Level 1
Flora and Vegetation Survey of the Baloo Gold Prospect Proposed Access Corridor

Prepared for

Polar Metals Pty Ltd

DRAFT
August 2015

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1 INTRODUCTION

Polar Metals Pty Ltd (PM) has identified the Baloo gold prospect under Lake Cowan with potential to support a mining development. PM holds an exploration tenement over the area and will be taking steps in the future to convert this to mining tenure and seek to develop the prospect.

The Baloo Project is located on Lake Cowan, 45km southeast of Widgiemooltha and 45km north of Norseman in Western Australia within exploration tenement E15/1298 (Figure 1). The tenement is located primarily on the bed of Lake Cowan, but also includes approximately 100 ha of a peninsula extending into the lake. Exploration drilling is active to further define the resource. Pit dimensions and infrastructure locations have not been defined, but development is likely to include an open pit on the lake bed, mine waste dump either on the lake or on shore, offices on shore and an access haul road connecting to the Coolgardie Esperance Highway near Higginsville or to Metals X owned facilities east of the highway.

MBS Environmental (MBS) commissioned Native Vegetation Solutions (NVS) on behalf of PM to complete a Level 1 Flora and Vegetation Survey of the proposed access corridor survey area from 11th to 13th of May 2015, to provide baseline data to assist with project design and determine requirements for further studies and approvals.

The total survey area was approximately 1,387 ha, comprising of 5.92 ha of existing disturbance and 22.61 ha of bare salt lake, representing approximately 0.43% and 1.63% of the total survey area, respectively.

Figure 1: Regional map of survey location (Yellow Boundary)

1.1 Objectives

The objective of this report is to document the results of the flora and vegetation component of a Level 1 assessment conducted in accordance with the Environmental Protection Authority (EPA) "*Terrestrial Biological Surveys as an Element of Biodiversity Protection; Position Statement No 3*" (EPA 2002) and *Guidance Statement No. 51 "Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004)".

A Level 1 study has two components:
1). Desktop study which includes a literature review and a search of the relevant databases;

and

2). Reconnaissance survey of the survey area to verify the desktop survey, to define vegetation units present in the area, search for species of conservation significance and to determine potential sensitivity to impact.

As part of the reporting for the Level 1 assessment, NVS has conducted a Flora and Vegetation Survey which includes broad-scale vegetation mapping and vegetation condition mapping of the survey area.

Therefore, the scope of work for the Flora and Vegetation Survey was to:
- conduct a desktop study that includes a literature review and search of the relevant databases;
- generally describe the vegetation associations in the survey area;
- prepare an inventory of species occurring in the survey area;
- identify any vegetation or flora of particular conservation significance; and
- provide recommendations, including the management of perceived impacts to flora and vegetation within the survey area.

1.2 Geology and Vegetation

The survey area lies in the Coolgardie (COO) bioregion within the Eastern Goldfields (COO3) subregion which totals over 5.1 million hectares (CALM, 2002). The COO3 subregion lies on the Yilgarn Craton's '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 of the region is of gneisses and granites eroded into flat planes covered with tertiary soils and with scattered exposures of bedrock. Calcareous earths are the dominant soil group and cover 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 vegetation is 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 graninulites of the Fraser Range (CALM, 2002).

1.3 Climate

The Coolgardie Region's climate is semi-arid (Dry) Warm Mediterranean and has 300 – 500 mm of annual rainfall during winter (CALM, 2002). The nearest official meteorological weather station with the most complete and up to date information is Norseman Aero, which is located approximately 47 km south of the survey area.

1.3.1 Temperature

Mean annual minimum temperature at Norseman Aero is 9.9°C and mean annual maximum temperature is 25.1°C. The coldest temperatures are attained in July (mean minimum temperature 4°C), the hottest is January (mean maximum temperature 32.5°C) and diurnal temperature variations are relatively consistent throughout the year (Figure 2).

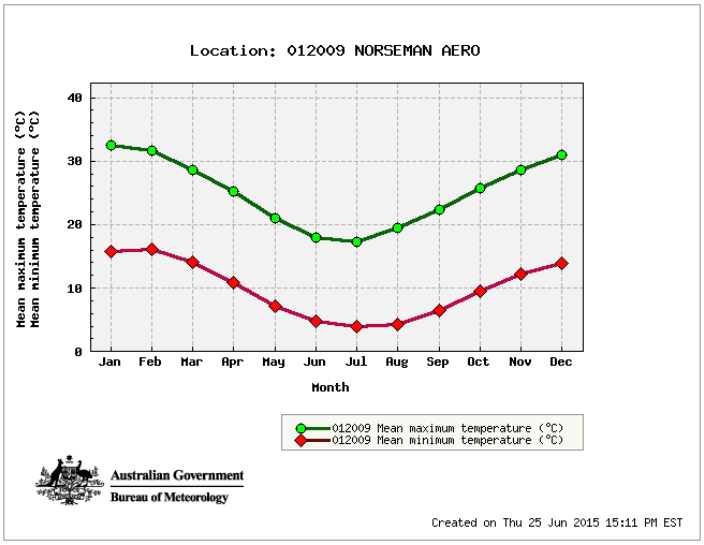

Figure 2: Mean temperature ranges for Norseman Aero weather station

1.3.2 Rainfall

The annual average rainfall at Norseman is 303.4 mm, which falls (>1 mm) on an average of 47.2 rain-days. Rainfall is relatively even throughout the year with slightly larger rainfall events falling between the months of November and March (Figure 3). In 2015 however, rainfall in April only exceeded monthly averages, with January, March and May receiving below average rainfall events.

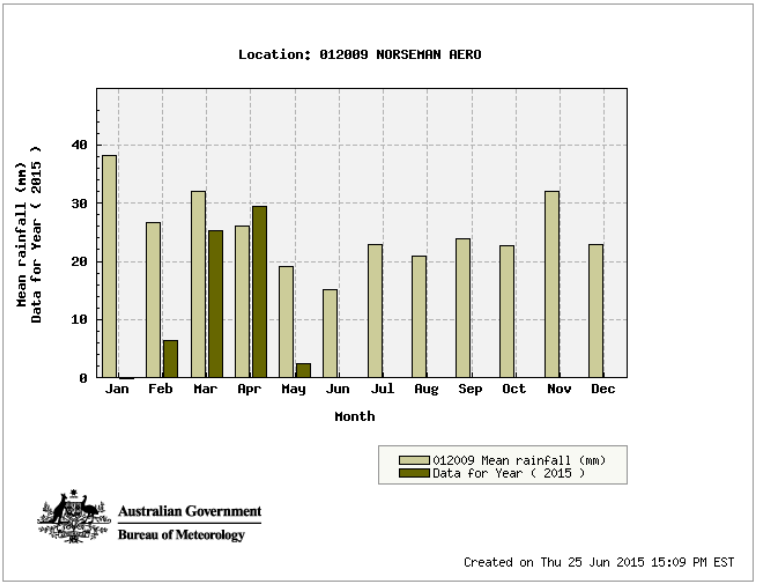

Figure 3: Monthly and mean rainfall for Norseman Aero weather station 2015

2. ASSESSMENT METHODOLOGY

2.1 Preliminary Desktop Study

A preliminary assessment of the survey area and its potential constraints was undertaken by reviewing a number of government agency managed databases (see Appendix 1) and consulting where necessary. The following sections provide a summary of the methodology used for each potential environmental aspect associated with the project.

2.1.1 *Environment Protection and Biodiversity Conservation Act* Protected Matters

The *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* Protected Matters Search tool was utilised to provide results for matters of National Environmental Significance within the survey area.
(http://www.environment.gov.au/arcgis-framework/apps/pmst/pmst-coordinate.jsf)

2.1.2 Threatened Flora and Communities

The Species and Communities Branch of the Department of Parks and Wildlife (DPAW) was contacted for a search of their databases containing known populations of threatened flora (Reference: 05-1111FL).

The presence of Threatened and Priority Ecological Communities (TECs & PECs) was determined by examining Geographic Information System (GIS) data supplied by the DPAW upon request (Reference: 06-1111EC).

2.1.3 Environmentally Sensitive Areas (ESAs) and Conservation Reserves

Department of Environment Regulation's (DER) Clearing Permit System Map Viewer was used to determine the location of any ESAs (https://cps.der.wa.gov.au/main.html).

The location of any Conservation Reserves was determined by examining GIS data available from the DER website and consulting with the local DER office where necessary.

2.1.4 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. This data comprises Beard's Pre-European vegetation groups.
Note: This data was provided to Native Vegetation Solutions via a license agreement with the DAFWA.

2.1.5 Wetlands

The location of wetlands within the project area was determined by examining DER's Clearing Permit System Map Viewer (https://cps.der.wa.gov.au/main.html).

2.1.6 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 below the 26th parallel.

2.2 Site Investigation

A site visit was carried out by Botanist Eren Reid from Native Vegetation Solutions on the from 11th to 13th May 2015, to examine the flora and vegetation groups contained within the survey area. A total of 30 hours was spent on site traversing the survey area, by four wheel drive vehicle and on foot.
The survey was conducted in accordance with relevant EPA's Statements and Guidelines (Section 1.1).

EPA's *Position Statement No. 3* (EPA, 2002) provides indicative levels of biological survey in relation to the scale and nature of the impact and the sensitivity of the receiving environment. The EPA uses the Interim Biogeographic Regionalisation of Australia (IBRA) as the largest unit for Environmental Impact Assessment decision making in relation to the conservation of biodiversity. Given the unknown scale and nature of the proposed disturbances and that the survey area is located within the Coolgardie IBRA region, a Level 1 flora and vegetation survey was required.

2.3 Personnel and Reporting

The following personnel were involved in the preparation of this report;

- Eren Reid *BSc (Biological Science),* Principal Botanist, Native Vegetation Solutions, undertook the survey, data collation, preparation and review of the report

2.4 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). As shown, this survey was not limited by any factors listed below.

Table 1: List of potential survey limitations

Potential Limitations	Constraint (Y/N)	Comment
Competency and experience of the consultants undertaking the survey	N	Mr Eren Reid is an experienced botanist who has conducted many flora and vegetation surveys in the Goldfields, Pilbara and South-west regions of WA.
Proportion of flora identified during survey	N	As the survey was planned to target species of conservation significance and flora within a small survey area a complete census of the species present was attempted (Approx. 95%). Sufficient identifications were made to allow vegetation descriptions to be made.
Sources of information	N	DRF and Priority Flora GIS information was available from DPAW.
Proportion of the task achieved	N	All tasks completed
Timing/Season	N	The targeted survey was conducted in Autumn 2015. Due to the above average rainfall in April, many species were still in flower with emergent annuals.
Disturbance in survey area	N	Disturbance was present in the form of historic exploration.
Intensity of survey effort	N	Transects were walked through the survey area with all parts visited
Resources	N	Adequate resources were available
Access problems	N	No problems with access
Availability of contextual information on the region	N	Information on the Coolgardie Bioregion is readily available.

3. RESULTS

3.1 Preliminary Desktop Assessment

3.1.1 EPBC Act Protected Matters

The EPBC Protected Matters search tool revealed that the survey area could possibly be suitable habitat for the weed species *Carrichtera annua* (Wards Weed) (DOTE, 2015).

3.1.2 Threatened Flora and Communities

The DPAW database searches revealed a potential for 2 Threatened and 54 Priority Flora species to occur within a 25km radius of the survey area (DPAW, 2011). No known locations of these Flora occur within the survey area, while the closest location occurs approximately 1 km west of the survey area.

Results of the threatened flora database search are included in Appendix 2.

The PEC/TEC search (DPAW, 2011a) revealed that the eastern half of the survey area lies within the buffer zone of the Fraser Range Vegetation Complex, Priority 1 PEC. The buffer zone is centred 96km southeast of the survey area with a 100km radius. The PEC is defined by DPAW (2015) below:

> " Plant assemblages of the Fraser Range Vegetation Complex: *Allocasuarina huegeliana* and *Pittosporum phylliraeoides* open woodland over *Beyeria lechenaultii* and *Dodonaea microzyga* Scrub and *Aristida contorta* bunch grasses (granite complex), on the slopes and summits of hills; *Acacia acuminata* Tall Shrubland dominated by *Melaleuca uncinata* and *Triodia scariosa* on uplands with shallow loamy sands; *Eucalyptus* aff. *uncinata* (KRN 7854) over *Senna artemisioides* subsp. *helmsii*, *Cryptandra miliaris*, *Dodonaea boroniifolia*, *D. stenozyga* and *Triodia scariosa* (*Eucalyptus effusa* Mallee) on colluvial flats with loamy clay sands, and; *E. oleosa*, *E. transcontinentalis*, *E. flocktoniae* Woodland on flats. ."

This PEC description does not define any vegetation groups identified within the survey area.

3.1.3 Environmentally Sensitive Areas and Conservation Reserves

No ESA's are located within the survey area (DER, 2015).

3.1.4 Vegetation Type, Extent and Status

Information relating to known vegetation within the survey area has been summarised in Tables 2, 3, 4 and 5 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 (*E. salmonophloia*) & gimlet (*E. salubris*)				
Pre-European Extent (ha)	Scale				
	***By Association** (WA)*	***By Association** (WA)*	***By IBRA Region** (COO)*	***By IBRA Sub-region** (COO3)*	***By Shire** (Shire of Coolgardie)*
	1,096,450*	694,368**	280,248**	226,086**	160,584**
% Pre-European Extent Remaining	*57.63%**	*49.89%***	*98.34%***	*99.53%***	*99.34***
Surrounding Land Use***	Mining, Exploration, Pastoral Lease				
Weed prevalence***	Low				

* Source: Shepherd *et al.* (2002) Appendix 2
**Source: Shepherd *et al.* (2002) Associated GIS data
***Source: Field assessment

Table 3: Summary of information regarding Pre-European and current vegetation extent of Vegetation Association 125 within the survey area

Factor	Value				
Beard Vegetation Association*	125				
Vegetation Association Description*	Bare Areas; salt lakes				
Pre-European Extent (ha)	Scale				
	By Association (WA)	***By Association** (WA)*	***By IBRA Region** (COO)*	***By IBRA Sub-region** (COO3)*	***By Shire** (Shire of Coolgardie)*
	3,578,590*	3,485,786**	545,717**	303,090**	152,429**
% Pre-European Extent Remaining	*90.46%**	*90.25%***	*92.87%***	*99.13%***	*98.45%***
Surrounding Land Use***	Mining, Exploration, Pastoral Lease				
Weed prevalence***	Low				

* Source: Shepherd *et al.* (2002) Appendix 2
**Source: Shepherd *et al.* (2002) Associated GIS data
***Source: Field assessment

Table 4: Summary of information regarding Pre-European and current vegetation extent of Vegetation Association 501 within the survey area

Factor	Value				
Beard Vegetation Association*	501				
Vegetation Association Description*	Medium woodland; goldfields blackbutt (*E. lesouefii*)				
Pre-European Extent (ha)	Scale				
	By Association *(WA)*	***By Association*** *(WA)*	***By IBRA Region*** *(COO)*	***By IBRA Sub-region*** *(COO3)*	***By Shire*** *(Shire of Coolgardie)*
	47,731*	48,022**	43,938**	43,871**	5,797**
% Pre-European Extent Remaining	*100.00%**	*99.72%***	*99.70%***	*99.70%***	*97.70%***
Surrounding Land Use***	Mining, Exploration, Pastoral Lease				
Weed prevalence***	Low				

* Source: Shepherd *et al.* (2002) Appendix 2
**Source: Shepherd *et al.* (2002) Associated GIS data
***Source: Field assessment

Table 5: Summary of information regarding Pre-European and current vegetation extent of Vegetation Association 522 within the survey area

Factor	Value				
Beard Vegetation Association*	522				
Vegetation Association Description*	Medium woodland; redwood (*E. transcontinentalis*) & merrit (*E. flocktoniae*)				
Pre-European Extent (ha)	Scale				
	By Association *(WA)*	***By Association*** *(WA)*	***By IBRA Region*** *(COO)*	***By IBRA Sub-region*** *(COO3)*	***By Shire*** *(Shire of Coolgardie)*
	676,324*	709,715**	688,407**	208,175**	313,238**
% Pre-European Extent Remaining	*100.00%**	*99.93%***	*99.93%***	*99.78%***	*99.86%***
Surrounding Land Use***	Mining, Exploration, Pastoral Lease				
Weed prevalence***	Low				

* Source: Shepherd *et al.* (2002) Appendix 2
**Source: Shepherd *et al.* (2002) Associated GIS data
***Source: Field assessment

3.1.5 Wetlands

No wetlands which are recorded on the DER Clearing Permit System Map Viewer occur within the survey area (DER, 2015).

3.1.6 Dieback

The survey area lies south of the 26th parallel, however receives average annual rainfall of 303.4mm, 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 (seeds of non-native species *etc*.) which poses a risk in the survey area during seasonally favourable conditions.

3.2 Field Assessment

3.2.1 Threatened Flora

No plant taxa located in the survey area are gazetted as DRF pursuant to subsection 2 of Section 23F of the *Wildlife Conservation Act 1950*. No plant taxa listed as Threatened pursuant to Schedule 1 of the *Environment Protection and Biodiversity Conservation Act 1999* were located in the survey area.

Although not located in the survey area, Priority species *Diocirea acutifolia* (P3) was recorded at 19 locations to the north of the survey area, with approximately 4607 plants sighted (Appendix 4). This species is both widespread and in large numbers throughout the local and regional area, and is well documented by previous flora surveys. Recorded locations range from Coolgardie, Norseman, Kambalda, Widgiemooltha and Madoonia Downs.

Table 6: Priority Flora locations recorded outside of the survey area

Species	Conservation Code	Zone	Nothing	Easting	No. Of Plants
Diocirea acutifolia	P3	51J	379591	6486770	117
Diocirea acutifolia	P3	51J	379763	6486817	38
Diocirea acutifolia	P3	51J	379662	6486871	516
Diocirea acutifolia	P3	51J	379484	6486902	5
Diocirea acutifolia	P3	51J	379480	6486949	40
Diocirea acutifolia	P3	51J	379419	6486960	11
Diocirea acutifolia	P3	51J	379464	6487003	540
Diocirea acutifolia	P3	51J	379582	6486985	275
Diocirea acutifolia	P3	51J	379633	6486970	25
Diocirea acutifolia	P3	51J	379939	6486864	70
Diocirea acutifolia	P3	51J	379940	6486935	93
Diocirea acutifolia	P3	51J	379854	6486459	400
Diocirea acutifolia	P3	51J	380026	6486450	2000
Diocirea acutifolia	P3	51J	379907	6487589	1
Diocirea acutifolia	P3	51J	379914	6487642	200
Diocirea acutifolia	P3	51J	379946	6487635	200
Diocirea acutifolia	P3	51J	379953	6487311	21
Diocirea acutifolia	P3	51J	379960	6487361	35
Diocirea acutifolia	P3	51J	379241	6487265	20

3.2.2 Vegetation Type, Extent and Status

A total of 29 Families, 62 Genera and 136 Species were recorded within the survey area. Fifteen major vegetation groups were recorded in the survey area, and are considered to be in Very Good to Good Health condition (using the scale of Keighery 1994, see Appendix 3). Maps of the survey area can be seen in Appendix 4.

The vegetation groups are described in more detail below.

3.2.2.1 *Eucalyptus lesouefii* and *E. flocktoniae* woodland over *Melaleuca sheathiana*

This vegetation group consisted of 8 Families, 14 Genera and 29 Species. The vegetation group was approximately 0.69 ha which makes up 0.05% of the survey area.

Dominant species were *Eucalyptus flocktoniae* subsp. *hebes, Melaleuca sheathiana, Atriplex nummularia* subsp*. spathulata, Eremophila interstans* subsp. *virgata, Maireana sedifolia, Cratystylis conocephala and Olearia muelleri.*

Figure 4: *Eucalyptus lesouefii* and *E. flocktoniae* woodland over *Melaleuca sheathiana* within the survey area

3.2.2.2 *Melaleuca sheathiana* thicket

This vegetation group consisted of 7 Families, 12 Genera and 15 Species. The vegetation group was approximately 0.07 ha which makes up 0.01% of the survey area.

Dominant species were *Melaleuca sheathiana, Atriplex vesicaria, Sclerolaena diacantha, Maireana georgei, Solanum nummularium,* and *Angianthus tomentosus.*

(No photo available.)

3.2.2.3 *Eucalyptus salmonophloia* woodland over sclerophyll shrubland

This vegetation group consisted of 13 Families, 20 Genera and 45 Species. The vegetation group was approximately 459.93 ha which makes up 33.16% of the survey area.

Dominant species were *Eucalyptus salmonophloia, E. salubris, Melaleuca sheathiana, Atriplex nummularia* subsp*. spathulata, Eremophila interstans* subsp. *virgata, Maireana sedifolia, Cratystylis conocephala and Olearia muelleri.*

Figure 5: *Eucalyptus salmonophloia* woodland over sclerophyll shrubland within the survey area

3.2.2.4 *Eucalyptus ravida* woodland

This vegetation group consisted of 7 Families, 13 Genera and 21 Species. The vegetation group was approximately 1.56 ha which makes up 0.11% of the survey area.

Dominant species were *Eucalyptus ravida, E. flocktoniae* subsp*. hebes, Eremophila scoparia, E. maculata* subsp. *brevifolia, Atriplex nummularia* subsp*. spathulata, and Olearia muelleri.*

Figure 6: Eucalyptus ravida woodland within the survey area

3.2.2.5 Mixed *Eucalyptus* woodland over mixed shrubland

This vegetation group consisted of 13 Families, 24 Genera and 42 Species. The vegetation group was approximately 221.35 ha which makes up 15.96% of the survey area.

Dominant species were numerous *Eucalyptus* species, *Eremophila scoparia, E. interstans* subsp. *virgata, Atriplex vesicaria and A. nummularia* subsp. *spathulata.*

Figure 7: **Mixed *Eucalyptus* woodland over mixed shrubland within the survey area**

3.2.2.6 Open *Eucalyptus salmonophloia* woodland

This vegetation group consisted of 11 Families, 19 Genera and 30 Species. The vegetation group was approximately 65.35 ha which makes up 4.71% of the survey area.

Dominant species were *Eucalyptus salmonophloia, Atriplex vesicaria, Atriplex nummularia* subsp. *spathulata, Senna artemisioides* subsp. *filifolia, Maireana sedifolia* and *Eremophila scoparia.*

Figure 8: **Open *Eucalyptus salmonophloia* woodland within the survey area**

3.2.2.7 Open mixed *Eucalyptus* woodland over Chenopod shrubland

This vegetation group consisted of 16 Families, 24 Genera and 33 Species. The vegetation group was approximately 95.24 ha which makes up 6.87% of the survey area.

Dominant species were *numerous Eucalyptus species, over Atriplex vesicaria, Frankenia pauciflora, Maireana tomentosa, Sclerolaena diacantha* and *Carpobrotus modestus.*

Figure 9: Open mixed *Eucalyptus* woodland over Chenopod shrubland within the survey area

3.2.2.8 *Acacia quadrimarginea* shrubland

This vegetation group consisted of 18 Families, 28 Genera and 35 Species. The vegetation group was approximately 10.05 ha which makes up 0.72% of the survey area.

Dominant species were *Acacia quadrimarginea, Beyeria lechenaultii, Triodia rigidissima, Dodonaea lobulata* and *Eremophila oppositifolia* subsp. *angustifolia.*

Figure 10: *Acacia quadrimarginea* shrubland within the survey area

3.2.2.9 *Tecticornia* shrubland

This vegetation group consisted of 7 Families, 16 Genera and 24 Species. The vegetation group was approximately 5.72 ha which makes up 0.41% of the survey area.

Dominant species were *Tecticornia indica* subsp. *bidens, T. moniliformis, T. pergranulata* subsp. *pergranulata* and *T. syncarpa.*

Figure 11: *Tecticornia* shrubland within the survey area

3.2.2.10 *Eucalyptus oleosa* and *E. lesouefii* over *Melaleuca sheathiana* and mixed shrubland on undulating hills

This vegetation group consisted of 19 Families, 29 Genera and 43 Species. The vegetation group was approximately 45.45 ha which makes up 3.28% of the survey area.

Dominant species were *Eucalyptus oleosa* subsp. *oleosa, E. lesouefii, Melaleuca sheathiana, Acacia quadrimarginea, Scaevola spinescens, Acacia tetragonophylla, Senna artemisioides* subsp. *filifolia and Alyxia buxifolia.*

Figure 12: *Eucalyptus oleosa* and *E. lesouefii* over *Melaleuca sheathiana* and mixed shrubland on undulating hills within the survey area

3.2.2.11 Mixed *Eucalyptus* woodland over *Melaleuca sheathiana* and *Cratystylis conocephala*

This vegetation group consisted of 13 Families, 20 Genera and 37 Species. The vegetation group was approximately 97.02 ha which makes up 7% of the survey area.

Dominant species were *numerous Eucalyptus* species *over Melaleuca sheathiana, Cratystylis conocephala, Ptilotus obovatus, Atriplex vesicaria* and *Eremophila interstans* subsp. *virgata.*

Figure 13: Mixed *Eucalyptus* woodland over *Melaleuca sheathiana* and *Cratystylis conocephala* within the survey area

3.2.2.12 *Acacia acuminata* thicket with emergent *Eucalyptus griffithsii*

This vegetation group consisted of 10 Families, 13 Genera and 14 Species. The vegetation group was approximately 5.86 ha which makes up 0.42% of the survey area.

Dominant species were *Acacia acuminata, Eucalyptus griffithsii, Alyxia buxifolia, Dodonaea microzyga* subsp. *acrolobata and Prostanthera campbellii.*

Figure 14: *Acacia acuminata* thicket with emergent *Eucalyptus griffithsii* within the survey area

3.2.2.13 Mixed sclerophyll shrubland

This vegetation group consisted of 15 Families, 27 Genera and 37 Species. The vegetation group was approximately 11.41 ha which makes up 0.82% of the survey area.

Dominant species were *Atriplex vesicaria, Eremophila scoparia, Exocarpos aphyllus, Atriplex stipitata, Lycium australe* and *Cratystylis subspinescens.*

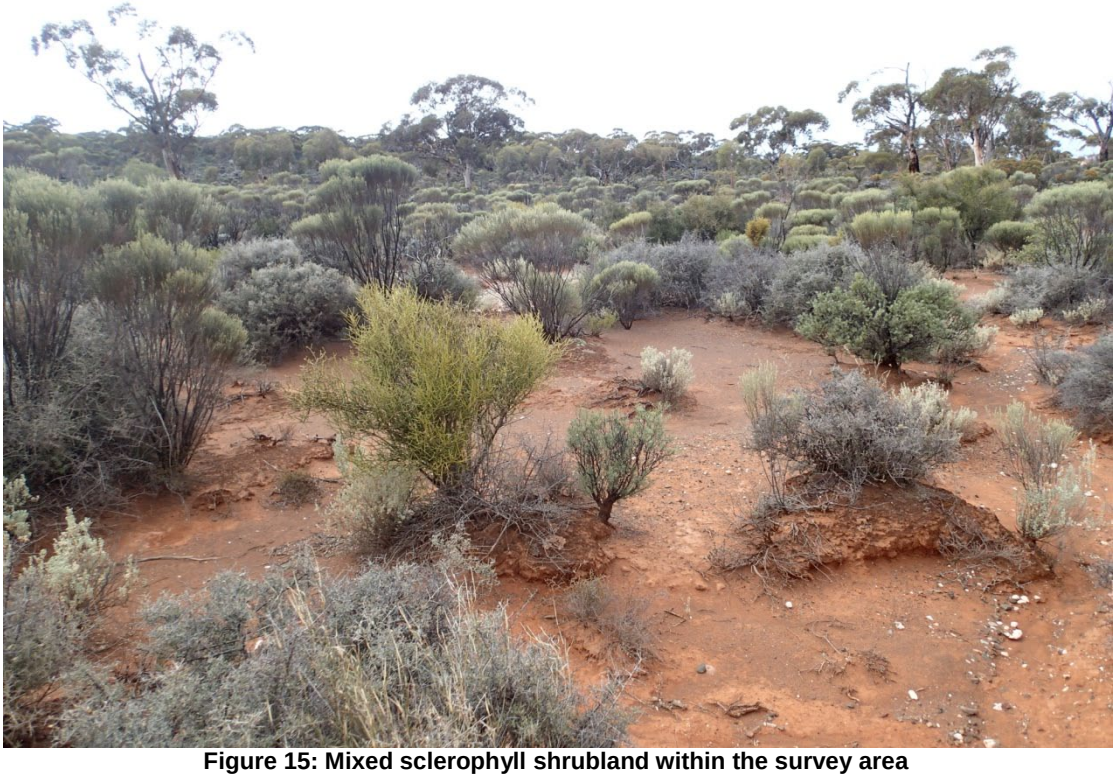

Figure 15: Mixed sclerophyll shrubland within the survey area

3.2.2.14 Sclerophyll shrubland with emergent *Bossiaea walkeri*

This vegetation group consisted of 18 Families, 25 Genera and 29 Species. The vegetation group was approximately 2.29 ha which makes up 0.17% of the survey area.

Dominant species were *Bossiaea walkeri, Cratystylis subspinescens, Olearia subspicata, Scaevola spinescens, Frankenia setosa, Frankenia interioris,* and *Ptilotus obovatus.*

Figure 16: Sclerophyll shrubland with emergent *Bossiaea walkeri* within the survey area

3.2.2.15 *Eucalyptus torquata* and *Eucalyptus lesouefii* over mixed sclerophyll shrubland on undulating hills

This vegetation group consisted of 13 Families, 21 Genera and 39 Species. The vegetation group was approximately 336.48 ha which makes up 24.26% of the survey area.

Dominant species were *Eucalyptus torquata, E. lesouefii, Atriplex nummularia* subsp. *spathulata, Dodonaea lobulata, Eremophila glabra* subsp. *glabra, Olearia muelleri, Acacia tetragonophylla, Scaevola spinescens,* and *Senna artemisioides* subsp. *filifolia.*

Figure 17: *Eucalyptus torquata* and *Eucalyptus lesouefii* over mixed sclerophyll shrubland on undulating hills within the survey area

3.2.2.16 Existing Disturbance

This vegetation group consisted of 2 Families, 4 Genera and 12 Species. The vegetation group was approximately 5.92 ha which makes up 0.43% of the survey area. Not all disturbed areas contained vegetation and were completely bare.

Dominant species were *Atriplex nummularia* subsp. *spathulata, A. vesicaria* and numerous *Sclerolaena* species.

Figure 18: Existing disturbance within the survey area

3.2.3 Weeds

Two weed species were recorded within the survey area; *Carrichtera annua* (Ward's Weed) and *Medicago polymorpha* (Burr Medic). Burr Medic was restricted to limited areas within the Open mixed *Eucalyptus* woodland over Chenopod shrubland vegetation group, whilst Ward's Weed was a little more widespread throughout the Eucalypt woodland vegetation groups.

Carrichtera annua was introduced into Australia from the eastern Mediterranean, and is now widespread throughout South Australia, the Interior, and Western Australia (Lamp & Collet, 1999).

Medics are known to have originated from Europe and Asia with some species of medics cultivated as pasture legumes. Burr medic is considered widely naturalised in many situations throughout WA, including domestic lawns (Hussey *et al*, 2007)

None of these species are listed as declared plants by DAFWA (2015).

3.2.4 Vegetation Condition

Evidence of some grazing was observed during the field assessment. Overall, the condition of the vegetation was determined to be “Very Good” with areas which were affected by historic exploration, clearing and grazing in “Good” condition. A map of the vegetation condition of the survey area can be seen in Appendix 4.

4. DISCUSSION

The field assessment established that the condition of the vegetation in the proposed disturbance area is overall “Very Good”, with certain areas affected by exploration in “Good” condition. No areas of vegetation were assessed to be in “Pristine” condition.

No DRF, TECs or Priority Flora were recorded in the survey area. The buffer zone for the P1 Fraser Range vegetation complex PEC overlaps the eastern half of the survey area. The definition of this PEC does not reflect the vegetation groups within the survey area.

Any proposed disturbance/clearing of vegetation will result in a loss of species from the proposed upgrade to the Access Road. However, given the size of the area and the extent of the Beard (Shepherd *et al.*, 2002) vegetation associations elsewhere, the impact on the vegetation and its component flora will not affect the conservation values of either, or create fragmentation or patches of remnant vegetation.

The following recommendations arise from the Level 1 flora survey:

- Where possible, the Access Road route should be aligned with existing clearing;
- Clearing should be kept to the minimum size required for the access road construction;
- All clearing should be kept within the bounds of the survey area; and
- Weed control measures should be implemented during and following clearing and construction of the access road route.

5. REFERENCES

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Appendix 1

Relevant Government Database Search Results

Australian Government
Department of the Environment

EPBC Act Protected Matters Report

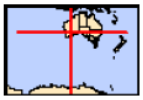
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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.

Report created: 17/07/15 17:26:00

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:	1
Listed Migratory Species:	4

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/index.html

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:	5
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:	8
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		
Leipoa ocellata Malleefowl [934]	Vulnerable	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		
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
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

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		
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

Name	Threatened	Type of Presence
		habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat likely to 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
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Mammals		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		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.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

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

-31.748493 121.716181,-31.796489 121.86152,-31.796489 121.86152

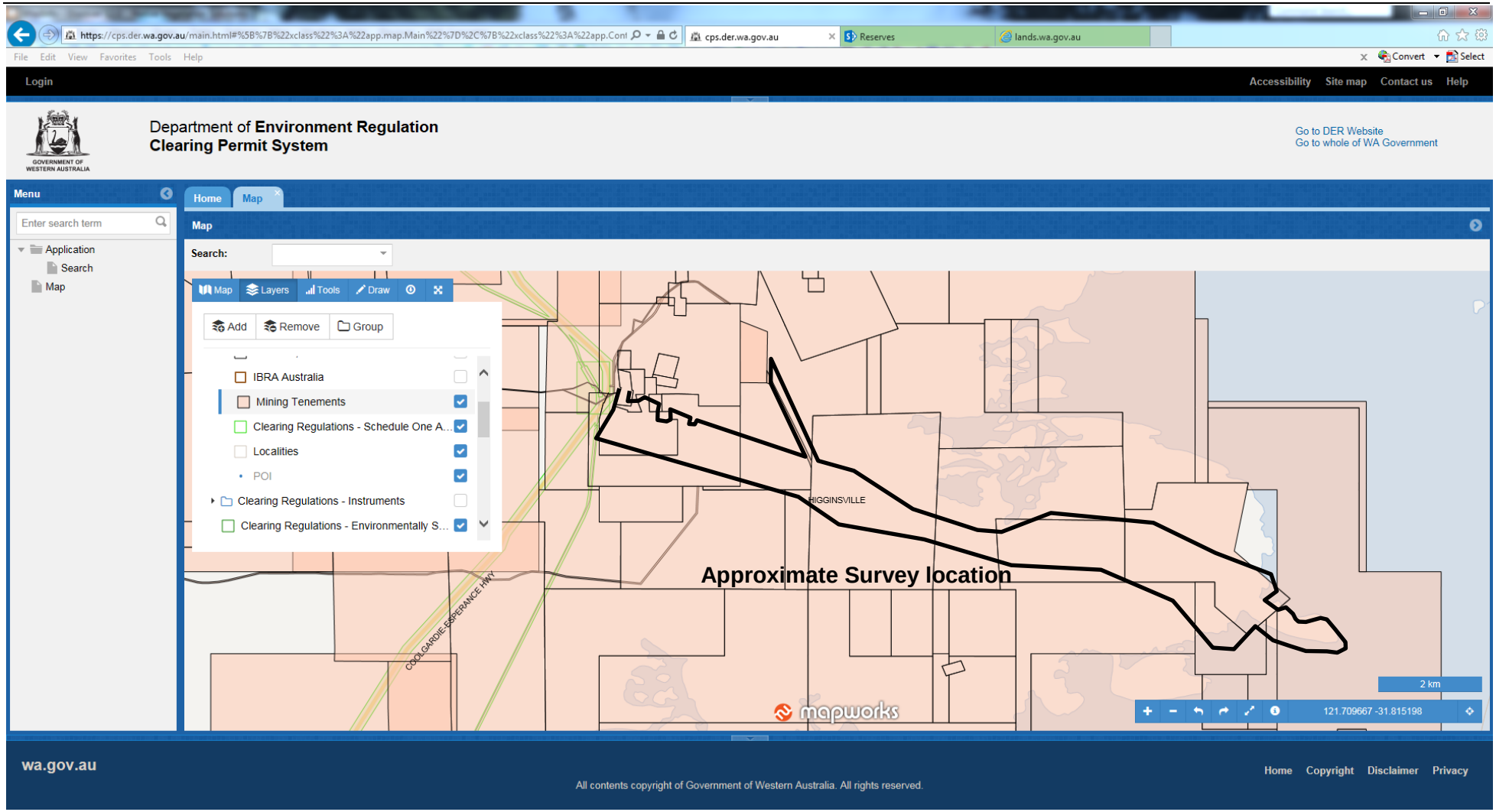
Acknowledgements

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

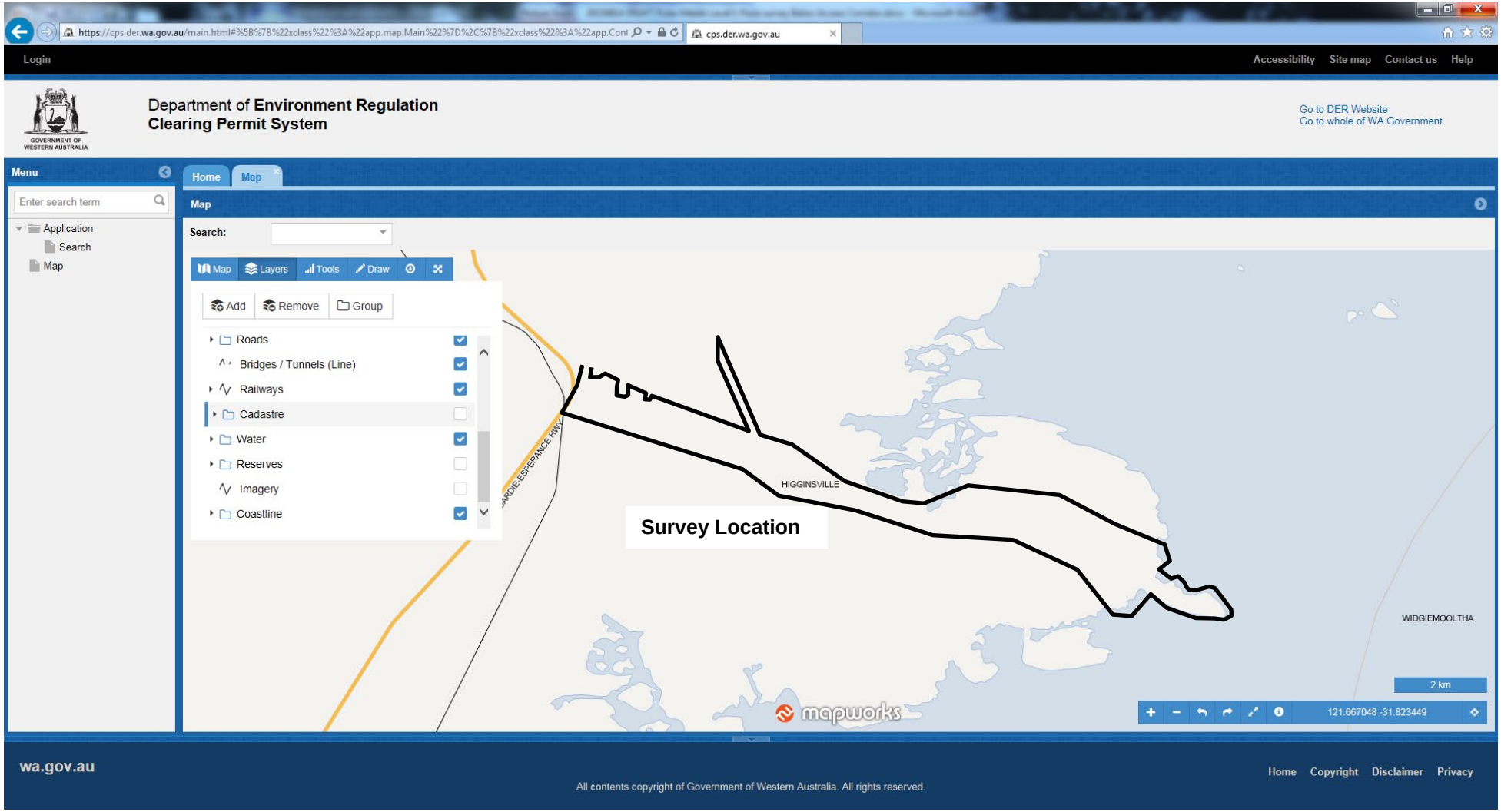
-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA 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, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-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.



DER's Clearing Permit System Map Viewer showing no ESA's (dark green shaded areas) within the survey area (DER, 2015)



DER's Clearing Permit System Map Viewer showing no Wetlands within the survey area (DER, 2015)

Appendix 2

Threatened Flora Databases Search Results

4/11/2011 **DEPARTMENT OF ENVIRONMENT AND CONSERVATION** Page 1
DECLARED RARE AND PRIORITY FLORA LIST
16 September 2010

SPECIES / TAXON	CONS CODE	DEC REGION	DISTRIBUTION	FLOWER PERIOD
Acacia dorsenna	1	SC	Norseman, Lake Cowan	Aug
Acacia eremophila numerous-nerved variant	3	GLD,SC	Norseman, Neale Junction, Great Victoria Desert, Balladonia, Plumridge Lakes	Sep,Jul
Acacia kerryana	2	SC,GLD,WB	Norseman, Jimberlana Hill, Bremer Range, Lake Cronin, Spargoville	Dec-Feb
Allocasuarina eriochlamys subsp. grossa	3	GLD,SC	Zanthus, Lake Cowan, Norseman	
Astartea sp. Bungalbin Hill (KR Newbey 8989)	3	GLD	Bungalbin Hill, Helena & Aurora Ranges, Queen Victoria Rocks, Kalgoorlie, Boorabbin	Sep-Dec,Mar
Astartea sp. Esperance (A Fairall 2431)	1	SC	Esperance, Dowak, Norseman	Oct
Atriplex lindleyi subsp. conduplicata	3	P,GLD,MW, SC	Credo Stn, Norseman, Karratha Stn, Balfour Downs Stn	
Austrostipa blackii	3	GLD,WB,MW	Merredin, Dalwallinu, Jaurdi, Widgiemooltha, eastern States, Tutanning Nature Reserve, Beverley, Blue Hills Range, Yandanoo Hills,Mt Manning Range, Barcooting Hill	
Beyeria sulcata var. truncata	3	WB,SC	Jerdacuttup, Ravensthorpe, Norseman, Lake King, Frank Hann N.P.	Oct
Bossiaea arcuata	1	SC	Norseman	Sep
Bossiaea aurantiaca	1	SC	Norseman	Sep,Oct
Bossiaea laxa	2	GLD	Widgiemooltha	May
Bossiaea saxosa	1	SC	Norseman	Sep,Dec
Bossiaea simulata	1	SC	Fraser Range, Mt Willgonarinya	Oct,Nov
Comesperma calcicola	3	SC,WB	Kau Rock, Pine Hill, Norseman, Forrestania, Mount Ragged	
Cryptandra crispula	3	GLD,SC	Lake Lefroy, Bullabulling, Karonie, Fraser Range	Jul-Sep
Dampiera sericantha	3	SC	Norseman, Munglinup	Oct-Nov
Darwinia polycephala	4	SC	Lake Halbert (NE Mt Ridley), Grasspatch, Scaddan, Norseman	Mar
Daviesia microcarpa	T	SC	NE of Norseman, Southern Cross	Aug-Sep
Diocirea acutifolia	3	GLD	Coolgardie, Kambala, Widgiemooltha	Nov-Dec
Eremophila lucida	1	WB,SC	Forrestania, Norseman	Jul-Oct
Eremophila parvifolia subsp. parvifolia	4	SC	Norseman, Balladonia, Bardoc, Caiguna to South Australia	
Eremophila purpurascens	3	SC	Norseman	Oct-Nov
Eremophila veronica	3	GLD	Queen Victoria Rock, Coolgardie	Oct-Nov
Eucalyptus brachyphylla x	4	GLD	Lake Lefroy, Karonie, Widgiemooltha	-
Eucalyptus brockwayi	3	SC	Norseman	Apr-Jun
Eucalyptus fraseri subsp. melanobasis	2	SC	Fraser Range, Eucla, Newman Rock, Junana Rock, Pine Hill	Jan-Feb
Eucalyptus jimberlanica	1	SC	Jimberlana Hill, Norseman	-
Eucalyptus platydisca	T	SC	Norseman, Mt Norcott	Mar-May
Eucalyptus pterocarpa	4	SC	Norseman, Bronzite Ridge	Sep-Nov
Eucalyptus websteriana subsp. norsemanica	1	SC,GLD	Norseman, Coolgardie	-

4/11/2011 **DEPARTMENT OF ENVIRONMENT AND CONSERVATION** Page 2
DECLARED RARE AND PRIORITY FLORA LIST
16 September 2010

SPECIES / TAXON	CONS CODE	DEC REGION	DISTRIBUTION	FLOWER PERIOD
Euryomyrtus leptospermoides	3	WB,GLD,SC	Koorarawalyee, Burracoppin, Korbel, Karalee, Merredin, Muntagin, Boodarding Rock, NW of Norseman, Goongarrie Stn.,Forrestania, Boorabbin, Hyden, Ghooli, Wogarl	Aug-Nov
Eutaxia actinophylla	3	SC,WB,GLD	Norseman, Salmon Gums, Mt Newmont, Bruce Rock, Wallaroo Rock, Mt Willgonarinya	Sep-Dec
Frankenia glomerata	3	WB,SW,GLD,SC,MW	Waeel, Cunderdin, Lake King, Northam, Little Sandy Desert, Carnarvon Range, Norseman, Arrino, Kellerberrin, Three Springs, Yenyenning Lakes	Mar,Nov
Gastrolobium hians	1	SC	Norseman	Sep
Gnephosis sp. Norseman (KR Newbey 8096)	3	GLD,SC	Jaurdi Stn, Norseman	Sep,Oct
Goodenia corralina	2	SC	Norseman	May
Grevillea phillipsiana	1	SC,GLD	Norseman, Yardina, Kambalda, Widgiemooltha	Aug-Sep
Leucopogon sp. Yellowdine (M. Hislop & F. Hort MH 3194)	1	WB,GLD,SC	N of Yellowdine, Holleton,Hyden-Norseman Track,	Jan, May, Aug
Logania nanophylla	2	SC	Norseman	Aug
Melaleuca coccinea	3	GLD,SC	Karonie, Boulder, Widgiemooltha, Erayinia Hill, Norseman, Ravensthorpe	Oct-Nov
Melaleuca macronychia subsp. trygonoides	3	SC,GLD	Lake View Rock, McDermid Rock, Queen Victoria Rock, Cave Hill	Feb,Jul,Aug
Micromyrtus papillosa	1	SC	Norseman, Jimberlana Hill, Beacon Hill, Mt Norcott	April, Aug-Oct
Microseris scapigera	3	SC,WB	Scaddan, Marvel Loch, Lake Grace, Fraser range, Norseman, Southern Hills Stn, Holt Rock,Marble Rocks, Pingrup, Woodanilling, Lake Magenta	Sep-Oct
Myriophyllum petraeum	4	WB,GLD,SC	Sth Cross-Mt Ragged, Narembeen, Mt Madden, Norseman	Aug-Sep
Newcastelia insignis	2	GLD,SC	Adelong Stn, Comet Vale, Queen Victoria Spring, Norseman	Sep-Nov
Philotheca apiculata	2	SC,GLD,WB	Norseman, Mt Kirk, Widgiemooltha, Holleton	Aug-Sep
Phlegmatospermum eremaeum	2	GLD,SC	Coolgardie, Norseman, Cocklebiddy, Forrest	Aug-Oct
Pityrodia sp. Yilgarn (AP Brown 2679)	3	GLD,WB	Forrestania, Marvel Loch, Jilbadji, Norseman, Southern Cross (Barker Lake), Widgiemooltha	Oct,Nov
Prostanthera splendens	1	GLD,SC	Widgiemooltha, Higginsville, Cascade	Aug-Oct
Ptilotus rigidus	1	GLD	Widgiemooltha, Lake Lefroy	
Tecticornia flabelliformis	1	GLD,WB,*	Lake Yindarlgooda, Lake Deborah, Widgiemooltha, Eastern States	
Teucrium sp. Dwarf (R. Davis 8813)	1	SC	Mt Gordon, Norseman	April
Verticordia stenopetala	3	WB,GLD	Mt Holland, Moorine Rock, Queen Victoria Rock, Marvel Loch, Carrabin, Mt Walton, Holleton	Oct

GIS information provided in the Search results (Reference: 05-1111FL) also lists the additional species:

- *Stylidium choreanthum (P3)*
- *Eucalyptus kruseana (P4)*

Appendix 3

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.

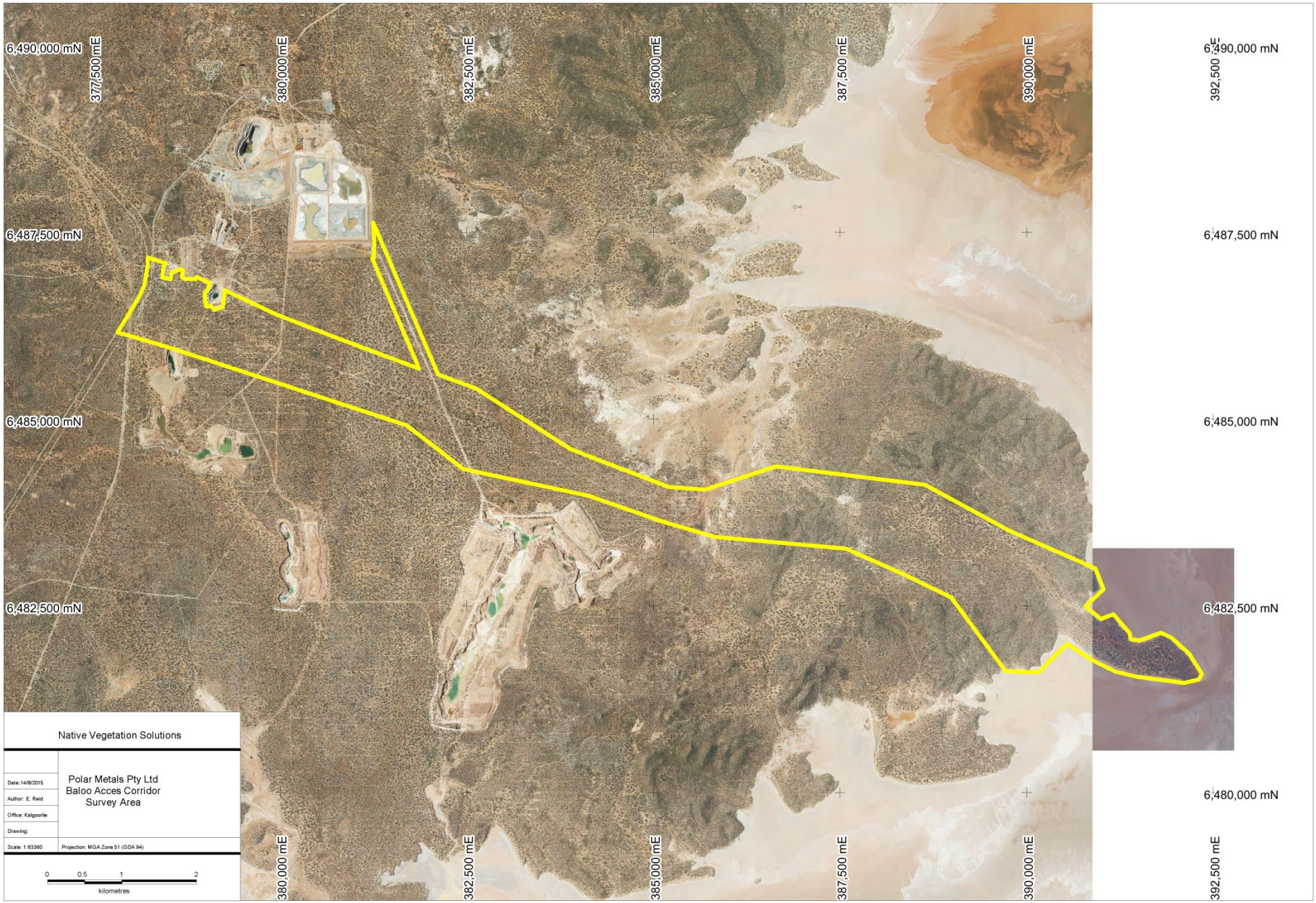
Good (4). Vegetation structure significantly altered by very obvious signs of multiple disturbance.
Retains basic vegetation structure or ability to regenerate it.
For example, disturbance to vegetation structure caused by frequent fires, the presence of some very aggressive weeds at high density, partial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

Vegetation Mapping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Polar Metals Pty Ltd
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Survey Area
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Author: E. Reid
Office: Kalgoorlie
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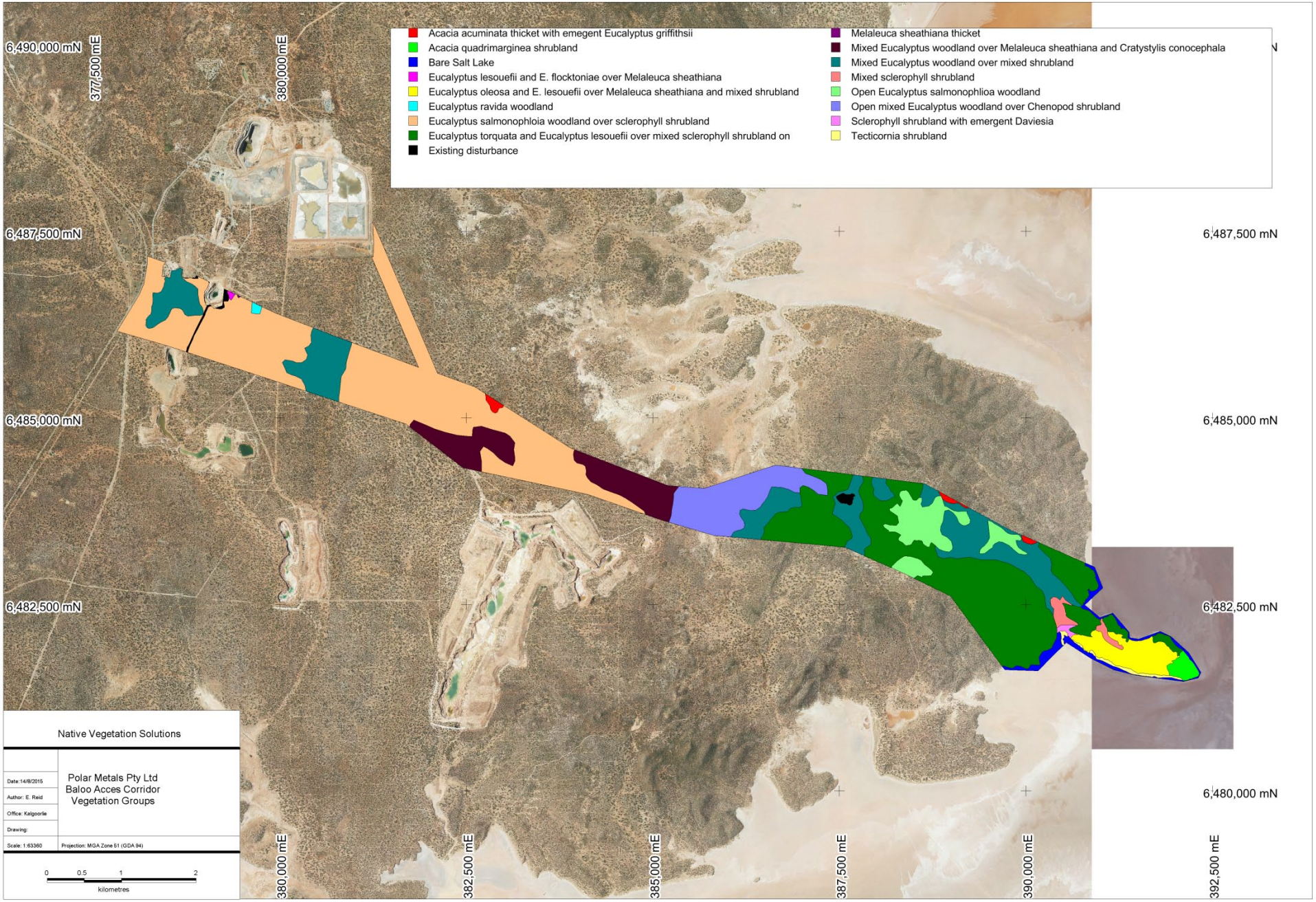
Acacia acuminata thicket with emegent Eucalyptus griffithsii
Acacia quadrimarginea shrubland
Bare Salt Lake
Eucalyptus lesouefii and E. flocktoniae over Melaleuca sheathiana
Eucalyptus oleosa and E. lesouefii over Melaleuca sheathiana and mixed shrubland
Eucalyptus ravida woodland
Eucalyptus salmonophloia woodland over sclerophyll shrubland
Eucalyptus torquata and Eucalyptus lesouefii over mixed sclerophyll shrubland on
Existing disturbance
Melaleuca sheathiana thicket
Mixed Eucalyptus woodland over Melaleuca sheathiana and Cratystylis conocephala
Mixed Eucalyptus woodland over mixed shrubland
Mixed sclerophyll shrubland
Open Eucalyptus salmonophlioa woodland
Open mixed Eucalyptus woodland over Chenopod shrubland
Sclerophyll shrubland with emergent Daviesia
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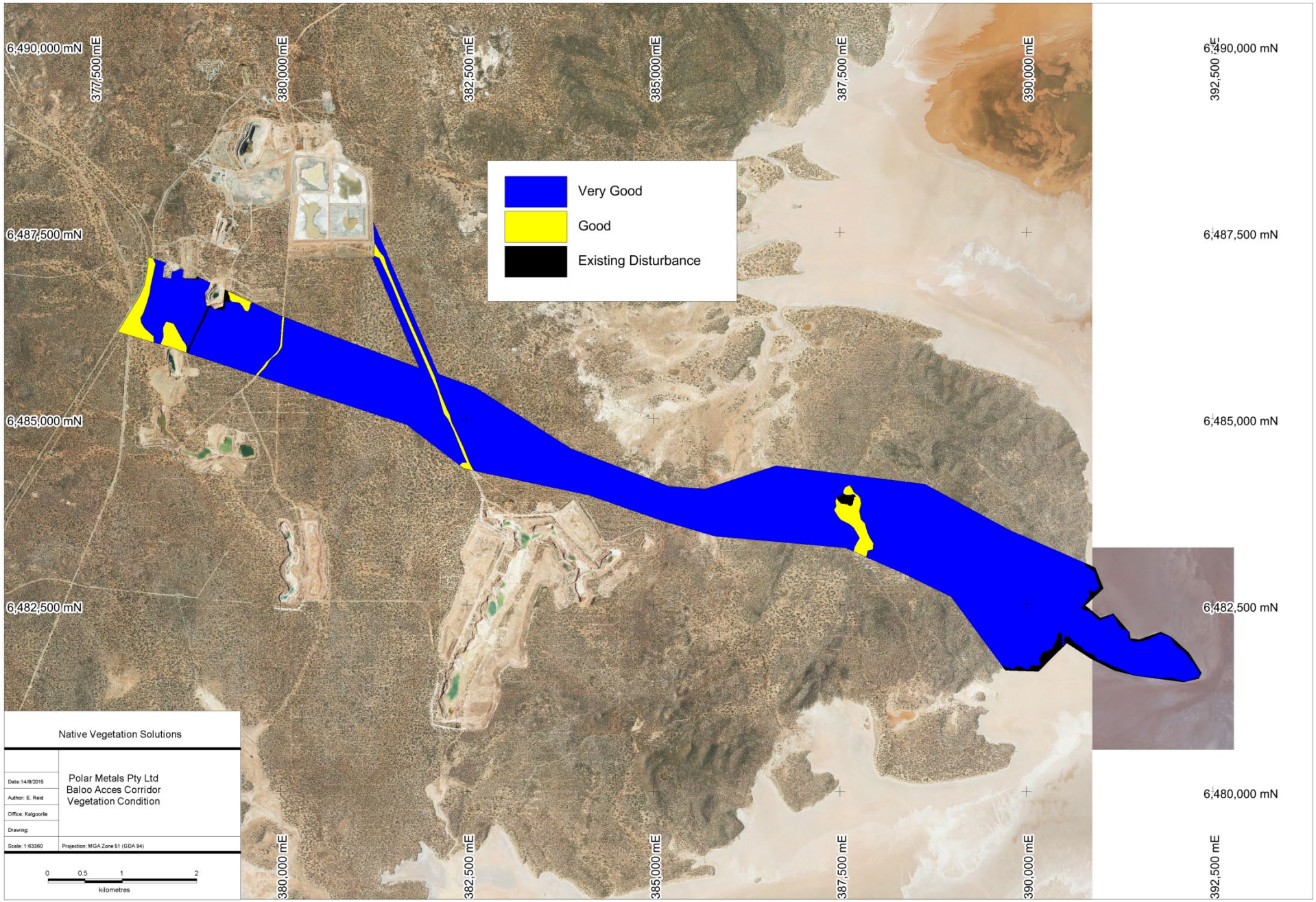
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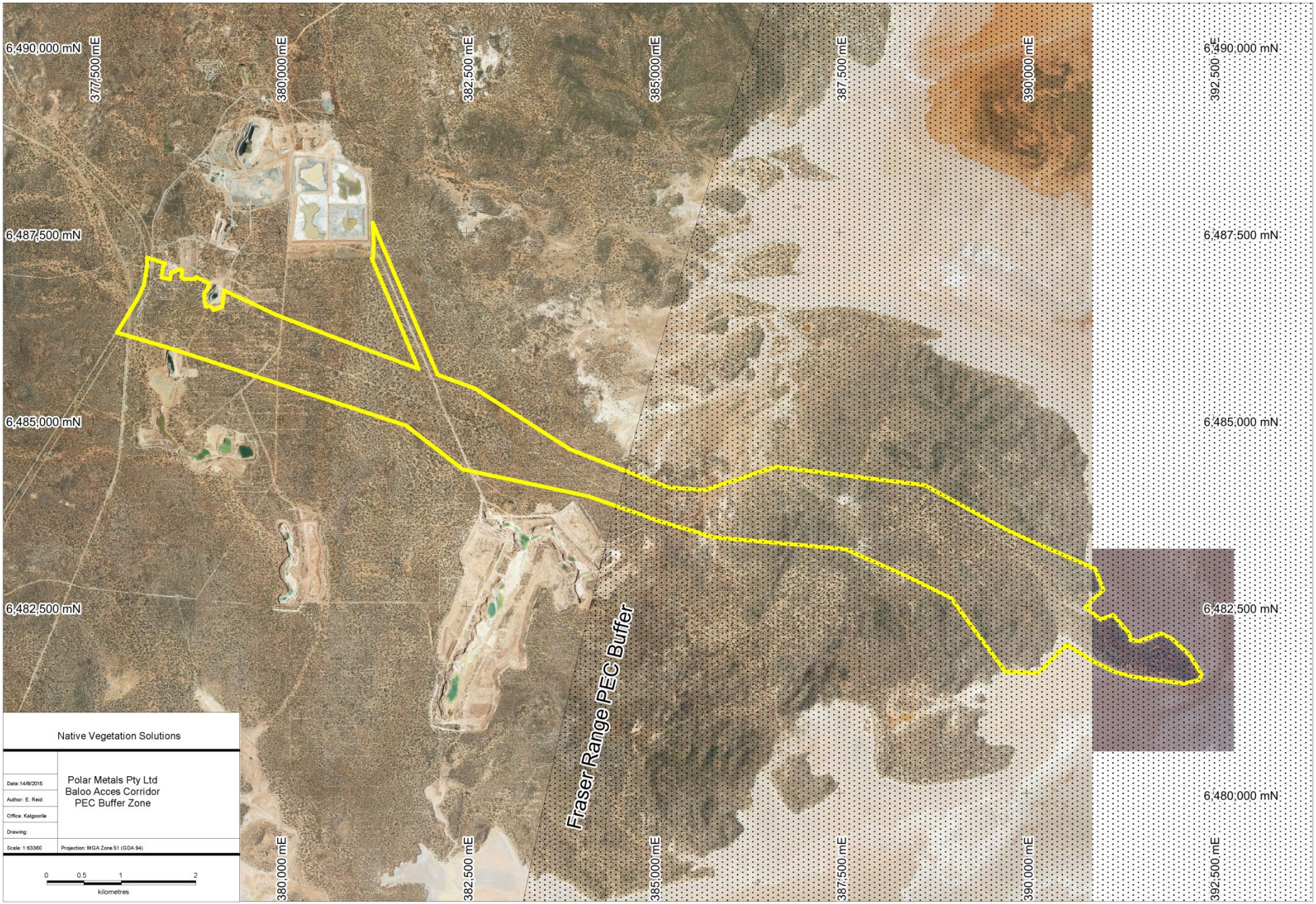
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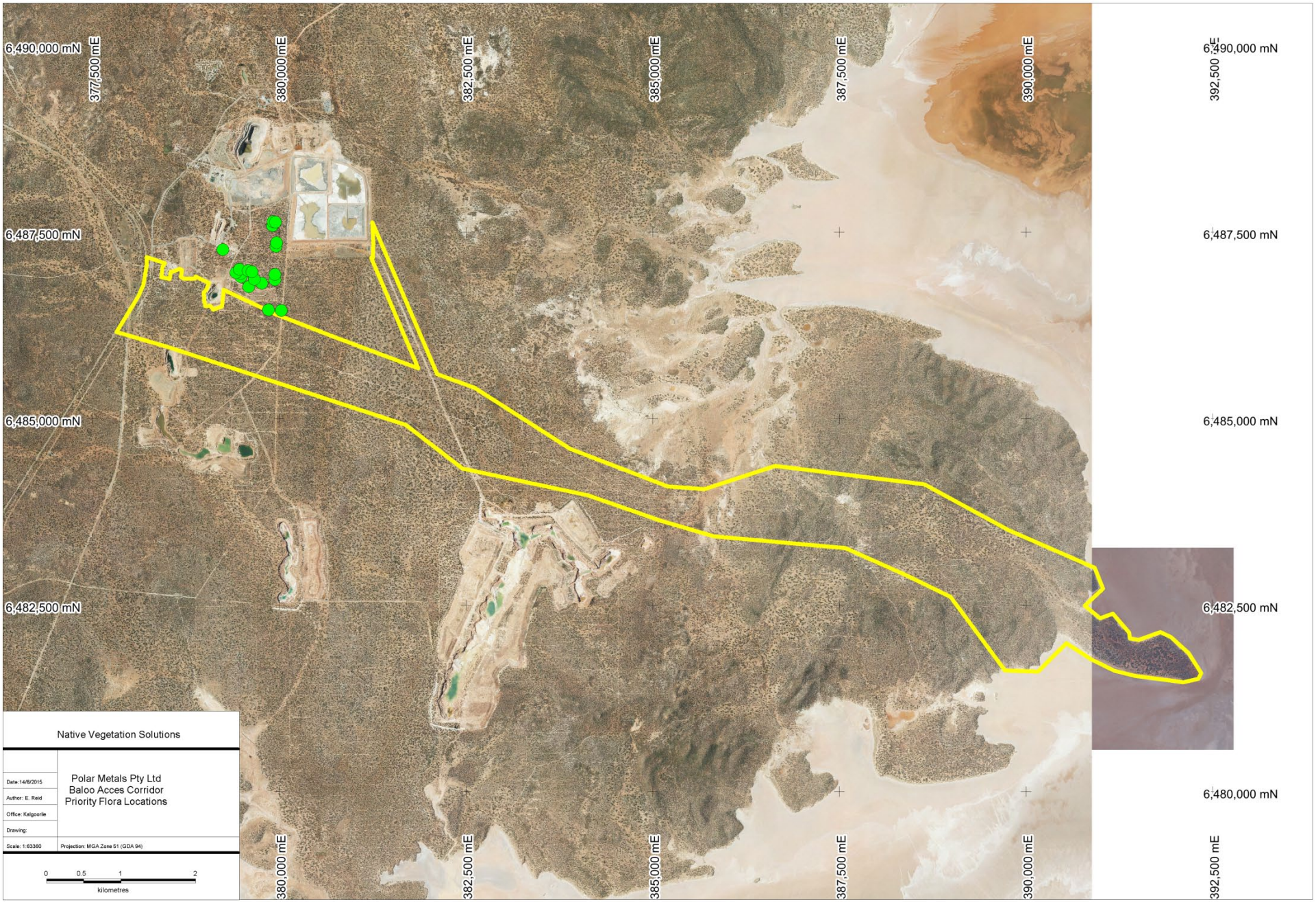
382,500 mE
385,000 mE
387,500 mE
390,000 mE
392,500 mE
Fraser Range PEC Buffer
Native Vegetation Solutions
Polar Metals Pty Ltd
Baloo Acces Corridor
PEC Buffer Zone
Date: 14/8/2015
Author: E. Reid
Office: Kalgoorlie
Drawing:
Scale: 1:63360
Projection: MGA Zone 51 (GDA 94)
0 0.5 1 2
kilometres


6,490,000 mN
6,487,500 mN
6,485,000 mN
6,482,500 mN
6,480,000 mN
377,500 mE
380,000 mE
382,500 mE
385,000 mE
387,500 mE
390,000 mE
392,500 mE
Native Vegetation Solutions
Polar Metals Pty Ltd
Baloo Acces Corridor
Priority Flora Locations
Date: 14/8/2015
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Drawing:
Scale: 1:63360
Projection: MGA Zone 51 (GDA 94)
0 0.5 1 2
kilometres

Appendix 5

Species List

Family	Genus	Species	Perennial (P) Annual (A) Non Native (NN)	*Eucalyptus lesouefii* and *E. flocktoniae* over *Melaleuca sheathiana*	*Melaleuca sheathiana* thicket	*Eucalyptus salmonophloia* woodland over sclerophyll shrubland	*Eucalyptus ravida* woodland	Mixed *Eucalyptus* woodland over mixed shrubland	Open *Eucalyptus salmonophloia* woodland	Open mixed *Eucalyptus* woodland over Chenopod shrubland	*Acacia quadrimarginea* shrubland	*Tecticornia* shrubland	*Eucalyptus oleosa* and *E. lesouefii* over *Melaleuca sheathiana* and mixed shrubland on undulating hills	Mixed *Eucalyptus* woodland over *Melaleuca sheathiana* and *Cratystylis conocephala*	*Acacia acuminata* thicket with emergent *Eucalyptus griffithsii*	Mixed sclerophyll shrubland	Sclerophyll shrubland with emergent *Bossiaea walkeri*	*Eucalyptus torquata* and *Eucalyptus lesouefii* over mixed sclerophyll shrubland on undulating hills	Existing disturbance
Aizoaceae	*Carpobrotus*	*modestus*	P							*						*	*		
Aizoaceae	*Disphyma*	*crassifolium* subsp. *clavellatum*	P									*							
Aizoaceae	*Gunniopsis*	*quadrifida*	P								*	*							
Amaranthaceae	*Ptilotus*	*nobilis*	A	*															
Amaranthaceae	*Ptilotus*	*obovatus*	P	*		*		*		*	*		*	*		*	*	*	
Apocynaceae	*Alyxia*	*buxifolia*	P					*	*	*			*	*	*	*		*	
Apocynaceae	*Marsdenia*	*australis*	P													*	*	*	
Asteraceae	*Angianthus*	*tomentosus*	A		*		*												
Asteraceae	*Brachyscome*	*ciliaris*	A								*	*				*			
Asteraceae	*Cratystylis*	*conocephala*	P	*		*	*		*				*	*		*			
Asteraceae	*Cratystylis*	*subspinescens*	P					*			*	*				*	*		
Asteraceae	*Olearia*	*muelleri*	P	*		*	*	*	*				*	*	*			*	
Asteraceae	*Olearia*	*subspicata*	P														*	*	
Asteraceae	*Rhodanthe*	*charsleyae*	A					*											
Asteraceae	*Rhodanthe*	*floribunda*	A					*				*				*			
Asteraceae	*Senecio*	*glossanthus*	A									*							
Boraginaceae	*Halgania*	*andromedifolia*	P											*					
Brassicaceae	*Carrichtera*	*annua*	A, NN	*	*					*									
Casuarinaceae	*Casuarina*	*pauper*	P										*						
Chenopodiaceae	*Atriplex*	*bunburyana*	P	*				*											*
Chenopodiaceae	*Atriplex*	*holocarpa*	A									*							*
Chenopodiaceae	*Atriplex*	*nummularia* subsp. *spathulata*	P	*		*	*	*	*				*					*	*
Chenopodiaceae	*Atriplex*	*stipitata*	P	*		*	*	*	*		*	*				*		*	*
Chenopodiaceae	*Atriplex*	*vesicaria*	P	*	*	*	*	*	*	*		*		*		*	*	*	*
Chenopodiaceae	*Chenopodium*	*gaudichaudianum*	P					*		*								*	
Chenopodiaceae	*Dissocarpus*	*paradoxus*	P							*									
Chenopodiaceae	*Enchylaena*	*tomentosa*	P					*	*		*					*		*	
Chenopodiaceae	*Eriochiton*	*sclerolaenoides*	P					*	*	*								*	
Chenopodiaceae	*Maireana*	*amoena*	P									*					*		
Chenopodiaceae	*Maireana*	*georgei*	P	*	*		*	*	*		*	*						*	
Chenopodiaceae	*Maireana*	*glomerifolia*	P									*							
Chenopodiaceae	*Maireana*	*pentatropis*	P						*				*	*		*			
Chenopodiaceae	*Maireana*	*platycarpa*	P			*													
Chenopodiaceae	*Maireana*	*pyramidata*	P			*													
Chenopodiaceae	*Maireana*	*sedifolia*	P	*		*	*	*	*										
Chenopodiaceae	*Maireana*	*tomentosa*	P	*				*	*	*		*		*				*	
Chenopodiaceae	*Maireana*	*triptera*	P	*	*	*								*					
Chenopodiaceae	*Rhagodia*	*drummondii*	P	*							*		*				*		
Chenopodiaceae	*Salsola*	*australis*	A			*													
Chenopodiaceae	*Sclerolaena*	*cuneata*	P						*	*			*					*	*
Chenopodiaceae	*Sclerolaena*	*densiflora*	P	*				*	*	*				*		*		*	*
Chenopodiaceae	*Sclerolaena*	*diacantha*	P	*	*	*	*	*	*	*				*		*		*	*
Chenopodiaceae	*Sclerolaena*	*eriacantha*	P	*															
Chenopodiaceae	*Sclerolaena*	*eurotioides*	P											*					
Chenopodiaceae	*Sclerolaena*	*patenticuspis*	P	*					*				*	*		*			*
Chenopodiaceae	*Tecticornia*	*disarticulata*	P		*				*	*				*					*
Chenopodiaceae	*Tecticornia*	*indica* subsp. *bidens*	P									*							
Chenopodiaceae	*Tecticornia*	*moniliformis*	P									*							
Chenopodiaceae	*Tecticornia*	*pergranulata* subsp. *pergranulata*	P									*							
Chenopodiaceae	*Tecticornia*	*syncarpa*	P									*							

Family	Genus	Species	Perennial (P) Annual (A) Non Native (NN)	*Eucalyptus lesouefii* and *E. flocktoniae* over *Melaleuca sheathiana*	*Melaleuca sheathiana* thicket	*Eucalyptus salmonophloia* woodland over sclerophyll shrubland	*Eucalyptus ravida* woodland	Mixed *Eucalyptus* woodland over mixed shrubland	Open *Eucalyptus salmonophloia* woodland	Open mixed *Eucalyptus* woodland over Chenopod shrubland	*Acacia quadrimarginea* shrubland	*Tecticornia* shrubland	*Eucalyptus oleosa* and *E. lesouefii* over *Melaleuca sheathiana* and mixed shrubland on undulating hills	Mixed *Eucalyptus* woodland over *Melaleuca sheathiana* and *Cratystylis conocephala*	*Acacia acuminata* thicket with emergent *Eucalyptus griffithsii*	Mixed sclerophyll shrubland	Sclerophyll shrubland with emergent *Bossiaea walkeri*	*Eucalyptus torquata* and *Eucalyptus lesouefii* over mixed sclerophyll shrubland on undulating hills	Existing disturbance
Cupressaceae	*Callitris*	*preissii*	P										*				*		
Cyperaceae	*Lepidosperma*	*sanguinolentum*	P										*						
Ericaceae	*Leucopogon*	*sp.* Clyde Hill	P								*		*						
Euphorbiaceae	*Beyeria*	*lechenaultii*	P								*								
Fabaceae	*Acacia*	acuminata	P												*				
Fabaceae	*Acacia*	*colletioides*	P			*												*	
Fabaceae	*Acacia*	*erinacea*	P						*				*						
Fabaceae	*Acacia*	*kalgoorliensis*	P			*													
Fabaceae	*Acacia*	*ligulata*	P			*													
Fabaceae	*Acacia*	*quadrimarginea*	P								*		*					*	
Fabaceae	*Acacia*	*tetragonophylla*	P					*		*	*		*			*	*	*	
Fabaceae	*Bossiaea*	*walkeri*	P										*				*		
Fabaceae	*Jacksonia*	*arida*	P								*								
Fabaceae	*Medicago*	*polymorpha*	A,NN							*									
Fabaceae	*Senna*	*artemisioides* subsp. *filifolia*	P			*			*	*			*	*	*	*	*	*	
Frankeniaceae	*Frankenia*	*interioris*	P				*	*				*		*		*	*		
Frankeniaceae	*Frankenia*	*pauciflora*	P					*		*						*			
Frankeniaceae	*Frankenia*	*setosa*	P														*		
Goodeniaceae	*Scaevola*	*spinescens*	P			*		*	*	*	*		*	*	*	*	*	*	
Lamiaceae	*Prostanthera*	*campbellii*	P								*						*		
Lamiaceae	*Prostanthera*	*grylloana*	P												*				
Lamiaceae	*Westringia*	*rigida*	P			*							*		*				
Malvaceae	*Abutilon*	*cryptopetalum*	P														*		
Malvaceae	*Radyera*	*farragei*	P			*													
Malvaceae	*Sida*	*sp.* dark green fruits	P								*								
Marsileaceae	*Marsilea*	*drummondii*	P							*									
Myrtaceae	*Eucalyptus*	*calycogona*	P			*													
Myrtaceae	*Eucalyptus*	*celastroides*	P					*		*				*					
Myrtaceae	*Eucalyptus*	*cylindriflora*	P			*													
Myrtaceae	*Eucalyptus*	*dundasii*	P			*				*									
Myrtaceae	*Eucalyptus*	*flocktoniae* subsp. *hebes*	P			*	*						*	*					
Myrtaceae	*Eucalyptus*	*griffithsii*	P							*			*		*				
Myrtaceae	*Eucalyptus*	*lesouefii*	P	*		*		*		*			*	*				*	
Myrtaceae	*Eucalyptus*	*melanoxylon*	P			*				*									
Myrtaceae	*Eucalyptus*	*oleosa* subsp. *oleosa*	P			*					*		*	*				*	
Myrtaceae	*Eucalyptus*	*ravida*	P	*			*	*		*				*					
Myrtaceae	*Eucalyptus*	*salicola*	P										*						
Myrtaceae	*Eucalyptus*	*salmonophloia*	P			*		*	*	*			*	*					
Myrtaceae	*Eucalyptus*	*salubris*	P			*		*						*					
Myrtaceae	*Eucalyptus*	*stricklandii*	P							*			*						
Myrtaceae	*Eucalyptus*	*torquata*	P															*	
Myrtaceae	*Eucalyptus*	*transcontinentalis*	P			*								*					
Myrtaceae	*Eucalyptus*	*yilgarnensis*	P						*					*					
Myrtaceae	*Melaleuca*	*lateriflora*	P										*						
Myrtaceae	*Melaleuca*	*sheathiana*	P	*	*	*	*	*					*	*					
Poaceae	*Aristida*	*contorta*	P								*	*	*		*		*		
Poaceae	*Austrostipa*	*elegantissima*	P			*		*			*	*		*		*	*	*	
Poaceae	*Austrostipa*	*nitida*	P			*	*	*	*	*	*		*	*	*	*		*	
Poaceae	*Eragrostis*	*dielsii*	A								*	*				*	*		
Poaceae	*Eragrostis*	*eriopoda*	P								*		*				*		

Family	Genus	Species	Perennial (P) Annual (A) Non Native (NN)	*Eucalyptus lesouefii* and *E. flocktoniae* over *Melaleuca sheathiana*	*Melaleuca sheathiana* thicket	*Eucalyptus salmonophloia* woodland over sclerophyll shrubland	*Eucalyptus ravida* woodland	Mixed *Eucalyptus* woodland over mixed shrubland	Open *Eucalyptus salmonophloia* woodland	Open mixed *Eucalyptus* woodland over Chenopod shrubland	*Acacia quadrimarginea* shrubland	*Tecticornia* shrubland	*Eucalyptus oleosa* and *E. lesouefii* over *Melaleuca sheathiana* and mixed shrubland on undulating hills	Mixed *Eucalyptus* woodland over *Melaleuca sheathiana* and *Cratystylis conocephala*	*Acacia acuminata* thicket with emergent *Eucalyptus griffithsii*	Mixed sclerophyll shrubland	Sclerophyll shrubland with emergent *Bossiaea walkeri*	*Eucalyptus torquata* and *Eucalyptus lesouefii* over mixed sclerophyll shrubland on undulating hills	Existing disturbance
Poaceae	*Monachather*	*paradoxus*	P								*								
Poaceae	*Triodia*	*rigidissima*	P								*		*						
Proteaceae	*Grevillea*	*acuaria*	P										*			*	*		
Pteridaceae	*Cheilanthes*	*sieberi* subsp. *sieberi*	P								*								
Rhamnaceae	*Trymalium*	*myrtillus* subsp. *myrtillus*	P										*						
Santalaceae	*Exocarpos*	*aphyllus*	P		*	*	*	*	*					*		*	*	*	
Santalaceae	*Santalum*	*acuminatum*	P		*	*	*			*				*		*		*	
Santalaceae	*Santalum*	*spicatum*	P						*		*		*					*	
Sapindaceae	*Dodonaea*	*lobulata*	P					*		*	*		*			*		*	
Sapindaceae	*Dodonaea*	*microzyga* var. *acrolobata*	P								*				*			*	
Sapindaceae	*Dodonaea*	*stenozyga*	P					*											
Sapindaceae	*Dodonaea*	*viscosa* subsp. *angustissima*	P														*		
Scrophulariaceae	*Eremophila*	*alternifolia*	P					*					*				*	*	
Scrophulariaceae	*Eremophila*	*clavata*	P	*		*	*							*					
Scrophulariaceae	*Eremophila*	*decipiens* subsp. *decipiens*	P			*	*								*	*	*		
Scrophulariaceae	*Eremophila*	*georgei*	P								*							*	
Scrophulariaceae	*Eremophila*	*glabra subsp. glabra*	P	*	*	*		*	*	*	*		*	*		*		*	
Scrophulariaceae	*Eremophila*	*interstans* subsp. *virgata*	P	*		*	*	*	*					*				*	*
Scrophulariaceae	*Eremophila*	*ionantha*	P			*									*				
Scrophulariaceae	*Eremophila*	*longifolia*	P			*		*											
Scrophulariaceae	*Eremophila*	*maculata* subsp. *brevifolia*	P	*	*	*	*												
Scrophulariaceae	*Eremophila*	*miniata*	P										*			*			
Scrophulariaceae	*Eremophila*	*oldfieldii* subsp. *angustifolia*	P								*								
Scrophulariaceae	*Eremophila*	*oppositifolia* subsp. *angustifolia*	P								*								
Scrophulariaceae	*Eremophila*	*parvifolia* subsp. *auricampa*	P										*			*			
Scrophulariaceae	*Eremophila*	*scoparia*	P	*	*	*	*	*	*				*	*		*		*	*
Scrophulariaceae	*Myoporum*	*platycarpum* subsp. *platycarpum*	P					*								*			
Solanaceae	*Duboisia*	*hopwoodii*	P					*				*	*			*			
Solanaceae	*Lycium*	*australe*	P	*	*			*			*			*		*			
Solanaceae	*Solanum*	*lasiophyllum*	P								*						*		
Solanaceae	*Solanum*	*nummularium*	P	*	*	*		*	*	*		*		*		*	*	*	
Solanaceae	*Solanum*	*orbiculatum*	P															*	
Solanaceae	*Solanum*	*petrophilum*	P												*				
Thymelaeaceae	*Pimelea*	*microcephala* subsp. *microcephala*	P							*	*	*				*	*	*	
Zygophyllaceae	*Zygophyllum*	*aurantiacum*	P			*													
Zygophyllaceae	*Zygophyllum*	*eremaeum*	A	*		*			*										