

Review of Flora, Vegetation and Conservation Values of the proposed Eclipse Pit Harmony Gold, Mt Magnet

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Undescribed taxon *Hemigenia* sp. Yalgoo (A.M. Ashby 2624)



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1.0 Introduction

Harmony Gold Australia, Mt Magnet operates open cut and underground mining just outside the town of Mt Magnet. A series of low lying, narrow ridges comprised of Banded Ironstone Formations (BIFs) occur throughout the MMG tenements. Within the broad footprint of current mine operations, many of these have been subjected to historical and more recent disturbance. A number of these sites are proposed for new pits and waste dumps.

Western Botanical was commissioned by Harmony Gold Australia, Mt Magnet (MMG) to undertake a flora and vegetation survey of several areas across MMG tenements. The survey areas comprised proposed pits (Eclipse, Golden Stream (Kern & True, 2006a) waste dumps (Hesperus (Kern & True, 2006b) and exploration tenements. This report documents the survey of the proposed Eclipse Pit footprint.

2.0 Methods

2.1 Botanical Survey

Denise True and Stephen Kern of Western Botanical conducted field surveys of the MMG tenements, during the period 10th to 15th October 2006. The proposed Eclipse Pit footprint area was traversed on foot on the 11th October 2006. Relevés were conducted at two sites (Figure 1), selected to represent the diversity of vegetation types within the footprint. Vegetation structure at each site was described using a modification of the Muir (1977) classification system (Appendix 2). Complete species inventories were compiled within each vegetation type. Any flora not readily identified in the field were collected and identified at the WA Herbarium while vouchers of all species encountered were also taken as reference material and have been retained by Western Botanical. Good quality specimens and species with conservation significance will be vouchered at the WA Herbarium.

All locations were recorded using hand held Garmin 76 GPS with an accuracy of approximately 5m using the WGS 84 datum. Photographs of representative habitats and known significant flora were taken for reference using a five megapixel digital camera.

Selected information gathered as part of the wider surveys conducted at the time has been considered to provide a regional context on specific issues at Eclipse.

2.2 Limitations and Constraints

Rainfall has been below average throughout much of Western Australia in 2006. As a result there was a very low occurrence of annual herbaceous species. In addition, flowering of perennial species was also affected. Despite the seasonal affects, all species collected were successfully identified to species level.



3.0 Results

3.1 Flora

A total of 59 taxa were recorded from within the survey area (Appendix 1), including three weeds (*Opuntia stricta*, *Cenchrus ciliaris*, *Acetosa vesicaria*). The majority of taxa were represented by the families: Poaceae (10 taxa), Mimosaceae (8 taxa), Chenopodiaceae (8 taxa), Myoporaceae (6 taxa), Amaranthaceae (3 taxa), Malvaceae (3 taxa), and Myrtaceae (3 taxa).

3.2.1 Flora of Conservation Significance

No flora with Priority or DRF status was recorded within the Eclipse footprint. Two undescribed species, *Hemigenia* sp. Yalgoo (A.M. Ashby 2624) and *Sida* sp. unisexual (N.H. Speck 574), were present within the survey area. *Sida* sp. unisexual (NH Speck 574) is a common and widespread shrub in the north-eastern Goldfields, often found growing in drainage foci and loamy soils on the margins of drainage lines, within Mulga Groves and similar resource-gaining sites in hardpan plains (WB 382). *Hemigenia* sp. Yalgoo (A.M. Ashby 2624) is also known to be widespread and both species do not have or warrant, conservation status.

3.2 Vegetation

The majority of vegetation within the Eclipse Pit footprint is highly degraded from historic activity with numerous ruins scattered across the site (Plate 1) and some areas are completely cleared (Plate 2). Two vegetation types were distinguished from the area included in this survey. Colonising grasses, chenopods and historical garden escapees dominated the most heavily degraded areas. Due to the highly disturbed nature of the ground the vegetation boundaries were not mapped.



Plate 1. Ruins and disturbed vegetation within the Eclipse Pit Footprint



Plate 2. Cleared area within Eclipse Pit footprint

3.2.1 Site 1: Mulga Shrubland on Outwash Plains

Site 1 is located down slope from the Banded Ironstone ridge on soils largely composed of silt and gravel. Vegetation is dominated by *Acacia ramulosa* var. *ramulosa*, *Acacia aneura* var. *aneura* Scrub over *Maireana villosa*, *Sclerolaena densifolia*, *Sclerolaena eriacantha* Dwarf Scrub.



Plate 3. Mulga Shrubland on Outwash Plains

3.2.2 Site 2: Banded Ironstone Mulga Shrubland

Site 2 is located on the north/south running banded ironstone ridge. Vegetation is dominated by *Acacia aneura* var. *aneura* Open Scrub over *Thryptomene decussata*, *Philotheca brucei* subsp. *brucei* Open Low Scrub over *Enneapogon caeruleus*, *Paspalidium basicladum* scattered Grass.



Plate 4. Banded Ironstone Mulga Shrubland

4.0 Discussion

The flora of the MMG tenements is representative of the overall flora of the Austin Botanical District (Murchison Bioregion) predominately mulga low woodland on plains, reduced to scrub on hills (Beard, 1990).

Within the MMG tenements a series of low lying, narrow, Banded Ironstone Formations (BIFs) ridges occur. Banded Iron Formations (BIFs) are highly prospective for iron ore and most if not all of the surrounding BIFs are subject to either exploration or mining. Equally there is significant interest in the conservation values of these BIFs, as previous studies have shown high levels of floristic endemism and unique ecological communities associated with these ranges.

The Department of Environment and Conservation is undertaking detailed floristic studies of the flora and vegetation of banded iron formations of the Yilgarn Craton. The aim of the study is to expand on the currently limited knowledge of the flora and vegetation that occur on the ranges where banded ironstone occurs and to place the plant communities described during the survey into a regional context with other ranges throughout the Yilgarn Craton.

A north/south running BIF ridge passes through the proposed Eclipse footprint. However the area exhibits high levels of both historic and more recent disturbance and is considered a severely degraded site. Only a small proportion of vegetation remains relatively intact. The remaining BIF ridges, which are up to 15m wide, have been largely dissected and cleared to the edges of the outcropping rocks.

During discussions with DEC regarding further surveys of the BIFs within the MMG tenements, it was agreed that given the highly degraded nature of the site, a quadrat based approach as per the BIF Survey Protocol (Gibson & Coffey, 2006), would not provide more meaningful data than that collected by the relevés. More importantly,

the level of intactness and conservation value of this BIF is considered very low. The extensive BIFs occurring on the MMG tenements will be the subject of further survey during 2007-08.

Summary of findings against the Clearing Principles (*Environmental Protection Act 1986*)

The findings of the survey work have been assessed against the clearing principles a, c, d and h.

Principle (a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

Criteria including representativeness of the area within the Bioregion, ecosystem diversity, diversity of plant species at the bioregional and local level, were used to provide an assessment of the flora and vegetation values in addressing this Principle. Acknowledging that this report does not consider the fauna values in addressing this Principle, and taking the above criteria into account, it is not considered that the proposed clearing area comprises a high level of biological diversity.

Principle (c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of rare flora.

There was no known flora of conservation significance recorded within the proposed clearing area.

Principle (d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

There are no known Threatened Ecological Communities recorded from the proposed clearing area. None of vegetation types recorded was considered to fit the criteria to be considered as a threatened ecological community.

Principle (h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

The proposed clearing is an area surrounded by existing mine operations and associated infrastructure and exhibits high levels of disturbance. There is no nearby or adjacent conservation area.

5.0 References

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- Kern S. & True D.E. (2006b) Review of Flora, Vegetation and Conservation Values of the proposed Eclipse Waste Dump Harmony Gold, Mt Magnet, October 2006. Report Ref.: WB390.
- Kern S. & True D.E. (2006a) Review of Flora, Vegetation and Conservation Values of the proposed Golden Stream Pit Harmony Gold, Mt Magnet, October 2006. Report Ref.: WB397.
- Muir, B.G. (1977) Biological Survey of the Western Australian Wheatbelt. Part II: Vegetation and habitat of the Bending Reserve. *Records of the Western Australian Museum*, Suppl. No. 3.

Appendix 1. Species Recorded within Survey Area (* denotes introduced species)

Family #	Family	Species	Site 1	Site 2	Opp
31	Poaceae	* <i>Cenchrus ciliaris</i>			1
31	Poaceae	<i>Aristida contorta</i>	1		
31	Poaceae	<i>Austrostipa nitida</i>		1	
31	Poaceae	<i>Cymbopogon ambiguus</i>			1
31	Poaceae	<i>Enneapogon caerulescens</i>		1	
31	Poaceae	<i>Eragrostis eriopoda</i>	1		
31	Poaceae	<i>Eriachne mucronata</i>			1
31	Poaceae	<i>Eriachne pulchella</i>		1	
31	Poaceae	<i>Paspalidium basicladum</i>		1	
31	Poaceae	<i>Thyridolepis mitchelliana</i>		1	
90	Proteaceae	<i>Grevillea nematophylla</i> subsp. <i>supraplana</i>			1
90	Proteaceae	<i>Hakea preissii</i>			1
97	Loranthaceae	<i>Lysiana exocarpi</i> subsp. <i>exocarpi</i>			1
103	Polygonaceae	* <i>Acetosa vesicaria</i>			1
105	Chenopodiaceae	<i>Atriplex codonocarpa</i>			1
105	Chenopodiaceae	<i>Atriplex semilunaris</i>	1		
105	Chenopodiaceae	<i>Maireana carnosa</i>			1
105	Chenopodiaceae	<i>Maireana georgei</i>	1		
105	Chenopodiaceae	<i>Maireana villosa</i>	1		
105	Chenopodiaceae	<i>Rhagodia drummondii</i>	1		
105	Chenopodiaceae	<i>Sclerolaena densiflora</i>	1		
105	Chenopodiaceae	<i>Sclerolaena eriacantha</i>	1		
106	Amaranthaceae	<i>Ptilotus exaltatus</i>			1
106	Amaranthaceae	<i>Ptilotus obovatus</i>	1	1	
106	Amaranthaceae	<i>Ptilotus schwartzii</i>		1	
163	Mimosaceae	<i>Acacia aneura</i> var. <i>aneura</i>	1	1	
163	Mimosaceae	<i>Acacia aneura</i> var. <i>argentea</i>			1
163	Mimosaceae	<i>Acacia aneura</i> var. <i>fuliginea</i>			1
163	Mimosaceae	<i>Acacia aulacophylla</i>			1
163	Mimosaceae	<i>Acacia grasbyi</i>	1		
163	Mimosaceae	<i>Acacia quadrimarginea</i>			1
163	Mimosaceae	<i>Acacia ramulosa</i> var. <i>ramulosa</i>	1	1	
163	Mimosaceae	<i>Acacia tetragonophylla</i>	1	1	
164	Caesalpiniaceae	<i>Senna artemisioides</i> subsp. <i>x sturtii</i>			1
175	Rutaceae	<i>Philotheca brucei</i>		1	
207	Sapindaceae	<i>Dodonaea petiolaris</i>		1	
221	Malvaceae	<i>Sida atrovirens</i>		1	
221	Malvaceae	<i>Sida excedentifolia</i>			1
221	Malvaceae	<i>Sida</i> sp. <i>Unisexual</i> (N.H. Speck 574)	1		
223	Sterculiaceae	<i>Brachychiton gregorii</i>			1
256	Cactaceae	* <i>Opuntia stricta</i>			1
273	Myrtaceae	<i>Aluta aspera</i> subsp. <i>hesperia</i>			1
273	Myrtaceae	<i>Micromyrtus sulphurea</i>		1	
273	Myrtaceae	<i>Thryptomene decussata</i>		1	
305	Asclepiaceae	<i>Sarcostemma viminale</i>			1
313	Lamiaceae	<i>Hemigenia</i> sp. <i>Yalgoo</i> (A.M. Ashby 2624)			1
315	Solanaceae	<i>Solanum lasiophyllum</i>		1	

Family #	Family	Species	Site 1	Site 2	Opp
326	Myoporaceae	<i>Eremophila clarkei</i>	1	1	
326	Myoporaceae	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>	1		
326	Myoporaceae	<i>Eremophila fraseri</i> subsp. <i>galeata</i>	1		
326	Myoporaceae	<i>Eremophila jucunda</i> subsp. <i>jucunda</i>	1		
326	Myoporaceae	<i>Eremophila latrobei</i>	1	1	
326	Myoporaceae	<i>Eremophila platycalyx</i> subsp. <i>platycalyx</i> ms			1
331	Rubiaceae	<i>Psydrax rigidula</i>			1
331	Rubiaceae	<i>Psydrax suaveolens</i>			1
341	Goodeniaceae	<i>Scaevola spinescens</i>	1		
343	Stylidiaceae	<i>Stylidium longibracteatum</i>		1	
54E	Phormiaceae	<i>Dianella revoluta</i>		1	

Appendix 2. Vegetation Classification

Form/Height	Canopy Cover				
	Dense 70-100%	Mid-Dense 30-70%	Sparse 10-30%	Very Sparse 2-10%	Scattered <2%
Trees >30m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland	Scattered Tall Trees
Trees 15-30m	Dense Forest	Forest	Woodland	Open Woodland	Scattered Trees
Trees 5-15m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A	Scattered Low Trees A
Trees <5m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B	Scattered Low Trees B
Mallee tree form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee	Scattered Tree Mallees
Mallee shrub form	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee	Scattered Shrub Mallees
Shrubs >2m	Dense Thicket	Thicket	Scrub	Open Scrub	Scattered Tall Shrubs
Shrubs 1-2m	Dense Heath	Heath	Low Scrub	Open Low Scrub	Scattered Shrubs
Shrubs <1m	Dense Low Heath	Low Heath	Dwarf Scrub	Open Dwarf Scrub	Scattered Low Shrubs
Mat plants, Bunch Grass, Hummock Grass, Sedges, Herbs	Dense Mat Plants/ Grass/ Hummock Grass/ Sedges/ Herbs	Mat Plants/ Grass/ Hummock Grass/ Sedges/ Herbs	Open Mat Plants/ Grass/ Hummock Grass/ Sedges/ Herbs	Very Open Mat Plants/ Grass/ Hummock Grass/ Sedges/ Herbs	Scattered Mat Plants/ Grasses/ Hummock Grasses/ Sedges/ Herbs

*Modification of the vegetation classification system of Muir (1977)