Beacon Minerals Ltd

JAURDI HILLS LEVEL 2 FLORA AND VEGETATION SURVEY

Part 1- July 2017

Prepared for:

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EXECUTIVE SUMMARY

The parent entity, Beacon Minerals Limited (BCN) is a publicly listed company which has a 100% interest in Beacon Mining Pty Ltd (BM). BCM is required to make all the financial and operating policy decisions for this subsidiary. BM has gold interests and is the operator of its Jaurdi Hills Project in the Coolgardie Region of Western Australia. Via exploration drilling within the project area, BM has identified the Lost Dog Deposit within the Mining Lease M16/529. BM provided Native Vegetation Solutions (NVS) with a survey area which encompasses the main mining areas as well as other infrastructure related to mining the mineral resource. The location of this survey area is approximately 32 km northwest of Coolgardie (Figure 1).

This report will support numerous applications including mining proposals, works approvals and clearing permits submitted to relative Government Departments.

The survey area, for the purposes of this report, encompasses an area totalling approximately 589.91 ha, which intersects Mining Tenements M16/34, M16/115, M16/255, M16/529, Prospecting Licenses P16/2925, P16/2926, P16/3031 and Exploration License E16/469. At this stage, the final footprint of mining related disturbances is yet to be finalised, however will be encompassed entirely within the survey area.

The survey area is located in the Coolgardie Botanical District of Beard (1990). The Coolgardie Botanical District is dominated by eucalypt woodlands, eucalypt open woodlands in the east, other shrublands, heath, *Acacia* shrublands, chenopod and samphire shrublands, mallee woodlands and shrublands. There are small areas of *Acacia* forests and woodlands, and hummock grasslands occurring in the north (DOTEE, 2017).

Within the Coolgardie Botanical District, the Eastern Goldfields subregion is comprised of Mallees, *Acacia* thickets and shrubheaths on sandplains. Diverse *Eucalyptus* woodlands occur around salt lakes, on ranges, and in valleys. Salt lakes support dwarf shrublands of samphire. Woodlands and *Dodonaea* shrubland occur on basic granulites of the Fraser Range. The area is rich in endemic *Acacia*'s (CALM, 2002).

The Goldfields Woodlands is a centre of endemism and includes exceptionally high diversity of *Eucalyptus* species with as many as 170 species occurring in the bioregion. The COO3 subregion also has high diversity in *Acacia* species, as well as ephemeral flora communities of tertiary sandplain shrublands and of valley floor woodlands (CALM, 2002).

The search undertaken with the EPBC's Protected Matters Search Tool reported that no TECs were present in the survey area (DOTEE, 2017b). The search also revealed that the survey area may contain habitat for the invasive weed species *Carrichtera annua* (Ward's Weed).

The threatened species, *Gastrolobium graniticum*, was listed as either likely to be in the area or having potential habitat occurring in the area. This species occurs mainly on granite outcrops. No granite outcrops were identified in the survey area.

The DPAW database searches revealed a potential for 2 Threatened and 39 Priority Flora species to occur within a 30km radius of the survey area (DBCA, 2017a). No known locations of these Flora occur within the survey area, while the closest location occurs approximately 7 km east of the survey area.

Results of the threatened flora database search are included in Appendix D.

The PEC/TEC search (DBCA, 2017) revealed no TECs or PECs within the survey area.

The survey area does not lie within or contain any ESA's or Conservation Reserves (DWER, 2017).

No water bodies were identified within the survey area via the CPS Map Viewer (DWER, 2017).

The survey area lies south of the 26th parallel, however receives average annual rainfall of approximately 270.3 mm (BOM, 2017), below the 400mm threshold mark. There is no record of *Phytophthora cinnamomi* establishing in natural ecosystems in regions receiving <400mm rainfall per annum (CALM, 2003). Therefore, Dieback is not considered an issue for this survey area, however all measures should be taken to prevent any possible soil contamination or weed infestations which could pose a risk within the survey area during seasonally favourable conditions.

Nine vegetation groups were identified during this survey, largely following topographical features and dominant species. Mapping of the 9 vegetation groups, as well as the quadrat locations can be seen in Appendix C.

Eighty-six species were recorded within the survey area with 85 species recorded within quadrats. Thirty-nine genera and 24 families were found. These are listed in Appendix E, per Quadrat as well as per vegetation group. Of the native species, Chenopodiaceae had the highest representation, with 19 species from 8 genera, dominated by *Maireana.* Fabaceae and Scrophulariaceae were the next best represented families with 12 species each.

Of the 86 taxa recorded there were two introduced weed species; *Carrichtera annua* (Ward's Weed) and *Cucumis myriocarpus* (Prickly Paddy Melon). These weed species were recorded within 2 of the 29 quadrats. No weed species recorded were considered declared plants by DPIRD (2017).

The most common and widespread species were *Eremophila scoparia, Exocarpos aphyllus and Senna artemisioides* subsp. *filifolia,* which were recorded within 25 quadrats. Its canopy cover was 10-30%. The next most common and widespread species was *Ptilotus obovatus,* recorded in 19 quadrats, with a canopy cover less than 10%.

There were 30 taxa recorded from within a single site, Q23. Of these, none were weed species.

No Threatened species were recorded during the survey.

One Priority species, Eremophila praecox (P1), was identified in the survey area within Q22, which lies within Vegetation Group H. Two plants were recorded here within a 200m radius.

Vegetation condition was generally 'Good' to 'Very Good' (Keighery 1994). Disturbance was present within the survey area mostly attributed to historic mining activities, access tracks, exploration related activities, and also grazing.

The EPA objective for flora and vegetation is to maintain the abundance, species diversity and geographical distribution of flora and vegetation as well as protect Threatened flora consistent with the provisions of the *Biodiversity Conservation Act 2016.*

The proposed clearing of vegetation will result in the loss of some individuals from the local area; however, the impact will not be great enough to remove whole communities or populations. Most of the species and communities recorded during this survey are widespread throughout the Eastern Goldfields subregion and adjoining regions, and therefore the loss of a small proportion from this area will not be significant.

This report summarises the results of the first stage of the Level 2 survey. It is deemed necessary to conduct a second stage follow up survey in Spring 2017, to incorporate any additional taxa that may appear during this seasonal variation.

TABLE OF CONTENTS

Page No.

FIGURES

TABLES

APPENDICES

1 INTRODUCTION

1.1 BACKGROUND

The parent entity, Beacon Minerals Limited (BCN) is a publicly listed company which has a 100% interest in Beacon Mining Pty Ltd (BM). BCN is required to make all the financial and operating policy decisions for this subsidiary. BM has gold interests and is the operator of its Jaurdi Hills Project in the Coolgardie Region of Western Australia. Via exploration drilling within the project area, BM has identified the Lost Dog Deposit within the Mining Lease M16/529. BM provided Native Vegetation Solutions (NVS) with a survey area which encompasses the main mining areas as well as other infrastructure related to mining the mineral resource. The location of this survey area is approximately 32 km northwest of Coolgardie (Figure 1).

This report will support numerous applications including mining proposals, works approvals and clearing permits submitted to relative Government Departments.

The survey area, for the purposes of this report, encompasses an area totalling approximately 589.91 ha, which intersects Mining Tenements M16/34, M16/115, M16/255, M16/529, Prospecting Licenses P16/2925, P16/2926, P16/3031 and Exploration License E16/469. At this stage, the final footprint of mining related disturbances is yet to be finalised, however will be encompassed entirely within the survey area.

Figure 1: Regional Location of the Jaurdi Hills Survey Area

1.2 PURPOSE AND SCOPE

The objective of this report is to record and analyse the results of the flora and vegetation component of a Level 2 assessment conducted in accordance with the following documents:

- *Terrestrial Biological Surveys as an Element of Biodiversity Protection; Position Statement No 3 (EPA, 2002);*
- *Guidance Statement No. 51- Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA, 2004); and*
- *Technical Guide- Flora and Vegetation Surveys for Environmental Impact Assessment (EPA and DPAW, 2015).*

A Level 2 Flora and Vegetation Survey has two components:

1) Level 1 Survey
   a) Desktop study which includes a literature review and a search of the relevant databases; and
   b) Reconnaissance survey of the subject area to verify the desktop survey, undertake low impact sampling, define vegetation groups present in the area, search for species of conservation significance and to determine potential sensitivity to impact.

2) Detailed Plot Based Survey
   a) Detailed survey, comprising multiple visits in main flowering seasons or other seasons and replication of plots in vegetation units incorporating greater coverage than a reconnaissance survey; and
   b) Comprehensive survey when necessary to: enhance the level of knowledge at the locality or sub-regional scale, in order to provide wider context for the local scale.

Therefore, the scope of work for the Level 2 flora and vegetation survey was to:

- Conduct a desktop study that includes a literature review and search of relevant databases;
- Conduct a plot-based survey within the survey area (20m x 20m quadrats);
- Prepare an inventory of species occurring in the study area;
- Conduct PATN analysis of quadrat based presence/absence data;
- Quantify survey intensity via Species Accumulation Curve;
- Describe the vegetation associations in the survey area;
- Identify any vegetation communities or flora species of particular conservation significance;
- Map broad-scale vegetation groups found within the survey area, including vegetation condition; and
- Provide recommendations, including the management of perceived impacts to flora and vegetation, particularly flora of conservation significance, within the study area.

2 EXISTING ENVIRONMENT

2.1 CLIMATE

Typically, the climate is characterised as being arid to semi-arid Mediterranean with mainly winter rainfall as well as summer thunderstorms. The area receives approximately 250-300mm of rainfall per year (Beard, 1990; CALM, 2002). The nearest official meteorological weather station with the most complete and up to date information is Coolgardie, which is located approximately 32 km southeast of the survey area.

2.1.1 Temperature

Mean annual minimum temperature at Coolgardie is 11.2°C and mean annual maximum temperature is 25.0°C (BOM, 2017). The coldest temperatures occur in July (mean minimum temperature 5.2°C), the hottest is January (mean maximum temperature 33.3°C) and diurnal temperature variations are relatively consistent throughout the year (Figure 2).

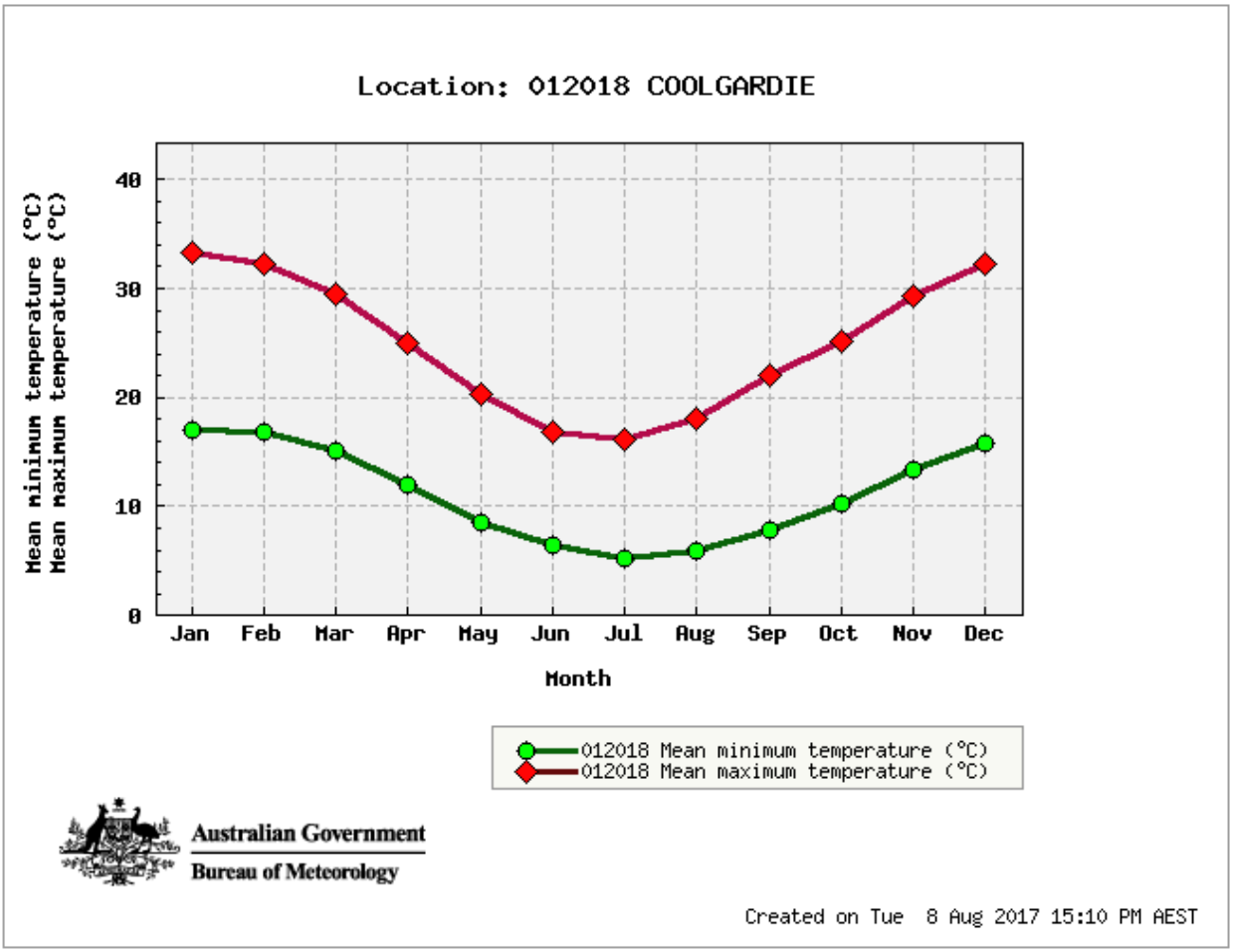

Figure 2: Mean temperature ranges for Coolgardie weather station (BOM, 2017)

2.1.2 Rainfall

The annual average rainfall at Coolgardie is 270.7mm over an average 34.7 rain days (BOM, 2017). Average rainfall varies across the months, with slightly larger rainfall events falling between January to August (Figure 3), and the least rainfall received in September. Rainfall for 2016 was more than triple the average for January, with June, August and December also receiving above average rainfall levels. All other months in 2016 recorded below average levels. November was the driest month for 2016.

Rainfall for 2017 was not recorded at the Coolgardie weather station (012018) and the nearest rainfall recorded was Credo which is located approximately 27km northwest of the survey area. Rainfall at Credo in 2017 was more than quadruple the average of Coolgardie for January, with February and March also receiving above average rainfall levels (Figure 4). April, May, June and July all received lower than Coolgardie's average in 2017.

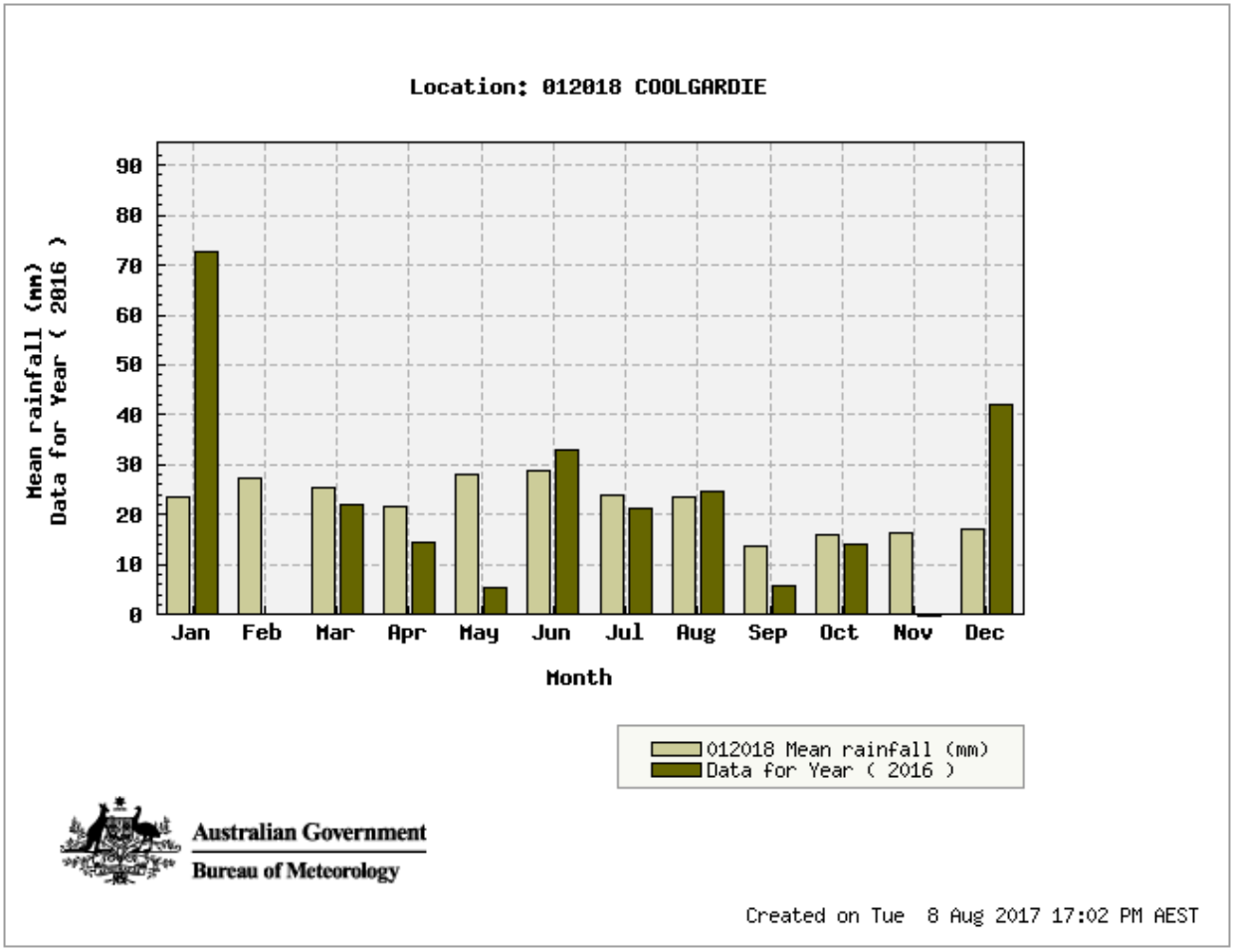

Figure 3: Rainfall data for the Coolgardie Meteorological Station (BOM, 2017)

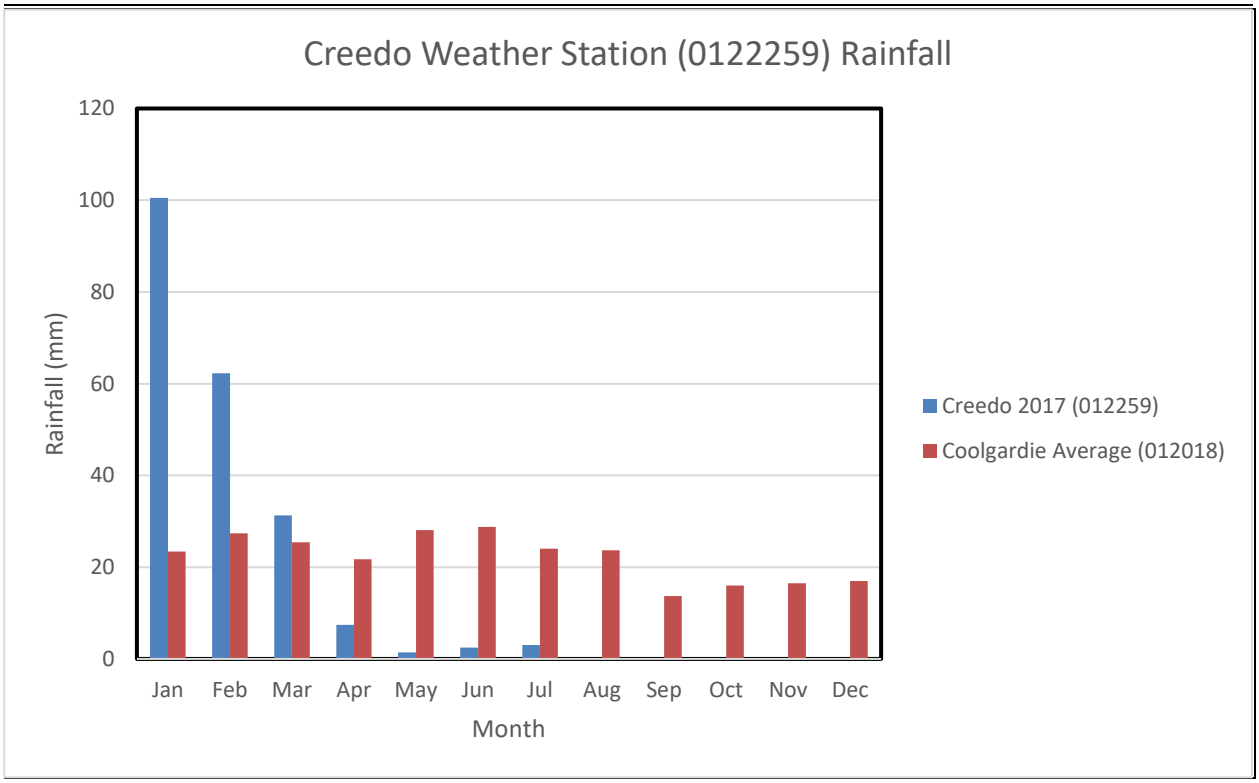

Figure 4: Rainfall data for the Credo Meteorological Station (BOM, 2017)

2.2 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA (IBRA) REGION

The IBRA recognises 89 bioregions within Australia and 419 subregions (DOTEE, 2017a). The project is located in the Eastern Goldfields IBRA subregion (COO3) which totals over 5.1 million hectares (CALM, 2002). The Eastern Goldfields subregion lies on the 'Eastern Goldfields Terrains'. The relief is subdued and comprises of gently undulating plains interrupted in the west with low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite. The underlying geology is of gneisses and granites eroded into a flat plane covered with tertiary soils and with scattered exposures of bedrock. Calcareous earths are the dominant soil group and over much of the plains and greenstone areas. A series of large playa lakes in the western half are the remnants of an ancient major drainage line.

The dominant land uses of the COO3 subregion are: UCL and Crown reserves, Grazing-Native pastures-leasehold (37.8%), freehold (7.15%), conservation, mining leases (CALM, 2002).

2.3 LANDFORMS AND SOILS

This bioregion consists of granite rocky outcrops, low greenstone hills, laterite uplands and broad plains. There are no major rivers or creeks within the bioregion. Numerous salt lakes of varying size occur across the region (DOTEE, 2017).

Beard (1990) describes the soil types in the COO3 subregion as: principally brown calcareous earths, with sandplains in the western part and some large playa lakes.

2.4 BOTANICAL DISTRICTS AND EXISTING VEGETATION

The survey area is located in the Coolgardie Botanical District of Beard (1990). The Coolgardie Botanical District is dominated by eucalypt woodlands, eucalypt open woodlands in the east, other shrublands, heath, *Acacia* shrublands, chenopod and samphire shrublands, mallee woodlands

and shrublands. There are small areas of *Acacia* forests and woodlands, and hummock grasslands occurring in the north (DOTEE, 2017).

Within the Coolgardie Botanical District, the Eastern Goldfields subregion is comprised of Mallees, *Acacia* thickets and shrubheaths on sandplains. Diverse *Eucalyptus* woodlands occur around salt lakes, on ranges, and in valleys. Salt lakes support dwarf shrublands of samphire. Woodlands and *Dodonaea* shrubland occur on basic granulites of the Fraser Range. The area is rich in endemic *Acacia*'s (CALM, 2002).

The Goldfields Woodlands is a centre of endemism and includes exceptionally high diversity of *Eucalyptus* species with as many as 170 species occurring in the bioregion. The COO3 subregion also has high diversity in *Acacia* species, as well as ephemeral flora communities of tertiary sandplain shrublands and of valley floor woodlands (CALM, 2002).

3 METHODS

3.1 PERSONNEL AND REPORTING

The following personnel were involved in the Level 2 flora and vegetation survey:

- Mr Eren Reid (BSc- Biological Science), Principal Botanist, Native Vegetation Solutions, undertook the survey, vegetation mapping, data collation, identification of flora during field work and post field work, preparation and review of the report.

3.2 PRELIMINARY DESKTOP STUDY

A preliminary assessment of the survey area and its potential constraints was undertaken by reviewing relevant government agency managed databases (Sections 3.2.1 to 3.2.5, and Appendices 1 & 2) and consulting with government agencies where necessary. The following sections provide a summary of desktop searches undertaken for the project.

3.2.1 Environment Protection and Biodiversity Conservation Act Protected Matters

The *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* Protected Matters Search tool was utilised to provide results for matters of National Environmental Significance within the survey area using the coordinates displayed within the search results (Appendix 1) with a 1km buffer (DOTEE, 2017b).
(http://www.environment.gov.au/arcgis-framework/apps/pmst/pmst-coordinate.jsf)

3.2.2 Threatened Flora and Communities

The Threatened and Priority Flora Database managed by the Department of Biodiversity, Conservation and Attractions (DBCA) was searched for threatened and priority flora within a 30km radial area of the survey area shapefile (Reference: 04-0717FL).

The Threatened and Priority Ecological Communities (TECs and PECs) database was searched to determine the presence of PECs or TECs (Reference: 11-0717DBCA), with Geographic Information System (GIS) data supplied for assessment, within a 10km radial area of the survey area shapefile.

3.2.3 Environmentally Sensitive Areas (ESAs) and Conservation Reserves

The Department of Water and Environmental Regulation (DWER) Clearing Permit System Map Viewer was used to determine the location of any ESAs and Conservation Reserves (https://cps.der.wa.gov.au/main.html).

3.2.4 Vegetation Type, Extent and Status

Vegetation extent and status data was sourced from the Department of Agriculture and Food (DAFWA) report “Land-Use and Vegetation in Western Australia- National Land and Water Resources Audit Report” and its associated GIS file (Shepherd *et al*, 2002). This data comprises Beard’s Pre-European vegetation groups.

DPaW's Statewide Vegetation Statistics (DPAW, 2017) was also referenced for the current extent of Beard's Vegetation Groups.

3.2.5 Wetlands

The potential of wetlands within the project area was determined by examining DWER’s Clearing Permit System Map Viewer (DWER, 2017).

3.2.6 Dieback

Dieback is only considered a potential issue for the project if both the mean annual rainfall of the area is >400mm, and if the project area resides south of the 26th parallel. Dieback is not considered an issue for the survey area as although it lies south of the 26th parallel it receives average annual rainfall of 270.3 mm, which is below the 400mm threshold mark. There are no records of *Phytophthora cinnamomi* establishing in natural ecosystems in regions receiving less than 400mm rainfall per annum (CALM, 2003).

3.3 LEVEL OF SURVEY

The survey was conducted in accordance with EPA's Position Statement No. 3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA, 2002), *Guidance for the Assessment of Environmental Factors No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2004) and *Technical Guide- Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA and DPAW, 2015).

In designing this survey, note was taken of Tables 2 and 3 of EPA Guidance Statement 51 (pp 39-45). Using the Table 3 criterion on 'Size/scale of the proposal/impact' it is determined that the impact of this mining proposal is High, although other criteria (for example 'Degree of degradation or clearing within region' and 'Rarity of vegetation') may mitigate this to Medium impact. This survey, however, is designed to accommodate the High impact and as such, in the Eastern Goldfields subregion, a Level 2 survey is required.

3.4 SITE INVESTIGATION

The first stage of the field survey was conducted by Mr. Eren Reid, Botanist of NVS, on the 6th, 7th, 11th and 13th July 2017.

3.4.1 Field Methods

Prior to the field work, the aerial photography was examined and representative sample sites for quadrats were chosen to provide coverage over all viable vegetation types. Twenty-nine sites were chosen by this method.

In the field, these sites were visited and 20 x 20m quadrats established in appropriate locations, taking into account representativeness of the site to surrounding vegetation and vegetation boundaries.

Each quadrat site was marked in all corners with a 97cm galvanized fence dropper and was defined by tape measures. The location of one corner was captured on a TwoNav Aventura GPS at ±4m accuracy, using Universal Transverse Mercator location on GDA94 datum. Digital photographs were taken of each quadrat site.

Data collected at each quadrat included:

- Species Present;
- Topography;
- Rock Type;
- Soil Colour and Type;
- Aspect;
- % Bare Ground and Litter;
- Disturbance Level; and
- Vegetation Condition.

As well as a complete list of all species encountered, the average height and estimated coverage of the species making up the three stratum levels (Tallest, Mid and Lower).

Specimens of taxa not recognised by the Botanists were collected and pressed along with specimens of taxa recognised as, or thought to be, conservation-significant species.

The condition of each quadrat was assessed using the method developed by Keighery (1994). Definitions of the condition scale are presented in Appendix A.

Vegetation groups were mapped (section 3.4.3 below).

Opportunistic sampling of plant taxa and vegetation group mapping was also utilised in the survey area between quadrat sampling points, via wandering traverses. Relevé sites were also utilised as opportunistic sample sites to collect flora specimens and assist in mapping vegetation groups.

All sample sites and GPS tracks are included in Appendix C.

3.4.2 Post-Field Methods

Unknown specimens collected in the field were identified post field work by Eren Reid with reference to published keys and samples held in the Reference Section of the Western Australian Herbarium (WAHERB).

Species information was transferred into Microsoft Excel® worksheets in preparation for PATN analysis (Belbin, 1994), via Bray and Curtis Flexible UPGMA, as well as input into a computer program which generates a species accumulation curve (Seaby & Henderson, 2006).

3.4.3 Mapping

Vegetation mapping was produced via GPS recorded information in the field, cross-referenced with vegetation descriptions made in the field, overlaid on aerial imagery of the survey area. The GPS utilized (TwoNav Aventura GPS) displayed aerial imagery, hence real-time mapping of vegetation groups was available during field work.

Vegetation Health Condition was assessed in the field with reference to Keighery (1994).

GPS tracks and waypoints recorded during field work are presented in Appendix C.

3.5 LICENCE AND PERMITS

Flora was collected for identification under the Scientific Collection License SL011847 held by Mr E. Reid with expiry 09/07/2017.

3.6 NOMENCLATURE AND TAXONOMY

Nomenclature follows that used by the WAHERB.

Recently the WAHERB has updated its sequence and arrangement of collections to conform to the systematic sequence of the Angiosperm Phylogeny Group (APGIII), with the result that many Families and Genera have been moved or renamed. This report attempts to follow those changes in relation to species recorded during this survey. Definitions of Threatened Flora are also included in Section 9 below.

3.7 LIMITATIONS

Table 1 lists potential limitations that may have affected the survey. These are based on the listing given in the *Guidance Statement No. 51 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004).

Table 1: List of potential survey limitations

Possible Limitation	Constraint	Comment
Competency/experience of the consultant carrying out the survey	No	Experienced and competent personnel conducted the survey. Eren Reid has over 13 years' experience in botanical surveys throughout the Goldfields and over a variety of environments across Western Australia.
Scope	No	The Scope of work was adequately defined. Vascular flora species were the focus of the survey and were thoroughly sampled. Of all the plant taxa identified, 17.5 % were considered annual species.
Proportion of flora identified, recorded and/or collected	No	All taxa not identified in the field were collected and pressed, and later identified by Eren Reid. See also Species Accumulation Curves in section 4.2.2.2.
Sources of information	No	Information on flora and vegetation of the region and local area was available from publicly available databases, books and reports.
Proportion of the tasks achieved	No	All tasks completed.
Timing/season	Potential	This survey was undertaken in July 2017. Rainfall averages were exceeded in January, February and March 2017, while rainfall in April, May, June and July 2017 was below average. Only 6 specimens were collected during field work, which were all identified post field work. Timing would have been ideal earlier in April/May, however the second part of the field work is expected to account for seasonal variation in Spring 2017.
Disturbance in survey area	No	Disturbance from grazing and exploration was apparent in the survey area. However, the structural dominants of the vegetation persist and, the vegetation remains in Good to Very Good condition.
Intensity of survey effort	No	The survey intensity is considered to have been sufficient for a Level 2 survey according to EPA (2004) guidelines. Areas most likely to contain threatened and priority species were targeted. Vegetation mapping sites were selected to provide adequate coverage of the survey area.
Resources	No	Resources, in terms of time, equipment, support and personnel were adequate to undertake and complete the Level 2 survey.
Remoteness and/or access problems	No	All the areas in need of survey were easily accessible from existing tracks, or by foot.
Availability of contextual information for the region`	No	Contextual information regarding vegetation and flora around the Eastern Goldfields subregion is readily available. Adequate information was able to be accessed from available databases (DBCA 2017 and DOTEE 2017b).

4 RESULTS

4.1 PRELIMINARY DESKTOP ASSESSMENT

4.1.1 EPBC Protected Matters Search Tool

The search undertaken with the EPBC's Protected Matters Search Tool reported that no TECs were present in the survey area (DOTEE, 2017b). The search also revealed that the survey area may contain habitat for the invasive weed species *Carrichtera annua* (Ward's Weed).

The threatened species, *Gastrolobium graniticum*, was listed as either likely to be in the area or having potential habitat occurring in the area. This species occurs mainly on granite outcrops. No granite outcrops were identified in the survey area.

Results of the EPBC Protected Matters Search Tool are included in Appendix B.

4.1.2 Threatened Flora and Communities

The DPAW database searches revealed a potential for 2 Threatened and 39 Priority Flora species to occur within a 30km radius of the survey area (DBCA, 2017a). No known locations of these Flora occur within the survey area, while the closest location occurs approximately 7 km east of the survey area.

Results of the threatened flora database search are included in Appendix D.

The PEC/TEC search (DBCA, 2017) revealed no TECs or PECs within the survey area.

4.1.3 Environmentally Sensitive Areas and Conservation Reserves

The survey area does not lie within or contain any ESA's or Conservation Reserves (DWER, 2017).

4.1.4 Vegetation Type, Extent and Status

Three vegetation units defined by Beard (1990) were identified as part of the desktop assessment. These vegetation units identify the Pre-European extent of vegetation, as mapped by Beard (1990).

Information relating to known Beard (1990) vegetation units within the survey area has been summarised in Tables 2 and 3 below. This information has been compiled through both desktop assessments and the site visit.

Table 2: Summary of information regarding Pre-European and current vegetation extent of vegetation association 8 within the survey area

Factor	Value				
Beard Vegetation Association*	8				
Vegetation Association Description*	Medium woodland; salmon gum & gimlet				
Pre-European Extent (ha)	Scale				
	By Association	***By Association***	***By IBRA Region*** *(Coolgardie-COO)*	***By IBRA Sub-region*** *(Eastern Goldfields-COO3)*	***By Shire*** *(Shire of Coolgardie)*
	1,096,450*	694,638**	280,248**	226,086**	160,584**
% Pre-European Extent Remaining	*57.63%**	*49.89%***	*98.34%***	*99.53%***	*99.34%***
Surrounding Land Use***	Pasture Grazing, Exploration and Mining				
Weed prevalence***	Low				

* Source: Shepherd *et al.* (2002)
**Source: DPAW (2017)
***Source: Field Assessment

Table 3: Summary of information regarding Pre-European and current vegetation extent of vegetation association 468 within the survey area

Factor	Value				
Beard Vegetation Association*	468				
Vegetation Association Description*	Medium woodland; salmon gum & goldfields blackbutt				
Pre-European Extent (ha)	Scale				
	By Association	***By Association***	***By IBRA Region*** *(Coolgardie-COO)*	***By IBRA Sub-region*** *Eastern Goldfields-COO3)*	***By Shire*** *(Shire of Coolgardie)*
	476,113*	592,022**	583,357**	482,361**	149,487**
% Pre-European Extent Remaining	*100.00%**	*98.63%***	*98.63%***	*98.34%***	*99.43%***
Surrounding Land Use***	Pasture Grazing, Exploration and Mining				
Weed prevalence***	Low				

* Source: Shepherd *et al.* (2002)
**Source: DPAW (2017)
***Source: Field Assessment

4.1.5 Wetlands

No water bodies were identified within the survey area via the CPS Map Viewer (DWER, 2017).

4.1.6 Dieback

The survey area lies south of the 26th parallel, however receives average annual rainfall of approximately 270.3 mm (BOM, 2017), below the 400mm threshold mark. There is no record of *Phytophthora cinnamomi* establishing in natural ecosystems in regions receiving <400mm rainfall per annum (CALM, 2003). Therefore, Dieback is not considered an issue for this survey area, however all measures should be taken to prevent any possible soil contamination or weed infestations which could pose a risk within the survey area during seasonally favourable conditions.

4.2 FIELD ASSESSMENT

4.2.1 Vegetation of the Survey Area

Beard's vegetation associations are very broad and are used over large areas in which there is also a large amount of variation at a more local level. The vegetation groups described below for the survey area fit into the broader Beard descriptions above in section 4.1.4.

The vegetation groups described below were determined visually based on dominant species, to form the descriptions taken at the time of the field survey

Descriptions of all 29 sites/quadrats are presented in Appendix F. For each site the physical features, vegetation description and unit, along with the species lists for the 20 x 20m plots with typical canopy cover and height, are provided.

4.2.1.1 Vegetation Groups

Nine vegetation groups were identified during this survey, largely following topographical features and dominant species. Mapping of the 9 vegetation groups, as well as the quadrat locations can be seen in Appendix C. Photographs of each quadrat and the relevant vegetation group can be seen in Appendix F.

A. *Eucalyptus griffithsii* and *E. campaspe* over *Acacia acuminata* over mixed sclerophyll shrubland

Open Shrub Mallee of *Eucalyptus griffithsii* and *E. campaspe* over *Acacia acuminata* and *Eremophila oldfieldii* subsp. *angustifolia* over *Dodonaea lobulata, Scaevola spinescens, Beyeria sulcata* var. *sulcata* and *Ptilotus obovatus*.

Quadrats: 1 and 2

B. *Eucalyptus campaspe* and *Eucalyptus clelandii* woodland

Low Woodland of *Eucalyptus campaspe* and *E. clelandii* over *Eremophila oldfieldii* subsp. *angustifolia, Eremophila interstans* subsp*. virgata and Senna artemisioides* subsp. *filifolia* over *Atriplex nummularia* subsp. *spathulata, Eremophila scoparia, Acacia erinacea, Eremophila pustulata, Olearia muelleri* and *Ptilotus obovatus.*

Quadrats: 3, 4 and 5

C. *Eucalyptus griffithsii* woodland over Chenopod shrublands

Open Tree Mallee of *Eucalyptus griffithsii* over *Eremophila alternifolia* and *Atriplex nummularia* subsp*. spathulata* over *Senna artemisioides* subsp*. filifolia, Atriplex stipitata* and *Ptilotus obovatus.*

Quadrat: 7

D. Open Chenopod shrubland

Tall Open Shrubland of *Eremophila interstans* subsp. *virgata* and *Atriplex nummularia* subsp. *spathulata* over *Eremophila scoparia* and *Senna cardiosperma* over *Atriplex stipitata*.

Quadrat: 6

E. *Eucalyptus salmonophloia* woodland

Woodland of *Eucalyptus salmonophloia* with occasional *E. transcontinentalis* over occasional *E. oleosa* subsp. *oleosa* over *Eremophila scoparia, Exocarpos aphyllus, Eremophila caperata, Eremophila interstans* subsp. *virgata* and *Eremophila ionantha* over *Olearia muelleri, Senna artemisioides* subsp. filifolia, *Atriplex vesicaria, Atriplex stipitata, Senna cardiosperma, Acacia hemiteles, Ptilotus obovatus* and *Scaevola spinescens*.

Quadrats: 8,10,11,12,13,14 and 20

F. Mixed *Eucalyptus* woodland over sclerophyll shrubland

Low Woodland of *Eucalyptus clelandii, Eucalyptus salubris, Eucalyptus oleosa* subsp*. oleosa, Eucalyptus griffithsii* and occasional *Casuarina pauper* over *Eremophila interstans* subsp. *virgata, Santalum acuminatum, Eremophila caperata, and Eremophila oldfieldii* subsp. *angustifolia,* over *Senna artemisioides* subsp. *filifolia, Eremophila glabra* subsp. *glabra, Olearia muelleri, Acacia hemiteles, Eremophila pustulata* and *Eremophila parvifolia* subsp. *auricampa.*

Quadrats: 9, 15, 18, 19, 21, 24 and 29

G. *Eucalyptus thicket in open depressions*

Low Open Forrest of *Eucalyptus clelandii, E. salubris and E. oleosa* subsp. *oleosa* over *Senna artemisioides* subsp*. filifolia, Acacia merrallii, Exocarpos aphyllus* and *Eremophila scoparia* over *Acacia colletioides, Eremophila ionantha* and *Eremophila decipiens* subsp. *decipiens.*

Quadrats: 16 and 17

H. *Eucalyptus oleosa* subsp. *oleosa* over Chenopod shrublands

Open Shrub Mallee of *Eucalyptus oleosa subsp. oleosa* with occasional *E. yilgarnensis* over *Eremophila interstans* subsp. *virgata* and *Eremophila scoparia* over *Cratystylis subspinescens, Cratystylis conocephala, Eremophila decipiens* subsp. *decipiens* and *Eremophila parvifolia* subsp. *auricampa*.

Quadrats: 22 and 23

I. *Eucalyptus* over *Melaleuca sheathiana* over *Cratystylis conocephala* on calcrete rises

Low Woodland of *Eucalyptus clelandii* over *Melaleuca sheathiana, Acacia hemiteles* and *Exocarpos aphyllus* over *Cratystylis conocephala, Westringia rigida, Grevillea acuaria, Acacia colletioides* and *Eremophila scoparia*.

Quadrats: 25, 26, 27 and 28

J. Existing Disturbance

This classification was for the purposes of mapping and was completely degraded, including historic open pits, haul roads and waste landforms.

Table 4: Vegetation Group Extent within Survey Area

Vegetation Group	Families	Genera	Species	Area (ha)	Percentage of survey area (%)
A	14	16	24	5.051	0.86%
B	12	19	36	42.94	7.28%
C	9	15	26	1.55	0.26%
D	8	13	26	9.58	1.62%
E	14	26	53	164.27	27.85%
F	16	25	53	255.03	43.23%
G	9	11	19	26.90	4.56%
H	10	17	37	5.04	0.85%
I	14	24	40	55.37	9.39%
J- Existing Disturbance	0	0	0	24.18	4.10%
Total	**24***	**39***	**86***	**589.91#**	**100.00%#**

*Denotes total recorded in the survey area (not sum of column)
# Denotes sum of column

4.2.1.2 PATN Analysis of Quadrat Data

PATN Analysis was completed on both the dominant species and all species recorded within each quadrat. The results are supplied below in Figure 5 and Figure 6.

The PATN analysis dendrogram of the dominant species in Figure 5, displays each quadrat with like symbols representing NVS mapped vegetation groups, and coloured lines depicting PATN defined vegetation groups. The dendrogram shows a good association between vegetation groups described in section 4.2.1.1, however there were some outliers (highlighted green).

These outliers are expected to occur for vegetation groups with transitional dominant species. In most cases one or two species will be present within a 20x20 quadrat, but it will not contain all the varieties of dominant species that will occur across that vegetation type, and as such some quadrats of the same vegetation group will be separated as different when assessed by the PATN Analysis.

Quadrat Q19 and Q4 were grouped together via PATN analysis, however were mapped as different vegetation groups because of the overall species composition of surrounding vegetation.

Due to the overlap and variation of lower storey species, these were grouped together via PATN Analysis.

Quadrats 6 and 9, were grouped via PATN analysis with vegetation group B, however were mapped as group D and group F respectively based on other species present and vegetation structure.

Quadrat 12 and 24 were combined as a separate group via PATN Analysis, due to the presence of similar dominant species *Eucalyptus oleosa subsp. oleosa, Eremophila scoparia* and *Daviesia aphylla* however, overall species composition saw these quadrats mapped as groups E and F respectively.

Vegetation groups G and F have been grouped together via PATN analysis based on dominant species. These vegetation groups are varieties of *Eucalyptus* woodland, which demonstrates that although the dominant Eucalypts may differ between vegetation groups, the dominant understorey species may remain similar, providing stronger correlations to some quadrats representing different vegetation groups. The dendrogram also demonstrates stronger correlation within this grouping which favours the vegetation groups mapped by NVS, i.e. Q15, Q21 and Q29 are more similar, representing vegetation group F; Q16 and Q17 are grouped more similarly representing vegetation group G;

Quadrat 18 was combined with Vegetation Group I via PATN analysis based on dominant species, including *Eucalyptus clelandii*, *Exocarpos aphyllus* and *Acacia hemiteles*. This quadrat was mapped as part of group F due to the other non-dominant species present and the vegetation structure, as well as the lack of *Melaleuca sheathiana* and *Cratystylis conocephala*.

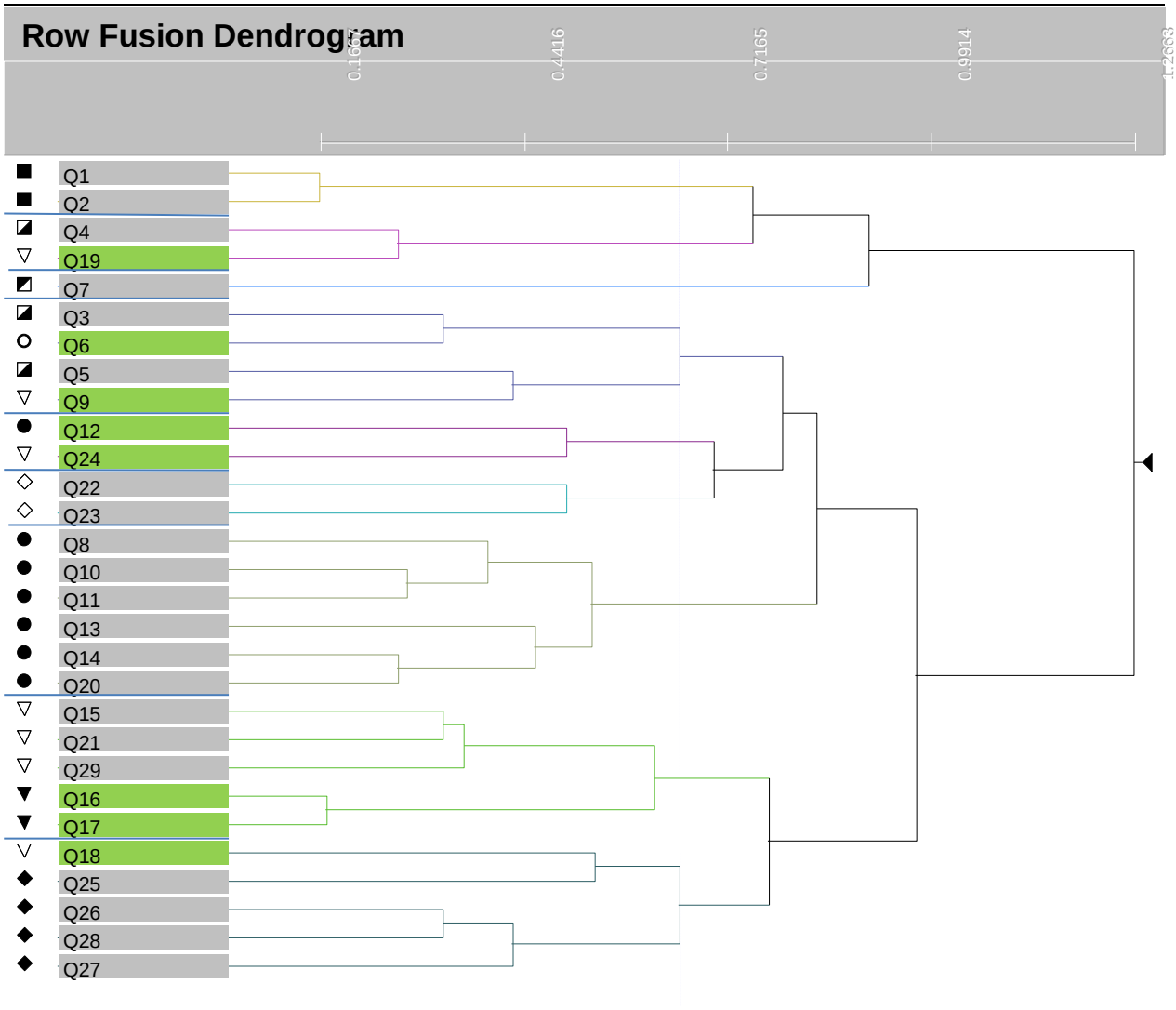

Figure 5: PATN Analysis of Dominant Species into 9 groups

The dendrogram below (Figure 6) of the analysis of all species shows a correlation to pre-grouped quadrats described in section 4.2.1.1. The dendrogram displays each quadrat with like symbols representing NVS mapped vegetation groups, and coloured lines depicting PATN defined vegetation groups. However, there were some outliers and these are highlighted in green (Figure 6).

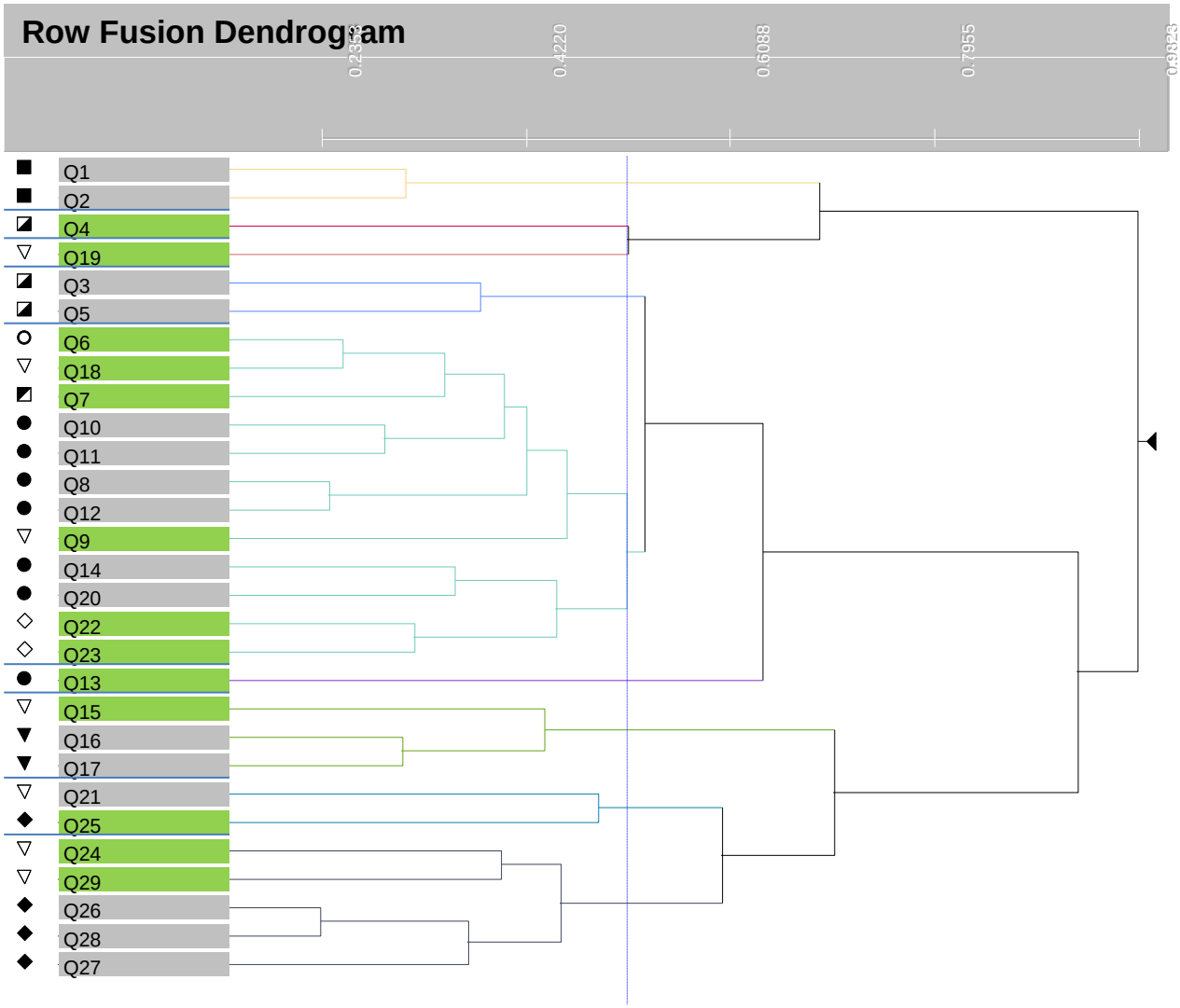

Figure 6: PATN Analysis of All Species into 9 groups

4.2.1.3 Vegetation Condition

Vegetation in the survey area has been subjected to historic mining, exploration activities and grazing.

According to Keighery (1994), most of the sites/quadrats inspected were in Good to Very Good condition (Appendix F). There were existing vehicle tracks in some areas, due to mine exploration activities. The vegetation more than 0.5m off these tracks was mostly in a Good to Very Good condition (Keighery 1994).

As discussed below in Section 4.2.2.4, there were two species of weeds observed during the survey.

4.2.2 Flora of the Survey Area

4.2.2.1 General

Eighty-six species were recorded within the survey area with 85 species recorded within quadrats. Thirty-nine genera and 24 families were found. These are listed in Appendix E, per Quadrat as well as per vegetation group. Of the native species, Chenopodiaceae had the highest representation, with 19 species from 8 genera, dominated by *Maireana.* Fabaceae and Scrophulariaceae were the next best represented families with 12 species each.

Of the 86 taxa recorded there were two introduced weed species; *Carrichtera annua* (Ward's Weed) and *Cucumis myriocarpus* (Prickly Paddy Melon). These weed species were recorded within 2 of the 29 quadrats. No weed species recorded were considered declared plants by DPIRD (2017).

The most common and widespread species were *Eremophila scoparia, Exocarpos aphyllus and Senna artemisioides* subsp. *filifolia,* which were recorded within 25 quadrats. Its canopy cover was 10-30%. The next most common and widespread species was *Ptilotus obovatus,* recorded in 19 quadrats, with a canopy cover less than 10%.

There were 30 taxa recorded from within a single site, Q23. Of these, none were weed species.

4.2.2.2 Species Accumulation Curves

A Species Accumulation Curve was generated using the computer programme **Species Diversity and Richness Version 4.1.2** (Seaby & Henderson, 2006). This curve was then fitted to a logarithmic curve in **Excel®**, which is plotted in Figure 7 below. According to the Species Accumulation Curve below, the R^2 value (0.998) shows an acceptable fit for a logarithmic curve of the total accumulated species per number of quadrats established (Figure 7).

Sufficient sampling was inferred via the effort of intensity (number of quadrats established) versus the return of species collected (total accumulated species). The logarithmic trend line and R^2 values were generated in **Excel®**. From this fitted logarithmic curve formula, the asymptote was calculated where the gain of new species was less than 1% for every new quadrat established. Based on this reasoning, the asymptote was reached at 25 quadrats, at which the extrapolated total accumulated number of species is 83.3. Therefore the 85 species collected within the 29 quadrats represents 102.03% of the projected asymptote.

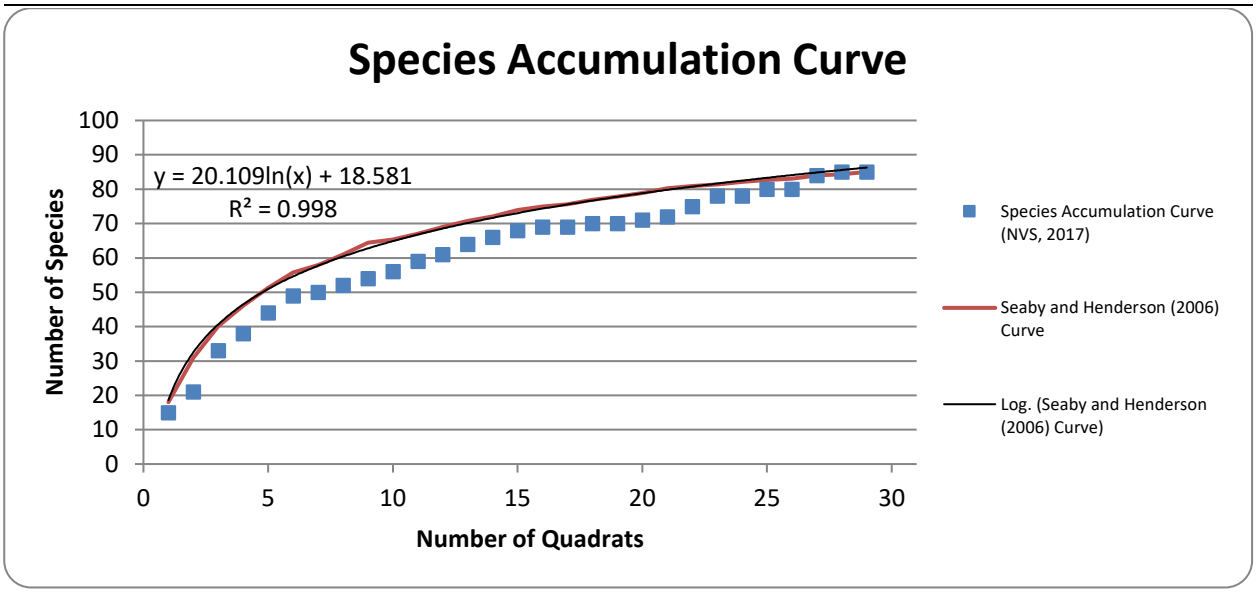

Figure 7: Species Accumulation Curve for the 29 sampled quadrats

4.2.2.3 Conservation significant species

No Threatened species were recorded during the survey.

One Priority species, *Eremophila praecox* (P1), was identified in the survey area within Q22, which lies within Vegetation Group H. Two plants were recorded here within a 200m radius. There is some suggestion that *Eremophila praecox* (P1) is a hybrid between *Eremophila ionantha* and *Eremophila parvifolia*, which were both abundant in the general area.

4.2.2.4 Introduced species

Two introduced species recorded in the survey area, not considered Declared Plants by the DPIRD (2017) are listed below:

- *Carrichtera annua* (Ward's Weed) is an annual, native to the Mediterranean. This weed is abundant in the Goldfields and Nullarbor shrublands, often dominating mine rehabilitation sites (Hussey *et al*, 2007). This species was recorded in Q5 and Q6.
- *Cucumis myriocarpus* (Prickly Paddy Melon) is a summer growing annual. It is a native southern Africa, and is often found in paddocks, roadsides and disturbed lands throughout the agricultural areas and southern Kimberley (Hussey *et al*, 2007). This species was recorded in Q5.

5 DISCUSSION

The EPA (2002) indicated that an ecological assessment of a site must consider its ecological value at the ecosystem level and its biodiversity value at the genetic, species and ecosystem level.

The survey area is located within the Eastern Goldfields subregion which includes four centres of endemism, all of which occur outside the survey area (CALM, 2002). This survey established that mostly, the flora within the project area is not unique, and is in fact common throughout the Eastern Goldfields subregion and adjoining regions.

Eighty-six species were recorded within the survey area with 85 species recorded within quadrats. Thirty-nine genera and 24 families were recorded. Of the native species, Chenopodiaceae had the highest representation, with 19 species from 8 genera, dominated by *Maireana.* Fabaceae and Scrophulariaceae were the next best represented families with 12 species each.

Of the 86 taxa recorded there were two introduced weed species; *Carrichtera annua* (Ward's Weed) and *Cucumis myriocarpus* (Prickly Paddy Melon) These weed species were recorded within 2 of the 29 quadrats. No weed species recorded were considered declared plants by DPIRD (2017).

No Threatened Flora were recorded in the survey area.

No TECs or PEC's were recorded within the survey area.

One Priority species, Eremophila praecox (P1), was identified in the survey area within Q22, which lies within Vegetation Group H. Two plants were recorded here within a 200m radius

Vegetation condition was generally 'Good' to 'Very Good' (Keighery 1994). Disturbance was present within the survey area mostly attributed to historic mining activities, access tracks, exploration related activities, and also grazing.

It is therefore not expected that the disturbance within the survey area will significantly negatively impact on the vegetation in the area in terms of fragmentation and loss of vegetation associations or species that may be unique. This is partially due to the overall size of the survey area as well as the similar abundant vegetation and habitat outside of the survey area.

6 IMPACT ASSESSMENT

6.1 THREATENING PROCESSES

The major processes likely to impact the Flora within the Survey area, if clearing were to proceed include:

- Vegetation clearing and therefore a reduction in biodiversity;
- Vehicle impacts on uncleared vegetation could increase if tracks are not adhered to;
- An increase in the area of disturbed land could result in an increase in non-native species;
- Dust generated during clearing of native vegetation and associated activities may settle on adjacent native vegetation, causing possible stress and perhaps death, especially during drier months; and
- Accidental fire arising from clearing and associated activities, may affect vegetation in surrounding areas.

7 CONCLUSIONS AND RECOMMENDATIONS

The survey established that the condition of the vegetation in the survey area is overall 'Good' to 'Very Good' condition. No Threatened Flora were recorded in the area. No TECs/PECs were recorded in the survey area.

One Priority Species *Eremophila praecox* (P1) was recorded in Q22. Only two plants were recorded at this location within a 200m radius.

The EPA objective for flora and vegetation is to maintain the abundance, species diversity and geographical distribution of flora and vegetation as well as protect Threatened flora consistent with the provisions of the *Biodiversity Conservation Act 2016.*

The proposed clearing of vegetation will result in the loss of some individuals from the local area; however, the impact will not be great enough to remove whole communities or populations. Most of the species and communities recorded during this survey are widespread throughout the Eastern Goldfields subregion and adjoining regions, and therefore the loss of a small proportion from this area will not be significant.

This report summarises the results of the first stage of the Level 2 survey. It is deemed necessary to conduct a second stage follow up survey in Spring 2017, to incorporate any additional annuals that may appear during this seasonal variation.

The following recommendations arise from the current flora survey:

- Follow-up Stage 2 survey in Spring 2017;
- Any disturbance/clearing be minimised as much as practicable to reduce the loss of individuals and impact on populations;
- Weed control measures should be implemented/followed during and post construction activities;
- Driving restrictions, ensuring that off-road driving is minimised; and
- All staff to be educated on the importance of fire prevention, and equipment provided for use in the event of fire.

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9 GLOSSARY

Acronyms:

BOM	Bureau of Meteorology, Australian Government
BSc	Bachelor of Science
CALM	Department of Conservation and Land Management (now DBCA)
COO	Coolgardie Bioregion, IBRA
COO3	Eastern Goldfields Subregion, IBRA
CPS	Clearing Permit System (DWER)
DBCA	Department of Biodiversity, Conservation and Attractions, Western Australia
DMIRS	Department of Mines, Industry Regulation and Safety, Western Australia
DRF	Declared Rare Flora
DOTEE	Department of the Environment and Energy, Australian Government
DPAW	Department of Parks and Wildlife, Western Australia (now DBCA)
DPIRD	Department of Primary Industries and Regional Development, Western Australia
DWER	Department of Water and Environmental Regulation, Western Australia
EPA	Environmental Protection Authority, Western Australia
EP Act	*Environmental Protection Act 1986*, Western Australia
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth Act)
ESA	Environmentally Sensitive Area
GIS	Geographical Information System
ha	Hectare (10,000 square metres)
IBRA	Interim Biogeographic Regionalisation for Australia, DOTEE
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union
km	Kilometres
m	Metres
NVS	Native Vegetation Solutions
PEC	Priority Ecological Community, Western Australia
TEC	Threatened Ecological Community
WA	Western Australia
WAHERB	Western Australian Herbarium, DBCA

Definitions:

{DPAW (2017) Conservation Codes for Western Australian Flora and Fauna. Department of Parks and Wildlife, Western Australia, May 2017}: -

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

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

Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the Wildlife Conservation Act. The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

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

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

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

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

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

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

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

P Priority species
Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

P1 Priority One - Poorly-known species:
Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

P2 Priority Two - Poorly-known species:
Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

P3 Priority Three - Poorly-known species:
Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

P4 Priority Four - Rare, Near Threatened and other species in need of monitoring:
(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.
(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix A - Vegetation Condition Scale (Keighery, 1994)

Pristine (1). Pristine or nearly so, no obvious signs of disturbance.

Excellent (2). Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.

Very Good (3). Vegetation structure altered obvious signs of disturbance.
For example, disturbance to vegetation structure caused by repeating fires, the presence of some more aggressive weeds, dieback, logging and grazing.

Good (4). Vegetation structure significantly altered by very obvious signs of multiple disturbance.
Retains basic vegetation structure or ability to regenerate it.
For example, disturbance to vegetation structure caused by frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

Degraded (5). Basic vegetation structure severely impacted by disturbance.
Scope for regeneration but not to a state approaching good condition without intensive management.
For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

Completely Degraded (6). The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.
These areas are often described as ‘parkland cleared’ with the flora compromising weed or crop species with isolated trees or shrubs.

Appendix B – EPBC and Other Government Database Search Results

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

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

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

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

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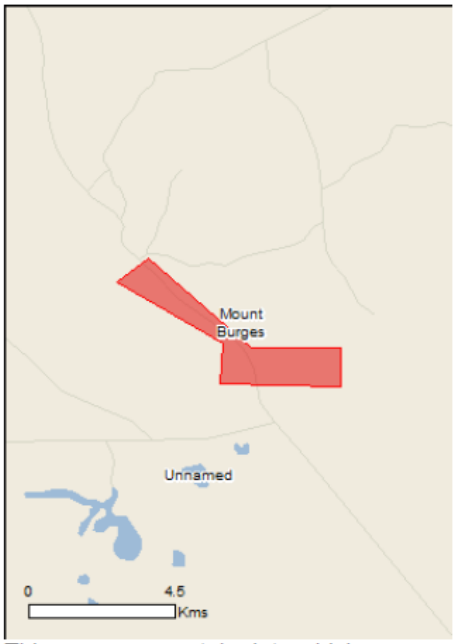

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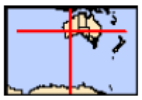
Coordinates
Buffer: 1.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	4
Listed Migratory Species:	6

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	9
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	7
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may occur within area
Plants		
Gastrolobium graniticum Granite Poison [14872]	Endangered	Species or species habitat likely to occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Mammals		
Capra hircus Goat [2]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Carrichtera annua Ward's Weed [9511]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-30.7021 120.9099,-30.708 120.9013,-30.7224 120.9309,-30.7321 120.9298,-30.7328 120.9632,-30.7235 120.9634,-30.7234 120.9387,-30.7021 120.9099

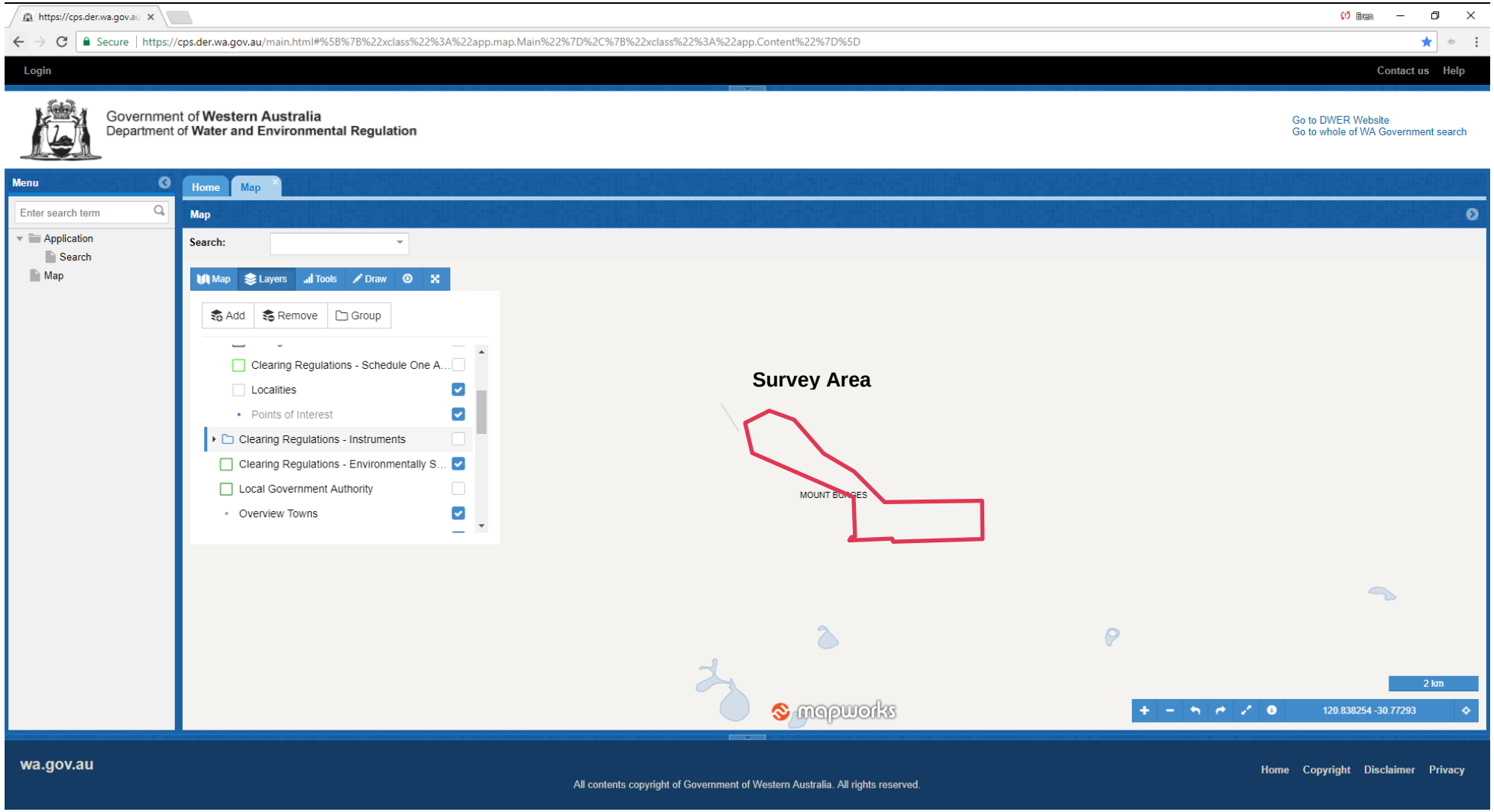
Acknowledgements

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

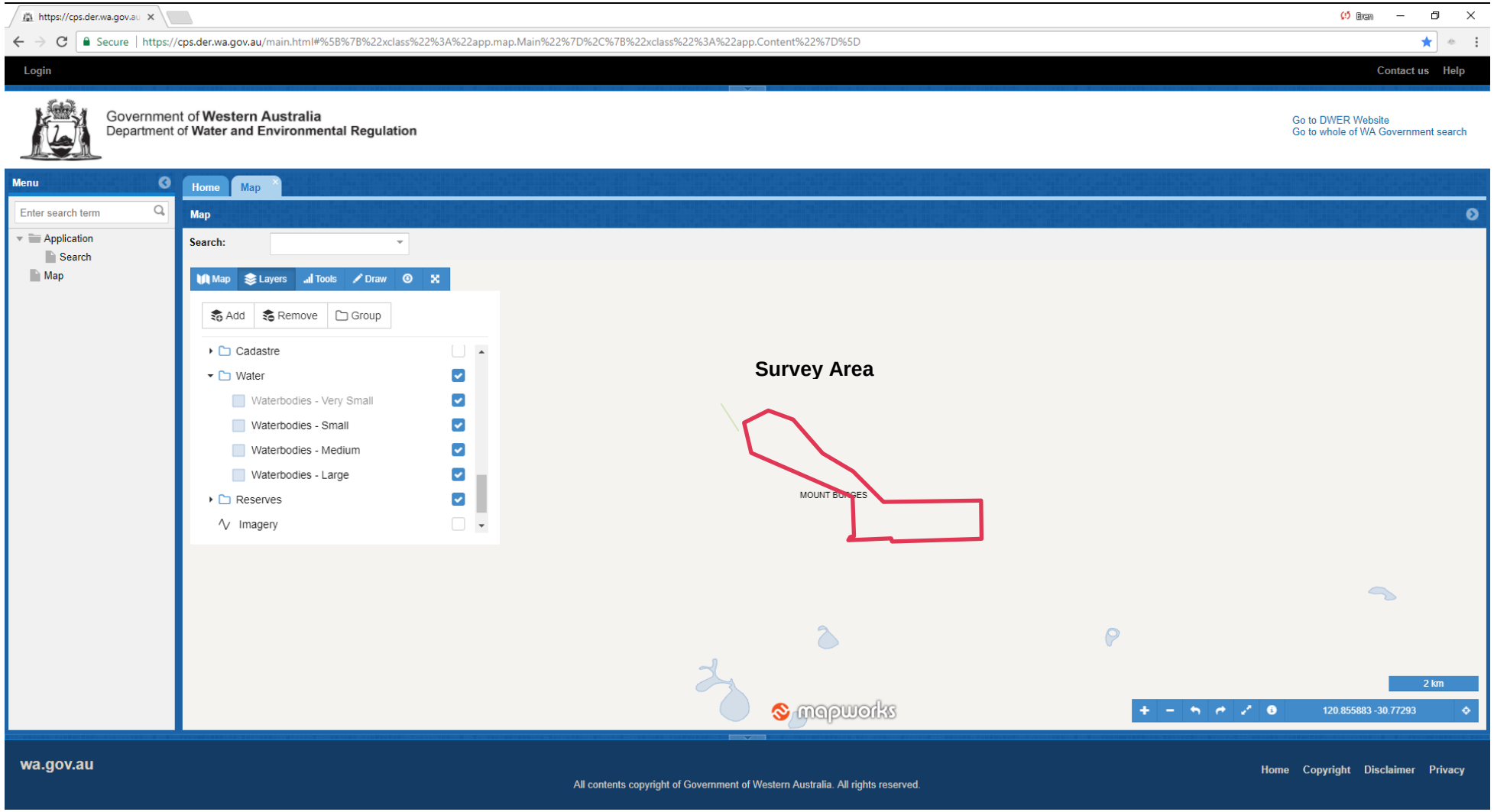
-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management,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

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

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

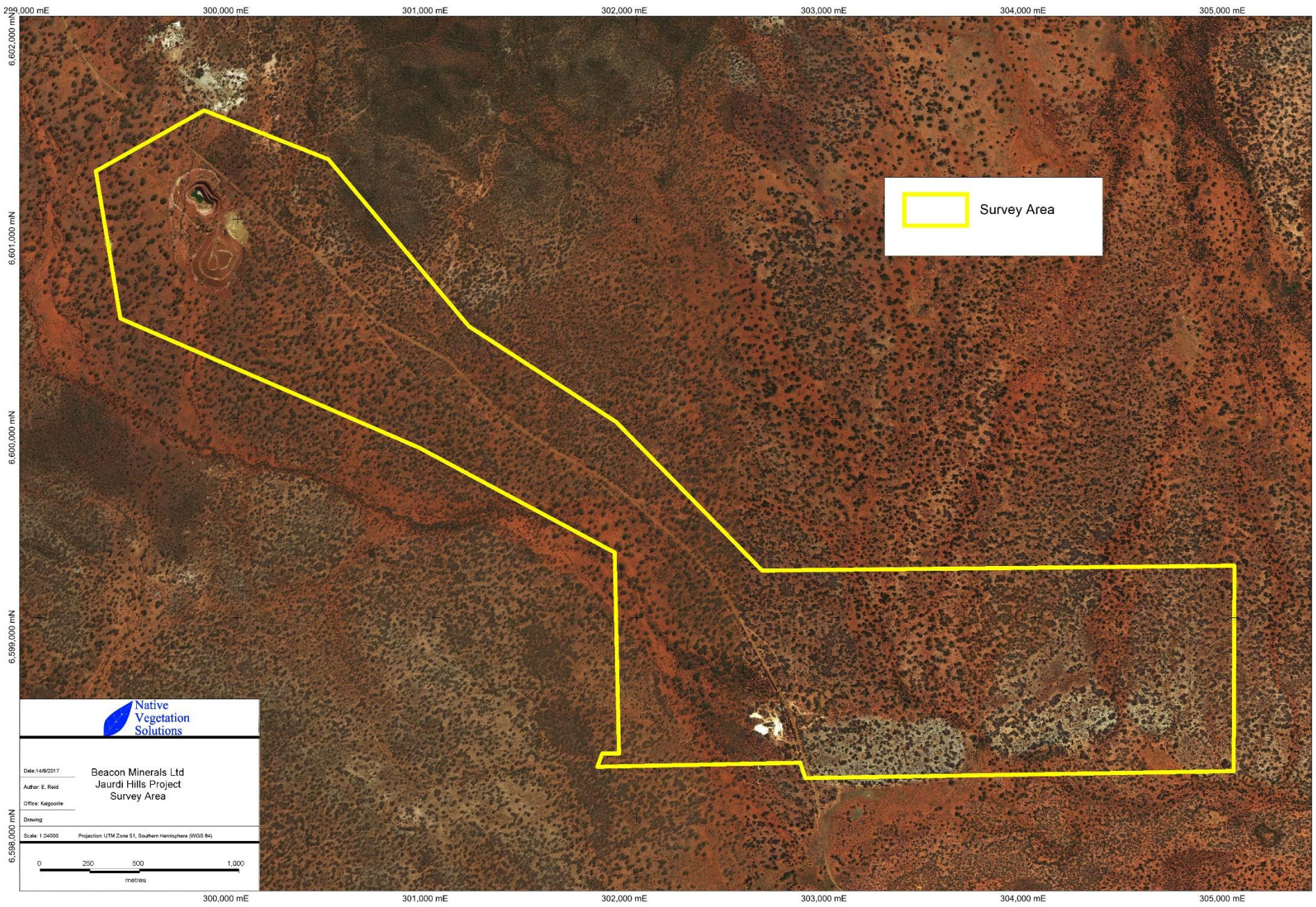


DWER CPS Map Viewer - showing no ESA's (dark green shaded areas) within the survey area (pink polygon) (DWER, 2017)



DWER CPS Map Viewer - showing no water bodies within the survey area (pink polygon) (DWER, 2017)

Appendix C - Maps


299,000 mE
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303,000 mE
304,000 mE
305,000 mE
6,602,000 mN
6,601,000 mN
6,600,000 mN
6,599,000 mN
6,598,000 mN
Survey Area
Native Vegetation Solutions
Date:14/8/2017
Author: E. Reid
Office: Kalgoorlie
Drawing:
Scale: 1:24000
Projection: UTM Zone 51, Southern Hemisphere (WGS 84)
Beacon Minerals Ltd
Jaurdi Hills Project
Survey Area
0
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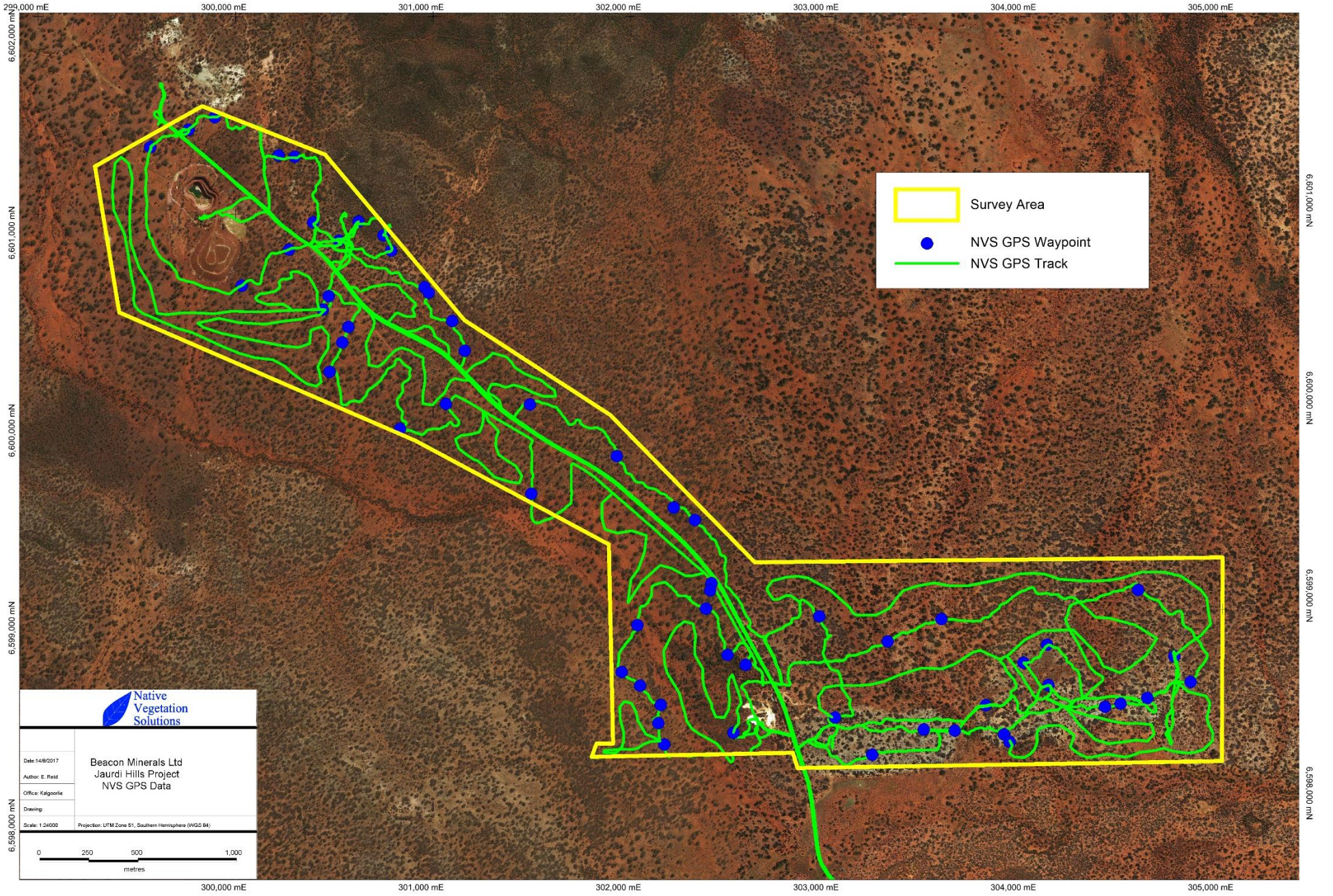
metres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6,599,000 mN
6,598,000 mN
Survey Area
NVS GPS Waypoint
NVS GPS Track
Native Vegetation Solutions
Date:14/8/2017
Author: E. Reid
Office: Kalgoorlie
Drawing:
Scale: 1:24000
Beacon Minerals Ltd
Jaurdi Hills Project
NVS GPS Data
Projection: UTM Zone 51, Southern Hemisphere (WGS 84)
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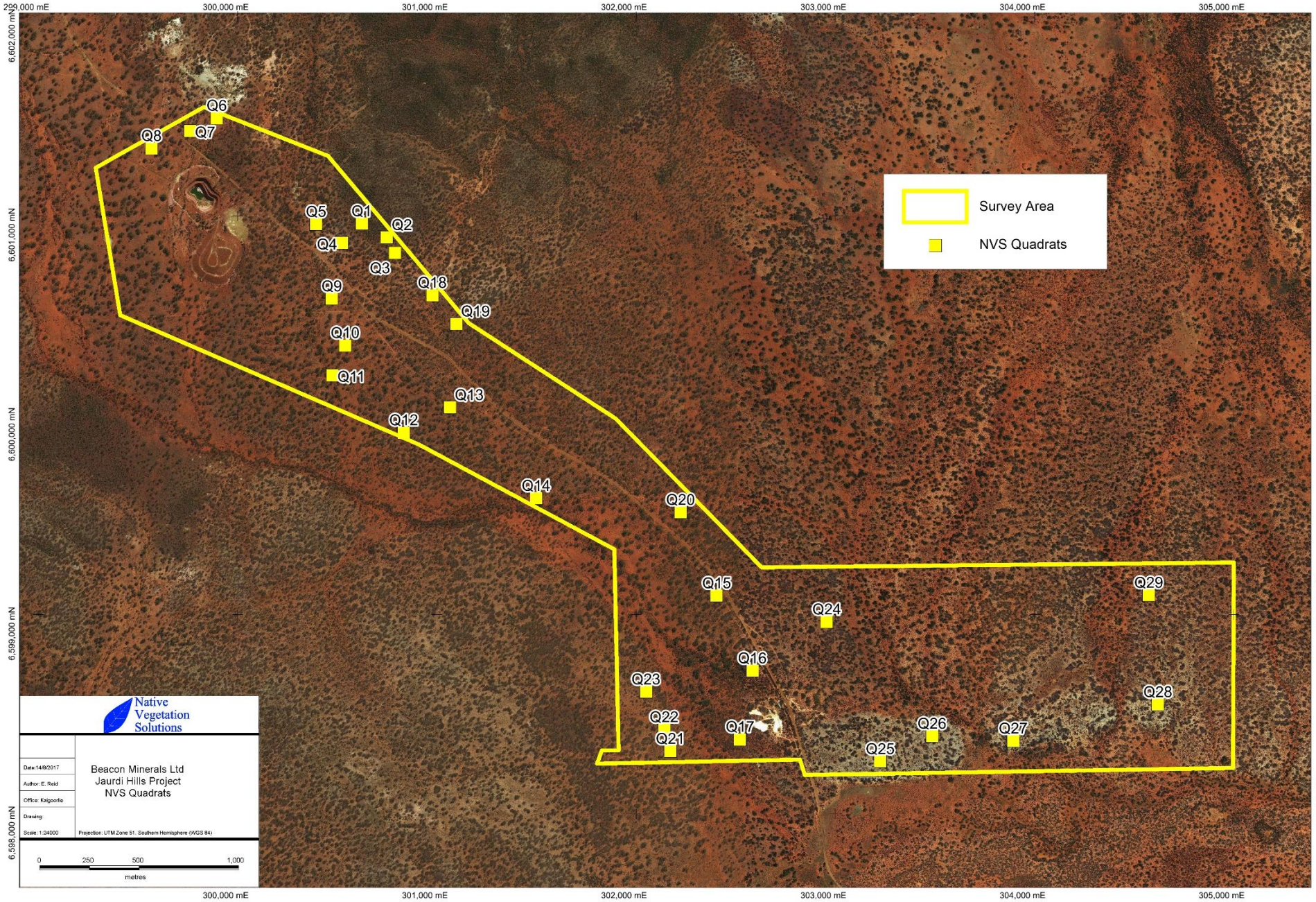
metres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Q19
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Q11
Q13
Q12
Q14
Q20
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Q29
Q24
Q16
Q23
Q28
Q22
Q21
Q17
Q26
Q27
Q25
Survey Area
NVS Quadrats
Native Vegetation Solutions
Date:14/8/2017
Author: E. Reid
Office: Kalgoorlie
Drawing:
Scale: 1:24000
Beacon Minerals Ltd
Jaurdi Hills Project
NVS Quadrats
Projection: UTM Zone 51, Southern Hemisphere (WGS 84)
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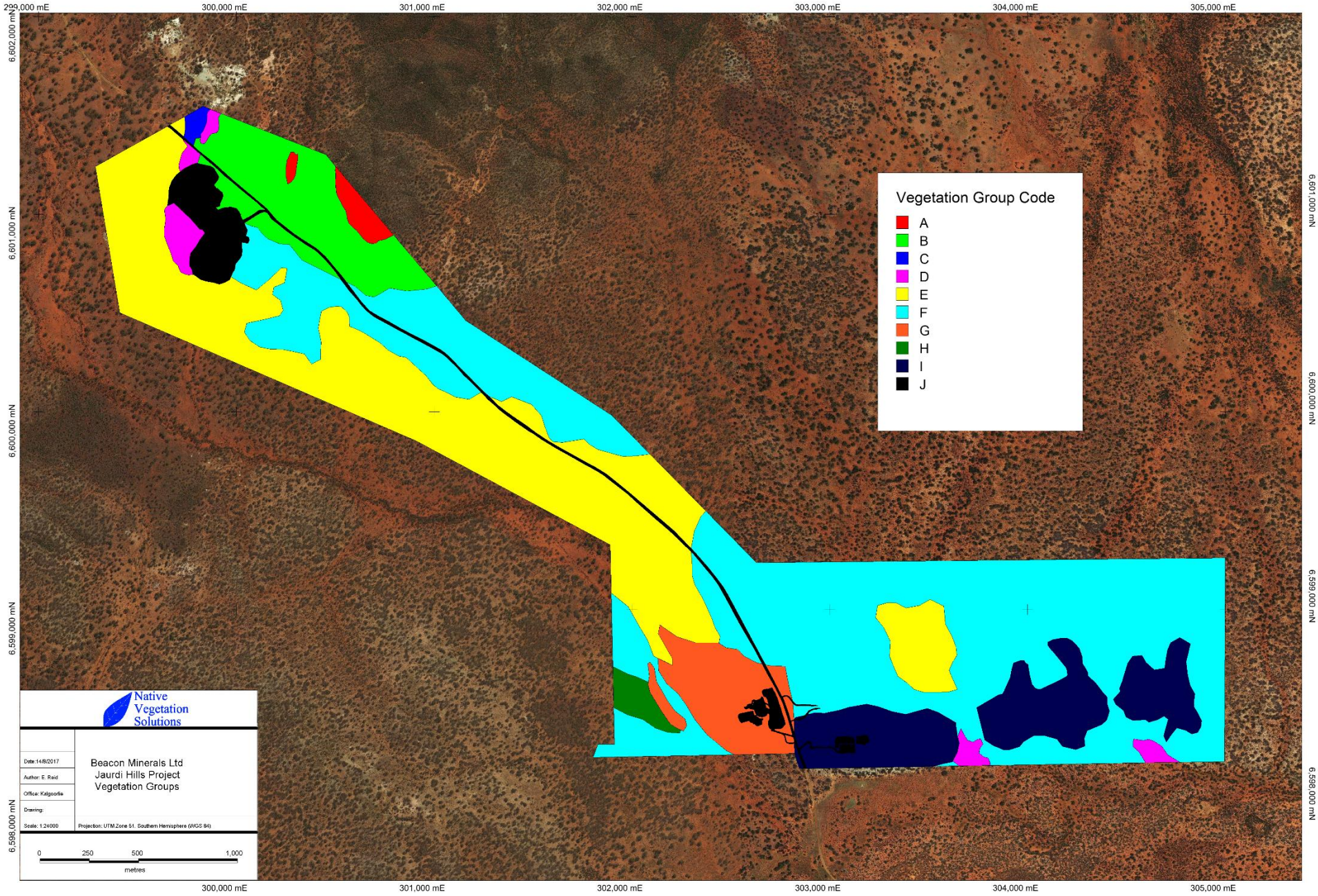
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Vegetation Group Code
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B
C
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F
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H
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J
Native Vegetation Solutions
Date:14/8/2017
Author: E. Reid
Office: Kalgoorlie
Drawing:
Scale: 1:24000
Beacon Minerals Ltd
Jaurdi Hills Project
Vegetation Groups
Projection: UTM Zone 51, Southern Hemisphere (WGS 84)
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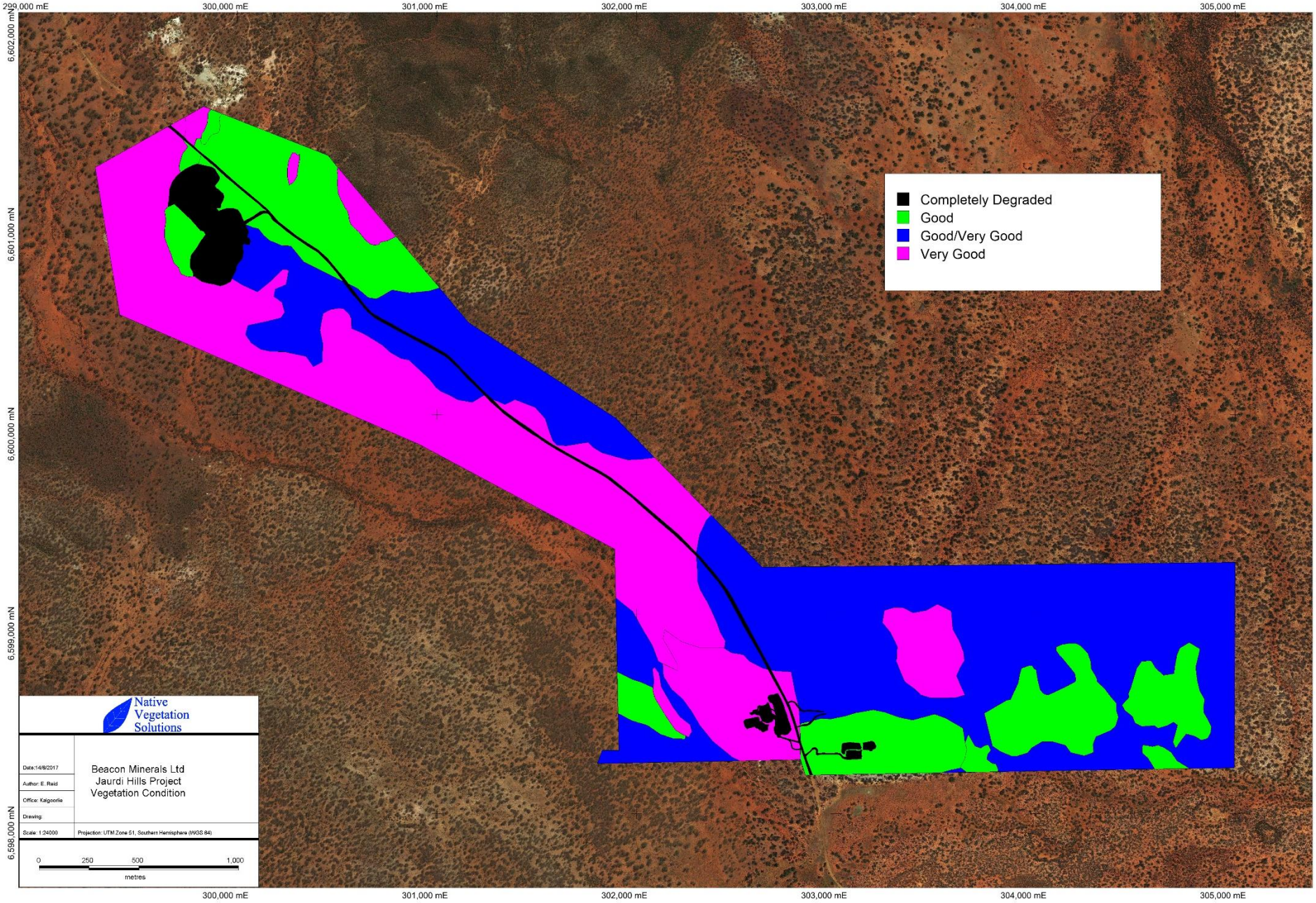
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6,599,000 mN
6,598,000 mN
Completely Degraded
Good
Good/Very Good
Very Good
Native Vegetation Solutions
Date:14/8/2017
Author: E. Reid
Office: Kalgoorlie
Drawing:
Scale: 1:24000
Beacon Minerals Ltd
Jaurdi Hills Project
Vegetation Condition
Projection: UTM Zone 51, Southern Hemisphere (WGS 84)
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1,000
metres

Appendix D – Threatened Flora Database Search Results

Taxon	Status	Distribution	Flowering Period
Acacia crenulata	P3	Southern Cross, Carrabin, Bullabulling, Walyahmoning Rock, Chiddarcooping, Sandford Rocks N.R., Marvel Loch	Sep-Oct
Alyxia tetanifolia	P3	Kalgoorlie, Diemals, Goongarri, Boogardie, Mt Magnet	May
Angianthus prostratus	P3	Glenorn Stn, Baladjie Lake NR, Quairading, Lake Barlee, Bulga Downs Stn, Kalgoorlie	Jul-Sept
Austroparmelina macrospora	P3	Kalgoorlie, Ninghan Stn, Wanjarri NR,Mount Harry, Kathleen, Bullfinch, Kalbarri	
Baeckea sp. Bulla Bulling (D.J.E. Whibley 4648)	P1	Kalgoorlie, Bulla Bulling	Oct
Calytrix creswellii	P3	Helena & Aurora Range,Credo Stn., Mt Manning Range, Wallaroo Rock	Nov-Dec
Cryptandra crispula	P3	Lake Lefroy, Bullabulling, Karonie, Fraser Range	Jul-Sep
Cyathostemon verrucosus	P3	Bungalbin Hill, Helena & Aurora Ranges, Queen Victoria Rocks, Kalgoorlie, Boorabbin	Sep-Dec,Mar
Diocirea microphylla	P3	Bullabulling, Gibraltar, Maggie Hays Hill, Lake Johnston	Dec
Elachanthus pusillus	P2	Orchid Rock, Cocklebiddy, Kalgoorlie, Jaurdi Stn	Oct
Eremophila praecox	P1	Five Mile Hill, (Kurrawang), Kalgoorlie, Kanowna Belle	Aug-Sep,Dec
Eucalyptus crucis subsp. crucis	T	Westonia, Southern Cross, Burracoppin, Ora Banda	Dec-Mar
Eutaxia actinophylla	P3	Norseman, Salmon Gums, Mt Newmont, Bruce Rock, Wallaroo Rock, Mt Willgonarinya	Sep-Dec
Gastrolobium graniticum	T	Coolgardie, Gnamma Hill, Narembeen, Yellowdine, Bullabulling	Aug-Nov
Hakea rigida	P2	Campion, Bullfinch, Wallaroo Rock, Mt Burges	Sep
Hakea sp. Great Victoria Desert (L. Cockram LAC 139) PN	P1	E Kalgoorlie	
Lepidium fasciculatum	P3	Salmon Gums, Kalgoorlie, Esperance, Mingenew	Oct-Feb
Notisia intonsa	P3	Gibraltar, Boorabbin, Dundas, Ravensthorpe, North Ironcap, Ora Banda, Lake Cowan, Parker Range	Sep
Phebalium clavatum	P2	Londonderry	Nov
Styphelia sp. Bullfinch (M. Hislop 3574)	P3	Jackson Range, Bullfinch, Koolyanobbing, Bullabulling, Diemals Stn.	Apr-May
Xanthoparmelia dayiana	P3	Kalgoorlie, Northern Territory, Karara	

Additional taxa supplied via database coordinates

Taxon	Conservation Code
Acacia coatesii	P1
Acacia epedunculata	P1
Acacia sclerophylla var. teretiuscula	P1
Acacia websteri	P1
Allocasuarina eriochlamys subsp. grossa	P3
Austrostipa blackii	P3
Chrysocephalum apiculatum subsp. norsemanense	P3
Eremophila caerulea subsp. merrallii	P4
Eremophila veronica	P3
Eucalyptus jutsonii subsp. jutsonii	P4
Gompholobium cinereum	P3
Grevillea georgeana	P3
Lepidium merrallii	P2
Melichrus sp. Coolgardie (K.R. Newbey 8698)	P1
Myriophyllum petraeum	P4
Phebalium appressum	P1
Phlegmatospermum eremaeum	P3
Ptilotus chortophytus	P1
Thryptomene sp. Coolgardie (E. Kelso s.n. 1902)	P1
Thryptomene sp. Londonderry (R.H. Kuchel 1763)	P1

Appendix E - Species Recorded During the July 2017 Survey

Species List per Quadrat

Family	Genus	Species	A, P, NN	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29
Amaranthaceae	Ptilotus	aervoides	A					*																*		*						
Amaranthaceae	Ptilotus	obovatus	P	*	*	*		*	*	*	*	*	*	*	*		*	*		*	*	*	*		*	*						
Apocynaceae	Marsdenia	australis	P	*						*			*	*								*						*				
Asteraceae	Cratystylis	conocephala	P										*					*						*	*	*			*		*	
Asteraceae	Cratystylis	microphylla	P																						*						*	
Asteraceae	Cratystylis	subspinescens	P																							*		*				
Asteraceae	Olearia	muelleri	P		*	*		*				*	*	*		*		*			*	*	*		*		*	*	*	*	*	*
Asteraceae	Olearia	pimeleoides	P																		*											
Brassicaceae	Carrichtera	annua	A, NN					*	*																							
Casuarinaceae	Casuarina	pauper	P									*							*													
Chenopodiaceae	Atriplex	nummularia subsp. spathulata	P			*		*	*	*		*				*	*				*		*	*				*				
Chenopodiaceae	Atriplex	stipitata	P			*		*	*	*	*		*			*	*						*		*	*						
Chenopodiaceae	Atriplex	vesicaria	P			*		*	*	*			*			*	*				*		*		*	*	*	*	*	*		
Chenopodiaceae	Chenopodium	gaudichaudianum	P					*	*	*	*	*	*		*		*						*	*	*	*		*				
Chenopodiaceae	Enchylaena	tomentosa var. tomentosa	P			*		*	*	*			*	*	*		*						*		*	*					*	
Chenopodiaceae	Eriochiton	sclerolaenoides	P																				*	*	*	*						
Chenopodiaceae	Maireana	georgei	P	*	*	*		*		*	*	*	*				*						*	*		*		*				
Chenopodiaceae	Maireana	pentatropis	P					*			*							*					*		*		*	*	*	*	*	
Chenopodiaceae	Maireana	pyramidata	P						*																	*						
Chenopodiaceae	Maireana	sedifolia	P			*										*							*	*		*						
Chenopodiaceae	Maireana	thesioides	P																							*						
Chenopodiaceae	Maireana	tomentosa	P			*			*	*	*	*			*		*				*			*	*	*	*		*	*		
Chenopodiaceae	Maireana	trichoptera	P			*		*	*	*	*		*	*	*						*					*		*				
Chenopodiaceae	Maireana	triptera	P		*	*		*	*	*	*			*	*		*															
Chenopodiaceae	Rhagodia	drummondii	P						*	*	*		*	*	*		*				*			*	*	*		*	*	*	*	
Chenopodiaceae	Salsola	australis	A														*															
Chenopodiaceae	Sclerolaena	densiflora	P			*		*	*		*	*	*	*	*	*	*				*		*	*	*	*		*				
Chenopodiaceae	Sclerolaena	diacantha	P			*			*	*	*	*	*	*	*						*		*	*		*		*				
Chenopodiaceae	Sclerolaena	patenticuspis	P						*								*							*		*						
Cucurbitaceae	Cucumis	myriocarpus	A, NN					*																								
Euphorbiaceae	Beyeria	sulcata var. sulcata	P	*																												
Fabaceae	Acacia	acuminata	P	*	*					*																						
Fabaceae	Acacia	colletioides	P																*	*		*	*	*			*		*	*		*
Fabaceae	Acacia	erinacea	P		*		*															*										
Fabaceae	Acacia	hemiteles	P									*	*	*		*	*			*	*	*	*						*	*	*	*
Fabaceae	Acacia	ligulata	P													*												*				
Fabaceae	Acacia	merrallii	P															*	*	*				*				*	*		*	*
Fabaceae	Acacia	prainii	P											*																		
Fabaceae	Acacia	tetragonophylla	P	*						*																				*		
Fabaceae	Daviesia	aphylla	P												*	*											*					
Fabaceae	Senna	artemisioides subsp. artemisioides	P						*	*						*	*		*	*	*		*									*
Fabaceae	Senna	artemisioides subsp. filifolia	P					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Fabaceae	Senna	cardiosperma	P			*	*		*		*		*		*	*		*			*	*	*	*		*						
Frankeniaceae	Frankenia	interioris	P																					*	*	*						
Goodeniaceae	Scaevola	collaris	P																											*		*

Family	Genus	Species	A, P, NN	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29
Goodeniaceae	Scaevola	spinescens	P	*	*				*	*	*	*	*	*	*	*		*			*	*	*							*		*
Hemerocallidaceae	Dianella	revoluta subsp. divaricata	P																											*		
Lamiaceae	Westringia	rigida	P				*															*						*	*	*	*	*
Loranthaceae	Amyema	preissii	P										*									*										
Myrtaceae	Eucalyptus	campaspe	P	*	*	*	*	*																								
Myrtaceae	Eucalyptus	clelandii	P				*	*				*						*	*	*	*	*		*			*	*	*	*	*	*
Myrtaceae	Eucalyptus	griffithsii	P	*	*					*												*										
Myrtaceae	Eucalyptus	oleosa subsp. oleosa	P												*				*	*					*	*	*					
Myrtaceae	Eucalyptus	salmonophloia	P								*		*	*	*	*	*						*									
Myrtaceae	Eucalyptus	salubris	P															*	*	*												*
Myrtaceae	Eucalyptus	transcontinentalis	P													*																
Myrtaceae	Eucalyptus	yilgarnensis	P																							*						
Myrtaceae	Melaleuca	sheathiana	P																									*	*	*	*	
Pittosporaceae	Pittosporum	angustifolium	P											*																		
Poaceae	Austrostipa	elegantissima	P	*	*								*	*			*		*			*		*			*	*	*			*
Poaceae	Triodia	rigidissima	P																											*		
Proteaceae	Grevillea	acuaria	P																											*		
Santalaceae	Exocarpos	aphyllus	P	*	*	*			*	*	*	*	*	*	*	*	*			*	*	*	*	*	*	*	*	*	*	*	*	*
Santalaceae	Santalum	acuminatum	P			*												*		*	*		*									
Santalaceae	Santalum	spicatum	P		*								*	*							*		*									
Sapindaceae	Dodonaea	lobulata	P	*	*																											
Sapindaceae	Dodonaea	viscosa subsp. angustissima	P																									*	*	*		
Scrophulariaceae	Eremophila	alternifolia	P							*				*						*												
Scrophulariaceae	Eremophila	caperata	P													*		*						*			*					*
Scrophulariaceae	Eremophila	decipiens subsp. decipiens	P			*				*								*	*	*			*		*	*		*		*		
Scrophulariaceae	Eremophila	glabra subsp. glabra	P		*		*		*	*		*		*	*						*	*	*		*	*				*	*	
Scrophulariaceae	Eremophila	interstans subsp. virgata	P	*		*		*	*			*	*	*							*	*			*	*						
Scrophulariaceae	Eremophila	ionantha	P														*	*	*	*			*		*					*		
Scrophulariaceae	Eremophila	longifolia	P				*																									
Scrophulariaceae	Eremophila	oldfieldii subsp. angustifolia	P	*	*		*		*					*			*				*	*										
Scrophulariaceae	Eremophila	parvifolia subsp. auricampa	P																						*		*	*	*	*	*	*
Scrophulariaceae	Eremophila	praecox (P1)	P																						*							
Scrophulariaceae	Eremophila	pustulata	P				*	*														*										
Scrophulariaceae	Eremophila	scoparia	P		*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*		*	*	*	*
Solanaceae	Duboisia	hopwoodii	P								*																					
Solanaceae	Solanum	lasiophyllum	P	*	*			*	*	*	*		*	*							*											
Solanaceae	Solanum	nummularium	P						*	*			*				*	*	*		*		*	*	*			*		*		
Thymelaeaceae	Pimelea	microcephala subsp. microcephala	P											*			*	*	*				*		*	*						
Zygophyllaceae	Zygophyllum	eremaeum	A				*																									

Species List per Vegetation Group (Quadrat data including opportunistic sampling)

Family	Genus	Species	A, P, NN	Vegetation Group Codes								
				A	B	C	D	E	F	G	H	I
Amaranthaceae	Ptilotus	aervoides	A		*				*		*	
Amaranthaceae	Ptilotus	obovatus	P	*	*	*	*	*	*	*	*	
Apocynaceae	Alyxia	buxifolia	P									*
Apocynaceae	Marsdenia	australis	P	*		*		*	*			*
Asteraceae	Cratystylis	conocephala	P					*	*		*	*
Asteraceae	Cratystylis	microphylla	P								*	*
Asteraceae	Cratystylis	subspinescens	P								*	*
Asteraceae	Olearia	muelleri	P	*	*			*	*		*	*
Asteraceae	Olearia	pimeleoides	P						*			
Brassicaceae	Carrichtera	annua	A, NN		*		*					
Casuarinaceae	Casuarina	pauper	P	*					*	*		
Chenopodiaceae	Atriplex	nummularia subsp. spathulata	P	*	*	*	*	*	*			*
Chenopodiaceae	Atriplex	stipitata	P		*	*	*	*			*	
Chenopodiaceae	Atriplex	vesicaria	P		*	*	*	*	*		*	*
Chenopodiaceae	Chenopodium	gaudichaudianum	P		*	*	*	*	*		*	*
Chenopodiaceae	Enchylaena	tomentosa var. tomentosa	P		*	*	*	*			*	*
Chenopodiaceae	Eriochiton	sclerolaenoides	P					*	*		*	
Chenopodiaceae	Maireana	georgei	P	*	*	*		*	*		*	*
Chenopodiaceae	Maireana	pentatropis	P		*			*	*		*	*
Chenopodiaceae	Maireana	pyramidata	P				*				*	
Chenopodiaceae	Maireana	sedifolia	P		*			*	*		*	
Chenopodiaceae	Maireana	thesioides	P								*	
Chenopodiaceae	Maireana	tomentosa	P		*	*	*	*	*		*	*
Chenopodiaceae	Maireana	trichoptera	P		*	*	*	*	*		*	*
Chenopodiaceae	Maireana	triptera	P	*	*	*	*	*				
Chenopodiaceae	Rhagodia	drummondii	P		*	*	*	*	*		*	*
Chenopodiaceae	Salsola	australis	A					*				
Chenopodiaceae	Sclerolaena	densiflora	P		*		*	*	*		*	*
Chenopodiaceae	Sclerolaena	diacantha	P		*	*	*	*	*		*	*
Chenopodiaceae	Sclerolaena	patenticuspis	P				*	*	*		*	
Cucurbitaceae	Cucumis	myriocarpus	A, NN		*							
Euphorbiaceae	Beyeria	sulcata var. sulcata	P	*								
Fabaceae	Acacia	acuminata	P	*		*						
Fabaceae	Acacia	colletioides	P					*	*	*		*
Fabaceae	Acacia	erinacea	P	*	*				*			
Fabaceae	Acacia	hemiteles	P					*	*	*		*
Fabaceae	Acacia	ligulata	P					*				*
Fabaceae	Acacia	merrallii	P						*	*		*
Fabaceae	Acacia	prainii	P					*				
Fabaceae	Acacia	tetragonophylla	P	*		*						*
Fabaceae	Daviesia	aphylla	P					*	*			
Fabaceae	Senna	artemisioides subsp. artemisioides	P			*	*	*	*	*		
Fabaceae	Senna	artemisioides subsp. filifolia	P		*	*	*	*	*	*	*	*
Fabaceae	Senna	cardiosperma	P		*		*	*	*		*	
Frankeniaceae	Frankenia	interioris	P						*		*	
Goodeniaceae	Scaevola	collaris	P						*			*
Goodeniaceae	Scaevola	spinescens	P	*		*	*	*	*			*

Family	Genus	Species	A, P, NN	Vegetation Group Codes								
				A	B	C	D	E	F	G	H	I
Hemerocallidaceae	Dianella	revoluta subsp. divaricata	P									*
Lamiaceae	Westringia	rigida	P		*				*			*
Loranthaceae	Amyema	preissii	P					*	*			
Myrtaceae	Eucalyptus	campaspe	P	*	*							
Myrtaceae	Eucalyptus	clelandii	P		*			*	*	*		*
Myrtaceae	Eucalyptus	griffithsii	P	*		*			*			
Myrtaceae	Eucalyptus	oleosa subsp. oleosa	P	*				*	*	*	*	
Myrtaceae	Eucalyptus	salmonophloia	P					*				
Myrtaceae	Eucalyptus	salubris	P						*	*		
Myrtaceae	Eucalyptus	transcontinentalis	P					*				
Myrtaceae	Eucalyptus	yilgarnensis	P					*			*	
Myrtaceae	Melaleuca	sheathiana	P									*
Pittosporaceae	Pittosporum	angustifolium	P					*				
Poaceae	Austrostipa	elegantissima	P	*				*	*	*		*
Poaceae	Triodia	rigidissima	P									*
Proteaceae	Grevillea	acuaria	P									*
Santalaceae	Exocarpos	aphyllus	P	*	*	*	*	*	*	*	*	*
Santalaceae	Santalum	acuminatum	P		*			*	*	*		
Santalaceae	Santalum	spicatum	P	*				*	*			
Sapindaceae	Dodonaea	lobulata	P	*								
Sapindaceae	Dodonaea	viscosa subsp. angustissima	P									*
Scrophulariaceae	Eremophila	alternifolia	P			*		*		*		
Scrophulariaceae	Eremophila	caperata	P					*	*			
Scrophulariaceae	Eremophila	decipiens subsp. decipiens	P		*	*		*	*	*	*	*
Scrophulariaceae	Eremophila	glabra subsp. glabra	P	*	*	*	*	*	*		*	*
Scrophulariaceae	Eremophila	interstans subsp. virgata	P	*	*		*	*	*		*	
Scrophulariaceae	Eremophila	ionantha	P					*	*	*	*	*
Scrophulariaceae	Eremophila	longifolia	P		*							
Scrophulariaceae	Eremophila	oldfieldii subsp. angustifolia	P	*	*		*	*	*			
Scrophulariaceae	Eremophila	parvifolia subsp. auricampa	P						*		*	*
Scrophulariaceae	Eremophila	praecox (P1)	P								*	
Scrophulariaceae	Eremophila	pustulata	P		*				*			
Scrophulariaceae	Eremophila	scoparia	P	*	*	*	*	*	*	*	*	*
Solanaceae	Duboisia	hopwoodii	P					*				
Solanaceae	Solanum	lasiophyllum	P	*	*	*	*	*	*			
Solanaceae	Solanum	nummularium	P			*	*	*	*	*	*	*
Thymelaeaceae	Pimelea	microcephala subsp. microcephala	P					*	*	*	*	
Zygophyllaceae	Zygophyllum	eremaeum	A		*							

Appendix F - Site Descriptions

Project Name: Jaurdi Hills			
Date:	6/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q1
Quadrat size:	20x20		
Vegetation group:	A		
WP:	1		
Photo number:		22	
Landform:		Lower slope/Hillslope	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		Very; abundant/Cobbly; or cobbles/Subangular tabular	
Rock outcrop (abundance/runoff):		Very slightly rocky/Moderately rapid	
Soil (profile/field texture/soil surface):		Duplex/Sandy loam/Firm	
% Cover leaf litter:		30	
% Cover bare ground:		40	

Tallest stratum		**Mid-stratum**		**Lower stratum**	
Growth form:	Y Shrub Mallee (< 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus griffithsii		Acacia acuminata		Beyeria sulcata var. sulcata	
		Eremophila oldfieldii subsp. angustifolia		Dodonaea lobulata	
				Scaevola spinescens	

ALL SPECIES
Acacia acuminata
Acacia tetragonophylla
Austrostipa elegantissima
Beyeria sulcata var. sulcata
Dodonaea lobulata
Eremophila interstans subsp. virgata
Eremophila oldfieldii subsp. angustifolia
Eucalyptus campaspe
Eucalyptus griffithsii
Exocarpos aphyllus
Maireana georgei
Marsdenia australis
Ptilotus obovatus
Scaevola spinescens
Solanum lasiophyllum

Project Name:			
Date:	6/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q2
Quadrat size:	20x20		
Vegetation group:	A		
WP:	2		
Photo number:		27	
Landform:		Lower slope/Hillslope	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		Very; abundant/Cobbly; or cobbles/Subangular tabular	
Rock outcrop (abundance/runoff):		Very slightly rocky/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy loam/Firm	
% Cover leaf litter:		30	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	Y Shrub Mallee (< 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus griffithsii		Acacia acuminata		Dodonaea lobulata	
		Eremophila oldfieldii subsp. angustifolia		Ptilotus obovatus	
				Scaevola spinescens	

ALL SPECIES
Acacia acuminata
Acacia erinacea
Austrostipa elegantissima
Dodonaea lobulata
Eremophila glabra subsp. glabra
Eremophila oldfieldii subsp. angustifolia
Eremophila scoparia
Eucalyptus campaspe
Eucalyptus griffithsii
Exocarpos aphyllus
Maireana georgei
Maireana triptera
Olearia muelleri
Ptilotus obovatus
Santalum spicatum
Scaevola spinescens
Solanum lasiophyllum

Adjacent
Atriplex nummularia subsp. spathulata
Casuarina pauper
Eucalyptus oleosa subsp. oleosa

Project Name:			
Date:	6/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q3
Quadrat size:	20x20		
Vegetation group:	B		
WP:	3		
Photo number:		31	
Landform:		Lower slope/Footslope	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		Slightly; few/Coarse gravelly; large pebbles/Subrounded tabular	
Rock outcrop (abundance/runoff):		Very slightly rocky/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy loam/Firm	
% Cover leaf litter:		80	
% Cover bare ground:		60	

Tallest stratum		**Mid-stratum**		**Lower stratum**	
Growth form:	M Tree Mallee (> 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus campaspe		Eremophila interstans subsp. virgata		Atriplex nummularia subsp. spathulata	
				Eremophila scoparia	

ALL SPECIES
Atriplex nummularia subsp. spathulata
Atriplex stipitata
Atriplex vesicaria
Enchylaena tomentosa var. tomentosa
Eremophila decipiens subsp. decipiens
Eremophila interstans subsp. virgata
Eremophila scoparia
Eucalyptus campaspe
Exocarpos aphyllus
Maireana georgei
Maireana sedifolia
Maireana tomentosa
Maireana trichoptera
Maireana triptera
Olearia muelleri
Ptilotus obovatus
Santalum acuminatum
Sclerolaena densiflora
Sclerolaena diacantha
Senna cardiosperma

Project Name:			
Date:	6/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q4
Quadrat size:	20x20		
Vegetation group:	B		
WP:	4		
Photo number:		35	
Landform:		Lower slope/Footslope	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		Slightly; few/Coarse gravelly; large pebbles/Subrounded	
Rock outcrop (abundance/runoff):		No bedrock exposed/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy loam/Firm	
% Cover leaf litter:		50	
% Cover bare ground:		70	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus campaspe		Eremophila oldfieldii subsp. angustifolia		Acacia erinacea	
Eucalyptus clelandii				Eremophila pustulata	

ALL SPECIES
Acacia erinacea
Eremophila glabra subsp. glabra
Eremophila longifolia
Eremophila oldfieldii subsp. angustifolia
Eremophila pustulata
Eucalyptus campaspe
Eucalyptus clelandii
Senna cardiosperma
Westringia rigida
Zygophyllum eremaeum
Adjacent
Eremophila interstans subsp. virgata
Olearia muelleri
Senna artemisioides subsp. filifolia

Project Name:			
Date:	6/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q5
Quadrat size:	20x20		
Vegetation group:	B		
WP:	5		
Photo number:		38	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Slow	
Soil (profile/field texture/soil surface):		Duplex/Silty clay loam/Firm	
% Cover leaf litter:		80	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	M 30-70	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus campaspe		Eremophila interstans subsp. virgata		Atriplex nummularia subsp. spathulata	
Eucalyptus clelandii		Senna artemisioides subsp. filifolia		Olearia muelleri	
				Ptilotus obovatus	

ALL SPECIES
Atriplex nummularia subsp. spathulata
Atriplex stipitata
Atriplex vesicaria
Carrichtera annua*
Chenopodium gaudichaudianum
Cucumis myriocarpus*
Enchylaena tomentosa var. tomentosa
Eremophila interstans subsp. virgata
Eremophila pustulata
Eremophila scoparia
Eucalyptus campaspe
Eucalyptus clelandii
Maireana georgei
Maireana pentatropis
Maireana trichoptera
Maireana triptera
Olearia muelleri
Ptilotus aervoides
Ptilotus obovatus
Sclerolaena densiflora
Senna artemisioides subsp. filifolia
Solanum lasiophyllum

Adjacent
Maireana sedifolia
Rhagodia drummondii

Project Name:			
Date:	6/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q6
Quadrat size:	20x20		
Vegetation group:	D		
WP:	8		
Photo number:		42	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Slow	
Soil (profile/field texture/soil surface):		Duplex/Silty clay loam/Firm	
% Cover leaf litter:		10	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	3-6m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	V <10	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Atriplex nummularia subsp. spathulata		Eremophila scoparia		Atriplex stipitata	
Eremophila interstans subsp. virgata		Senna cardiosperma		Senna cardiosperma	

ALL SPECIES
Atriplex nummularia subsp. spathulata
Atriplex stipitata
Atriplex vesicaria
Carrichtera annua*
Chenopodium gaudichaudianum
Enchylaena tomentosa var. tomentosa
Eremophila glabra subsp. glabra
Eremophila interstans subsp. virgata
Eremophila oldfieldii subsp. angustifolia
Eremophila scoparia
Exocarpos aphyllus
Maireana pyramidata
Maireana tomentosa
Maireana trichoptera
Maireana triptera
Ptilotus obovatus
Rhagodia drummondii
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Sclerolaena patenticuspis
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Senna cardiosperma
Solanum lasiophyllum
Solanum nummularium

Project Name:			
Date:	6/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q7
Quadrat size:	20x20		
Vegetation group:	C		
WP:	9		
Photo number:		45	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Silty clay loam/Firm	
% Cover leaf litter:		60	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	M Tree Mallee (> 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	M 30-70
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus griffithsii		Eremophila alternifolia		Senna artemisioides subsp. artemisioides	
		Atriplex nummularia subsp. spathulata		Atriplex stipitata	
				Ptilotus obovatus	

ALL SPECIES
Acacia acuminata
Acacia tetragonophylla
Atriplex nummularia subsp. spathulata
Atriplex stipitata
Atriplex vesicaria
Chenopodium gaudichaudianum
Enchylaena tomentosa var. tomentosa
Eremophila alternifolia
Eremophila decipiens subsp. decipiens
Eremophila glabra subsp. glabra
Eremophila scoparia
Eucalyptus griffithsii
Exocarpos aphyllus
Maireana georgei
Maireana tomentosa
Maireana trichoptera
Maireana triptera
Marsdenia australis
Ptilotus obovatus
Rhagodia drummondii
Scaevola spinescens
Sclerolaena diacantha
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Solanum lasiophyllum
Solanum nummularium

Project Name:			
Date:	6/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q8
Quadrat size:	20x20		
Vegetation group:	E		
WP:	10		
Photo number:		51	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		70	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	12-20m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	S 10-30	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus salmonophloia		Eremophila scoparia		Atriplex stipitata	
		Exocarpos aphyllus		Scaevola spinescens	
				Senna artemisioides subsp. filifolia	

ALL SPECIES
Atriplex stipitata
Chenopodium gaudichaudianum
Duboisia hopwoodii
Eremophila scoparia
Eucalyptus salmonophloia
Exocarpos aphyllus
Maireana georgei
Maireana pentatropis
Maireana tomentosa
Maireana trichoptera
Maireana triptera
Ptilotus obovatus
Rhagodia drummondii
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. filifolia
Senna cardiosperma
Solanum lasiophyllum
Adjacent
Acacia ligulata
Atriplex nummularia subsp. spathulata
Eucalyptus clelandii
Eucalyptus transcontinentalis

Project Name:			
Date:	7/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q9
Quadrat size:	20x20		
Vegetation group:	F		
WP:	14		
Photo number:		63	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		80	
% Cover bare ground:		50	

Tallest stratum		**Mid-stratum**		**Lower stratum**	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Casuarina pauper		Eremophila interstans subsp. virgata		Eremophila glabra subsp. glabra	
Eucalyptus clelandii		Eremophila scoparia		Olearia muelleri	
				Senna artemisioides subsp. filifolia	

ALL SPECIES
Acacia hemiteles
Atriplex nummularia subsp. spathulata
Casuarina pauper
Chenopodium gaudichaudianum
Eremophila glabra subsp. glabra
Eremophila interstans subsp. virgata
Eremophila scoparia
Eucalyptus clelandii
Exocarpos aphyllus
Maireana georgei
Maireana tomentosa
Olearia muelleri
Ptilotus obovatus
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. filifolia
Adjacent
Acacia colletioides
Maireana pentatropis
Rhagodia drummondii

Project Name:			
Date:	7/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q10
Quadrat size:	20x20		
Vegetation group:	E		
WP:	16		
Photo number:		64-65	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		60	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus salmonophloia		Eremophila interstans subsp. virgata		Acacia hemiteles	
		Eremophila scoparia		Senna artemisioides subsp. filifolia	
		Exocarpos aphyllus		Senna cardiosperma	

ALL SPECIES
Acacia hemiteles
Amyema preissii
Atriplex stipitata
Atriplex vesicaria
Austrostipa elegantissima
Chenopodium gaudichaudianum
Cratystylis conocephala
Enchylaena tomentosa var. tomentosa
Eremophila interstans subsp. virgata
Eremophila scoparia
Eucalyptus salmonophloia
Exocarpos aphyllus
Maireana georgei
Maireana trichoptera
Marsdenia australis
Olearia muelleri
Ptilotus obovatus
Rhagodia drummondii
Santalum spicatum
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. filifolia
Senna cardiosperma
Solanum lasiophyllum
Solanum nummularium
Adjacent
Acacia ligulata
Atriplex nummularia subsp. spathulata
Eremophila alternifolia
Eucalyptus transcontinentalis

Project Name:			
Date:	7/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q11
Quadrat size:	20x20		
Vegetation group:	E		
WP:	17		
Photo number:		73	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		40	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	12-20m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus salmonophloia		Eremophila interstans subsp. virgata		Eremophila alternifolia	
		Eremophila scoparia		Ptilotus obovatus	
		Exocarpos aphyllus		Senna artemisioides subsp. filifolia	

ALL SPECIES
Acacia hemiteles
Acacia prainii
Austrostipa elegantissima
Enchylaena tomentosa var. tomentosa
Eremophila alternifolia
Eremophila glabra subsp. glabra
Eremophila interstans subsp. virgata
Eremophila oldfieldii subsp. angustifolia
Eremophila scoparia
Eucalyptus salmonophloia
Exocarpos aphyllus
Maireana trichoptera
Maireana triptera
Marsdenia australis
Olearia muelleri
Pimelea microcephala subsp. microcephala
Pittosporum angustifolium
Ptilotus obovatus
Rhagodia drummondii
Santalum spicatum
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. filifolia
Solanum lasiophyllum

Project Name:			
Date:	7/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q12
Quadrat size:	20x20		
Vegetation group:	E		
WP:	18		
Photo number:		76	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		60	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	Y Shrub Mallee (< 8m)	**Growth form:**	S Shrub
Height:	12-20m	**Height:**	3-6m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus salmonophloia		Eucalyptus oleosa subsp. oleosa		Daviesia benthamii subsp. acanthoclona	
				Eremophila scoparia	
				Senna cardiosperma	

ALL SPECIES
Chenopodium gaudichaudianum
Daviesia aphylla
Enchylaena tomentosa var. tomentosa
Eremophila glabra subsp. glabra
Eremophila scoparia
Eucalyptus oleosa subsp. oleosa
Eucalyptus salmonophloia
Exocarpos aphyllus
Maireana tomentosa
Maireana trichoptera
Maireana triptera
Ptilotus obovatus
Rhagodia drummondii
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. filifolia
Senna cardiosperma

Project Name:			
Date:	7/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q13
Quadrat size:	20x20		
Vegetation group:	E		
WP:	19		
Photo number:		80	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		80	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	12-20m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	S 10-30	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus salmonophloia		Eremophila caperata		Acacia hemiteles	
Eucalyptus transcontinentalis		Eremophila scoparia		Atriplex vesicaria	
				Senna artemisioides subsp. filifolia	

ALL SPECIES
Acacia hemiteles
Acacia ligulata
Atriplex nummularia subsp. spathulata
Atriplex stipitata
Atriplex vesicaria
Daviesia aphylla
Eremophila caperata
Eremophila scoparia
Eucalyptus salmonophloia
Eucalyptus transcontinentalis
Exocarpos aphyllus
Maireana sedifolia
Olearia muelleri
Scaevola spinescens
Sclerolaena densiflora
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Senna cardiosperma
Adjacent
Eucalyptus oleosa subsp. oleosa
Santalum acuminatum

Project Name:			
Date:	7/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q14
Quadrat size:	20x20		
Vegetation group:	E		
WP:	20		
Photo number:		83	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		60	
% Cover bare ground:		30	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	12-20m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	M 30-70
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus salmonophloia		Eremophila scoparia		Eremophila ionantha	
				Eremophila scoparia	
				Senna artemisioides subsp. filifolia	

ALL SPECIES
Acacia hemiteles
Atriplex nummularia subsp. spathulata
Atriplex stipitata
Atriplex vesicaria
Austrostipa elegantissima
Chenopodium gaudichaudianum
Enchylaena tomentosa var. tomentosa
Eremophila ionantha
Eremophila oldfieldii subsp. angustifolia
Eremophila scoparia
Eucalyptus salmonophloia
Exocarpos aphyllus
Maireana georgei
Maireana tomentosa
Maireana triptera
Pimelea microcephala subsp. microcephala
Ptilotus obovatus
Rhagodia drummondii
Salsola australis
Sclerolaena densiflora
Sclerolaena patenticuspis
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Solanum nummularium

Adjacent
Eucalyptus transcontinentalis
Eucalyptus yilgarnensis
Santalum spicatum

Project Name:			
Date:	7/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q15
Quadrat size:	20x20		
Vegetation group:	F		
WP:	22		
Photo number:		87	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		80	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	M Tree Mallee (> 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	M 30-70	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Eremophila scoparia		Acacia merrallii	
Eucalyptus salubris		Santalum acuminatum		Eremophila caperata	
				Eremophila ionantha	

ALL SPECIES
Acacia merrallii
Cratystylis conocephala
Eremophila caperata
Eremophila decipiens subsp. decipiens
Eremophila ionantha
Eremophila scoparia
Eucalyptus clelandii
Eucalyptus salubris
Maireana pentatropis
Olearia muelleri
Pimelea microcephala subsp. microcephala
Ptilotus obovatus
Santalum acuminatum
Scaevola spinescens
Senna artemisioides subsp. filifolia
Senna cardiosperma
Solanum nummularium

Project Name:			
Date:	7/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q16
Quadrat size:	20x20		
Vegetation group:	G		
WP:	23		
Photo number:		90	
Landform:		Open depression (vale)/Drainage depression	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		95	
% Cover bare ground:		30	

Tallest stratum		**Mid-stratum**		**Lower stratum**	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	3-6m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	M 30-70	**Crown cover %:**	S 10-30	**Crown cover %:**	M 30-70
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Acacia merrallii		Acacia colletioides	
Eucalyptus oleosa subsp. oleosa		Senna artemisioides subsp. filifolia		Eremophila decipiens subsp. decipiens	
Eucalyptus salubris				Eremophila ionantha	

ALL SPECIES
Acacia colletioides
Acacia merrallii
Austrostipa elegantissima
Casuarina pauper
Eremophila decipiens subsp. decipiens
Eremophila ionantha
Eremophila scoparia
Eucalyptus clelandii
Eucalyptus oleosa subsp. oleosa
Eucalyptus salubris
Pimelea microcephala subsp. microcephala
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Solanum nummularium

Project Name:			
Date:	7/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q17
Quadrat size:	20x20		
Vegetation group:	G		
WP:	24		
Photo number:		94	
Landform:		Open depression (vale)/Drainage depression	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		40	
% Cover bare ground:		40	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	M 30-70	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Eremophila scoparia		Acacia colletioides	
Eucalyptus oleosa subsp. oleosa		Exocarpos aphyllus		Senna artemisioides subsp. filifolia	
Eucalyptus salubris		Senna artemisioides subsp. filifolia		Eremophila ionantha	

ALL SPECIES
Acacia colletioides
Acacia hemiteles
Acacia merrallii
Eremophila alternifolia
Eremophila decipiens subsp. decipiens
Eremophila ionantha
Eremophila scoparia
Eucalyptus clelandii
Eucalyptus oleosa subsp. oleosa
Eucalyptus salubris
Exocarpos aphyllus
Ptilotus obovatus
Santalum acuminatum
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia

Project Name:			
Date:	7/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q18
Quadrat size:	20x20		
Vegetation group:	F		
WP:	26		
Photo number:		98	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		40	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	M 30-70	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Eremophila interstans subsp. virgata		Acacia hemiteles	
		Santalum spicatum		Exocarpos aphyllus	
		Senna artemisioides subsp. filifolia		Senna artemisioides subsp. filifolia	

ALL SPECIES
Acacia hemiteles
Atriplex nummularia subsp. spathulata
Atriplex vesicaria
Eremophila glabra subsp. glabra
Eremophila interstans subsp. virgata
Eremophila oldfieldii subsp. angustifolia
Eremophila scoparia
Eucalyptus clelandii
Exocarpos aphyllus
Maireana tomentosa
Maireana trichoptera
Olearia muelleri
Olearia pimeleoides
Ptilotus obovatus
Rhagodia drummondii
Santalum acuminatum
Santalum spicatum
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Senna cardiosperma
Solanum lasiophyllum
Solanum nummularium

Project Name:			
Date:	7/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q19
Quadrat size:	20x20		
Vegetation group:	F		
WP:	27		
Photo number:		101	
Landform:		Hillock/Mound	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		Very; abundant/Fine gravelly; small pebbles/Subrounded	
Rock outcrop (abundance/runoff):		No bedrock exposed/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		30	
% Cover bare ground:		70	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	M Tree Mallee (> 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	I <1	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Eremophila oldfieldii subsp. angustifolia		Acacia erinacea	
Eucalyptus griffithsii				Eremophila pustulata	
				Scaevola spinescens	

ALL SPECIES
Acacia colletioides
Acacia erinacea
Acacia hemiteles
Amyema preissii
Austrostipa elegantissima
Eremophila glabra subsp. glabra
Eremophila interstans subsp. virgata
Eremophila oldfieldii subsp. angustifolia
Eremophila pustulata
Eucalyptus clelandii
Eucalyptus griffithsii
Exocarpos aphyllus
Marsdenia australis
Olearia muelleri
Ptilotus obovatus
Scaevola spinescens
Senna artemisioides subsp. filifolia
Senna cardiosperma
Westringia rigida
Adjacent
Atriplex nummularia subsp. spathulata
Atriplex vesicaria
Santalum acuminatum
antalum spicatum

Project Name:			
Date:	11/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q20
Quadrat size:	20x20		
Vegetation group:	E		
WP:	30		
Photo number:		105-106	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		60	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	12-20m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	M 30-70	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus salmonophloia		Eremophila ionantha		Atriplex stipitata	
		Eremophila scoparia		Atriplex vesicaria	
		Senna artemisioides subsp. filifolia		Olearia muelleri	

ALL SPECIES
Acacia colletioides
Acacia hemiteles
Atriplex nummularia subsp. spathulata
Atriplex stipitata
Atriplex vesicaria
Chenopodium gaudichaudianum
Enchylaena tomentosa var. tomentosa
Eremophila decipiens subsp. decipiens
Eremophila glabra subsp. glabra
Eremophila ionantha
Eremophila scoparia
Eriochiton sclerolaenoides
Eucalyptus salmonophloia
Exocarpos aphyllus
Maireana georgei
Maireana pentatropis
Maireana sedifolia
Olearia muelleri
Pimelea microcephala subsp. microcephala
Ptilotus obovatus
Santalum acuminatum
Santalum spicatum
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Senna cardiosperma
Solanum nummularium

Project Name:			
Date:	11/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q21
Quadrat size:	20x20		
Vegetation group:	F		
WP:	33		
Photo number:		114	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		60	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	V <10	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Eremophila caperata		Acacia merrallii	
		Eremophila scoparia		Cratystylis conocephala	
				Eremophila scoparia	

ALL SPECIES
Acacia colletioides
Acacia merrallii
Atriplex nummularia subsp. spathulata
Austrostipa elegantissima
Chenopodium gaudichaudianum
Cratystylis conocephala
Eremophila caperata
Eremophila scoparia
Eriochiton sclerolaenoides
Eucalyptus clelandii
Exocarpos aphyllus
Frankenia interioris
Maireana georgei
Maireana sedifolia
Maireana tomentosa
Ptilotus aervoides
Rhagodia drummondii
Sclerolaena densiflora
Sclerolaena diacantha
Sclerolaena patenticuspis
Senna artemisioides subsp. filifolia
Senna cardiosperma
Solanum nummularium

Project Name:			
Date:	11/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q22
Quadrat size:	20x20		
Vegetation group:	F		
WP:	34		
Photo number:		115	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		80	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	M Tree Mallee (> 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus oleosa subsp. oleosa		Eremophila interstans subsp. virgata		Cratystylis conocephala	
		Eremophila scoparia		Eremophila decipiens subsp. decipiens	
				Eremophila parvifolia subsp. auricampa	

ALL SPECIES
Atriplex stipitata
Atriplex vesicaria
Chenopodium gaudichaudianum
Cratystylis conocephala
Cratystylis microphylla
Enchylaena tomentosa var. tomentosa
Eremophila decipiens subsp. decipiens
Eremophila glabra subsp. glabra
Eremophila interstans subsp. virgata
Eremophila ionantha
Eremophila parvifolia subsp. auricampa
Eremophila praecox (P1)- 2 plants
Eremophila scoparia
Eriochiton sclerolaenoides
Eucalyptus oleosa subsp. oleosa
Exocarpos aphyllus
Frankenia interioris
Maireana pentatropis
Maireana tomentosa
Olearia muelleri
Pimelea microcephala subsp. microcephala
Ptilotus obovatus
Rhagodia drummondii
Sclerolaena densiflora
Senna artemisioides subsp. filifolia
Solanum nummularium

Project Name:			
Date:	11/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q23
Quadrat size:	20x20		
Vegetation group:	H		
WP:	36		
Photo number:		119	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		20	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	Y Shrub Mallee (< 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	3-6m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus oleosa subsp. oleosa		Eremophila interstans subsp. virgata		Cratystylis subspinescens	
Eucalyptus yilgarnensis				Eremophila scoparia	
				Maireana pyramidata	

ALL SPECIES
Atriplex stipitata
Atriplex vesicaria
Chenopodium gaudichaudianum
Cratystylis conocephala
Cratystylis subspinescens
Enchylaena tomentosa var. tomentosa
Eremophila decipiens subsp. decipiens
Eremophila glabra subsp. glabra
Eremophila interstans subsp. virgata
Eremophila scoparia
Eriochiton sclerolaenoides
Eucalyptus oleosa subsp. oleosa
Eucalyptus yilgarnensis
Exocarpos aphyllus
Frankenia interioris
Maireana georgei
Maireana pyramidata
Maireana sedifolia
Maireana thesioides
Maireana tomentosa
Maireana trichoptera
Pimelea microcephala subsp. microcephala
Ptilotus aervoides
Ptilotus obovatus
Rhagodia drummondii
Sclerolaena densiflora
Sclerolaena diacantha
Sclerolaena patenticuspis
Senna artemisioides subsp. filifolia
Senna cardiosperma

Project Name:			
Date:	11/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q24
Quadrat size:	20x20		
Vegetation group:	F		
WP:	41		
Photo number:		122-123	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		50	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus oleosa subsp. oleosa		Eremophila caperata		Daviesia aphylla	
Eucalyptus clelandii		Eremophila scoparia		Eremophila scoparia	
		Senna artemisioides subsp. filifolia		Olearia muelleri	

ALL SPECIES
Acacia colletioides
Atriplex vesicaria
Austrostipa elegantissima
Daviesia aphylla
Eremophila caperata
Eremophila parvifolia subsp. auricampa
Eremophila scoparia
Eucalyptus clelandii
Eucalyptus oleosa subsp. oleosa
Exocarpos aphyllus
Maireana pentatropis
Maireana tomentosa
Olearia muelleri
Senna artemisioides subsp. filifolia
Adjacent
Acacia merrallii
Eucalyptus salubris
Santalum acuminatum

Project Name:			
Date:	11/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q25
Quadrat size:	20x20		
Vegetation group:	I		
WP:	43		
Photo number:		127	
Landform:		Hillock/Mound	
Land surface/disturbance:		Limited clearing	
Coarse fragments on the surface (abundance/size/shape):		Very; abundant/Cobbly; or cobbles/Rounded	
Rock outcrop (abundance/runoff):		Slightly rocky/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		15	
% Cover bare ground:		70	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	V <10	**Crown cover %:**	S 10-30	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Exocarpos aphyllus		Acacia merrallii	
		Melaleuca sheathiana		Atriplex vesicaria	
		Senna artemisioides subsp. filifolia		Westringia rigida	

ALL SPECIES
Acacia ligulata
Acacia merrallii
Atriplex nummularia subsp. spathulata
Atriplex vesicaria
Austrostipa elegantissima
Chenopodium gaudichaudianum
Cratystylis subspinescens
Dodonaea viscosa subsp. angustissima
Eremophila decipiens subsp. decipiens
Eremophila parvifolia subsp. auricampa
Eucalyptus clelandii
Exocarpos aphyllus
Maireana georgei
Maireana pentatropis
Maireana trichoptera
Marsdenia australis
Melaleuca sheathiana
Olearia muelleri
Rhagodia drummondii
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. filifolia
Solanum nummularium
Westringia rigida

Project Name:			
Date:	11/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q26
Quadrat size:	20x20		
Vegetation group:	I		
WP:	44		
Photo number:		130	
Landform:		Hillock/Mound	
Land surface/disturbance:		Limited clearing	
Coarse fragments on the surface (abundance/size/shape):		Very; abundant/Coarse gravelly; large pebbles/Rounded	
Rock outcrop (abundance/runoff):		Slightly rocky/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		40	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Acacia hemiteles		Acacia colletioides	
		Exocarpos aphyllus		Cratystylis conocephala	
		Melaleuca sheathiana		Eremophila scoparia	

ALL SPECIES
Acacia colletioides
Acacia hemiteles
Acacia merrallii
Atriplex vesicaria
Austrostipa elegantissima
Cratystylis conocephala
Dodonaea viscosa subsp. angustissima
Eremophila parvifolia subsp. auricampa
Eremophila scoparia
Eucalyptus clelandii
Exocarpos aphyllus
Maireana pentatropis
Maireana tomentosa
Melaleuca sheathiana
Olearia muelleri
Rhagodia drummondii
Senna artemisioides subsp. filifolia
Westringia rigida

Project Name:			
Date:	11/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q27
Quadrat size:	20x20		
Vegetation group:	I		
WP:	46		
Photo number:		134	
Landform:		Hillock/Mound	
Land surface/disturbance:		Limited clearing	
Coarse fragments on the surface (abundance/size/shape):		Very; abundant/Cobbly; or cobbles/Rounded	
Rock outcrop (abundance/runoff):		Slightly rocky/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		50	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	M Tree Mallee (> 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	V <10	**Crown cover %:**	V <10	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Acacia hemiteles		Acacia colletioides	
		Melaleuca sheathiana		Grevillea acuaria	
				Westringia rigida	

ALL SPECIES
Acacia colletioides
Acacia hemiteles
Acacia tetragonophylla
Atriplex vesicaria
Dianella revoluta subsp. divaricata
Dodonaea viscosa subsp. angustissima
Eremophila decipiens subsp. decipiens
Eremophila glabra subsp. glabra
Eremophila ionantha
Eremophila parvifolia subsp. auricampa
Eremophila scoparia
Eucalyptus clelandii
Exocarpos aphyllus
Grevillea acuaria
Maireana pentatropis
Maireana tomentosa
Melaleuca sheathiana
Olearia muelleri
Rhagodia drummondii
Scaevola collaris
Scaevola spinescens
Senna artemisioides subsp. filifolia
Solanum nummularium
Triodia rigidissima
Westringia rigida

Adjacent
Alyxia buxifolia

Project Name:			
Date:	11/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q28
Quadrat size:	20x20		
Vegetation group:	I		
WP:	50		
Photo number:		142	
Landform:		Hillock/Mound	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No qualifier; common/Coarse gravelly; large pebbles/Rounded	
Rock outcrop (abundance/runoff):		No bedrock exposed/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		60	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Melaleuca sheathiana		Cratystylis conocephala	
				Eremophila scoparia	
				Westringia rigida	

ALL SPECIES
Acacia hemiteles
Acacia merrallii
Cratystylis conocephala
Cratystylis microphylla
Enchylaena tomentosa var. tomentosa
Eremophila glabra subsp. glabra
Eremophila parvifolia subsp. auricampa
Eremophila scoparia
Eucalyptus clelandii
Exocarpos aphyllus
Maireana pentatropis
Melaleuca sheathiana
Olearia muelleri
Rhagodia drummondii
Senna artemisioides subsp. filifolia
Westringia rigida

Project Name:			
Date:	11/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q29
Quadrat size:	20x20		
Vegetation group:	F		
WP:	52		
Photo number:		148	
Landform:		Flat/Terrace plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		70	
% Cover bare ground:		40	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	M 30-70	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Acacia hemiteles		Acacia merrallii	
Eucalyptus salubris		Eremophila caperata		Olearia muelleri	
		Eremophila scoparia		Westringia rigida	

ALL SPECIES
Acacia colletioides
Acacia hemiteles
Acacia merrallii
Austrostipa elegantissima
Eremophila caperata
Eremophila parvifolia subsp. auricampa
Eremophila scoparia
Eucalyptus clelandii
Eucalyptus salubris
Exocarpos aphyllus
Olearia muelleri
Scaevola collaris
Scaevola spinescens
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Westringia rigida

Beacon Minerals Ltd

JAURDI HILLS LEVEL 2 FLORA AND VEGETATION SURVEY

Part 2- September 2017

Prepared for:

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FINAL
V2.0
September 2017

EXECUTIVE SUMMARY

The parent entity, Beacon Minerals Limited (BCN) is a publicly listed company which has a 100% interest in Beacon Mining Pty Ltd (BM). BCM is required to make all the financial and operating policy decisions for this subsidiary. BM has gold interests and is the operator of its Jaurdi Hills Project in the Coolgardie Region of Western Australia. Via exploration drilling within the project area, BM has identified the Lost Dog Deposit within the Mining Lease M16/529. BM provided Native Vegetation Solutions (NVS) with a survey area which encompasses the main mining areas as well as other infrastructure related to mining the mineral resource. The location of this survey area is approximately 32 km northwest of Coolgardie (Figure 1).

This report will support numerous applications including mining proposals, works approvals and clearing permits submitted to relative Government Departments.

The survey area, for the purposes of this report, encompasses an area totalling approximately 589.91 ha, which intersects Mining Tenements M16/34, M16/115, M16/255, M16/529, Prospecting Licenses P16/2925, P16/2926, P16/3031 and Exploration License E16/469. At this stage, the final footprint of mining related disturbances is yet to be finalised, however will be encompassed entirely within the survey area.

The survey area is located in the Coolgardie Botanical District of Beard (1990). The Coolgardie Botanical District is dominated by eucalypt woodlands, eucalypt open woodlands in the east, other shrublands, heath, *Acacia* shrublands, chenopod and samphire shrublands, mallee woodlands and shrublands. There are small areas of *Acacia* forests and woodlands, and hummock grasslands occurring in the north (DOTEE, 2017).

Within the Coolgardie Botanical District, the Eastern Goldfields subregion is comprised of Mallees, *Acacia* thickets and shrubheaths on sandplains. Diverse *Eucalyptus* woodlands occur around salt lakes, on ranges, and in valleys. Salt lakes support dwarf shrublands of samphire. Woodlands and *Dodonaea* shrubland occur on basic granulites of the Fraser Range. The area is rich in endemic *Acacia*'s (CALM, 2002).

The Goldfields Woodlands is a centre of endemism and includes exceptionally high diversity of *Eucalyptus* species with as many as 170 species occurring in the bioregion. The COO3 subregion also has high diversity in *Acacia* species, as well as ephemeral flora communities of tertiary sandplain shrublands and of valley floor woodlands (CALM, 2002).

The search undertaken with the EPBC's Protected Matters Search Tool reported that no TECs were present in the survey area (DOTEE, 2017b). The search also revealed that the survey area may contain habitat for the invasive weed species *Carrichtera annua* (Ward's Weed).

The threatened species, *Gastrolobium graniticum*, was listed as either likely to be in the area or having potential habitat occurring in the area. This species occurs mainly on granite outcrops. No granite outcrops were identified in the survey area.

The DPAW database searches revealed a potential for 2 Threatened and 39 Priority Flora species to occur within a 30km radius of the survey area (DBCA, 2017a). No known locations of these Flora occur within the survey area, while the closest location occurs approximately 7 km east of the survey area.

Results of the threatened flora database search are included in Appendix D.

The PEC/TEC search (DBCA, 2017) revealed no TECs or PECs within the survey area.

The survey area does not lie within or contain any ESA's or Conservation Reserves (DWER, 2017).

No water bodies were identified within the survey area via the CPS Map Viewer (DWER, 2017).

The survey area lies south of the 26th parallel, however receives average annual rainfall of approximately 270.3 mm (BOM, 2017), below the 400mm threshold mark. There is no record of *Phytophthora cinnamomi* establishing in natural ecosystems in regions receiving <400mm rainfall per annum (CALM, 2003). Therefore, Dieback is not considered an issue for this survey area, however all measures should be taken to prevent any possible soil contamination or weed infestations which could pose a risk within the survey area during seasonally favourable conditions.

Nine vegetation groups were identified during this survey, largely following topographical features and dominant species. Mapping of the 9 vegetation groups, as well as the quadrat locations can be seen in Appendix C.

Eighty-five species were recorded within the survey area with 84 species recorded within quadrats. Thirty-nine genera and 24 families were found. These are listed in Appendix E, per Quadrat as well as per vegetation group. Of the native species, Chenopodiaceae had the highest representation, with 19 species from 8 genera, dominated by *Maireana.* Fabaceae and Scrophulariaceae were the next best represented families with 12 species each.

Of the 85 taxa recorded there were two introduced weed species; *Carrichtera annua* (Ward's Weed) and *Cucumis myriocarpus* (Prickly Paddy Melon). These weed species were recorded within 2 of the 29 quadrats. No weed species recorded were considered declared plants by DPIRD (2017).

The most common and widespread species were *Eremophila scoparia, Exocarpos aphyllus and Senna artemisioides* subsp. *filifolia,* which were recorded within 25 quadrats. Its canopy cover was 10-30%. The next most common and widespread species was *Ptilotus obovatus,* recorded in 19 quadrats, with a canopy cover less than 10%.

There were 30 taxa recorded from within a single site, Q23. Of these, none were weed species.

No Threatened species were recorded during the survey.

One Priority species, Eremophila praecox (P1), was identified in the survey area within Q22, which lies within Vegetation Group H. Two plants were recorded here within a 200m radius.

Vegetation condition was generally 'Good' to 'Very Good' (Keighery 1994). Disturbance was present within the survey area mostly attributed to historic mining activities, access tracks, exploration related activities, and also grazing.

The EPA objective for flora and vegetation is to maintain the abundance, species diversity and geographical distribution of flora and vegetation as well as protect Threatened flora consistent with the provisions of the *Biodiversity Conservation Act 2016.*

The proposed clearing of vegetation will result in the loss of some individuals from the local area; however, the impact will not be great enough to remove whole communities or populations. Most of the species and communities recorded during this survey are widespread throughout the Eastern Goldfields subregion and adjoining regions, and therefore the loss of a small proportion from this area will not be significant.

This report summarises the results of the second stage of the Level 2 survey, incorporation Winter and Spring surveys of 2017.

TABLE OF CONTENTS

Page No.

FIGURES

TABLES

APPENDICES

1 INTRODUCTION

1.1 BACKGROUND

The parent entity, Beacon Minerals Limited (BCN) is a publicly listed company which has a 100% interest in Beacon Mining Pty Ltd (BM). BCN is required to make all the financial and operating policy decisions for this subsidiary. BM has gold interests and is the operator of its Jaurdi Hills Project in the Coolgardie Region of Western Australia. Via exploration drilling within the project area, BM has identified the Lost Dog Deposit within the Mining Lease M16/529. BM provided Native Vegetation Solutions (NVS) with a survey area which encompasses the main mining areas as well as other infrastructure related to mining the mineral resource. The location of this survey area is approximately 32 km northwest of Coolgardie (Figure 1).

This report will support numerous applications including mining proposals, works approvals and clearing permits submitted to relative Government Departments.

The survey area, for the purposes of this report, encompasses an area totalling approximately 589.91 ha, which intersects Mining Tenements M16/34, M16/115, M16/255, M16/529, Prospecting Licenses P16/2925, P16/2926, P16/3031 and Exploration License E16/469. At this stage, the final footprint of mining related disturbances is yet to be finalised, however will be encompassed entirely within the survey area.

Figure 1: Regional Location of the Jaurdi Hills Survey Area

1.2 PURPOSE AND SCOPE

The objective of this report is to record and analyse the results of the flora and vegetation component of a Level 2 assessment conducted in accordance with the following documents:

- *Terrestrial Biological Surveys as an Element of Biodiversity Protection; Position Statement No 3 (EPA, 2002);*
- *Guidance Statement No. 51- Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA, 2004); and*
- *Technical Guide- Flora and Vegetation Surveys for Environmental Impact Assessment (EPA and DPAW, 2015).*

A Level 2 Flora and Vegetation Survey has two components:

1) Level 1 Survey
   a) Desktop study which includes a literature review and a search of the relevant databases; and
   b) Reconnaissance survey of the subject area to verify the desktop survey, undertake low impact sampling, define vegetation groups present in the area, search for species of conservation significance and to determine potential sensitivity to impact.

2) Detailed Plot Based Survey
   a) Detailed survey, comprising multiple visits in main flowering seasons or other seasons and replication of plots in vegetation units incorporating greater coverage than a reconnaissance survey; and
   b) Comprehensive survey when necessary to: enhance the level of knowledge at the locality or sub-regional scale, in order to provide wider context for the local scale.

Therefore, the scope of work for the Level 2 flora and vegetation survey was to:

- Conduct a desktop study that includes a literature review and search of relevant databases;
- Conduct a plot-based survey within the survey area (20m x 20m quadrats);
- Prepare an inventory of species occurring in the study area;
- Conduct PATN analysis of quadrat based presence/absence data;
- Quantify survey intensity via Species Accumulation Curve;
- Describe the vegetation associations in the survey area;
- Identify any vegetation communities or flora species of particular conservation significance;
- Map broad-scale vegetation groups found within the survey area, including vegetation condition; and
- Provide recommendations, including the management of perceived impacts to flora and vegetation, particularly flora of conservation significance, within the study area.

2 EXISTING ENVIRONMENT

2.1 CLIMATE

Typically, the climate is characterised as being arid to semi-arid Mediterranean with mainly winter rainfall as well as summer thunderstorms. The area receives approximately 250-300mm of rainfall per year (Beard, 1990; CALM, 2002). The nearest official meteorological weather station with the most complete and up to date information is Coolgardie, which is located approximately 32 km southeast of the survey area.

2.1.1 Temperature

Mean annual minimum temperature at Coolgardie is 11.2°C and mean annual maximum temperature is 25.0°C (BOM, 2017). The coldest temperatures occur in July (mean minimum temperature 5.2°C), the hottest is January (mean maximum temperature 33.3°C) and diurnal temperature variations are relatively consistent throughout the year (Figure 2).

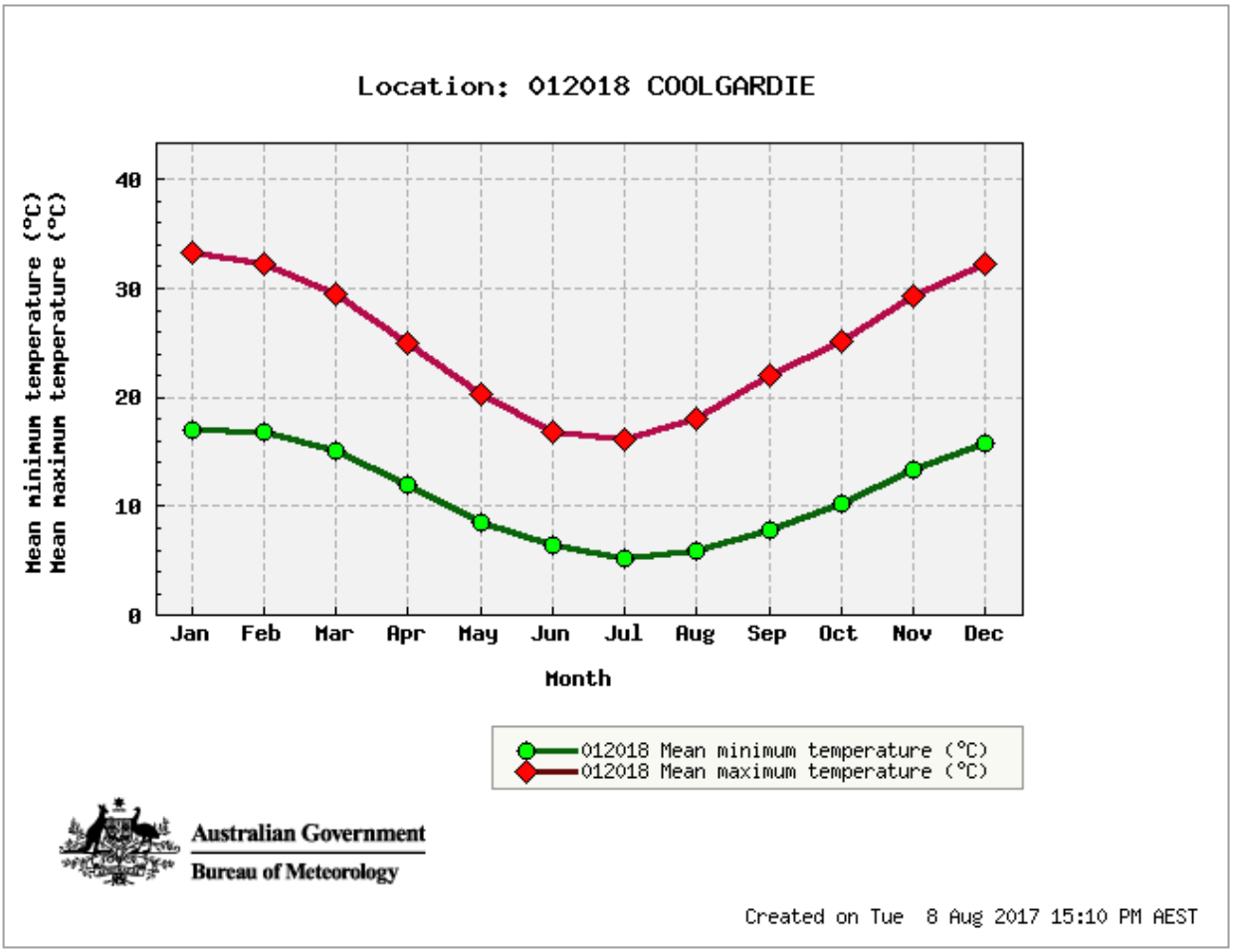

Figure 2: Mean temperature ranges for Coolgardie weather station (BOM, 2017)

2.1.2 Rainfall

The annual average rainfall at Coolgardie is 270.7mm over an average 34.7 rain days (BOM, 2017). Average rainfall varies across the months, with slightly larger rainfall events falling between January to August (Figure 3), and the least rainfall received in September. Rainfall for 2016 was more than triple the average for January, with June, August and December also receiving above average rainfall levels. All other months in 2016 recorded below average levels. November was the driest month for 2016.

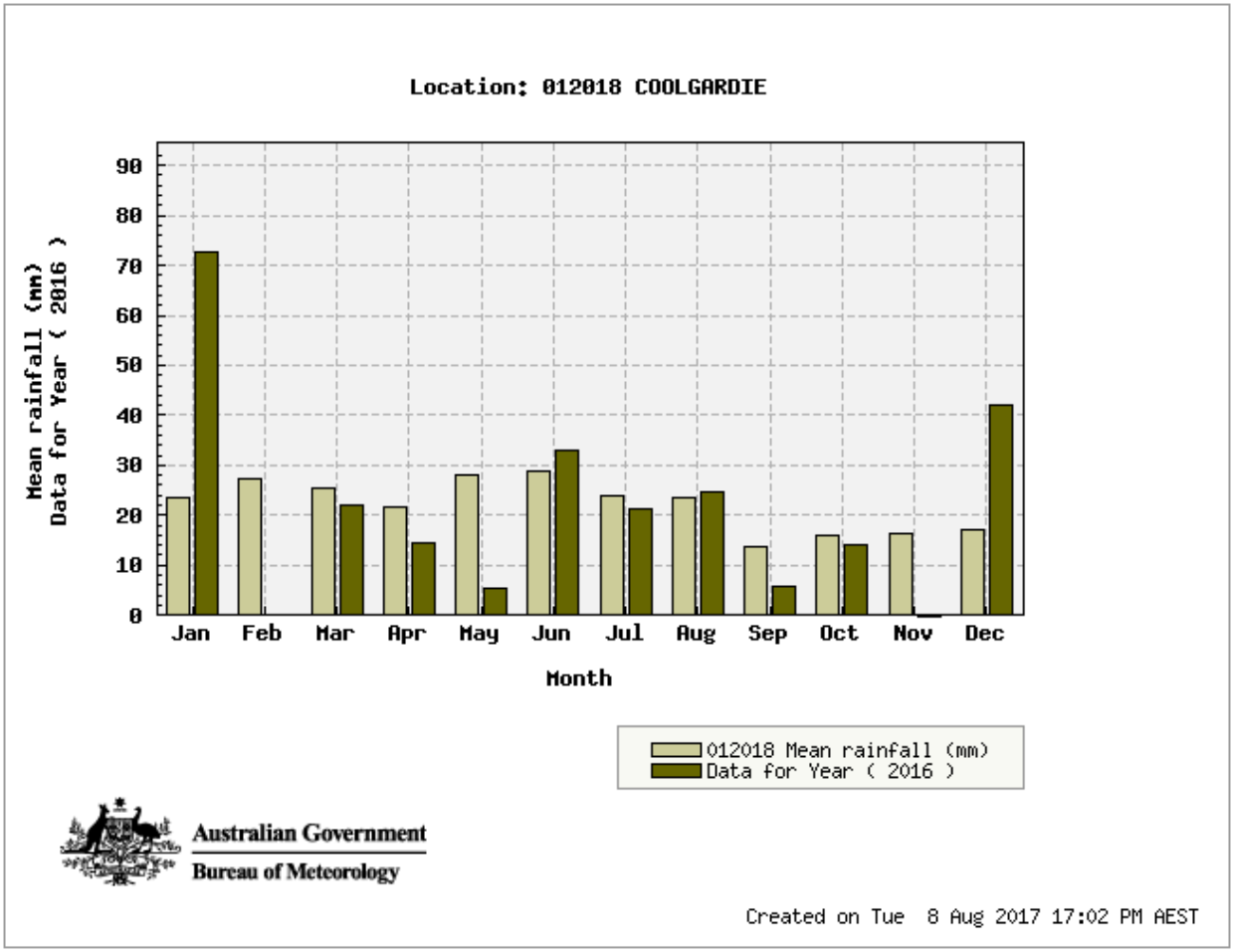

Figure 3: Rainfall data for the Coolgardie Meteorological Station (BOM, 2017)

Rainfall for 2017 was not recorded at the Coolgardie weather station (012018) and the nearest rainfall recorded was Credo which is located approximately 27km northwest of the survey area. Rainfall at Credo (012259) in 2017 was more than quadruple the average of Coolgardie for January, with February and March also receiving above average rainfall levels (Figure 4). April, May, June, July and August all received lower than Coolgardie's average in 2017.

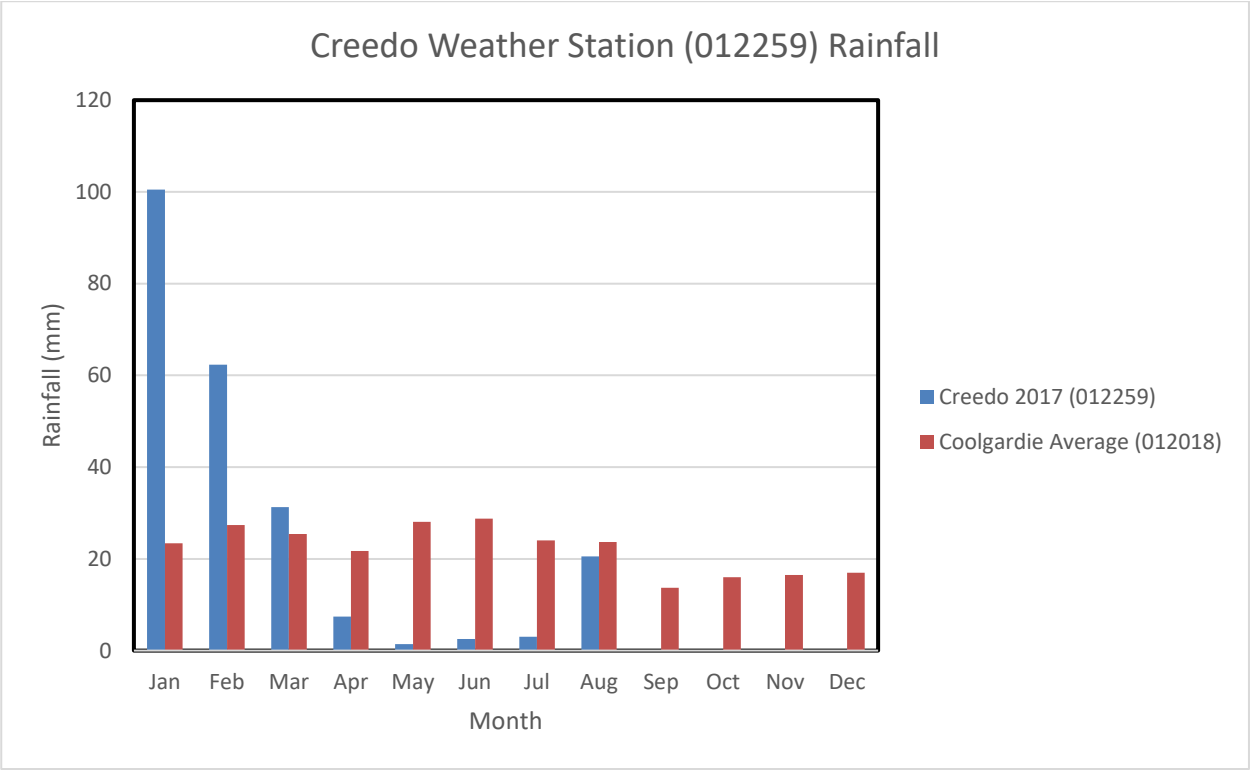

Figure 4: Rainfall data for the Credo Meteorological Station (BOM, 2017)

2.2 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA (IBRA) REGION

The IBRA recognises 89 bioregions within Australia and 419 subregions (DOTEE, 2017a). The project is located in the Eastern Goldfields IBRA subregion (COO3) which totals over 5.1 million hectares (CALM, 2002). The Eastern Goldfields subregion lies on the 'Eastern Goldfields Terrains'. The relief is subdued and comprises of gently undulating plains interrupted in the west with low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite. The underlying geology is of gneisses and granites eroded into a flat plane covered with tertiary soils and with scattered exposures of bedrock. Calcareous earths are the dominant soil group and over much of the plains and greenstone areas. A series of large playa lakes in the western half are the remnants of an ancient major drainage line.

The dominant land uses of the COO3 subregion are: UCL and Crown reserves, Grazing-Native pastures-leasehold (37.8%), freehold (7.15%), conservation, mining leases (CALM, 2002).

2.3 LANDFORMS AND SOILS

This bioregion consists of granite rocky outcrops, low greenstone hills, laterite uplands and broad plains. There are no major rivers or creeks within the bioregion. Numerous salt lakes of varying size occur across the region (DOTEE, 2017).

Beard (1990) describes the soil types in the COO3 subregion as: principally brown calcareous earths, with sandplains in the western part and some large playa lakes.

2.4 BOTANICAL DISTRICTS AND EXISTING VEGETATION

The survey area is located in the Coolgardie Botanical District of Beard (1990). The Coolgardie Botanical District is dominated by eucalypt woodlands, eucalypt open woodlands in the east, other shrublands, heath, *Acacia* shrublands, chenopod and samphire shrublands, mallee woodlands

and shrublands. There are small areas of *Acacia* forests and woodlands, and hummock grasslands occurring in the north (DOTEE, 2017).

Within the Coolgardie Botanical District, the Eastern Goldfields subregion is comprised of Mallees, *Acacia* thickets and shrubheaths on sandplains. Diverse *Eucalyptus* woodlands occur around salt lakes, on ranges, and in valleys. Salt lakes support dwarf shrublands of samphire. Woodlands and *Dodonaea* shrubland occur on basic granulites of the Fraser Range. The area is rich in endemic *Acacia*'s (CALM, 2002).

The Goldfields Woodlands is a centre of endemism and includes exceptionally high diversity of *Eucalyptus* species with as many as 170 species occurring in the bioregion. The COO3 subregion also has high diversity in *Acacia* species, as well as ephemeral flora communities of tertiary sandplain shrublands and of valley floor woodlands (CALM, 2002).

3 METHODS

3.1 PERSONNEL AND REPORTING

The following personnel were involved in the Level 2 flora and vegetation survey:

- Mr Eren Reid (BSc- Biological Science), Principal Botanist, Native Vegetation Solutions, undertook the survey, vegetation mapping, data collation, identification of flora during field work and post field work, preparation and review of the report.

3.2 PRELIMINARY DESKTOP STUDY

A preliminary assessment of the survey area and its potential constraints was undertaken by reviewing relevant government agency managed databases (Sections 3.2.1 to 3.2.5, and Appendices 1 & 2) and consulting with government agencies where necessary. The following sections provide a summary of desktop searches undertaken for the project.

3.2.1 Environment Protection and Biodiversity Conservation Act Protected Matters

The *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* Protected Matters Search tool was utilised to provide results for matters of National Environmental Significance within the survey area using the coordinates displayed within the search results (Appendix 1) with a 1km buffer (DOTEE, 2017b).
(http://www.environment.gov.au/arcgis-framework/apps/pmst/pmst-coordinate.jsf)

3.2.2 Threatened Flora and Communities

The Threatened and Priority Flora Database managed by the Department of Biodiversity, Conservation and Attractions (DBCA) was searched for threatened and priority flora within a 30km radial area of the survey area shapefile (Reference: 04-0717FL).

The Threatened and Priority Ecological Communities (TECs and PECs) database was searched to determine the presence of PECs or TECs (Reference: 11-0717DBCA), with Geographic Information System (GIS) data supplied for assessment, within a 10km radial area of the survey area shapefile.

3.2.3 Environmentally Sensitive Areas (ESAs) and Conservation Reserves

The Department of Water and Environmental Regulation (DWER) Clearing Permit System Map Viewer was used to determine the location of any ESAs and Conservation Reserves (https://cps.der.wa.gov.au/main.html).

3.2.4 Vegetation Type, Extent and Status

Vegetation extent and status data was sourced from the Department of Agriculture and Food (DAFWA) report “Land-Use and Vegetation in Western Australia- National Land and Water Resources Audit Report” and its associated GIS file (Shepherd *et al*, 2002). This data comprises Beard’s Pre-European vegetation groups.

DPaW's Statewide Vegetation Statistics (DPAW, 2017) was also referenced for the current extent of Beard's Vegetation Groups.

3.2.5 Wetlands

The potential of wetlands within the project area was determined by examining DWER’s Clearing Permit System Map Viewer (DWER, 2017).

3.2.6 Dieback

Dieback is only considered a potential issue for the project if both the mean annual rainfall of the area is >400mm, and if the project area resides south of the 26th parallel. Dieback is not considered an issue for the survey area as although it lies south of the 26th parallel it receives average annual rainfall of 270.3 mm, which is below the 400mm threshold mark. There are no records of *Phytophthora cinnamomi* establishing in natural ecosystems in regions receiving less than 400mm rainfall per annum (CALM, 2003).

3.3 LEVEL OF SURVEY

The survey was conducted in accordance with EPA's Position Statement No. 3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA, 2002), *Guidance for the Assessment of Environmental Factors No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2004) and *Technical Guide- Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA and DPAW, 2015).

In designing this survey, note was taken of Tables 2 and 3 of EPA Guidance Statement 51 (pp 39-45). Using the Table 3 criterion on 'Size/scale of the proposal/impact' it is determined that the impact of this mining proposal is High, although other criteria (for example 'Degree of degradation or clearing within region' and 'Rarity of vegetation') may mitigate this to Medium impact. This survey, however, is designed to accommodate the High impact and as such, in the Eastern Goldfields subregion, a Level 2 survey is required.

3.4 SITE INVESTIGATION

The first stage of the field survey was conducted by Mr. Eren Reid, Botanist of NVS, on the 6th, 7th, 11th and 13th July 2017. The second follow up survey was conducted by Mr. Eren Reid on 13th and 14th September 2017.

3.4.1 Field Methods

Prior to the field work, the aerial photography was examined and representative sample sites for quadrats were chosen to provide coverage over all viable vegetation types. Twenty-nine sites were chosen by this method.

In the field, these sites were visited and 20 x 20m quadrats established in appropriate locations, taking into account representativeness of the site to surrounding vegetation and vegetation boundaries.

Each quadrat site was marked in all corners with a 97cm galvanized fence dropper and was defined by tape measures. The location of one corner was captured on a TwoNav Aventura GPS at ±4m accuracy, using Universal Transverse Mercator location on GDA94 datum. Digital photographs were taken of each quadrat site.

Data collected at each quadrat included:

- Species Present;
- Topography;
- Rock Type;
- Soil Colour and Type;
- Aspect;
- % Bare Ground and Litter;
- Disturbance Level; and
- Vegetation Condition.

As well as a complete list of all species encountered, the average height and estimated coverage of the species making up the three stratum levels (Tallest, Mid and Lower).

Specimens of taxa not recognised by the Botanists were collected and pressed along with specimens of taxa recognised as, or thought to be, conservation-significant species.

The condition of each quadrat was assessed using the method developed by Keighery (1994). Definitions of the condition scale are presented in Appendix A.

Vegetation groups were mapped (section 3.4.3 below).

Opportunistic sampling of plant taxa and vegetation group mapping was also utilised in the survey area between quadrat sampling points, via wandering traverses. Relevé sites were also utilised as opportunistic sample sites to collect flora specimens and assist in mapping vegetation groups.

All sample sites and GPS tracks are included in Appendix C.

3.4.2 Post-Field Methods

Unknown specimens collected in the field were identified post field work by Eren Reid with reference to published keys and samples held in the Reference Section of the Western Australian Herbarium (WAHERB).

Species information was transferred into Microsoft Excel® worksheets in preparation for PATN analysis (Belbin, 1994), via Bray and Curtis Flexible UPGMA, as well as input into a computer program which generates a species accumulation curve (Seaby & Henderson, 2006).

3.4.3 Mapping

Vegetation mapping was produced via GPS recorded information in the field, cross-referenced with vegetation descriptions made in the field, overlaid on aerial imagery of the survey area. The GPS utilized (TwoNav Aventura GPS) displayed aerial imagery, hence real-time mapping of vegetation groups was available during field work.

Vegetation Health Condition was assessed in the field with reference to Keighery (1994).

GPS tracks and waypoints recorded during field work are presented in Appendix C.

3.5 LICENCE AND PERMITS

Flora was collected for identification under the Scientific Collection License SL011847 held by Mr E. Reid with expiry 09/07/2017.

3.6 NOMENCLATURE AND TAXONOMY

Nomenclature follows that used by the WAHERB.

Recently the WAHERB has updated its sequence and arrangement of collections to conform to the systematic sequence of the Angiosperm Phylogeny Group (APGIII), with the result that many Families and Genera have been moved or renamed. This report attempts to follow those changes in relation to species recorded during this survey. Definitions of Threatened Flora are also included in Section 9 below.

3.7 LIMITATIONS

Table 1 lists potential limitations that may have affected the survey. These are based on the listing given in the *Guidance Statement No. 51 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004).

Table 1: List of potential survey limitations

Possible Limitation	Constraint	Comment
Competency/experience of the consultant carrying out the survey	No	Experienced and competent personnel conducted the survey. Eren Reid has over 13 years' experience in botanical surveys throughout the Goldfields and over a variety of environments across Western Australia.
Scope	No	The Scope of work was adequately defined. Vascular flora species were the focus of the survey and were thoroughly sampled. Of all the plant taxa identified, 5.8% were considered annual species.
Proportion of flora identified, recorded and/or collected	No	All taxa not identified in the field were collected and pressed, and later identified by Eren Reid. See also Species Accumulation Curves in section 4.2.2.2.
Sources of information	No	Information on flora and vegetation of the region and local area was available from publicly available databases, books and reports.
Proportion of the tasks achieved	No	All tasks completed.
Timing/season	Potential	This survey was undertaken in July and September 2017. Rainfall averages were exceeded in January, February and March 2017, while rainfall in April, May, June, July and August 2017 was below average. Only 6 specimens were collected during field work, which were all identified post field work. Timing would have been ideal earlier in April/May for the first part of the survey. September was ideal for the second part of the survey.
Disturbance in survey area	No	Disturbance from grazing and exploration was apparent in the survey area. However, the structural dominants of the vegetation persist and, the vegetation remains in Good to Very Good condition.
Intensity of survey effort	No	The survey intensity is considered to have been sufficient for a Level 2 survey according to EPA (2004) guidelines. Areas most likely to contain threatened and priority species were targeted. Vegetation mapping sites were selected to provide adequate coverage of the survey area.
Resources	No	Resources, in terms of time, equipment, support and personnel were adequate to undertake and complete the Level 2 survey.
Remoteness and/or access problems	No	All the areas in need of survey were easily accessible from existing tracks, or by foot.
Availability of contextual information for the region`	No	Contextual information regarding vegetation and flora around the Eastern Goldfields subregion is readily available. Adequate information was able to be accessed from available databases (DBCA 2017 and DOTEE 2017b).

4 RESULTS

4.1 PRELIMINARY DESKTOP ASSESSMENT

4.1.1 EPBC Protected Matters Search Tool

The search undertaken with the EPBC's Protected Matters Search Tool reported that no TECs were present in the survey area (DOTEE, 2017b). The search also revealed that the survey area may contain habitat for the invasive weed species *Carrichtera annua* (Ward's Weed).

The threatened species, *Gastrolobium graniticum*, was listed as either likely to be in the area or having potential habitat occurring in the area. This species occurs mainly on granite outcrops. No granite outcrops were identified in the survey area.

Results of the EPBC Protected Matters Search Tool are included in Appendix B.

4.1.2 Threatened Flora and Communities

The DPAW database searches revealed a potential for 2 Threatened and 39 Priority Flora species to occur within a 30km radius of the survey area (DBCA, 2017a). No known locations of these Flora occur within the survey area, while the closest location occurs approximately 7 km east of the survey area.

Results of the threatened flora database search are included in Appendix D.

The PEC/TEC search (DBCA, 2017) revealed no TECs or PECs within the survey area.

4.1.3 Environmentally Sensitive Areas and Conservation Reserves

The survey area does not lie within or contain any ESA's or Conservation Reserves (DWER, 2017).

4.1.4 Vegetation Type, Extent and Status

Three vegetation units defined by Beard (1990) were identified as part of the desktop assessment. These vegetation units identify the Pre-European extent of vegetation, as mapped by Beard (1990).

Information relating to known Beard (1990) vegetation units within the survey area has been summarised in Tables 2 and 3 below. This information has been compiled through both desktop assessments and the site visit.

Table 2: Summary of information regarding Pre-European and current vegetation extent of vegetation association 8 within the survey area

Factor	Value				
Beard Vegetation Association*	8				
Vegetation Association Description*	Medium woodland; salmon gum & gimlet				
Pre-European Extent (ha)	Scale				
	By Association	***By Association***	***By IBRA Region*** *(Coolgardie-COO)*	***By IBRA Sub-region*** *(Eastern Goldfields-COO3)*	***By Shire*** *(Shire of Coolgardie)*
	1,096,450*	694,638**	280,248**	226,086**	160,584**
% Pre-European Extent Remaining	*57.63%**	*49.89%***	*98.34%***	*99.53%***	*99.34%***
Surrounding Land Use***	Pasture Grazing, Exploration and Mining				
Weed prevalence***	Low				

* Source: Shepherd *et al.* (2002)
**Source: DPAW (2017)
***Source: Field Assessment

Table 3: Summary of information regarding Pre-European and current vegetation extent of vegetation association 468 within the survey area

Factor	Value				
Beard Vegetation Association*	468				
Vegetation Association Description*	Medium woodland; salmon gum & goldfields blackbutt				
Pre-European Extent (ha)	Scale				
	By Association	***By Association***	***By IBRA Region*** *(Coolgardie-COO)*	***By IBRA Sub-region*** *Eastern Goldfields-COO3)*	***By Shire*** *(Shire of Coolgardie)*
	476,113*	592,022**	583,357**	482,361**	149,487**
% Pre-European Extent Remaining	*100.00%**	*98.63%***	*98.63%***	*98.34%***	*99.43%***
Surrounding Land Use***	Pasture Grazing, Exploration and Mining				
Weed prevalence***	Low				

* Source: Shepherd *et al.* (2002)
**Source: DPAW (2017)
***Source: Field Assessment

4.1.5 Wetlands

No water bodies were identified within the survey area via the CPS Map Viewer (DWER, 2017).

4.1.6 Dieback

The survey area lies south of the 26th parallel, however receives average annual rainfall of approximately 270.3 mm (BOM, 2017), below the 400mm threshold mark. There is no record of *Phytophthora cinnamomi* establishing in natural ecosystems in regions receiving <400mm rainfall per annum (CALM, 2003). Therefore, Dieback is not considered an issue for this survey area, however all measures should be taken to prevent any possible soil contamination or weed infestations which could pose a risk within the survey area during seasonally favourable conditions.

4.2 FIELD ASSESSMENT

4.2.1 Vegetation of the Survey Area

Beard's vegetation associations are very broad and are used over large areas in which there is also a large amount of variation at a more local level. The vegetation groups described below for the survey area fit into the broader Beard descriptions above in section 4.1.4.

The vegetation groups described below were determined visually based on dominant species, to form the descriptions taken at the time of the field survey

Descriptions of all 29 sites/quadrats are presented in Appendix F. For each site the physical features, vegetation description and unit, along with the species lists for the 20 x 20m plots with typical canopy cover and height, are provided.

4.2.1.1 Vegetation Groups

Nine vegetation groups were identified during this survey, largely following topographical features and dominant species. Mapping of the 9 vegetation groups, as well as the quadrat locations can be seen in Appendix C. Photographs of each quadrat and the relevant vegetation group can be seen in Appendix F.

A. *Eucalyptus griffithsii* and *E. campaspe* over *Acacia acuminata* over mixed sclerophyll shrubland

Open Shrub Mallee of *Eucalyptus griffithsii* and *E. campaspe* over *Acacia acuminata* and *Eremophila oldfieldii* subsp. *angustifolia* over *Dodonaea lobulata, Scaevola spinescens, Beyeria sulcata* var. *sulcata* and *Ptilotus obovatus*.

Quadrats: 1 and 2

B. *Eucalyptus campaspe* and *Eucalyptus clelandii* woodland

Low Woodland of *Eucalyptus campaspe* and *E. clelandii* over *Eremophila oldfieldii* subsp. *angustifolia, Eremophila interstans* subsp. *virgata and Senna artemisioides* subsp. *filifolia* over *Atriplex nummularia* subsp. *spathulata, Eremophila scoparia, Acacia erinacea, Eremophila pustulata, Olearia muelleri* and *Ptilotus obovatus.*

Quadrats: 3, 4 and 5

C. *Eucalyptus griffithsii* woodland over Chenopod shrublands

Open Tree Mallee of *Eucalyptus griffithsii* over *Eremophila alternifolia* and *Atriplex nummularia* subsp. *spathulata* over *Senna artemisioides* subsp. *filifolia, Atriplex stipitata* and *Ptilotus obovatus.*

Quadrat: 7

D. Open Chenopod shrubland

Tall Open Shrubland of *Eremophila interstans* subsp. *virgata* and *Atriplex nummularia* subsp. *spathulata* over *Eremophila scoparia* and *Senna cardiosperma* over *Atriplex stipitata*.

Quadrat: 6

E. *Eucalyptus salmonophloia* woodland

Woodland of *Eucalyptus salmonophloia* with occasional *E. transcontinentalis* over occasional *E. oleosa* subsp. *oleosa* over *Eremophila scoparia, Exocarpos aphyllus, Eremophila caperata, Eremophila interstans* subsp. *virgata* and *Eremophila ionantha* over *Olearia muelleri, Senna artemisioides* subsp. filifolia, *Atriplex vesicaria, Atriplex stipitata, Senna cardiosperma, Acacia hemiteles, Ptilotus obovatus* and *Scaevola spinescens*.

Quadrats: 8,10,11,12,13,14 and 20

F. Mixed *Eucalyptus* woodland over sclerophyll shrubland

Low Woodland of *Eucalyptus clelandii, Eucalyptus salubris, Eucalyptus oleosa* subsp. *oleosa, Eucalyptus griffithsii* and occasional *Casuarina pauper* over *Eremophila interstans* subsp. *virgata, Santalum acuminatum, Eremophila caperata, and Eremophila oldfieldii* subsp. *angustifolia,* over *Senna artemisioides* subsp. *filifolia, Eremophila glabra* subsp. *glabra, Olearia muelleri, Acacia hemiteles, Eremophila pustulata* and *Eremophila parvifolia* subsp. *auricampa.*

Quadrats: 9, 15, 18, 19, 21, 24 and 29

G. *Eucalyptus thicket in open depressions*

Low Open Forrest of *Eucalyptus clelandii, E. salubris and E. oleosa* subsp. *oleosa* over *Senna artemisioides* subsp. *filifolia, Acacia merrallii, Exocarpos aphyllus* and *Eremophila scoparia* over *Acacia colletioides, Eremophila ionantha* and *Eremophila decipiens* subsp. *decipiens.*

Quadrats: 16 and 17

H. *Eucalyptus oleosa* subsp. *oleosa* over Chenopod shrublands

Open Shrub Mallee of *Eucalyptus oleosa subsp. oleosa* with occasional *E. yilgarnensis* over *Eremophila interstans* subsp. *virgata* and *Eremophila scoparia* over *Cratystylis subspinescens, Cratystylis conocephala, Eremophila decipiens* subsp. *decipiens* and *Eremophila parvifolia* subsp. *auricampa*.

Quadrats: 22 and 23

I. *Eucalyptus* over *Melaleuca sheathiana* over *Cratystylis conocephala* on calcrete rises

Low Woodland of *Eucalyptus clelandii* over *Melaleuca sheathiana, Acacia hemiteles* and *Exocarpos aphyllus* over *Cratystylis conocephala, Westringia rigida, Grevillea acuaria, Acacia colletioides* and *Eremophila scoparia*.

Quadrats: 25, 26, 27 and 28

J. Existing Disturbance

This classification was for the purposes of mapping and was completely degraded, including historic open pits, haul roads and waste landforms.

Table 4: Vegetation Group Extent within Survey Area

Vegetation Group	Families	Genera	Species	Area (ha)	Percentage of survey area (%)
A	14	16	26	5.051	0.86%
B	12	19	36	42.94	7.28%
C	9	15	27	1.55	0.26%
D	8	13	26	9.58	1.62%
E	14	26	53	164.27	27.85%
F	16	25	57	255.03	43.23%
G	9	11	19	26.90	4.56%
H	10	17	37	5.04	0.85%
I	14	24	40	55.37	9.39%
J- Existing Disturbance	0	0	0	24.18	4.10%
Total	**24***	**39***	**85***	**589.91#**	**100.00%#**

*Denotes total recorded in the survey area (not sum of column)
# Denotes sum of column

4.2.1.2 PATN Analysis of Quadrat Data

PATN Analysis was completed on both the dominant species and all species recorded within each quadrat. The results are supplied below in Figure 5 and Figure 6.

The PATN analysis dendrogram of the dominant species in Figure 5, displays each quadrat with like symbols representing NVS mapped vegetation groups, and coloured lines depicting PATN defined vegetation groups. The dendrogram shows a good association between vegetation groups described in section 4.2.1.1, however there were some outliers (highlighted green).

These outliers are expected to occur for vegetation groups with transitional dominant species. In most cases one or two species will be present within a 20x20 quadrat, but it will not contain all the varieties of dominant species that will occur across that vegetation type, and as such some quadrats of the same vegetation group will be separated as different when assessed by the PATN Analysis.

Quadrat Q19 and Q4 were grouped together via PATN analysis, however were mapped as different vegetation groups because of the overall species composition of surrounding vegetation.

Due to the overlap and variation of lower storey species, these were grouped together via PATN Analysis.

Quadrats 6 and 9, were grouped via PATN analysis with vegetation group B, however were mapped as group D and group F respectively based on other species present and vegetation structure.

Quadrat 12 and 24 were combined as a separate group via PATN Analysis, due to the presence of similar dominant species *Eucalyptus oleosa subsp. oleosa, Eremophila scoparia* and *Daviesia aphylla* however, overall species composition saw these quadrats mapped as groups E and F respectively.

Vegetation groups G and F have been grouped together via PATN analysis based on dominant species. These vegetation groups are varieties of *Eucalyptus* woodland, which demonstrates that although the dominant Eucalypts may differ between vegetation groups, the dominant understorey species may remain similar, providing stronger correlations to some quadrats representing different vegetation groups. The dendrogram also demonstrates stronger correlation within this grouping which favours the vegetation groups mapped by NVS, i.e. Q15, Q21 and Q29 are more similar, representing vegetation group F; Q16 and Q17 are grouped more similarly representing vegetation group G;

Quadrat 18 was combined with Vegetation Group I via PATN analysis based on dominant species, including *Eucalyptus clelandii*, *Exocarpos aphyllus* and *Acacia hemiteles*. This quadrat was mapped as part of group F due to the other non-dominant species present and the vegetation structure, as well as the lack of *Melaleuca sheathiana* and *Cratystylis conocephala*.

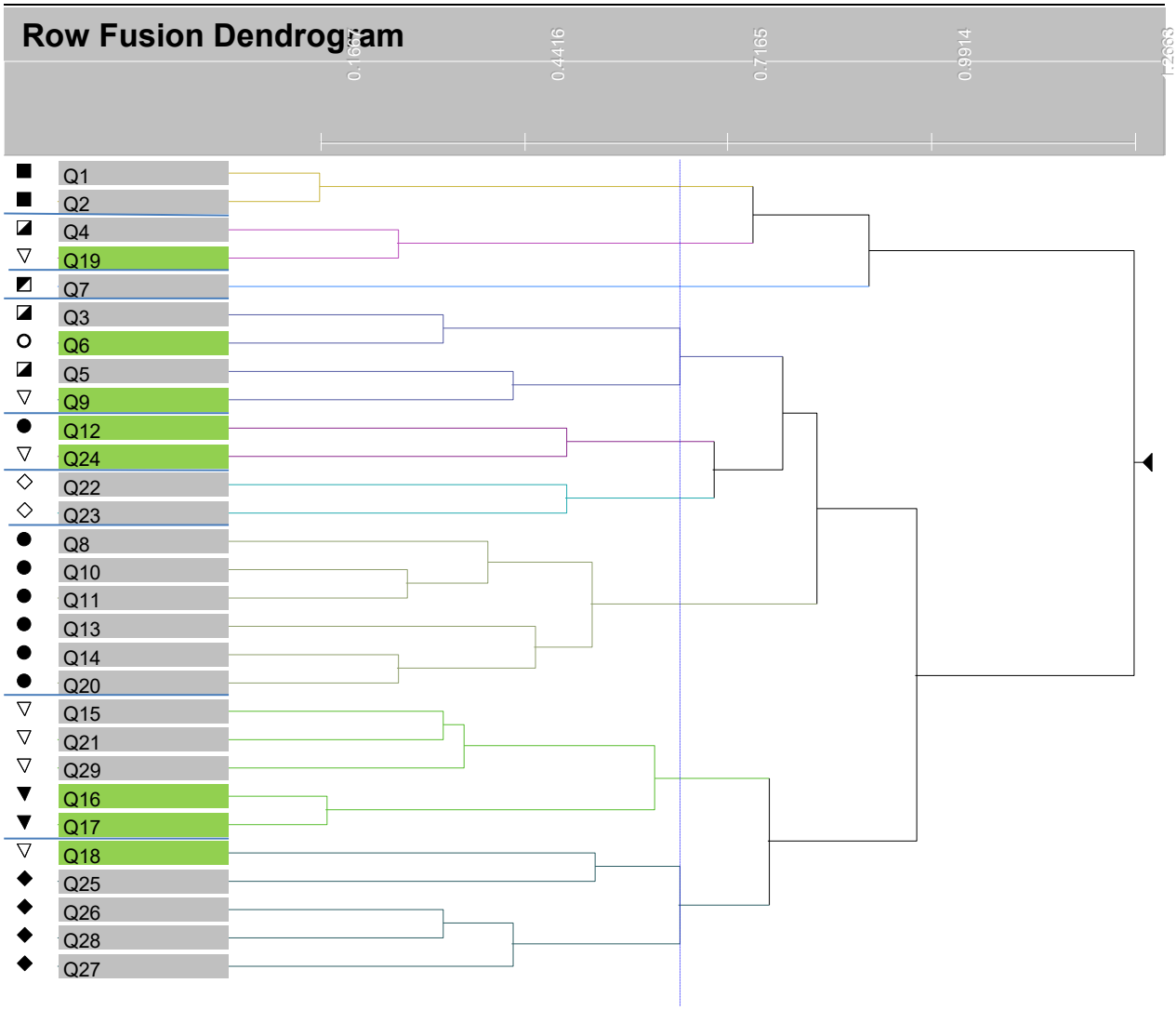

Figure 5: PATN Analysis of Dominant Species into 9 groups

The dendrogram below (Figure 6) of the analysis of all species shows a correlation to pre-grouped quadrats described in section 4.2.1.1. The dendrogram displays each quadrat with like symbols representing NVS mapped vegetation groups, and coloured lines depicting PATN defined vegetation groups. However, there were some outliers and these are highlighted in green (Figure 6).

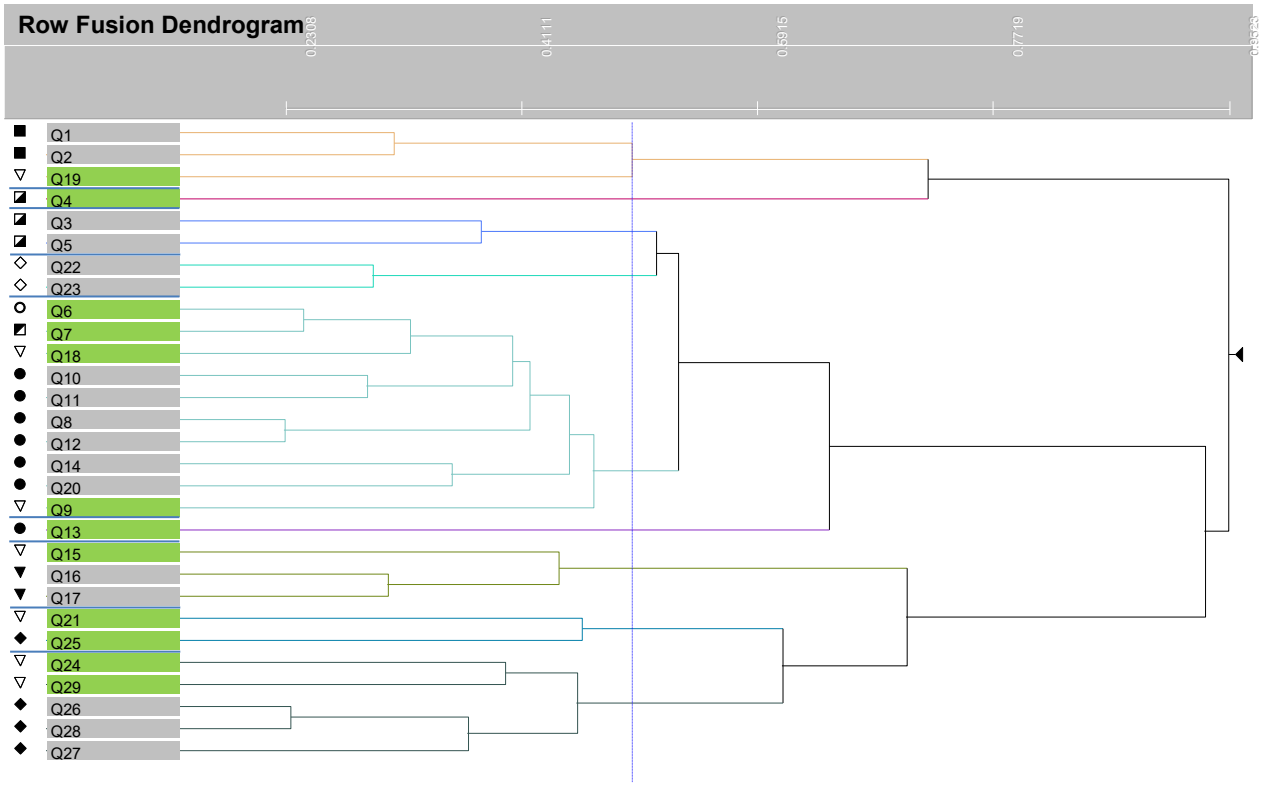

Figure 6: PATN Analysis of All Species into 9 groups

4.2.1.3 Vegetation Condition

Vegetation in the survey area has been subjected to historic mining, exploration activities and grazing.

According to Keighery (1994), most of the sites/quadrats inspected were in Good to Very Good condition (Appendix F). There were existing vehicle tracks in some areas, due to mine exploration activities. The vegetation more than 0.5m off these tracks was mostly in a Good to Very Good condition (Keighery 1994).

As discussed below in Section 4.2.2.4, there were two species of weeds observed during the survey.

4.2.2 Flora of the Survey Area

4.2.2.1 General

Eighty-five species were recorded within the survey area with 84 species recorded within quadrats. Thirty-nine genera and 24 families were found. These are listed in Appendix E, per Quadrat as well as per vegetation group. Of the native species, Chenopodiaceae had the highest representation, with 19 species from 8 genera, dominated by *Maireana.* Fabaceae and Scrophulariaceae were the next best represented families with 12 species each.

Of the 85 taxa recorded there were two introduced weed species; *Carrichtera annua* (Ward's Weed) and *Cucumis myriocarpus* (Prickly Paddy Melon). These weed species were recorded within 2 of the 29 quadrats. No weed species recorded were considered declared plants by DPIRD (2017).

The most common and widespread species were *Eremophila scoparia, Exocarpos aphyllus and Senna artemisioides* subsp. *filifolia,* which were recorded within 25 quadrats. Its canopy cover was 10-30%. The next most common and widespread species was *Ptilotus obovatus,* recorded in 19 quadrats, with a canopy cover less than 10%.

There were 30 taxa recorded from within a single site, Q23. Of these, none were weed species.

4.2.2.2 Species Accumulation Curves

A Species Accumulation Curve was generated using the computer programme **Species Diversity and Richness Version 4.1.2** (Seaby & Henderson, 2006). This curve was then fitted to a logarithmic curve in **Excel®**, which is plotted in Figure 7 below. According to the Species Accumulation Curve below, the R^2 value (0.991) shows an acceptable fit for a logarithmic curve of the total accumulated species per number of quadrats established (Figure 7).

Sufficient sampling was inferred via the effort of intensity (number of quadrats established) versus the return of species collected (total accumulated species). The logarithmic trend line and R^2 values were generated in **Excel®**. From this fitted logarithmic curve formula, the asymptote was calculated where the gain of new species was less than 1% for every new quadrat established. Based on this reasoning, the asymptote was reached at 24 quadrats, at which the extrapolated total accumulated number of species is 80.6. Therefore the 84 species collected within the 29 quadrats represents 104.21% of the projected asymptote.

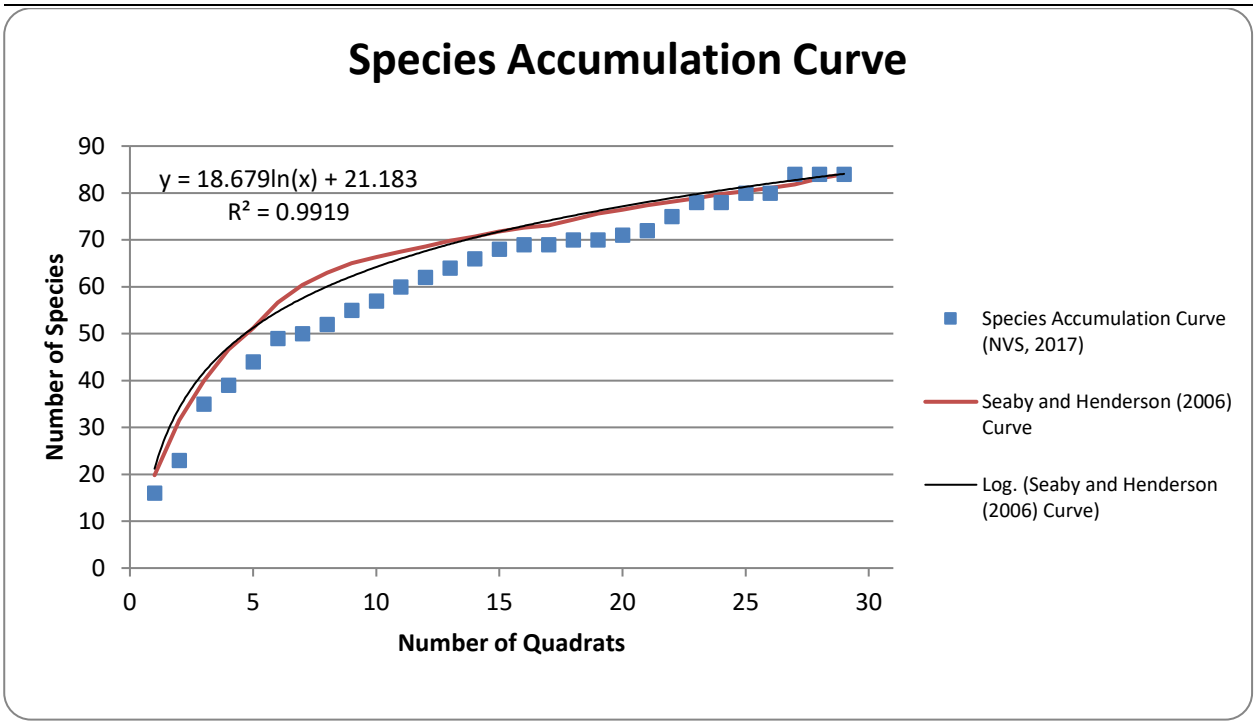

Figure 7: Species Accumulation Curve for the 29 sampled quadrats

4.2.2.3 Conservation significant species

No Threatened species were recorded during the survey.

One Priority species, *Eremophila praecox* (P1), was identified in the survey area within Q22, which lies within Vegetation Group H. Two plants were recorded here within a 200m radius. There is some suggestion that *Eremophila praecox* (P1) is a hybrid between *Eremophila ionantha* and *Eremophila parvifolia*, which were both abundant in the general area.

4.2.2.4 Introduced species

Two introduced species recorded in the survey area, not considered Declared Plants by the DPIRD (2017) are listed below:

- *Carrichtera annua* (Ward's Weed) is an annual, native to the Mediterranean. This weed is abundant in the Goldfields and Nullarbor shrublands, often dominating mine rehabilitation sites (Hussey *et al*, 2007). This species was recorded in Q5 and Q6.
- *Cucumis myriocarpus* (Prickly Paddy Melon) is a summer growing annual. It is a native southern Africa, and is often found in paddocks, roadsides and disturbed lands throughout the agricultural areas and southern Kimberley (Hussey *et al*, 2007). This species was recorded in Q5.

5 DISCUSSION

The EPA (2002) indicated that an ecological assessment of a site must consider its ecological value at the ecosystem level and its biodiversity value at the genetic, species and ecosystem level.

The survey area is located within the Eastern Goldfields subregion which includes four centres of endemism, all of which occur outside the survey area (CALM, 2002). This survey established that mostly, the flora within the project area is not unique, and is in fact common throughout the Eastern Goldfields subregion and adjoining regions.

Eighty-five species were recorded within the survey area with 84 species recorded within quadrats. Thirty-nine genera and 24 families were recorded. Of the native species, Chenopodiaceae had the highest representation, with 19 species from 8 genera, dominated by *Maireana.* Fabaceae and Scrophulariaceae were the next best represented families with 12 species each.

Of the 85 taxa recorded there were two introduced weed species; *Carrichtera annua* (Ward's Weed) and *Cucumis myriocarpus* (Prickly Paddy Melon) These weed species were recorded within 2 of the 29 quadrats. No weed species recorded were considered declared plants by DPIRD (2017).

No Threatened Flora were recorded in the survey area.

No TECs or PEC's were recorded within the survey area.

One Priority species, Eremophila praecox (P1), was identified in the survey area within Q22, which lies within Vegetation Group H. Two plants were recorded here within a 200m radius

Vegetation condition was generally 'Good' to 'Very Good' (Keighery 1994). Disturbance was present within the survey area mostly attributed to historic mining activities, access tracks, exploration related activities, and also grazing.

It is therefore not expected that the disturbance within the survey area will significantly negatively impact on the vegetation in the area in terms of fragmentation and loss of vegetation associations or species that may be unique. This is partially due to the overall size of the survey area as well as the similar abundant vegetation and habitat outside of the survey area.

6 IMPACT ASSESSMENT

6.1 THREATENING PROCESSES

The major processes likely to impact the Flora within the Survey area, if clearing were to proceed include:

- Vegetation clearing and therefore a reduction in biodiversity;
- Vehicle impacts on uncleared vegetation could increase if tracks are not adhered to;
- An increase in the area of disturbed land could result in an increase in non-native species;
- Dust generated during clearing of native vegetation and associated activities may settle on adjacent native vegetation, causing possible stress and perhaps death, especially during drier months; and
- Accidental fire arising from clearing and associated activities, may affect vegetation in surrounding areas.

7 CONCLUSIONS AND RECOMMENDATIONS

The survey established that the condition of the vegetation in the survey area is overall 'Good' to 'Very Good' condition. No Threatened Flora were recorded in the area. No TECs/PECs were recorded in the survey area.

One Priority Species *Eremophila praecox* (P1) was recorded in Q22. Only two plants were recorded at this location within a 200m radius.

The EPA objective for flora and vegetation is to maintain the abundance, species diversity and geographical distribution of flora and vegetation as well as protect Threatened flora consistent with the provisions of the *Biodiversity Conservation Act 2016.*

The proposed clearing of vegetation will result in the loss of some individuals from the local area; however, the impact will not be great enough to remove whole communities or populations. Most of the species and communities recorded during this survey are widespread throughout the Eastern Goldfields subregion and adjoining regions, and therefore the loss of a small proportion from this area will not be significant.

This report summarises the results of the first and second stages of the Level 2 survey.

The following recommendations arise from the current flora survey:

- Any disturbance/clearing be minimised as much as practicable to reduce the loss of individuals and impact on populations;
- Weed control measures should be implemented/followed during and post construction activities;
- Driving restrictions, ensuring that off-road driving is minimised; and
- All staff to be educated on the importance of fire prevention, and equipment provided for use in the event of fire.

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9 GLOSSARY

Acronyms:

BOM	Bureau of Meteorology, Australian Government
BSc	Bachelor of Science
CALM	Department of Conservation and Land Management (now DBCA)
COO	Coolgardie Bioregion, IBRA
COO3	Eastern Goldfields Subregion, IBRA
CPS	Clearing Permit System (DWER)
DBCA	Department of Biodiversity, Conservation and Attractions, Western Australia
DMIRS	Department of Mines, Industry Regulation and Safety, Western Australia
DRF	Declared Rare Flora
DOTEE	Department of the Environment and Energy, Australian Government
DPAW	Department of Parks and Wildlife, Western Australia (now DBCA)
DPIRD	Department of Primary Industries and Regional Development, Western Australia
DWER	Department of Water and Environmental Regulation, Western Australia
EPA	Environmental Protection Authority, Western Australia
EP Act	*Environmental Protection Act 1986*, Western Australia
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth Act)
ESA	Environmentally Sensitive Area
GIS	Geographical Information System
ha	Hectare (10,000 square metres)
IBRA	Interim Biogeographic Regionalisation for Australia, DOTEE
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union
km	Kilometres
m	Metres
NVS	Native Vegetation Solutions
PEC	Priority Ecological Community, Western Australia
TEC	Threatened Ecological Community
WA	Western Australia
WAHERB	Western Australian Herbarium, DBCA

Definitions:

{DPAW (2017) Conservation Codes for Western Australian Flora and Fauna. Department of Parks and Wildlife, Western Australia, May 2017}: -

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

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

Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the Wildlife Conservation Act. The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

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

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

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

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

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

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

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

P Priority species
Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

P1 Priority One - Poorly-known species:
Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

P2 Priority Two - Poorly-known species:
Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

P3 Priority Three - Poorly-known species:
Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

P4 Priority Four - Rare, Near Threatened and other species in need of monitoring:
(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.
(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix A - Vegetation Condition Scale (Keighery, 1994)

Pristine (1). Pristine or nearly so, no obvious signs of disturbance.

Excellent (2). Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.

Very Good (3). Vegetation structure altered obvious signs of disturbance.
For example, disturbance to vegetation structure caused by repeating fires, the presence of some more aggressive weeds, dieback, logging and grazing.

Good (4). Vegetation structure significantly altered by very obvious signs of multiple disturbance.
Retains basic vegetation structure or ability to regenerate it.
For example, disturbance to vegetation structure caused by frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

Degraded (5). Basic vegetation structure severely impacted by disturbance.
Scope for regeneration but not to a state approaching good condition without intensive management.
For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

Completely Degraded (6). The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.
These areas are often described as 'parkland cleared' with the flora compromising weed or crop species with isolated trees or shrubs.

Appendix B – EPBC and Other Government Database Search Results

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

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

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

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

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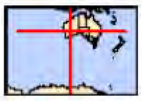


Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	4
Listed Migratory Species:	6

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	9
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	7
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may occur within area
Plants		
Gastrolobium graniticum Granite Poison [14872]	Endangered	Species or species habitat likely to occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area

Extra Information

Invasive Species		[Resource Information]
Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.		
Name	Status	Type of Presence
Mammals		
Capra hircus Goat [2]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Carrichtera annua Ward's Weed [9511]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-30.7021 120.9099,-30.708 120.9013,-30.7224 120.9309,-30.7321 120.9298,-30.7328 120.9632,-30.7235 120.9634,-30.7234 120.9387,-30.7021 120.9099

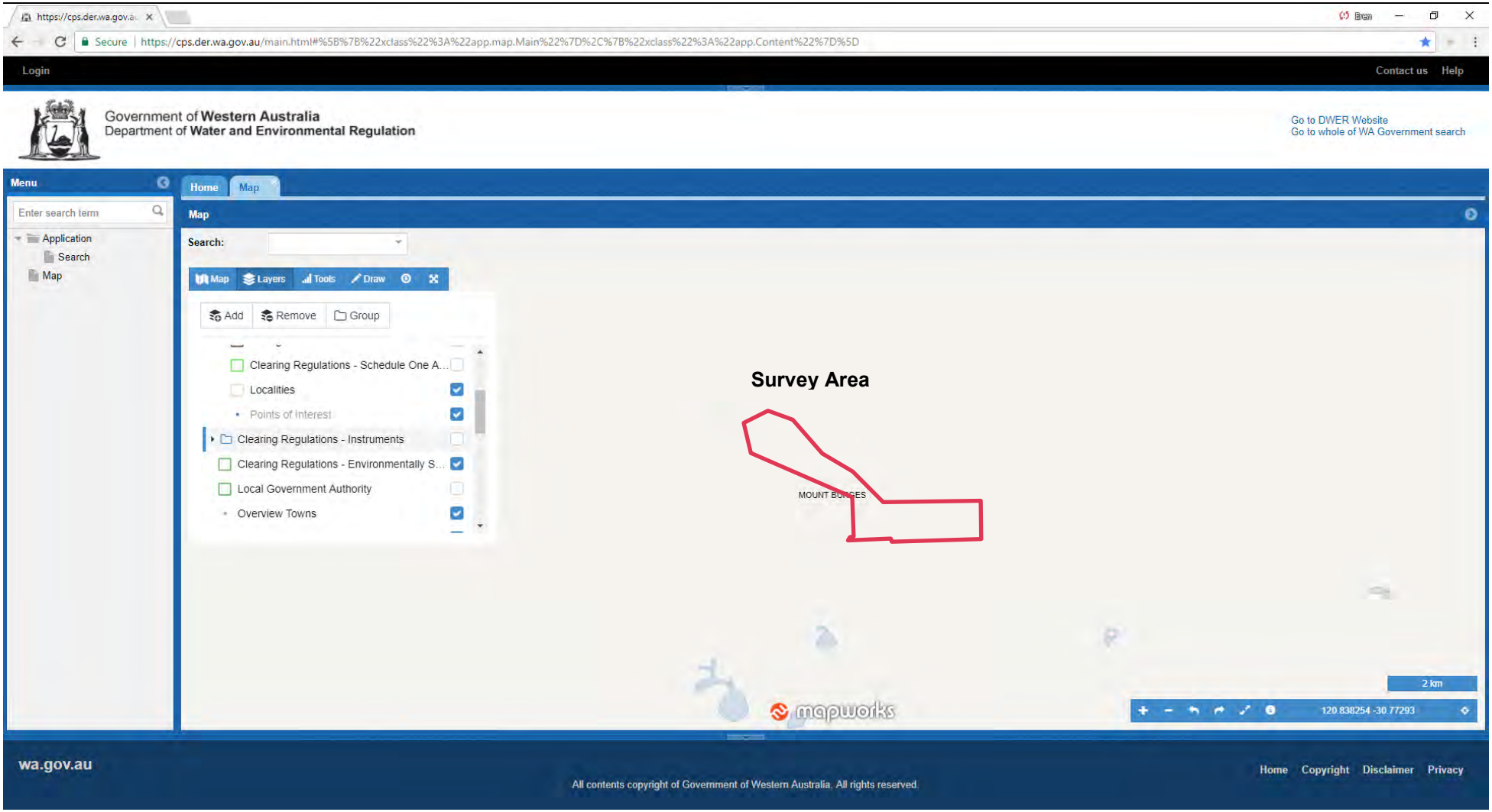
Acknowledgements

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

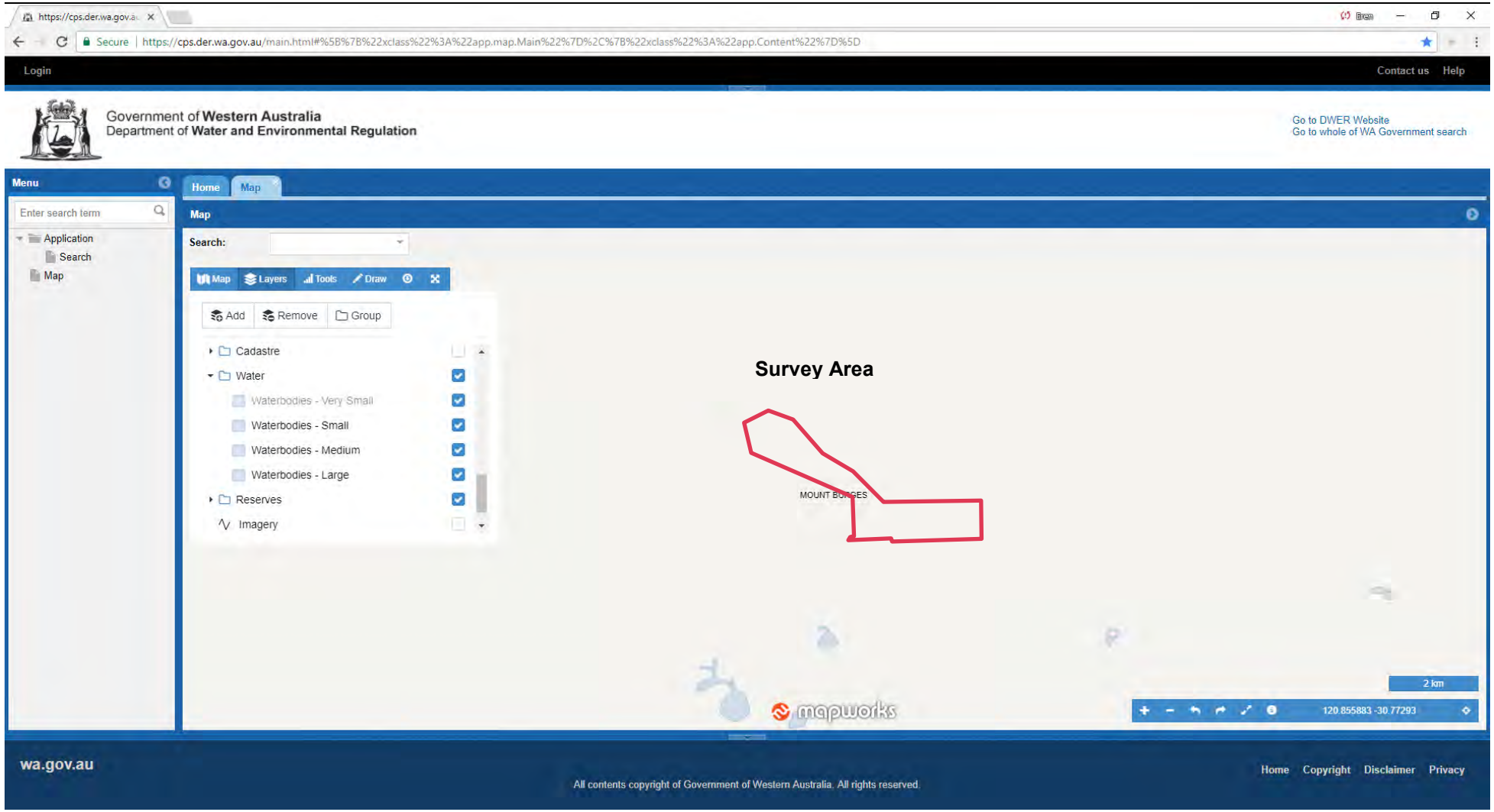
-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management,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

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

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

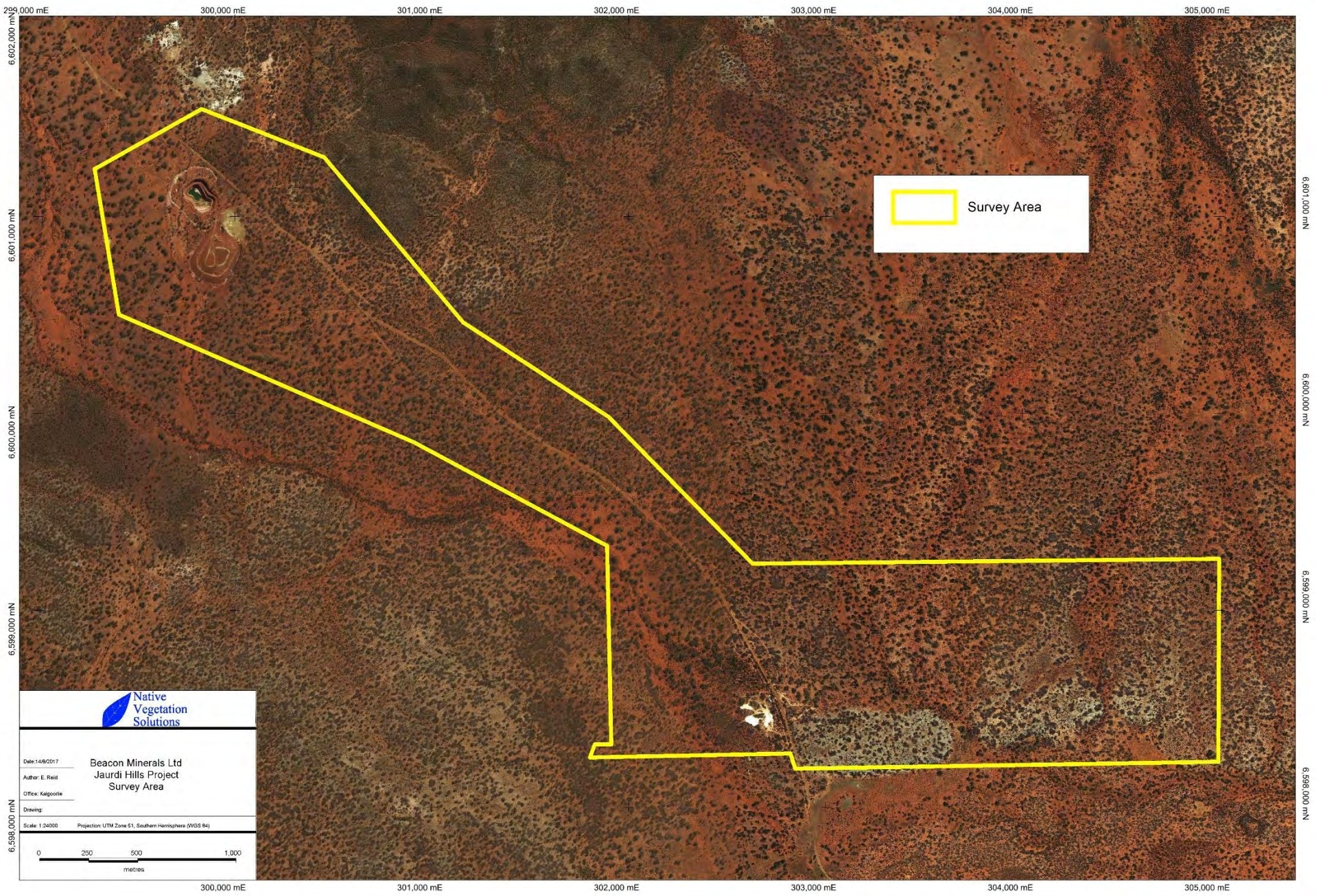


DWER CPS Map Viewer - showing no ESA's (dark green shaded areas) within the survey area (pink polygon) (DWER, 2017)



DWER CPS Map Viewer - showing no water bodies within the survey area (pink polygon) (DWER, 2017)

Appendix C - Maps


299,000 mE
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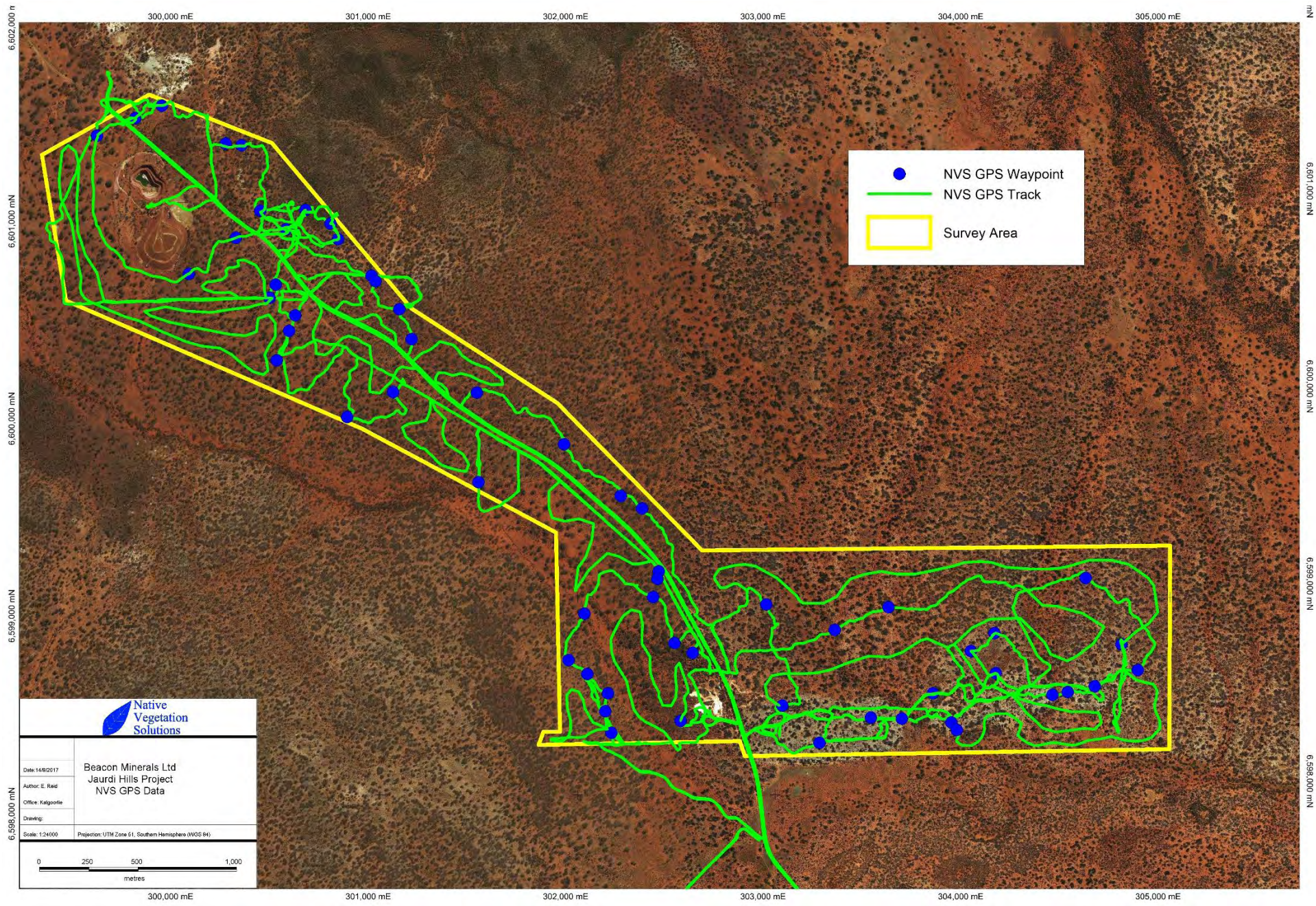
301,000 mE
302,000 mE
303,000 mE
304,000 mE
305,000 mE
6,602,000 mN
6,601,000 mN
6,600,000 mN
6,599,000 mN
6,598,000 mN
Survey Area
Native Vegetation Solutions
Date:14/9/2017
Author: E. Reid
Office: Kalgoorlie
Drawing:
Scale: 1:24000
Projection: UTM Zone 51, Southern Hemisphere (WGS 84)
Beacon Minerals Ltd
Jaurdi Hills Project
Survey Area
0
250
500
1,000
metres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6,598,000 mN
NVS GPS Waypoint
NVS GPS Track
Survey Area
Native Vegetation Solutions
Beacon Minerals Ltd
Jaurdi Hills Project
NVS GPS Data
Date: 14/9/2017
Author: E. Reid
Office: Kalgoorlie
Drawing:
Scale: 1:24000
Projection: UTM Zone 51, Southern Hemisphere (WGS 84)
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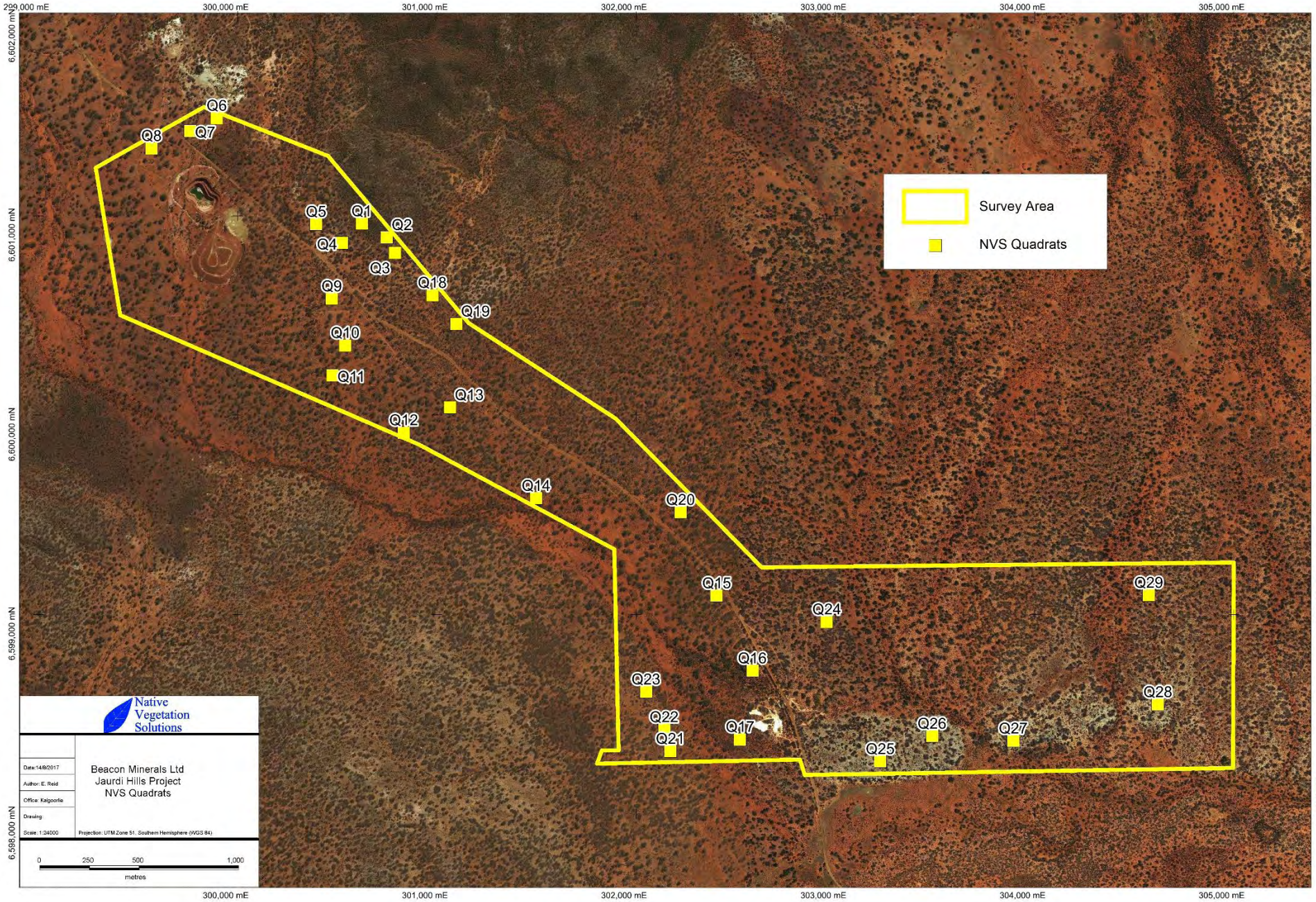
metres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Q21
Q22
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Q24
Q25
Q26
Q27
Q28
Q29
Survey Area
NVS Quadrats
Native Vegetation Solutions
Date:14/9/2017
Author: E. Reid
Office: Kalgoorlie
Drawing:
Scale: 1:24000
Beacon Minerals Ltd
Jaurdi Hills Project
NVS Quadrats
Projection: UTM Zone 51, Southern Hemisphere (WGS 84)
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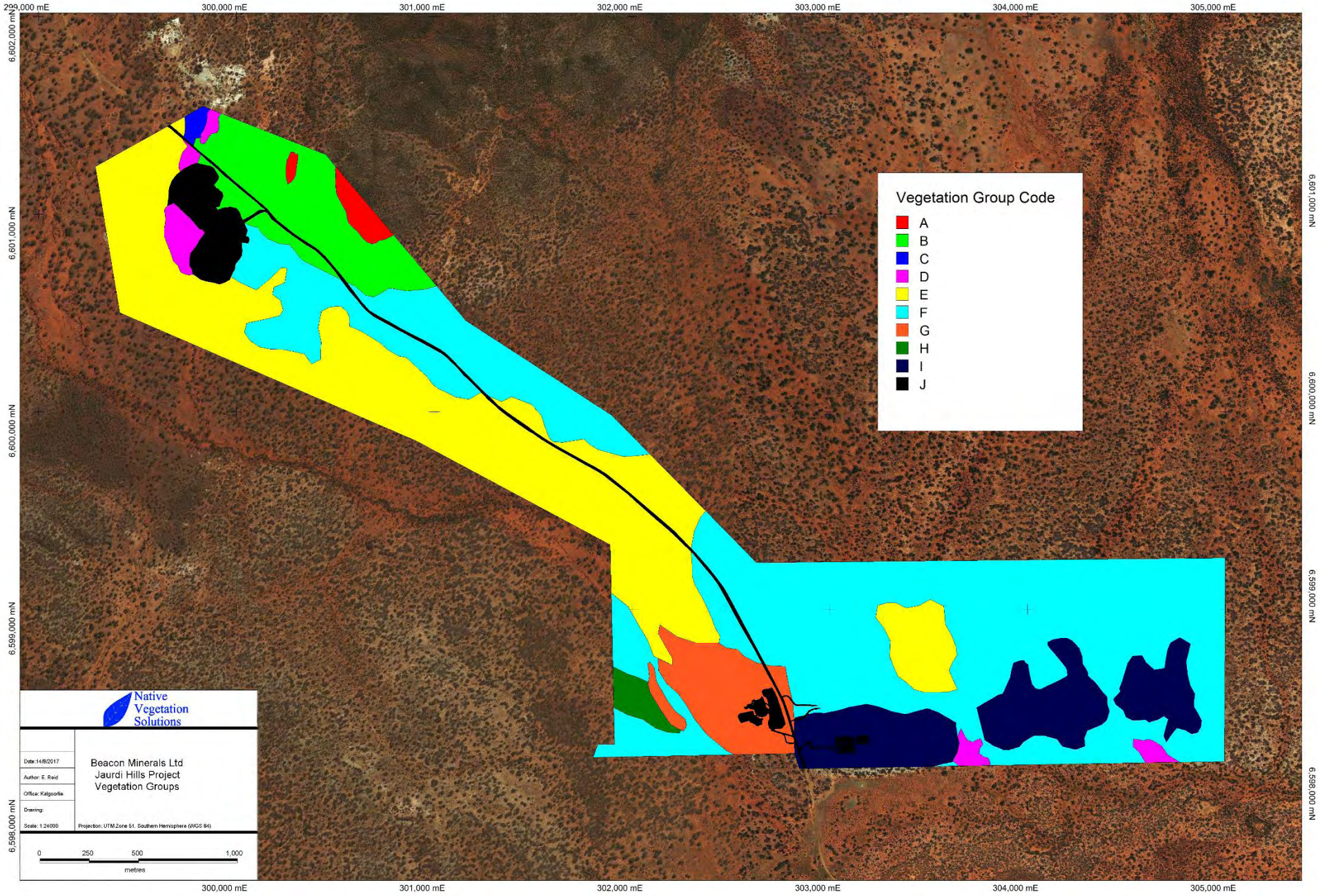
metres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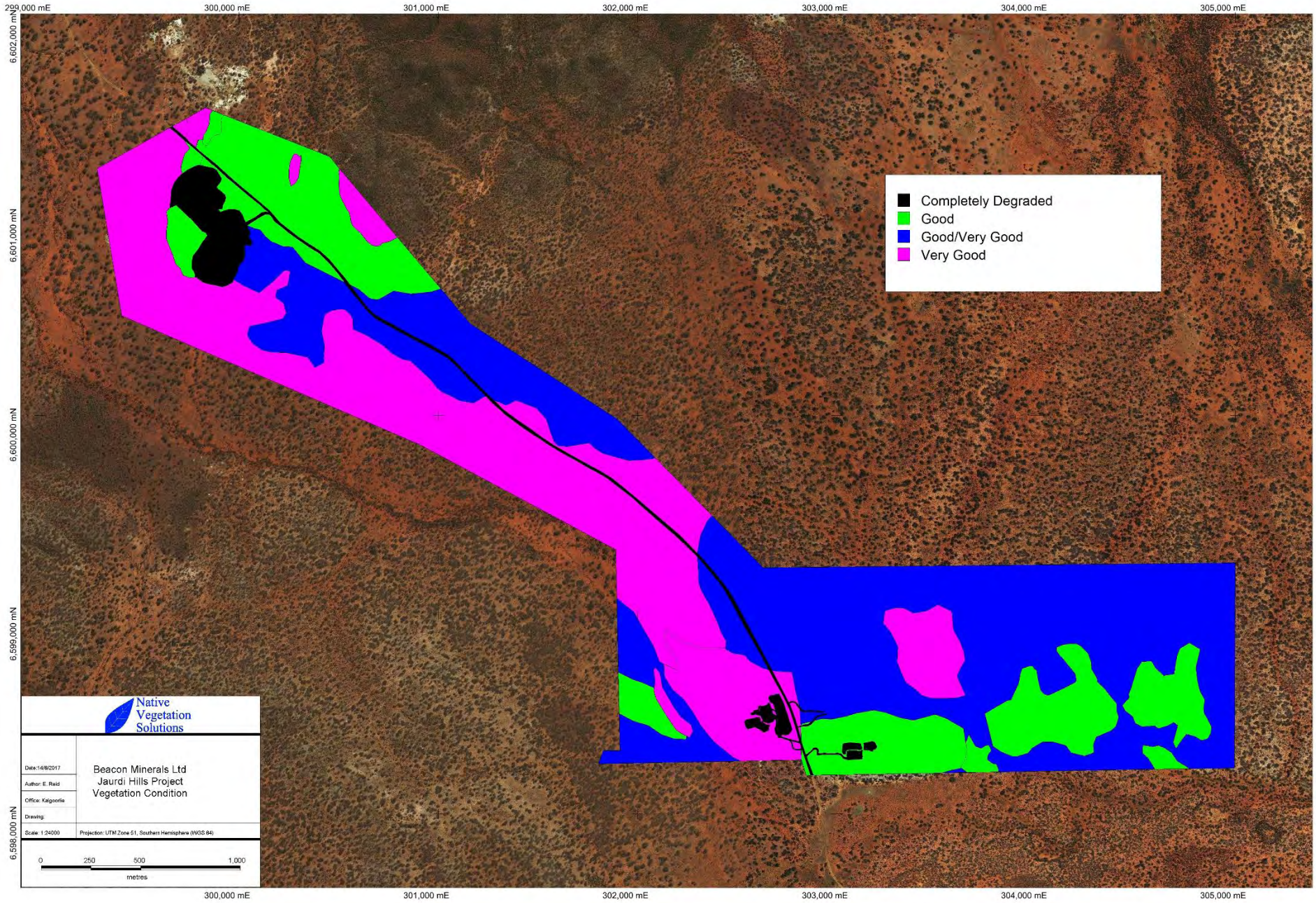
6,599,000 mN
6,598,000 mN
Vegetation Group Code
A
B
C
D
E
F
G
H
I
J
Native Vegetation Solutions
Date:14/8/2017
Author: E. Reid
Office: Kalgoorlie
Drawing:
Scale: 1:24000
Beacon Minerals Ltd
Jaurdi Hills Project
Vegetation Groups
Projection: UTM Zone 51, Southern Hemisphere (WGS 84)
0
250
500
1,000
metres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303,000 mE
304,000 mE
305,000 mE
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6,601,000 mN
6,600,000 mN
6,599,000 mN
6,598,000 mN
Completely Degraded
Good
Good/Very Good
Very Good
Native Vegetation Solutions
Date:14/8/2017
Author: E. Reid
Office: Kalgoorlie
Drawing:
Beacon Minerals Ltd
Jaurdi Hills Project
Vegetation Condition
Scale: 1:24000
Projection: UTM Zone 51, Southern Hemisphere (WGS 84)
0
250
500
1,000
metres

Appendix D – Threatened Flora Database Search Results

Taxon	Status	Distribution	Flowering Period
Acacia crenulata	P3	Southern Cross, Carrabin, Bullabulling, Walyahmoning Rock, Chiddarcooping, Sandford Rocks N.R., Marvel Loch	Sep-Oct
Alyxia tetanifolia	P3	Kalgoorlie, Diemals, Goongarri, Boogardie, Mt Magnet	May
Angianthus prostratus	P3	Glenorn Stn, Baladjie Lake NR, Quairading, Lake Barlee, Bulga Downs Stn, Kalgoorlie	Jul-Sept
Austroparmelina macrospora	P3	Kalgoorlie, Ninghan Stn, Wanjarri NR,Mount Harry, Kathleen, Bullfinch, Kalbarri	
Baeckea sp. Bulla Bulling (D.J.E. Whibley 4648)	P1	Kalgoorlie, Bulla Bulling	Oct
Calytrix creswellii	P3	Helena & Aurora Range,Credo Stn., Mt Manning Range, Wallaroo Rock	Nov-Dec
Cryptandra crispula	P3	Lake Lefroy, Bullabulling, Karonie, Fraser Range	Jul-Sep
Cyathostemon verrucosus	P3	Bungalbin Hill, Helena & Aurora Ranges, Queen Victoria Rocks, Kalgoorlie, Boorabbin	Sep-Dec,Mar
Diocirea microphylla	P3	Bullabulling, Gibraltar, Maggie Hays Hill, Lake Johnston	Dec
Elachanthus pusillus	P2	Orchid Rock, Cocklebiddy, Kalgoorlie, Jaurdi Stn	Oct
Eremophila praecox	P1	Five Mile Hill, (Kurrawang), Kalgoorlie, Kanowna Belle	Aug-Sep,Dec
Eucalyptus crucis subsp. crucis	T	Westonia, Southern Cross, Burracoppin, Ora Banda	Dec-Mar
Eutaxia actinophylla	P3	Norseman, Salmon Gums, Mt Newmont, Bruce Rock, Wallaroo Rock, Mt Willgonarinya	Sep-Dec
Gastrolobium graniticum	T	Coolgardie, Gnamma Hill, Narembeen, Yellowdine, Bullabulling	Aug-Nov
Hakea rigida	P2	Campion, Bullfinch, Wallaroo Rock, Mt Burges	Sep
Hakea sp. Great Victoria Desert (L. Cockram LAC 139) PN	P1	E Kalgoorlie	
Lepidium fasciculatum	P3	Salmon Gums, Kalgoorlie, Esperance, Mingenew	Oct-Feb
Notisia intonsa	P3	Gibraltar, Boorabbin, Dundas, Ravensthorpe, North Ironcap, Ora Banda, Lake Cowan, Parker Range	Sep
Phebalium clavatum	P2	Londonderry	Nov
Styphelia sp. Bullfinch (M. Hislop 3574)	P3	Jackson Range, Bullfinch, Koolyanobbing, Bullabulling, Diemals Stn.	Apr-May
Xanthoparmelia dayiana	P3	Kalgoorlie, Northern Territory, Karara	

Additional taxa supplied via database coordinates

Taxon	Conservation Code
Acacia coatesii	P1
Acacia epedunculata	P1
Acacia sclerophylla var. teretiuscula	P1
Acacia websteri	P1
Allocasuarina eriochlamys subsp. grossa	P3
Austrostipa blackii	P3
Chrysocephalum apiculatum subsp. norsemanense	P3
Eremophila caerulea subsp. merrallii	P4
Eremophila veronica	P3
Eucalyptus jutsonii subsp. jutsonii	P4
Gompholobium cinereum	P3
Grevillea georgeana	P3
Lepidium merrallii	P2
Melichrus sp. Coolgardie (K.R. Newbey 8698)	P1
Myriophyllum petraeum	P4
Phebalium appressum	P1
Phlegmatospermum eremaeum	P3
Ptilotus chortophytus	P1
Thryptomene sp. Coolgardie (E. Kelso s.n. 1902)	P1
Thryptomene sp. Londonderry (R.H. Kuchel 1763)	P1

Appendix E - Species Recorded During the July 2017 Survey

Species List per Quadrat

Family	Genus	Species	A=Annual P= Perennial NN=Non-Native	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29
Amaranthaceae	Ptilotus	aervoides	A					*																*		*						
Amaranthaceae	Ptilotus	obovatus	P	*	*	*		*	*	*	*	*	*	*	*		*	*		*	*	*	*		*	*						
Apocynaceae	Marsdenia	australis	P	*						*			*	*								*						*				
Asteraceae	Cratystylis	conocephala	P										*					*						*	*	*			*		*	
Asteraceae	Cratystylis	microphylla	P																						*						*	
Asteraceae	Cratystylis	subspinescens	P																							*		*				
Asteraceae	Olearia	muelleri	P	*	*	*		*				*	*	*		*		*			*	*	*		*		*	*	*	*	*	*
Asteraceae	Olearia	pimeleoides	P																		*											
Brassicaceae	Carrichtera	annua	A, NN					*	*																							
Casuarinaceae	Casuarina	pauper	P									*							*													
Chenopodiaceae	Atriplex	nummularia subsp. spathulata	P			*		*	*	*		*				*	*				*		*	*				*				
Chenopodiaceae	Atriplex	stipitata	P			*		*	*	*	*		*			*	*						*		*	*						
Chenopodiaceae	Atriplex	vesicaria	P			*		*	*	*			*			*	*				*		*		*	*	*	*	*	*		
Chenopodiaceae	Chenopodium	gaudichaudianum	P					*	*	*	*	*	*		*		*						*	*	*	*		*				
Chenopodiaceae	Enchylaena	tomentosa var. tomentosa	P			*		*	*	*	*	*	*	*	*		*						*		*	*					*	
Chenopodiaceae	Eriochiton	sclerolaenoides	P																				*	*	*	*						
Chenopodiaceae	Maireana	georgei	P	*	*	*		*		*	*	*	*				*						*	*		*		*				
Chenopodiaceae	Maireana	pentatropis	P					*			*							*					*		*		*	*	*	*	*	
Chenopodiaceae	Maireana	pyramidata	P						*																	*						
Chenopodiaceae	Maireana	sedifolia	P			*										*							*	*		*						
Chenopodiaceae	Maireana	thesioides	P																							*						
Chenopodiaceae	Maireana	tomentosa	P			*			*	*	*	*			*		*				*			*	*	*	*		*	*		
Chenopodiaceae	Maireana	trichoptera	P			*		*	*	*	*		*	*	*						*			*	*	*		*				
Chenopodiaceae	Maireana	triptera	P		*	*		*	*	*	*			*	*		*															
Chenopodiaceae	Rhagodia	drummondii	P						*	*	*		*	*	*		*				*			*	*	*		*	*	*	*	
Chenopodiaceae	Salsola	australis	A														*															
Chenopodiaceae	Sclerolaena	densiflora	P			*		*	*		*	*	*	*	*	*	*				*		*	*	*	*		*				
Chenopodiaceae	Sclerolaena	diacantha	P			*			*	*	*	*	*	*	*						*		*	*		*		*				
Chenopodiaceae	Sclerolaena	patenticuspis	P						*								*							*		*						
Cucurbitaceae	Cucumis	myriocarpus	A, NN					*																								
Euphorbiaceae	Beyeria	sulcata var. sulcata	P	*																												
Fabaceae	Acacia	acuminata	P	*	*					*		*																				
Fabaceae	Acacia	colletioides	P																*	*		*	*	*			*		*	*		*
Fabaceae	Acacia	erinacea	P		*		*															*										
Fabaceae	Acacia	hemiteles	P									*	*	*		*	*			*	*	*	*						*	*	*	*
Fabaceae	Acacia	ligulata	P													*												*				
Fabaceae	Acacia	merrallii	P															*	*	*				*				*	*		*	*
Fabaceae	Acacia	prainii	P											*																		
Fabaceae	Acacia	tetragonophylla	P	*						*																				*		
Fabaceae	Daviesia	aphylla	P												*	*											*					
Fabaceae	Senna	artemisioides subsp. artemisioides	P						*	*						*	*		*	*	*		*									*
Fabaceae	Senna	artemisioides subsp. filifolia	P		*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Family	Genus	Species	A=Annual P= Perennial NN=Non-Native	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29
Fabaceae	Senna	cardiosperma	P			*	*		*		*		*		*	*		*			*	*	*	*		*						
Frankeniaceae	Frankenia	interioris	P																					*	*	*						
Goodeniaceae	Scaevola	collaris	P																											*		*
Goodeniaceae	Scaevola	spinescens	P	*	*				*	*	*	*	*	*	*	*		*			*	*	*							*		*
Hemerocallidaceae	Dianella	revoluta subsp. divaricata	P																											*		
Lamiaceae	Westringia	rigida	P				*															*						*	*	*	*	*
Loranthaceae	Amyema	preissii	P										*									*										
Myrtaceae	Eucalyptus	campaspe	P	*	*	*	*	*																								
Myrtaceae	Eucalyptus	clelandii	P				*	*				*						*	*	*	*	*		*			*	*	*	*	*	*
Myrtaceae	Eucalyptus	griffithsii	P	*	*					*												*										
Myrtaceae	Eucalyptus	oleosa subsp. oleosa	P												*				*	*					*	*	*					
Myrtaceae	Eucalyptus	salmonophloia	P								*		*	*	*	*	*						*									
Myrtaceae	Eucalyptus	salubris	P															*	*	*												*
Myrtaceae	Eucalyptus	transcontinentalis	P									*				*																
Myrtaceae	Eucalyptus	yilgarnensis	P																							*						
Myrtaceae	Melaleuca	sheathiana	P																									*	*	*	*	
Pittosporaceae	Pittosporum	angustifolium	P											*																		
Poaceae	Austrostipa	elegantissima	P	*	*								*	*			*		*			*		*			*	*	*			*
Poaceae	Triodia	rigidissima	P																											*		
Proteaceae	Grevillea	acuaria	P																											*		
Santalaceae	Exocarpos	aphyllus	P	*	*	*			*	*	*	*	*	*	*	*	*			*	*	*	*	*	*	*	*	*	*	*	*	*
Santalaceae	Santalum	acuminatum	P			*					*							*		*	*		*									
Santalaceae	Santalum	spicatum	P		*								*	*							*		*									
Sapindaceae	Dodonaea	lobulata	P	*	*																											
Sapindaceae	Dodonaea	viscosa subsp. angustissima	P																									*	*	*		
Scrophulariaceae	Eremophila	alternifolia	P							*				*						*												
Scrophulariaceae	Eremophila	caperata	P													*		*						*			*					*
Scrophulariaceae	Eremophila	decipiens subsp. decipiens	P			*				*								*	*	*			*		*	*		*		*		
Scrophulariaceae	Eremophila	glabra subsp. glabra	P		*		*		*	*		*		*	*						*	*	*		*	*				*	*	
Scrophulariaceae	Eremophila	interstans subsp. virgata	P	*		*		*	*			*	*	*							*	*			*	*						
Scrophulariaceae	Eremophila	ionantha	P														*	*	*	*			*		*					*		
Scrophulariaceae	Eremophila	longifolia	P		*		*																									
Scrophulariaceae	Eremophila	oldfieldii subsp. angustifolia	P	*	*		*		*	*				*			*				*	*										
Scrophulariaceae	Eremophila	parvifolia subsp. auricampa	P																						*		*	*	*	*	*	*
Scrophulariaceae	Eremophila	praecox (P1)	P																						*							
Scrophulariaceae	Eremophila	pustulata	P				*	*														*										
Scrophulariaceae	Eremophila	scoparia	P		*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*		*	*	*	*
Solanaceae	Duboisia	hopwoodii	P								*																					
Solanaceae	Solanum	lasiophyllum	P	*	*			*	*	*	*		*	*							*											
Solanaceae	Solanum	nummularium	P						*	*			*				*	*	*		*		*	*	*			*		*		
Thymelaeaceae	Pimelea	microcephala subsp. microcephala	P											*			*	*	*				*		*	*						
Zygophyllaceae	Zygophyllum	eremaeum	A				*																									

Species List per Vegetation Group (Quadrat data including opportunistic sampling)

Family	Genus	Species	A, P, NN	A	B	C	D	E	F	G	H	I
Amaranthaceae	Ptilotus	aervoides	A		*				*		*	
Amaranthaceae	Ptilotus	obovatus	P	*	*	*	*	*	*	*	*	
Apocynaceae	Alyxia	buxifolia	P									*
Apocynaceae	Marsdenia	australis	P	*		*		*	*			*
Asteraceae	Cratystylis	conocephala	P					*	*		*	*
Asteraceae	Cratystylis	microphylla	P								*	*
Asteraceae	Cratystylis	subspinescens	P								*	*
Asteraceae	Olearia	muelleri	P	*	*			*	*		*	*
Asteraceae	Olearia	pimeleoides	P						*			
Brassicaceae	Carrichtera	annua	A, NN		*		*					
Casuarinaceae	Casuarina	pauper	P	*					*	*		
Chenopodiaceae	Atriplex	nummularia subsp. spathulata	P	*	*	*	*	*	*			*
Chenopodiaceae	Atriplex	stipitata	P		*	*	*	*			*	
Chenopodiaceae	Atriplex	vesicaria	P		*	*	*	*	*		*	*
Chenopodiaceae	Chenopodium	gaudichaudianum	P		*	*	*	*	*		*	*
Chenopodiaceae	Enchylaena	tomentosa var. tomentosa	P		*	*	*	*	*		*	*
Chenopodiaceae	Eriochiton	sclerolaenoides	P					*	*		*	
Chenopodiaceae	Maireana	georgei	P	*	*	*		*	*		*	*
Chenopodiaceae	Maireana	pentatropis	P		*			*	*		*	*
Chenopodiaceae	Maireana	pyramidata	P				*				*	
Chenopodiaceae	Maireana	sedifolia	P		*			*	*		*	
Chenopodiaceae	Maireana	thesioides	P								*	
Chenopodiaceae	Maireana	tomentosa	P		*	*	*	*	*		*	*
Chenopodiaceae	Maireana	trichoptera	P		*	*	*	*	*		*	*
Chenopodiaceae	Maireana	triptera	P	*	*	*	*	*				
Chenopodiaceae	Rhagodia	drummondii	P		*	*	*	*	*		*	*
Chenopodiaceae	Salsola	australis	A					*				
Chenopodiaceae	Sclerolaena	densiflora	P		*		*	*	*		*	*
Chenopodiaceae	Sclerolaena	diacantha	P		*	*	*	*	*		*	*
Chenopodiaceae	Sclerolaena	patenticuspis	P				*	*	*		*	
Cucurbitaceae	Cucumis	myriocarpus	A, NN		*							
Euphorbiaceae	Beyeria	sulcata var. sulcata	P	*								
Fabaceae	Acacia	acuminata	P	*		*			*			
Fabaceae	Acacia	colletioides	P					*	*	*		*
Fabaceae	Acacia	erinacea	P	*	*				*			
Fabaceae	Acacia	hemiteles	P					*	*	*		*
Fabaceae	Acacia	ligulata	P					*				*
Fabaceae	Acacia	merrallii	P						*	*		*
Fabaceae	Acacia	prainii	P					*				
Fabaceae	Acacia	tetragonophylla	P	*		*						*
Fabaceae	Daviesia	aphylla	P					*	*			
Fabaceae	Senna	artemisioides subsp. artemisioides	P			*	*	*	*	*		
Fabaceae	Senna	artemisioides subsp. filifolia	P	*	*	*	*	*	*	*	*	*
Fabaceae	Senna	cardiosperma	P		*		*	*	*		*	
Frankeniaceae	Frankenia	interioris	P						*		*	
Goodeniaceae	Scaevola	collaris	P						*			*
Goodeniaceae	Scaevola	spinescens	P	*		*	*	*	*			*
Hemerocallidaceae	Dianella	revoluta subsp. divaricata	P									*

Family	Genus	Species	A, P, NN	A	B	C	D	E	F	G	H	I
Lamiaceae	Westringia	rigida	P		*				*			*
Loranthaceae	Amyema	preissii	P					*	*			
Myrtaceae	Eucalyptus	campaspe	P	*	*							
Myrtaceae	Eucalyptus	clelandii	P		*			*	*	*		*
Myrtaceae	Eucalyptus	griffithsii	P	*		*			*			
Myrtaceae	Eucalyptus	oleosa subsp. oleosa	P	*				*	*	*	*	
Myrtaceae	Eucalyptus	salmonophloia	P					*				
Myrtaceae	Eucalyptus	salubris	P						*	*		
Myrtaceae	Eucalyptus	transcontinentalis	P					*	*			
Myrtaceae	Eucalyptus	yilgarnensis	P					*			*	
Myrtaceae	Melaleuca	sheathiana	P									*
Pittosporaceae	Pittosporum	angustifolium	P					*				
Poaceae	Austrostipa	elegantissima	P	*				*	*	*		*
Poaceae	Triodia	rigidissima	P									*
Proteaceae	Grevillea	acuaria	P									*
Santalaceae	Exocarpos	aphyllus	P	*	*	*	*	*	*	*	*	*
Santalaceae	Santalum	acuminatum	P		*			*	*	*		
Santalaceae	Santalum	spicatum	P	*				*	*			
Sapindaceae	Dodonaea	lobulata	P	*								
Sapindaceae	Dodonaea	viscosa subsp. angustissima	P						*			*
Scrophulariaceae	Eremophila	alternifolia	P			*		*		*		
Scrophulariaceae	Eremophila	caperata	P					*	*			
Scrophulariaceae	Eremophila	decipiens subsp. decipiens	P		*	*		*	*	*	*	*
Scrophulariaceae	Eremophila	glabra subsp. glabra	P	*	*	*	*	*	*		*	*
Scrophulariaceae	Eremophila	interstans subsp. virgata	P	*	*		*	*	*		*	
Scrophulariaceae	Eremophila	ionantha	P					*	*	*	*	*
Scrophulariaceae	Eremophila	longifolia	P	*	*							
Scrophulariaceae	Eremophila	oldfieldii subsp. angustifolia	P	*	*	*	*	*	*			
Scrophulariaceae	Eremophila	parvifolia subsp. auricampa	P						*		*	*
Scrophulariaceae	Eremophila	praecox (P1)	P								*	
Scrophulariaceae	Eremophila	pustulata	P		*				*			
Scrophulariaceae	Eremophila	scoparia	P	*	*	*	*	*	*	*	*	*
Solanaceae	Duboisia	hopwoodii	P					*				
Solanaceae	Solanum	lasiophyllum	P	*	*	*	*	*	*			
Solanaceae	Solanum	nummularium	P			*	*	*	*	*	*	*
Thymelaeaceae	Pimelea	microcephala subsp. microcephala	P					*	*	*	*	
Zygophyllaceae	Zygophyllum	eremaeum	A		*							

Appendix F - Site Descriptions

Project Name: Jaurdi Hills Jaurdi Hills			
Date:	6/07/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q1
Quadrat size:	20x20		
Vegetation group:	A		
WP:	1		
Photo number:		22	
Landform:		Lower slope/Hillslope	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		Very; abundant/Cobbly; or cobbles/Subangular tabular	
Rock outcrop (abundance/runoff):		Very slightly rocky/Moderately rapid	
Soil (profile/field texture/soil surface):		Duplex/Sandy loam/Firm	
% Cover leaf litter:		30	
% Cover bare ground:		40	

Tallest stratum		**Mid-stratum**		**Lower stratum**	
Growth form:	Y Shrub Mallee (< 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus griffithsii		Acacia acuminata		Beyeria sulcata var. sulcata	
		Eremophila oldfieldii subsp. angustifolia		Dodonaea lobulata	
				Scaevola spinescens	

ALL SPECIES
Acacia acuminata
Acacia tetragonophylla
Austrostipa elegantissima
Beyeria sulcata var. sulcata
Dodonaea lobulata
Eremophila interstans subsp. virgata
Eremophila oldfieldii subsp. angustifolia
Eucalyptus campaspe
Eucalyptus griffithsii
Exocarpos aphyllus
Maireana georgei
Marsdenia australis
Ptilotus obovatus
Olearia muelleri
Scaevola spinescens
Solanum lasiophyllum
Adjacent:
Acacia erinacea

Project Name: Jaurdi Hills			
Date:	6/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q2
Quadrat size:	20x20		
Vegetation group:	A		
WP:	2		
Photo number:		27	
Landform:		Lower slope/Hillslope	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		Very; abundant/Cobbly; or cobbles/Subangular tabular	
Rock outcrop (abundance/runoff):		Very slightly rocky/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy loam/Firm	
% Cover leaf litter:		30	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	Y Shrub Mallee (< 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus griffithsii		Acacia acuminata		Dodonaea lobulata	
		Eremophila oldfieldii subsp. angustifolia		Ptilotus obovatus	
				Scaevola spinescens	

ALL SPECIES
Acacia acuminata
Acacia erinacea
Austrostipa elegantissima
Dodonaea lobulata
Eremophila glabra subsp. glabra
Eremophila longifolia
Eremophila oldfieldii subsp. angustifolia
Eremophila scoparia
Eucalyptus campaspe
Eucalyptus griffithsii
Exocarpos aphyllus
Maireana georgei
Maireana triptera
Olearia muelleri
Ptilotus obovatus
Santalum spicatum
Scaevola spinescens
Senna artemisioides subsp. filifolia
Solanum lasiophyllum

Adjacent
Atriplex nummularia subsp. spathulata
Casuarina pauper
Eucalyptus oleosa subsp. oleosa

Project Name: Jaurdi Hills			
Date:	6/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q3
Quadrat size:	20x20		
Vegetation group:	B		
WP:	3		
Photo number:		31	
Landform:		Lower slope/Footslope	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		Slightly; few/Coarse gravelly; large pebbles/Subrounded tabular	
Rock outcrop (abundance/runoff):		Very slightly rocky/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy loam/Firm	
% Cover leaf litter:		80	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	M Tree Mallee (> 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus campaspe		Eremophila interstans subsp. virgata		Atriplex nummularia subsp. spathulata	
				Eremophila scoparia	

ALL SPECIES
Atriplex nummularia subsp. spathulata
Atriplex stipitata
Atriplex vesicaria
Enchylaena tomentosa var. tomentosa
Eremophila decipiens subsp. decipiens
Eremophila interstans subsp. virgata
Eremophila scoparia
Eucalyptus campaspe
Exocarpos aphyllus
Maireana georgei
Maireana sedifolia
Maireana tomentosa
Maireana trichoptera
Maireana triptera
Olearia muelleri
Ptilotus obovatus
Santalum acuminatum
Sclerolaena densiflora
Sclerolaena diacantha
Senna cardiosperma

Project Name: Jaurdi Hills			
Date:	6/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q4
Quadrat size:	20x20		
Vegetation group:	B		
WP:	4		
Photo number:		35	
Landform:		Lower slope/Footslope	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		Slightly; few/Coarse gravelly; large pebbles/Subrounded	
Rock outcrop (abundance/runoff):		No bedrock exposed/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy loam/Firm	
% Cover leaf litter:		50	
% Cover bare ground:		70	

Tallest stratum		**Mid-stratum**		**Lower stratum**	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus campaspe		Eremophila oldfieldii subsp. angustifolia		Acacia erinacea	
Eucalyptus clelandii				Eremophila pustulata	

ALL SPECIES
Acacia erinacea
Eremophila glabra subsp. glabra
Eremophila longifolia
Eremophila oldfieldii subsp. angustifolia
Eremophila pustulata
Eucalyptus campaspe
Eucalyptus clelandii
Senna cardiosperma
Westringia rigida
Zygophyllum eremaeum
Adjacent
Eremophila interstans subsp. virgata
Exocarpos aphyllus
Olearia muelleri
Senna artemisioides subsp. filifolia

Project Name: Jaurdi Hills			
Date:	6/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q5
Quadrat size:	20x20		
Vegetation group:	B		
WP:	5		
Photo number:		38	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Slow	
Soil (profile/field texture/soil surface):		Duplex/Silty clay loam/Firm	
% Cover leaf litter:		80	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	M 30-70	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus campaspe		Eremophila interstans subsp. virgata		Atriplex nummularia subsp. spathulata	
Eucalyptus clelandii		Senna artemisioides subsp. filifolia		Olearia muelleri	
				Ptilotus obovatus	

ALL SPECIES
Atriplex nummularia subsp. spathulata
Atriplex stipitata
Atriplex vesicaria
Carrichtera annua*
Chenopodium gaudichaudianum
Cucumis myriocarpus*
Enchylaena tomentosa var. tomentosa
Eremophila interstans subsp. virgata
Eremophila pustulata
Eremophila scoparia
Eucalyptus campaspe
Eucalyptus clelandii
Maireana georgei
Maireana pentatropis
Maireana trichoptera
Maireana triptera
Olearia muelleri
Ptilotus aervoides
Ptilotus obovatus
Sclerolaena densiflora
Senna artemisioides subsp. filifolia
Solanum lasiophyllum

Adjacent
Eremophila decipiens subsp. decipiens
Maireana sedifolia
Rhagodia drummondii

Project Name: Jaurdi Hills			
Date:	6/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q6
Quadrat size:	20x20		
Vegetation group:	D		
WP:	8		
Photo number:		42	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Slow	
Soil (profile/field texture/soil surface):		Duplex/Silty clay loam/Firm	
% Cover leaf litter:		10	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	3-6m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	V <10	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Atriplex nummularia subsp. spathulata		Eremophila scoparia		Atriplex stipitata	
Eremophila interstans subsp. virgata		Senna cardiosperma		Senna cardiosperma	

ALL SPECIES
Atriplex nummularia subsp. spathulata
Atriplex stipitata
Atriplex vesicaria
Carrichtera annua*
Chenopodium gaudichaudianum
Enchylaena tomentosa var. tomentosa
Eremophila glabra subsp. glabra
Eremophila interstans subsp. virgata
Eremophila oldfieldii subsp. angustifolia
Eremophila scoparia
Exocarpos aphyllus
Maireana pyramidata
Maireana tomentosa
Maireana trichoptera
Maireana triptera
Ptilotus obovatus
Rhagodia drummondii
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Sclerolaena patenticuspis
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Senna cardiosperma
Solanum lasiophyllum
Solanum nummularium

Project Name: Jaurdi Hills			
Date:	6/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q7
Quadrat size:	20x20		
Vegetation group:	C		
WP:	9		
Photo number:		45	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Silty clay loam/Firm	
% Cover leaf litter:		60	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	M Tree Mallee (> 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	M 30-70
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus griffithsii		Eremophila alternifolia		Senna artemisioides subsp. artemisioides	
		Atriplex nummularia subsp. spathulata		Atriplex stipitata	
				Ptilotus obovatus	

ALL SPECIES
Acacia acuminata
Acacia tetragonophylla
Atriplex nummularia subsp. spathulata
Atriplex stipitata
Atriplex vesicaria
Chenopodium gaudichaudianum
Enchylaena tomentosa var. tomentosa
Eremophila alternifolia
Eremophila decipiens subsp. decipiens
Eremophila glabra subsp. glabra
Eremophila oldfieldii subsp. angustifolia
Eremophila scoparia
Eucalyptus griffithsii
Exocarpos aphyllus
Maireana georgei
Maireana tomentosa
Maireana trichoptera
Maireana triptera
Marsdenia australis
Ptilotus obovatus
Rhagodia drummondii
Scaevola spinescens
Sclerolaena diacantha
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Solanum lasiophyllum
Solanum nummularium

Project Name: Jaurdi Hills			
Date:	6/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q8
Quadrat size:	20x20		
Vegetation group:	E		
WP:	10		
Photo number:		51	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		70	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	12-20m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	S 10-30	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus salmonophloia		Eremophila scoparia		Atriplex stipitata	
		Exocarpos aphyllus		Scaevola spinescens	
				Senna artemisioides subsp. filifolia	

ALL SPECIES
Atriplex stipitata
Chenopodium gaudichaudianum
Duboisia hopwoodii
Enchylaena tomentosa var. tomentosa
Eremophila scoparia
Eucalyptus salmonophloia
Exocarpos aphyllus
Maireana georgei
Maireana pentatropis
Maireana tomentosa
Maireana trichoptera
Maireana triptera
Ptilotus obovatus
Rhagodia drummondii
Santalum acuminatum
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. filifolia
Senna cardiosperma
Solanum lasiophyllum
Adjacent
Acacia ligulata
Atriplex nummularia subsp. spathulata
Eucalyptus clelandii
Eucalyptus transcontinentalis

Project Name: Jaurdi Hills			
Date:	7/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q9
Quadrat size:	20x20		
Vegetation group:	F		
WP:	14		
Photo number:		63	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		80	
% Cover bare ground:		50	

Tallest stratum		**Mid-stratum**		**Lower stratum**	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Casuarina pauper		Eremophila interstans subsp. virgata		Eremophila glabra subsp. glabra	
Eucalyptus clelandii		Eremophila scoparia		Olearia muelleri	
				Senna artemisioides subsp. filifolia	

ALL SPECIES
Acacia hemiteles
Atriplex nummularia subsp. spathulata
Casuarina pauper
Chenopodium gaudichaudianum
Enchylaena tomentosa var. tomentosa
Eremophila glabra subsp. glabra
Eremophila interstans subsp. virgata
Eremophila scoparia
Eucalyptus clelandii
Exocarpos aphyllus
Maireana georgei
Maireana tomentosa
Olearia muelleri
Ptilotus obovatus
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. filifolia
Adjacent
Acacia acuminata
Acacia colletioides
Eucalyptus transcontinentalis
Maireana pentatropis
Rhagodia drummondii

Project Name: Jaurdi Hills			
Date:	7/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q10
Quadrat size:	20x20		
Vegetation group:	E		
WP:	16		
Photo number:		64-65	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		60	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus salmonophloia		Eremophila interstans subsp. virgata		Acacia hemiteles	
		Eremophila scoparia		Senna artemisioides subsp. filifolia	
		Exocarpos aphyllus		Senna cardiosperma	

ALL SPECIES
Acacia hemiteles
Amyema preissii
Atriplex stipitata
Atriplex vesicaria
Austrostipa elegantissima
Chenopodium gaudichaudianum
Cratystylis conocephala
Enchylaena tomentosa var. tomentosa
Eremophila interstans subsp. virgata
Eremophila scoparia
Eucalyptus salmonophloia
Exocarpos aphyllus
Maireana georgei
Maireana trichoptera
Marsdenia australis
Olearia muelleri
Ptilotus obovatus
Rhagodia drummondii
Santalum spicatum
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. filifolia
Senna cardiosperma
Solanum lasiophyllum
Solanum nummularium
Adjacent
Acacia ligulata
Atriplex nummularia subsp. spathulata
Eremophila alternifolia
Eucalyptus transcontinentalis

Project Name: Jaurdi Hills			
Date:	7/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q11
Quadrat size:	20x20		
Vegetation group:	E		
WP:	17		
Photo number:		73	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		40	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	12-20m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus salmonophloia		Eremophila interstans subsp. virgata		Eremophila alternifolia	
		Eremophila scoparia		Ptilotus obovatus	
		Exocarpos aphyllus		Senna artemisioides subsp. filifolia	

ALL SPECIES
Acacia hemiteles
Acacia prainii
Austrostipa elegantissima
Enchylaena tomentosa var. tomentosa
Eremophila alternifolia
Eremophila glabra subsp. glabra
Eremophila interstans subsp. virgata
Eremophila oldfieldii subsp. angustifolia
Eremophila scoparia
Eucalyptus salmonophloia
Exocarpos aphyllus
Maireana trichoptera
Maireana triptera
Marsdenia australis
Olearia muelleri
Pimelea microcephala subsp. microcephala
Pittosporum angustifolium
Ptilotus obovatus
Rhagodia drummondii
Santalum spicatum
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. filifolia
Solanum lasiophyllum

Project Name: Jaurdi Hills			
Date:	7/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q12
Quadrat size:	20x20		
Vegetation group:	E		
WP:	18		
Photo number:		76	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		60	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	Y Shrub Mallee (< 8m)	**Growth form:**	S Shrub
Height:	12-20m	**Height:**	3-6m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus salmonophloia		Eucalyptus oleosa subsp. oleosa		Daviesia benthamii subsp. acanthoclona	
				Eremophila scoparia	
				Senna cardiosperma	

ALL SPECIES
Chenopodium gaudichaudianum
Daviesia aphylla
Enchylaena tomentosa var. tomentosa
Eremophila glabra subsp. glabra
Eremophila scoparia
Eucalyptus oleosa subsp. oleosa
Eucalyptus salmonophloia
Exocarpos aphyllus
Maireana tomentosa
Maireana trichoptera
Maireana triptera
Ptilotus obovatus
Rhagodia drummondii
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. filifolia
Senna cardiosperma

Project Name: Jaurdi Hills			
Date:	7/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q13
Quadrat size:	20x20		
Vegetation group:	E		
WP:	19		
Photo number:		80	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		80	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	12-20m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	S 10-30	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus salmonophloia		Eremophila caperata		Acacia hemiteles	
Eucalyptus transcontinentalis		Eremophila scoparia		Atriplex vesicaria	
				Senna artemisioides subsp. filifolia	

ALL SPECIES
Acacia hemiteles
Acacia ligulata
Atriplex nummularia subsp. spathulata
Atriplex stipitata
Atriplex vesicaria
Daviesia aphylla
Eremophila caperata
Eremophila scoparia
Eucalyptus salmonophloia
Eucalyptus transcontinentalis
Exocarpos aphyllus
Maireana sedifolia
Olearia muelleri
Scaevola spinescens
Sclerolaena densiflora
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Senna cardiosperma
Adjacent
Eucalyptus oleosa subsp. oleosa
Santalum acuminatum

Project Name: Jaurdi Hills			
Date:	7/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q14
Quadrat size:	20x20		
Vegetation group:	E		
WP:	20		
Photo number:		83	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		60	
% Cover bare ground:		30	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	12-20m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	M 30-70
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus salmonophloia		Eremophila scoparia		Eremophila ionantha	
				Eremophila scoparia	
				Senna artemisioides subsp. filifolia	

ALL SPECIES
Acacia hemiteles
Atriplex nummularia subsp. spathulata
Atriplex stipitata
Atriplex vesicaria
Austrostipa elegantissima
Chenopodium gaudichaudianum
Enchylaena tomentosa var. tomentosa
Eremophila ionantha
Eremophila oldfieldii subsp. angustifolia
Eremophila scoparia
Eucalyptus salmonophloia
Exocarpos aphyllus
Maireana georgei
Maireana tomentosa
Maireana triptera
Pimelea microcephala subsp. microcephala
Ptilotus obovatus
Rhagodia drummondii
Salsola australis
Sclerolaena densiflora
Sclerolaena patenticuspis
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Solanum nummularium

Adjacent
Eucalyptus transcontinentalis
Eucalyptus yilgarnensis
Santalum spicatum

Project Name: Jaurdi Hills			
Date:	7/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q15
Quadrat size:	20x20		
Vegetation group:	F		
WP:	22		
Photo number:		87	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		80	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	M Tree Mallee (> 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	M 30-70	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Eremophila scoparia		Acacia merrallii	
Eucalyptus salubris		Santalum acuminatum		Eremophila caperata	
				Eremophila ionantha	

ALL SPECIES
Acacia merrallii
Cratystylis conocephala
Eremophila caperata
Eremophila decipiens subsp. decipiens
Eremophila ionantha
Eremophila scoparia
Eucalyptus clelandii
Eucalyptus salubris
Maireana pentatropis
Olearia muelleri
Pimelea microcephala subsp. microcephala
Ptilotus obovatus
Santalum acuminatum
Scaevola spinescens
Senna artemisioides subsp. filifolia
Senna cardiosperma
Solanum nummularium

Project Name: Jaurdi Hills			
Date:	7/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q16
Quadrat size:	20x20		
Vegetation group:	G		
WP:	23		
Photo number:		90	
Landform:		Open depression (vale)/Drainage depression	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		95	
% Cover bare ground:		30	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	3-6m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	M 30-70	**Crown cover %:**	S 10-30	**Crown cover %:**	M 30-70
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Acacia merrallii		Acacia colletioides	
Eucalyptus oleosa subsp. oleosa		Senna artemisioides subsp. filifolia		Eremophila decipiens subsp. decipiens	
Eucalyptus salubris				Eremophila ionantha	

ALL SPECIES
Acacia colletioides
Acacia merrallii
Austrostipa elegantissima
Casuarina pauper
Eremophila decipiens subsp. decipiens
Eremophila ionantha
Eremophila scoparia
Eucalyptus clelandii
Eucalyptus oleosa subsp. oleosa
Eucalyptus salubris
Pimelea microcephala subsp. microcephala
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Solanum nummularium

Project Name: Jaurdi Hills			
Date:	7/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q17
Quadrat size:	20x20		
Vegetation group:	G		
WP:	24		
Photo number:		94	
Landform:		Open depression (vale)/Drainage depression	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		40	
% Cover bare ground:		40	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	M 30-70	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Eremophila scoparia		Acacia colletioides	
Eucalyptus oleosa subsp. oleosa		Exocarpos aphyllus		Senna artemisioides subsp. filifolia	
Eucalyptus salubris		Senna artemisioides subsp. filifolia		Eremophila ionantha	

ALL SPECIES
Acacia colletioides
Acacia hemiteles
Acacia merrallii
Eremophila alternifolia
Eremophila decipiens subsp. decipiens
Eremophila ionantha
Eremophila scoparia
Eucalyptus clelandii
Eucalyptus oleosa subsp. oleosa
Eucalyptus salubris
Exocarpos aphyllus
Ptilotus obovatus
Santalum acuminatum
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia

Project Name: Jaurdi Hills			
Date:	7/07/2017 & 14/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q18
Quadrat size:	20x20		
Vegetation group:	F		
WP:	26		
Photo number:		98	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		40	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	M 30-70	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Eremophila interstans subsp. virgata		Acacia hemiteles	
		Santalum spicatum		Exocarpos aphyllus	
		Senna artemisioides subsp. filifolia		Senna artemisioides subsp. filifolia	

ALL SPECIES
Acacia hemiteles
Atriplex nummularia subsp. spathulata
Atriplex vesicaria
Eremophila glabra subsp. glabra
Eremophila interstans subsp. virgata
Eremophila oldfieldii subsp. angustifolia
Eremophila scoparia
Eucalyptus clelandii
Exocarpos aphyllus
Maireana tomentosa
Maireana trichoptera
Olearia muelleri
Olearia pimeleoides
Ptilotus obovatus
Rhagodia drummondii
Santalum acuminatum
Santalum spicatum
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Senna cardiosperma
Solanum lasiophyllum
Solanum nummularium
Adjacent
Eremophila decipiens subsp. decipiens

Project Name: Jaurdi Hills			
Date:	7/07/2017 & 14/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q19
Quadrat size:	20x20		
Vegetation group:	F		
WP:	27		
Photo number:		101	
Landform:		Hillock/Mound	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		Very; abundant/Fine gravelly; small pebbles/Subrounded	
Rock outcrop (abundance/runoff):		No bedrock exposed/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		30	
% Cover bare ground:		70	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	M Tree Mallee (> 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	I <1	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Eremophila oldfieldii subsp. angustifolia		Acacia erinacea	
Eucalyptus griffithsii				Eremophila pustulata	
				Scaevola spinescens	

ALL SPECIES
Acacia colletioides
Acacia erinacea
Acacia hemiteles
Amyema preissii
Austrostipa elegantissima
Eremophila glabra subsp. glabra
Eremophila interstans subsp. virgata
Eremophila oldfieldii subsp. angustifolia
Eremophila pustulata
Eucalyptus clelandii
Eucalyptus griffithsii
Exocarpos aphyllus
Marsdenia australis
Olearia muelleri
Ptilotus obovatus
Scaevola spinescens
Senna artemisioides subsp. filifolia
Senna cardiosperma
Westringia rigida
Adjacent
Atriplex nummularia subsp. spathulata
Atriplex vesicaria
Santalum acuminatum
antalum spicatum

Project Name: Jaurdi Hills			
Date:	11/07/2017 & 14/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q20
Quadrat size:	20x20		
Vegetation group:	E		
WP:	30		
Photo number:		105-106	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		60	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	12-20m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	M 30-70	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus salmonophloia		Eremophila ionantha		Atriplex stipitata	
		Eremophila scoparia		Atriplex vesicaria	
		Senna artemisioides subsp. filifolia		Olearia muelleri	

ALL SPECIES
Acacia colletioides
Acacia hemiteles
Atriplex nummularia subsp. spathulata
Atriplex stipitata
Atriplex vesicaria
Chenopodium gaudichaudianum
Enchylaena tomentosa var. tomentosa
Eremophila decipiens subsp. decipiens
Eremophila glabra subsp. glabra
Eremophila ionantha
Eremophila scoparia
Eriochiton sclerolaenoides
Eucalyptus salmonophloia
Exocarpos aphyllus
Maireana georgei
Maireana pentatropis
Maireana sedifolia
Olearia muelleri
Pimelea microcephala subsp. microcephala
Ptilotus obovatus
Santalum acuminatum
Santalum spicatum
Scaevola spinescens
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Senna cardiosperma
Solanum nummularium

Project Name: Jaurdi Hills			
Date:	11/07/2017 & 14/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q21
Quadrat size:	20x20		
Vegetation group:	F		
WP:	33		
Photo number:		114	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		60	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	V <10	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Eremophila caperata		Acacia merrallii	
		Eremophila scoparia		Cratystylis conocephala	
				Eremophila scoparia	

ALL SPECIES
Acacia colletioides
Acacia merrallii
Atriplex nummularia subsp. spathulata
Austrostipa elegantissima
Chenopodium gaudichaudianum
Cratystylis conocephala
Eremophila caperata
Eremophila scoparia
Eriochiton sclerolaenoides
Eucalyptus clelandii
Exocarpos aphyllus
Frankenia interioris
Maireana georgei
Maireana sedifolia
Maireana tomentosa
Maireana trichoptera
Ptilotus aervoides
Rhagodia drummondii
Sclerolaena densiflora
Sclerolaena diacantha
Sclerolaena patenticuspis
Senna artemisioides subsp. filifolia
Senna cardiosperma
Solanum nummularium

Project Name: Jaurdi Hills			
Date:	11/07/2017 & 14/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q22
Quadrat size:	20x20		
Vegetation group:	F		
WP:	34		
Photo number:		115	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		80	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	M Tree Mallee (> 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus oleosa subsp. oleosa		Eremophila interstans subsp. virgata		Cratystylis conocephala	
		Eremophila scoparia		Eremophila decipiens subsp. decipiens	
				Eremophila parvifolia subsp. auricampa	

ALL SPECIES
Atriplex stipitata
Atriplex vesicaria
Chenopodium gaudichaudianum
Cratystylis conocephala
Cratystylis microphylla
Enchylaena tomentosa var. tomentosa
Eremophila decipiens subsp. decipiens
Eremophila glabra subsp. glabra
Eremophila interstans subsp. virgata
Eremophila ionantha
Eremophila parvifolia subsp. auricampa
Eremophila praecox (P1)- 2 plants
Eremophila scoparia
Eriochiton sclerolaenoides
Eucalyptus oleosa subsp. oleosa
Exocarpos aphyllus
Frankenia interioris
Maireana pentatropis
Maireana tomentosa
Maireana trichoptera
Olearia muelleri
Pimelea microcephala subsp. microcephala
Ptilotus obovatus
Rhagodia drummondii
Sclerolaena densiflora
Senna artemisioides subsp. filifolia
Solanum nummularium
Adjacent
Austrostipa elegantissima
Dodonaea viscosa subsp. angustissima

Project Name: Jaurdi Hills			
Date:	11/07/2017 & 14/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q23
Quadrat size:	20x20		
Vegetation group:	H		
WP:	36		
Photo number:		119	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		20	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	Y Shrub Mallee (< 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	3-6m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus oleosa subsp. oleosa		Eremophila interstans subsp. virgata		Cratystylis subspinescens	
Eucalyptus yilgarnensis				Eremophila scoparia	
				Maireana pyramidata	

ALL SPECIES
Atriplex stipitata
Atriplex vesicaria
Chenopodium gaudichaudianum
Cratystylis conocephala
Cratystylis subspinescens
Enchylaena tomentosa var. tomentosa
Eremophila decipiens subsp. decipiens
Eremophila glabra subsp. glabra
Eremophila interstans subsp. virgata
Eremophila scoparia
Eriochiton sclerolaenoides
Eucalyptus oleosa subsp. oleosa
Eucalyptus yilgarnensis
Exocarpos aphyllus
Frankenia interioris
Maireana georgei
Maireana pyramidata
Maireana sedifolia
Maireana thesioides
Maireana tomentosa
Maireana trichoptera
Pimelea microcephala subsp. microcephala
Ptilotus aervoides
Ptilotus obovatus
Rhagodia drummondii
Sclerolaena densiflora
Sclerolaena diacantha
Sclerolaena patenticuspis
Senna artemisioides subsp. filifolia
Senna cardiosperma

Project Name: Jaurdi Hills			
Date:	11/07/2017 & 14/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q24
Quadrat size:	20x20		
Vegetation group:	F		
WP:	41		
Photo number:		122-123	
Landform:		Flat/Plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		50	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus oleosa subsp. oleosa		Eremophila caperata		Daviesia aphylla	
Eucalyptus clelandii		Eremophila scoparia		Eremophila scoparia	
		Senna artemisioides subsp. filifolia		Olearia muelleri	

ALL SPECIES
Acacia colletioides
Atriplex vesicaria
Austrostipa elegantissima
Daviesia aphylla
Eremophila caperata
Eremophila parvifolia subsp. auricampa
Eremophila scoparia
Eucalyptus clelandii
Eucalyptus oleosa subsp. oleosa
Exocarpos aphyllus
Maireana pentatropis
Maireana tomentosa
Olearia muelleri
Senna artemisioides subsp. filifolia
Adjacent
Acacia merrallii
Eucalyptus salubris
Santalum acuminatum

Project Name: Jaurdi Hills			
Date:	11/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q25
Quadrat size:	20x20		
Vegetation group:	I		
WP:	43		
Photo number:		127	
Landform:		Hillock/Mound	
Land surface/disturbance:		Limited clearing	
Coarse fragments on the surface (abundance/size/shape):		Very; abundant/Cobbly; or cobbles/Rounded	
Rock outcrop (abundance/runoff):		Slightly rocky/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		15	
% Cover bare ground:		70	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	V <10	**Crown cover %:**	S 10-30	**Crown cover %:**	V <10
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Exocarpos aphyllus		Acacia merrallii	
		Melaleuca sheathiana		Atriplex vesicaria	
		Senna artemisioides subsp. filifolia		Westringia rigida	

ALL SPECIES
Acacia ligulata
Acacia merrallii
Atriplex nummularia subsp. spathulata
Atriplex vesicaria
Austrostipa elegantissima
Chenopodium gaudichaudianum
Cratystylis subspinescens
Dodonaea viscosa subsp. angustissima
Eremophila decipiens subsp. decipiens
Eremophila parvifolia subsp. auricampa
Eucalyptus clelandii
Exocarpos aphyllus
Maireana georgei
Maireana pentatropis
Maireana trichoptera
Marsdenia australis
Melaleuca sheathiana
Olearia muelleri
Rhagodia drummondii
Sclerolaena densiflora
Sclerolaena diacantha
Senna artemisioides subsp. filifolia
Solanum nummularium
Westringia rigida

Project Name: Jaurdi Hills			
Date:	11/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q26
Quadrat size:	20x20		
Vegetation group:	I		
WP:	44		
Photo number:		130	
Landform:		Hillock/Mound	
Land surface/disturbance:		Limited clearing	
Coarse fragments on the surface (abundance/size/shape):		Very; abundant/Coarse gravelly; large pebbles/Rounded	
Rock outcrop (abundance/runoff):		Slightly rocky/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		40	
% Cover bare ground:		60	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	V <10	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Acacia hemiteles		Acacia colletioides	
		Exocarpos aphyllus		Cratystylis conocephala	
		Melaleuca sheathiana		Eremophila scoparia	

ALL SPECIES
Acacia colletioides
Acacia hemiteles
Acacia merrallii
Atriplex vesicaria
Austrostipa elegantissima
Cratystylis conocephala
Dodonaea viscosa subsp. angustissima
Eremophila parvifolia subsp. auricampa
Eremophila scoparia
Eucalyptus clelandii
Exocarpos aphyllus
Maireana pentatropis
Maireana tomentosa
Melaleuca sheathiana
Olearia muelleri
Rhagodia drummondii
Senna artemisioides subsp. filifolia
Westringia rigida

Project Name: Jaurdi Hills			
Date:	11/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q27
Quadrat size:	20x20		
Vegetation group:	I		
WP:	46		
Photo number:		134	
Landform:		Hillock/Mound	
Land surface/disturbance:		Limited clearing	
Coarse fragments on the surface (abundance/size/shape):		Very; abundant/Cobbly; or cobbles/Rounded	
Rock outcrop (abundance/runoff):		Slightly rocky/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		50	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	M Tree Mallee (> 8m)	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	V <10	**Crown cover %:**	V <10	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Acacia hemiteles		Acacia colletioides	
		Melaleuca sheathiana		Grevillea acuaria	
				Westringia rigida	

ALL SPECIES
Acacia colletioides
Acacia hemiteles
Acacia tetragonophylla
Atriplex vesicaria
Dianella revoluta subsp. divaricata
Dodonaea viscosa subsp. angustissima
Eremophila decipiens subsp. decipiens
Eremophila glabra subsp. glabra
Eremophila ionantha
Eremophila parvifolia subsp. auricampa
Eremophila scoparia
Eucalyptus clelandii
Exocarpos aphyllus
Grevillea acuaria
Maireana pentatropis
Maireana tomentosa
Melaleuca sheathiana
Olearia muelleri
Rhagodia drummondii
Scaevola collaris
Scaevola spinescens
Senna artemisioides subsp. filifolia
Solanum nummularium
Triodia rigidissima
Westringia rigida

Adjacent
Alyxia buxifolia

Project Name: Jaurdi Hills			
Date:	11/07/2017 & 13/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q28
Quadrat size:	20x20		
Vegetation group:	I		
WP:	50		
Photo number:		142	
Landform:		Hillock/Mound	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No qualifier; common/Coarse gravelly; large pebbles/Rounded	
Rock outcrop (abundance/runoff):		No bedrock exposed/Slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		60	
% Cover bare ground:		50	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	S 10-30	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Melaleuca sheathiana		Cratystylis conocephala	
				Eremophila scoparia	
				Westringia rigida	

ALL SPECIES
Acacia hemiteles
Acacia merrallii
Cratystylis conocephala
Cratystylis microphylla
Enchylaena tomentosa var. tomentosa
Eremophila glabra subsp. glabra
Eremophila parvifolia subsp. auricampa
Eremophila scoparia
Eucalyptus clelandii
Exocarpos aphyllus
Maireana pentatropis
Melaleuca sheathiana
Olearia muelleri
Rhagodia drummondii
Senna artemisioides subsp. filifolia
Westringia rigida

Project Name: Jaurdi Hills			
Date:	11/07/2017 & 14/09/2017	**Botanist:**	Eren Reid
Location:	Jaurdi Hills Mining Project	**Quadrat:**	Q29
Quadrat size:	20x20		
Vegetation group:	F		
WP:	52		
Photo number:		148	
Landform:		Flat/Terrace plain	
Land surface/disturbance:		No effective disturbance	
Coarse fragments on the surface (abundance/size/shape):		No coarse fragments	
Rock outcrop (abundance/runoff):		No bedrock exposed/Very slow	
Soil (profile/field texture/soil surface):		Duplex/Sandy clay loam/Firm	
% Cover leaf litter:		70	
% Cover bare ground:		40	

Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	**Growth form:**	S Shrub	**Growth form:**	S Shrub
Height:	6-12m	**Height:**	1-3m	**Height:**	0.5-1m
Crown cover %:	M 30-70	**Crown cover %:**	S 10-30	**Crown cover %:**	S 10-30
Dominant taxa:		**Dominant taxa:**		**Dominant taxa:**	
Eucalyptus clelandii		Acacia hemiteles		Acacia merrallii	
Eucalyptus salubris		Eremophila caperata		Olearia muelleri	
		Eremophila scoparia		Westringia rigida	

ALL SPECIES
Acacia colletioides
Acacia hemiteles
Acacia merrallii
Austrostipa elegantissima
Eremophila caperata
Eremophila parvifolia subsp. auricampa
Eremophila scoparia
Eucalyptus clelandii
Eucalyptus salubris
Exocarpos aphyllus
Olearia muelleri
Scaevola collaris
Scaevola spinescens
Senna artemisioides subsp. artemisioides
Senna artemisioides subsp. filifolia
Westringia rigida