Mount Gibson Mining

EXTENSION HILL HEMATITE OPERATION

Annual Malleefowl Mound Monitoring November 2010

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Rev	Date	Revision description	By	Distribution
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1. INTRODUCTION

1.1 Location

Extension Hill and Extension Hill North are located in the Mt Gibson Ranges, approximately 350km north-east of Perth in Western Australia. The Mt Gibson Ranges have a semi-desert Mediterranean climate, characterised by hot, dry summers with 9 to 11 months of dry weather and mild, wet winters (Payne et al. 1998). The rainfall in the area averages approximately 278.8mm per annum at Paynes Find, 70km to the north (Bureau of Meteorology 2010). There was 257.0mm of rainfall recorded at Paynes Find for the period Feb 2009 – Jan 2010. Bushfires occur naturally and frequently in this region, mostly started by lightning strikes or human activities, although no major bushfires occurred in the survey area since the last monitoring program.

The Mt Gibson Ranges occurs on the boundary of the Austin Botanical District of the Eremaean and the Avon Botanical District of the Southwest Botanical Provinces (Beard 1990). They are located in the Avon Wheatbelt bioregion (McKenzie et al. 2003), but are near the junction of the Yalgoo and Coolgardie Interim Biogeographical Regional Assessment (IBRA) bioregions. As a consequence, the floristic composition of the area is considered to be representative of all three Bioregions.

Mount Gibson has a diverse range of vegetation communities comprising of six woodlands, four mallee, 12 thicket and two heath communities (Bennett Environmental Consulting, 2000). From a fauna perspective, the habitat can be divided into four broad categories: the flat sand plains, the flat woodlands, slopes and the iron stone ridges.

Surface drainage in the Mt Gibson Ranges area is primarily characterised by ephemeral flows.

1.2 Background

Malleefowl's wariness and colouration make it difficult to reliably and accurately census their numbers. As such, the number of active mounds is used as a proxy census which directly relates to the number of breeding birds in the area and hence provides an indication of population survival likelihood and impact assessment.

Each of the major habitat types was surveyed for malleefowl mounds by ATA Environmental (2005) in 2004/05. Most of the mounds at Mt Gibson were found in thickets, typically on the sand plain and pebbly soils on the slopes or base of the ironstone range (Figure 1). However, mounds were not confined to these areas. Active mounds were spread across the tenements.

In accordance with the Malleefowl Management Plan (ATA Environmental *et al* 2008), Mount Gibson Mining Limited (MGM) and Extension Hill Pty Ltd (EHPL) are required to conduct annual monitoring of known malleefowl mounds within the Extension Hill project leases (see Figure 1). Following the initial survey, the first complete monitoring survey of the known mounds was conducted in October and November 2008 during the 2008/2009 breeding season. The monitoring survey for the 2009/2010 breeding season was conducted in January 2010. The 2010/2011 breeding season survey was conducted in November 2010.

Ground disturbing activities commenced on the mining tenements on the 23rd June 2010. This primarily involved vegetation clearing around the existing, decommissioned airstrip and around the Camp Area (Figure 1). There will be a permanent presence on site from this time until the completion of mining (expected to last ~40yrs, with Mount Gibson Mining's hematite component scheduled to last ~5yrs).

1.3 Malleefowl

1.3.1 Description

Malleefowl (*Leipoa ocellata*) is a member of the family of mound building birds (Megapodiidae). It is the only species in the genus *Leipoa* (Benshemesh 2007). Adult males (65-67.5cm) are slightly larger than females (56.5-62.0cm) and are much heavier (1.7-2.1kg versus 1.5-1.6kg).

The adult malleefowl has a greyish head and neck, with a short dark bill, brown irises, a narrow white stripe beneath each eye, chestnut colouring on the chin, a dark-brown to blackish medial stripe that extends from the forehead to the base of the head, and a broad black stripe that extends from the throat to the upper breast. The upper surfaces of the wings have a complex pattern of markings, consisting of mottled brown, white, grey and black. The upper surface of the tail is mostly greyish, with narrow brown-black barring and some small patches of white. The breast, belly and flanks are a creamy white colour, and the legs and feet range from pale grey to blackish-brown in colour, and have darker claws (Marchant & Higgins 1993).

1.3.2 Breeding and Nesting

Malleefowl tend to be a sedentary, mostly terrestrial species that nest in the same general area each year (Firth 1962a; Priddel and Wheeler 2003). Malleefowl will reuse 'old' mounds that have been inactive for a number of years. In the event of the death of a partner, males display greater nest-site fidelity than females. Malleefowl are generally monogamous, pairing for life, but quickly find a new mate, if a partner dies (Priddel and Wheeler 2003).

Construction of a malleefowl nesting mound occurs intermittently over several months and is undertaken by both partners. The mound consists of sand, gravel and vegetation and is generally 3-5m wide and over 1m high, although sizes vary as material builds up in mounds that are used regularly. Mound construction mostly occurs between autumn and spring. Upon completion, the male will continue tending the mound while the female spends most of her time feeding (Benshemesh 2007). Incubation temperature of the mound is influenced by microbial decomposition of the vegetation, particularly in the early stages, and solar radiation.

1.3.3 Habitat

Malleefowl are able to survive in semi-arid and arid habitats not normally populated by extant megapodes due to their ability to manipulate external heat sources to incubate their eggs (Benshemesh 2007).

The habitat requirements of Malleefowl are poorly understood, however a sandy substrate and abundance of leaf litter are clear requirements for the construction of the birds' nesting mounds (Frith, 1959, 1962a). Densities of the breeding birds are positively influenced by rainfall, soil fertility, shrub diversity, and density of canopy cover and are negatively influenced by grazing (Frith 1962a; Woinarski 1989; Benshemesh 1992a, 2007; Copley and Williams 1995; Priddel and Wheeler 2005).

The Malleefowl is now primarily found in semi-arid and arid shrublands and low woodlands dominated by mallee (Frith 1962a, b). The vegetation is often broombush (*Melaleuca uncinata*) (Woinarski, 1989a, b) and scrub pine (*Callitris verrucosa*). They also occur in woodlands dominated by eucalypts such as wandoo (*E. wandoo*), marri (*E. calophylla*) and mallet (*E. astringens*), and in some shrublands dominated by acacia in Western Australia (Johnstone and Storr 1998).

The malleefowl mounds at Mt Gibson were predominantly, although not exclusively, found in thickets, typically on the sand plain and pebbly soils on the slopes or base of the ironstone range (ATA Environmental 2005).

1.3.4 Distribution and Abundance

Malleefowl's geographic distribution includes much of the southern half of Australia from the Great Dividing Range to the west coast (Blakers et al. 1984), and originally as far north as the Tanami Desert (Kimber 1985). Its geographic range has contracted in recent years, particularly in arid areas and around the periphery of its distribution (Benshemesh 2007). This is mostly attributed to habitat clearing (Benshemesh 2007).

Whilst resource competition with introduced grazers such as sheep, goats and rabbits is widely accepted as having a significant impact on Malleefowl abundance, the impact of predation from foxes has historically been debated. It is believed that in some environments (areas with dense understorey, lower incidence of drought and reliable food supplies on the southern margins of the Malleefowl's range), high fecundity may reduce or buffer the impact of fox predation on Malleefowl (Short 2004). Short (2004) summarized that fox control alone is not likely to permit recovery of the species and should be conducted in conjunction with management of introduced grazers and fire management.

1.4 Previous Surveys

Previous fauna and bird surveys were conducted by Hart, Simpson and Associates (2000), Recher (surveys conducted in 2000, 2001, 2002, 2003) and Dell (2001) in the Mt Gibson area. Malleefowl were observed by Hart, Simpson and Associates, and Recher (2004) however, no details on the number of birds or mounds are available. Dell (2001) recorded old mounds present in the area of Mount Gibson Station, however the exact location of these observations is not known.

Between September 2004 and January 2005, ATA Environmental (2005) undertook an extensive grid search of the entire proposed mine site and some of the surrounding area, recording 113 Malleefowl mounds. Fifteen of these were active at the time of the survey. In addition, one freshly killed bird and four live birds were sighted during these surveys (ATA Environmental 2005). Based on this data, ATA Environmental (2005) concluded that the proposed Mt Gibson mine site and surrounds support a breeding population of Malleefowl.

The first complete monitoring survey of the mounds located by ATA Environmental (2005) was conducted in November 2008 for the 2008/2009 breeding season by Mount Gibson Mining Ltd, with training and assistance from the North Central Malleefowl Preservation Group (Mount Gibson Mining Ltd 2009). An additional 2 inactive mounds were discovered during the survey, resulting in a total of 96 inactive mounds and 5 active mounds. Six mounds were not found, despite extensive searching, and 8 mounds were not checked due to equipment failure (Mount Gibson Mining 2009).

The Malleefowl mound monitoring survey for the 2009/2010 breeding season was conducted in January 2010. An additional inactive mound was discovered during this survey. Ten mounds were classified as active, 96 were inactive and 9 were not found. One inactive mound located within the mine site footprint had been cleared during exploration drilling works (Mount Gibson Mining Ltd 2010). There did not appear to be an impact on the Malleefowl population due to exploration drilling works conducted on Extension Hill. Due to the heat impacts on personnel of conducting the survey in January, it was recommended that future surveys occur earlier in the breeding season, Nov/Oct.

2. METHODOLOGY

2.1 Survey

The 2010/2011 breeding season malleefowl mound survey was conducted from the 5th – 7th of November 2010. Each known mound was located using a hand held Garmin GPSmap 60Cx, with an accuracy range of approximately 3-5m, and was visually inspected and photographed.

Mounds were classified as either 'active' (appear to be in use) or 'inactive'. Inactive mounds were further classified as extinct if they are unlikely to be used again, ie mounds that are flat and in areas that contain alternative open spaces suitable for mound building, amongst the vegetation. Large, stable inactive mounds with little vegetation growth inside them have been further classified as good mounds, likely to be used sometime in the future. A number of inactive mounds were also classified as

'Worked/Disturbed' where it appeared that Malleefowl had started working the mound but had not completed it.

Where a mound could not be found, the area was walked and inspected for approximately a 20 - 30m radius of the marked location of the mound before it was recorded as not found.

2.2 Data analysis

The known Malleefowl mounds have been grouped into 5 categories, based on their proximity to the final proposed mine footprint. Roads and tracks with regular traffic (more than 2 vehicle movements/day) have also been classified as impacted areas. The term 'impacted areas' also includes both the areas already impacted and the areas proposed for future impact. This is intended to enable comparison of each year's data as the Project expands until the final footprint is achieved. The categories are defined in Table 1.

Table 1 Mound Category Descriptions

Category	Distance from Impact Areas*
Category A	Within Project footprint
Category B	0 – 500m
Category C	500m – 1km
Category D	1km – 1.5km
Category E	1.5 – 2km

* Note that not all 'impact areas' are currently being impacted (see discussion above).

It is acknowledged that other factors, such as rainfall and food availability will also impact on the number of Malleefowl breeding, however these impacts should influence all categories equally.

Discussion of the data collected during this survey is outlined in Section 4.

3. CONSTRAINTS AND LIMITATIONS

Table 2 Survey Constraints and Limitations

Aspect	Constraint (yes/no) Significant/ Moderate/ Negligible	Comment
Competency and experience of staff	No	The project was managed and assessments conducted by a competent Environmental Engineer, previously trained in malleefowl mound assessment by the North Central Malleefowl Preservation Group president.
Scope	No	Methodology and scope as per previous surveys.
Proportion of fauna identified, recorded, collected	Negligible	No fauna identified, recorded or collected. 8 mounds were not found.
Sources of information	No	Previous survey data was available for comparison.
Proportion of the task achieved	No	Task was completed.
Timing, weather, season, cycle	No	Timing, weather, season, cycle did not impact on survey data.
Disturbances	No	No natural disturbances were experienced that influenced results.
Intensity	No	Intensity of monitoring equivalent to previous survey.
Completeness	No	All known mounds were searched for.
Resources	No	Adequate personnel with sufficient experience were available.
Remoteness and access	No	Vehicle access not available to most sites – extensive surveying on foot was required.
Efficacy of methods	No	Methods are suitable for the target species.

4. RESULTS

Subsequent to the previous survey of 115 known malleefowl mounds (Mount Gibson Mining 2010) an additional 2 mounds were discovered – one of which was located during the course of this survey. The status of the mounds are summarised in Table 3 and displayed in Figure 1.

Table 4 shows the number and percentage of mounds in each 'distance from disturbance' category that were active and inactive. Mounds that were not checked, not found or cleared were not included in calculating these percentages.

Twelve mounds (11% of checked mounds) were classified as active during this survey. Nine of these were classified as active in at least one previous survey, with four having been classified as active every time they were checked. One was a newly discovered mound. An additional six mounds showed signs of activity but were not worked sufficiently to be classified as active.

As a result of this survey, five malleefowl mounds (numbers 4, 7, 20, 101 and 103) will be excluded from future monitoring in accordance with the *National Manual for the Malleefowl Monitoring System* (National Heritage Trust 2006). These mounds were not found during this survey nor during the previous 2 surveys.

A total of 97 mounds (89% of checked mounds) were classified as inactive during this survey.

Table 3 Malleefowl mound status site summary

Status		Number of Mounds				
		2010/2011	2009/2010	2008/2009	2007/2008	2004/2005
Active		12	10	5	1	15
Inactive	*General Inactive*	*65*	*52*	*65*	*8*	*98*
	Extinct	*14*	*17*	*16*		
	Good Mound	*12*	*21*	*14*		
	Worked/Disturbed	*6*	*6*	*1*		
	Total Inactive	97	96	96	8	98
Not Found		8	9	6		
Not Checked		0	0	8	104	
Cleared		0	1			
Total Mounds		**117**	**116**	**115**	**113**	**113**

Table 4 Malleefowl mound distance from disturbance and status summary

Status		Number of Mounds									
		2010/2011		2009/2010		2008/2009		2007/2008		2004/2005	
	Distance from Disturbance Catergory	Number of Mounds	% of checked mounds	Number of Mounds	% of checked mounds	Number of Mounds	% of checked mounds	Number of Mounds	% of checked mounds	Number of Mounds	% of checked mounds
Active	A	1	1%	2	2%	1	1%	1	11%	3	3%
	B	5	5%	4	4%	2	2%	0	0%	9	8%
	C	1	1%	1	1%	1	1%	0	0%	1	1%
	D	3	3%	3	3%	1	1%	0	0%	2	2%
	E	2	2%	0	0%	0	0%	0	0%	0	0%
	Total	**12**	**11%**	**10**	**9%**	**5**	**5%**	**1**	**11%**	**15**	**13%**
Inactive	A	33	30%	32	30%	33	33%	5	56%	34	30%
	B	38	35%	38	36%	38	38%	3	33%	34	30%
	C	14	13%	13	12%	12	12%	0	0%	16	14%
	D	10	9%	10	9%	11	11%	0	0%	11	10%
	E	2	2%	3	3%	2	2%	0	0%	3	3%
	Total	**97**	**89%**	**96**	**91%**	**96**	**95%**	**8**	**89%**	**98**	**87%**
Total Mounds Checked		**109**		**106**		**101**		**9**		**113**	

5. DISCUSSION

Due to the difficulties and impracticality of accurately assessing the malleefowl population through census of individuals of this species, the number of active nesting mounds in an area is widely used and recognised as a suitable proxy. It provides data regarding the number of reproductively active birds in the area, which has a direct relationship with the likelihood of survival of the local population.

Twelve mounds were classified as active during this survey. It is noted however, that the classification of active, as defined for the purposes of this survey is relatively broad and encompasses any mounds that appear to be in use at the time of the survey, rather than only mounds that are confirmed to contain eggs. This ensures the implementation of stricter controls in relation to mining impact and removes any need to disturb mounds to confirm the presence of eggs, however still meets the objective of determining whether malleefowl are present and active in the area. The twelve mounds classified as active may not all actually contain eggs.

Discussions of this data have been commenced with a nearby conservation group, with the intent of using data collected on their nearby station as control data for comparison. These initial discussions have also identified the need to coordinate the survey timing and methodology in order to produce comparable data.

Thirteen percent (15 mounds out of 113 checked) of the mounds checked in the initial survey were active, compared to 11% (12 mounds out of 109 checked) in this survey. There is insufficient data available at this stage to draw any conclusions in relation to the movement of malleefowl away from impact areas, however the proportion of the active mounds that are within 1km of project appears to have slightly declined in this survey, relative to previous years. This appears to be due more to an increase in the number of active mounds identified further from the impact area, rather than a decrease in the number of active mounds within 1km of the impact area. It is also noted that not all of the project areas are currently active and that the number of mounds varies slightly as new mounds are discovered and some existing mounds are cleared. It is expected that next season's survey will allow for a more conclusive investigation of this trend.

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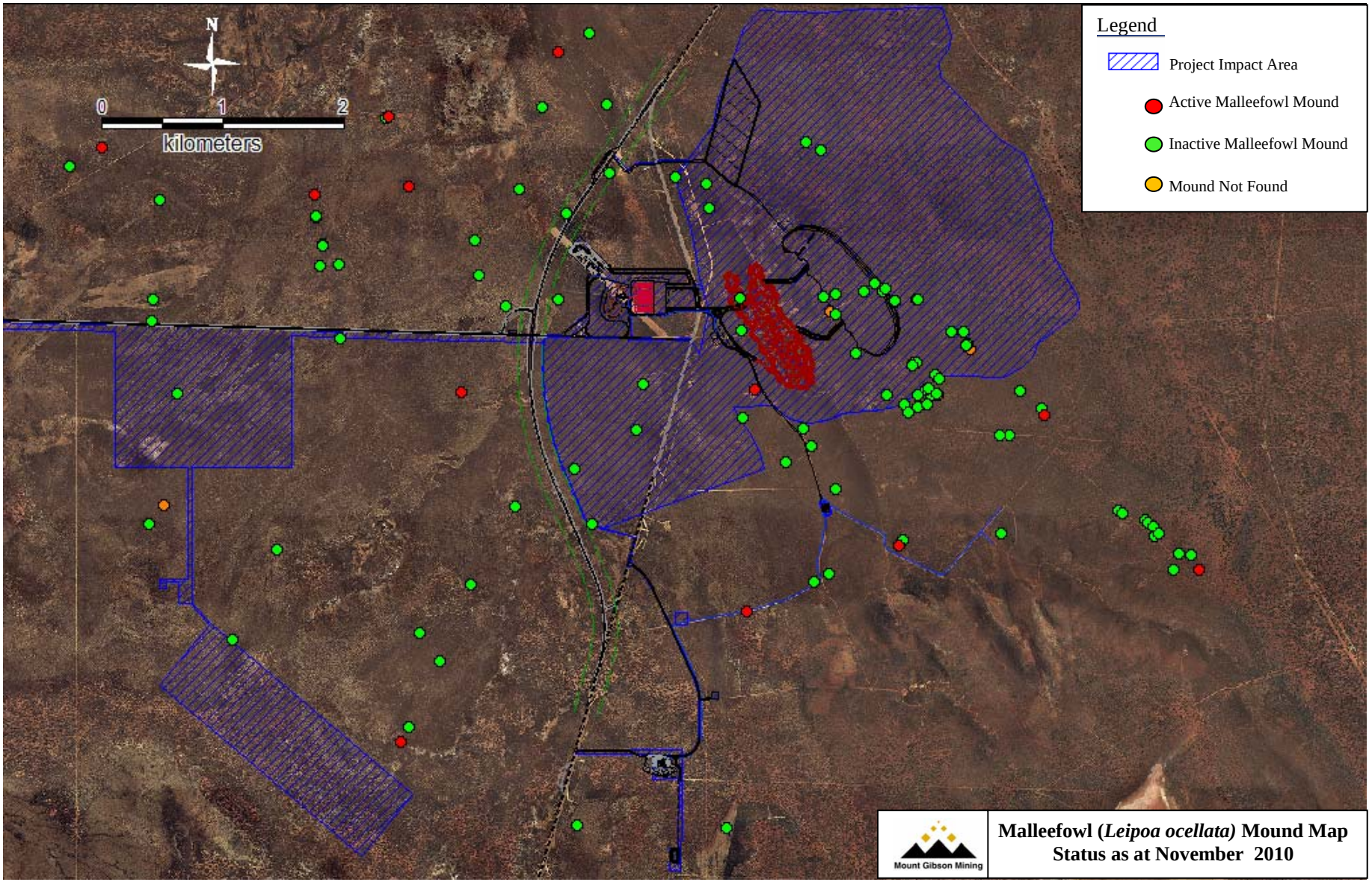

Figure 1 Malleefowl Mound Map