2	1							
	Moloch horridus	Thorny Devil																						1			1							
	Pogona minor	Dwarf Bearded Dragon									1		2	1	1				2			2	1		2	2								
	Tympanocryptis cephalus	Pebble Dragon												1																	1			
Carphodactylidae	*Nephrurus vertebralis*	Midline Knob-tail											1												2						2			
	Underwoodisaurus milii	Barking Gecko						2										9						2										
Diplodactylidae	*Diplodactylus granariensis*	Wheat-belt Stone Gecko																				2	1						7					
	Diplodactylus pulcher	Fine-faced Gecko						1								4		3	1					3					2	1		1		
	Lucasium maini	Main's Ground Gecko																				1												
	Lucasium squarrosum	Mottled Ground Gecko											1	3		1		3			2								6	3		2		
	Strophurus assimilis	Goldfields Spiny-tailed Gecko																											1			1		
	Strophurus ciliaris	Spiny-tailed Gecko														2		1			1			2										
	Strophurus strophurus	Western Spiny-tailed Gecko																							7						4			
	Strophurus wellingtonae	Western Shield Spiny-tailed Gecko		1																											1			
Elapidae	*Brachyurophis fasciolata*	Narrow-banded Burrowing Snake																			1													
	Parasuta monachus	Monk Snake										1				1		3											1		1			
	Pseudechis butleri	Spotted Mulga Snake										1																						
	Simoselaps bertholdi	Jan's Banded Snake																	1															
	Suta fasciata	Rosen's Snake																						2										
Gekkonidae	*Gehyra variegata*	Tree Dtella	3	9	3	16	3	9	2		3	1						15	1	1	1		2	15	1			1		5	2			
	Heteronotia binoei	Bynoe's Prickly Gecko		3		1						1						34					2	7							1	1		
	Rhynchoedura ornata	Western Beaked Gecko																				1			2	1					1			
Pygopodidae	*Pygopus nigriceps*	Western Hooded Scaly-foot																1			1	1												
Scincidae	*Cryptoblepharus buchananii*	Buchanan's Snake-eyed Skink		2								1				1						1	1											
	Ctenotus calurus	Blue-tailed Finesnout Ctenotus																	1															
	Ctenotus greeri	Spotted-necked Ctenotus																	12															
	Ctenotus helenae	Clay-soil Ctenotus																	1															
	Ctenotus leonhardii	Leonhardi's Ctenotus			1								5	4											2	5	9							
	Ctenotus pantherinus	Leopard Skink																	4															

		Surveys	A										B															C					
Family	Species	Common Name	MME1	MME2	MME3	MME4	MME5	MME6	MME7	MME8	MME9	Opportunistic	Site 11	Site 11a	Site 14	Site 14a	Site 14b	Site 17a	Site 19	Site 1a	Site 20a	Site 21	Site 21a	Site 5a	Site 8	Site 9	Site 9a	CM001	CM002	CM003	CM004	CM005	Opportunistic
	Ctenotus quattuordecimlineatus	Fourteen-lined Ctenotus																	11														
	Ctenotus schomburgkii	Schomburgk's Ctenotus	1								2	1	3						11		2	3			15	1							
	Ctenotus severus	Stern Ctenotus																6		1													
	Ctenotus uber	Spotted Ctenotus														3		2			6	1	1										
	Egernia depressa	Pygmy Spiny-tailed Skink						1													4	2											
	Egernia formosa	Goldfields Crevice-skink																						3									
	Eremiascincus richardsonii	Broad-banded Sand Swimmer														1		1												1	1		
	Lerista desertorum	Central Desert Robust Slider						1			1	1						6	6		2										5		
	Lerista macropisthopus	Unpatterned Robust Slider																						2									
	Lerista muelleri	Wood Mulch-slider																											1		2		
	Lerista picturata	Southern Robust Slider																						2									
	Lerista sp.							2			1	1						9	1			1			5								
	Liopholis inornata	Desert Skink																				1	1										
	Liopholis striata	Nocturnal Desert Skink																			2												
	Menetia greyii	Common Dwarf Skink	4								1	1										1		4		1					2		
	Morethia butleri	Woodland Morethia Skink		2		4	2	3	1	1	1	1			2			6					2	4									
Typhlopidae	*Anilios hamatus*	Pale-headed Blind Snake														1									1								
	Anilios margaretae	Buff-snouted Blind Snake																															
	Anilios waitii	Waite's Blind Snake														2									1								
Varanidae	*Varanus caudolineatus*	Stripe-tailed Monitor		1				1								1					6			2		1		1					
	Varanus giganteus	Perentie																						1									
	Varanus gouldii	Gould's Goanna																1				2	2	1		1	1						
	Varanus panoptes	Yellow-spotted Monitor						1			1	1	1			2					1								1	4	2		
Birds																																	
Casuariidae	*Dromaius novaehollandiae*	Emu	1	1				1		1	1	1		2		1	5		2				1	2		1				1			
Megapodiidae	*Leipoa ocellata*	Malleefowl										1																					
Phasianidae	*Coturnix pectoralis*	Stubble Quail															1																
Anatidae	*Cygnus atratus*	Black Swan										1																					
	Tadorna tadornoides	Australian Shelduck										1																					
	Malacorhynchus membranaceus	Pink-eared Duck										1																					
	Anas gracilis	Grey Teal										1																					
	Anas superciliosa	Pacific Black Duck										1																					
Columbidae	*Phaps chalcoptera*	Common Bronzewing										1											1		1								
	Ocyphaps lophotes	Crested Pigeon	2					2			3	1			1	5	2	11			7			6	9	6			2		1		
Podargidae	*Podargus strigoides*	Tawny Frogmouth									2										1												
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar																		2				2									
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar													3	3	2								1								
Otididae	*Ardeotis australis*	Australian Bustard												1		4																	
Ardeidae	*Ardea pacifica*	White-necked Heron										1																					
	Egretta novaehollandiae	White-faced Heron										1																					
Accipitridae	*Haliaeetus albicilla*	White-bellied Sea-eagle	1		2	1	1	1		1		1																					
	Accipiter fasciatus	Brown Goshawk																	3														
	Circus assimilis	Spotted Harrier															1					1											
	Aquila audax	Wedge-tailed Eagle													6	2		2							3				2				

		Surveys	A										B																C					
Family	Species	Common Name	MME1	MME2	MME3	MME4	MME5	MME6	MME7	MME8	MME9	Opportunistic	Site 11	Site 11a	Site 14	Site 14a	Site 14b	Site 17a	Site 19	Site 1a	Site 20a	Site 21	Site 21a	Site 5a	Site 8	Site 9	Site 9a	CM001	CM002	CM003	CM004	CM005	Opportunistic
	Hieraaetus morphnoides	Little Eagle		1															3		1													
Falconidae	*Falco cenchroides*	Nankeen Kestrel									1					5		2	3					4	2					1				
	Falco berigora	Brown Falcon									1					3	1	2	5		3				3					2				
	Falco longipennis	Australian Hobby			1						1														1									
	Falco peregrinus	Peregrine Falcon		1																														
Rallidae	*Tribonyx ventralis*	Black-tailed Native-hen										1																						
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt										1																						
ae	*Recurvirostra novaehollandiae*	Red-necked Avocet										1																						
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover										1																						
	Elseyornis melanops	Black-fronted Dotterel										1																						
	Vanellus tricolor	Banded Lapwing											9				4	4						1										
Turnicidae	*Turnix velox*	Little Button-quail															5				2													
Cacatuidae	*Eolophus roseicapillus*	Galah					15					1		1	44	908	8	2	5		7		62	7	4					3				
	Nymphicus hollandicus	Cockatiel												6		2	4		3				4		35							10		
Psittacidae	*Barnardius zonarius*	Australian Ringneck		1			4	3	2		2	1			25	31	36		16		3	3		1	9	10								
	Psephotus varius	Mulga Parrot			1			5	5			1					11		2		14	2				3								
	Melopsittacus undulatus	Budgerigar												20	11	9	15	2	29		17	38			170						6			
	Neopsephotus bourkii	Bourke's Parrot										1									4													
Cuculidae	*Chalcites basalis*	Horsfield's Bronze-cuckoo												3					3				2		1	1								
	Chalcites osculans	Black-eared Cuckoo																	1		2													
	Heteroscenes pallidus	Pallid Cuckoo										1			2				1		1	4			1					1				
Halcyonidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher															1	6			1													
Meropidae	*Merops ornatus*	Rainbow Bee-eater																	3		3													
Climacteridae	*Climacteris affinis*	White-browed Treecreeper							2			1									4	1	1											
Maluridae	*Malurus splendens*	Splendid Fairy-wren							9			1																						
	Malurus leucopterus	White-winged Fairy-wren	3								8		3	76		1	2								40	17								
Acanthizidae	*Pyrrholaemus brunneus*	Redthroat				1						1					2					2	1		2									
	Smicrornis brevirostris	Weebill					10					1							98		7	2	2											
	Acanthiza robustirostris	Slaty-backed Thornbill							2			1							3		6													
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill	5	6		6	17	2	4			1							4		8				9	4								
	Acanthiza uropygialis	Chestnut-rumped Thornbill	8	30	2	10	14	15	50			1				3	5		88		126		10	3	53	27								
	Acanthiza apicalis	Inland Thornbill	2					2	6			1							3		2	1	2											
	Aphelocephala leucopsis	Southern Whiteface				4		6	20			1					8		5		52		12		4									
Pardalotidae	*Pardalotus striatus*	Striated Pardalote					3					1					1		2															
Meliphagidae	*Certhionyx variegatus*	Pied Honeyeater												2	2																			
	Gavicalis virescens	Singing Honeyeater		4	2		1	1	1	1	1	1		3	11		3	2	2		3			1	8	4			7	6	2			
	Lichenostomus plumulus	Grey-fronted Honeyeater					7								56				3		2													
	Purnella albifrons	White-fronted Honeyeater	80	100	12	40	8	1	10	6	6	1		1	3		1		4			7	6		2	16								
	Manorina flavigula	Yellow-throated Miner	10	5	7		2	10		2	2	1			10	15	98	1	13		41	3			21	109				1	12		6	
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater	25	20		1	6	2	1	1	2	1			11	2	2	5	8		10	6	4	2	9	7				1	2			
	Anthochaera carunculata	Red Wattlebird									3								2		3					1								
	Conopophila whitei	Grey Honeyeater															18						17			1								
	Epthianura tricolor	Crimson Chat												18	154	24		6			29				75									
	Epthianura aurifrons	Orange Chat												5																				

		Surveys	A										B																C					
Family	**Species**	**Common Name**	**MME1**	**MME2**	**MME3**	**MME4**	**MME5**	**MME6**	**MME7**	**MME8**	**MME9**	**Opportunistic**	**Site 11**	**Site 11a**	**Site 14**	**Site 14a**	**Site 14b**	**Site 17a**	**Site 19**	**Site 1a**	**Site 20a**	**Site 21**	**Site 21a**	**Site 5a**	**Site 8**	**Site 9**	**Site 9a**	**CM001**	**CM002**	**CM003**	**CM004**	**CM005**	**Opportunistic**
Pomatostomidae	*Pomatostomus temporalis*	Grey-crowned Babbler																												12		
	Pomatostomus superciliosus	White-browed Babbler										1					3						3	2									
Psophodidae	*Cinclosoma castaneothorax*	Chestnut-breasted Quail-thrush												2							3									1			
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella															2		6														
Campephagidae	*Coracina maxima*	Ground Cuckoo-shrike												4		31	2	3															
	Coracina novaehollandiae	Black-faced Cuckoo-shrike		2		1						1			4	5	6	1	9		10				7	3			1				
	Lalage tricolor	White-winged Triller														3	9				34		6		39	2							
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler					1	1	1	1		1							8				1										
	Colluricincla harmonica	Grey Shrike-thrush						1	2			1							5				1										
	Oreoica gutturalis	Crested Bellbird	1	3	1	2	1	1	2			1		3	14	5	1		15	2	10		2		6	2			4				
Artamidae	*Artamus personatus*	Masked Woodswallow												2	2		31		2		72												
	Artamus superciliosus	White-browed Woodswallow			4		1	1				1									3												
	Artamus cinereus	Black-faced Woodswallow												7	55	25	6	11			1		1		12				9	2			6
	Cracticus torquatus	Grey Butcherbird	1	1	1		2	1	1		2	1			2	4	7		8		8				4	1			1	1	3		
	Cracticus nigrogularis	Pied Butcherbird	2	1	1						1	1			6	23	1		4	1			2	4	13	14				2	2		
	Gymnorhina tibicen	Australian Magpie	3								3	1				3		9			1					5			1	5		2	
	Strepera versicolor	Grey Currawong			1											2	3		2				1			4							
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail							1																								
	Rhipidura leucophrys	Willie Wagtail	1									1				2	2	1							12	1			1				1
Corvidae	*Corvus bennetti*	Little Crow		2			6		1			1		11	29	50	21	12	24		6			7	36	149				7	4		
	Corvus orru	Torresian Crow		1	2		1	1		2		1		2			2														2		
Monarchidae	*Grallina cyanoleuca*	Magpie-lark		1	2			2			2	1				12	7	2							3								
Petroicidae	*Microeca fascinans*	Jacky Winter														1			22		1												
	Petroica goodenovii	Red-capped Robin	1	2		1		2	6			1			1	5	3	1	29	3	47		4	3	3	4					1		
	Melanodryas cucullata	Hooded Robin			3							1		1	2	1					1		1		2				2				
Megaluridae	*Cincloramphus mathewsi*	Rufous Songlark															3						2										
	Cincloramphus cruralis	Brown Songlark											7	7	3	7		8			1												
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow			2							1						2															
	Hirundo rustica	Barn Swallow						5																									
	Petrochelidon ariel	Fairy Martin																											6				
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird															4					1			5	4							
Estrildidae	*Taeniopygia guttata*	Zebra Finch										1		9	12		4		5						36				6				
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit			4							1	7	18		16	1	36								2			4	1			
Mammals																																	
Bovidae	*Capra hircus*	Goat										1			1	1			1					1									
	Ovis aries	Sheep														1			1		1	1				1	1						
Camelidae	*Camelus dromedarius*	Dromedary											1																				
Canidae	*Canis familiaris*	Dog											1																				
	Canis lupus	Dingo										1																					
	Vulpes vulpes	Red Fox										1							1		1		1	1									
Felidae	*Felis catus*	House Cat											1																				
Molossidae	*Austronomus australis*	White-striped Free-tail Bat																						1									
	Ozimops planiceps	Southern Free-tail Bat																						1									
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat														1								3									

		Surveys	A										B															C					
Family	**Species**	**Common Name**	**MME1**	**MME2**	**MME3**	**MME4**	**MME5**	**MME6**	**MME7**	**MME8**	**MME9**	**Opportunistic**	**Site 11**	**Site 11a**	**Site 14**	**Site 14a**	**Site 14b**	**Site 17a**	**Site 19**	**Site 1a**	**Site 20a**	**Site 21**	**Site 21a**	**Site 5a**	**Site 8**	**Site 9**	**Site 9a**	**CM001**	**CM002**	**CM003**	**CM004**	**CM005**	**Opportunistic**
	Nyctophilus geoffroyi	Lesser Long-eared Bat														4		9						3										
	Scotorepens balstoni	Inland Broad-nosed Bat														6								1										
Dasyuridae	*Ningaui ridei*	Wongai Ningaui																	5															
	Sminthopsis crassicaudata	Fat-tailed Dunnart	1		1								5								7			1			1							
	Sminthopsis fuliginosus	Grey-bellied Dunnart																																
	Sminthopsis dolichura	Little Long-tailed Dunnart											1			2			1		1	1		1	2									
	Sminthopsis macroura	Stripe-faced Dunnart																											2		2			
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo										1												1	1									
	Osphranter robustus	Euro				1						1						1	1		1	1		1	1									
Leporidae	*Oryctolagus cuniculus*	European Rabbit				1						1	1					1						2	1					1				
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna		1								1																		1	3	1	
Equidae	*Equus asinus*	Donkey										1																						
Muridae	*Mus musculus*	House Mouse	1	2	2	1	2	2					2					1	3					2										
	Notomys alexis	Spinifex Hopping Mouse	7						2													2			1									
	Notomys mitchellii	Mitchell's Hopping Mouse																				1												
	Pseudomys bolami	Bolam's Mouse																					3											
	Pseudomys hermannsburgensis	Sandy Inland Mouse						1			4		1			1			7		2				1									

A Ninox Wildlife Consulting (1998) *A Vertebrate Fauna Survey of the Murrin Murrin Expansion Project*. Unpublished report for Anaconda Nickel Ltd, Perth.

B Dell, J. and How, R. A. (1988) Vertebrate fauna. In: The biological survey of the Eastern Goldfields of Western Australia, Part 5, Edjudina - Menzies Study Area. *Records of the Western Australian Museum*, Supplement No 31, 38-77.

C Biota Environmental Sciences (2004) *Cosmos Nickel Mine Extension Fauna Survey*. Unpublished report for Sir Samuel Mines NL and URS, Perth.

Appendix B(3) Vertebrate Fauna Recorded in Biological Surveys in the Region

		Surveys	A															B	C																					
Family	Species	Common Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Opportunistic	Granny Deeps birds	Agnew Gold	BKBO1	BKBO4	BKBO5	BKBO7	BKBO9	BKBS04	BKBO2	BKBO3	BKBO12	BKBO8	BKBO6	BKBO10	BKBO11	BKBS01	BKBHarp01	BKBS03
Frogs																																								
Hylidae	*Cyclorana maini*	Sheep Frog		1							11	5	1																											
	Cyclorana platycephala	Water-holding Frog		1	1						5	2		1	1																									
	Litoria rubella	Desert Tree Frog																1																						
Limnodynastidae	*Neobatrachus kunapalari*	Kunapalari Frog									1																													
	Neobatrachus sudelli	Sudell's Frog																	2	1	1	1	2																	
	Neobatrachus sutor	Shoemaker Frog	8	2	5	3	1			1	13	2		1																										
Reptiles																																								
Agamidae	*Ctenophorus caudicinctus*	Ring-tailed Dragon																1						1																
	Ctenophorus isolepis	Crested Dragon																1																						
	Ctenophorus reticulatus	Western Netted Dragon																							2	1														
	Ctenophorus scutulatus	Lozenge-marked Dragon																1									3												
	Diporiphora amphiboluroides	Mulga Dragon				2	1	1																															
	Pogona minor	Dwarf Bearded Dragon																1			1																		
	Tympanocryptis cephalus	Pebble Dragon				2	3	1		1																													
Carphodactylidae	*Nephrurus vertebralis*	Midline Knob-tail																	2				1		1														
Diplodactylidae	*Diplodactylus granariensis*	Wheat-belt Stone Gecko										1																1											
	Diplodactylus pulcher	Fine-faced Gecko	2			1	4	3	1			2	1		1					1	2				1	2		3	2										
	Strophurus assimilis	Goldfields Spiny-tailed Gecko																												1	1								
	Strophurus strophurus	Western Spiny-tailed Gecko																				1																	
	Strophurus wellingtonae	Shield Spiny-tailed Gecko	4	2											1															1									
Elapidae	*Parasuta monachus*	Monk Snake						1		1																													
	Suta fasciata	Rosen's Snake																					1																
Gekkonidae	*Gehyra variegata*	Tree Dtella		3	2	4		1		3		2	1	2				1																					
	Heteronotia binoei	Bynoe's Prickly Gecko	2				1					1	2	1	5			1																					
	Rhynchoedura ornata	Western Beaked Gecko	3					2			1								11	5		5	3				6	9	3	1								
Pygopodidae	*Pygopus nigriceps*	Western Hooded Scaly-foot																			1																	
Scincidae	*Ctenotus leonhardii*	Leonhardi's Ctenotus	2	2					1		5	9	7	16	27				2	3			1		4	4												
	Ctenotus schomburgkii	Schomburgk's Ctenotus																					2		1	2	4	2										
	Ctenotus severus	Stern Ctenotus																																					
	Ctenotus uber	Spotted Ctenotus																				2																	
	Egernia depressa	Pygmy Spiny-tailed Skink		1	1	2	2	3	9	6		1																											
	Eremiascincus richardsonii	Broad-banded Sand Swimmer				2									1																								
	Lerista bipes	North-western Sandslider																																					
	Lerista desertorum	Central Desert Robust Slider													2															1		1							
	Lerista distinguenda	Orange-tailed Slider													1																								
	Lerista sp.																							2	1	1	1												
	Menetia greyii	Common Dwarf Skink											1											1																
	Morethia butleri	Woodland Morethia Skink		1		1		2			6	1		3																								

		Surveys	A															B	C																			
Family	Species	Common Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Opportunistic	Granny Deeps birds	Agnew Gold	BKBO1	BKBO4	BKBO5	BKBO7	BKBO9	BKBS04	BKBO2	BKBO3	BKBO12	BKBO8	BKBO6	BKBO10	BKBO11	BKBS01	BKBHarp01	BKBS03
	Tiliqua multifasciata	Centralian Blue-tongued Lizard	1																																			
Typhlopidae	*Anilios australis*	Austral Blind Snake								1	1																											
	Anilios bicolor	Dark-spined Blind Snake			1																																	
	Anilios waitii	Waite's Blind Snake																													1							
Varanidae	*Varanus caudolineatus*	Stripe-tailed Monitor		2		1	3	1	1			1		2							1	3	1		1				1	3							
	Varanus gouldii	Gould's Goanna																1																			
	Varanus panoptes	Yellow-spotted Monitor	4		7		3	2	2			4	2		6							2						2		1							
Birds																																						
Casuariidae	*Dromaius novaehollandiae*	Emu														3		1				1															
Anatidae	*Biziura lobata*	Musk Duck														2																					
	Tadorna tadornoides	Australian Shelduck																1																			
	Chenonetta jubata	Australian Wood Duck														77		1																			
	Malacorhynchus membranaceus	Pink-eared Duck														5																					
	Anas gracilis	Grey Teal														74																					
	Anas superciliosa	Pacific Black Duck														13		1																			
	Aythya australis	Hardhead														2																					
Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe																1																			
	Poliocephalus poliocephalus	Hoary-headed Grebe														30		1																			
Columbidae	*Phaps chalcoptera*	Common Bronzewing																1																			
Columbidae	*Ocyphaps lophotes*	Crested Pigeon																1	6			2						9									
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar																1																			
Ardeidae	*Egretta novaehollandiae*	White-faced Heron														2																					
Accipitridae	*Elanus axillaris*	Black-shouldered Kite																1																			
	Haliastur sphenurus	Whistling Kite																							1												
	Accipiter fasciatus	Brown Goshawk																1																			
	Aquila audax	Wedge-tailed Eagle														2		1					3														
Falconidae	*Falco cenchroides*	Nankeen Kestrel														2		1					1						1								
	Falco berigora	Brown Falcon														1																					
Rallidae	*Fulica atra*	Eurasian Coot														21																					
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt														5																					
	Cladorhynchus leucocephalus	Banded Stilt														14																					
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel														1		1																			
Cacatuidae	*Eolophus roseicapillus*	Galah																											8							
Psittacidae	*Barnardius zonarius*	Australian Ringneck																1	1	2			1					1								
	Psephotus varius	Mulga Parrot														8				2		2														
	Melopsittacus undulatus	Budgerigar																1																		
Cuculidae	*Chalcites basalis*	Horsfield's Bronze-cuckoo																			1					1		1								
	Heteroscenes pallidus	Pallid Cuckoo														2																					
Meropidae	*Merops ornatus*	Rainbow Bee-eater																1																			
Ptilonorhynchidae	*Ptilonorhynchus guttatus*	Western Bowerbird														2	5		1																		
Maluridae	*Malurus splendens*	Splendid Fairy-wren															12						8													
	Malurus leucopterus	White-winged Fairy-wren														1	3																			

		Surveys	A															B	C																					
Family	Species	Common Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Opportunistic	Granny Deeps birds	Agnew Gold	BKBO1	BKBO4	BKBO5	BKBO7	BKBO9	BKBS04	BKBO2	BKBO3	BKBO12	BKBO8	BKBO6	BKBO10	BKBO11	BKBS01	BKBHarp01	BKBS03
Maluridae	*Malurus lamberti*	Variegated Fairy-wren																1																
Acanthizidae	*Gerygone fusca*	Western Gerygone																					2					1						
	Acanthiza robustirostris	Slaty-backed Thornbill															68								2					5				
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill															1				2		3		2									
	Acanthiza uropygialis	Chestnut-rumped Thornbill																	16	7	4	23	11		33		2	11		3	9			
	Acanthiza apicalis	Inland Thornbill															12	1	4			5	11				3			2				
	Aphelocephala leucopsis	Southern Whiteface															13	1	1		1		5		4									
Pardalotidae	*Pardalotus striatus*	Striated Pardalote															1																	
Meliphagidae	*Certhionyx variegatus*	Pied Honeyeater															2				4													
	Gavicalis virescens	Singing Honeyeater															68	1	8	9	7	2	1				2	4	3	1				
	Lichenostomus flavicollis	Yellow-throated Honeyeater																	3	4	3	15	4		4		5	9		3	4			
	Manorina flavigula	Yellow-throated Miner														3	38	1																
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater															44	1			2	4			2									
	Epthianura tricolor	Crimson Chat															4				9		1						1					
	Epthianura albifrons	White-fronted Chat																1																
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler															14	1					4											
Psophodidae	*Cinclosoma castanotum*	Chestnut Quail-thrush																	3															
	Cinclosoma castaneothorax	Chestnut-breasted Quail-thrush																			2													
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella																		2														
Campephagidae	*Coracina maxima*	Ground Cuckoo-shrike														2	5												2					
	Coracina novaehollandiae	Black-faced Cuckoo-shrike															7					1						2		1				
	Lalage tricolor	White-winged Triller														4			1															
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler															22		1			1	3		6		1			2				
	Colluricincla harmonica	Grey Shrike-thrush															3	1							1									
	Oreoica gutturalis	Crested Bellbird														1	45	1	6	1	4	2	2		6		1	5	1	4	1			
Artamidae	*Artamus personatus*	Masked Woodswallow														4	23	1																
	Artamus cinereus	Black-faced Woodswallow															6	1	5		9	2	2		1			7	7					
	Artamus minor	Little Woodswallow															2	1																
	Cracticus torquatus	Grey Butcherbird														4	5	1	1											2	1			
	Cracticus nigrogularis	Pied Butcherbird														2	3	1	5		2	1	4					6	1					
	Gymnorhina tibicen	Australian Magpie														1		1										1						
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail														5	5	1	1			1	2											
Corvidae	*Corvus bennetti*	Little Crow														4	1	1			2						1	6		3				
	Corvus orru	Torresian Crow															2	1							3									
Monarchidae	*Grallina cyanoleuca*	Magpie-lark														6	11	1	3	1								1						
Petroicidae	*Petroica goodenovii*	Red-capped Robin															10	1	5	1	2	1	3		8		3	1		1				
	Melanodryas cucullata	Hooded Robin															7	1	2		4									1				
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow														4	2																	
	Hirundo neoxena	Welcome Swallow														2	4	1																
	Petrochelidon nigricans	Tree Martin														1	9	1																
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird														2	2																	
Estrildidae	*Taeniopygia guttata*	Zebra Finch														2		1											2					

		Surveys	A															B	C																			
Family	Species	Common Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Opportunistic	Granny Deeps birds	Agnew Gold	BKBO1	BKBO4	BKBO5	BKBO7	BKBO9	BKBS04	BKBO2	BKBO3	BKBO12	BKBO8	BKBO6	BKBO10	BKBO11	BKBS01	BKBHarp01	BKBS03
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit														6	2	1																
Mammals																																		
Bovidae	*Capra hircus*	Goat																1					1										
Molossidae	*Ozimops planiceps*	Southern Free-tail Bat																1															
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat																1															
	Nyctophilus geoffroyi	Lesser Long-eared Bat																1														2	
	Scotorepens balstoni	Inland Broad-nosed Bat																1															
	Vespadelus baverstocki	Inland Forest Bat																1															
	Vespadelus finlaysoni	Finlayson's Cave Bat																1															
Dasyuridae	*Antechinomys laniger*	Kultarr	2	1			3	3	3	2		2			1																		
	Sminthopsis dolichura	Little Long-tailed Dunnart	1	1	3	7	5	4	13	3	5	3		1	1																		
	Sminthopsis hirtipes	Hairy-footed Dunnart				1																											
	Sminthopsis longicaudata	Long-tailed Dunnart					1	1							1																		
	Sminthopsis macroura	Stripe-faced Dunnart	2	3		2	1	1	1	1	1	5	5	3	2						3						1	1	2	7				
	Sminthopsis ooldea	Ooldea Dunnart																		1													
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo																1															
	Osphranter robustus	Euro																1				1							1	1			1
	Osphranter rufus	Red Kangaroo																1	4	2		4	1		2				3				
Leporidae	*Oryctolagus cuniculus*	European Rabbit																1															
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna																1					1							1	2		1
Muridae	*Mus musculus*	House Mouse						1					5																				
	Notomys alexis	Spinifex Hopping Mouse	3																														
	Pseudomys desertor	Desert Mouse																		1													
	Pseudomys hermannsburgensis	Sandy Inland Mouse	1	1	1	3					1	2	2	5	6				1		1				1					1			

A Terrestrial Ecosystems (2010a) *Level 2 Fauna Risk Assessment for Granny Deeps Project Area*. Unpublished report for Barrick Gold Corporation, Perth.

B ENV Australia (2008) *Agnew Prospects Fauna Assessment*. Unpublished report for Agnew Gold Mining Company Pty Limited, Perth.

C Biota Environmental Sciences (2007) *Bannockburn Fauna Habitat and Assemblage Survey*. Unpublished report for Jubilee Mines NL, Perth.

Appendix B(4) Vertebrate Fauna Recorded in Biological Surveys in the Region

		Survey	A																															
Family	**Species**	**Common Name**	**REG Open spinifex 1**	**REG Open spinifex 2**	**REG Open spinifex 3**	**REG Open spinifex 4**	**REG Shrubs over spinifex 1**	**REG Shrubs over spinifex 2**	**REG Shrubs over spinifex 3**	**REG Shrubs over spinifex 4**	**REG Dogbolter 2**	**REG Mulga woodland 1**	**REG Mulga woodland 4**	**REG Eucalypt over spinifex 2**	**REG Eucalypt over spinifex 4**	**REG Eucalypt over spinifex 1**	**REG Dogbolter 1**	**REG Dogbolter 3**	**REG Dogbolter 4**	**REG Eucalypt over spinifex 3**	**REG Mulga woodland 2**	**REG Mulga woodland 3**	**REG Opportunistic**	**REG Open spinifex**	**REG Mulga woodland**	**REG Eucalypt over spinifex**	**REG Shrubs over spinifex**	**REG Mulga thicket 2**	**REG Turkeys**	**REG Mulga thicket 1**	**REG Dogbolter**
Reptiles																																		
Agamidae	*Ctenophorus isolepis*	Crested Dragon	1	10	8	2	3	5	1	1																								
	Ctenophorus nuchalis	Central Netted Dragon			1	1																												
	Ctenophorus scutulatus	Lozenge-marked Dragon									2	1	1																					
	Diporiphora amphiboluroides	Mulga Dragon										3	1																					
	Moloch horridus	Thorny Devil							1																									
	Pogona minor	Dwarf Bearded Dragon											1	3	1																			
Carphodactylidae	*Nephrurus laevissimus*	Smooth Knob-tail					2		1																									
	Nephrurus vertebralis	Midline Knob-tail												1		1																		
Diplodactylidae	*Diplodactylus pulcher*	Fine-faced Gecko										1	3				1																	
	Lucasium squarrosum	Mottled Ground Gecko					2	1	7	2																								
	Strophurus elderi	Jewelled Gecko	2	7						1																								
	Strophurus strophurus	Western Spiny-tailed Gecko					2	1	2	1																								
	Strophurus wellingtonae	Western Shield Spiny-tailed Gecko										3	9	1		1	7	3	1	1	4	2												
Elapidae	*Brachyurophis semifasciata*	Half-girdlerd Snake			1					2				3	6	3																	
	Furina ornata	Orange-naped Snake								1		1																						
	Parasuta monachus	Monk Snake				1			1		2		1		1							1												
	Pseudechis australis	Mulga Snake														2																		
	Pseudonaja mengdeni	Gwardar		2																														
	Pseudonaja modesta	Ringed Brown Snake																1																
	Simoselaps bertholdi	Jan's Banded Snake							1																									
Gekkonidae	*Gehyra purpurascens*	Purplish Dtella		1						2					1																			
	Gehyra variegata	Tree Dtella	2			1			1	2					1	1	2		1	3	1	10												
	Heteronotia binoei	Bynoe's Prickly Gecko						2							1		1				1	3												
	Rhynchoedura ornata	Western Beaked Gecko											1	1			7	4																
Pygopodidae	*Delma butleri*	Unbanded Delma	1	2	2	1	2	1	3	1		1								1														
	Lialis burtonis	Burton's Snake-lizard												1	2																			
	Pygopus nigriceps	Western Hooded Scaly-foot					1	1							1	3																		
Scincidae	*Ctenotus ariadnae*	Ariadna's Ctenotus	1		4	3	7	4	6	8					2					4													
	Ctenotus dux	Fine Side-lined Ctenotus		2	2		6	2	13	2				4		14				4													

		Survey	A																																	
Family	**Species**	**Common Name**	**REG Open spinifex 1**	**REG Open spinifex 2**	**REG Open spinifex 3**	**REG Open spinifex 4**	**REG Shrubs over spinifex 1**	**REG Shrubs over spinifex 2**	**REG Shrubs over spinifex 3**	**REG Shrubs over spinifex 4**	**REG Dogbolter 2**	**REG Mulga woodland 1**	**REG Mulga woodland 4**	**REG Eucalypt over spinifex 2**	**REG Eucalypt over spinifex 4**	**REG Eucalypt over spinifex 1**	**REG Dogbolter 1**	**REG Dogbolter 3**	**REG Dogbolter 4**	**REG Eucalypt over spinifex 3**	**REG Mulga woodland 2**	**REG Mulga woodland 3**	**REG Opportunistic**	**REG Open spinifex**	**REG Mulga woodland**	**REG Eucalypt over spinifex**	**REG Shrubs over spinifex**	**REG Mulga thicket 2**	**REG Turkeys**	**REG Mulga thicket 1**	**REG Dogbolter**
	Ctenotus grandis	Grand Ctenotus	6	8	9	14	1	3	3	4				4	1																					
	Ctenotus greeri	Spotted-necked Ctenotus												9	7	8				6																
	Ctenotus helenae	Clay-soil Ctenotus	1	2			20	23	13	10				20	14	15				26																
	Ctenotus leonhardii	Leonhardi's Ctenotus	1		4	6					11	6	7	37	16	15	11	20	16	25	6	2													
	Ctenotus pantherinus	Leopard Skink	9		6	3	12	11	1	1				9	3	1				13																
	Ctenotus piankai	Coarse Sands Ctenotus	1	4	3	2		1	1	1																										
	Ctenotus quattuordecimlineatus	Fourteen-lined Ctenotus	4	12	3	2	19	16	9	5	4			2	3		1		1	9															
	Ctenotus schomburgkii	Schomburgk's Ctenotus				1					7		3				8	16			1														
	Ctenotus uber	Spotted Ctenotus									2	7	18				1	10	7		8														
	Egernia depressa	Southern Pygmy Spiny-tailed Skink											1	1					1		4	1													
	Egernia formosa	Goldfields Crevice-skink											1	1		1	1					2													
	Eremiascincus richardsonii	Broad-banded Sand Swimmer												2	1							1													
	Lerista bipes	North-western Sandslider	35	37	10	17	5	11	48	56																									
	Lerista desertorum	Central Desert Robust Slider	1	2		1		1		1	1	1	1		3	1				3															
	Lerista muelleri	Wood Mulch-slider										2		1		1		1			1														
	Liopholis inornata	Desert Skink					2	10	14	5																									
	Liopholis striata	Nocturnal Desert Skink	2	2	5	4																													
	Menetia greyii	Common Dwarf Skink	2	4	12	8						2				1		1		2	1														
	Morethia butleri	Woodland Morethia Skink													1					1		1													
	Tiliqua multifasciata	Centralian Blue-tongued Lizard		1	1	1		4																											
Typhlopidae	*Anilios bicolor*	Dark-spined Blind Snake			3					1			1	1	2					1															
	Anilios hamatus	Pale-headed Blind Snake	1	1		2	1		2	1					1	1				2															
	Anilios waitii	Waite's Blind Snake				1		1	1							1				1															
Varanidae	*Varanus brevicauda*	Short-tailed Pygmy Monitor	1	2	3	3		1							1					1															
	Varanus caudolineatus	Stripe-tailed Monitor									2	5		3	1	1	3	7	2		4	9													
	Varanus eremius	Pygmy Desert Monitor	2		6	2		2																											
	Varanus gouldii	Gould's Goanna	6	8	3	1	15	15	12	8		1	1	2	2	1																			
	Varanus panoptes	Yellow-spotted Monitor															4			2		1													
	Varanus tristis	Black-headed Monitor												2																					
Birds																																			
Casuariidae	*Dromaius novaehollandiae*	Emu																					5	3											

		Survey	A																												
Family	Species	Common Name	REG Open spinifex 1	REG Open spinifex 2	REG Open spinifex 3	REG Open spinifex 4	REG Shrubs over spinifex 1	REG Shrubs over spinifex 2	REG Shrubs over spinifex 3	REG Shrubs over spinifex 4	REG Dogbolter 2	REG Mulga woodland 1	REG Mulga woodland 4	REG Eucalypt over spinifex 2	REG Eucalypt over spinifex 4	REG Eucalypt over spinifex 1	REG Dogbolter 1	REG Dogbolter 3	REG Dogbolter 4	REG Eucalypt over spinifex 3	REG Mulga woodland 2	REG Mulga woodland 3	REG Opportunistic	REG Open spinifex	REG Mulga woodland	REG Eucalypt over spinifex	REG Shrubs over spinifex	REG Mulga thicket 2	REG Turkeys	REG Mulga thicket 1	REG Dogbolter
Columbidae	*Ocyphaps lophotes*	Crested Pigeon																					1		2						
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar																					1								
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar																					1								
Apodidae	*Apus pacificus*	Fork-tailed Swift																							2						
Otididae	*Ardeotis australis*	Australian Bustard																					2								
Accipitridae	*Aquila audax*	Wedge-tailed Eagle																					3	1							
Falconidae	*Falco cenchroides*	Nankeen Kestrel																					2	1							
	Falco berigora	Brown Falcon																						2							
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel																					2								
Cacatuidae	*Eolophus roseicapillus*	Galah																					2								
Psittacidae	*Barnardius zonarius*	Australian Ringneck																					10			2	5				
	Psephotus varius	Mulga Parrot																					5								
Meropidae	*Merops ornatus*	Rainbow Bee-eater																					1								
Ptilonorhynchidae	*Ptilonorhynchus guttatus*	Western Bowerbird																					3								
Maluridae	*Malurus splendens*	Splendid Fairy-wren																					4	2	8	13		5	10	5	
	Malurus lamberti	Variegated Fairy-wren																									4				
Acanthizidae	*Pyrrholaemus brunneus*	Redthroat																							1						
	Smicrornis brevirostris	Weebill																					3			13	5				
	Gerygone fusca	Western Gerygone																													1
	Acanthiza robustirostris	Slaty-backed Thornbill																							4				2		6
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill																							2				1		6
	Acanthiza uropygialis	Chestnut-rumped Thornbill																					1		7	5	3		3		8
	Acanthiza apicalis	Inland Thornbill																							8		1	6		6	4
	Aphelocephala leucopsis	Southern Whiteface																							3			2	1	2	2
Meliphagidae	*Gavicalis virescens*	Singing Honeyeater																					1	2	3	5	1	2	2	2	1
	Manorina flavigula	Yellow-throated Miner																					3	12	5	5	8	7	3	7	
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler																					3						2		
Psophodidae	*Cinclosoma castaneothorax*	Chestnut-breasted Quail-thrush																										1		1	
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike																						2		3			2		
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler																							4	3		3		3	2
	Pachycephala rufiventris	Rufous Whistler																													

		Survey	A																													
Family	**Species**	**Common Name**	**REG Open spinifex 1**	**REG Open spinifex 2**	**REG Open spinifex 3**	**REG Open spinifex 4**	**REG Shrubs over spinifex 1**	**REG Shrubs over spinifex 2**	**REG Shrubs over spinifex 3**	**REG Shrubs over spinifex 4**	**REG Dogbolter 2**	**REG Mulga woodland 1**	**REG Mulga woodland 4**	**REG Eucalypt over spinifex 2**	**REG Eucalypt over spinifex 4**	**REG Eucalypt over spinifex 1**	**REG Dogbolter 1**	**REG Dogbolter 3**	**REG Dogbolter 4**	**REG Eucalypt over spinifex 3**	**REG Mulga woodland 2**	**REG Mulga woodland 3**	**REG Opportunistic**	**REG Open spinifex**	**REG Mulga woodland**	**REG Eucalypt over spinifex**	**REG Shrubs over spinifex**	**REG Mulga thicket 2**	**REG Turkeys**	**REG Mulga thicket 1**	**REG Dogbolter**
	Colluricincla harmonica	Grey Shrike-thrush																								1	1				
	Oreoica gutturalis	Crested Bellbird																						3	3	5	4	1	1	1	3
Artamidae	*Artamus cinereus*	Black-faced Woodswallow																					3								
	Cracticus torquatus	Grey Butcherbird																					3	3	1	2	2	2		2	
	Cracticus nigrogularis	Pied Butcherbird																					2	4	2	2	4	1		1	2
	Gymnorhina tibicen	Australian Magpie																					2	3	2						
	Strepera versicolor	Grey Currawong																								1	2				
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail																													1
	Rhipidura leucophrys	Willie Wagtail																					3			4					
Corvidae	*Corvus orru*	Torresian Crow																								3					
Monarchidae	*Grallina cyanoleuca*	Magpie-lark																					7		4			3		3	
Petroicidae	*Microeca fascinans*	Jacky Winter																								1	1				
	Petroica goodenovii	Red-capped Robin																									1				
	Melanodryas cucullata	Hooded Robin																									1				1
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit																													1
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheath-tail Bat				1																									
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat								1			1		1																
	Chalinolobus morio	Chocolate Wattled Bat				1							1																		
	Mormopterus sp.	Free-tail Bat Sp.				1				1			1		1																
	Nyctophilus sp.	Long-eared Bat Sp.								1	1		1		1																
	Scotorepens balstoni	Inland Broad-nosed Bat				1				1			1				1														
Dasyuridae	*Dasycercus cristicauda*	Crest-tailed Mulgara		1																											
	Ningaui ridei	Wongai Ningaui	2	3	1	2	1	3	5	1	2				6	2	1		1	2											
	Sminthopsis dolichura	Little Long-tailed Dunnart	1			2						1	1	2	1	5	5	3	3	4	2	3								
	Sminthopsis macroura	Stripe-faced Dunnart		1								2	1					1													
Muridae	*Mus musculus*	House Mouse	7	1	3		2	1		1																					
	Notomys alexis	Spinifex Hopping Mouse		1			1		4				1																		
	Pseudomys desertor	Desert Mouse	1				1	3		1								1	1	1											
	Pseudomys hermannsburgensis	Sandy Inland Mouse	1		2						1				2						2										

A Coffey Environments (2008) *Level 2 Fauna Assessment for Moolart Well, Dogbolter and Erlistou*n. Unpublished report for Regis Resources, Perth.

Appendix B(5) Vertebrate Fauna Recorded in Biological Surveys in the Region

		Surveys	A							B																	
Family	**Species**	**Common Name**	**Site 1**	**Site 2**	**Site 7**	**Site 5**	**Site 6**	**Site 3**	**Site 4**	**Site 2**	**Site 3**	**Site 4**	**Site 5**	**Site 6**	**Site 7**	**Site 8**	**Site 9**	**Site 10**	**Site 11**	**Site 12**	**Site 13**	**Site 14**	**Site 15**	**Opportunistic**	**Birds**
Reptiles																									
Agamidae	*Ctenophorus reticulatus*	Western Netted Dragon	1																						
	Diporiphora amphiboluroides	Mulga Dragon									1	2			1	1						1	1		
	Pogona minor	Dwarf Bearded Dragon		1															1						
	Tympanocryptis cephalus	Pebble Dragon								2			2	1											
Boidae	*Antaresia stimsoni*	Stimson's Python			1																				
Carphodactylidae	*Underwoodisaurus milii*	Barking Gecko		1										1											
Diplodactylidae	*Diplodactylus pulcher*	Fine-faced Gecko				1					1	1	3			5	3	2	3	7	4	6	3	3	
	Strophurus assimilis	Goldfields Spiny-tailed Gecko		1																					
	Strophurus wellingtonae	Western Shield Spiny-tailed Gecko								1	2		3	1			3	4	5	1		2	4	1	
Elapidae	*Parasuta monachus*	Monk Snake																		1					
Gekkonidae	*Heteronotia binoei*	Bynoe's Prickly Gecko	1				1				1			1	7	1	1		3	7		7	1	1	
Pygopodidae	*Pygopus nigriceps*	Western Hooded Scaly-foot									1														
Scincidae	*Cryptoblepharus buchananii*	Buchanan's Snake-eyed Skink		1																					
	Cryptoblepharus plagiocephalus	Peron's Snake-eyed Skink																3				3			
	Ctenotus schomburgkii	Schomburgk's Ctenotus										1													
	Ctenotus uber	Spotted Ctenotus				1				3	1		8	4		2				1		1	2	2	
	Egernia depressa	Pygmy Spiny-tailed Skink			1		1	1	1				1				1				1	1		3	
	Egernia formosa	Goldfields Crevice-skink			1					1	1	1					2	2	4				1		
	Eremiascincus richardsonii	Broad-banded Sand Swimmer	1	1								2				1							1		
	Lerista desertorum	Central Desert Robust Slider		1												1		6	2	5		1	2		
	Lerista muelleri	Wood Mulch-slider								2						5				1	1		5	4	
	Lerista sp.					1	1		1																
	Liopholis striata	Nocturnal Desert Skink					1																		
	Menetia greyii	Common Dwarf Skink	1	1		1										1							1		
	Morethia butleri	Woodland Morethia Skink								1						2	2		2	1	1	1	1		
Typhlopidae	*Anilios australis*	Austral Blind Snake																					1		
Varanidae	*Varanus caudolineatus*	Stripe-tailed Monitor		1						4		3		3			2		1	1			1		
	Varanus panoptes	Yellow-spotted Monitor													1		1						1		
	Varanus panoptes rubidus	Yellow-spotted Monitor	1	1	1	1	1	1	1																
Cheluidae	*Chelodina steindachneri*	Steindachner's Turtle	1																						
Birds																									
Casuariidae	*Dromaius novaehollandiae*	Emu	1	1	1	1	1	1	1															1	

		Surveys	A							B																	
Family	Species	Common Name	Site 1	Site 2	Site 7	Site 5	Site 6	Site 3	Site 4	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Opportunistic	Birds
Columbidae	*Phaps chalcoptera*	Common Bronzewing	1	1		1	1		1															1	3
Columbidae	*Ocyphaps lophotes*	Crested Pigeon	1	1	1	1	1	1																1	14
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar																							1
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar						1																	
Otididae	*Ardeotis australis*	Australian Bustard		1																					
Accipitridae	*Accipiter fasciatus*	Brown Goshawk	1																						
	Aquila audax	Wedge-tailed Eagle					1																		
	Hieraaetus morphnoides	Little Eagle		1																					
Falconidae	*Falco cenchroides*	Nankeen Kestrel		1	1	1		1	1															1	
	Falco berigora	Brown Falcon	1	1			1																		
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel	1																						
Charadriidae	*Vanellus tricolor*	Banded Lapwing					1																		
Turnicidae	*Turnix velox*	Little Button-quail							1																
Cacatuidae	*Eolophus roseicapillus*	Galah	1	1	1	1	1	1																1	1
Psittacidae	*Barnardius zonarius*	Australian Ringneck	1			1	1	1																	12
	Psephotus varius	Mulga Parrot	1			1	1																	1	3
	Melopsittacus undulatus	Budgerigar	1	1		1	1	1	1																
	Neopsephotus bourkii	Bourke's Parrot				1	1																		
Cuculidae	*Chalcites basalis*	Horsfield's Bronze-cuckoo	1	1			1		1																
	Chalcites osculans	Black-eared Cuckoo		1			1																		
	Heteroscenes pallidus	Pallid Cuckoo	1					1	1																
Halcyonidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher		1				1	1																
Meropidae	*Merops ornatus*	Rainbow Bee-eater	1					1																	
Climacteridae	*Climacteris affinis*	White-browed Treecreeper				1	1	1	1															1	1
Ptilonorhynchidae	*Ptilonorhynchus maculatus*	Spotted Bowerbird	1					1																	
	Ptilonorhynchus guttatus	Western Bowerbird																						1	3
Maluridae	*Malurus splendens*	Splendid Fairy-wren	1	1			1																		19
	Malurus leucopterus	White-winged Fairy-wren		1				1																	3
	Malurus lamberti	Variegated Fairy-wren	1	1			1																		
Acanthizidae	*Pyrrholaemus brunneus*	Redthroat		1																					
	Smicrornis brevirostris	Weebill		1																					3
	Gerygone fusca	Western Gerygone	1	1																					
	Acanthiza robustirostris	Slaty-backed Thornbill	1		1	1	1	1	1																34
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill	1		1	1	1	1	1																1
	Acanthiza uropygialis	Chestnut-rumped Thornbill	1		1	1	1	1	1																8

		Surveys	A							B																	
Family	Species	Common Name	Site 1	Site 2	Site 7	Site 5	Site 6	Site 3	Site 4		Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Opportunistic	Birds
	Acanthiza apicalis	Inland Thornbill	1	1	1			1	1																	30
	Aphelocephala leucopsis	Southern Whiteface	1	1	1	1	1	1																		7
Meliphagidae	*Certhionyx variegatus*	Pied Honeyeater	1	1		1			1																	
	Gavicalis virescens	Singing Honeyeater	1	1	1	1	1	1	1																	24
	Purnella albifrons	White-fronted Honeyeater	1	1					1																	
	Manorina flavigula	Yellow-throated Miner	1	1	1	1	1	1	1																1	10
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater	1	1		1	1	1	1																	13
	Epthianura tricolor	Crimson Chat		1		1	1	1	1																	
	Sugomel niger	Black Honeyeater							1																	
	Lichmera indistincta	Brown Honeyeater		1																						
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler	1				1																		1	8
Psophodidae	*Cinclosoma castaneothorax*	Chestnut-breasted Quail-thrush				1	1	1	1																	
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella			1																					
Campephagidae	*Coracina maxima*	Ground Cuckoo-shrike	1	1				1																		
	Coracina novaehollandiae	Black-faced Cuckoo-shrike	1	1		1		1	1																	2
	Lalage tricolor	White-winged Triller		1			1																			
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	1	1	1	1	1	1	1																	22
	Colluricincla harmonica	Grey Shrike-thrush	1	1	1	1	1	1	1																	13
	Oreoica gutturalis	Crested Bellbird	1	1	1	1	1	1	1																	40
Artamidae	*Artamus cinereus*	Black-faced Woodswallow	1	1		1		1	1																2	3
	Cracticus torquatus	Grey Butcherbird	1	1	1	1	1	1	1																	
	Cracticus nigrogularis	Pied Butcherbird	1	1	1	1	1	1	1																1	2
	Gymnorhina tibicen	Australian Magpie	1		1		1																			
	Strepera versicolor	Grey Currawong	1																							
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	1	1			1		1																	
Corvidae	*Corvus bennetti*	Little Crow			1	1	1		1																	14
	Corvus orru	Torresian Crow	1	1	1		1	1	1																1	
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	1	1																					1	
Petroicidae	*Petroica goodenovii*	Red-capped Robin	1	1	1	1	1	1	1																	14
	Melanodryas cucullata	Hooded Robin	1	1	1		1	1	1																	3
Megaluridae	*Cincloramphus mathewsi*	Rufous Songlark		1				1																		
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	1				1	1	1																	
	Petrochelidon ariel	Fairy Martin							1																	
	Petrochelidon nigricans	Tree Martin						1	1																	
Estrildidae	*Taeniopygia guttata*	Zebra Finch	1	1	1	1		1	1																	

		Surveys	A							B																	
Family	**Species**	**Common Name**	**Site 1**	**Site 2**	**Site 7**	**Site 5**	**Site 6**	**Site 3**	**Site 4**		**Site 2**	**Site 3**	**Site 4**	**Site 5**	**Site 6**	**Site 7**	**Site 8**	**Site 9**	**Site 10**	**Site 11**	**Site 12**	**Site 13**	**Site 14**	**Site 15**	**Opportunistic**	**Birds**
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit		1				1																	1	
Mammals																										
Bovidae	*Bos taurus*	Cow	1	1	1	1	1	1	1																	
	Capra hircus	Goat	1	1																						
Canidae	*Canis lupus*	Dingo	1																							
	Vulpes vulpes	Red Fox	1																							
Felidae	*Felis catus*	House Cat	1	1																						
Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat																					4			
Dasyuridae	*Sminthopsis crassicaudata*	Fat-tailed Dunnart		1																						
	Sminthopsis dolichura	Little Long-tailed Dunnart								1	5		1	4	4	2			1		1	1	3	2		
	Sminthopsis macroura	Stripe-faced Dunnart				1					1	1			1	3	1		1							
Macropodidae	*Osphranter robustus*	Euro			1																					
	Osphranter rufus	Red Kangaroo	1	1				1																		
Leporidae	*Oryctolagus cuniculus*	European Rabbit	1			1																				
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna			1																					
Equidae	*Equus caballus*	Domestic Horse		1				1																		
Muridae	*Mus musculus*	House Mouse	1	1		1		1	1																	

A Halpern Glick Maunsell (1999) *Rosemont Gold Project Biological Assessment Survey - Phases 1 & 2*. Unpublished report for Johnson's Well Mining NL. Perth.

B Terrestrial Ecosystems (2010) *Level 2 Fauna Risk Assessment for the Garden Well Project Area*. Unpublished report for Regis Resources, Perth.

Appendix B(6) Vertebrate Fauna Recorded in Biological Surveys in the Region

		Survey	A									
Family	**Species**	**Common Name**	**TM1**	**JS2**	**WM2**	**WS2**	**WM1**	**WS1**	**JS3**	**JS1**	**JS4**	**HB1**
Frogs												
Limnodynastidae	*Neobatrachus sutor*	Shoemaker Frog										
	Neobatrachus wilsmorei	Goldfields Bullfrog	3	1								
	Platyplectrum spenceri	Spencer's Burrowing Frog										
Myobatrachidae	*Pseudophryne occidentalis*	Orange-crowned Toadlet										
Reptiles												
Agamidae	*Ctenophorus caudicinctus*	Ring-tailed Dragon										
	Ctenophorus fordi	Mallee Dragon										
	Ctenophorus inermis	Military Dragon			1							
	Ctenophorus maculatus	Spotted Dragon				2						
	Ctenophorus reticulatus	Western Netted Dragon					1					
	Ctenophorus salinarum	Saltpan Dragon				2		1				
	Ctenophorus vadnappa	Red-barred Dragon										
	Moloch horridus	Thorny Devil										
	Pogona minor	Dwarf Bearded Dragon	1		2				2	1	1	
	Tympanocryptis cephalus	Pebble Dragon										
Carphodactylidae	*Nephrurus vertebralis*	Midline Knob-tail					1		1			
	Underwoodisaurus milii	Barking Gecko										
Diplodactylidae	*Diplodactylus granariensis*	Wheat-belt Stone Gecko										
	Diplodactylus pulcher	Fine-faced Gecko										
	Lucasium maini	Main's Ground Gecko										
	Lucasium squarrosum	Mottled Ground Gecko	2	1	5	2	1					2
	Strophurus assimilis	Goldfields Spiny-tailed Gecko										
	Strophurus ciliaris	Spiny-tailed Gecko										
	Strophurus elderi	Jewelled Gecko		1					1	2		
	Strophurus strophurus	Western Spiny-tailed Gecko										
	Strophurus wellingtonae	Western Shield Spiny-tailed Gecko										
Elapidae	*Brachyurophis fasciolata*	Narrow-banded Burrowing Snake										
	Parasuta monachus	Monk Snake										
	Simoselaps bertholdi	Jan's Banded Snake	1									
	Suta fasciata	Rosen's Snake										
Gekkonidae	*Gehyra variegata*	Tree Dtella										
	Gehyra xenopus	Crocodile-faced Dtella		1			1			1	1	
	Heteronotia binoei	Bynoe's Prickly Gecko	1				2				2	3
	Rhynchoedura ornata	Western Beaked Gecko										
Pygopodidae	*Delma nasuta*	Sharp-snouted Delma									1	
	Pygopus nigriceps	Western Hooded Scaly-foot									1	
Scincidae	*Cryptoblepharus buchananii*	Buchanan's Snake-eyed Skink										
	Ctenotus calurus	Blue-tailed Finesnout Ctenotus										
	Ctenotus greeri	Spotted-necked Ctenotus										
	Ctenotus helenae	Clay-soil Ctenotus		2					2	1		
	Ctenotus leonhardii	Leonhardi's Ctenotus	6	3	3	6	7				2	4
	Ctenotus pantherinus	Leopard Skink										

		Survey	A									
Family	**Species**	**Common Name**	**TM1**	**JS2**	**WM2**	**WS2**	**WM1**	**WS1**	**JS3**	**JS1**	**JS4**	**HB1**
	Ctenotus quattuordecimlineatus	Fourteen-lined Ctenotus										
	Ctenotus schomburgkii	Schomburgk's Ctenotus										
	Ctenotus severus	Stern Ctenotus										
	Ctenotus uber	Spotted Ctenotus										
	Egernia depressa	Pygmy Spiny-tailed Skink										
	Egernia formosa	Goldfields Crevice-skink										
	Eremiascincus richardsonii	Broad-banded Sand Swimmer										
	Lerista desertorum	Central Desert Robust Slider	4	1	1				1	2	1	
	Lerista kingi	King's Slider					1					
	Lerista macropisthopus	Unpatterned Robust Slider										
	Lerista muelleri	Wood Mulch-slider										
	Lerista picturata	Southern Robust Slider										
	Lerista sp.											
	Liopholis inornata	Desert Skink										
	Liopholis striata	Nocturnal Desert Skink										
	Menetia greyii	Common Dwarf Skink				1	1					
	Morethia butleri	Woodland Morethia Skink										
Typhlopidae	*Anilios hamatus*	Pale-headed Blind Snake					1				1	
	Anilios waitii	Waite's Blind Snake										
Varanidae	*Varanus caudolineatus*	Stripe-tailed Monitor			1							
	Varanus giganteus	Perentie										
	Varanus gouldii	Gould's Goanna					1		1			
	Varanus panoptes	Yellow-spotted Monitor										
	Varanus tristis	Black-headed Monitor										
Birds												
Casuariidae	*Dromaius novaehollandiae*	Emu										
Phasianidae	*Coturnix pectoralis*	Stubble Quail										
Columbidae	*Phaps chalcoptera*	Common Bronzewing										
	Ocyphaps lophotes	Crested Pigeon										
	Geopelia cuneata	Diamond Dove										
Podargidae	*Podargus strigoides*	Tawny Frogmouth										
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar										
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar										
Otididae	*Ardeotis australis*	Australian Bustard										
Accipitridae	*Accipiter fasciatus*	Brown Goshawk										
	Circus assimilis	Spotted Harrier										
	Aquila audax	Wedge-tailed Eagle										
	Hieraaetus morphnoides	Little Eagle										
Falconidae	*Falco cenchroides*	Nankeen Kestrel										
	Falco berigora	Brown Falcon										
	Falco longipennis	Australian Hobby										
Charadriidae	*Vanellus tricolor*	Banded Lapwing										
Turnicidae	*Turnix velox*	Little Button-quail										
Cacatuidae	*Eolophus roseicapillus*	Galah										

		Survey	A									
Family	**Species**	**Common Name**	**TM1**	**JS2**	**WM2**	**WS2**	**WM1**	**WS1**	**JS3**	**JS1**	**JS4**	**HB1**
	Nymphicus hollandicus	Cockatiel										
Psittacidae	*Barnardius zonarius*	Australian Ringneck										
	Psephotus varius	Mulga Parrot										
	Melopsittacus undulatus	Budgerigar										
	Neopsephotus bourkii	Bourke's Parrot										
Cuculidae	*Chalcites basalis*	Horsfield's Bronze-cuckoo										
	Chalcites osculans	Black-eared Cuckoo										
	Heteroscenes pallidus	Pallid Cuckoo										
Halcyonidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher										
Meropidae	*Merops ornatus*	Rainbow Bee-eater										
Climacteridae	*Climacteris affinis*	White-browed Treecreeper										
Maluridae	*Malurus leucopterus*	White-winged Fairy-wren										
Acanthizidae	*Pyrrholaemus brunneus*	Redthroat										
	Smicrornis brevirostris	Weebill										
	Acanthiza robustirostris	Slaty-backed Thornbill										
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill										
	Acanthiza uropygialis	Chestnut-rumped Thornbill										
	Acanthiza apicalis	Inland Thornbill										
	Aphelocephala leucopsis	Southern Whiteface										
Pardalotidae	*Pardalotus striatus*	Striated Pardalote										
Meliphagidae	*Certhionyx variegatus*	Pied Honeyeater										
	Gavicalis virescens	Singing Honeyeater										
	Lichenostomus plumulus	Grey-fronted Honeyeater										
	Purnella albifrons	White-fronted Honeyeater										
	Manorina flavigula	Yellow-throated Miner										
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater										
	Anthochaera carunculata	Red Wattlebird										
	Conopophila whitei	Grey Honeyeater										
	Epthianura tricolor	Crimson Chat										
	Epthianura aurifrons	Orange Chat										
Pomatostomidae	*Pomatostomus temporalis*	Grey-crowned Babbler										
	Pomatostomus superciliosus	White-browed Babbler										
Psophodidae	*Cinclosoma castaneothorax*	Chestnut-breasted Quail-thrush										
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella										
Campephagidae	*Coracina maxima*	Ground Cuckoo-shrike										
	Coracina novaehollandiae	Black-faced Cuckoo-shrike										
	Lalage tricolor	White-winged Triller										
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler										
	Colluricincla harmonica	Grey Shrike-thrush										
	Oreoica gutturalis	Crested Bellbird										
Artamidae	*Artamus personatus*	Masked Woodswallow										
	Artamus superciliosus	White-browed Woodswallow										
	Artamus cinereus	Black-faced Woodswallow										
	Cracticus torquatus	Grey Butcherbird										

		Survey	A									
Family	**Species**	**Common Name**	**TM1**	**JS2**	**WM2**	**WS2**	**WM1**	**WS1**	**JS3**	**JS1**	**JS4**	**HB1**
	Cracticus nigrogularis	Pied Butcherbird										
	Gymnorhina tibicen	Australian Magpie										
	Strepera versicolor	Grey Currawong										
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail										
Corvidae	*Corvus bennetti*	Little Crow										
	Corvus orru	Torresian Crow										
Monarchidae	*Grallina cyanoleuca*	Magpie-lark										
Petroicidae	*Microeca fascinans*	Jacky Winter										
	Petroica goodenovii	Red-capped Robin										
	Melanodryas cucullata	Hooded Robin										
Megaluridae	*Cincloramphus mathewsi*	Rufous Songlark										
	Cincloramphus cruralis	Brown Songlark										
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow										
	Petrochelidon ariel	Fairy Martin										
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird										
Estrildidae	*Taeniopygia guttata*	Zebra Finch										
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit										
Mammals												
Bovidae	*Capra hircus*	Goat										
	Ovis aries	Sheep										
Camelidae	*Camelus dromedarius*	Dromedary										
	Canis familiaris	Dog										
	Vulpes vulpes	Red Fox										
Felidae	*Felis catus*	House Cat										
Molossidae	*Austronomus australis*	White-striped Free-tail Bat										
	Ozimops planiceps	Southern Free-tail Bat										
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat										
	Nyctophilus geoffroyi	Lesser Long-eared Bat										
	Scotorepens balstoni	Inland Broad-nosed Bat										
Dasyuridae	*Ningaui ridei*	Wongai Ningaui							1			
	Sminthopsis crassicaudata	Fat-tailed Dunnart										
	Sminthopsis dolichura	Little Long-tailed Dunnart										
	Sminthopsis macroura	Stripe-faced Dunnart										
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo										
	Osphranter robustus	Euro										
	Osphranter rufus	Red Kangaroo										
Leporidae	*Oryctolagus cuniculus*	European Rabbit										
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna										
Muridae	*Mus musculus*	House Mouse										
	Notomys alexis	Spinifex Hopping Mouse							1			
	Notomys mitchellii	Mitchell's Hopping Mouse										
	Pseudomys bolami	Bolam's Mouse										
	Pseudomys hermannsburgensis	Sandy Inland Mouse										

A Dunlop, J.N. and Payne, W. (1999) *A vertebrate fauna survey of the North Lake Carey region*, Unpublished report for Placer (Granny Smith) and Homestake.

Appendix C
Definitions of Significant Fauna under the WA *Wildlife Conservation Act 1950* and Priority Species

APPENDIX C
DEFINITIONS OF SIGNIFICANT FAUNA UNDER THE EPBC ACT AND THE WESTERN AUSTRALIAN *WILDLIFE CONSERVATION ACT 1950*

Published as Specially Protected under the *Wildlife Conservation Act 1950,* and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).

Threatened fauna is that subset of 'Specially Protected Fauna' declared to be 'likely to become extinct' pursuant to section 14(4) of the Wildlife Conservation Act.

Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the Wildlife Conservation Act.

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

CR Critically endangered species

Threatened species considered to be facing an extremely high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in **Schedule 1** of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

EN Endangered species

Threatened species considered to be facing a very high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in **Schedule 2** of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

VU Vulnerable species

Threatened species considered to be facing a high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in **Schedule 3** of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

EX Presumed extinct species

Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in **Schedule 4** of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.

IA Migratory birds protected under an international agreement

Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in **Schedule 5** of the Wildlife Conservation (Specially Protected Fauna) Notice.

CD Conservation dependent fauna

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice.

OS Other specially protected fauna

Fauna otherwise in need of special protection to ensure their conservation. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in **Schedule 7** of the Wildlife Conservation (Specially Protected Fauna) Notice.

Priority species

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

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

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

P1 Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

P2 Priority 2: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

P3 Priority 3: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

P4 Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.

(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.