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Mineral Resources Limited
Mount Marion Lithium Project
Malleefowl Survey, January 2020

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1 Introduction

Mineral Resources Limited (MRL) is planning to extend their operations at the Mount Marion minesite. In order to progress the expansion, and to satisfy Condition 10 of the Clearing Permit CPS 8632/1, a fauna survey within the area cross-hatched red on Plan 8632/1 (see Appendix 1) to identify Malleefowl (*Leipoa ocellata*) mounds and Malleefowl critical habitat was required. Bamford Consulting Ecologists (BCE) was commissioned by MRL to conduct the pre-clearance Malleefowl survey, and this report provides the findings of that work.

2 Background

The Malleefowl is listed as Vulnerable under both the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and *WA Biodiversity Conservation Act* 2016 (BC Act). In Western Australia, Malleefowl occur mainly in scrubs and thickets of Mallee (*Eucalyptus* spp.), Boree (*Melaleuca lanceolata*), Bowgada (*Acacia linophylla*), and other dense litter-forming shrublands including Mulga (*Acacia aneura*) shrublands (Johnstone and Storr 1998; Burbidge 2004; Benshemesh 2007). The species' distribution was once larger and less fragmented, but the widespread clearing of suitable habitat, coupled with the degradation of habitat by fire and livestock, and fox predation, has reduced Malleefowl numbers considerably (Johnstone and Storr 1998; Burbidge 2004; Benshemesh 2007).

Eleven Malleefowl mounds have been previously recorded from the Mount Marion area (Metcalf and Bamford 2019). Details of those mounds are reiterated here, in Appendix 2. All previously known mounds were Moderately Old to Very Old (see Methods for definitions of age classes) and were inactive, and Metcalf and Bamford (2019) suggested Malleefowl may no longer nest in the project area, though they may utilise the area for foraging. Malleefowl could forage anywhere through the extended project area, but mounds are most likely to be constructed in shrublands and thickets where dense vegetation provides leaf-litter for the mounds, and where the soil is free-draining at least to some extent; thus not clays or heavy loams (Metcalf and Bamford 2019).

3 Study Areas and Methods

3.1 Survey area

A subset (c. 158 ha) of the area cross-hatched red on Plan 8632/1 (Appendix 1) was surveyed for the presence of Malleefowl, Malleefowl nest mounds and Malleefowl critical habitat. This 'survey area' is shown in Figure 1.

3.2 Survey date and personnel

The surveys were conducted from the 6th to the 8th January 2020 by:

- Dr Wes Bancroft *BSc (Zool./Microbiol.), Hons (Zool.), PhD (Zool.)*;
- Dr Barry Shepherd *BSc (Environmental Biology), Hons (Environmental Biology), PhD (Ecology)*; and
- Mr Andrew McCreery *BSc (Biol.)*.

MRL personnel Ben Sambell and Kim Dennison also kindly assisted in the field.

Data analysis, GIS management and report preparation were by Wes Bancroft, and

- Dr Mike Bamford *BSc (Biol.), Hons (Biol.), PhD (Biol.)*.

3.3 Survey methods

The survey was conducted with reference to the *National Manual for The Malleefowl Monitoring System: Standards, Protocols and Monitoring Procedures* (NHT 2007), the *National Recovery Plan for Malleefowl* (Benshemesh 2007) and the *Survey Guidelines for Australia's Threatened Birds* (DSEWPaC 2010).

3.3.1 Malleefowl nest mounds

The entire survey area was inspected for Malleefowl mounds on foot, with field personnel walking a systematic grid at approximately 50 m intervals (see Figure 1 for survey tracks). Spacing was adjusted where appropriate (e.g. dense vegetation) to ensure complete coverage. Surveyors also looked for direct (e.g. sighting, calls) or secondary evidence (feathers, tracks, droppings) of Malleefowl presence.

Known mounds within the survey area were re-visited and re-examined (for signs of activity) and any additional mounds were recorded, measured (diameter across mound in meters, height of mound in centimetres and depth of crater in centimetres) and scored for mound profile and age, as described below:

Mound Profile

The profile of a Malleefowl mound changes with breeding activity and age (erosion and vegetation growth). A number of profile stages are classified according to age (NHT 2007):

- Profile 1: Typical crater with raised rims. This is the typical shape of an inactive nest. However, this is also the profile of a mound being worked early in the breeding season;
- Profile 2: Nest fully dug out. The characteristic of this profile is that the crater slopes down steeply and at the base the sides drop vertically to form a box- like structure with side usually 20 to 30 cm deep. Often, litter will have been raked into windrows, and may have started to enter the nest;

- Profile 3: Nest with litter. This is the next stage after profile 2. Litter will have been raked into the nest by Malleefowl, and thick layers of litter are evident on the surface. There may or may not be sand mixed with the litter at this stage;
- Profile 4: Nest mounded up (no crater). This is the typical profile of an active but unopened Malleefowl nest. The active mound is closed and dome shaped;
- Profile 5: Nest a crater with peak in centre. This is a typical profile of an active nest which is in the process of being closed by Malleefowl; and
- Profile 6: Nest low and flat without peak or crater. This mound has not been used for some time and weathering and erosion have 'flattened" the original mound.

Mound Age

- Active: Fresh scratching, Malleefowl scats, loose soil, mound may be dug out in preparation for the breeding season or mounded for breeding;
- Recently used (1-5 years): Mound contains signs of recent activity (e.g., eggshell fragments) and mound may still contain large amounts of leaf litter if not excavated. Soil surface compacted, mound structure intact with well-defined central depression. No vegetation colonising mound;
- Moderately old (5-20 years): No recent activity, mound compacted. Surface of mound showing some weathering and some minor plant colonisation possibly present. Mound profile raised; central depression defined;
- Old (20-100 years): Mound moderately to very weathered, often with a veneer of gravel on the slopes because of removal of fine materials from the surface. Extensive plant colonisation. Mound profile raised; no or minimal central depression; and
- Very old (100+ years): Mound very weathered, with a low profile. Bushes and even small trees growing on mound. No central depression.

3.3.2 Malleefowl critical habitat

Only a brief general definition of 'critical habitat' is provided under section 207B of the EPBC Act: "habitat identified … as being critical to the survival of a listed threatened species or listed threatened ecological community" (DEH 2000). Critical habitat specifically for Malleefowl is not presently defined (DoE 2020a) and, therefore, it is not currently listed on the Federal (EPBC Act) Register of Critical Habitat (DoE 2020b).

In the assessment of "Habitat critical for survival" for the *National Recovery Plan for Malleefowl*, Benshemesh (2007) noted that, at a national level at least, critical habitat is "not well understood". Habitat studies available at that time were not of sufficient scope to adequately describe the habitat features that are important for Malleefowl across their range (Benshemesh 2007). Benshemesh (2007) also noted that, at the time of publication, no particular populations or general areas can be described as being of greater importance for the long-term survival of Malleefowl.

In the absence of direct guidance at the national scale, for the purposes of this survey we define critical habitat at the regional scale with the purpose of protecting a buffer zone around any active nest mound such that there is a minimal disruption to the breeding success of that mound. There are no data available to guide the establishment of buffer widths but it is noted that active Malleefowl

mounds have been observed in close proximity to disturbance areas (e.g. along the edges of active tracks or drill-lines; M. Bamford, W. Bancroft, pers. obs.). It is vital to preserve any connectivity of the active mound area to broadscale areas of native vegetation to facilitate movement through the natural landscape for parents (e.g. for foraging, while tending the mound) and offspring (for dispersal).

Suitable *potential* nesting habitat is not a limiting factor in the region (soils suited to mound construction, including loam-sand to gravel but not clay, with sufficient surrounding vegetation to provide leaf litter), and the Malleefowl is a mobile species that has the ability to transit to other areas without assistance. Therefore, the loss of inactive mounds at the local scale will be highly unlikely to affect the long term survival of local individuals and will not affect the regional survival of the species. Suitable potential nesting habitat could be considered to be critical habitat if it supported active mounds (i.e. supported a breeding population of the species).

In the absence of a clear definition of critical habitat for Malleefowl, we concluded that this should be decided on a case by case basis where an active mound is found.

3.4 Mapping

Low resolution maps have been provided within the body this report. Higher resolution maps can be supplied if required.

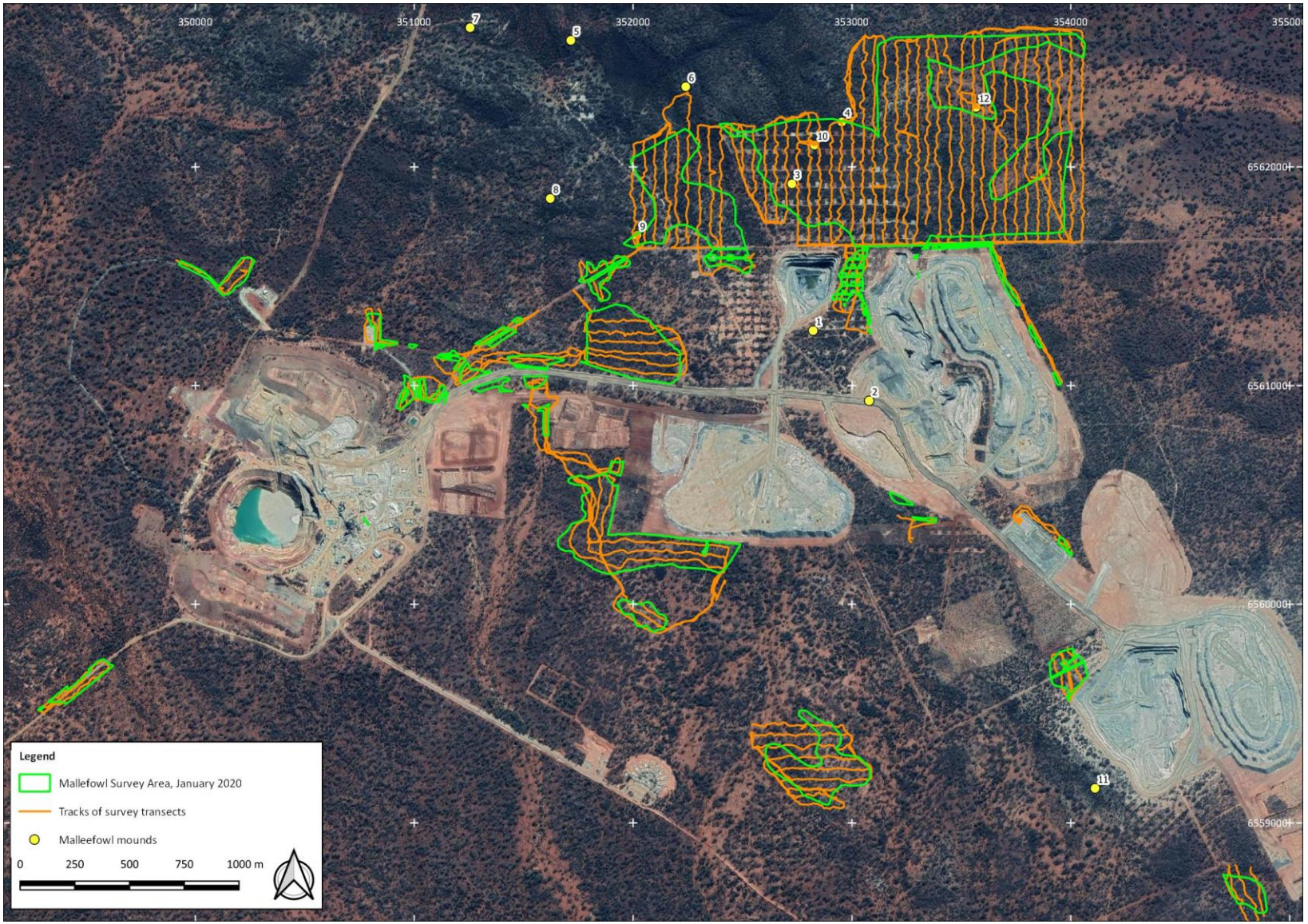

Figure 1. Mount Marion Malleefowl survey area, January 2020, and known Malleefowl mounds in the vicinity.

4 Results

The entire survey area (Figure 1) was assessed and no active or recently used Malleefowl nest mounds were identified. No Malleefowl were seen, and there were no signs of Malleefowl presence (e.g. tracks, droppings, feathers). Due to the absence of any evidence of Malleefowl being present in the area, no habitat within the survey area was considered critical for the survival of the Malleefowl.

Four of the previously known Malleefowl mounds (Metcalf and Bamford 2019) were located within the survey area (mounds 3, 4, 9 and 10; see Figure 1). There was no change to the status of these mounds (see Appendix 2) and no evidence to suggest that they had been revisited by Malleefowl since their previous inspection (at which mound ages ranged from moderately to very old; see Appendix 2).

One additional (very old, inactive) mound was located within the study area, as indicated in Table 1.

Table 1. Additional Malleefowl nest mounds recorded during the January 2020 survey at Mount Marion.

UTM Zone 51. Mound width (W, metres), height (H, centimetres), depth (D, centimetres) and profile (P) listed. See Methods for explanation of profile and age categories.

See also Appendix 2 for details of the previously located mounds.

	Easting	Northing	Habitat / Vegetation	W	H	D	Age	P
12	353566	6562272	*Acacia* spp. shrubland	4.5	20	0	Very Old	6

Five of the previously known Malleefowl mounds that are located outside of the survey area were also reassessed (mounds 5, 6, 7, 8 and 11; see Figure 1). There was no change to the status of these mounds (see Appendix 2), and no sign of recent Malleefowl activity.

Example photographs of the mounds, taken in the January 2020 survey, are presented in Appendix 3.

An annotated list of all vertebrate species recorded during the survey is provided in Appendix 4.

5 Conclusion

The findings of the January 2020 survey for Malleefowl support Metcalf and Bamford's (2019) assertion that the species may no longer nest in the vicinity of the Mount Marion minesite. There was no evidence to suggest that Malleefowl currently use the survey area, and no habitat in the survey area is considered critical for the survival of the species (either regionally or nationally).

6 References

BCE. (2016a). BCE Fauna Database. Bamford Consulting Ecologists, Kingsley, WA.

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NHT. (2007). National Manual for The Malleefowl Monitoring System: Standards, Protocols and Monitoring Procedures. National Heritage Trust, Commonwealth of Australia, Canberra, Australia.

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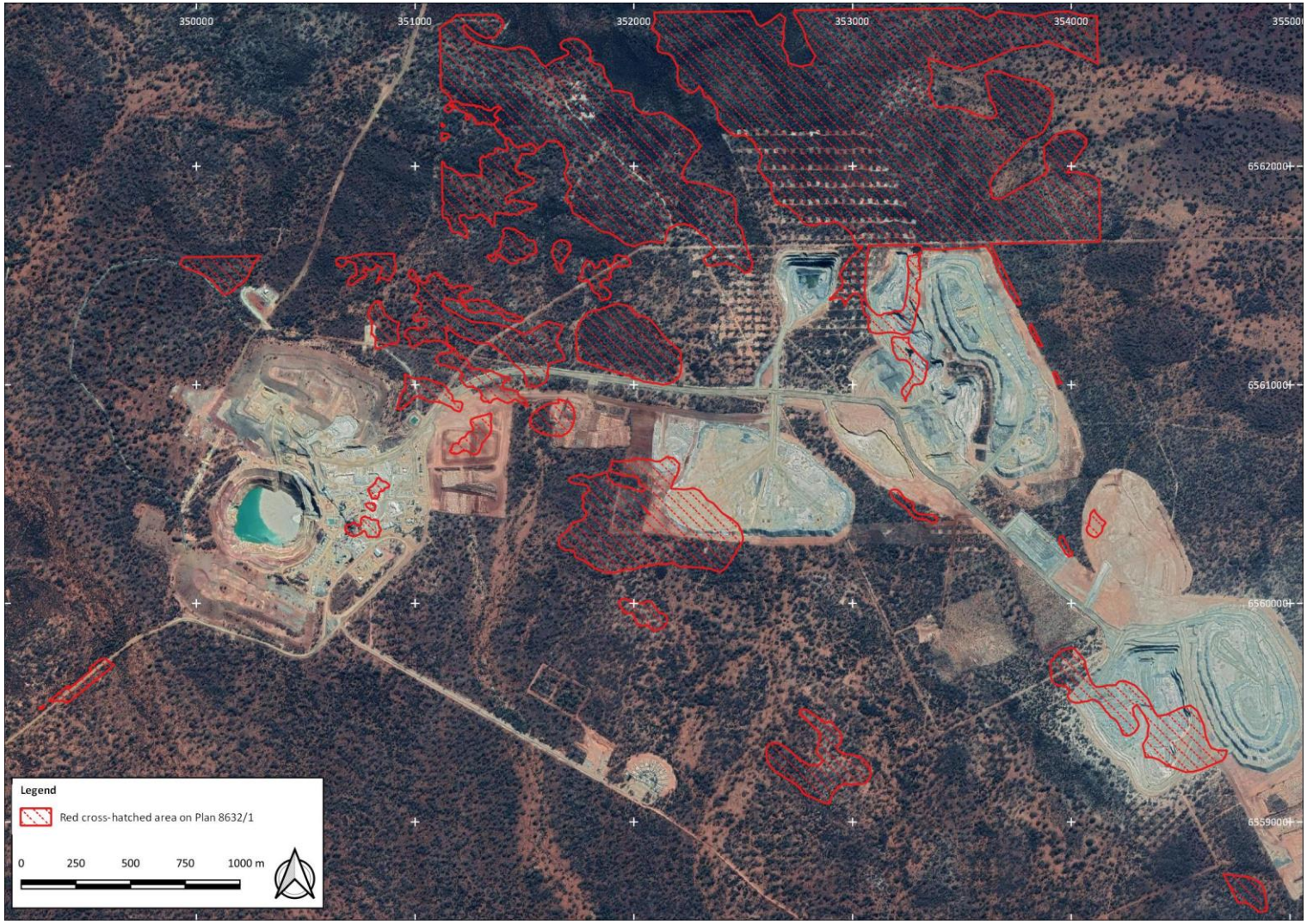
7 Appendices

Appendix 1. Areas in which Malleefowl pre-clearing surveys are required, as indicated by red cross-hatches on CPS 8632/1.



Appendix 2. Malleefowl nest mounds previously recorded during fauna surveys at Mount Marion.

UTM Zone 51. Mound width (W, metres), height (H, centimetres), depth (D, centimetres) and profile (P) listed. See Methods for explanation of profile and age categories.

	Easting	Northing	Habitat / Vegetation	W	H	D	Age	P	Reference
1	352822	6561252	*Eucalyptus spp.* And *Acacia acuminata* over *Melaleuca* and *Eremophila.*	3	50	-	Very Old	6	Rapallo (2010)
2	353078	6560931	*Allocasuarina* over *Melaleuca pauperiflora* shrubland	4	40	20	Very Old	6	Rapallo (2010)
3	352725	6561923	*Acacia quadrimarginea* over *Allocasuarina* on gravelly/rocky slight	NA	NA	NA	Very Old	NA	BCE (2016b)
4	352953	6562206	*A. quadrimarginea* shrubland, *A. acuminata*, *E. oldfieldi*	7	50	40	Moderately old	1	BCE (2016a)
5	351715	6562579	*A. quadrimarginea* shrubland, *A. acuminata*, *E. lesouefii*	6	30	30	Very Old	1	BCE (2016a)
6	352240	6562367	*Acacia, Allocasuarina, Senna,* Mallee thicket	7	100	50	Old	1	BCE (2016a)
7	351255	6562637	Mallee*, A. quadrimarginea, Dodonea sp, Scavola spinescens*	4	50	20	Old	1	BCE (2016a)
8	351621	6561856	Mallee, Melaleuca thicket	5	10	10	Very Old	1	BCE (2016a)
9	352017	6561688	Mallee, Melaleuca thicket	10	50	0	Very Old	6	BCE (2016a)
10	352828	6562100	*A. quadrimarginea*, *A. acuminata*, *E. oldfieldi, E scoparia*	7	50	0	Very Old	6	BCE (2016a)
11	354110	6559159	*Eucalypt* woodland over open mixed shrubland	4	20	0	Very Old	6	Metcalf and Bamford (2017)

Appendix 3. Example photographs of Malleefowl mounds inspected in the January 2020 survey.

Mound 4

Mound 5

Mound 7

Mound 8

Mound 9

Mound 10

Mound 11

Mound 12

Appendix 4. Annotated list of species recorded during the January 2020 Malleefowl survey.

Species	Common Name	Notes
Ctenophorus cristatus	Crested Dragon	Numerous individuals seen active throughout.
Varanus gouldii	Bungarra or Sand Monitor	Occasional diggings throughout.
Leipoa ocellata	Malleefowl	Old mounds.
Phaps chalcoptera	Common Bronzewing	Pairs, mostly in areas of Melaleuca shrubland.
Podargus strigoides	Tawny Frogmouth	Four birds flushed in northern part of study area.
Aegotheles cristatus	Australian Owlet-nightjar	One bird seen, flushed and then perched.
Merops ornatus	Rainbow Bee-eater	Single birds seen occasionally throughout.
Todiramphus sanctus	Sacred Kingfisher	One bird seen in southern part of survey area.
Psephotus varius	Mulga Parrot	Occasional pairs and small flocks in eucalypt woodlands.
Barnardius zonarius	Australian Ringneck	Pairs and singles around camp.
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	Common, in small numbers, in eucalypt woodlands.
Climacteris rufa	Rufous Treecreeper	Singles and pairs in eucalypt woodlands.
Malurus pulcherrimus	Blue-breasted Fairy-wren	A pair seen in open shrubland under Eucalypt woodland.
Malurus splendens	Splendid Fairy-wren	Small party possibly heard in dense, low shrubland.
Lichmera indistincta	Brown Honeyeater	Occasional single birds, mostly in eucalypt woodlands.
Nesoptilotus leucotis	White-eared Honeyeater	Small number of birds in eucalypt woodlands.
Melithreptus brevirostris	Brown-headed Honeyeater	Flock of eight to ten birds in central study area.
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	Single birds throughout.
Anthochaera carunculata	Red Wattlebird	One or two individuals in eucalypt woodlands.
Ptilotula ornatus	Yellow-plumed Honeyeater	Several birds, patchily, in eucalypt woodlands.
Purnella albifrons	White-fronted Honeyeater	Common, in small numbers, throughout.
Manorina flavigula	Yellow-throated Miner	Occasional (few individuals) throughout.
Smicrornis brevirostris	Weebill	Common in eucalypt woodlands.
Aphelocephala leucopsis	Southern Whiteface	Possibly heard in shrubland.
Acanthiza apicalis	Inland Thornbill	One or two individuals in shrubland.
Acanthiza uropygialis	Chestnut-rumped Thornbill	Small flock seen in Eucalypt woodland.
Pomatostomus superciliosus	White-browed Babbler	Small flock busy in northern part of study area. Nests seen throughout.
Cinclosoma clarum	Copper-backed Quail-thrush	Singles and pairs, scattered throughout.
Pachycephala rufiventris	Rufous Whistler	One bird seen in northern part of survey area.
Colluricincla harmonica	Grey Shrike-thrush	One bird heard in southern part of survey area.
Oreoica gutturalis	Crested Bellbird	Heard occasionally, throughout.
Strepera versicolor	Grey Currawong	Single birds, occasionally, throughout.
Gymnorhina tibicen	Australian Magpie	One bird heard in northern part of survey area.

Species	Common Name	Notes
Artamus cyanopterus	Dusky Woodswallow	Small flock in eucalypt woodland in southern part of survey area.
Artamus cinereus	Black-faced Woodswallow	One bird flying over central survey area.
Artamus minor	Little Woodswallow	One or two birds over and around mine pits.
Rhipidura leucophrys	Willie Wagtail	Pair nesting in eucalypt woodland in southern survey area.
Corvus coronoides	Australian Raven	Family group around camp.
Grallina cyanoleuca	Magpie-lark	One bird around camp.
Eopsaltria griseogularis	Western Yellow Robin	One bird in Eucalypt woodland.
Tachyglossus aculeatus	Echidna	Occasional diggings throughout.
Macropus robustus	Euro	Pairs or trios occasionally seen throughout. Very little evidence of scats.
Oryctolagus cuniculus	Rabbit	Occasional scat piles throughout.
Capra hircus	Goat	One small area of scats in central study area and skull found in eastern study area.