GMA Mining Australia

CPS 3544/2 Documentation for a Native Vegetation Clearing Permit Amendment Application

Contents

Abbreviations

Abbreviation	Definition
BAM Act	Biosecurity and Agricultural Management Act 2007
BoM	Bureau of Meteorology
DAWE	Department of Agriculture, Water and Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DP	Declared Pest
DWER	Department of Water and Environmental Regulation
EP Act	*Environmental Protection Act 1986*
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
ESA	Environmentally Sensitive Area
NVCP	Native Vegetation Clearing Permit
PEC	Priority Ecological Community
RIWI Act	*Rights in Water and Irrigation Act 1914*
TEC	Threatened Ecological Community
BC Act	*Biodiversity and Conservation Act 2016*

1. Introduction

1.1 Background

GMA Garnet Pty Ltd (GMA) is a wholly owned subsidiary of Garnet International Resources Pty Ltd. GMA owns and operates the garnet mineral sand mining and processing operations in the Mid-West Region, Port Gregory, Western Australia. GMA operates two open cut alluvial garnet mines, the Hose Mine (tenements G70/171, M70/856, M70/926 and M70/927) and the Lynton Mine (tenements M70/204, M70/259, M70/968, M70/1330 and M70/1331). Mining is undertaken within M70/204, M70/968 and M70/926. All ore is processed at the wet separation plant (wet plant) located on M70/856.

GMA recently completed mining on M70/927 and rehabilitation has commenced. GMA continues to maintain a haul road between the Wet plant located on M70/856 to access M70/926, and this Haul Road intersects M70/927. GMA is unable to fulfil the requirements of condition 7. The proposed amendment extends the permit's duration from 30 April 2025 to 30 April 2030.

1.2 Document Purpose

This document provides supporting information for amending the CPS 3544/2 clearing permit under Section 51k of Part V of the *Environmental Protection Act 1986*.

This document comprises the following:

- A description of the clearing details.
- Environmental Setting.
- Summary of rehabilitation undertaken within M70/927.
- Risk assessment and management.

GMA commissioned GHD Pty Ltd (GHD, 2012) to undertake a flora and vegetation survey of the application area. Section 3 details the environmental assessment component of this report (Appendix A).

The submission details are summarised in Section 2.

Table 1 IBSA Submission Details

Report name	IBSA number
GMA Garnet Pty Ltd Report for Port Gregory Mine Clearing Permit Offset Proposal (GHD 2012)	IBSA-2025-0008

2. Clearing Amendment Details

Future clearing activities are limited to firebreak maintenance along the boundary of this permit boundary. GMA is unable to fulfil the requirements of condition 7. The proposed amendment extends the permit's duration from 30 April 2025 to 30 April 2030.

225000 m

Legend

- CPS 3544 Clearing Area
- Exclusion Area

M70/926

Application Area

M70/927

M70/856

0000 m

6890000

Map Projection: Transverse Mecator
Horizontal Datum: GDA 1994
Survey: GHD (2020)
Grid :GDA 1994 MGA Zone 50

0 m 100 m 200 m 300 m

N

Figure 1
GMA Garnet
Port Gregory Mine Site
CPS 3544/2
Application Amendment Area

225000 m

3. Environmental Setting

3.1 Climate

The application area is located within the Mid-West Region of Western Australia. The Mid-West climate is considered warm, semi-arid, to Mediterranean, with 400 to 500 mm of rainfall per annum (Desmond and Chant, 2002). The region experiences a short mild, wet winter, and the remainder of the year is warm to hot, dry, or windy.

Annual Evaporation rate in the area is around 2,500 mm.

The nearest Bureau of Meteorological (BoM) station that provides reliable wind data is the Geraldton Airport (Site No. 8051). The BoM's Geraldton Airport 2007 meteorological file indicates dominant wind blows from the south and south-east direction, with a secondary prevailing wind from the north-east direction (Chart 1). Wind speeds between 2 and 6 m/s are most often observed, with wind speed reaching 8 m/s from the south-east direction.

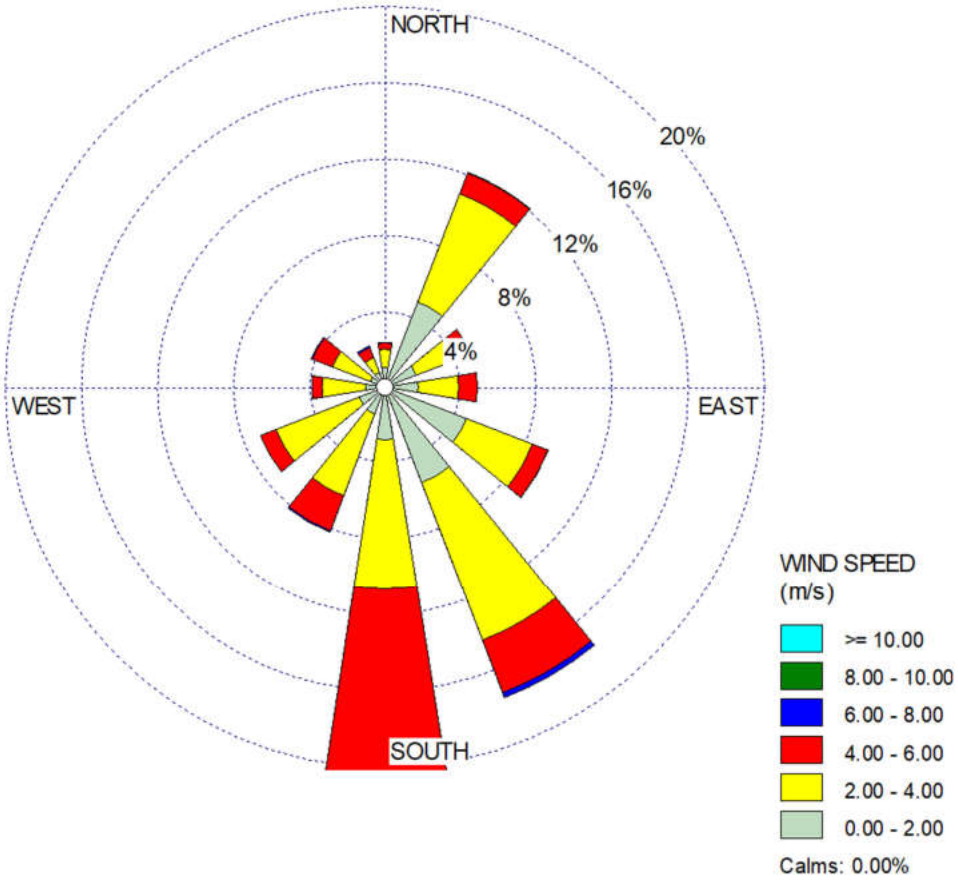


Chart 1 Wind rose (9 am and 3 pm) BoM 2007

3.2 Surrounding Land use

3.2.1 Reserves

A search of the *NatureMap* database identified one DBCA listed reserve – Utcha Well Nature Reserve is located less than 100m west of the application area (GHD, 2020a).

3.3 Landforms, geology and soils

The application area is located on intermediate westerly facing slopes between the dune systems to

the east and coastal plains associated with the Hutt Lagoon in the west while the offset area is located on intermediate westerly facing slopes between the dune systems to the east and coastal plains associated with the Hutt Lagoon in the west (GHD 2011). Scattered limestone pieces are located at or near the surface of the ridge.

The soils within the survey area are sandy and are highly permeable.

3.4 Hydrogeology and Hydrology

3.4.1 Surface water

The clearing application area in the M70/927 tenement is located on the Tamala Limestone Unit, which overlies the Tumblagooda Sandstone Unit of the Perth Basin (Playford et al., 1976). The landforms of the application area are part of the Tamala North 1 subsystem, which is described as undulating rises and swales associated with coastal parabolic dunes, featuring some limestone outcrop (DAFWA, 2010). The application area itself is described as a sloping sandplain (DAFWA, 2010).

The soils of the application area have been described as deep sands (DAFWA, 2010). These deep sands are internally draining, with no obvious surface drainage from the area (DAFWA, 2010). The proposed clearing is not likely to contribute to water erosion, given that the deep sands would facilitate high infiltration rates with little runoff (DAWFA, 2010). The deep sands of the application have a high to very high wind erosion risk.

The Hutt Lagoon, located 2083 m from the disturbance footprint, is listed as a wetland of national importance on the Directory of Important Wetlands in Australia (DIWA) (DEC 2009). Hutt Lagoon is a macroscale elongated sumpland aligned northwest to south-east, parallel to the coast. The lagoon is usually partly filled with hypersaline water during winter, and it is usually dry for the remainder of the year. The Lagoon contains the world's largest microalgae production plan, a 250-hectare series of artificial ponds used to produce beta-carotene. During summer and in dry seasons, the Lagoon is mostly empty except for the artificial ponds used for algal cultivation (URS, 2013). The Hutt Lagoon neighbours a macroscale elongate floodplain (to the north-west and the south-east) that includes more than twenty microscale elongate sumplands such as Utcha Swamp (Jaensch 1992). Water supply for the Hutt Lagoon derives from direct precipitation, surface information from several minor creeks and groundwater seepage (DEC, 2009).

The nearest surface water is the Utcha reserve is located approximately 50 metres west of the project. The Utcha Swamp is a microscale elongate sumpland that forms part of an elongated floodplain located northwest and northeast of the Hutt Lagoon (DEC 2009). The water supply for Utcha Swamp is understood to derive from direct precipitation and seepage of groundwater (DEE 2019).

3.4.2 Groundwater

The groundwater salinity of the application area is between 1000 -3000 millimetres per litre of Total Dissolved Solids (TDS) (GIS Database). This is brackish. As the application area is already within a predominantly cleared agricultural landscape, it is not likely that the proposed clearing will adversely impact groundwater quality (DAFWA, 2010). The average annual rainfall for Kalbarri is 340.7 millimetres, and the average annual evaporation rate is 2600 millimetres (BoM, 2010; GIS Database). The soils within the application area are likely to facilitate high infiltration, so there is likely to be little surface water runoff into low-lying areas west of the application area (DAFWA, 2010)

3.4.3 Public Drinking Water Source Areas

There are no public drinking water source areas within 10 km of the application area. The nearest public drinking water source is 60 km north of the application area – Kalbarri Water Reserve (Department of Water and Environmental Regulation, 2020).

3.5 Flora and Vegetation

3.5.1 Broad Vegetation mapping and Extent

Broadscale mapping (1:1,000,000) pre-European vegetation mapping (Beard, 1976) indicates two Beard Vegetation Associations (BVA) was mapped within the application area including:

- BVA 371 - Low forest.

Shephard et al. (2002) adapted and digitised the pre-European mapping. The extent of vegetation associations has been determined by the State-Wide vegetation extents calculations maintained by the DBCA (current as of March 2019—GoWA, 2019).

As shown in Table 3, the current extent of BVA 371 is below the 30% retention target of the pre-clearing size at all levels except Local Government Authority Levels.

Table 2 Pre-European Vegetation Extent Association (GoWA, 2020)

Pre-European Vegetation Extent Association	Pre-European (ha)	Current extent (ha)	Remaining pre-European extent (%)
Greenough_371			
State	32,816.04	3,499.60	10.66
IBRA Bioregion: Geraldton Sandplains	32,807.53	3.499.10	10.67
Sub-IBRA: Geraldton Hills	32,807.53	3,499.10	10.67
LGA: Shire of Northampton	5,749.92	2,142.08	36.94

3.5.2 Mapped vegetation types and conditions

In 2011, GMA engaged GHD Pty Ltd (GHD) to survey flora. GHD (2011) mapped two vegetation aligning within the application area including:

- *Acacia rostellifera* low forest to open low shrubland.
- Cleared/Degraded vegetation used historically for agricultural

The *Acacia rostellifera* low open forest was relatively degraded due to weed invasion and grazing by livestock with the condition ranging from Good to Degraded. The condition of vegetation is consistent with that previously described for the area proposed to be cleared. The *Acacia rostellifera* low forest vegetation type aligns with Beard Vegetation Association 371 (GHD, 2011).

3.5.3 Ecological Communities

GHD (2011) desktop searches did not identify Threatened Ecological Communities within the application area. No Threatened (Declared Rare) or Priority Flora species are known to occur in the area, nor are they considered likely due to the degraded nature of the habitat present in the Project Area. No PECs or TECs were delineated from the application area (GHD, 2011).

3.5.4 Flora Diversity

GHD (2011) recorded a total of 49 flora taxa from 25 families were recorded from the surveyed area, with 13 taxa recorded as introduced/exotic species. The following families dominated the vegetation:

- Asteraceae (daisies): 6 taxa;
- Chenopodiaceae (saltbush): 5 taxa;
- Fabaceae (wattles, peas): 4 taxa; and
- Poaceae (grasses): 4 taxa

3.5.5 Conservation Significant Flora

No other conservation significant flora taxa (i.e. flora species recorded at or beyond their known range) were recorded from the area proposed to be cleared. GHD (2011) recorded no conservation-listed flora species within the survey area. The clearing area is currently mapped as Beard Vegetation Association 371: Low forest;

Acacia rostellifera in a mostly *Degraded* condition. Despite its *Degraded* condition, the vegetation is a critical asset as less than 30% of it remains within the bioregion. The vegetation also has value as an ecological linkage (for highly mobile fauna) between Utcha Well Nature Reserve to the west, and the vegetation to the east (GHD, 2012).

No *flora listed under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), Biodiversity Conservation Act 2016 (BC Act), or Department of Biodiversity Conservation and Attraction* were recorded within the survey area.

No collections were made of species considered flora of interest from the survey area, such as significant range extensions or collections of taxonomic interest representing potential new species.

3.6 Environmentally Sensitive Area

No Environmentally Sensitive Area (ESA) was identified within or adjacent to the application area (GHD 2020a).

4. Environmental Risk Assessment and management

4.1 Identifying Environmental Threats

Threats related to the clearing of native vegetation for the Lynton Project are summarised in the table below.

Table 3 Pre-European Vegetation Extent Association (GoWA, 2019)

Environmental Threats	Potential Risk
Clearing of native vegetation	Clearing beyond approved boundaries and/or exceeding approved disturbance boundaries.
Dust	Impacts on native flora caused by dust emanating from the area.
Native fauna and habitat	Clearing of vegetation and activity associated with the project has the potential to directly (vehicle strikes, habitat removal) and indirectly impact native fauna (changes to foraging and dispersion dynamics)
Introduced flora	Weeds compete with native species and impact the success of rehabilitation.

4.2 Risk Assessment

An Environmental Risk Assessment was completed for the threats identified above using the criteria adopted from the DEMIRS Statutory Guidelines for Mining Proposal (2020); refer to the table below. Appendix B provides further details concerning the Environmental Risk Assessment process.

Table 4 Risk assessment and management

Environmental Threat	Cause	Potential impact	C	L	Inherent Risk Level	Management	C	L	Treated risk
Clearing of vegetation	Clearing works undertaken to the proposal.	Clearing of native vegetation in unapproved areas and/or outside the tenement boundary. Environmental factor: • Biodiversity/flora/fauna and biodiversity.	minor	possible	9 - medium	• Awareness training highlights the procedure for clearing and • Clearing and Ground Disturbance permit systems and procedures are in place. • Survey control of areas to be cleared. • Post-clearing checks to ensure clearing has been undertaken following the permit conditions.	minor	Infrequent	5 – low
Dust	Vehicle and machinery movement	Dust resulting from the movement of vehicles and the operation of machinery settles on adjacent vegetation within the Premises and off-site (adjoining Utcha Well Nature Reserve) and causes plant death. Environmental Factors: • Biodiversity/flora/ecosystem	minor	possible	9 - medium		minor	Infrequent	5 - low
	Wind	Dust from wind blowing across cleared areas and stockpiles settles on adjacent vegetation and causes plant death. Windblown dust causing impacts to health and condition of conservation significant native vegetation within the Premises and off-site (adjoining Utcha Well Nature Reserve) Environmental Factors: • Biodiversity/flora/ecosystem	moderate	likely	17- high	Dust management will be undertaken as per GMA's licence L8561/2011/1, condition 16 and 20 as provided in Appendix C. The following management measures are proposed: • Water carts will undertake dust suppression on haul roads • Dust suppressant additives (mulches or polymer additives) will be used if water applicates is insufficient to ameliorate dust generation. • Any mining activities will cease in the event dust	minor	infrequent	5 - low

Environmental Threat	Cause	Potential impact	C	L	Inherent Risk Level	Management	C	L	Treated risk
						suppression controls fail to mitigate dust emissions. Potential impacts associated with wind erosion can be minimised by progressive rehabilitation.			
Native fauna and habitat	Clearing of vegetation.	Biodiversity Loss	minor	likely	10-medium	Clearing is managed through the clearing and ground disturbance procedure.	minor	infrequent	5 - Low
	Interaction with fauna.	Interaction with native fauna. Environmental Factors: Biodiversity/flora/fauna/ecosystem				• Fauna awareness training. • One directional clearing to allow fauna to abscond. • Speed limits impose on access and haul roads.			
Introduced flora	New weed species introduced to site.	Any machinery brought to site must have completed a weed and seed certificate. Environmental Factors: • Biodiversity/flora/fauna/ecosystem	Minor	Likely	10 – medium	• Weed and hygiene procedure. • Machinery or equipment brought to sit clean before mobilisation. • Inspection of machinery on arrival. • Weed surveys to be undertaken.	minor	Infrequent	5- low

4.3 Specific Management Actions to Address Impacts from Clearing

4.3.1 Clearing of Native Vegetation Management Action

To ensure clearing is managed appropriately, management actions will include:

- Vegetation clearing procedures and processes to prevent unauthorised clearing, including as part of the Site induction training.
- A clearing and ground disturbance permit system that requires authorisation from the Environmental and Land Access and Compliance departments.
- Survey control to ensure the clearing extent is demarcated with flagging tape.
- All site personnel undertaking clearing activities have been inducted and understand the clearing procedure and permitting processes.

4.3.2 Dust

The main environmental impact of dust emission is vegetation death from high dust settling on plant leaves, preventing photosynthesis and respiration.

The main dust sources are vegetation clearing, vehicle movement, machinery operations and strong winds.

Newly cleared areas, along with existing open areas such as Run-of-Mines, laydown areas, and stockpiles, have the potential to generate dust, particularly in windy conditions.

Management Actions

As per our Environmental Licence L8561/2011/1, dust generation management actions include:

- Staged clearing of areas to minimise open areas.
- Land clearing and topsoil handling avoid windy conditions, particularly where they may impact sensitive receptors.
- Water cart to suppress dust.
- Progressive rehabilitation of mined areas.
- Cessation of activities if causing visible dust lift-off.

5. Clearing and Rehabilitation Status

Table 4 summarises the clearing and rehabilitation extents undertaken under CPS 3544/2, and Figure 4, and Figure 5 identifies the areas where clearing and rehabilitation activities have been undertaken. Rehabilitation efforts include 27.8 ha.

GMA commissioned Emerge Associates (Emerge) to undertake rehabilitation monitoring of the rehabilitated areas within CPS 3544/2 in August 2024. The report concluded:

- Monitoring indicates that the Hose rehabilitation is on track to meet the completion criteria after five years.
- Whilst no upper stratum cover was recorded with rehabilitation quadrats in 2024, upper stratum juveniles of species in the adjacent remnant vegetation are present. Over time, these juveniles will likely grow and meet the criteria to be classified as upper stratum.
- Weed cover in the rehabilitation area was generally low and at the lower end of the range recorded in reference areas.

The report is provided in Appendix D. The photographs below demonstrate the successful re-establishment of the vegetation communities with the rehabilitation sites.

Plate 1 Rehabilitation Site 2017

Plate 2 Rehabilitation Site 2021

CPS 3544/2 Offset Management

Section 1.2.1 of GHD (2012) Clearing Permit Offset proposal outlines the offset management requirements for CPS 3544/2. The following have been undertaken:

- Excised part of the western portion of M70/927 for vegetation conservation under a land swap arrangement with the Department of Biodiversity, Conservation and Attractions (formerly Department of Environment and Conservation) in 2007.
- GMA is progressively rehabilitating M70/927 to achieve a good or better condition.
- Engaged a rehabilitation contractor to actively manage weeds through a weed spraying program within the rehabilitation sites.
- Excluded stock from the rehabilitation areas by maintaining the boundary fence line on M70/856. Cattle was de-stocked from M70/926 in 2011.

5.1 CPS 3544/2 Summary of Clearing and Rehabilitation

Table 4 summarises rehabilitation work undertaken within the CPS 3544/2 permit area since 2012.

Table 5 Clearing and Rehabilitation Works

Reporting Periods 1 July to 30 June	Clearing extent (ha)	Clearing Accumulative Total (ha)	Rehabilitation (ha)	Rehabilitation Accumulative Total (ha)
2012 - 2013	3.1	3.1	-	-
2013 - 2014	4.58	7.68	-	-
2014 - 2015	4.24	11.92	-	-
2015 - 2016	3.88	15.8	0.75	0.75
2016 - 2017	2.08	17.88	0	0
2017 - 2018	2.17	20.05	0.02	0.77
2018 - 2019	3.86	23.91	1.82	0.952
2019-2020	3.28	27.19	6.474	7.426
2020-2021	2.002	29.192	9.81	17.236
2021-2022	0.45	29.642	3.695	20.931
2022 -2023	NIL			
2023-2024	NIL		6.87	27.801
Total to date		29.642	27.801	27.801

6. Assessment of the Ten Clearing Principles

An assessment of the proposed clearing action against the ten clearing principles, as outlined in Schedule 5 of the EP Act provided in Table 6.

The assessment indicates the clearing is 'not considered to be at variance with the Ten Clearing Principles'.

Table 6 Assessment of the Ten Clearing Principles

Clearing Principle	Assessment	Conclusion
Principle (a) – Native vegetation should not be cleared if it comprises a high level of biological diversity.	Vegetation comprised of mostly degraded *Acacia rostellifera* low forest. This is considered to be a rare vegetation association (CALM, 2002).	The proposed clearing not considered to be at variance with this Principle.
Principle (b) – Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	Potential that the application area may provide an ecological linkage (for highly mobile fauna). The understorey is comprised almost wholly of agricultural weeds. Open canopies over a highly disturbed understorey may only be of value to highly mobile species (Molloy *et al.*,2009).	The proposed clearing is not considered to be at variance with this Principle.
Principle (c) – Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	Priority 3 species *Melaleuca huttensis* listed may potentially occur in the application area. No *Melaleuca* was observed in the application area during a site visit.	The proposed clearing is not considered to be at variance with this Principle.
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.	No Threatened Ecological Communities (TECs) were identified within 10 km of the application area. The vegetation mapped within the survey area does not correspond with any of the Priority Ecological Communities (PECs) or Threatened Ecological Communities (TECs) recorded within a 10 km radius of the application area.	The proposed clearing is not considered to be at variance with this Principle.
Principle (e) – Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	Remnant mapped as Beard Vegetation Association 371: Low Forest; *Acacia rostellifera*. This has a representation of lower than 30% within the bioregion and is classed as being a critical asset. It is in mostly degraded condition, but because it is a critical asset, offsets are required, and hence with focus on offsetting BVA 371.	The proposed clearing is considered to be at variance with this Principle.
Principle (f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	The project is not located within any proclaimed Surface Water Areas and has no major fresh waterways or tributaries within the tenement. Any surface water channels are ephemeral and do not feature year-round base flow. As the application area is already within a predominantly cleared agricultural landscape, it is not likely that the proposed clearing will adversely impact groundwater quality (DAFWA, 2010). The average annual rainfall for Kalbarri is 35.31 millimeters, and the average annual evaporation rate is 2600 millimetres (BoM, 2010; GIS Database). The soils within the application area are likely to facilitate high infiltration, so there is likely to be little surface water runoff into low-lying areas west of the application area(DAFWA, 2010) The Hutt Lagoon, located approximately 2081 m south-west from the disturbance footprint, is listed as a wetland of national importance on the Directory of Important Wetlands in Australia (DIWA) (DEC 2009). The nearest surface water is the Utcha reserve,	The proposed clearing is not considered to be at variance with this Principle.

Clearing Principle	Assessment	Conclusion
	located approximately 50 metres west of the project (DEC 2009). The disturbance envelope does not intersect any of their tributaries.	
Principle (g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	The deep sands of the area have a high to very high wind erosion risk. Much of the clearing envelope has been successfully rehabilitated. Clearing will be limited to firebreak maintenance.	The proposed clearing is not considered to be at variance with this Principle.
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.	Utcha Well Nature Reserve is adjacent to the west of the application area. Clearing may disrupt an ecological linkage between the nature reserve and other areas of remnant vegetation.	The proposed clearing is not considered to be at variance with this Principle.
Principle (i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water	Due to the porous nature of the soils, any rainfall rapidly infiltrates directly through limestone. It is expected that most of the surface water will also rapidly infiltrate. Much of the clearing envelope has been successfully rehabilitated. Clearing will be limited to firebreak maintenance.	The proposed clearing is not considered to be at variance with this Principle.
Principle (j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.	The DE has no major fresh waterways or tributaries within its boundary.	The proposed clearing is not considered to be at variance with this Principle.

225000 m

Legend
CPS 3544 Clearing Area
Exclusion Area

M70/926

M70/927

Application Area

M70/856

6890000

90000 m

Map Projection: Transverse Mecator
Horizontal Datum: GDA 1994
Survey: GHD (2020)
Grid :GDA 1994 MGA Zone 50

50 m 150 m 250 m

N

Figure 2a
GMA Garnet
Port Gregory Mine Site
CPS 3544/2 Amendment
Application Topography

225000 m

Legend
CPS 3544 Clearing Area
Environmentally Sensitive Area
Exclusion Area

M70/926

M70/927

Application Area

M70/856

6890000

0000 m

Map Projection: Transverse Mecator
Horizontal Datum: GDA 1994
Survey: GHD (2020)
Grid :GDA 1994 MGA Zone 50

0 m 500 m 1000 m

N

Figure 2b
GMA Garnet
Port Gregory Mine Site
CPS 3544/2
Application Amendment Area
ESA

225000 m

225000 m

Legend
- Acacia Rostellifera
- Cleared/ Degraded
- CPS 3544 Clearing Area
- Exclusion Area

M70/926

Application Area

M70/927

M70/856

0000 m

6890000

Map Projection: Transverse Mecator
Horizontal Datum: GDA 1994
Survey: GHD (2020)
Grid :GDA 1994 MGA Zone 50

0 m 100 m 200 m 300 m

N

Figure 3
GMA Garnet
Port Gregory Mine Site
CPS 3544/2
Application Amendment Area
Mapped Vegetation Type (GHD 2011)

225000 m

Legend
- Completely Degraded
- Degraded
- Unknown Area Type

M70/926

Application Area

M70/856

0000 m

6890000

Map Projection: Transverse Mecator
Horizontal Datum: GDA 1994
Survey: GHD (2020)
Grid :GDA 1994 MGA Zone 50

0 m 100 m 200 m 300 m

N

Figure 4
GMA Garnet
Port Gregory Mine Site
CPS 3544/2
Application Amendment Area
Mapped Vegetation Conditions
(GHD 2011)

225000 m

225000 m

Legend

CPS3544 Clearing Extent

M70/926

Application Area

M70/927

M70/856

0000 m

6890000

Map Projection: Transverse Mecator
Horizontal Datum: GDA 1994
Grid :GDA 1994 MGA Zone 50

0 m 50 m 100 m 150 m

N

Figure 4
GMA Garnet
Port Gregory Mine Site
CPS 3544/2
Application Amendment Area
Clearing Extent

225000 m

6890000

0000 m

Legend

- Exclusion Area
- Stage 1 - Topsoil Spread
- Stage 2 - Monitoring

M70/926

Application Area

M70/927

M70/856

Map Projection: Transverse Mecator
Horizontal Datum: GDA 1994
Grid :GDA 1994 MGA Zone 50

0 m 50 m 100 m 150 m

N

Figure 4
GMA Garnet
Port Gregory Mine Site
CPS 3544/2
Application Amendment Area
Rehabilitation Effort

7. Reference

Desmond, A and Chant, A (2001) Geraldton Sandplains (GS2 – Geraldton Hills Subregion). A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002.

GHD (2012) GMA Garnet Pty Ltd Report for Port Gregory Mine Clearing Permit Offset Proposal

URS (2013) *Hose Mine Hydrological Assessment.* Unpublished. Prepared for GMA Garnet.

Appendix A. Environmental Surveys

CLIENTS | PEOPLE | PERFORMANCE

GMA Garnet Pty Ltd

Report for Port Gregory Mine

Clearing Permit Offset Proposal

June 2012

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

This Clearing Permit Offset Proposal *("Report"):*

1. *has been prepared by GHD Pty Ltd ("GHD") for GMA Garnet Pty Ltd ("GMA Garne"t);*
2. *may only be used and relied on by GMA Garnet;*
3. *must not be copied to, used by, or relied on by any person other than GMA Garnet without the prior written consent of GHD;*
4. *may only be used for the purpose of seeking approvals for a clearing permit offset (and must not be used for any other purpose).*

GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than GMA Garnet Pty Ltd arising from or in connection with this Report.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report:

- *were limited to the scope indicated in the GHD proposal dated 23/11/2011;*
- *did not include fauna surveys, or an assessment of the ecological linkage.*

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking services and preparing the Report ("Assumptions"), including (but not limited to):

- *Information supplied by GMA Garnet is correct to 30/11/2011*
- *Information supplied by various government agencies is correct to 30/11/2011*

GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.

Subject to the paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation and may be relied on until 2015 after which time, GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with those opinions, conclusions and any recommendations.

Contents

Table Index

Figure Index

Appendices

1. Introduction

1.1 Project Background

GMA Garnet Pty Ltd (GMA Garnet) currently own and operate the Port Gregory Mine, located approximately 12 km north of Port Gregory in Western Australia (Figure 1, Appendix A). GMA Garnet has recently acquired a portion of the Utcha Well Nature Reserve (the Project Area) east of George Grey Drive from the Department of Environment and Conservation (DEC) as part of a land-swap for a larger, more intact parcel of land in better condition (See Appendix F for full information pertaining to the land-swap).

The Project Area (M70/927) is proposed to be cleared and mined for garnet via the open-cut mining process currently in place. Upon application for a clearing permit, the GMA Garnet Clearing Permit Decision Report (CPS 3544/1) (Appendix B) indicates that the proposed clearing of vegetation within the Project Area is at variance with Clearing Principles (e) and (g) and may be at variance with Principles (a), (b), (c), and (h).

A Clearing Permit (with conditions) has been obtained for the Project Area (CPS 3544/1). One of the conditions (Condition 6) of the Clearing Permit is that an Offset Proposal must be submitted to the Department of Mines and Petroleum (DMP) and approved before any clearing takes place.

This report details the proposed GMA Garnett Clearing Permit Offset Proposal; Vegetation and Flora survey, and Proposed Rehabilitation Management Plan required by GMA Garnet necessary to assist in the adhering with Condition 6 of the Clearing Permit CPS 3544/1.

1.2 Clearing Permit Offset Proposal

1.2.1 Summary

GHD Pty Ltd (GHD) has been commissioned by GMA Garnet Pty Ltd (GMA Garnet) to prepare an offset proposal for CPS 3544/1. GHD have liaised with GMA Garnet, the Department of Mines and Petroleum (DMP) and prepared an outline of the proposed offset.

Condition 6 of the Clearing Permit for CPS 3544/1 states:

> "If part or all of the clearing to be done is or may be at variance with one or more the clearing principles, then the Permit Holder must implement an offset in accordance with Conditions 6(a) and (b) of this Permit with respect to that clearing."

Part or all of the clearing to be done under CPS 3544/1 is or may be at variance to principles (a), (b), (c), (e), (g) and (h). The aspect of the clearing to which the level of variance applies, and an outline of the proposed offset/s, was presented against these principles (Appendix C).

The DMP commented (A. Buck, 11/08/2011) that the proposed offset

> "…doesn't need to address every Principle that is at or may be at variance, only ones for certain significant environmental values. In this case it relates to the loss of Beard Vegetation Association 371 and Principle (e). However, as you have pointed out, by implementing the offset proposed it will indirectly address impacts identified under other Principles.
>
> Given the existing largely degraded state of the application area, and that the whole of the permit area is return to good or better condition, then the direct offset proposed would likely result in a net environmental benefit above what would be required under existing conditions. An important part to this proposal will the monitoring and management measures in place to ensure that this is achieved. Accompanied with the contributing offsets of active weed management and exclusion of livestock from the rehabilitation area the offset proposal as a whole would appear to be acceptable in this instance."

In summary, GMA Garnet proposes the following offsets:

Direct Offset:

- Rehabilitation of the area to be cleared to Beard Vegetation Association 371 in *Good* or better condition with active management. The offset proposal will include a detailed rehabilitation management plan and will have regard to the offset principles under CPS 3544/1. In summary:
  - Where areas exist that are *Completely Degraded*, these will be rehabilitated to *Good* condition.
  - Where areas exist that are in *Good* condition, these will be rehabilitated to better than *Good* condition.
- Land Swap: GMA Garnet has already, in good faith, undertaken a land swap with the Department of Environment and Conservation (DEC). Details are included in Appendix F, with a summary below:
  - The land swap involved an excision from and additions to the Utcha Well Nature Reserve.
  - GMA Garnet received portions of the Utcha Well Nature Reserve east of George Grey Drive (deemed to contain vegetation in Severely Degraded condition). This portion went to GMA Garnet free of cost as a freehold title.
  - The DEC received areas west of the George Grey Drive (formerly part of Victoria Location 3581) which were much larger in area and of high value for conservation purposes. This portion went to the DEC and added to Utcha Well Nature Reserve.

Contributing offsets:

The rehabilitation management plan will include these contributing offsets:

- The rehabilitation area will be actively managed to minimise weed infestation and eradicate weed species;

- Livestock will be excluded from the area to be cleared by fencing at the northern boundary; and
- Management measures for controlling wind erosion will be presented.

2. Clearing Permit Offset Proposal for CPS 3544/1

Section 1: Contact Details

Date: **28/11/2011**

Purpose permit holder contact person:
Person responsible for compliance with permit & implementation of the Offset Proposal following approval.

Name **Amanda Gundry, Production Manager, GMA Garnet Group**

Phone numbers **(08) 9923 6000 / 9923 6010 (Direct) / 0417 956 855 (Mobile)**

Email **amandag@gmagarnet.com.au**

Environmental specialist contact person:
This person will have contributed technical information in this proposal.

Name : **Joshua Foster, Principal Ecologist, GHD Pty Ltd**

Phone numbers **(08) 9920 9409**

Email **Joshua.Foster@ghd.com**

Environmental specialist's qualifications or equivalent, and relevant experience:

- Bachelor of Science (Botany, Zoology) – University of Western Australia
- Graduate Diploma Science (Botany) – University of Western Australia
- Diploma Applied Science (Environmental Technology) – Curtin University of Technology
- PhD (current) (Mining and Salt Lake Ecology) – Curtin University of Technology

Joshua has over 14 years' experience in ecological work with extensive experience in baseline botanical surveys, targeted searches for particular species, mapping of vegetation communities, weed management, revegetation and rehabilitation planning and assessment. He has also completed a number of zoological surveys, environmental impact assessments and environmental management plans. All survey experience obtained within Western Australia.

Section 2: Information within your Clearing Permit

This information is obtained from the first page of your clearing permit

Purpose permit Number: **CPS 3544/1**

Permit holder: **GMA Garnet Pty Ltd**

Purpose of clearing: **Mineral sand mining (Garnet)**

Land on which clearing is to be done (including number of hectares):

GMA Garnet have been granted a permit to clear up to 33.227 hectares of native vegetation on M70/927 for the purposes of mineral sand mining. M70/927 is located along George Grey Drive, approximately 12 kilometres north of Port Gregory in the Shire of Northampton (Figure 1, Appendix A).

The offset area (34.938 hectares) incorporates 33.227 hectares approved to clear east of a 20 m corridor buffer (where no clearing will occur) totalling 1.711 hectares

Section 3: Overview - information within the Decision Report (Assessment of application against Clearing Principles), and outline of offset proposal

This information is obtained from the 'Decision Report' that accompanied the Clearing Permit.
Detail the impact of the clearing: e.g. vegetation extent, fauna habitat, rare flora, wetlands/ watercourse etc (if needed discuss with Native Vegetation Conservation Branch).

State the clearing principle/s your clearing is at, or may be at, variance to and the impact of the clearing on the environment:

Part or all of the clearing to be done under CPS 3544/1 is or may be at variance to principles (a), (b), (c), (e), (g) and (h). The aspect of the clearing to which the level of variance applies, and an outline of the proposed offset/s, is presented against these principles in the table below. In summary, GMA Garnet proposes the following offsets:

Direct Offset:

- Rehabilitation of the area to be cleared to Beard Vegetation Association 371: Low forest; *Acacia rostellifera* (BVA 371) in good or better condition with active management. The offset proposal includes a detailed rehabilitation management plan and has regard to the offset principles under CPS 3544/1.
- Land Swap: GMA Garnet has already, in good faith, undertaken a land swap with the Department of Environment and Conservation (DEC). A summary is included below:

– The land swap involved an excision from and additions to the Utcha Well Nature Reserve.

– GMA Garnet received portions of the Utcha Well Nature Reserve east of George Grey Drive (deemed to contain vegetation in Severely Degraded condition). This portion went to GMA Garnet free of cost as a freehold title.

– The DEC received areas west of the George Grey Drive (formerly part of Victoria Location 3581) which were much larger in area and of high value for conservation purposes. This portion went to the DEC and added to Utcha Well Nature Reserve.

Contributing Offsets:

The rehabilitation management plan will include these contributing offsets:

- The rehabilitation area will be actively managed to minimise weed infestation;
- Livestock will be excluded from the area to be cleared by fencing at the northern boundary; and
- Management measures for controlling wind erosion will be presented.

Clearing Principle	Level f variance	Aspect of clearing to which level of variance applies	Offset proposal outline
(a) Native vegetation should not be cleared if it comprises a high level of biological diversity	May be at variance	Vegetation comprised of mostly degraded *Acacia rostellifera* low forest. This is considered to be a rare vegetation association (CALM, 2002).	As a direct offset, GMA Garnet proposes to rehabilitate the area to be cleared to good or better condition. Each year, a belt of vegetation approximately 100 metres in length is cleared to the north of the mine face. Rehabilitation is progressive and occurs at a rate of approximately 100 metres a year once mining is complete (to the south of the active mine area). At any one time, the area cleared (active mine area) consists of a belt of land approximately 300 to 400 metres in length. A rehabilitation management plan will be developed as part of the offset proposal and will outline the species and practises used in the rehabilitation. The area will be actively managed to minimise weed infestation and aim to revegetate the area with species native to BVA 371. The area will be rehabilitated to good or better condition, and the value of the ecological linkage may be improved. The offset proposal will include long term management measures for improving the vegetation condition. As part of a contributing offset, livestock will be excluded from the area to be cleared by fencing at the northern boundary.
(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia	May be at variance	Potential that the application area may provide an ecological linkage (for highly mobile fauna). Understorey is comprised almost wholly of agricultural weeds. Open canopies over a highly disturbed understorey may only be of value to highly mobile species (Molloy *et al.*, 2009).	
(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	May be at variance	Priority 1 species *Melaleuca huttensis* may potentially occur in the application area. Assessing officer did not observe any *Melaleuca* in the application area during a site visit.	GHD conducted a flora and vegetation survey on 2 June 2011 within the area approved to clear and found no *Melaleuca huttensis* within this area. The vegetation association within the area approved to clear is not considered to be optimal for this species, with its preferred habitat generally with low heath vegetation and limestone at or near the soil surface. In the light of the results from the recent survey, that the vegetation of the area approved to be cleared is not optimal for this species, offsets for this principle are no longer considered necessary.

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	Is at variance	Remnant mapped as Beard Vegetation Association 371: Low Forest; *Acacia rostellifera*. This has a representation of lower than 30% within the bioregion and is classed as being a critical asset. It is in mostly degraded condition, but because it is a critical asset, offsets are required, with focus on offsetting BVA 371.	As a direct offset, GMA Garnet proposes to rehabilitate the area to be cleared to BVA 371 to good or better condition. See comment against conditions (a) and (b) for further information.
(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	Is at variance	The deep sands of the area have a high to very high wind erosion risk.	GMA Garnet's current practise is to clear vegetation just prior to winter. Before clearing, vegetation is removed using a raised blade technique. Pre-winter clearing allows rain to wash into the soil, preserving root stock and encourages grass cover on the soil surface, which binds the soil. This controls erosion until mining commences. GMA Garnet does not clear vegetation in summer. Current rehabilitation (for pasture at the southern end of M70/856) spreads topsoil and seeds with associated pasture species during the winter months. This minimises the risk associated with wind erosion. The rehabilitation management plan prepared as part of the direct offset proposal will include management measures for controlling wind erosion during rehabilitation.
(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.	May be at variance	Utcha Well Nature Reserve is adjacent to the west of the application area. Clearing may disrupt an ecological linkage between the nature reserve and other areas of remnant vegetation.	As a direct offset, GMA Garnet proposes to rehabilitate the area to be cleared to *Good* or better condition, and thus the value of the ecological linkage may be improved. See comment against conditions (a) and (b) for further information. Each year, a belt of vegetation approximately 100 metres in length is cleared to the north of the mine face. Rehabilitation is progressive and occurs at a rate of approximately 100 metres a year once mining is complete (to the south of the active mine area). At any one time, the area cleared (active mine area) consists of a belt of land approximately 300 to 400 metres in length. The progressive rehabilitation of the former mining areas will ensure that the ecological linkage between the Utcha Well Nature Reserve and remnant native vegetation to the east of the proposed mining area is not completely severed.

Section 4: Developing Your Offset Proposal

Describe the vegetation within the site to be cleared:
You have previously stated the location and described the land to be cleared from the information in your permit and decision report (this can be in written or table format). Describe the vegetation at these sites.

Decision Report Information

The Clearing Permit Decision Report for CPS 3544/1 indicates that the Project Area contains Beard Vegetation Association (BVA) 371; Low forest; *Acacia rostellifera.*

Previous site visits in 1996 by BSD Consultants and an assessing officer indicates that the vegetation of the majority of the Project Area contains remnants of *Acacia rostellifera* low woodland to low forest with an understorey grazed by livestock and dominated by exotic pasture grasses and weeds. Site visits indicate that the condition of vegetation ranges from *Good* to *Degraded*

The Decision Report further indicates that no Threatened (Declared Rare) Flora or Priority Flora species are known to occur in the area, nor are considered likely due to the degraded nature of the habitat present in the Project Area.

GHD Pty Ltd Vegetation and Flora Survey

GHD Pty Ltd undertook a Vegetation and Flora survey on the 2nd of June 2011. The survey was completed by an experienced field ecologist (Joshua Foster) with assistance from an environmental scientist (Amanda Melling).

A summary of the outcomes of this survey is included below. See Appendix D for data.

A total of two vegetation types were recorded from the area proposed to be cleared:

- An *Acacia rostellifera* low forest to open low shrubland; and
- Cleared/Degraded vegetation used historically for agricultural purposes.

The *Acacia rostellifera* low open forest was relatively degraded due to weed invasion and grazing by livestock with the condition ranging from *Good* to *Degraded*. The condition of vegetation is considered to be consistent with that previously described for the area proposed to be cleared. The *Acacia rostellifera* low forest is considered to be a match for the Beard Vegetation Association 371.

The Cleared/Degraded vegetation is considered to be *Completely Degraded*, and consisted primarily of pasture grasses and herbs, with scattered native shrubs

A total of 49 flora taxa from 25 families were recorded from the surveyed area, with 13 taxa recorded as introduced/exotic species. The vegetation was dominated by the following families:

- Asteraceae (daisies): 6 taxa;
- Chenopodiaceae (saltbush): 5 taxa;
- Fabaceae (wattles, peas): 4 taxa; and
- Poaceae (grasses): 4 taxa

No Threatened (Declared Rare) Flora taxa were recorded from the area proposed to be cleared.

No Priority Flora taxa were recorded from the Project Area. No other conservation significant flora taxa (i.e. flora species recorded at or beyond their known range) were recorded from the area proposed to be cleared.

No noxious Declared Plants with control codes applicable to the Shire of Northampton were recorded from the area proposed to be cleared.

Describe the proposed offset site prior to revegetation (location, area, species composition) and why it is suitable to offset the vegetation that will be lost due to the above clearing:
Detail the location, the amount of hectares and what it looks like (including soil type) prior to revegetation (structure; upper, middle, lower storey, density(%),ecological function and any other values).

The offset area comprises the area approved to clear and therefore has the same location, soils and area as the area applied to clear (up to 33.227 hectares in total. Note – the CPS 3544/1 only approves the clearing of 33.227 hectares; however, the offset itself will be for 34.938 hectares as the management measures apply to the entire area).

The clearing area is currently mapped as Beard Vegetation Association 371: Low forest; *Acacia rostellifera* in a mostly *Degraded* condition. Despite its *Degraded* condition, the vegetation is considered to be a critical asset as there is less than 30% of it remaining within the bioregion. The vegetation also has value as an ecological linkage (for highly mobile fauna) between Utcha Well Nature Reserve to the west, and the vegetation to the east.

The offset area (clearing area) will be progressively rehabilitated after it has been cleared and mined to BVA 371 in *Good* or better condition with active management. This will be in accordance with the rehabilitation management plan, which details how the offset area will be rehabilitated, and the species composition (See Appendix E).

Improving the condition of the vegetation in the offset area is expected to improve its ecological function, both as a remnant of BVA 371 and as an ecological linkage.

With the improved vegetation condition and active management of the offset area, the potential for invasion of disturbance response species and weeds will be reduced. The habitat and foraging value will be increased, thus improving the value of the ecological linkage afforded by the offset area.

Description of proposed process of achieving the offset and what you expect the offset will consist of when completed:
How will you achieve the offset? How many of what species will be planted per hectare? How does your proposal consider possible failure (e.g. drought, weeds, disease)?

Each year, a belt of vegetation approximately 100 metres in length will be cleared to the north of the mine face within the area approved to clear. Rehabilitation will be progressive, occurring at a rate of approximately 100 metres a year once mining is complete (to the south of the active mine area). At any one time, the area cleared (active mine area) will consist of a belt of land approximately 300 to 400 metres in length.

A rehabilitation management plan has been prepared for the offset area (see Appendix E). This details how the offset area will be rehabilitated, and presents the targets for species composition. Indirect offsets included in the rehabilitation management plan comprise:

- Management measures to minimise weed infestation;
- Livestock exclusion fencing at the northern boundary of the offset area; and
- Management measures for controlling wind erosion.

Section 5: Verification that all Twelve Offset Principles have been Addressed

1. Direct offsets should directly counterbalance the loss of the native vegetation.

Direct offsets generally occur away from the area cleared and are designed to counterbalance the adverse environmental impact, with the aim of achieving no environmental difference (i.e. no net loss) (refer to Native Vegetation Fact Sheet 11 for more details).

The offset comprises rehabilitation of the area to be cleared (up to 33.227 hectares of native vegetation) to Beard Vegetation Association 371: Low forest; *Acacia rostellifera* (BVA 371) in *Good* or better condition with active management. The offset proposal includes a detailed rehabilitation management plan and has regard to the offset principles under CPS 3544/1.

GMA Garnet has already undertaken a land-swap with the Department of Environment and Conservation, whereby the excised area of the Utcha Well Nature Reserve east of George Grey Drive (i.e. the area proposed to be cleared) was swapped for a parcel of land immediately north of the Utcha Well Nature Reserve west of George Grey Drive. This land-swap was undertaken in October 2006 and resulted in a larger area of land that is in much better condition being included into the Utcha Well Nature Reserve.

2. Contributing offsets should complement and enhance the direct offset.

Contributing offsets may include protection of areas of native vegetation, removal of threatening processes, management of areas of native vegetation and developing education awareness programs (refer to Native Vegetation Fact Sheet 11 for more details).

The rehabilitation management plan includes the following contributing offsets:

- Measures for management of weed infestation within the offset area;
- Livestock exclusion from the offset area by fencing at the northern boundary; and
- Management measures for controlling wind erosion.

3. Offsets are implemented only once all avenues to avoid, minimise, rectify or reduce environmental impacts have been exhausted.

Explain why the vegetation must be cleared, detailing how it was not possible to avoid, minimise or reduce environmental harm.

The vegetation will be cleared in order for GMA Garnet to carry out mineral sand mining within the area approved to clear. GMA Garnet has mined the pasture within M70/856 to the south, and the mine face is progressively moving northward along the orebody towards the vegetated M70/927 at a rate of approximately 100 metres per year. Rehabilitation is progressive and occurs at a rate of approximately 100 metres a year once mining is complete (ie. to the south of the active mine area). At any one time, the area cleared (active mine area) consists of an east-west belt of land approximately 300 to 400 metres in length.

The distance from the southern to northern boundary of the area approved to clear is approximately 850 metres. GMA Garnet's progressive mining and rehabilitation process described above will ensure that there is always an ecological linkage between Utcha Well Nature Reserve and the vegetated land to the east of the clearing area.

The environmental impact of the clearing will be mitigated through rehabilitation of the clearing (offset) area in accordance with the rehabilitation management plan.

4. The environmental values, habitat, species, ecological community, physical area, ecosystem, landscape, and hydrology of the offset should be the same as, or better than, that of the area of native vegetation being offset.

Describe the values that will be removed as a result of the clearing and how your offset will provide equivalent of better replacement for these values (e.g. nesting boxes, fencing the site, other habitat provided etc).

The area approved to clear is currently mapped as Beard Vegetation Association 371: Low forest; *Acacia rostellifera* in a mostly degraded condition. Despite its degraded condition, the vegetation is considered to be a critical asset as there is less than 30% of it remaining within the bioregion. The vegetation also has value as an ecological linkage (for highly mobile fauna) between Utcha Well Nature Reserve to the west, and the vegetation to the east.

This area approved to clear (offset area) will be progressively rehabilitated after it has been cleared and mined to BVA 371 in good or better condition with active management. This will be in accordance with the rehabilitation management plan. Improving the condition of the vegetation is expected to improve its ecological function, both as a remnant of BVA 371 and as an ecological linkage. With the improved vegetation condition and active management of the offset area, the potential for invasion of disturbance response species and weeds will be reduced. The habitat and foraging value will be increased, thus improving the value of the ecological linkage afforded by the offset area.

The following table provides a comparison of the clearing area and offset area, and demonstrates that the offset fulfils the criteria of being 'like for like or better'.

	Clearing area	**Offset area**
Area:	Up to 33.227 hectares	34.938 hectares
Ecological community:	Beard Vegetation Association 371: Low forest; *Acacia rostellifera*	Beard Vegetation Association 371: Low forest; *Acacia rostellifera*
Condition:	Mostly *Degraded*. *Degraded* vegetation condition is defined as, "Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management" (Keighery, 1994).	*Good* or better. *Good* vegetation condition is defined as, "Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate" (Keighery, 1994).
Species:	See Section 4 of this offset proposal. GHD's survey of 2 June 2011, recorded a total of 49 flora taxa, of which 13 were weed species within the clearing area.	See Section 4 of this offset proposal. The rehabilitation management plan proposes that local native flora taxa be used to rehabilitate the offset area. Measures for management of weed infestation are detailed in the rehabilitation management plan.

Landform:	Located on intermediate westerly facing slopes between the dune systems to the east and coastal plains associated with the Hutt Lagoon in the west.	Located on intermediate westerly facing slopes between the dune systems to the east and coastal plains associated with the Hutt Lagoon in the west. Condition 5 of CPS 3544/1 requires re-shaping of the surface of the land so that it is consistent with the surrounding 5 metres of uncleared land.
Hydrology:	The soils within the clearing area are highly permeable, being sands.	The soils of the offset area will comprise the soils removed from the clearing area prior to mineral sand mining. As such, they will have the same hydrological characteristics as the clearing area.
Habitat:	The understorey within the clearing area is comprised almost wholly of agricultural weeds. It is not likely that the clearing area has significant habitat values for fauna given its mostly degraded condition. The clearing area may provide an ecological linkage, but this would only be expected for highly mobile species. Open canopies over a highly disturbed understorey may only be of value to highly mobile species (Molloy et al., 2009).	The offset area will be actively managed to minimise weed infestation and revegetated with species native to BVA 371. The area will be rehabilitated to good or better condition, which may improve the habitat value and the ecological linkage. Further, the livestock exclusion fence along the northern boundary of the offset area will reduce potential impacts of livestock grazing and trampling on the condition of the vegetation within the offset area. This will aid in improving the value of the habitat and the potential ecological linkage.
Ecological function:	Sandy soils are highly permeable and support the ecological community of the clearing area.	Sandy soils are highly permeable and support the ecological community of the clearing area.
	Soils contain and store nutrients from various sources (inherent in the soil, in water infiltrating from rainfall or runoff, from decomposition of organic matter), and supply them to vegetation.	Soils contain and store nutrients from various sources (inherent in the soil, in water infiltrating from rainfall or runoff, from decomposition of organic matter), and supply them to vegetation.
	Soils contain microorganisms important in decomposition processes, and which may be a food source for animals.	Soils contain microorganisms important in decomposition processes, and which may be a food source for animals.
	Due to varying conditions (e.g. aerobic vs. anaerobic) in the soil profile, soils provide niches for microecosystems.	Due to varying conditions (e.g. aerobic vs. anaerobic) in the soil profile, soils provide niches for microecosystems.

	Vegetation in a mostly degraded condition has little ability to prevent invasion of weeds and disturbance response species, is a source of nutrients through decomposition and provide conditions for microecosystems to function.	Vegetation in a good or better condition with management of weed invasion reduces invasion of weeds and disturbance response species, is a source of nutrients through decomposition and provide conditions for microecosystems to function.
	Weeds and disturbance response species reduce the ecological function of the vegetation.	Weeds and disturbance response species reduce the ecological function of the vegetation. Maintenance of weed management program to minimise infestionation.
	Fauna use the habitat afforded by the ecosystem for food and shelter. Species present are likely to be limited due to the mostly degraded state of the habitat. Highly mobile fauna may use the clearing area as an ecological linkage. Fauna maintain ecosystem balance through controlling flora and fauna populations, and supplying nutrients through decomposition of organic matter.	Fauna use the habitat afforded by the ecosystem for food and shelter. More species are likely to be present due to the good or better condition of the habitat. Fauna may use the clearing area as an ecological linkage. Fauna maintain ecosystem balance through controlling flora and fauna populations, and supplying nutrients through decomposition of organic matter.
	Livestock (cattle) trample and graze in the clearing area, impacting the condition of the vegetation and potentially competing with native fauna. They reduce the ecological function of the vegetation, fauna and soils.	The livestock exclusion fence along the northern boundary of the offset area will reduce potential impacts of livestock grazing and trampling on the condition of the vegetation, and competition with native fauna. This will improve the ecological function of the vegetation, fauna and soils.

5. A ratio greater than 1:1 should be applied to the size of the area of native vegetation that is offset to compensate for the risk that the offset may fail.

Detail the size of the site of proposed clearing and why?

The clearing area comprises up to 33.227 hectares of native vegetation, while the offset area comprises 34.938 hectares of native vegetation. The offset area is 34.938, greater than that approved to clear under CPS 3544/1, and is greater than a ratio of 1:1.

The Environmental Protection Authority's (EPA's) *Guidance for the Assessment of Environmental Factors: Environmental Offsets –Biodiversity* (2008) states that:

> "This principle prevents complex ecosystems or unique species (that are difficult to restore, rehabilitate or re-establish) from being systematically degraded over time, particularly through cumulative impacts. Therefore, in these instances, the size of the offset to impact ratio should be greater than 'like for like' …" (p. 10)

The vegetation of the clearing area is neither a complex ecosystem, nor does it contain unique species as they are defined in Guidance Statement No. 19 (EPA, 2008). As the clearing area cannot be described as such, it follows that the offset to impact ratio of 1:1 is appropriate in this instance.

GMA Garnet will take measures to reduce the risk of failure of the offset, including implementing the measures detailed in the rehabilitation management plan over a 10 to 30 year timeframe. Further, the land on which M70/927 and the clearing area is located is a freehold title, held by GMA Garnet Pty Ltd Suite 4, Level 8 The Exchange Plaxa, No. 2 The Esplanade, Perth WA 6000, which will aid in ensuring the success of the offset.

6. Offsets must entail a robust and consistent assessment process.

Describe assessment process for your offset proposal. You may need to include an attachment describing best practice methodology and why you used these methods.

GHD has reviewed the Decision Report, Clearing Permit and Plan for CPS 3544/1 and identified the aspects of the clearing that are required to be offset. Each aspect has been addressed within this offset proposal, with a summary provided in Section°3.

GHD liaised with GMA Garnet and the Department of Mines and Petroleum (DMP) to determine an offset which would both be acceptable in accounting for the aspects of concern identified in the Decision Report, and to GMA Garnet.

GHD conducted a flora and vegetation survey of the clearing area on 2 June 2011, in order to determine the vegetation types and floristic composition of the area This has enabled detailed description of the clearing area to be made, as well as facilitating the development of the rehabilitation management plan.

7. In determining an appropriate offset, consideration should be given to ecosystem function, rarity and type of ecological community, vegetation condition, habitat quality and area of native vegetation cleared.

Explain how your proposed offset will address the clearing principles that your permit may be or is at variance to (detailed in the Decision Report).

Part or all of the clearing to be done under CPS 3544/1 is or may be at variance to principles (a), (b), (c), (e), (g) and (h). The aspect of the clearing to which the level of variance applies, and an outline of the proposed offset/s, is presented against these principles in the table in Section 3.

The tabulation against offset principle 4 within this proposal demonstrates that the determination of the offset proposed has taken into consideration:

- ecosystem function;
- rarity and type of ecological community;
- vegetation condition;
- habitat quality; and,
- area of native vegetation cleared.

8. The offset should either result in no net loss of native vegetation, or lead to a net gain in native vegetation and improve the condition of the natural environment.

Describe how the net gain in size, quality and quantity when the offset is completed.

This offset will result in a net gain of native vegetation in terms of both the density and diversity of the vegetation in the offset area when compared with the clearing area. Ongoing monitoring and management will ensure successful establishment and maintenance of the vegetation in the offset area.

9. Offsets must satisfy all statutory requirements.

Explain any other legislation you have satisfied (e.g. animal removal and relocation and seed collection).

Appropriate approvals and licenses will be obtained from the Department of Environment and Conservation in relation to the collection of seed. Approval will be sought if collection of seed from the Utcha Well Nature Reserve is necessary.

10. Offsets must be clearly defined, documented and audited.

Describe how you will define, document and audit your offset.

Reporting and auditing will be done in accordance with the requirements of Clearing Permit 3544/1. Refer to 'Monitoring Commitments' and 'Management Commitments' below for details of GMA Garnet's commitment to ensuring successful establishment and maintenance of the offset.

11. Offset must a long term (10-30 year) benefit.

Explain what management processes you will implement to ensure that there is an environmental benefit achieved for 10-30 years.

GMA Garnet will take measures to ensure success of the offset, including

implementing the measures detailed in the rehabilitation management plan (and summarised in Section 6) over a 10 to 30 year timeframe. Further, the land on which the offset is located is a freehold title, held by GMA Garnet Pty Ltd Suite 4, Level 8 The Exchange Plaxa, No. 2 The Esplanade, Perth WA 6000, which will aid in ensuring the success of the offset.

The location of the offset on GMA Garnet's freehold title adjacent to Utcha Well Nature Reserve contributes a number of functions, including:

- A potential ecological linkage between the reserve to the west and the vegetated dune system to the west; and,
- Extending the area of habitat available to wildlife to the east of Utcha Well Nature Reserve; and,
- Improving the condition of BVA371 in the offset area.

The site will be fenced along its northern boundary to ensure long-term security from stock grazing, and will managed in monitored for its effectiveness.

12. An environmental specialist must be involved in the design, assessment and monitoring of offsets.

Describe how the environmental specialist will be involved in the design and at when the environmental specialist with assess and monitor the offset.

GHD has been employed to undertake surveys of the flora vegetation of the clearing area, to liaise with stakeholders, identify a suitable offset, and develop a rehabilitation management plan for the offset.

GMA Garnet will engage a qualified environmental specialist to supervise the implementation and ongoing success of the offset proposal (including the rehabilitation management plan).

Section 6: Commitments and consultation

Monitoring Commitment:

How will you monitor the success of the offset and over what period?

Monitoring commitments are outlined in the Rehabilitation Management Plan. In summary, rehabilitation monitoring will occur annually for a minimum of five years following the completion of rehabilitation and include:

- Photographic monitoring points established at selected sites in the offset area;
- Walking through the offset area to measure success of the wind erosion measures;
- Identifying success at monitoring points in terms of percentage cover of native flora, and number of species present (e.g. richness, diversity measures) as proxies for ecosystem recovery are similar or better than vegetation pre-mining;
- Examination of level of weed invasion to ensure that management measures can be applied where required;
- Examination of the condition rating of vegetation to ensure that the rehabilitation is progressing as *Good* or better than vegetation pre-mining;
- An examination to see if native fauna species (e.g. ants, mammals) are utilising the rehabilitated area; and
- Checking the integrity of the northern stock proof fence.

Reports required under condition 8 of CPS 3544/1 will be forwarded to the Department of Mines and Petroleum in accordance with this condition.

Management Commitment:

What ongoing management activities will be undertaken?

Management commitments are outlined in the Rehabilitation Management Plan. In summary, management of the offset area and remedial actions will be undertaken where required, and may include:

- Management of weed invasion in the offset area;
- Management of wind erosion in the offset area;
- Manual infill planting (as required) where seeding has not succeeded, to ensure successful establishment of revegetation to the target species composition, (see Section 4 above and the Rehabilitation Management Plan); and
- Repairing the northern stockproof fence should its integrity be compromised.

Reports required under condition 8 of CPS 3544/1 will be forwarded to the Department of Mines and Petroleum in accordance with this condition.

Agencies consulted and submissions received:

Include relevant stakeholders, e.g. local environment, catchment, and flora / fauna groups (include contact details).

The following stakeholders have been consulted with regards to this proposal:

- the Department of Mines and Petroleum (DMP);

- the Department of Environment and Conservation (DEC); and
- GMA Garnet Pty Ltd.

Section 7: Supporting information (appendices)

Figures, including: Locality plan / aerial photograph/s indicating the offset site

Rehabilitation Management Plan

GHD survey data – quadrat data

Appendix A

Figures

Project Area Location

LEGEND

- GMA Garnet Leases
- Study Area

1: 686,513 (at A3)

0 125 250 500 750 1,000 1,250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone XX

N

CLIENTS | PEOPLE | PERFORMANCE

GMA Garnet Pty Ltd
Port Gregory Mine Offset Proposal

Job Number XX-12345
Revision A
Date 30 Nov 2011

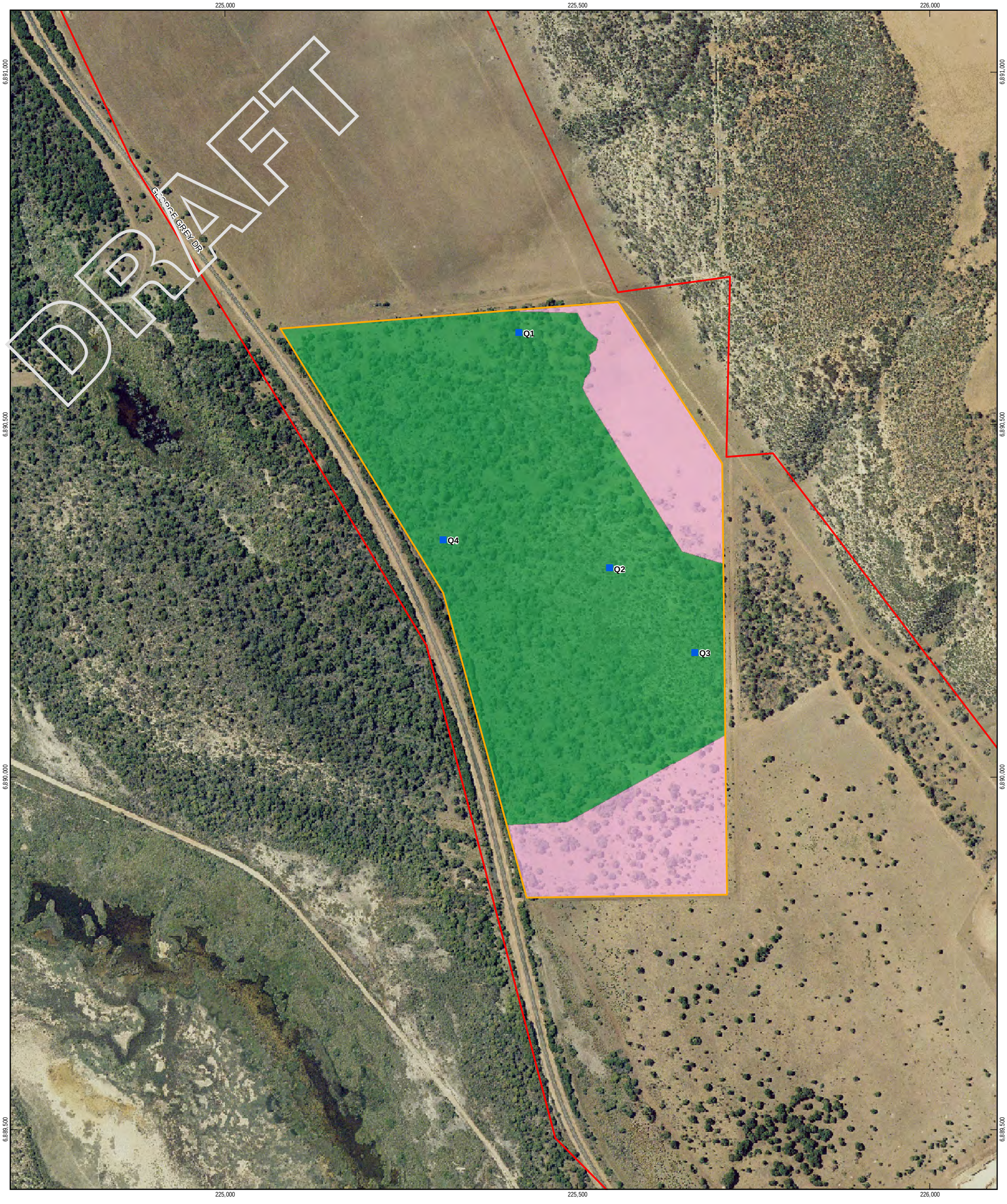
Locality

Figure 1

G:\61\26983\GIS\Maps\MXD\6126983_G001_RevA.mxd

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au

Data source: Landgate: 2004 Travellers Atlas - 20111130; GHD: GMA Garnet Lease - 20111130, Study Area - 20111130; GA: Topographic 250K Serios III - 2006 Created by: cagilbert



LEGEND

- Quadrat
- GMA Garnet Leases
- Study Area

Vegetation Type

- *Acacia rostellifera* low forest to open low shrubland
- Cleared/Degraded

1: 5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

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CLIENTS | PEOPLE | PERFORMANCE

GMA Garnet Pty Ltd
Port Gregory Mine Offset Proposal

Job Number 61-26983
Revision A
Date 30 Nov 2011

Vegetation Type

Figure 2

G:\61\26983\GIS\Maps\MXD\6126983_G002_RevA.mxd

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au

Data source: Landgate: Hutt 2006 Mosaic - 20111130; GHD: GMA Garnet Lease - 20111130, Study Area - 20111130, Quadrat - 20111130, Vegetation Type - 20111130. Created by: cagilbert

225,000 225,500 226,000

6,891,000 6,890,500 6,890,000 6,889,500

GEORGE GREY DR

6 4 5 4 6

LEGEND

GMA Garnet Leases

Study Area

Vegetation Condition

1. Pristine or Nearly So
2. Excellent
3. Very Good
4. Good
5. Degraded
6. Completely Degraded

1: 5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

CLIENTS | PEOPLE | PERFORMANCE

GMA Garnet Pty Ltd
Port Gregory Mine Offset Proposal

Job Number 61-26983
Revision A
Date 30 Nov 2011

Vegetation Condition

Figure 3

G:\61\26983\GIS\Maps\MXD\6126983_G003_RevA.mxd

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au

Data source: Landgate: Hutt 2006 Mosaic - 20111130; GHD: GMA Garnet Lease - 20111130, Study Area - 20111130, Vegetation Condition - 20111130. Created by: cagilbert

Appendix B

Clearing Permit

GOVERNMENT OF WESTERN AUSTRALIA

CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

PERMIT DETAILS

Purpose Permit Number: 3544 / 1
File Number: A0181/201001
Duration of Permit: From 1 May 2010 to 30 April 2020

PERMIT HOLDER

GMA Garnet Pty Ltd

LAND ON WHICH CLEARING IS TO BE DONE

Mining Lease 70/927
Mining Lease 70/856

PURPOSE FOR WHICH THE CLEARING MAY BE DONE

1. Clearing for the purpose of mineral sand mining.

CONDITIONS

Type of clearing authorised

1. The Permit Holder must not clear more than 33.227 hectares of native vegetation. All clearing must be within the area cross-hatched yellow on attached Plan 3544/1.

2. The Permit Holder shall not clear any native vegetation within the area shaded red, on attached Plan 3544/1.

Avoid, minimise etc clearing

3. In determining the amount of native vegetation to be cleared pursuant to this Permit, the Permit Holder must have regard to the following principles, set out in order of preference:

   (i) avoid the clearing of native vegetation;
   (ii) minimise the amount of native vegetation to be cleared; and
   (iii) reduce the impact of clearing on any environmental value.

Weed control

4. When undertaking any clearing or other activity authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of *weeds*:

   (i) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
   (ii) ensure that no *weed*-affected soil, *mulch*, *fill* or other material is brought into the area to be cleared; and
   (iii) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

Retain and spread vegetative material and topsoil

5. The Permit Holder shall:

   (a) Retain the vegetative material and topsoil removed by clearing authorised under this Permit and stockpile the vegetative material and topsoil in an area cross-hatched yellow on attached Plan 3544/1.

(b) Within 3 months following completion of mining, *revegetate* and *rehabilitate* the area(s) that are no longer required for the purpose for which they were cleared under this Permit by:

(i) re-shaping the surface of the land so that it is consistent with the surrounding 5 metres of uncleared land; and
(ii) laying the vegetative material and topsoil retained under Condition 5(a).

(c) Within 4 years of laying the vegetative material and topsoil on the cleared area in accordance with Condition 5(b) of this Permit:

(i) engage an *environmental specialist* to determine the species composition, structure and density of the area *revegetated* and *rehabilitated*; and
(ii) where, in the opinion of an *environmental specialist*, the composition structure and density determined under Condition 5(c)(i) of this Permit will not result in a similar species composition, structure and density to that of pre-clearing vegetation types in that area, *revegetate* the area by deliberately *planting* and/or *direct seeding* native vegetation that will result in a similar species composition, structure and density of native vegetation to pre-clearing vegetation types in that area and ensuring only *local provenance* seeds and propagating material are used.

Offsets

6. If part or all of the clearing to be done is or may be at variance with one or more of the clearing principles, then the Permit Holder must implement an *offset* in accordance with Conditions 6(a) and (b) of this Permit with respect to that clearing.

(a) Determination of *offsets*:
(i) in determining the *offset* to be implemented with respect to a particular area of native vegetation proposed to be cleared under this Permit, the Permit Holder must have regard to the *offset* principles contained in Condition 6(b) of this Permit;
(ii) once the Permit Holder has developed an *offset proposal*, the Permit Holder must provide that *offset proposal* to the Director, Environment Division, Department of Mines and Petroleum for the Director, Environment Division, Department of Mines and Petroleum's approval prior to undertaking any clearing to which the *offset* relates, and prior to implementing the *offset*;
(iii) clearing may not commence until and unless the Director, Environment Division, Department of Mines and Petroleum has approved the *offset proposal* to which the clearing relates;
(iv) the Permit Holder shall implement the *offset proposal* approved under Condition 6(a)(iii); and
(v) each *offset proposal* shall include a *direct offset*, timing for implementation of the *offset proposal* and may additionally include *contributing offsets*.

(b) For the purpose of this condition, the *offset* principles are as follows:
(i) *direct offsets* should directly counterbalance the loss of the native vegetation;
(ii) *contributing offsets* should complement and enhance the *direct offset*;
(iii) *offsets* are implemented only once all avenues to avoid, minimise, rectify or reduce environmental impacts have been exhausted;
(iv) the environmental values, habitat, species, *ecological community*, physical area, ecosystem, landscape, and hydrology of the *offset* should be the same as, or better than, that of the area of native vegetation being *offset*;
(v) a ratio greater than 1:1 should be applied to the size of the area of native vegetation that is offset to compensate for the risk that the *offset* may fail;
(vi) *offsets* must entail a robust and consistent assessment process;
(vii) in determining an appropriate *offset*, consideration should be given to ecosystem function, rarity and type of *ecological community*, vegetation *condition*, habitat quality and area of native vegetation cleared;
(viii) the *offset* should either result in no net loss of native vegetation, or lead to a net gain in native vegetation and improve the *condition* of the natural environment;
(ix) *offsets* must satisfy all statutory requirements;
(x) *offsets* must be clearly defined, documented and audited;
(xi) *offsets* must ensure a long-term (10-30 year) benefit; and
(xii) an *environmental specialist* must be involved in the design, assessment and monitoring of *offsets*.

Records to be kept

7. The Permit Holder must maintain the following records for activities done pursuant to this Permit:

(a) In relation to the clearing of native vegetation authorised under this Permit:

(i) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings;
(ii) the date that the area was cleared;
(iii) the size of the area cleared (in hectares); and
(iv) purpose for which clearing was undertaken.

(b) In relation to the *revegetation* and *rehabilitation* of areas pursuant to Condition 5 of this Permit:

(i) the location of any areas revegetated and rehabilitated, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings;
(ii) a description of the revegetation and rehabilitation activities undertaken;
(iii) the size of the area revegetated and rehabilitated (in hectares); and
(iv) the species composition, structure and density of *revegetation* and *rehabilitation.*

(c) In relation to the *offset* of areas pursuant to Condition 6:
(i) the location of any area of *offsets* recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings;
(ii) a description of the *offset* activities undertaken; and
(iii) the size of the *offset* area (in hectares).

Reporting

8. (a) The Permit Holder shall provide a report to the Director, Environment Division, Department of Mines and Petroleum by 31 July each year for the life of this permit, demonstrating adherence to all conditions of this permit, and setting out the records required under Condition 7 of this Permit in relation to clearing carried out between 1 July and 30 June of the previous financial year.

(b) Prior to 30 April 2020, the Permit Holder must provide to the Director, Environment Division, Department of Mines and Petroleum a written report of records required under Condition 7 of this Permit where these records have not already been provided under Condition 8(a) of this Permit.

Definitions

The following meanings are given to terms used in this Permit:

condition means the rating given to native vegetation using the *Keighery scale* and refers to the degree of change in the structure, density and species present in the particular vegetation in comparison to undisturbed vegetation of the same type;

contributing offset/s has the same meaning as is given to that term in the Environmental Protection Authority's *Position Statement No.9: Environmental Offsets*, January 2006;

direct offset/s has the same meaning as is given to that term in the Environmental Protection Authority's *Position Statement No.9: Environmental Offsets*, January 2006;

direct seeding means a method of re-establishing vegetation through the establishment of a seed bed and the introduction of seeds of the desired plant species;

ecological community/ies means a naturally occurring biological assemblage that occurs in a particular type of habitat (English and Blythe, 1997; 1999);

environmental specialist means a person who is engaged by the Permit Holder for the purpose of providing environmental advice, who holds a tertiary qualification in environmental science or equivalent, and has experience relevant to the type of environmental advice that an environmental specialist is required to provide under this Permit;

fill means material used to increase the ground level, or fill a hollow;

Keighery scale means the vegetation condition scale described in *Bushland Plant Survey: A Guide to Plant Community Survey for the Community (1994)* as developed by B.J. Keighery and published by the Wildflower Society of WA (Inc). Nedlands, Western Australia;

local provenance means native vegetation seeds and propagating material from natural sources within 100 kilometres of the area cleared;

mulch means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation;

offset/s means an offset required to be implemented under Condition [6] of this Permit;

offset proposal means an *offset* determined by the Permit Holder in accordance with Condition [6]of this Permit;

planting means the re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species;

regenerate/ed/ion means *revegetation* that can be established from in situ seed banks contained either within the topsoil or seed-bearing *mulch*;

rehabilitate/ed/ion means actively managing an area containing native vegetation in order to improve the ecological function of that area;

revegetate/ed/ion means the re-establishment of a cover of *local provenance* native vegetation in an area using methods such as *regeneration*, *direct seeding* and/or *planting*, so that the species composition, structure and density is similar to pre-clearing vegetation types in that area;

weed/s means a species listed in Appendix 3 of the "Environmental Weed Strategy" published by the Department of Conservation and Land Management (1999), and plants declared under section 37 of the *Agriculture and Related Resources Protection Act 1976.*

SGG P3. MOT

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- 7 APR 2010

Government of Western Australia
Department of Mines and Petroleum

Clearing Permit Decision Report

1. Application details

1.1. Permit application details

Permit application No.: 3544/1
Permit type: Purpose Permit

1.2. Proponent details

Proponent's name: GMA Garnet Pty Ltd

1.3. Property details

Property: Mining Lease 70/927
Mining Lease 70/856
Local Government Area: Shire of Northampton
Colloquial name: Port Gregory Mine

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:
33.227		Mechanical Removal	Mineral Sand Mining

2. Site Information

2.1. Existing environment and information

2.1.1. Description of the native vegetation under application

Vegetation Description
Beard Vegetation Associations have been mapped at a 1:250,000 scale for the whole of Western Australia and are useful to look at vegetation extent in a regional context. The following Beard Vegetation Association is located within the proposed clearing area (GIS Database):

371: Low forest; *Acacia rostellifera.*

The vegetation of the majority of the application area has been described as remnants of recently grazed *Acacia rostellifera* low woodland and exotic pasture grasses and weeds (BSD Consultants, 1996).

During a site visit the assessing officer confirmed that the application area was *Acacia rostellifera* low forest. The understorey has been grazed in the past and is comprised predominantly by weeds with a few native species namely *Rhagodia baccata* and *Styloblasium spathulatum* (DAFWA, 2010).

Clearing Description
GMA Garnet has applied to clear up to 34.938 hectares within an area of 34.938 hectares for the purposes of mineral sand mining. The application area is located approximately 12 kilometres north of Port Gregory (GIS Database). Clearing will be by mechanical means.

Vegetation Condition
Good: Structure significantly altered by multiple disturbance; retains basic structure/ability to regenerate (Keighery, 1994).

to

Degraded: Structure severely disturbed; regeneration to good condition requires intensive management (Keighery, 1994).

Comment
The vegetation condition has been determined by the assessing officer based on a site visit and information from BSD Consultants (1996).

3. Assessment of application against clearing principles

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

Comments

Proposal may be at variance to this Principle
The application area occurs within the Geraldton Hills subregion of the Geraldton Sandplains Interim Biogeographic Regionalisation of Australia (IBRA) bioregion (GIS Database). At a broad scale vegetation can be described as sand heaths with emergent *Banksia* and *Actinostrobus*, York Gum woodlands on limestones depending on depth of coastal-sand mantle, low closed forest of *Acacia rostellifera* (now cleared) on alluvial plains of Greenough and Irwin River (behind beach dune system south of Geraldton) (CALM, 2002).

The application area consists of *Acacia rostellifera* low forest with a disturbed understorey. *Acacia rostellifera* forest has been identified as being a rare feature within this subregion (CALM, 2002). The majority of the understorey consists of agricultural weeds resulting in the application area being in a predominately 'degraded' condition.

Given the application area consists largely of *Acacia rostellifera* and weed species, it is not likely to represent an area of high floristic diversity. No Declared Rare or Priority Flora species have been recorded, however, no targeted searches of the application area have been carried out (GIS Database). Given its degraded state, the application area is not likely to provide as significant habitat for rare and priority flora as the adjacent Utcha Well Nature Reserve.

Similarly, the degraded state of the application area is likely to result in there being a low level of faunal diversity. The application area may provide an ecological linkage between the Utcha Well Nature Reserve and other areas of remnant vegetation, however, the link is not likely to be a strong one.

Whilst the application area is representative of a rare vegetation association, there is a larger area of this vegetation in a better condition in the adjacent Utcha Well Nature Reserve.

Based on the above, the proposed clearing may be at variance to this Principle.

Methodology

CALM (2002)
GIS Database
- Declared Rare and Priority Flora
- IBRA WA (Regions – Sub Regions)

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Comments

Proposal may be at variance to this Principle

No fauna surveys have been conducted within the application area in the past 15 years. A biological survey of the Utcha Well Nature Reserve was conducted by Ecologia (1995) in December 1994 as part of an assessment for the upgrade of the Horrocks to Kalbarri road. This broader survey recorded 56 species of bird, 9 species of mammal and 12 species of reptile (Ecologia, 1995). Six of the mammal species were introduced.

There is one known occurrence of conservation significant fauna within the local area (10 kilometre radius), namely the Australian Bustard (*Ardeotis australis*) (DEC Priority 4 listing) (DEC, 2010). This was recorded within the adjacent Utcha Well Nature Reserve so it would not be unexpected for the species to be found within the application area (GIS Database). The Australian Bustard is a nomadic bird that is found throughout most of the state (Johnstone and Storr, 2004). Given the degraded nature of the application area, it is not likely to represent significant habitat for this species.

There is the potential that application area may provide an ecological linkage. The application area is situated on intermediate slopes between the dune system in the east and the coastal plains in the west. The majority of these interrmediate slopes have been cleared for agriculture (GIS Database). The application area represents the best connection of these areas for several kilometres in either direction. However, the understorey within the application area is comprised almost wholly of agricultural weeds. It has been noted that open canopies over a highly disturbed understorey may only be of value to highly mobile species (Molloy et al., 2009). It has been indicated that even in modestly cleared areas, agricultural clearing presents a significant barrier to movement of small lizards and arthropods (Molloy et al., 2009). The George Grey Road passes through the middle of the application area and the Utcha Well Nature Reserve, further limiting small mammals and lizards from moving through the area. During a site visit, the assessing officer observed several bird species and kangaroos passing through the application area. This suggests that the application area is still used by some fauna, however, there is a fence at the boundary of George Grey Road which will further limit fauna movement to the Nature Reserve. Whilst there are several barriers preventing fauna movement, the application area is still the only remaining remnant of vegetation on the mid-slopes in the local (3 kilometre radius) area, and may provide a linkage for some highly mobile fauna.

Besides providing a linkage to the Utcha Well Nature Reserve, the application area is not likely to have significant habitat values for the fauna of the local area given its mostly degraded state.

Based on the above, the proposed clearing may be at variance to this Principle.

Methodology

DEC (2010)
Ecologia (1995)
Johnstone and Storr (2004)
Molloy et al. (2009)
GIS Database
- Hutt 50cm Orthomosaic – Landgate 2006
- Threatened Fauna
- DEC Tenure

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

Comments

Proposal may be at variance to this Principle

According to available databases, there are no records of Declared Rare Flora (DRF) or Priority Flora within the application area (GIS Database). A biological survey of the Utcha Well Nature Reserve was conducted by

Ecologia (1995) in December 1994 as part of an assessment for the upgrade of the Horrocks to Kalbarri road. This survey did not record any DRF or Priority Flora within the application area.

There are records of five species of DRF within 20 kilometres of the application area with the nearest known record approximately 12.5 kilometres west of the application area (GIS Database). Based on known habitats for these species, it is not expected that they would be occurring within the application area (Western Australian Herbarium, 2010). There is a record of Priority 1 species *Melaleuca huttensis* within the same Beard Vegetation Association approximately 8.3 kilometres north of the application area (GIS Database). There was also a record of the species approximately 37 kilometres south of the application area on the same soil type (GIS Database). This species was only described in 1999, so it may have been overlooked during the 1994 survey (Western Australian Herbarium, 2010). During a site visit the assessing officer did not observe any Melaleucas within the application area.

Based on the above, the proposed clearing may be at variance to this Principle.

Methodology

Ecologia (1995)
Western Australian Herbarium (2010)
GIS Database
- Declared Rare and Priority Flora
- Pre-European Vegetation
- Soils, Statewide

(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.

Comments

Proposal is not likely to be at variance to this Principle

According to available databases there are no Threatened Ecological Communities (TEC's) within the application area. The nearest known TEC is located approximately 100 kilometres south-east of the application area (GIS Database).

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology

GIS Database
- Threatened Ecological Sites
- Threatened Ecological Sites Buffered

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Comments

Proposal is at variance to this Principle

The application area falls within the Geraldton Sandplains Interim Biogeographic Regionalisation of Australia (IBRA) bioregion in which approximately 42.77% of Pre-European vegetation remains (see table) (GIS Database; Shepherd, 2007).

The vegetation of the application area has been mapped as Beard Vegetation Association 371: Low forest; *Acacia rostellifera* (Shepherd, 2007).

According to Shepherd (2007) approximately 10.1% of Beard Vegetation 371 remains at a state, bioregion and subregional level. This is below the 30% threshold below which species loss appears to accelerate exponentially (EPA, 2000). Vegetation Associations with representations below 30% within the bioregion are classed as being critical assets.

The proposed clearing of 34.938 hectares of Beard Vegetation Association 371 will reduce the current extent to approximately 9.9%. This will change the conservation status of this Vegetation Association from Vulnerable to Endangered. Should a condition be implemented excluding clearing of the western 20 metres of the application area, the proposed clearing will be 33.227 hectares. This would result in the current extent changing from 10.1% to 10%, which is still 'Vulnerable'.

The condition of the vegetation was mostly 'degraded' with small parts of the application area that could be classified as 'good'. The application area has been grazed in the past and understorey is predominantly agricultural weeds. The application is not likely to return to a 'good' condition without intensive management. Rehabilitation work previously carried out by GMA Garnet suggests that regeneration of *Acacia rostellifera* is easily achieved by replacing the topsoil (BSD Consultants, 1996). If the area was rehabilitated and the weeds removed, it may result in the application area being in better condition than what is currently present.

Where native vegetation clearing proposals will impact upon a critical asset it is advised that offsets are required. The Environmental Protection Authority's Position Statement No. 9 '*Environmental Offsets*' defines environmental offsets to be 'environmentally beneficial activities undertaken to counterbalance an adverse environmental impact, aspiring to achieve no net environmental loss or a net environmental benefit outcome'. Critical assets are defined as 'the most important environmental assets in Western Australia that must be fully protected and conserved for the state to meet its statutory requirements and to remain sustainable in the longer term' (EPA, 2006).

IBRA Bioregion – Geraldton Sandplains	3,136,024	1,341,266	~42.77	Depleted	15.35 (35.58)
IBRA Subregion – Geraldton Hills	1,964,255	845,822	~43.06	Depleted	13.89 (32.15)
Local Government – Northampton	1,258,676	909,535	~72.26	Least Concern	14.66 (20.26)
[illegible]					
371	32,816	3,315	~10.1	Vulnerable	0.8 (6.02)
[illegible]					
371	32,808	3,315	~10.1	Vulnerable	0.81 (6.02)
[illegible]					
371	32,807	3,315	~10.1	Vulnerable	0.81 (6.02)

* Shepherd (2007)
** Department of Natural Resources and Environment (2002)

Options to select from: Bioregional Conservation Status of Ecological Vegetation Classes (Department of Natural Resources and Environment 2002)

Presumed extinct	Probably no longer present in the bioregion
Endangered+	<10% of pre-European extent remains
Vulnerable+	10-30% of pre-European extent exists
Depleted+	>30% and up to 50% of pre-European extent exists
Least concern+	>50% pre-European extent exists and subject to little or no degradation over a majority of this area

Based on the above, the proposed clearing is at variance to this Principle. In accordance with EPA Position Statement No. 9, it is recommended that should a clearing permit be granted, a condition be imposed requiring the proponent to develop and implement an environmental offset within the Geraldton Hills IBRA subregion. The environmental offset proposal must be endorsed by the decision maker prior to any native vegetation clearing being undertaken, and must focus on offsetting the loss of critical assets (Beard Vegetation Association 371).

Methodology

BSD Consultants (1996)
EPA (2000)
EPA (2006)
Department of Natural Resources and Environment (2002)
Shepherd (2007)
GIS Database
- IBRA WA (Regions – Sub Regions)
- Pre-European Vegetation

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Comments

Proposal is not likely to be at variance to this Principle

According to available databases, there are no watercourses or wetlands within the application area (GIS Database). There is an area subject to inundation approximately 250 metres west of the application area (GIS Database). During a site visit the assessing officer observed that the vegetation in the application area is not associated with this wet area. The proposed clearing is not expected to impact any vegetation growing in or association with a wetland or watercourse.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology

GIS Database
- Hydrography, linear

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Comments

Proposal is at variance to this Principle

The application area is located on the Tamala Limestone Unit which overlies the Tumblagooda Sandstone Unit of the Perth Basin (Playford et al., 1976). The landforms of the application area are part of the Tamala North 1

subsystem, which is described as undulating rises and swales associated with coastal parabolic dunes, featuring some limestone outcrop (DAFWA, 2010). The application area itself is described as sloping sandplain (DAFWA, 2010).

The soils of the application area have been described as deep sands (DAFWA, 2010). These deep sands present are internally draining with no obvious surface drainage from the area (DAFWA, 2010). The proposed clearing is not likely to contribute to water erosion given the deep sands would facilitate high infiltration rates with little runoff (DAFWA, 2010).

At a broad scale the surface soil within the application area pH is 5.5 – 6.0 and there is no known occurrence of acid sulphate soils (CSIRO, 2009). As the application area is already within a predominantly cleared agricultural landscape, it is not likely that the proposed clearing will contribute to a rise in groundwater table and salinity (DAFWA, 2010).

The deep sands of the application area have a high to very high wind erosion risk (DAFWA, 2010).

Based on the above, the proposed clearing is at variance to this Principle.

GMA Garnet has advised (pers comm. March, 2010) that before an area is mined it is cleared of larger vegetation using a raised blade technique. This is done before winter to allow rain to wash into the soil. The proposed timing and technique of the clearing will preserve root stock and encourage grass cover on the soil surface, thereby binding soils. This helps control erosion until mining commences.

Methodology
CSIRO (2009)
DAFWA (2010)
GMA Garnet (2010)
Playford et al. (1976)

(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.

Comments

Proposal may be at variance to this Principle

According to available databases, the application area is not located within any conservation area or DEC managed lands (GIS Database). The Utcha Well Nature Reserve is located approximately 50 metres west of the application area (GIS Database). The application area was previously part of the Utcha Well Nature Reserve. In October 2006 it was excised from the nature reserve as part of a land swap that resulted larger area of land that is in much better condition than that of the application area being included into the Utcha Well Nature Reserve.

The proposed clearing may disrupt an ecological linkage between the nature reserve and other areas of remnant vegetation. It is recommended that a buffer of vegetation be kept between the proposed clearing and George Grey Road. This will help reduce potential edge effects of the Nature Reserve. Should a permit be granted, it is recommended that a condition be imposed excluding 20 metres of the application area on the most western side.

Based on the above, the proposed clearing may be at variance to this Principle.

Methodology
GIS Database
- DEC Tenure

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Comments

Proposal is not likely to be at variance to this Principle

According to available databases, the application area is not located within a Public Drinking Water Source Area (PDWSA) (GIS Database).

There are no watercourses or wetlands within the application area (GIS Database). The average annual rainfall for Kalbarri (approximately 41 kilometres north) is 351.3 millimetres and the average annual evaporation rate is 2,600 millimetres (BoM, 2010; GIS Database). The soils within the application area are likely to facilitate high infiltration so there is likely to be little surface water runoff into low lying areas west of the application area (DAFWA, 2010).

The groundwater salinity of the application area is between 1,000 – 3,000 milligrams per litre Total Dissolved Solids (TDS) (GIS Database). This is considered to be brackish. As the application area is already within a predominantly cleared agricultural landscape, it is not likely that the proposed clearing will adversely impact on groundwater quality (DAFWA, 2010).

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology
BoM (2010)
DAFWA (2010)

GIS Database
- Evaporation Isopleths
- Groundwater Salinity, Statewide
- Hydrography, linear
- Public Drinking Water Source Areas (PDWSA's)

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Comments

Proposal is not likely to be at variance to this Principle

The soils of the application area facilitate high infiltration rates with little surface runoff (DAFWA, 2010). The annual average evaporation rate is over 7 times the annual average rainfall (BoM, 2010, GIS Database). Despite the application area being on sloping sandplain, there is likely to be little surface water runoff. The proposed clearing is not likely to cause an increase in flooding to areas subject to inundation west of the application area.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology

BoM (2010)
DAFWA (2010)
GIS Database
- Evaporation Isopleths

Planning instrument, Native Title, Previous EPA decision or other matter.

Comments

The clearing permit application was advertised on 8 Feruary 2010 by the Department of Mines and Petroleum, inviting submissions from the public. There was one submission received stating no objection to the proposal.

There is one native title claim over the area under application; WC00/001 (GIS Database). This claim has been registered with the National Native Title Tribunal on behalf of the claimant group. However, the mining tenements have been granted in accordance with the future act regime of the *Native Title Act 1993* and the nature of the act (i.e. the proposed clearing activity) has been provided for in that process, therefore the granting of a clearing permit is not a future act under the *Native Title Act 1993.*

According to available databases there is one registered Aboriginal Site of Significance within the application area (GIS Database). It is the proponents' responsibility to comply with the *Aboriginal Heritage Act 1972* and ensure that no Aboriginal Sites of Significance are damaged through the clearing process.

It is the proponents' responsibility to liaise with the Department of Environment and Conservation and the Department of Water to determine whether a Works Approval, Water Licence, Bed and Banks Permit, or any other licences or approvals are required for the proposed works.

Methodology

GIS Database
- Native Title Claims
- Sites of Aboriginal Significance

4. Assessor's comments

Comment

The proposal has been assessed against the Clearing Principles, and the proposed clearing is at variance to Principles (e) and (g), may be at variance to Principles (a), (b), (c), and (h) and is not likely to be at variance to Principles (d), (f), (i) and (j).

Should the permit be granted it is recommended that conditions be imposed on the permit for the purposes of weed management, rehabilitation, environmental offsets, record keeping and permit reporting.

5. References

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6. Glossary

Acronyms:

BoM	Bureau of Meteorology, Australian Government.
CALM	Department of Conservation and Land Management, Western Australia.
DAFWA	Department of Agriculture and Food, Western Australia.
DA	Department of Agriculture, Western Australia.
DEC	Department of Environment and Conservation
DEH	Department of Environment and Heritage (federal based in Canberra) previously Environment Australia
DEP	Department of Environment Protection (now DoE), Western Australia.
DIA	Department of Indigenous Affairs
DLI	Department of Land Information, Western Australia.
DMP	Department of Mines and Petroleum, Western Australia.
DoE	Department of Environment, Western Australia.
DoIR	Department of Industry and Resources, Western Australia.
DOLA	Department of Land Administration, Western Australia.
DoW	Department of Water
EP Act	Environment Protection Act 1986, Western Australia.
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Federal Act)
GIS	Geographical Information System.
IBRA	Interim Biogeographic Regionalisation for Australia.
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union
RIWI	Rights in Water and Irrigation Act 1914, Western Australia.
s.17	Section 17 of the Environment Protection Act 1986, Western Australia.
TECs	Threatened Ecological Communities.

Definitions:

{Atkins, K (2005). *Declared rare and priority flora list for Western Australia, 22 February 2005*. Department of Conservation and Land Management, Como, Western Australia} :-

P1	**Priority One - Poorly Known taxa**: taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2	**Priority Two - Poorly Known taxa**: taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P3	**Priority Three - Poorly Known taxa**: taxa which are known from several populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.
P4	**Priority Four – Rare taxa**: taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5–10 years.

R **Declared Rare Flora – Extant taxa** *(= Threatened Flora = Endangered + Vulnerable)*: taxa which have been adequately searched for, and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee.

X **Declared Rare Flora - Presumed Extinct taxa**: taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee.

{Wildlife Conservation (Specially Protected Fauna) Notice 2005} [Wildlife Conservation Act 1950] :-

Schedule 1 **Schedule 1 – Fauna that is rare or likely to become extinct:** being fauna that is rare or likely to become extinct, are declared to be fauna that is need of special protection.

Schedule 2 **Schedule 2 – Fauna that is presumed to be extinct:** being fauna that is presumed to be extinct, are declared to be fauna that is need of special protection.

Schedule 3 **Schedule 3 – Birds protected under an international agreement:** being birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, are declared to be fauna that is need of special protection.

Schedule 4 **Schedule 4 – Other specially protected fauna:** being fauna that is declared to be fauna that is in need of special protection, otherwise than for the reasons mentioned in Schedules 1, 2 or 3.

{CALM (2005). *Priority Codes for Fauna*. Department of Conservation and Land Management, Como, Western Australia} :-

P1 **Priority One: Taxa with few, poorly known populations on threatened lands**: Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

P2 **Priority Two: Taxa with few, poorly known populations on conservation lands**: Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

P3 **Priority Three: Taxa with several, poorly known populations, some on conservation lands**: Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

P4 **Priority Four: Taxa in need of monitoring**: Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.

P5 **Priority Five: Taxa in need of monitoring**: Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Categories of threatened species (*Environment Protection and Biodiversity Conservation Act 1999*)

EX **Extinct:** A native species for which there is no reasonable doubt that the last member of the species has died.

EX(W) **Extinct in the wild:** A native species which:
(a) is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or
(b) has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.

CR **Critically Endangered:** A native species which is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.

EN **Endangered:** A native species which:
(a) is not critically endangered; and
(b) is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.

VU **Vulnerable:** A native species which:
(a) is not critically endangered or endangered; and
(b) is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

CD **Conservation Dependent:** A native species which is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Appendix C

Project Correspondence

From: **Kiera T Foster/Geraldton/GHD/AU** on **11/08/2011 05:05:38 PM**
Repository: 6126983 GMA Garnet Environmental Offset Program

To: "BUCK, Adam" <Adam.BUCK@dmp.wa.gov.au>
cc: Joshua.Foster@ghd.com, "MINCHAM, Ryan" <Ryan.MINCHAM@dmp.wa.gov.au>, amandag@gmagarnet.com.au
Subject: RE: Offsets

Thank you Adam for your response.

It is looking like good news (but understand that you are still to brief the Director and provide a more definite conclusion). Based on this advice, we will continue to proceed with finalising the Offsets Proposal, Rehabilitation Management Plan, and GHD's findings from the flora and vegetation survey of the 2 June 2011.

Kind Regards

Kiera Foster*
Senior Environmental Scientist/Engineer
*Please note: I work part time, on Wednesdays and Thursdays

GHD
T: 61 8 9920 9405 | V: 619405 | E: kiera.foster@ghd.com
PO Box 164 Geraldton WA 6531 | 76 Forrest Street Geraldton WA 6530 | www.ghd.com

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"BUCK, Adam" Hi Kiera, 11/08/2011 04:42:11 PM

From: "BUCK, Adam" <Adam.BUCK@dmp.wa.gov.au>
To: <Kiera.Foster@ghd.com>
Cc: <Joshua.Foster@ghd.com>, "MINCHAM, Ryan" <Ryan.MINCHAM@dmp.wa.gov.au>
Date: 11/08/2011 04:42 PM
Subject: RE: Offsets

Hi Kiera,

Thanks for sending that draft document through. Sorry for the late reply. I've reviewed the original assessment and the offset guidance material and have the following comments to provide. One thing that the condition itself doesn't highlight well (and we have been endeavouring to correct for the future) is that the offset doesn't need to address every Principle that is at or may be at variance, only ones for certain significant environmental values. In this case it relates to the loss of Beard Vegetation Association 371 and Principle (e). However, as you have pointed out, by implementing the offset proposed it will indirectly address impacts identified under other Principles.

Given the existing largely degraded state of the application area, and that the whole of the permit area is return to good or better condition, then the direct offset proposed would likely result in a net environmental benefit above what would be required under existing conditions. An important part to this proposal will the monitoring and management measures in place to ensure that this is achieved. Accompanied with the contributing offsets of active weed management and exclusion of livestock from the rehabilitation area the offset proposal as a whole would appear to be acceptable in this instance.

Ultimately the Executive Director is the one who signs off on offset proposals and has to be satisfied that they are acceptable. We will try and meet with him in the near future and brief him on this proposed offset. Once we have done that then we will be able to provide you with some further comments and a more definite conclusion on the suitability of the offset package.

If you have any further questions I'll endeavour to try and answer them for you.

Kind Regards

Adam Buck
T +61 8 9222 3563

From: Kiera.Foster@ghd.com [mailto:Kiera.Foster@ghd.com]
Sent: Thursday, 11 August 2011 2:20 PM
To: BUCK, Adam
Cc: JEFoster@ghd.com
Subject: Re: Offsets

Hi there Adam

Thank you for letting me know. We'll be keen to receive some comments by later this afternoon (please copy Josh Foster in your email too as today is my last day with GHD). We have drafted verification of how the 12 offset principles have been addressed (note, this is in draft form only) , and I have attached this to reassure the DMP of the suitability of the offsets which were broadly presented last week in my email.

This provides justification for the 1:1 ratio of the offset to the clearing area, as well as demonstrating in a tabular form why the offset is better (from a condition, species, habitat and ecological function viewpoint) than the clearing area.

In the light of the advice provided regarding the use of rehabilitation as an offset for mining projects (email from yourself on 14 June 2011), the operator is currently required to rehabilitate the area to its present state (mostly degraded). However, the offset proposal comprises rehabilitation to a better condition with active management and additional contributing offsets. We hope that this will be considered to be sufficient as an offset to CPS 3544/1.

For your information - GHD has completed a flora and vegetation survey of the clearing area (offset area) on 2 June 2011 and the results are currently being drafted and will be used in the rehabilitation management plan (which is also being drafted).

Kind Regards

Kiera Foster*
Senior Environmental Scientist/Engineer
*Please note: I work part time, on Wednesdays and Thursdays

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PO Box 164 Geraldton WA 6531 | 76 Forrest Street Geraldton WA 6530 | www.ghd.com

From: "BUCK, Adam" <Adam.BUCK@dmp.wa.gov.au>
To: <Kiera.Foster@ghd.com>
Date: 11/08/2011 12:14 PM
Subject: Offsets

Hi Kiera,

Sorry I haven't given you a response yet. It is turning out more difficult than anticipated to gain a clear view on the suitability of offsets. I should be able to have some comments to provide you later this afternoon but our branch needs to have further discussions before we can provide any final recommendations.

Kind Regards

Adam Buck
Environmental Assessor
Native Vegetation Assessment Branch
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Appendix D

Vegetation and Flora Assessment

A total of two vegetation types were recorded from the area proposed to be cleared:

- An *Acacia rostellifera* low forest to open low shrubland; and
- Cleared/Degraded vegetation used historically for agricultural purposes.

The *Acacia rostellifera* low open forest was relatively degraded due to weed invasion and grazing by livestock with the condition ranging from *Good* to *Degraded*. The condition of vegetation is considered to be consistent with that previously described for the area proposed to be cleared. The *Acacia rostellifera* low forest is considered to be a match for the Beard Vegetation Association 371.

The Cleared/Degraded vegetation is considered to be Completely Degraded, and consisted primarily of pasture grasses and herbs, with scattered native shrubs.

A total of 49 flora taxa from 25 families were recorded from the surveyed area, with 13 taxa recorded as introduced/exotic species. The vegetation was dominated by the following families:

- Asteraceae (daisies): 6 taxa;
- Chenopodiaceae (saltbush): 5 taxa;
- Fabaceae (wattles, peas): 4 taxa; and
- Poaceae (grasses): 4 taxa

No Threatened (Declared Rare) Flora taxa were recorded from the area proposed to be cleared.

No Priority Flora taxa were recorded from the Project Area. No other conservation significant flora taxa (i.e. flora species recorded at or beyond their known range) were recorded from the area proposed to be cleared.

A total of 13 weed and/or introduced flora species were recorded from the Project Area, dominated by daisies (Asteraceae) and grasses (Poaceae).

No Weeds of National Significance were recorded from the Project Area

No noxious Declared Plants with control codes applicable to the Shire of Northampton were recorded from the area proposed to be cleared.

Table 1 GMA Garnet Project Area Flora List

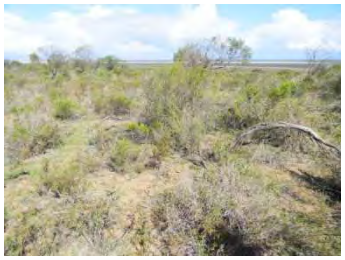
Family	Genus	Species	Common Name	Status	Incidentals	Rehab	Unmined	Q1	Q2	Q3	Q4
Aizoaceae	*Tetragonia*	*decumbens*	Sea Spinach	*							x
Aizoaceae	*Tetragonia*	*implexicoma*	Bower Spinach		x			x			
Amaranthaceae	*Ptilotus*	*divaricatus*	Climbing Mulla Mulla		x				x	x	
Asparagaceae	*Acanthocarpus*	*preissii*	Prickle Lily		x	x	x		x	x	
Asparagaceae	*Lomandra*	*maritima*							x	x	
Asteraceae	*Centaurea*	*melitensis*	Maltese Cockspur	*			x				
Asteraceae	*Helianthus*	*annus*	Sunflower	*		x					
Asteraceae	*Lactuca*	sp. (insufficient material)	Wild Lettuce	*	x						
Asteraceae	*Olearia*	*dampieri*						x	x	x	
Asteraceae	*Sonchus*	*oleraceus*	Common Sowthistle	*	x						
Asteraceae	*Urospermum*	*picroides*	False Hawkbit	*				x	x	x	x
Brassicaceae	*Raphanus*	*raphanistrum*	Wild Radish	*		x	x				
Chenopodiaceae	*Enchylaena*	*tomentosa*	Barrier Saltbush		x		x				
Chenopodiaceae	*Rhagodia*	*preissii* subsp. *obovata*						x		x	x
Chenopodiaceae	*Rhagodia*	*preissii* subsp. *preissii*					x	x	x	x	
Chenopodiaceae	*Salsola*	sp. (genus under revision)	Roly Poly		x	x	x				
Chenopodiaceae	*Threlkeldia*	*diffusa*	Coast Bonefruit		x						
Convolvulaceae	*Convolvulus*	*remotus*			x		x				
Cucurbitaceae	*Citrullus*	*lanatus*	Pie Melon	*		x	x				

Family	Genus	Species	Common Name	Status	Incidentals	Rehab	Unmined	Q1	Q2	Q3	Q4
Dioscoreaceae	*Dioscorea*	*hastifolia*	Warrine					x	x	x	
Euphorbiaceae	*Adriana*	*tomentosa*			x	x	x				
Euphorbiaceae	*Euphorbia*	*myrtoides*			x		x				
Euphorbiaceae	*Euphorbia*	*tannensis* subsp. *eremophila*	Desert Spurge		x		x		x		
Fabaceae	*Acacia*	*rostellifera*	Summer-scented Wattle			x	x	x	x	x	x
Fabaceae	*Glycine*	*canescens*	Silky Glycine							x	
Fabaceae	*Lupinus*	*cosentinii*	Western Australian Blue Lupin	*	x						
Fabaceae	*Senna*	*glutinosa*							x		
Fabaceae	*Templetonia*	*retusa*	Cockies Tongues						x		
Geraniaceae	*Erodium*	*cygnorum*	Blue Heronsbill		x						
Goodeniaceae	*Scaevola*	*tomentosa*	Raggedleaf Fanflower		x						
Malvaceae	*Alyogyne*	*hakeifolia*			x	x					
Malvaceae	*Rulingia*	*?borealis*			x						
Myrtaceae	*Thryptomene*	*baeckeacea*			x						
Nyctaginaceae	*Commicarpus*	*australis*	Perennial Tar Vine			x	x		x	x	x
Poaceae	*Austrostipa*	sp. (insufficient material)									x
Poaceae	*Eragrostis*	*curvula*	African Lovegrass	*					x	x	
Poaceae	*Poaceae*	sp. (insufficient material)						x		x	x
Poaceae	*Secale*	*spp.*	Sterile Rye Grass	*		x					

Family	Genus	Species	Common Name	Status	Incidentals	Rehab	Unmined	Q1	Q2	Q3	Q4
Polygonaceae	*Emex*	*australis*	Doublegee	*	x						
Ranunculaceae	*Clematis*	*linearifolia*			x						
Rubiaceae	*Opercularia*	*vaginalis*	Dog Weed		x						
Solanaceae	*Anthocercis*	*ilicifolia*			x						x
Solanaceae	*Solanum*	*nigrum*	Blackberry Nightshade	*		x	x				x
Solanaceae	*Solanum*	*nummularium*	Money-leaved Solanum				x		x	x	
Surianaceae	*Stylobasium*	*spathulatum*	Pebble Bush			x	x	x	x		
Thymelaeaceae	*Pimelea*	*argentea*	Silvery Leaved Pimelea		x						
Thymelaeaceae	*Pimelea*	*microcehala*	Shrubby Riceflower				x	x	x	x	x
Vitaceae	*Clematicissus*	*angustissima*									
Zygophyllaceae	*Zygophyllum*	*fruiticulosum*	Shrubby Twinleaf							x	x

Where: * = weed / introduced species

Table 2 GMA Garnet Project Area Quadrat Information

Site	GMA Q1	GMA Q2	GMA Q3	GMA Q4
Date	2/06/2011	2/06/2011	2/06/2011	2/06/2011
Location	Sand dune west of limestone ridge/cliff. Northern End of Project Area	Sand dune west of limestone ridge/cliff	Sand dune west of limestone ridge/cliff North	Sand dune west of limestone ridge/cliff North, west near road
Corner Photo Taken	NE	NE	NE	NE
Easting	225417	225546	225667	225310
Northing	6890631	6890297	6890177	6890337
Photo				
Habitat	Sand dune, Acacia woodlands	Sand dune, Acacia shrublands/woodlands	Sand dune, Acacia shrubland	Sand dune, Acacia woodlands
Soil Type	sand	sand	sand	sand
Colour	brown	brown	brown	brown
Topography	Gentle/medium	Gentle to top of slope	Top of slope gentle	gentle
Aspect	W	N	W	W
Rock Type	Nil, scattered limestone	Nil, scattered limestone	Nil, scattered limestone	Nil, scattered limestone
Rock %	<2	<2	<2	<2

Site	GMA Q1	GMA Q2	GMA Q3	GMA Q4
Bare Ground	10	40		15
% Logs	15	10		15
% Twigs	15	10		5
% Leaves	60	15		75
Vegetation Condition	4-5	4-5	4	4
Disturbance Type	Grazing, Weed Invasion, Physical Damage	Grazing having impact; less weeds	Grazing	Grazing, weeds
Age Since Fire	>20yrs	>20yrs	>20yrs	>20yrs
Field Description	Acacia rostellifera woodland	Acacia rostellifera open woodland / tall shrubland	Acacia rostellifera open shrubland	Acacia rostellifera low forest
Trees <10	30-70%			30-70%
Shrubs >2	10-30%	2-10%	<2%	<2%
Shrubs 1-2	2-10%	2-10%	2-10%	10-30%
Shrubs <1	-	10-30%	10-30%	2-10%
Herbs	-			10-30%

Appendix E

Rehabilitation Management Plan

CLIENTS | PEOPLE | PERFORMANCE

GMA Garnet Pty Ltd

Report for Port Gregory Minesite

Offset Area Rehabilitation Management Plan

June 2012

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Contents

Table Index

Figure Index

Appendices

1. Introduction

1.1 Background

GMA Garnet Pty Ltd (GMA Garnet) currently own and operate the Port Gregory Mine, located approximately 12 km north of Port Gregory in Western Australia (Figure 1, Appendix A). GMA Garnet has recently acquired a portion of the Utcha Well Nature Reserve (the Project Area) east of George Grey Drive from the Department of Environment and Conservation (DEC) as part of a land-swap for a larger, more intact parcel of land in better condition.

The Project Area (M70/927) is proposed to be cleared and mined for garnet via the open-cut mining process currently in place. Upon application for a clearing permit, the GMA Garnet Clearing Permit Decision Report (CPS 3544/1) indicates that the proposed clearing of vegetation within the Project Area is at variance with Clearing Principles (e) and (g) and may be at variance with Principles (a), (b), (c), and (h).

A Clearing Permit (with conditions) has been obtained for the Project Area (CPS 3544/1). One of the conditions (Condition 6) of the Clearing Permit is that an Offset Proposal must be submitted to the Department of Mines and Petroleum (DMP) and approved before any clearing takes place.

1.2 Purpose

This report details the Proposed Rehabilitation Management Plan required by GMA Garnet necessary to assist in the adhering with Condition 6 of the Clearing Permit CPS 3544/1.

This Rehabilitation Management Plan is to be reviewed as required.

2. Project Area Environment

2.1 Project Area Location

The Port Gregory Mine is located approximately 12 km north of Port Gregory in Western Australia (Figure 1, Appendix A).

The Project Area forms part of the former Utcha Well Nature Reserve located east of George Grey Drive.

GMA Garnet Pty Ltd is owner of the land within the Project Area.

2.2 Physical Environment

The Project Area falls between limestone cliffs to the east and lowlands associated with the northern end of Hutt Lagoon to the west, and is comprised of a north-south sand ridge. Scattered limestone pieces are located at or near the surface of the ridge.

The Project Area is located within the Geraldton Sandplains Interim Biogeographic Regionalisation of Australia (IBRA) region. The Beard Vegetation Association (BVA) 371: Low Forest; *Acacia rostellifera* is known to occur in the Project Area, and is also noted from other portions of the Utcha Well Nature Reserve.

2.3 Project Area Vegetation

A total of two vegetation types were recorded from the area proposed to be cleared:

- An *Acacia rostellifera* low forest to open low shrubland; and
- Cleared/Degraded vegetation used historically for agricultural purposes.

The *Acacia rostellifera* low open forest was relatively degraded due to weed invasion and grazing by livestock with the condition ranging from *Good* to *Degraded*. The condition of vegetation is considered to be consistent with that previously described for the area proposed to be cleared. The *Acacia rostellifera* low forest is considered to be a match for the Beard Vegetation Association 371.

Plate 1 GMA Garnet Quadrat 4 – *Acacia rostellifera* low forest

Plate 2 GMA Garnet Quadrat 3: *Acacia rostellifera* open shrubland

The Cleared/Degraded vegetation is considered to be Completely Degraded, and consisted primarily of pasture grasses and herbs, with scattered native shrubs.

Plate 3 GMA Garnet Cleared/Degraded Vegetation

2.4 Project Area Flora Records

A total of 49 flora taxa from 25 families were recorded by a botanical team from GHD Pty Ltd in June 2011 from the Project Area, with 13 taxa recorded as introduced/exotic species. The vegetation was dominated by the following families:

- Asteraceae (daisies): 6 taxa;
- Chenopodiaceae (saltbush): 5 taxa;
- Fabaceae (wattles, peas): 4 taxa; and
- Poaceae (grasses): 4 taxa

Table 1 Project Area Flora List

Family	Genus	Species	Common Name	Status
Aizoaceae	*Tetragonia*	*decumbens*	Sea Spinach	*
Aizoaceae	*Tetragonia*	*implexicoma*	Bower Spinach	
Amaranthaceae	*Ptilotus*	*divaricatus*	Climbing Mulla Mulla	
Asparagaceae	*Acanthocarpus*	*preissii*	Prickle Lily	
Asparagaceae	*Lomandra*	*maritima*		
Asteraceae	*Centaurea*	*melitensis*	Maltese Cockspur	*
Asteraceae	*Helianthus*	*annus*	Sunflower	*
Asteraceae	*Lactuca*	sp. (insufficient material)	Wild Lettuce	*
Asteraceae	*Olearia*	*dampieri*		
Asteraceae	*Sonchus*	*oleraceus*	Common Sowthistle	*
Asteraceae	*Urospermum*	*picroides*	False Hawkbit	*
Brassicaceae	*Raphanus*	*raphanistrum*	Wild Radish	*
Chenopodiaceae	*Enchylaena*	*tomentosa*	Barrier Saltbush	
Chenopodiaceae	*Rhagodia*	*preissii* subsp. *obovata*		
Chenopodiaceae	*Rhagodia*	*preissii* subsp. *preissii*		
Chenopodiaceae	*Salsola*	sp. (genus under revision)	Roly Poly	
Chenopodiaceae	*Threlkeldia*	*diffusa*	Coast Bonefruit	
Convolvulaceae	*Convolvulus*	*remotus*		
Cucurbitaceae	*Citrullus*	*lanatus*	Pie Melon	*
Dioscoreaceae	*Dioscorea*	*hastifolia*	Warrine	
Euphorbiaceae	*Adriana*	*tomentosa*		
Euphorbiaceae	*Euphorbia*	*myrtoides*		
Euphorbiaceae	*Euphorbia*	*tannensis* subsp. *eremophila*	Desert Spurge	
Fabaceae	*Acacia*	*rostellifera*	Summer-scented Wattle	
Fabaceae	*Glycine*	*canescens*	Silky Glycine	
Fabaceae	*Lupinus*	*cosentinii*	Western Australian Blue Lupin	*
Fabaceae	*Senna*	*glutinosa*		
Fabaceae	*Templetonia*	*retusa*	Cockies Tongues	
Geraniaceae	*Erodium*	*cygnorum*	Blue Heronsbill	
Goodeniaceae	*Scaevola*	*tomentosa*	Raggedleaf Fanflower	

Family	Genus	Species	Common Name	Status
Malvaceae	*Alyogyne*	*hakeifolia*		
Malvaceae	*Rulingia*	*?borealis*		
Myrtaceae	*Thryptomene*	*baeckeacea*		
Nyctaginaceae	*Commicarpus*	*australis*	Perennial Tar Vine	
Poaceae	*Austrostipa*	sp. (insufficient material)		
Poaceae	*Eragrostis*	*curvula*	African Lovegrass	*
Poaceae	*Poaceae*	sp. (insufficient material)		
Poaceae	*Secale*	spp.	Sterile Rye Grass	*
Polygonaceae	*Emex*	*australis*	Doublegee	*DP
Ranunculaceae	*Clematis*	*linearifolia*		
Rubiaceae	*Opercularia*	*vaginalis*	Dog Weed	
Solanaceae	*Anthocercis*	*ilicifolia*		
Solanaceae	*Solanum*	*nigrum*	Blackberry Nightshade	*
Solanaceae	*Solanum*	*nummularium*	Money-leaved Solanum	
Surianaceae	*Stylobasium*	*spathulatum*	Pebble Bush	
Thymelaeaceae	*Pimelea*	*argentea*	Silvery Leaved Pimelea	
Thymelaeaceae	*Pimelea*	*microcehala*	Shrubby Riceflower	
Vitaceae	*Clematicissus*	*angustissima*		
Zygophyllaceae	*Zygophyllum*	*fruiticulosum*	Shrubby Twinleaf	

2.4.1 Conservation Significant Flora

No Threatened (Declared Rare) Flora taxa were recorded from the area proposed to be cleared.

No Priority Flora taxa were recorded from the Project Area. No other conservation significant flora taxa (i.e. flora species recorded at or beyond their known range) were recorded from the area proposed to be cleared.

2.4.2 Weeds and Introduced Flora

A total of 13 weed and/or introduced flora species were recorded from the Project Area, dominated by daisies (Asteraceae) and grasses (Poaceae).

No Weeds of National Significance were recorded from the Project Area

No noxious Declared Plants with control codes applicable to the Shire of Northampton were recorded from the area proposed to be cleared.

2.5 Ecological Linkage

A degraded ecological linkage currently runs through the Project Area from the limestone hills to the east to the lowlands associated with the Utcha Well Nature Reserve west of George Grey Drive.

3. Completion Criteria and Performance Indicators

The main environmental objective for the Clearing Permit Offset Area is to enhance the condition of the vegetation within the Project Area following mining.

Part or all of the clearing to be undertaken under CPS 3544/1 is or may be at variance to Clearing Principles (a), (b), (c), (e), (g) and (h). The Department of Mines and Petroleum (DMP) has indicated that the Clearing Principle (e) is considered to be the greatest concern as Beard Vegetation Association 371: Low forest; *Acacia rostellifera*, covering the Project Area is under-represented with less than 30% of its pre-European extent remaining.

In summary, GMA Garnet proposes to use direct and contributory offsets as Completion Criteria and Key Performance Indicators (KPIs):

Direct Offset – Completion Criteria:

- Rehabilitation of the area to be cleared to Beard Vegetation Association 371 in *Good* or better condition with active management. The offset proposal will include a detailed rehabilitation management plan and will have regard to the offset principles under CPS 3544/1.
- In summary:
  - Where areas exist that are *Completely Degraded*, these will be rehabilitated to *Good* condition.
  - Where areas exist that are in *Good* condition, these will be rehabilitated to better than *Good* condition.

Contributing Offsets – KPIs:

The rehabilitation management plan will include these contributing offsets:

- The rehabilitation area will be actively managed to minimise weed infestation and eradicate weed species;
- Livestock will be excluded from the area to be cleared by fencing at the northern boundary; and
- Management measures for controlling wind erosion will be presented.

4. Rehabilitation Plan

4.1 Current Practice

GMA Garnet currently undertakes rehabilitation practices of its former mine areas and returns these areas to pre-existing landscape function. In the majority of the area south of the Project Area, the rehabilitated landscape has been returned to agricultural pasture, such that grazing by livestock can continue.

4.2 Project Area Objectives

The Mine Rehabilitation Plan (MRP) proposed to be developed for the Port Gregory Mine is considered suitable for inclusion as part of a Clearing Permit Offset Proposal.

The MRP delineates a formal target for the end-use of the Project Area, and, as such, an appropriate objective that should be aimed towards.

The MRP objectives will comprise the following:

- The development of a design for a suitable post-mining landform for the Project Area; in particular, a landform that is contoured with surrounding landscape;
- Development of a program to establish a sustainable vegetation community that is comparable with Beard Vegetation Association 371 which is currently present in the Project Area. This vegetation community is considered to provide a similar fauna habitat to that currently present. The community to be established will be managed to ensure that it is in *Good* or better condition than that currently present;
- An examination of the use by fauna species of the rehabilitated ecological linkage between the Utcha Well Nature Reserve to the west of the Project Area, and the remnant vegetation to the east of the Project Area, once rehabilitation is complete;
- Weed management including the spraying of weed species, and monitoring to ensure the minimisation of weed infestation;
- An upgrade of the fencing around the Project Area with the intention of the prevention of grazing of the rehabilitation by livestock; and
- Installation of a monitoring site within the Project Area to determine progress of rehabilitation.

The following Rehabilitation Plan is suggested and may be reviewed by GMA Garnet before a final decision is made on preferred methodology. The development of specific Rehabilitation Program; Weed Management Plan; and Rehabilitation Monitoring Plan may be undertaken separately to this document.

4.3 Rehabilitation Plan

4.3.1 Risks to Current Rehabilitation Program

GMA Garnet currently ensures that risks associated with their current rehabilitation program are minimised. Major risks currently managed include:

- Wind erosion;
- Weed invasion; and
- Feral fauna impacts.

Wind Erosion

The Project Area and associated mining lease is subject to strong winds during late spring and summer months associated with sea-breezes coming off the ocean from the south-west of the site.

GMA Garnet currently minimises risks to existing rehabilitation by:

- undertaking the spreading of topsoil only in winter months to ensure that topsoil does not blow away; and
- uses sterile ryegrass / wind fences / hydromulch for worst case situations as required.

Weed Invasion

GMA Garnet currently undertakes weed management, including the exclusion of native vegetation on the existing post-mining landform to ensure that it retains agricultural pasture characteristics.

In addition, the minesite undertakes a patrol and control action for a list of Declared Plants:

- Skeleton Weed (**Chondrilla juncea*);
- Thornapple species (**Datura* spp.);
- Variegated Thistle (**Silybum marianum*):
- Mexican Poppy (**Argemone ochloleuca*); and
- Golden Crownbeard (**Verbesina encelioides*).

These are currently managed through an herbicide spraying program in order to prevent the establishment of these invasive weeds on existing leases. During the GHD Pty Ltd Vegetation and Flora assessment, no Declared Plants were recorded.

Feral Fauna Management

GMA Garnet has assisted in regional fox-baiting programs in the past, but has found that these have been time consuming, and led to an increase in feral cat numbers in and around the minesite.

4.3.2 Current Rehabilitation Program

The current rehabilitation program employed by GMA Garnet ensures that the post-mining landform retains the ability to be used for agricultural purposes, in particular, grazing by livestock.

The following rehabilitation measures for the existing mining programme are currently employed:

- Topsoil to a minimum depth of 150 mm is progressively remove and stockpiled;
- Overburden (waste material) is progressively removed from the mine face, stockpile or placed directly over tailings during pit excavations;
- Tailings are progressively returned to the trailing edge of the excavated mine pit;
- Contouring to natural contours is achieved by the use of earth-moving machinery.
- Topsoil is placed over subsoil (overburden) or tails to a depth of a 150 mm;
- Deep ripping is undertaken on completion of respreading of overburden material and topsoil;
- In the area south of the current pit on Mining Leas M70/856 to the south of the Project Area, nutrients are added to assist in the restoration of the original pasture, with natural regrowth of *Acacia rostellifera* controlled by periodic raking or mulching and spraying with herbicide;
- At other mining leases, the natural revegetation of *Acacia rostellifera* and associated native plants is allowed to progress.

4.3.3 Proposed Program for Project Area

The current rehabilitation programme employed by GMA Garnet can be adapted to ensure the rehabilitation of the Project Area contains a vegetation community to a *Good* or better condition Beard Vegetation Association 371.

The following program will be employed at the Project Area.

Table 2 Proposed Rehabilitation Program

Stage	Task	Action	Objectives
1	Contour Survey	Topographical survey of Project Area	Match final post-mining landform with pre-mining landform, where possible
2	Seed Collection	Collection of seed of native species within Project Area	Retain genetic suite of remnant vegetation in Project Area

Stage	Task	Action	Objectives
3	Vegetation Removal	100 m corridor removed per year Standing remnant vegetation to be pushed into windrows for stockpiling for later respreading on areas rehabilitated	Ensure ecological linkage retained Biological matter retained
4	Topsoil removal	As per current practice – progressively remove topsoil to a minimum depth of 150 mm Topsoil to be stockpiled to a maximum depth of 2 metres Topsoil to be stockpiled for a maximum timeframe of 2 years	Maximum retention of soil fertility and existing seed bank Retention of biological material in topsoil Reduction in change in the physical structure of the topsoil as a result of compaction and change in moisture content Retention of preferred growth media to support plant growth in rehabilitated areas
5	Overburden removal	Overburden (where present) to be progressively remove and stockpiled or placed directly over tailings during pit excavations	Minimisation of open area of pit.
6	Tailings storage	Tailings to be progressively returned to the trailing edge of the excavated mine pit	Storage of tailings within landform profile
7	Overburden return	Stockpiled overburden to be returned to the trailing edge of the excavated mine pit over tailings as soon as practicable	Construction of post-mining landform Minimise storage time of overburden

Stage	Task	Action	Objectives
8	Landform construction	Contouring of completed mining area to natural contours to be achieved by earth-moving machinery	Construction of post-mining landform to match pre-mining landform Height and footprint ensure that the rehabilitated area blends in with surrounding landscape. New landform does not restrict the existing hydrological regime present in the area.
9	Topsoil return	Topsoil is placed over subsoil (overburden, tails) to a minimum depth of 150 mm	Construction of post-mining landform to match pre-mining landform Return of seed bank to landform Return of preferred growth media to landform
10	Soil treatment (as required)	Addition of fertilisers suitable for native plant growth (as required)	Create conditions suitable for native plant growth, but minimising weed growth (stage may not be required)
11	Integration of topsoil and landform	Deep ripping of constructed landform to ensure integration of topsoil and subsoil	Minimise risk of erosion by wind and water Increase rainfall penetration of soil profile
12	Return of larger vegetative material	Spreading across landscape of stockpiled logs, branches, and other vegetative material pushed up into windrows.	Minimise risk of erosion by wind and water Increase microhabitat Increase seed retention areas for growth
13	Seeding	Direct seeding of reconstructed landform with seeds collected from Project Area (or local area).	Return of seed bank to reconstructed landform Improved diversity of flora taxa in reconstructed Project Area over existing status
14	Monitoring	Establishment of long-term monitoring sites	Allows for the tracking of site rehabilitation Allows for monitoring of weed species such that management actions can be applied.

4.3.4 Establishment of Native Vegetation Community

In the initial stages of rehabilitation, newly established native vegetation will have a minimal effect on mitigating erosion, and sterile ryegrass may be considered for this stage of revegetation. Sterile ryegrass can provide soil cover quickly from germination to minimise erosion.

The weed management plan should also be implemented when establishing the vegetation communities. The practices currently employed by GMA Garnet involving the treatment of herbicides and/or physical removal can be applied to the Project Area. These practices should be undertaken throughout the year and especially during times of high growth which occur after wet periods (e.g. winter rainfall, summer storm events).

The construction landform should be examined to determine if it the ecosystem it supports functions in a manner that is stable, self-sustaining and similar to analogous natural ecosystems. This can be measured in conjunction with any monitoring of the vegetation community established on the post-mining landform.

The respread of topsoil, mulched vegetation and spread of logs and branches taken from the Project Area prior to mining will assist in the development of a vegetation community similar to the BVA 371: Low forest; *Acacia rostellifera*.

Direct seeding of the reconstructed post-mining landform is considered to be the most suitable method of developing the vegetation community. The use of locally collected seed is required, to prevent the preserve the genetic identify of the Project Area.

Additional planting of locally sourced native flora species can be used to supplement any seeding program implemented on the constructed landform. This can be undertaken to enhance biodiversity on-site where slower growing or recalcitrant species may be outcompeted by quick-growing colonisers.

Monitoring of the rehabilitation process is essential, with the information obtained useful in contribution to future rehabilitation programs.

4.4 Native Flora Species for Rehabilitation

Native flora species considered to be useful within the GMA Garnet Project Area for any seeding program are discussed in Table 3. These have been taken from the flora lists generated through the GHD Pty Ltd Vegetation and Flora assessment of the Project Area, and other species known from BVA 371 known to occur in the local area. Table 4 includes additional flora species considered to be suitable, not recorded from Project Area.

Seeding rates (i.e. kg/ha) is considered likely to vary depending on season and volume of seed available for collection/purchase from seed suppliers. GHD suggests that a seeding rate of between 5 - 8 kg/ha is likely to be suitable for the Project Area rehabilitation. GHD considers it likely that the rehabilitation will become dominated by *Acacia rostellifera* from seeds within the stored topsoil and growth habit. As such, the

seed mix should be made up of species considered to be more recalcitrant in germination, to ensure long-term presence in the developed seed-bank.

Table 3 Suggested Flora Species for use in Seeding Program

Taxon	Common Name	Notes
Acacia rostellifera	Summer-scented Wattle	Easy to collect Readily germinated using seed treatment methods. Likely to self-colonise Likely to dominate community
Acanthocarpus preissii	Prickle Lily	Relatively easy to collect (few seeds) Difficult to germinate (requires period of warm moist conditions similar to autumn-winter transition period)
Adriana tomentosa		Easy to collect Likely to self-colonise
Alyogyne hakeifolia		Easy to collect Germinate with smokewater Likely to self-colonise
Anthocercis ilificolia	Holly-leafed Tailflower	Easy to collect Germinate with smokewater Likely to self-colonise
Austrostipa spp.	Feathergrass	Easy to collect Best success as seedlings grown from seed trays
Clematicissus angustissima		Easy to collect Uncertain success
Clematis linearifolia	Slender Clematis	Easy to collect Needs to be sown directly from collection
Commicarpus australis		Easy to collect Needs to be sown directly from collection
Convolvulus remotus		Not easily collectable Grows well from seed
Dioscorea hasifolia	Warrine	Easy to collect Seed germination better when removed from fruit Low germination rate
Enchylaena tomentosa	Barrier Saltbush	Fruit readily collectable. Requires soaking for germination.
Euphorbia tannensis	Gascoyne Spurge	Difficult to collect Seed readily germinates after raings

Taxon	Common Name	Notes
Lomandra maritima		Difficult to propagate
Olearia dampieri	-	Easy to collect – though in small amounts Likely to germinate readily Do not substitute with *Olearia axillaris*
Opercularia vaginata	Dog Weed	From cuttings
Pimelea argentea	Silvery Leaved Pimelea	Better from cuttings
Pimelea microcephala	Shrubby Riceflower	Better from cuttings
Ptilotus divaricatus	Climbing Mulla-mulla	Easy to collect Germination improved by smokewater
Rhagodia preissii		Easy to collect Readily germinate in field Both subspecies applicable
Salsola spp.	Roly Poly	Easy to collect Readily germinates
Scaevola tomentosa	Ragged-leaf Fanflower	Not easy to collect (male vs. female flowers) Read
Senna glutinosa	Sticky Senna	Easy to collect Readily germinated using seed treatment methods
Stylobasium spathulatum	Pebble Bush	Easy to collect Germinates better when seed removed from fruit
Templetonia retusa	Cockies Tongue	Easy to collect Readily germinated using seed treatment methods.
Tetragonia implexicoma	Bower Spinach	Likely to also germinate from seedbank May dominate understorey in early community establishment
Threlkeldia diffusa	Coast Bonefruit	Readily grows from cuttings rather than seed.
Thryptomene baeckeacea		Easy to collect Seed germination better when removed from fruit Low germination rate
Zygophyllum fruticulosum	Shrubby Twinleaf	Easy to collect Seed germination better when removed from fruit Low germination rate

Table 4 Additional Species Considered to be Suitable

Taxon	Common Name	Notes
Acacia lasiocarpa	Panjang	Easy to collect Readily germinated using seed treatment methods. May dominate understorey community
Alyogyne hakeifolia	Sand Hibiscus	Easy to collect Germinate with smokewater
Alyxia buxifolia	Dysentery Bush	Better from cuttings. Can only transplant when mature
Anthocercis littorea	Yellow Tailflower	Easy to collect Germinate with smokewater Likely to self-colonise
Phyllanthus calycinus	False Boronia	Easy to collect Propagate from seed
Santalum acuminatum	Quandong	Easy to collect Difficult to grow – requires host plant and careful transplanting
Scaevola canescens	Grey Scaevola	Better from cuttings

4.5 Fauna Community and Ecological Linkage

The purpose of the rehabilitation program is to establish a sustainable native ecosystem, including a design to meet the habitat demands of native fauna.

4.5.1 Ecological Linkage Maintenance

The current progressive mining and rehabilitation method employed by GMA Garnet at the Port Gregory Mine will ensure that the ecological linkage currently in place in the Project Area that runs between the Utcha Well Nature Reserve on the west side of George Grey Drive and the remnant vegetation of the limestone cliffs to the east of the Project Area will not be completely severed.

During the proposed progressive mining of the Project Area, the BVA 371 will be re-established on the trailing edge of the excavation. As such, the newly establish ecological linkage on the southern side of the excavation will ensure that the ecological linkage is maintained.

4.5.2 Fauna Exclusion Fencing

To ensure that the Project Area is protected from grazing livestock, an upgrade of the fence on the northern side of the Project Area is required.

Where seedlings may be added to the rehabilitated area, the use of tree guards (plastic sleeves) to prevent grazing by feral fauna (rabbits) is suggested.

4.6 Monitoring

Monitoring of the rehabilitation progress is required such that any maintenance required (e.g. wee management, infill planting, etc.) can be undertaken.

The monitoring method should be robust enough to incorporate environmental changes during the year (e.g. seasonal impacts), be able to allow for the measurement of ecosystem processes and be cost effective. Outcomes of any monitoring program should allow for the prediction of progress of the rehabilitation over time. The use of an analogue site to facilitate comparison should be considered.

Suggested monitoring methods include the use of transects to examine the diversity of vegetation; and ecosystem function analysis (EFA) which examines aspects of the soil to produce estimates of comparative plant growth, soil stability, infiltration and nutrient cycling as they change over time.

Any outcomes of the rehabilitation monitoring should be reviewed to ensure that any changes to the Project Area can be applied to ensure that objectives are met.

The setting of targets to monitor the progress of the rehabilitation is suggested, such as percentage cover of native flora species, observation of native fauna, weed percentage cover, etc. GMA Garnet has advised GHD that as any rehabilitation program is not likely to commence until 2015-2016, the setting of targets for the rehabilitation will be finalised on commencement of the rehabilitation program.

4.7 Weed Management

A weed management program will need to be developed to ensure that the invasion of weed species to the retabulated areas is minimised.

The may include a monitoring program following rainfall periods (winter, summer thunderstorms) and/or an examination of the status of noxious weed species to prevent the seed set (e.g. Golden Crownbeard, **Verbesina encelioides*).

The use of selective herbicide spraying at specific times is considered to be the most effective method of controlling weeds. Physical removal may assist where the use of herbicides may affect native flora species.

Appendix A

Figures

LEGEND

- GMA Garnet Leases
- Study Area

1: 25,000 (at A3)

0 125 250 500 750 1,000 1,250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone XX

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GMA Garnet Pty Ltd
Port Gregory Mine Offset Proposal

Locality

Job Number 61-26983
Revision 0
Date 12 Dec 2011

Figure 1

G:\61\26983\GIS\Maps\MXD\6126983_G001_Rev0.mxd

239 Adelaide Terrace Perth WA 6004 Australia T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

Data source: Landgate: 2004 Travellers Atlas - 20111130; GHD: GMA Garnet Lease - 20111130, Study Area - 20111130; GA: Topographic 250K Serios III - 2006 Created by: cagilbert

Appendix F

Land Swap Documentation

Department of
Environment and Conservation

Your ref: 00307-1908-02 (Job 063274)
Our ref: 2005F000494V01
Enquiries: Robert Powell
Phone: 9334 0430
Fax: 9334 0253
Email: robert.powell@dec.wa.gov.au

Director General

Department for Planning & Infrastructure

Attention: Steve Burgess
Regional Manager
Mid-west Region
State Land Services

UTCHA WELL NATURE RESERVE (↑640)

I refer to my memos of 31 August 2006 and 20 November 2006 and to your letter of 5 October 2006.

With my memo of 31 August 2006 I attached a copy of my memo of 6 August 1997, describing a proposal to extend and consolidate Utcha Well Nature Reserve, which has been worked out between the following:

- this Department;
- the mining company G.M.A. Garnet Pty Ltd (GMA);
- the company's solicitors, Blakiston & Crabb;
- the lessees of Victoria Location 11491, Mr & Mrs Hutton.

This proposal (Map 1) is of considerable benefit to the State of Western Australia. It involves an excision from and additions to Utcha Well Nature Reserve (bordered green on Map 1). The area to be excised from the reserve, east of George Grey Drive (the subject of this Department's memo of 20 November 2006), is severely degraded. The area to be added to the reserve is much larger in area and is of high value to conservation. Part of the area concerned, the western part of Victoria Location 3581 (now Lot 100 on Deposited Plan 40730), has already been added, having been acquired by purchase by GMA.

The next stage of the agreed proposal is to make changes to the tenure of Victoria Location 11491 (bordered pink on Map 1). The eastern part of the Location, east of George Grey Drive, is to go to GMA free of cost as a freehold title, and the remaining, western part is to be added to Utcha Well Nature Reserve.

The native title on Location 11491 may have been extinguished by Special Lease 3116/8622, issued under the *Land Act 1933* on 1 July 1983. The decision of the Ward High Court on 8 August 2002 included that "the grant of special leases under s 116 of the *Land Act* 1933

wholly extinguished native title rights and interests"(see attached copy of point no. 20 of item 468, "summary", page 188). Both Mr Trevor Ramsden, of the Office of Native Title, and Ms Kate Morton, of your Department's native-title unit, have advised verbally that a special lease issued under the *Land Act 1933*, prior to 23 December 1996, would extinguish native title. Mr Ramsden may have had that confirmed by the State Solicitor's Office when he was with your Department.

I am aware that any extinguishment will need to be considered with regard to section 47B of the *Native Title Act 1993*: "vacant Crown land covered by claimant applications". The likely existence of the special lease at the time the application by the claimant was made [subsection I(b)(i)] may prevent any prior extinguishment from being disregarded. Subsection (4), about the renewal and extension of leases, may be relevant too, to allow the extinguishment to prevail. You may wish to discuss these aspects with Ms Morton, who has provided brief verbal comments to this Department.

The proposed changes in tenure to the eastern and western parts of Location 11491 will also, of course, involve cancelling Special Lease 3116/8622. You will note from the above that the lessees, Mr & Mrs Hutton, have been involved in the discussions on the land proposal. GMA is allowing the Huttons to run their stock on GMA's land immediately north of lease, comprising the eastern half of Location 3581 (now Lot 101 on Deposited Plan 40730). The Huttons will be allowed to continue to run their stock on this land, as well as the eastern part of Location 11491, after it is acquired by GMA. (except for areas required for active mining or related purposes). Since the Huttons own the land to the north of Lot 101, they have and will continue to have the grazing use of a substantial and contiguous area. The Huttons are aware that their special lease is to be cancelled, and that the western part of Location 11491 is to be included in a conservation reserve. A note I have received of discussions between GMA and Mr Hutton on 15 February 2007 confirms that the Huttons understand the land proposal and are agreeable to it.

In order not to interrupt the Huttons' use of eastern part of Location 11491, the cancelling of Special Lease 3116/8622 should coincide with the acquisition by GMA of the freehold title to the land.

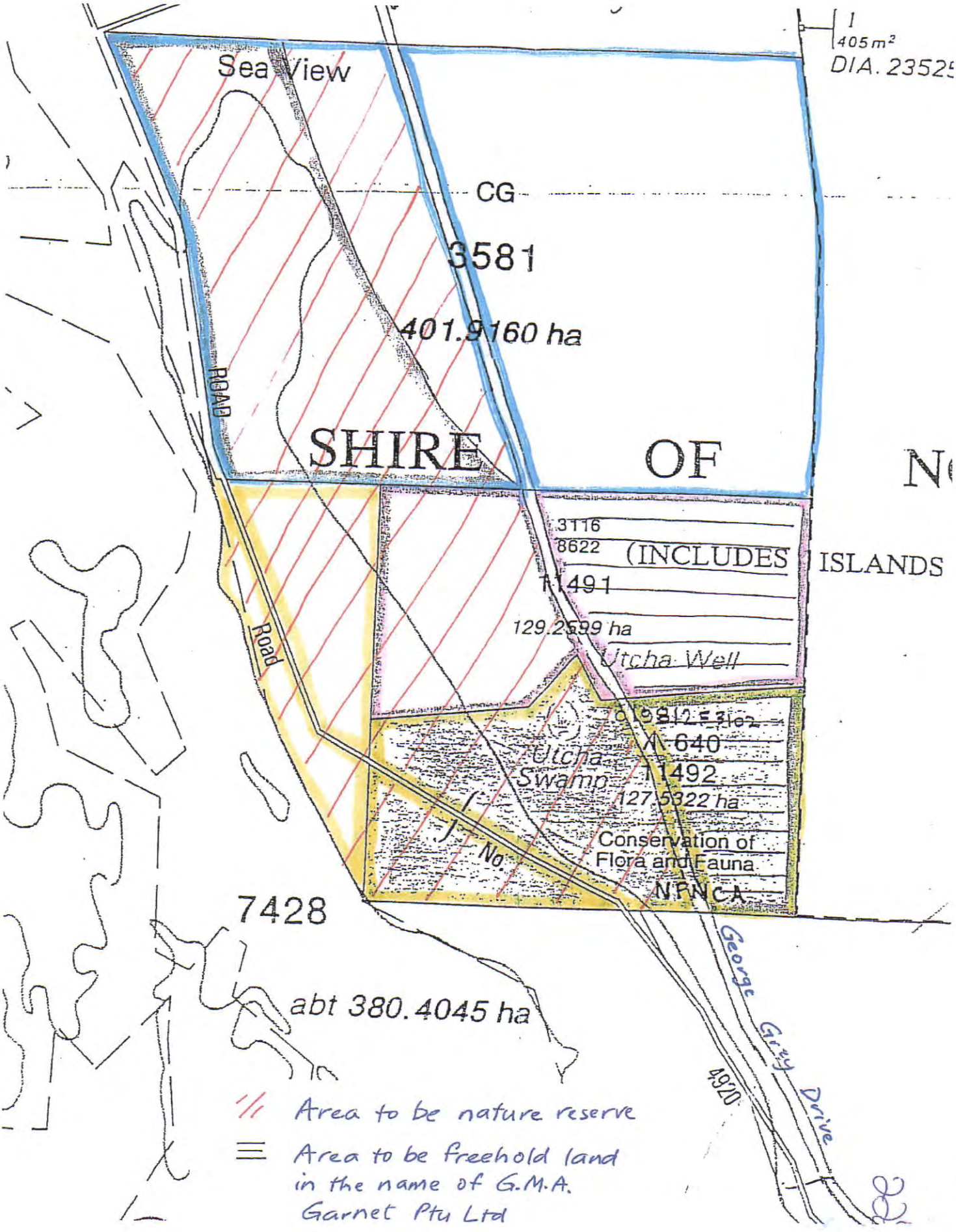
The area of unallocated Crown land (UCL), bordered yellow on Map 1, is now part of a larger proposal, to set aside the areas hatched in blue on Map 2 as a nature reserve. This is the subject of separate correspondence between our Departments (your ref. 50146-2007; Job No. 070459).

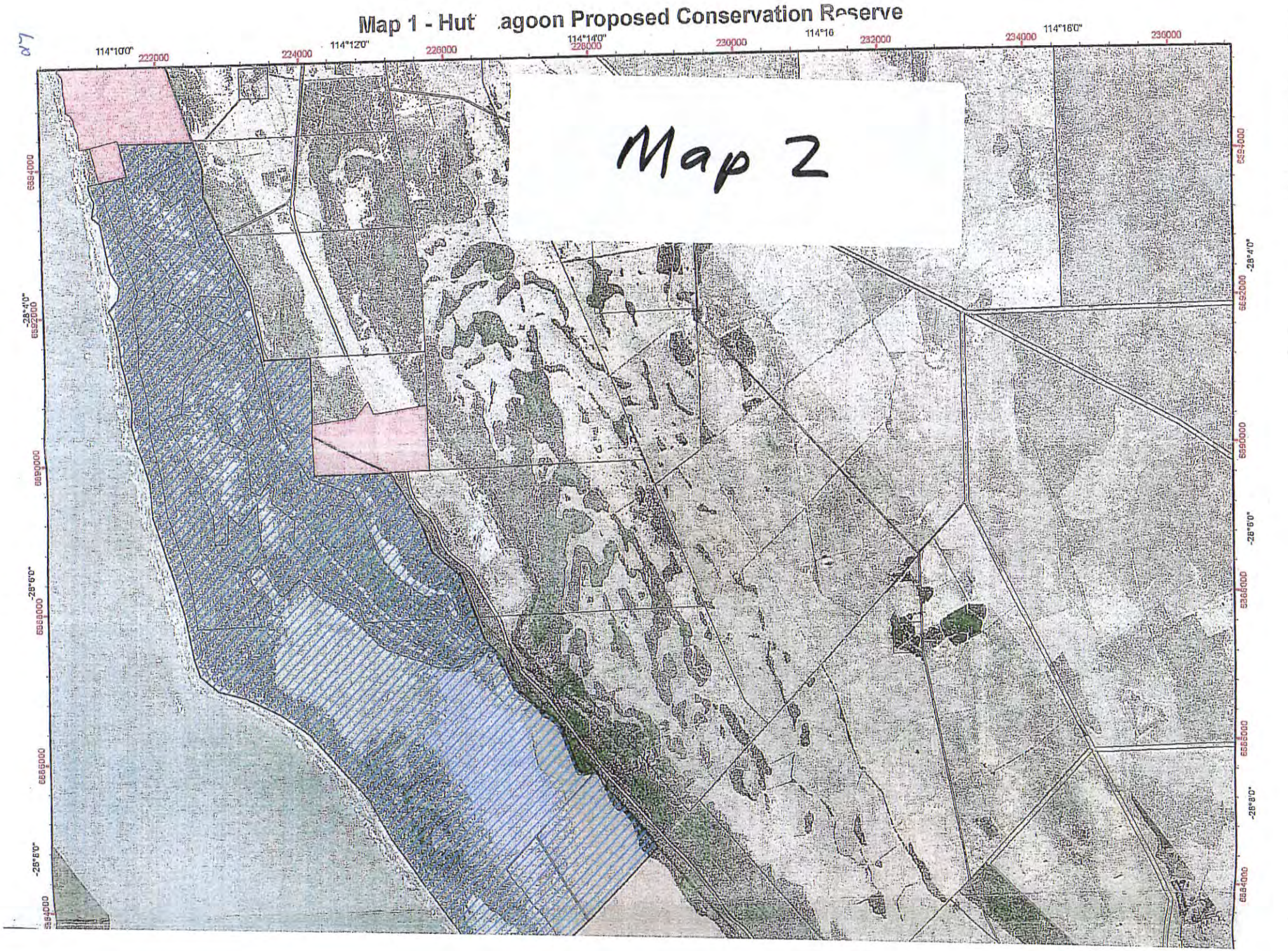
With my memo of 31 August 2006 I provided copies of letters from the Shire of Northampton and the Department of Industry and Resources, agreeing to the inclusion in Utcha Well Nature Reserve of the western part of Victoria Location 11491. I shall be grateful if you will consider taking action to add that part of the Location to Utcha Well Nature Reserve (↑640), as well as to issue, free of cost, a freehold title for the eastern part of the Location to GMA.

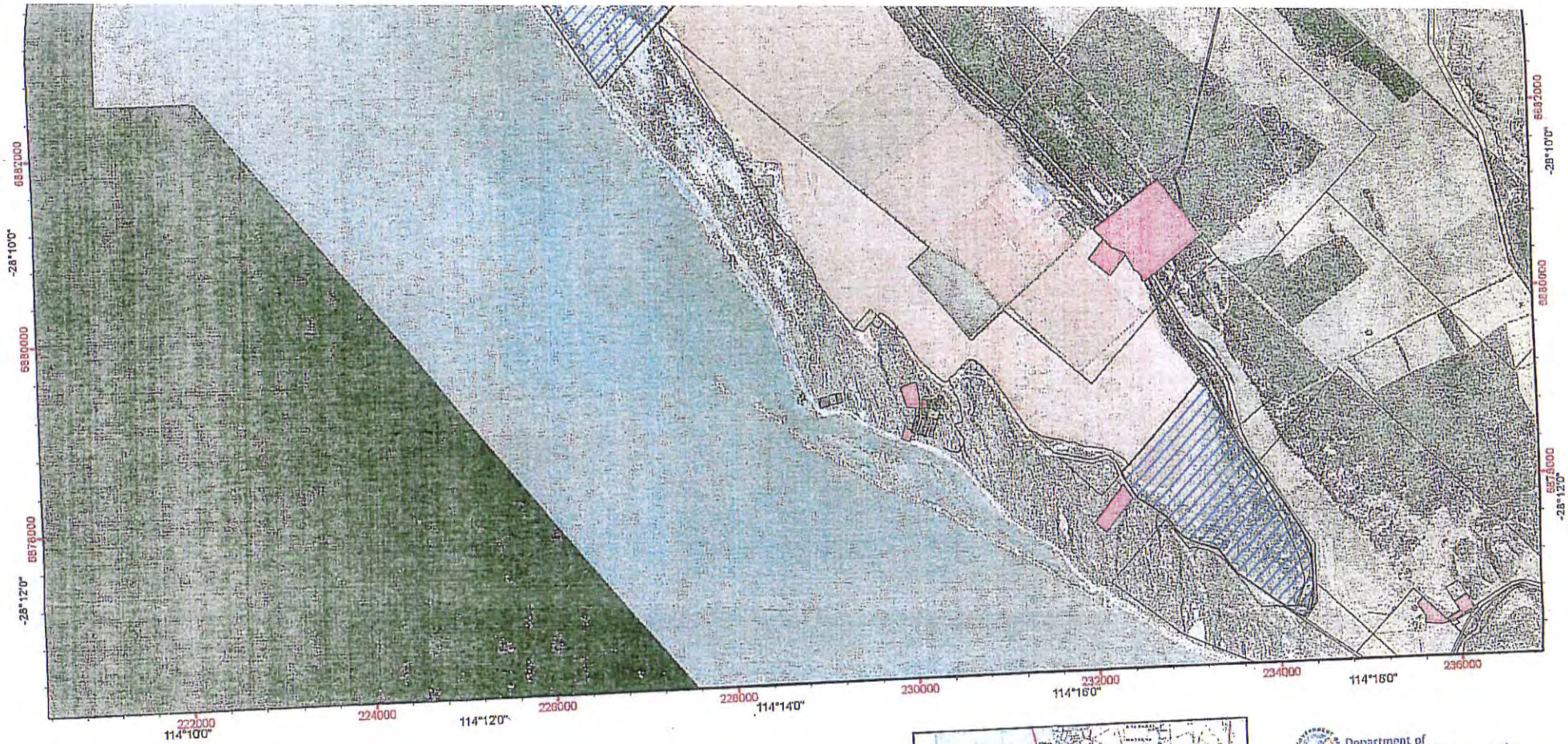
R Parnell
for Keiran McNamara
DIRECTOR GENERAL

26 February 2007

Map 1


1
405 m²
DIA. 2352
Sea View
CG
3581
401.9160 ha
ROAD
SHIRE
OF
N
3116
8622
(INCLUDES
11491
129.2599 ha
Utcha Well
ISLANDS
Road
9812 5316
X 640
Utcha
Swamp
11492
127.5322 ha
Conservation of
Flora and Fauna
NPWCA
No.
7428
abt 380.4045 ha
George Grey Drive
4920
// Area to be nature reserve
= Area to be freehold land
in the name of G.M.A.
Garnet Pty Ltd


Map 1 - Hut .agoon Proposed Conservation Reserve
Map 2
114°10'0"
222000
224000
114°12'0"
226000
114°14'0"
228000
230000
114°16
232000
234000
114°16'0"
236000
6894000
6892000
6890000
6888000
6886000
6884000
-28°4'0"
-28°6'0"
-28°8'0"



Graticule shown at 2 minutes intervals
Grid shown at 2000 metre intervals

Legend

- Proposed Hutt Lagoon Conservation Reserve
- Freehold/Lease
- Crown Reserve

N

1:60,000 (A3)

0 0.4 0.8 1.6 2.4 3.2
Kilometers

Projection: Universal Transverse Mercator
MGA Zone 50. Datum: GDA94

Department of Environment and Conservation

Produced by Deanne Pember
Under the Direction of
Keiran McNamara
Director General, Department of
Environment and Conservation

Produced at 14:6pm, on October 4, 2006

Amanda Gundry

From: McKernan, Beth [Beth.McKernan@dec.wa.gov.au]
Sent: Friday, 19 January 2007 8:09 AM
To: Martin Taylor
Cc: Amanda Gundry; Desmond, Anthony; Pember, Deanne
Subject: RE: Utcha M70/927 POW Application

Hi Amanda/Martin,

Thanks for the providing the opportunity for Deanne Pember and I to conduct a site visit of the area to be drilled by GMA Garnet currently within the Utcha Well Nature Reserve. After inspecting the site and given the likelihood of GMA Garnet acquiring this area of the Utcha Well Nature Reserve as freehold land, DEC (Parks and Conservation) Midwest Region provides the following comments and recommendations in regard to the exploration proposal on Mining Lease 70/927:

It is understood that the area east of the Port Gregory – Kalbarri Road originally gazetted as Nature Reserve is in the process of being excised from the Utcha Well Nature Reserve and will be transferred as freehold land owned by GMA Garnet. The decision to excise the area was due to the particularly degraded nature of the vegetation and infestation of weed species. Minimal native vegetation in good condition persists in the area and it is regularly grazed by neighbouring stock. A portion of the area has also been cleared for grazing in the past.

A land swap with DOLA has been negotiated to secure Lot 100 which was held as freehold by GMA Garnett. It is also the intent in good faith for the special lease 3116/8622 on Victoria Location 11491 to become freehold with GMA Garnett with the portion west of the road being excised and incorporated into the Utcha Well Nature Reserve. Lot 100 and Victoria Location 11491 both contain native remnant vegetation worthy of protection within the conservation estate. Lot 100 has now been added to the Utcha Well Nature Reserve. It is understood that GMA arranged for the subdivision of Location 3581 to create Lot 100 and prepared the transfer documentation.

Due to the acquisition by GMA Garnet of the portion of the Utcha Well Nature Reserve over which GMA Garnet has the Mining Lease M70/927, DEC (Parks and Conservation) believes a management plan for the drilling program is not required. Until formal transfer of the area to be drilled can be confirmed it is requested that GMA Garnet continue to liaise with the DEC Midwest Regional Office and provide advice, including a copy of the PoW to be submitted to DoIR, to the Midwest Regional Manager regarding the timing of the exploration program. It is acknowledged that GMA Garnet have provided flora and fauna survey assessment results to DEC and that no Rare or Priority species are likely to be impacted by the proposed program. The DEC Midwest Region has also reviewed and provided comments on a clearing application for exploration on M70/927 submitted by GMA Garnet to DoIR.

The vegetation in the area is severely degraded due to past clearing and grazing and is heavily weed infested. It is therefore recommended that the potential impacts of the exploration program be managed in the context of the proximity of the Utcha Well Nature Reserve as follows:

- Dust generated from the exploration activities has the potential to impact vegetation of the Utcha Well Nature Reserve and procedures should be developed to avoid and minimise impacts to vegetation (particularly roadside vegetation within the nature reserve).

- A vehicle hygiene procedure should be developed to minimise the potential for further spread and introduction of weed species to the nature reserve and within GMA Garnet's tenements. It is understood that GMA Garnet has a number of monitoring bores within the nature reserve that are monitored on a regular basis. Vehicles should be cleaned down prior to entering the nature reserve, of soil and vegetative matter that has the potential to harbour seeds and propagules of introduced species. Results of the monitoring bores should also be made available to the DEC Midwest Regional office given the potential for water drawdown impacts to groundwater dependent vegetation.

- During the proposed exploration program it is recommended that proponent use a raised blade approach where ever possible to preserve root stock and encourage revegetation of native species. Vegetation should be stockpiled and respread over drill lines and access tracks at the completion of the program to assist in rehabilitation and prevent potential erosion.

- It is evident that weeds are an issue on M70/927 and throughout M70/856. DEC supports the current weed monitoring and control program GMA Garnet has developed and strongly encourages the implementation of a vehicle hygiene procedure that applies particularly to vehicles entering the nature reserve for water bore monitoring.

HIGH COURT OF AUSTRALIA

GLEESON CJ,
GAUDRON, McHUGH, GUMMOW, KIRBY, HAYNE AND CALLINAN JJ

Matter No P59/2000

THE STATE OF WESTERN AUSTRALIA — APPELLANT

AND

BEN WARD & ORS — RESPONDENTS

Matter No P62/2000

THE ATTORNEY-GENERAL OF THE NORTHERN TERRITORY — APPELLANT

AND

BEN WARD & ORS — RESPONDENTS

Matter No P63/2000

CECIL NINGARMARA & ORS — APPELLANTS

AND

THE NORTHERN TERRITORY OF AUSTRALIA & ORS — RESPONDENTS

Matter No P67/2000

BEN WARD & ORS — APPELLANTS

AND

CROSSWALK PTY LTD & ORS — RESPONDENTS

Summary, para 468

Crown for an estate in fee simple. Resumption after 31 October 1975 was not inconsistent with the RDA and, in any event, was a previous exclusive possession act validated by the NTA and the State Validation Act[476].

17. The grant of mining leases in Western Australia would have extinguished the right to be asked permission to use or have access in relation to the whole of the area of the lease had it not been earlier extinguished by the grant of pastoral leases. Whether other native title rights and interests in relation to land were inconsistent with the rights granted under a mining lease is, for the reasons given in connection with pastoral leases, a question that cannot be answered on the findings of fact that have been made so far[477].

18. The same conclusions are reached about the Argyle mining lease and the general purpose lease as are reached in connection with other mining leases[478].

19. The grant of a permit to occupy land under the *Land Act* 1898 wholly extinguished native title rights and interests[479].

20. The grant of special leases under s 116 of the *Land Act* 1933 wholly extinguished native title rights and interests[480].

21. The grant before 31 October 1975 of leases of reserved land under s 32 of the *Land Act* 1933 wholly extinguished native title rights and interests. Grants after 31 October 1975, to persons other than the Crown or a "statutory authority", were previous exclusive possession acts and, where still in force on 23 December 1996, were "relevant acts" within the definition in the State Validation Act and therefore wholly extinguished native title rights and interests[481].

---

476 See [203]-[204] and [278]-[280].

477 See [296]-[310] and [341].

478 See [322]-[342].

479 See [346]-[349].

480 See [351]-[357].

481 See [358]-[375].

The scope of this advice is restricted to the impacts of the proposed activity on biodiversity conservation values.

Please contact me for further information or if you wish to discuss.

Kind regards,
Beth

Beth McKernan
Project Coordinator - Midwest Region
Biodiversity Impact Assessment

Department of Environment & Conservation
PO Box 72
Geraldton 6531
Ph. 9921 5955
Fax. 9921 5713

From: Martin T [mailto:martint@gmagarnet.com.au]
Sent: Thursday, 18 January 2007 4:17 PM
To: McKernan, Beth
Subject: Utcha M70/927 POW Application

Hi Beth,

Attached and below please find recent correspondence regarding the free-holding and land swap relating to Utcha Reserve (east of George Grey Rd). Perhaps this will provide you with the information you require. Note, Loc 11491 is adjoining land that was part of the original Utcha Reserve but is not part of M70/927 and not part of our POW application.

Regards,

Martin Taylor
General Manager
GMA Garnet Pty Ltd
Tel: 08 99236012 (direct)
Fax: 08 99233747
Mob: 0427 957048

-----Original Message-----
From: Pember, Deanne [mailto:Deanne.Pember@dec.wa.gov.au]
Sent: Wednesday, 10 January 2007 10:23 AM
To: Christine Lovitt
Cc: Powell, Robert; McKernan, Beth
Subject: FW: GMA Garnet - Utcha Nature Reserve

Christine

Thank you for your advice.

Could you please confirm that it is the intent of GMA Garnett to obtain freehold of the entire lease on Victoria Location 11419 and that the portion east of George Grey Road will be transferred as freehold to GMA Garnett and the western portion to the Conservation Commission of Western Australia.

Regards

Deanne Pember
Operations Officer

-----Original Message-----
From: Christine Lovitt [mailto:clovitt@blakcrab.com.au]
Sent: Tuesday, 9 January 2007 1:12 PM
To: Pember, Deanne
Cc: Martin T
Subject: GMA Garnet - Utcha Nature Reserve

<<20070109121413415.pdf>>
Deanne,

I act for GMA Garnet in this matter and they have suggested that I contact you directly to confirm that the excision of the eastern portion of Reserve 640 (Utcha Nature Reserve) is proceeding and that the transfer of Lot 100 (being the western portion of Location 3481) has been completed, as evidenced by the letter dated 20 November from Keiran McNamara to the Department of Planning & Infrastructure (copy attached).

I have also been instructed to commence an assessment of what native title and ancillary issues are likely to arise in relation to the next phase of the land swap, being Victoria Location 11491, with a view to progressing this. As requested, I will liaise directly with Robert Powell in relation to this aspect.

Please do not hesitate to contact me if you have any queries.

Regards,

Christine Lovitt

Partner

BLAKISTON & CRABB

Ph: + 61 8 9322 7644

Fax: + 61 8 9322 1506

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	K Foster E Lynch J Foster	J Foster		J Foster		28-06-2012

Appendix B. Risk Assessment

The Australian and New Zealand Standard on Risk Management (AS/NZS 4360) defines risk as the product of the likelihood of an event occurring and its consequences. The risk matrix has been developed based on the AS/NZS 4360:2004 to assess the level of risk from activities undertaken in this project. To maximise the benefit of environmental management, manpower and other resources must be allocated to issues on a priority basis. It is generally accepted that the highest-risk issues receive the highest priority.

GMA implements the following mitigation strategy to help manage the risks including:

- Avoid – avoid impacts where possible
- Minimise – if impacts cannot be avoided, minimise, and manage appropriately.
- Rectify – repair, rehabilitate and restore affected areas as soon as possible.
- Reduce – reduce affected areas through preservation and maintenance throughout the life of the mine.
- Offset – where negative impacts still occur, develop an offset package to achieve a net benefit.

Each risk identified was assessed against the DEMIRS environmental factors, as shown in Table B1. Each factor was considered relevant throughout all phases of the project.

Table B1 Objectives for Environmental Factors

Factor	Objective
Biodiversity	To maintain representation, diversity, viability and ecological function at the species, population and community level.
Water Resources	To maintain the hydrological regimes, quality and quantity of groundwater and surface water to the extent that existing and potential uses, including ecosystem maintenance, are protected.
Land and Soils	To maintain the quality of land and soils so that environmental values are protected.
Rehabilitation and Mine Closure	Mining activities are rehabilitated and closed in a manner to make them physically safe to humans and animals, geo-technically stable, geochemically non-polluting/noncontaminating, and capable of sustaining an agreed post-mining land use, and without unacceptable liability to the State.

Table B2 Likelihood Descriptor

Descriptor	Frequency	Probability
Almost Certain	Twice or more per year	Event will occur during the Project / period under review.
		High number of known incidents.
Likely	Once per year	Event likely to occur during the Project / period under review.
		Regular incidents known
Possible	Once in 5 years	Event may occur in some instances during the Project / period under review
		Occasional incidents known.
Unlikely	Once in 10 years	Event is not likely to occur during the Project / period under review
		Some occurrences known.
Rare	Once in 20 years	Event will occur in exceptional circumstances during the Project / period under review.
		Very few or no known occurrences.

Table B3 Consequence Descriptor

Factor	Insignificant	Minor	Moderate	Major	Severe
Biodiversity	Alteration or disturbance to an isolated area with no effect on habitat or ecosystem. Loss of an individual plant / animal of conservation significance.	Alteration or disturbance to <10% of a habitat or ecosystem resulting in a recoverable impact within 2 years. Loss of multiple plants / animals of conservation significance.	Alteration or disturbance to 10-40% of a habitat or ecosystem resulting in a recoverable impact within 2-5 years. Loss of <50% known local population of plant / animal of conservation significance.	Alteration or disturbance to 40-70% of a habitat or ecosystem resulting in a recoverable impact within 5-15 years. Loss of >50% known local population of plant / animal species with possible loss of entire local population.	Alteration or disturbance to >70% of a habitat or ecosystem resulting in a recoverable impact >15 years. Local loss of conservation significant or listed species. Extinction of a species.
Water Resources	Negligible change to hydrological processes, water availability or water quality	Short-term modification of hydrological processes, water availability and quality within project tenure, but no change in beneficial use.	Medium-term modification of hydrological processes, water availability and water quality within project tenure, but no change in beneficial use. Short-term modification of hydrological processes, water availability and water quality outside project tenure, but no change in beneficial use.	Long-term modification of hydrological processes, water availability and water quality within project tenure, but no change in beneficial use. Medium-term modification of hydrological processes, water availability and water quality outside project tenure, with change in beneficial use.	Long-term or permanent modification of hydrological processes, water availability or water quality outside project tenure, with impacts to a water-dependent environmental value and/or change in beneficial use.
Land and Soils	Clean-up by site personnel, rectified immediately. Confined to the immediate area around the source.	Clean-up by site personnel, remediation within 1 year. Confined to operational area.	Clean-up by site personnel, remediation within 1-3 years. Minor impact outside disturbance envelope or minor impact to soil stockpiles.	Clean-up requiring external specialist, remediation within 3-10 years. Impact has migrated outside the disturbance envelope or contamination of soil stockpiles.	Clean-up requiring external specialist. Remediation >10 years, or permanent residual impact. Impact outside the tenement boundary.
Rehabilitation and Mine Closure	Site is safe, stable a non-polluting. Post-mining land use is not adversely affected.	The site is safe, all major landforms are stable, and any stability or pollution issues are contained and require no residual management. Post mining land use is not adversely affected	Site is safe, and any stability or pollution issues require minor, ongoing maintenance by end land-user. Post mining land use cannot proceed without some management.	Site cannot be considered safe, stable or non-polluting without long-term management or intervention. Post mining land use cannot proceed without ongoing management.	Site is unsafe, unstable and/or causing pollution or contamination that will cause an ongoing residual affect. Post mining land use cannot be achieved.

Table B4 Risk Matrix

	Risk Matrix		Insignificant	Minor	Moderate	Major	Severe
Likelihood	5	Almost Certain	M	H	H	E	E
	4	Likely	M	M	H	H	E
	3	Possible	L	M	M	H	H
	2	Unlikely	L	L	M	H	H
	1	Rare	L	L	L	M	M

Table B5 Level of Consequence

Descriptor	Explanation
Low	Risk rating is based on subjective opinion or relevant past experience. Baseline data/information has limitations, with only general conclusions possible and further work is required.
Medium	Risk rating is based on similar conditions being observed previously. Baseline data/information has some gaps or minor further work required
High	Risk rating is based on testing, modelling or experiments. Baseline data/information is complete and analysis appropriate for level of data.

Table B6 Acceptability of Risk Level (Inherit)

Risk Level	Acceptability	Treatment
Extreme	Unacceptable	Risk will not be tolerated. Modification of activity required, and Mining Proposal amended.
High	May be acceptable, with specific risk treatments.	Risk may be tolerated with application of high reliability risk treatments. Environmental outcome / Closure objective required
Moderate	Acceptable, with relevant risk treatments.	Risk is tolerable with application of appropriate risk treatments. Environmental outcome / Closure objective required.
Low	Acceptable	Risk is acceptable, but still requires industry best practice environmental management.

Appendix C. GMA Dust and Management Plan

Fugitive dust controls

As per condition in our licence L8561/2011/1, condition 16, the licence holder must implement the controls specified in Table C1 in accordance with the requirements listed in
that table.

Table C1: Fugitive dust controls table

Control	Requirements
Topsoil stripping	• Must schedule to avoid periods of high winds from unfavourable directions relative to receptors (including George Grey Drive and Utcha Well Nature Reserve); • Where there is a risk of dust affecting sensitive receptors, must conduct when soil conditions are moist but not saturated. • Must cease/suspend topsoil stripping operations during high wind conditions where there is a risk of dust affecting sensitive receptors;
Water carts/sprays	Must operate when visible dust is generated from exposed surfaces on the Premises. • Must operate proactively subject to weather forecasting over a 24 hour period;
Dust suppressant (other than water)	• Must apply proactively to overburden/topsoil stockpiles. • Must reapply proactively subject to visual inspection and weather forecasting;
Cessation of activities	• Must cease an activity causing visible dust lift-off where dust management measures have not prevented dust lift-off and there is a risk of dust affecting sensitive receptors.

Appendix D. 2024 Rehabilitation Monitoring

2024 Rehabilitation Monitoring

Hose Mine, Yallabatharra

Project No: EP22-057(03)

Prepared for GMA Garnet Pty Ltd
November 2024

Document Control

Doc name:	2024 Rehabilitation Monitoring Hose Mine, Yallabatharra				
Doc no.:	**EP22-057(03)—008A SAC**				
Version	**Date**	**Author**		**Reviewer**	
1	October 2024	Stephanie Cullen	SAC	Rachel Weber	RAW
		Sean Moylan	SCM		
	Submitted for client review				
A	November 2024	Sean Moylan	SCM	Rachel Weber	RAW
	Updated with minor text edits				

Executive Summary

Emerge Associates (Emerge) were engaged by GMA Garnet Pty Ltd (GMA) to undertake monitoring of rehabilitation works at the Hose Garnet Mine (Hose Mine) in Yallabatharra (herein referred to as the 'site').

The objectives and management targets for rehabilitation at Hose Mine are specified in the *Rehabilitation Management Plan – Port Gregory* (RMP) (GMA 2020). The key objective relevant to the rehabilitation monitoring is "*to re-establish vegetation in line with practical completion and is self-sustaining*" (GMA 2020). The management targets to achieve this objective are as follows:

- The practical completion criteria for native vegetation:
  - An average of 75% species diversity of adjacent reference sites, +/-5%, for five years.
  - An average of 50% plant cover in the ground and mid layers of adjacent reference sites, +/-5%, for five years.
- The key upper storey species recorded in the vegetation type / adjacent reference site are present and likely to form an upper storey over time.

Botanists from Emerge conducted a field survey in August 2024 during which existing remnant vegetation (reference) and rehabilitation monitoring quadrats were assessed.

A total of 13 native and nine weed species were recorded within the reference quadrats, whilst 19 native and 15 weed species were recorded within the rehabilitation quadrats.

This years' monitoring indicates that the rehabilitation is likely to meet the completion criteria for native species diversity, lower stratum native vegetation cover and upper stratum species presence, and have been consistently for at least three years. The middle stratum cover does not yet meet the completion criteria, and is likely to require infill planting to achieve completion criteria.

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Table of Contents

List of Tables

List of Plates

Figures

Appendices

Abbreviation Tables

Table A1: Abbreviations – Organisations

Organisations	
EPA	Environmental Protection Authority
GMA	GMA Garnet Pty Ltd

Table A2: Abbreviations – General terms

General terms	
IBRA	Interim Biogeographic Regionalisation of Australia
RMP	Rehabilitation management plan
TC	Tropical cyclone
WoNS	Weeds of National Significance

Table A3: Abbreviations – Legislation

Legislation	
BAM Act	*Biosecurity and Agriculture Management Act 2007*

Table A4: Abbreviations – Units of measurement

Units of measurement	
ha	Hectare
km	Kilometre
mm	Millimetre

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1 Introduction

1.1 Project background

Emerge Associates (Emerge) were engaged by GMA Garnet Pty Ltd (GMA) to undertake monitoring of rehabilitation areas at the Hose Garnet Mine (Hose Mine) in Yallabatharra.

Hose Mine is located on mining tenements G70/171, M70/856, M70/926 and M70/927, with all monitoring areas associated with this scope of works contained within the M70/856 and M70/927 lease areas (herein referred to as the 'site'). The site is located approximately 86 kilometres (km) north-west of Geraldton within the Shire of Northampton.

The site is approximately 240.1 hectares (ha) in size and is bounded by rural landholdings to the north, east and south, and George Grey Drive to the east. The location and extent of the site is shown in **Figure 1**.

1.2 Purpose and scope of work

The scope of work was specifically to undertake an assessment of rehabilitation works within the site. As part of this scope of work, the following tasks were undertaken:

- Desktop review of relevant background information pertaining to the site and surrounds, including a review of previous monitoring.
- A field survey to record a comprehensive list of flora species and assess vegetation type and condition in quadrats, consistent with previous monitoring. Where relevant, the monitoring was undertaken in accordance with the Environmental Protection Authority's (EPA's) technical guidance (EPA 2016).
- Documentation of the methodology, field survey and results into a report.

1.3 Previous monitoring

Rehabilitation monitoring has been undertaken within Hose Mine since 2019, as shown below in **Table 1**.

Table 1: Previous monitoring within Hose Mine

Quadrat	Monitoring year
HQ01, HQ02, HQ03	GHD (2019, 2021); Emerge Associates (2023)
HQ04, HQ05, HQ6	GHD (2019, 2021); Emerge Associates (2022, 2023)
HQ07	GHD (2021); Emerge Associates (2023)
HQ08, HQ09	Emerge Associates (2022, 2023)

1.4 Rehabilitation objectives

Rehabilitation within the site is guided by the *Rehabilitation Management Plan – Port Gregory* (RMP) which provides objectives and management targets for the Hose Mine and adjacent Lynton Mine (GMA 2020). The extent of the rehabilitation areas within the site are shown in **Figure 2**.

The key objective relevant to the monitoring is "*to re-establish vegetation in line with practical completion and is self-sustaining*" (GMA 2020). The management targets to achieve this objective are as follows:

- The practical completion criteria for native vegetation:
  - An average of 75% species diversity of adjacent reference sites, +/-5%, for five years.
  - An average of 50% plant cover in the ground and mid layers of adjacent reference sites, +/-5%, for five years.
- The key upper storey species recorded in the vegetation type / adjacent reference site are present and likely to form an upper storey over time.

2 Environmental Context

2.1 Climate

Climate influences the types of vegetation that grow in a region and the life cycles of the flora present. It is therefore critical for rehabilitation monitoring to respond appropriately to climatic conditions to ensure that surveys are conducted during times when flora species are easiest to detect and identify.

The site lies within the Geraldton Sandplains *Interim Biogeographic Regionalisation for Australia* (IBRA) region and within the Geraldton Hills subregion (Environment Australia 2000). The Geraldton Hills subregion experiences a semi-arid (dry) warm Mediterranean climate which is characterised by hot, dry summers and mild, wet winters (DEC 2002).

An average of 342.4 millimetres (mm) of rainfall is recorded annually from the Kalbarri weather station (no. 8251), which is the closest weather station that records both temperature and rainfall (located approximately 48 km north of the site). The majority of the rainfall is received between the months of May to July. Mean minimum temperatures at the Kalbarri weather station range from 9.8°C in July to 20.7°C in February, while mean maximum temperatures range from 21.9°C in July to 34.1°C in February (BoM 2024).

A GMA-monitored weather station located on site recorded 474.8 mm of rain in the three months (May to July) prior to monitoring, whilst Kalbarri received 492.8 mm of rain over the same period, which is substantially higher than the long-term average of 203.3 mm (BoM 2024).

2.2 Vegetation

The RMP identifies that vegetation within the M70/927 mining tenement is '*Acacia rostellifera* low forest to open low shrubland', which is described as "*Acacia rostellifera* low to open forest over scattered shrubs of *Rhagodia preissii* subsp. *obovata*, *Tetragonia implexicoma*, *Alyxia buxifolia*, *Pimelea microcephala* over tussock grassland of **Ehrharta longiflora* over scattered herbs **Lysimachia arvensis*, **Leontodon rhagodioides*, **Richardia tingitana*" (GMA 2020).

2.3 Weeds and pests

Flora that are regarded as having negative environmental or economic impacts are often referred to as weeds (DBCA 2023). Many non-native flora species and some native species are considered to be weeds. The likelihood of weeds occurring is higher in disturbed areas, especially areas that have been set aside for mining activities.

Particularly detrimental weed species may be listed as a 'declared pest' pursuant to the State *Biosecurity and Agriculture Management Act 2007* (BAM Act) or as a 'weed of national significance' (WoNS) (DAFF 2021).

3 Methods

3.1 Field survey

Four botanists from Emerge undertook the rehabilitation monitoring within the site on 20 August 2024.

Plant specimens collected during the field survey were dried, pressed and named in accordance with requirements of the Western Australian Herbarium (2024). Identification of specimens occurred through comparison with named material and through the use of taxonomic keys. Flora species not native to Western Australia are denoted by an asterisk ('*') in text and raw data.

3.2 Sampling

Detailed sampling of the vegetation was undertaken using previously established, permanently marked 10 x 10 m quadrats established using fence droppers bound by measuring tape. The four corners of each quadrat were located using a hand-held GPS receiver. A total of nine quadrats were sampled: six within rehabilitation areas (HQ01, HQ02, HQ03, HQ04, HQ05 and HQ06) and three within remnant vegetation (HQ04, HQ05 and HQ06) (reference quadrats).

With each quadrat the following data was recorded:

- Site details (personnel/recorder, date, quadrat dimensions, GPS coordinates of all corners and photographs from each corner of the quadrat).
- Rehabilitation year and works.
- Environmental information (slope, drainage, bare-ground, rock outcropping, soil type and colour class, litter layer, topographical position, time since last fire event).
- Biological information (vegetation structure and condition, 'foliage projective cover' (FPC), degree of disturbance and species present, including density of weeds and declared pests).

3.3 Data analysis

Vegetation strata was classified in the RMP into three categories: upper (tree), middle (shrub) and lower (grasses/herbs) (GMA 2020). For the majority of species present within the site, delineation of the three strata was readily achievable based on observations made in the field. However, as there are multiple climbing and twining species that occur within the site, attribution of species into stratum was guided by the plant growth form descriptions provided in *Florabase* (Western Australian Herbarium 2024).

Alyogyne hakeifolia is referred to as a shrub on *Florabase*. However, based on the height and growth form observed on site, it was classified as an upper stratum species. Where upper strata species were observed to be juvenile (<2 m tall), they were attributed in the middle stratum. Of the climbing and twining species, *Commicarpus australis*, *Roepera fruticulosa* and *Tetragonia implexicoma* have all been considered as middle strata species as they are described as shrubs on Florabase, whilst *Convolvulus remotus*, *Dioscorea hastifolia* and *Glycine canescens* are all described as herbs and are

therefore classified as ground strata species. Where middle stratum species were observed to be juvenile (<0.5 m tall), they were attributed in the ground stratum.

For species diversity and percentage cover, mean values were calculated for 2024 reference data and 2024 rehabilitation data. The 2024 target mean species diversity for each vegetation type was calculated from the reference data, as per the objectives (75% +/-5% for species diversity and 50% +/-5% for percentage cover). The 2024 rehabilitation data mean was compared to the target for each vegetation type, to determine whether each rehabilitation area is meeting the objective. The key upper stratum species recorded in rehabilitation quadrats was compared to those recorded in applicable reference quadrats.

As the monitoring of the rehabilitation quadrats has not been occurring for five continuous years it is not possible to assess the data against the completion criteria (refer **Section 0**). However, the above analysis was used to assess trends and infer whether the vegetation is likely to meet the completion criteria in the future.

3.4 Limitations

The field survey was undertaken by experienced personnel within the optimal flowering period for assessment of flora in Geraldton Sandplains (EPA 2016). Climatic conditions prior to the survey were appropriate, with sufficient rainfall to promote growth and flowering.

The 2016 rehabilitation area has only one quadrat, which is not a large enough sample size to assess the outcomes of the rehabilitation within the site. All other rehabilitation areas have two or more quadrats which represents the minimum number of samples that might be assessed in order to reliably indicate the outcomes of rehabilitation.

Assessment of quadrat data from a single point in time does not provide a basis to interpret trends within a particular rehabilitation area. However, monitoring has been undertaken over multiple years which enables assessment of progress over time. The varying age of rehabilitation areas monitored offers some ability to analyse whether there are consistent trends across rehabilitation areas.

4 Results

4.1 General site conditions

The rehabilitation areas comprise a gently sloping landform with brushing cut from native vegetation present in windrows orientated roughly east-west across the western face of the slope.

Soils across both reference and rehabilitation areas are brown sand. Litter loads were higher in the reference areas than rehabilitation areas.

4.1.1 Species diversity

A total of 27 native and 16 non-native (weed) species were recorded during the field survey, representing 17 families and 40 genera. The dominant families containing native taxa were Fabaceae (three native taxa and three weed taxa) and Chenopodiaceae (three native and one weed taxa).

A total of 13 native and nine weed species were recorded with the reference quadrats, whilst 19 native and 15 weed species were recorded within the rehabilitation quadrats. A matrix of species recorded within the reference and rehabilitation quadrats is provided in **Appendix A**.

4.1.1.1 Reference areas

Comparison of the native and weed species diversity from the current and previous monitoring events for the reference quadrats is provided in **Table 2**. Species presence and cover within each quadrat are provided as **Appendix B**.

Table 2: Reference quadrats species diversity

Quadrat	No. native taxa					No. weed taxa				
	2019	2021	2022	2023	2024	2019	2021	2022	2023	2024
HQ04	7	5	2	3	3	2	2	7	7	6
HQ05	7	9	5	8	9	3	11	7	6	7
HQ06	7	6	8	8	8	3	5	5	5	6
Average	**7**	**7**	**5**	**6**	**7**	**3**	**6**	**6**	**6**	**6**

Note 2019 and 2021 data from *Revegetation Monitoring Assessment 2021 – Port Gregory Mine* (GHD 2021)

4.1.1.2 Rehabilitation areas

Comparison of the native and weed species diversity from the current and previous monitoring events for the rehabilitation quadrats is provided in **Table 3**. **Plate 1** presents the species diversity of the rehabilitation areas compared against the completion criteria derived from the reference quadrats.

Table 3: Rehabilitation quadrats species diversity

Quadrat and year of rehabilitation	No. native taxa					No. weed taxa				
	2019	2021	2022	2023	2024	2019	2021	2022	2023	2024
HQ03 (2016)	13	12	-	16	14	7	9	-	6	7
HQ01 (2017)	1	9	-	9	10	9	12	-	10	9
HQ02 (2017)	4	10	-	12	9	7	10	-	8	8
Average (2017)	**2.5**	**9.5**	**-**	**10.5**	**9.5**	**8**	**11**	**-**	**9**	**8.5**
HQ07 (2021)	-	4	-	9	9	-	3	-	6	7
HQ08 (2021)	-	-	6	12	8	-	-	9	10	10
HQ09 (2021)	-	-	5	7	9	-	-	9	10	7
Average (2021)	**-**	**4**	**6**	**9**	**9**	**-**	**3**	**9**	**8**	**8**

Note 2019 and 2021 data from *Revegetation Monitoring Assessment 2021 – Port Gregory Mine* (GHD 2021)

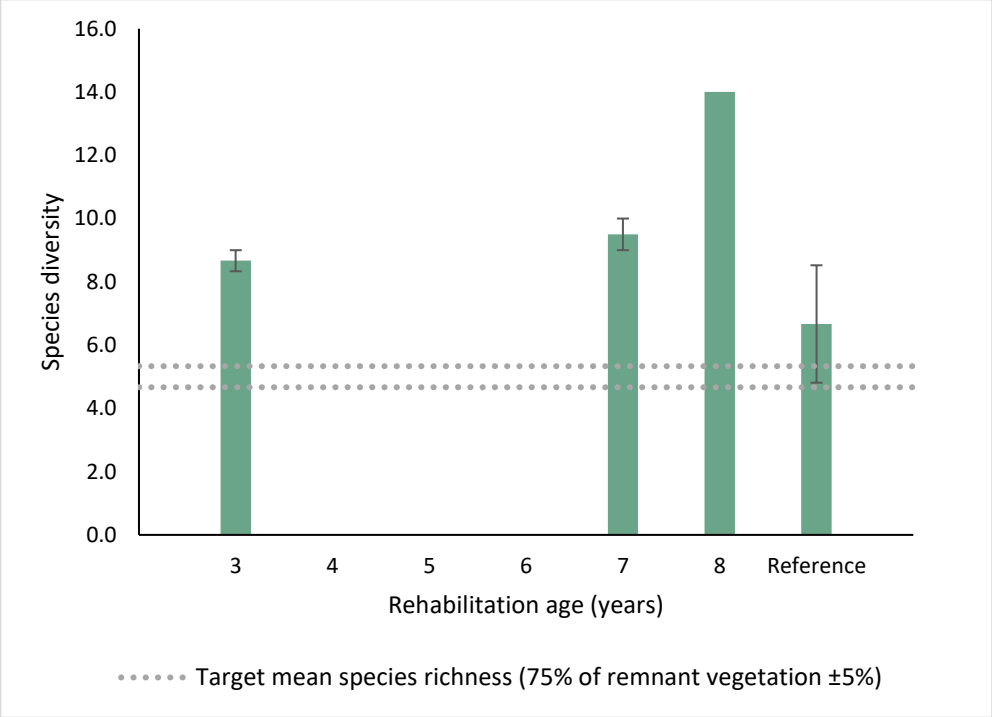

Plate 1: Mean species diversity (± standard errors) for 2024 monitoring of quadrats in rehabilitation areas and reference sites presented against completion criteria (native vegetation)

4.1.2 Percentage cover

4.1.2.1 Reference areas

Comparison of the stratum cover from the current and previous monitoring events for the reference quadrats is provided in **Table 4**.

Table 4: Reference quadrats percentage cover of native flora

Quadrat	Upper stratum cover (%)					Middle stratum cover (%)					Ground stratum cover (%)				
	2019	2021	2022	2023	2024	2019	2021	2022	2023	2024	2019	2021	2022	2023	2024
HQ04	0	0	85	85	85	96	96	1	0.2	0.1	0	6	0	0	0.1
HQ05	70	0	25	25	0	35	55	35	43	56.2	2	26	4	0.2	2
HQ06	80	0	10	20	25	32	75	10	17	25	28	77	5	0	0
Average	**50**	**0**	**40**	**43**	**33**	**54**	**75**	**15**	**20**	**27.1**	**10**	**36**	**3**	**0.1**	**0.7**

Note 2019 and 2021 data from *Revegetation Monitoring Assessment 2021 – Port Gregory Mine* (GHD 2021)

4.1.2.2 Rehabilitation areas

Comparison of the stratum cover from the current and previous monitoring events for the rehabilitation quadrats is provided in **Table 5**.

Table 5: Rehabilitation quadrats percentage cover of native flora

Quadrat and year of rehabili-tation	Upper stratum cover (%)					Middle stratum cover (%)					Ground stratum cover (%)				
	2019	2021	2022	2023	2024	2019	2021	2022	2023	2024	2019	2021	2022	2023	2024
HQ03 (2016)	0	0	-	60	6	32	45	-	13	0.7	11	8	-	3	7
HQ01 (2017)	0	0	-	25	25	1	16	-	7	5.1	-	2	-	1	3.8
HQ02 (2017)	0	0	-	22	8	6	42	-	2	2	1	42	-	2	2.3
Average (2017)	**0**	**0**	**-**	**24**	**16.5**	**3.5**	**29**	**-**	**5**	**3.6**	**0.5**	**22**	**-**	**2**	**3.1**
HQ07 (2021)	-	0	-	0	2	-	76	-	17	1.5	-	1	-	0.4	2.8
HQ08 (2021)	-	-	0	0	25	-	-	30	31	0%	-	-	3	3	6.8
HQ09 (2021)	-	-	0	0	0	-	-	52	51	25	-	-	1	1	1.1
Average (2021)	**-**	**0**	**0**	**0**	**9**	**-**	**76**	**41**	**33**	**8.8**	**-**	**1**	**2**	**1**	**3.57**

Note 2019 and 2021 data from *Revegetation Monitoring Assessment 2021 – Port Gregory Mine* (GHD 2021)

Percentage cover within the reference and rehabilitation areas are compared against the completion criteria in **Plate 2** and **Plate 3.**

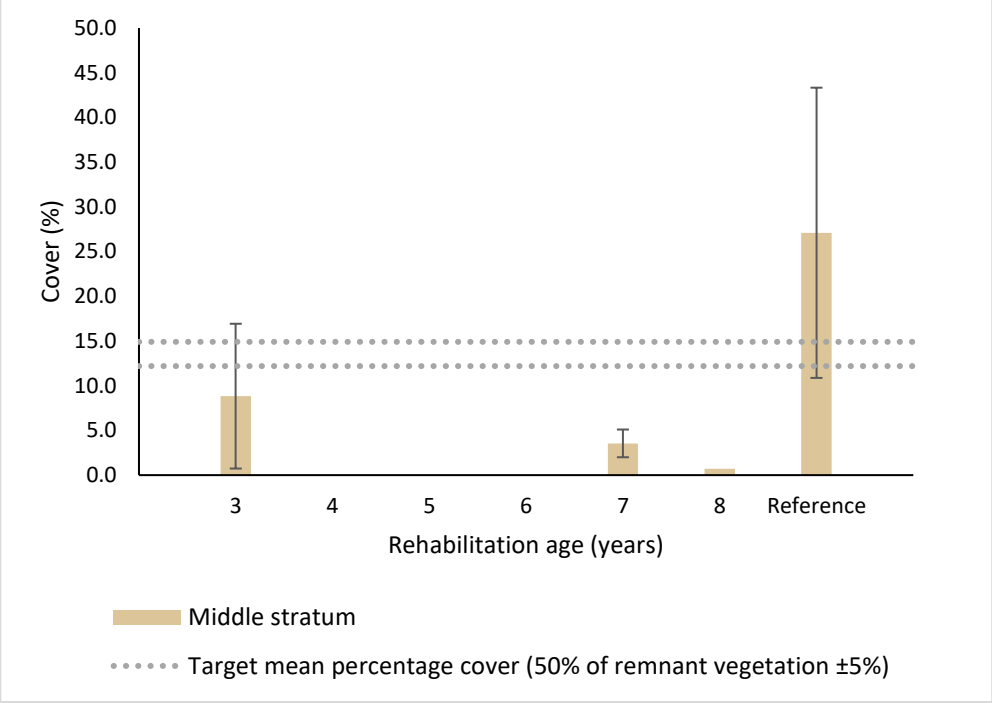

Plate 2: Mean percentage cover (± standard errors) for 2024 monitoring of quadrats in rehabilitation areas and reference sites presented against completion criteria for middle stratum (native vegetation)

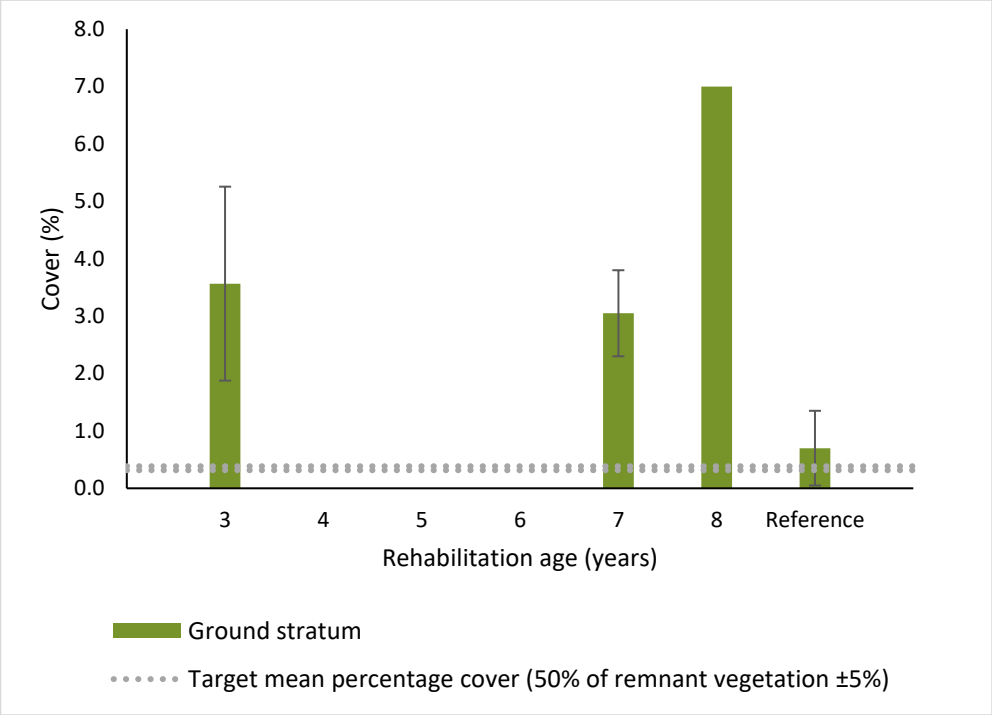

Plate 3: Mean percentage cover (± standard errors) for 2024 monitoring of quadrats in rehabilitation areas and reference sites presented against completion criteria for ground cover stratum (native vegetation)

4.2 Key upper stratum species

4.2.1 Reference

The key upper stratum species recorded within the reference quadrats are provided in **Table 6**.

Table 6: Reference quadrats key upper stratum species from 2024 monitoring

Quadrat	Key upper stratum species
HQ04	*Acacia rostellifera*
HQ05	*Acacia rostellifera*
HQ06	*Acacia rostellifera*

4.2.2 Rehabilitation

The key upper stratum species recorded within the reference quadrats are provided in **Table 7**.

Table 7: Rehabilitation quadrats key upper stratum species from 2024 monitoring

Quadrat	Key upper stratum species
HQ01	*Acacia rostellifera*
HQ02	*Acacia rostellifera, Alyogyne hakeifolia*
HQ03	*Acacia rostellifera, Alyogyne hakeifolia*
HQ07	*Acacia rostellifera* (juvenile)*, Alyogyne hakeifolia*
HQ08	*Acacia rostellifera*
HQ09	*Acacia rostellifera* (juvenile)*, Alyogyne hakeifolia*

4.3 Weeds

No declared pests or WoNS were recorded within the site.

Common weeds recorded across both rehabilitation and remnant monitoring sites included **Brassica tournefortii*, **Sonchus oleraceus* and **Urospermum picroides*. The most common grass weed within the rehabilitation quadrats was **Avena barbata* and in the reference quadrats was **Ehrharta longiflora*.

5 Discussion

The 2024 monitoring indicates that the Hose Mine rehabilitation is on track to meet the majority of the completion criteria.

All ages of rehabilitation are meeting the native species diversity and lower stratum cover criteria, and these have been met for at least three years, as shown in **Plate 4** and **Plate 5**. The eight-year old rehabilitation area has been consistently above the species diversity target for five years, noting one of these years was not monitored but would likely have met the target given performance in other years. Two to three further monitoring events meeting these completion criteria will demonstrate that the rehabilitation has met the objectives of the RMP.

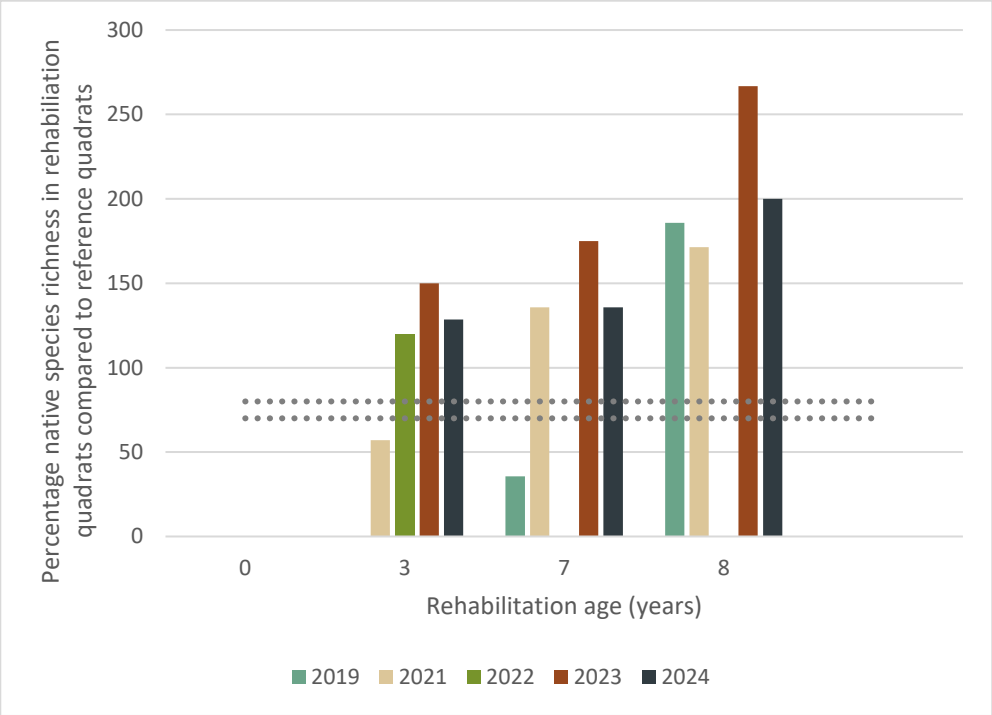

Plate 4: Percentage of mean native species richness in rehabilitation quadrats compared to reference quadrats compared over the course of five annual monitoring events compared to completion criteria (dotted line)

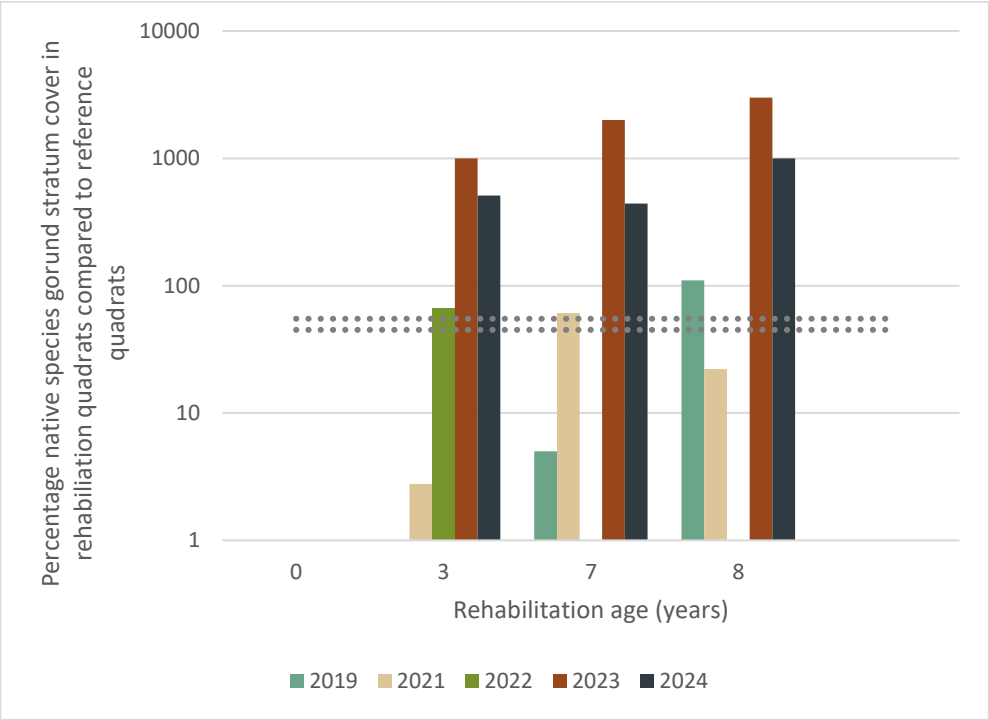

Plate 5: Percentage of mean ground stratum native species cover in rehabilitation quadrats compared to reference quadrats compared over the course of five annual monitoring events compared to completion criteria (dotted line)

Whilst the lower stratum vegetation cover has been meeting the completion criteria for the last two years, the middle stratum has not met the completion criteria since at least 2023 (and never within the seven-year old rehabilitation), as shown in **Plate 6**.

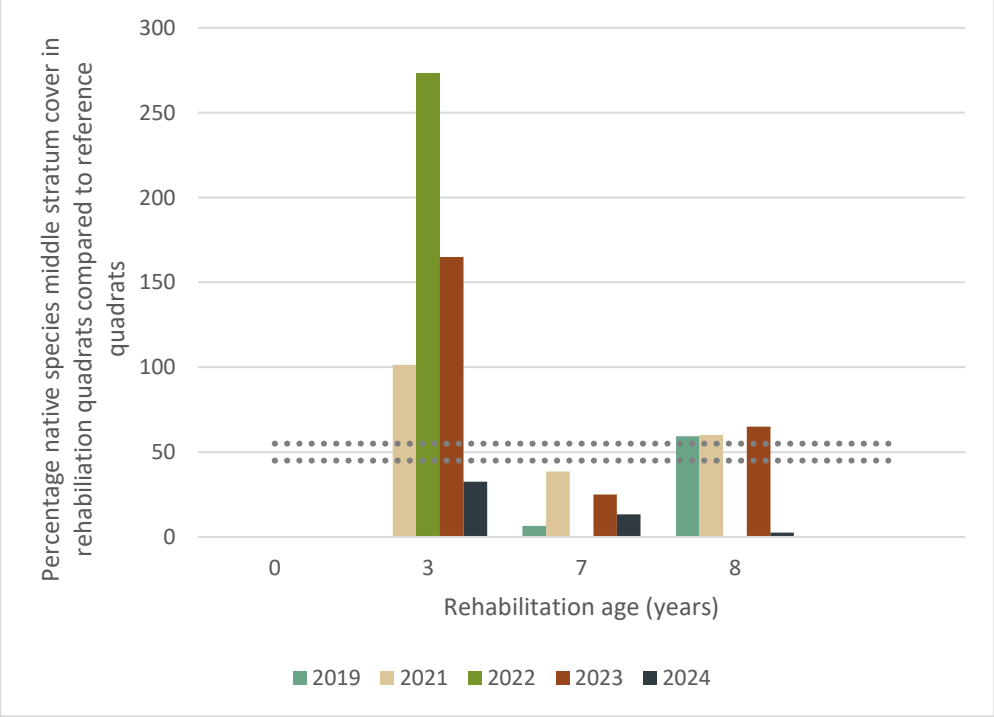

Plate 6: Percentage of mean middle stratum native species cover in rehabilitation quadrats compared to reference quadrats compared over the course of five annual monitoring events compared to completion criteria (dotted line)

Previous monitoring indicated that the three-year old rehabilitation quadrats were on the trajectory to meet the middle stratum cover. However, the middle stratum cover has declined in 2024, which can partially be attributed to the growth and transition of some individuals from within this stratum to the upper storey, and whilst there was significant rainfall received in the three months prior to the 2024 survey, the summer period was hot and dry and may have resulted in the increased mortality within rehabilitation quadrats.

In addition to the transition of individuals within this stratum to the upper storey, there is a lack of middle stratum species that are present within the reference quadrats that do not occur within the rehabilitation quadrats, which is particularly noted in the seven- and eight-year old rehabilitation. Specifically, *Rhagodia* spp. and *Tetragonia implexicoma* constitute the majority of the middle stratum within the rehabilitation quadrats, yet are present in low cover (or completely absent) within the rehabilitation quadrats. Infill planting that utilises these species will assist the rehabilitation in meeting in the middle stratum cover criteria.

All rehabilitation quadrats have the key reference upper stratum species *Acacia rostellifera* present. In addition, *Alyogyne hakeifolia* is present in some rehabilitation quadrats but not within reference quadrats. *A. hakeifolia* is common in the local area and is not unexpected to occur in the relevant remnant vegetation type. The 2016 (HQ03), 2017 (HQ01 and HQ02) and one of the 2021 rehabilitation quadrats (HQ08) currently have upper stratum species established. The remaining 2021 rehabilitation quadrats (HQ07 and HQ09) do not contain any individuals greater than 2 m tall, although it is anticipated over time that these juveniles will likely grow and meet the criteria to be classified as upper stratum.

Weed cover was generally higher within the 2016 and 2017 rehabilitation quadrats than the 2021 rehabilitation. Weed cover increased in 2024 compared to the previous monitoring in the majority of quadrats except for HQ02 (2017), HQ07 and HQ08 (2021) and HQ04 (remnant). The higher weed cover is likely a result of the higher than average rainfall that occurred in the months prior to the survey. Whilst weed cover was higher than previous years, it does not appear to have impacted the native vegetation, with groundcover stratum growth increasing in the previous year, potentially also stimulated by the increased rainfall.

6 References

6.1 General references

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GHD 2021, *Revegetation Monitoring Assessment 2021 - Port Gregory Mine*, 12553427, Revision 0.

GMA Mining Australia (GMA) 2020, *Rehabilitation Management Plan - Port Gregory*.

Western Australian Herbarium 2024, *Florabase*, Department of Biodiveristy, Conservation and Attractions (DBCA), <https://florabase.dbca.wa.gov.au/>.

6.2 Online references

The online resources that have been utilised in the preparation of this report are referenced in **Section 6.1**, with access date information provided in **Table R1**.

Table R1 Access dates for online references

Reference	Date accessed	Website or dataset name
BoM (2024)	28 October 2024	Climate Data Online
DAFF (2021)	28 October 2024	Weeds of National Significance (WoNS)
Western Australian Herbarium (2024)	28 October 2024	Florabase

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Figures

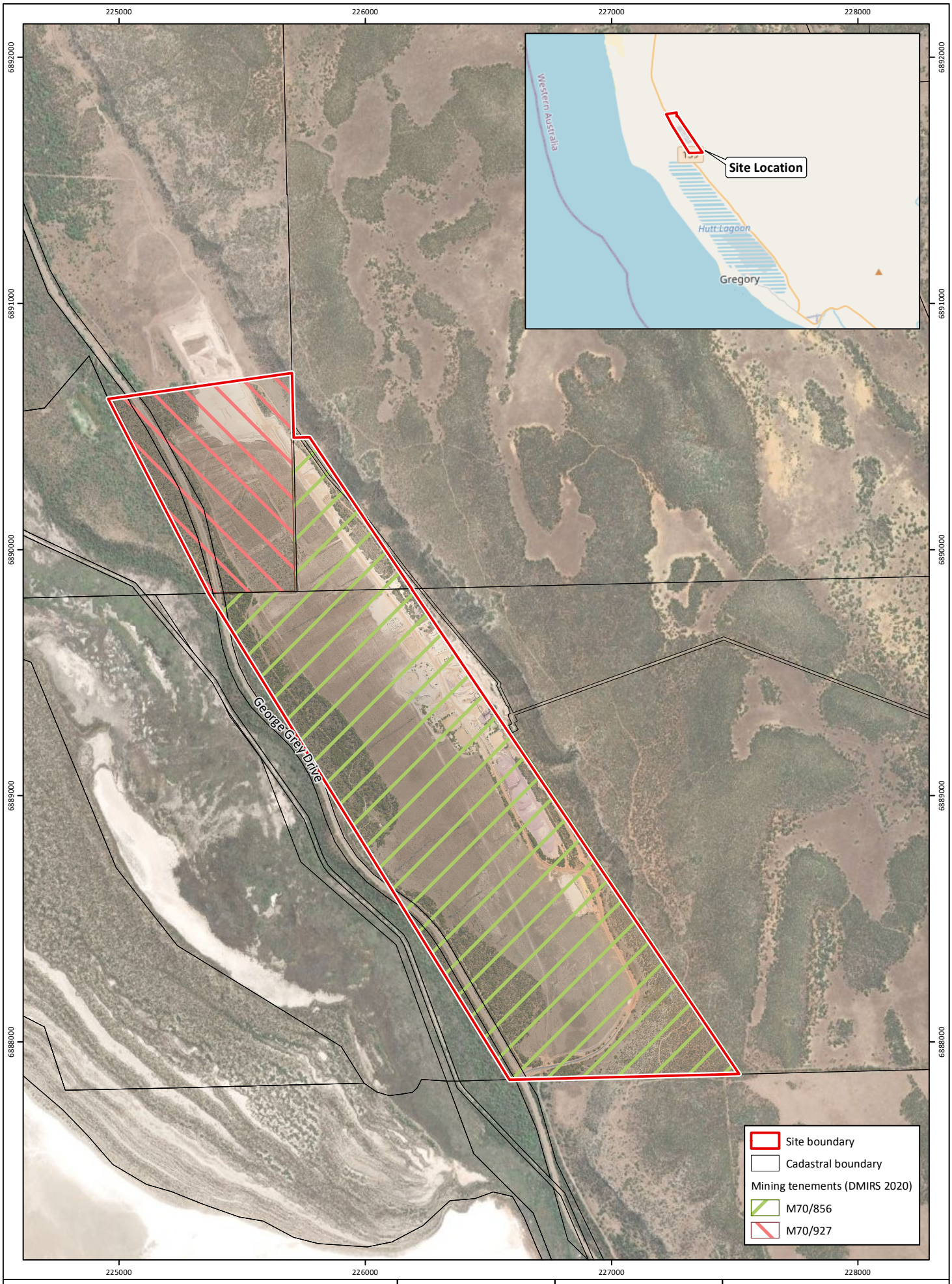

Figure 1: Site Location

Project: 2024 Rehabilitation Monitoring
Hose Mine, Yallabatharra

Client: GMA Garnet Pty Ltd

Plan Number: EP22-057(03)--F13

Drawn:	SCM
Date:	04/11/2024
Checked:	SCM
Approved:	RAW
Date:	04/11/2024

N

0 200 400
Metres

Scale: 1:20,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

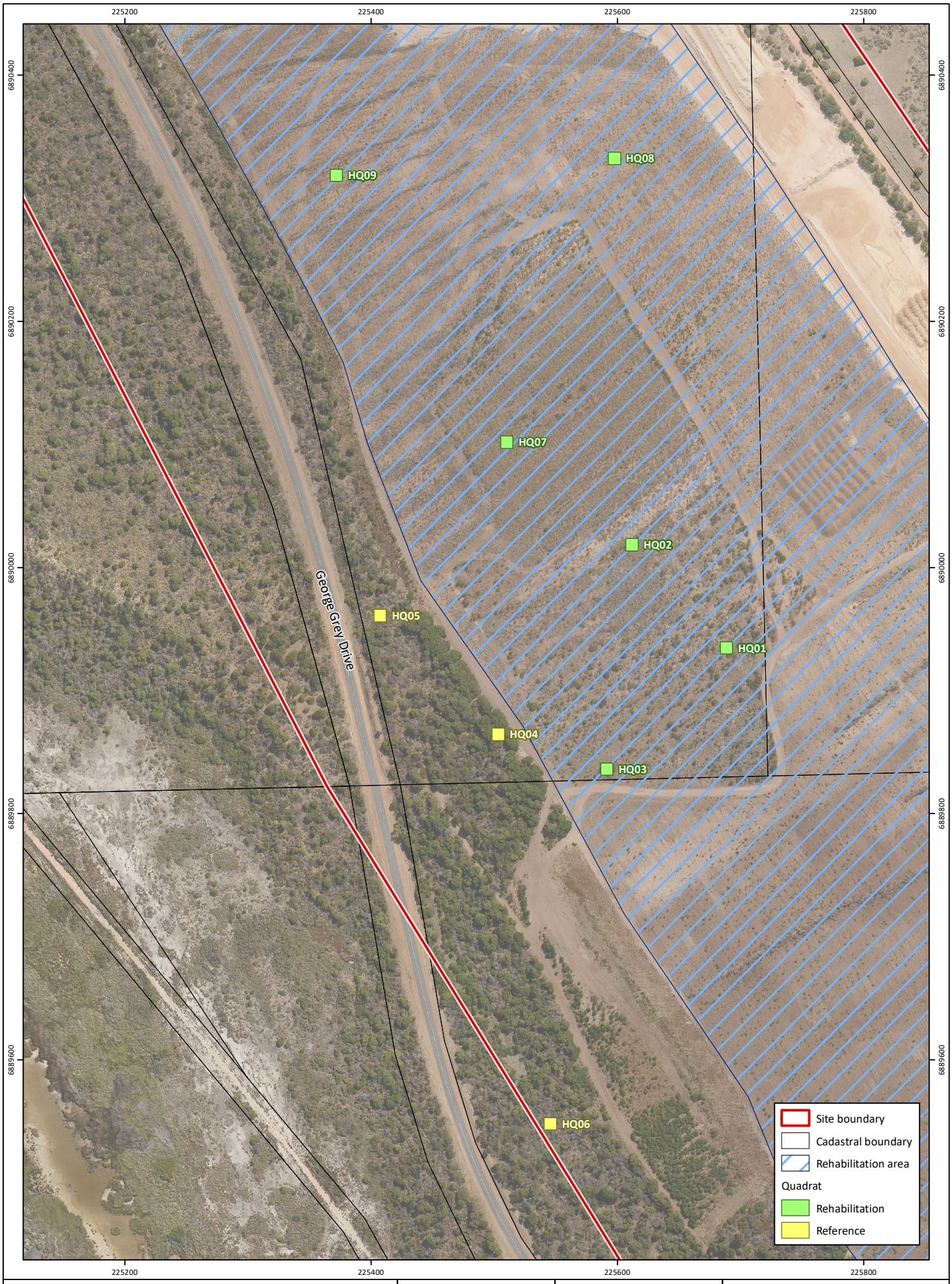

Figure 2: Quadrat Locations

Project: 2024 Rehabilitation Monitoring
Hose Mine, Yallabatharra
Client: GMA Garnet Pty Ltd

Plan Number:
EP22-057(03)--F14

Drawn:	SCM
Date:	04/11/2024
Checked:	SCM
Approved:	RAW
Date:	04/11/2024

N

0 50 100
Metres

Scale: 1:4,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

Appendix A

Species x Quadrat Type Matrix

Species	Quadrat	
	Reference	Rehabilitation
Acacia rostellifera	x	x
Acanthocarpus preissii	x	x
Alyogyne hakeifolia		x
Austrostipa flavescens		x
**Avena barbata*		x
**Brassica tournefortii*	x	x
**Bromus diandrus*		x
*Caryophyllaceae sp.	x	x
**Cenchrus ciliaris*	x	x
**Chenopodium murale*	x	
Commicarpus australis	x	x
Convolvulus remotus	x	x
Dioscorea hastifolia		x
**Ehrharta longiflora*	x	x
Enchylaena tomentosa	x	
Erodium cygnorum		x
Euphorbia ?boophthona		x
Euphorbia porcata		x
**Euphorbia terracina*		x
Glycine canescens		x
Goodenia berardiana		x
Hannafordia quadrivalvis	x	
**Hypochaeris glabra*		x
**Lupinus cosentinii*		x
**Lysimachia arvensis*	x	x
**Medicago polymorpha*	x	x
**Melilotus indicus*		x
Myoporum insulare	x	
Olearia sp. Kennedy Range (G. Byrne 66)		x
Paractaenum novae-hollandiae		x
Parietaria cardiostegia	x	
Pimelea microcephala	x	
Ptilotus villosiflorus		x
**Reichardia tingitana*		x
Rhagodia latifolia subsp. latifolia	x	
Rhagodia preissii subsp. obovata	x	x
Roepera fruticulosa		x
**Solanum nigrum*	x	
**Sonchus oleraceus*	x	x
Stylobasium spathulatum		x
Tetragonia implexicoma	x	
Thysanotus patersonii		x
**Urospermum picroides*	x	x

Appendix B

Quadrat Data

Vegetation Sample Data

Hose Mine

Sample Name: HQ01

Project no.:	EP22-057	Rehabilitation year:	2017
Date:	20/08/2024	**Status**	Permanent
Author:	SCM,SAC	HQ01: Page 1 of	2

Quadrat and landform details

Sample type:	Quadrat	Size:	10 m x 10 m
Altitude (m):	41	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	upper slope
Time since fire:	no evidence	Disturbance:	rehab - rehabilitation, weeds
Soil type/texture	sand/	Bare ground (%):	5
Rocks (%) and type:	0.5%, limestone	Soil colour:	brown/
Litter:	25% (logs,branches,twigs)	Vegetation condition:	degraded
Erosion:	None	Drainage:	Good

NW corner 225684 mE, 6889940 mN

NE corner 225692 mE, 6889944 mN

SW corner 225690 mE, 6889930 mN

SE corner 225699 mE, 6889935 mN

Vegetation Sample Data

Hose Mine

Sample Name: HQ01

Project no.: EP22-057

Date: 20/08/2024 **Status** Permanent

Author: SCM,SAC HQ01: Page 2 of 2

Species Data

* denotes non-native species

Cover (%)	Confirmed name	Height (cm)	Stratum
25	*Acacia rostellifera*	290	Upper
0.5	*Austrostipa flavescens*	75	Groundcover
50	**Avena barbata*	85	Groundcover
0.1	**Brassica tournefortii*	65	Groundcover
0.1	* Caryophyllaceae *sp.*	prostrate	Groundcover
0.1	*Commicarpus australis*	70	Middle
0.1	*Convolvulus remotus*	145	Groundcover
0.5	*Erodium cygnorum*	40	Groundcover
0.5	*Euphorbia ?boophthona*	45	Groundcover
0.1	*Euphorbia porcata*	prostrate	Groundcover
0.1	*Goodenia berardiana*	prostrate	Groundcover
0.1	**Hypochaeris glabra*	prostrate	Groundcover
0.1	**Lupinus cosentinii*	30	Groundcover
0.1	**Lysimachia arvensis*	prostrate	Groundcover
1	**Medicago polymorpha*	prostrate	Groundcover
5	*Rhagodia preissii subsp. obovata*	115	Middle
2	*Roepera fruticulosa*	105	Groundcover
0.5	**Sonchus oleraceus*	30	Groundcover
10	**Urospermum picroides*	30	Groundcover

Vegetation Sample Data

Hose Mine

Sample Name: HQ02

Project no.:	EP22-057	Rehabilitation year:	2017
Date:	20/08/2024	**Status**	Permanent
Author:	MS,KLG	HQ02: Page 1 of	2

Quadrat and landform details

Sample type:	Quadrat	Size:	10 m x 10 m
Altitude (m):	40	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	upper slope
Time since fire:	no evidence	Disturbance:	rehab - rehabilitation, weeds
Soil type/texture	sand/	Bare ground (%):	2
Rocks (%) and type:	0.1%, limestone	Soil colour:	cream/brown
Litter:	20% (logs,branches,leaves)	Vegetation condition:	degraded
Erosion:	None	Drainage:	Good

NW corner 225607 mE, 6890013 mN

NE corner 225616 mE, 6890021 mN

SW corner 225613 mE, 6890007 mN

SE corner 225620 mE, 6890009 mN

Vegetation Sample Data

Hose Mine

Sample Name: HQ02

Project no.: EP22-057

Date: 20/08/2024 **Status** Permanent

Author: MS,KLG HQ02: Page 2 of 2

Species Data

* denotes non-native species

Cover (%)	Confirmed name	Height (cm)	Stratum
5	*Acacia rostellifera*	280	Upper
0.1	*Acanthocarpus preissii*	50	Groundcover
3	*Alyogyne hakeifolia*	240	Upper
1	*Austrostipa flavescens*	105	Groundcover
60	**Avena barbata*	65	Groundcover
0.1	**Brassica tournefortii*	55	Groundcover
0.1	**Cenchrus ciliaris*	50	Groundcover
0.5	*Erodium cygnorum*	prostrate	Groundcover
0.1	*Euphorbia ?boophthona*	15	Groundcover
0.5	*Euphorbia porcata*	prostrate	Groundcover
0.1	*Glycine canescens*	160	Groundcover
0.1	**Lysimachia arvensis*	prostrate	Groundcover
2	**Medicago polymorpha*	prostrate	Groundcover
0.1	**Melilotus indicus*	5	Groundcover
2	*Rhagodia preissii subsp. obovata*	110	Middle
0.1	**Sonchus oleraceus*	30	Groundcover
7	**Urospermum picroides*	25	Groundcover

Vegetation Sample Data

Hose Mine

Sample Name: HQ03

Project no.:	EP22-057	Rehabilitation year:	2016
Date:	20/08/2024	**Status**	Permanent
Author:	SCM,SAC	HQ03: Page 1 of	2

Quadrat and landform details

Sample type:	Quadrat	Size:	10 m x 10 m
Altitude (m):	28	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	no evidence	Disturbance:	rehab - rehabilitation, weeds
Soil type/texture	sand/	Bare ground (%):	2
Rocks (%) and type:	0.1%, limestone	Soil colour:	brown/
Litter:	10% (logs,branches,twigs)	Vegetation condition:	degraded
Erosion:	None	Drainage:	Good

NW corner 225586 mE, 6889841 mN

NE corner 225595 mE, 6889847 mN

SW corner 225593 mE, 6889834 mN

SE corner 225600 mE, 6889838 mN

Vegetation Sample Data

Hose Mine

Sample Name: HQ03

Project no.: EP22-057

Date: 20/08/2024 **Status** Permanent

Author: SCM,SAC HQ03: Page 2 of 2

Species Data

* denotes non-native species

Cover (%)	Confirmed name	Height (cm)	Stratum
50	*Acacia rostellifera*	350	Upper
5	*Acanthocarpus preissii*	90	Groundcover
10	*Alyogyne hakeifolia*	280	Upper
0.5	*Austrostipa flavescens*	50	Groundcover
30	**Avena barbata*	110	Groundcover
0.1	**Brassica tournefortii*	55	Groundcover
0.1	*Commicarpus australis*	80	Middle
0.1	*Dioscorea hastifolia*	90	Groundcover
0.5	*Erodium cygnorum*	40	Groundcover
0.5	*Euphorbia ?boophthona*	50	Groundcover
0.1	*Euphorbia porcata*	prostrate	Groundcover
0.1	**Euphorbia terracina*	40	Groundcover
0.1	*Glycine canescens*	75	Groundcover
0.1	*Goodenia berardiana*	40	Groundcover
0.1	**Lysimachia arvensis*	prostrate	Groundcover
0.5	**Medicago polymorpha*	30	Groundcover
0.5	*Rhagodia preissii subsp. obovata*	100	Middle
0.5	**Sonchus oleraceus*	35	Groundcover
0.1	*Stylobasium spathulatum*	75	Middle
0.1	*Thysanotus patersonii*	prostrate	Groundcover
40	**Urospermum picroides*	35	Groundcover

Vegetation Sample Data

Hose Mine

Sample Name: HQ04

Project no.:	EP22-057	Rehabilitation year:	Remnant vegetation
Date:	20/08/2024	**Status**	Permanent
Author:	MS,KLG	HQ04: Page 1 of	2

Quadrat and landform details

Sample type:	Quadrat	Size:	10 m x 10 m
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	flat
Time since fire:	no evidence	Disturbance:	cyclone - fallen vegetation
Soil type/texture	sand/	Bare ground (%):	0
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	99% (leaves,branches,logs)	Vegetation condition:	good to very good
Erosion:	None	Drainage:	Good

NW corner 225504 mE, 6889873 mN

NE corner 225510 mE, 6889866 mN

SW corner 225498 mE, 6889870 mN

SE corner 225501 mE, 6889863 mN

Vegetation Sample Data

Hose Mine

Sample Name: HQ04

Project no.: EP22-057

Date: 20/08/2024 **Status** Permanent

Author: MS,KLG HQ04: Page 2 of 2

Species Data

* denotes non-native species

Cover (%)	Confirmed name	Height (cm)	Stratum
85	*Acacia rostellifera*	700	Upper
0.1	**Chenopodium murale*	10	Groundcover
0.1	*Commicarpus australis*	50	Groundcover
3	**Ehrharta longiflora*	40	Groundcover
0.1	**Lysimachia arvensis*	prostrate	Groundcover
0.1	*Rhagodia preissii subsp. obovata*	160	Middle
0.1	**Solanum nigrum*	10	Groundcover
0.1	**Sonchus oleraceus*	60	Groundcover
1	**Urospermum picroides*	10	Groundcover

Vegetation Sample Data

Hose Mine

Sample Name: HQ05

Project no.:	EP22-057	Rehabilitation year:	Remnant vegetation
Date:	20/08/2024	**Status**	Permanent
Author:	SCM,SAC	HQ05: Page 1 of	2

Quadrat and landform details

Sample type:	Quadrat	Size:	10 m x 10 m
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	no evidence	Disturbance:	cyclone - cyclone damage and wee
Soil type/texture	sand/	Bare ground (%):	0
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	85% (branches,logs,leaves)	Vegetation condition:	good
Erosion:	None	Drainage:	Good

NW corner 225410 mE, 6889963 mN

NE corner 225402 mE, 6889966 mN

SW corner 225400 mE, 6889956 mN

SE corner 225408 mE, 6889949 mN

Vegetation Sample Data

Hose Mine

Sample Name: HQ05

Project no.: EP22-057

Date: 20/08/2024 **Status** Permanent

Author: SCM,SAC HQ05: Page 2 of 2

Species Data

* denotes non-native species

Cover (%)	Confirmed name	Height (cm)	Stratum
0.1	*Acacia rostellifera*	150	Middle
0.5	*Acanthocarpus preissii*	130	Groundcover
1	**Brassica tournefortii*	100	Groundcover
0.1	* Caryophyllaceae *sp.*	30	Groundcover
1	**Cenchrus ciliaris*	80	Groundcover
10	*Commicarpus australis*	300	Middle
1	*Convolvulus remotus*	280	Groundcover
20	**Ehrharta longiflora*	60	Groundcover
5	*Hannafordia quadrivalvis*	210	Middle
0.5	*Parietaria cardiostegia*	60	Groundcover
1	*Pimelea microcephala*	100	Middle
40	*Rhagodia preissii subsp. obovata*	280	Middle
0.1	**Solanum nigrum*	30	Groundcover
1	**Sonchus oleraceus*	100	Groundcover
0.1	*Tetragonia implexicoma*	70	Middle
1	**Urospermum picroides*	55	Groundcover

Vegetation Sample Data

Hose Mine

Sample Name: HQ06

Project no.:	EP22-057	Rehabilitation year:	Remnant vegetation
Date:	20/08/2024	**Status**	Permanent
Author:	SCM,SAC	HQ06: Page 1 of	2

Quadrat and landform details

Sample type:	Quadrat	Size:	10 m x 10 m
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	no evidence	Disturbance:	cyclone - fallen vegetation
Soil type/texture	sand/	Bare ground (%):	0
Rocks (%) and type:	No rocks	Soil colour:	grey/
Litter:	75% (logs,branches,leaves)	Vegetation condition:	good
Erosion:	None	Drainage:	Good

NW corner 225540 mE/ 6889553 mN

NE corner 225538 mE/ 6889545 mN

SW corner 225549 mE/ 6889551 mN

SE corner 225545 mE/ 6889541 mN

Vegetation Sample Data

Hose Mine

Sample Name: HQ06

Project no.: EP22-057

Date: 20/08/2024 **Status** Permanent

Author: SCM,SAC HQ06: Page 2 of 2

Species Data

* denotes non-native species

Cover (%)	Confirmed name	Height (cm)	Stratum
25	*Acacia rostellifera*	500	Upper
0.5	**Brassica tournefortii*	prostrate	Groundcover
5	*Commicarpus australis*	350	Middle
10	**Ehrharta longiflora*	50	Groundcover
0.5	*Enchylaena tomentosa*	110	Middle
0.1	**Medicago polymorpha*	prostrate	Groundcover
2	*Myoporum insulare*	250	Middle
2	*Pimelea microcephala*	160	Middle
10	*Rhagodia latifolia subsp. latifolia*	150	Middle
0.5	*Rhagodia preissii subsp. obovata*	50	Middle
0.1	**Solanum nigrum*	30	Groundcover
0.1	**Sonchus oleraceus*	35	Groundcover
5	*Tetragonia implexicoma*	180	Middle
3	**Urospermum picroides*	40	Groundcover

Vegetation Sample Data

Hose Mine

Sample Name: HQ07

Project no.:	EP22-057	Rehabilitation year:	2021
Date:	20/08/2024	**Status**	Permanent
Author:	MS,KLG	HQ07: Page 1 of	2

Quadrat and landform details

Sample type:	Quadrat	Size:	10 m x 10 m
Altitude (m):	39	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	upper slope
Time since fire:	no evidence	Disturbance:	rehab - rehabiliation, weeds
Soil type/texture	sand/	Bare ground (%):	1
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	1% (leaves,branch,)	Vegetation condition:	degraded
Erosion:	None	Drainage:	Good

NW corner 225505 mE, 6890107 mN

NE corner 225515 mE, 6890108 mN

SW corner 225504 mE, 6890096 mN

SE corner 225515 mE, 6890097 mN

Vegetation Sample Data

Hose Mine

Sample Name: HQ07

Project no.: EP22-057

Date: 20/08/2024 **Status** Permanent

Author: MS,KLG HQ07: Page 2 of 2

Species Data

* denotes non-native species

Cover (%)	Confirmed name	Height (cm)	Stratum
0.5	*Acacia rostellifera*	150	Middle
1	*Acanthocarpus preissii*	90	Groundcover
2	*Alyogyne hakeifolia*	210	Upper
0.1	*Austrostipa flavescens*	65	Groundcover
70	**Avena barbata*	115	Groundcover
0.5	**Brassica tournefortii*	75	Groundcover
0.1	*Convolvulus remotus*	65	Groundcover
0.5	*Dioscorea hastifolia*	80	Groundcover
0.1	*Erodium cygnorum*	prostrate	Groundcover
1	*Euphorbia ?boophthona*	50	Groundcover
0.5	**Lysimachia arvensis*	prostrate	Groundcover
0.1	**Medicago polymorpha*	prostrate	Groundcover
1	*Olearia sp. Kennedy Range (G. Byrr*	110	Middle
0.1	**Reichardia tingitana*	65	Groundcover
0.1	**Sonchus oleraceus*	85	Groundcover
5	**Urospermum picroides*	10	Groundcover

Vegetation Sample Data

Hose Mine

Sample Name: HQ08

Project no.:	EP22-057	Rehabilitation year:	2021
Date:	20/08/2024	**Status**	Permanent
Author:	SCM,SAC	HQ08: Page 1 of	2

Quadrat and landform details

Sample type:	Quadrat	Size:	10 m x 10 m
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	no evidence	Disturbance:	same as 2022 - rehabiliation, kanga
Soil type/texture	sand/	Bare ground (%):	45
Rocks (%) and type:	1%, limestone	Soil colour:	cream/brown
Litter:	5% (leaves,branches,twigs)	Vegetation condition:	good
Erosion:	None	Drainage:	Good

NW corner 225593 mE, 6890337 mN

NE corner 225603 mE, 6890338 mN

SW corner 225604 mE, 6890329 mN

SE corner 225594 mE,6890330 mN

Vegetation Sample Data

Hose Mine

Sample Name: HQ08

Project no.: EP22-057

Date: 20/08/2024 **Status** Permanent

Author: SCM,SAC HQ08: Page 2 of 2

Species Data

* denotes non-native species

Cover (%)	Confirmed name	Height (cm)	Stratum
25	*Acacia rostellifera*	270	Upper
10	**Avena barbata*	110	Groundcover
1	**Brassica tournefortii*	70	Groundcover
0.1	**Bromus diandrus*	30	Groundcover
0.5	**Cenchrus ciliaris*	65	Groundcover
0.1	**Ehrharta longiflora*	50	Groundcover
5	*Erodium cygnorum*	45	Groundcover
0.5	*Euphorbia ?boophthona*	30	Groundcover
0.1	*Euphorbia porcata*	prostrate	Groundcover
0.1	*Goodenia berardiana*	25	Groundcover
0.1	**Lupinus cosentinii*	20	Groundcover
0.5	**Lysimachia arvensis*	prostrate	Groundcover
0.5	**Medicago polymorpha*	prostrate	Groundcover
0.5	*Paractaenum novae-hollandiae*	40	Groundcover
0.1	*Ptilotus villosiflorus*	prostrate	Groundcover
0.5	*Rhagodia preissii subsp. obovata*	70	Groundcover
0.1	**Sonchus oleraceus*	20	Groundcover
0.1	**Urospermum picroides*	prostrate	Groundcover

Vegetation Sample Data

Hose Mine

Sample Name: HQ09

Project no.:	EP22-057	Rehabilitation year:	2021
Date:	20/08/2024	**Status**	Permanent
Author:	MS,KLG	HQ09: Page 1 of	2

Quadrat and landform details

Sample type:	Quadrat	Size:	10 m x 10 m
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	lower slope
Time since fire:	no evidence	Disturbance:	same as 2022 - rehabiliation, kanga
Soil type/texture	sand/	Bare ground (%):	60
Rocks (%) and type:	1%, limestone	Soil colour:	cream/brown
Litter:	15% (leaves,branches,twigs)	Vegetation condition:	good
Erosion:	None	Drainage:	Good

NW corner 225367 mE,6890324 mN

NE corner 225375 mE, 6890325 mN

SW corner 225377 mE, 6890314 mN

SE corner 225366 mE,6890314 mN

Vegetation Sample Data

Hose Mine

Sample Name: HQ09

Project no.: EP22-057

Date: 20/08/2024 **Status** Permanent

Author: MS,KLG HQ09: Page 2 of 2

Species Data

* denotes non-native species

Cover (%)	Confirmed name	Height (cm)	Stratum
20	*Acacia rostellifera*	135	Middle
0.1	*Acanthocarpus preissii*	50	Groundcover
5	*Alyogyne hakeifolia*	160	Middle
0.1	*Austrostipa flavescens*	40	Groundcover
1	**Avena barbata*	100	Groundcover
1	**Brassica tournefortii*	90	Groundcover
0.1	*Convolvulus remotus*	135	Groundcover
0.5	*Erodium cygnorum*	30	Groundcover
0.1	*Goodenia berardiana*	30	Groundcover
0.1	**Hypochaeris glabra*	prostrate	Groundcover
0.1	**Lysimachia arvensis*	prostrate	Groundcover
0.5	**Medicago polymorpha*	prostrate	Groundcover
0.1	*Ptilotus villosiflorus*	prostrate	Groundcover
0.1	*Rhagodia preissii subsp. obovata*	45	Groundcover
0.1	**Sonchus oleraceus*	5	Groundcover
0.5	**Urospermum picroides*	15	Groundcover