

Native
Vegetation
Solutions

DETAILED FLORA AND
VEGETATION SURVEY OF THE MT
CELIA PROJECT AREA
Part 1- June 2020

Prepared for:



Prepared by: **Native Vegetation Solutions**
PO Box 41
KALGOORLIE WA 6430
Telephone: 08 9021 5818
Mobile: 0407 998 953
E-mail: eren@nativevegsolutions.com.au
ABN: 63 584 896 400

FINAL
V2.0
December 2020

EXECUTIVE SUMMARY

Legacy Iron Ore Ltd (ASX: LCY) has gold interests and is the operator of its Mt Celia Project in the Murchison Region of Western Australia. LCY provided Native Vegetation Solutions (NVS) with a survey area which encompasses the main mining areas as well as other infrastructure related to mining the Mt Celia mineral resource. The location of this survey area is approximately 169 km northeast of Kalgoorlie-Boulder, and approximately 89km south of Laverton in Western Australia.

The survey area, for the purposes of this report, encompasses an area totalling approximately 1,696 ha, which intersects Mining Tenements M39/1123, M39/1125, M39/1126, M39/1127, M39/1128 and Exploration License E39/1443. At this stage, the final footprint of mining related disturbances is yet to be finalised, however will be encompassed entirely within the survey area, and is expected to be approximately 400 hectares.

The survey area is located in the Eastern Murchison IBRA subregion. The vegetation of the Eastern Murchison botanical subregion is dominated by mulga woodlands and is often rich in ephemerals, hummock grasslands, saltbush shrublands and *Tecticornia* shrublands (CALM, 2002).

The EPBC Protected Matters Search Tool revealed that the survey area may contain habitat for the invasive weed species *Carrichtera annua* (Ward's Weed) and *Cenchrus ciliaris* (Buffel Grass) (DAWE, 2020). The EPBC Protected Matters report also indicated no TECs or Conservation Reserves within the requested search area.

The DBCA database searches revealed a potential for no Threatened and 10 Priority Flora species to occur within a 50km radius of the survey area (DBCA, 2020a). No known locations of these Flora occur within the survey area, while the closest location occurs approximately 5.8 km southwest of the survey area.

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

The PEC/TEC search (DBCA, 2020) 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, 2020).

No water bodies were identified within the survey area via the CPS Map Viewer (DWER, 2020).

The survey area lies south of the 26th parallel, however receives average annual rainfall of approximately 284.8mm (BOM, 2020), 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.

Twelve vegetation groups were identified during this survey, largely following topographical features and dominant species. Mapping of the 12 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.

One hundred and twenty-three species were recorded within the survey area with 115 species recorded within quadrats. Twenty-nine families and 57 genera were found. These are listed in Appendix E, per Quadrat as well as per vegetation group. Of the native species, Fabaceae had the highest representation, with 25 species from 3 genera, dominated by *Acacia*. Chenopodiaceae and Poaceae were the next best represented families with 20 species and 15 species respectively.

Of the 123 taxa recorded seven of these were introduced weed species. *Citrullus amarus* (Pie Melon) *Cucumis myriocarpus* (Prickly Paddy Melon) and *Cenchrus ciliaris* (Buffel Grass) were

captured within the quadrat sampling, whilst *Schinus mollee* var. *areira* (Pepper Tree), *Nerium oleander* (Oleander Tree), *Yucca aloifolia* (Yucca Tree), and *Tamarix aphylla* (Athel pine) were recorded from a single location within the vicinity of the the old Mt Celia homestead.

Of the seven non-native species above, only *Tamarix aphylla* (Athel pine) is a declared pest- s22(2) in the state of Western Australia.

The most common and widespread species was *Ptilotus obovatus*, which was recorded within all 43 quadrats. Its canopy cover was 10-30%. The next most common and widespread species was *Acacia aneura*, recorded in 34 quadrats, with a canopy cover between 10-30%.

There were 29 taxa recorded from within a single site, Q15. Of these, two were weed species.

No Threatened species were recorded during the survey.

No Priority species were identified in the survey area.

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 Murchison 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 detailed flora and vegetation survey, incorporating the Winter survey of 2020.

TABLE OF CONTENTS

Page No.

EXECUTIVESUMMARY	i
1 INTRODUCTION	5
1.1 BACKGROUND.....	5
1.2 PURPOSE AND SCOPE.....	7
2 EXISTING ENVIRONMENT	8
2.1 CLIMATE.....	8
2.1.1 Temperature.....	8
2.1.2 Rainfall.....	8
2.2 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA (IBRA) REGION.....	10
2.3 LANDFORMS AND SOILS.....	10
2.4 BOTANICAL SUBREGION AND EXISTING VEGETATION.....	10
3 METHODS	10
3.1 PERSONNEL AND REPORTING.....	10
3.2 PRELIMINARY DESKTOP STUDY.....	10
3.2.1 Environment Protection and Biodiversity Conservation Act Protected Matters.....	10
3.2.2 Threatened Flora and Communities.....	11
3.2.3 Environmentally Sensitive Areas (ESAs) and Conservation Reserves.....	11
3.2.4 Vegetation Type, Extent and Status.....	11
3.2.5 Wetlands.....	11
3.2.6 Dieback.....	11
3.3 SITE INVESTIGATION.....	11
3.3.1 Licenses.....	11
3.3.2 Field Methods.....	12
3.3.3 Post-Field Methods.....	12
3.3.4 Mapping.....	13
3.3.5 IBSA Data Package.....	13
3.4 NOMENCLATURE AND TAXONOMY.....	13
3.5 LIMITATIONS.....	14
4 RESULTS	15
4.1 PRELIMINARY DESKTOP ASSESSMENT.....	15
4.1.1 EPBC Protected Matters Search Tool.....	15
4.1.2 Threatened Flora and Communities.....	15
4.1.3 Environmentally Sensitive Areas and Conservation Reserves.....	15
4.1.4 Vegetation Type, Extent and Status.....	15
4.1.5 Wetlands.....	17
4.1.6 Dieback.....	17
4.2 FIELD ASSESSMENT.....	17
4.2.1 Vegetation of the Survey Area.....	17
4.2.2 Flora of the Survey Area.....	23
5 DISCUSSION	25
6 IMPACT ASSESSMENT	26
6.1 THREATENING PROCESSES.....	26
7 CONCLUSIONS AND RECOMMENDATIONS	27
8 REFERENCES	28
9 GLOSSARY	30

FIGURES

Figure 1: Regional Location of the Mt Celia Project Area 6
Figure 2: Mean temperature ranges for Laverton Aero Meteorological Station (BOM, 2020)..... 8
Figure 3: Rainfall data for the Laverton Aero Meteorological Station (BOM, 2020) 9
Figure 4: Rainfall data for the Edjudina Meteorological Station (BOM, 2020) 9
Figure 5: PATN Analysis of Dominant Species into 12 groups 21
Figure 6: PATN Analysis of All Species into 12 groups 22
Figure 7: Species Accumulation Curve for the 43 sampled quadrats 24

TABLES

Table 1: List of potential survey limitations 14
Table 2: Summary of information regarding Pre-European and current vegetation extent of
vegetation association 18 within the survey area 16
Table 3: Vegetation Group Extent within Survey Area..... 19

APPENDICES

Appendix A - EPBC and Other Government Database Search Results 33
Appendix B - Vegetation Definitions 44
Appendix C - Mapping 47
Appendix D - Threatened Flora Database Search Results 53
Appendix E - Species Recorded During the June 2020 Survey 55
Appendix F - Site Descriptions..... 61

1 INTRODUCTION

1.1 BACKGROUND

Legacy Iron Ore Ltd (ASX: LCY) has gold interests and is the operator of its Mt Celia Project in the Murchison Region of Western Australia. LCY provided Native Vegetation Solutions (NVS) with a survey area which encompasses the main mining areas as well as other infrastructure related to mining the Mt Celia mineral resource. The location of this survey area is approximately 169 km northeast of Kalgoorlie-Boulder, and approximately 89km south of Laverton in Western Australia (Figure 1).

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

The survey area, for the purposes of this report, encompasses an area totalling approximately 1,696 ha, which intersects Mining Tenements M39/1123, M39/1125, M39/1126, M39/1127, M39/1128 and Exploration License E39/1443. At this stage, the final footprint of mining related disturbances is yet to be finalised, however will be encompassed entirely within the survey area, and is expected to be approximately 400 hectares.



Figure 1: Regional Location of the Mt Celia Project 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 Detailed assessment conducted in accordance with the following documents:

- *Environmental Factor Guideline- Flora and Vegetation* (EPA, 2016); and
- *Technical Guidance- Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016a).

A Detailed Flora and Vegetation Survey has two components:

- 1) Reconnaissance 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 Detailed 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 of the general survey area 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 Laverton Aero (station number 012305), which is located approximately 92 km north of the survey area.

2.1.1 Temperature

Mean annual minimum temperature at Laverton Aero is 14.1°C and mean annual maximum temperature is 27.2°C (BOM, 2020). The coldest temperatures occur in July (mean minimum temperature 5.9°C), the hottest is January (mean maximum temperature 35.6°C) and diurnal temperature variations are relatively consistent throughout the year (Figure 2).

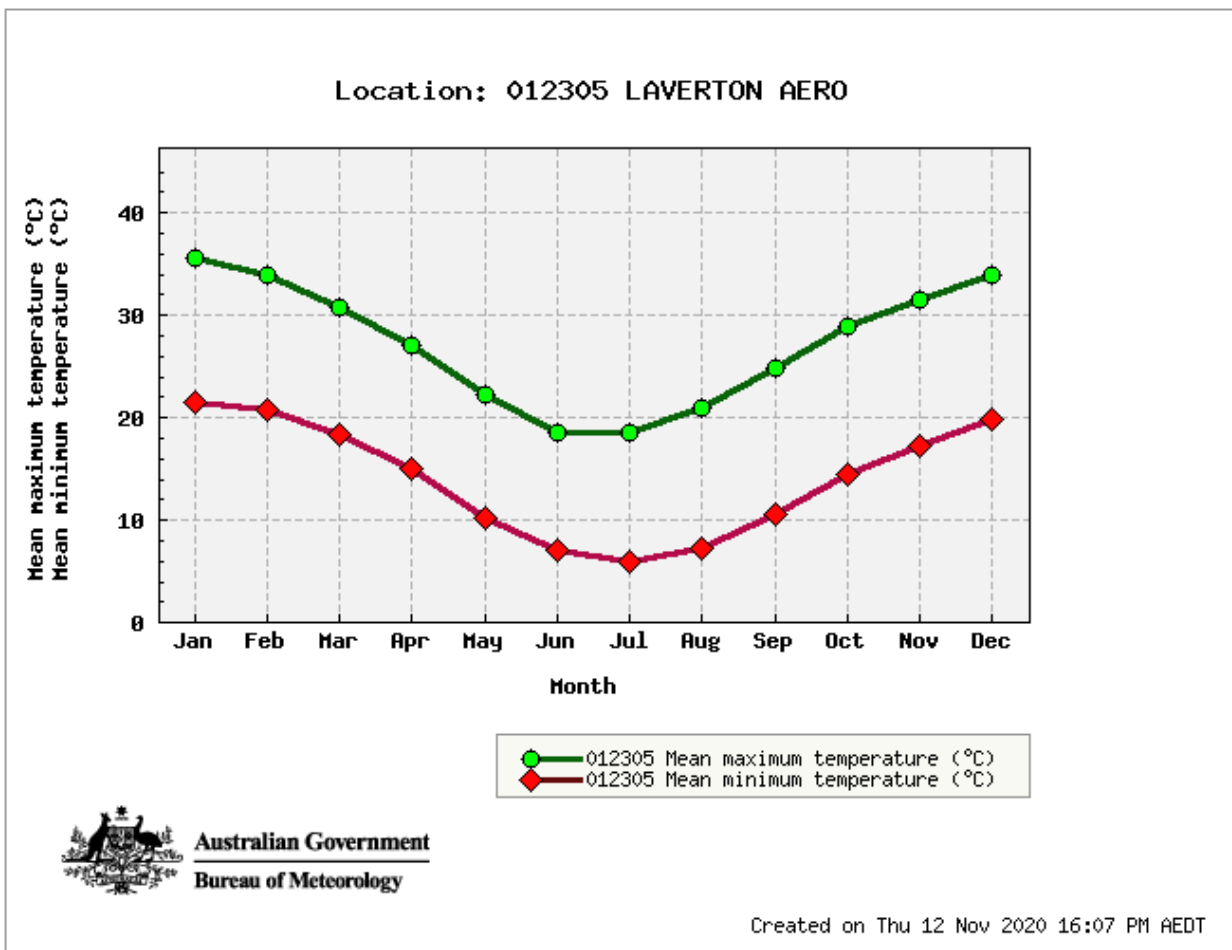


Figure 2: Mean temperature ranges for Laverton Aero Meteorological Station (BOM, 2020)

2.1.2 Rainfall

The annual average rainfall at Laverton Aero is 284.8mm over an average of 35 rain days (BOM, 2020). Average rainfall varies across the months, with slightly larger rainfall events falling between December to March (Figure 3), and the least rainfall received in September. Rainfall for 2020 was below average for all months prior to the survey with the exception of January.

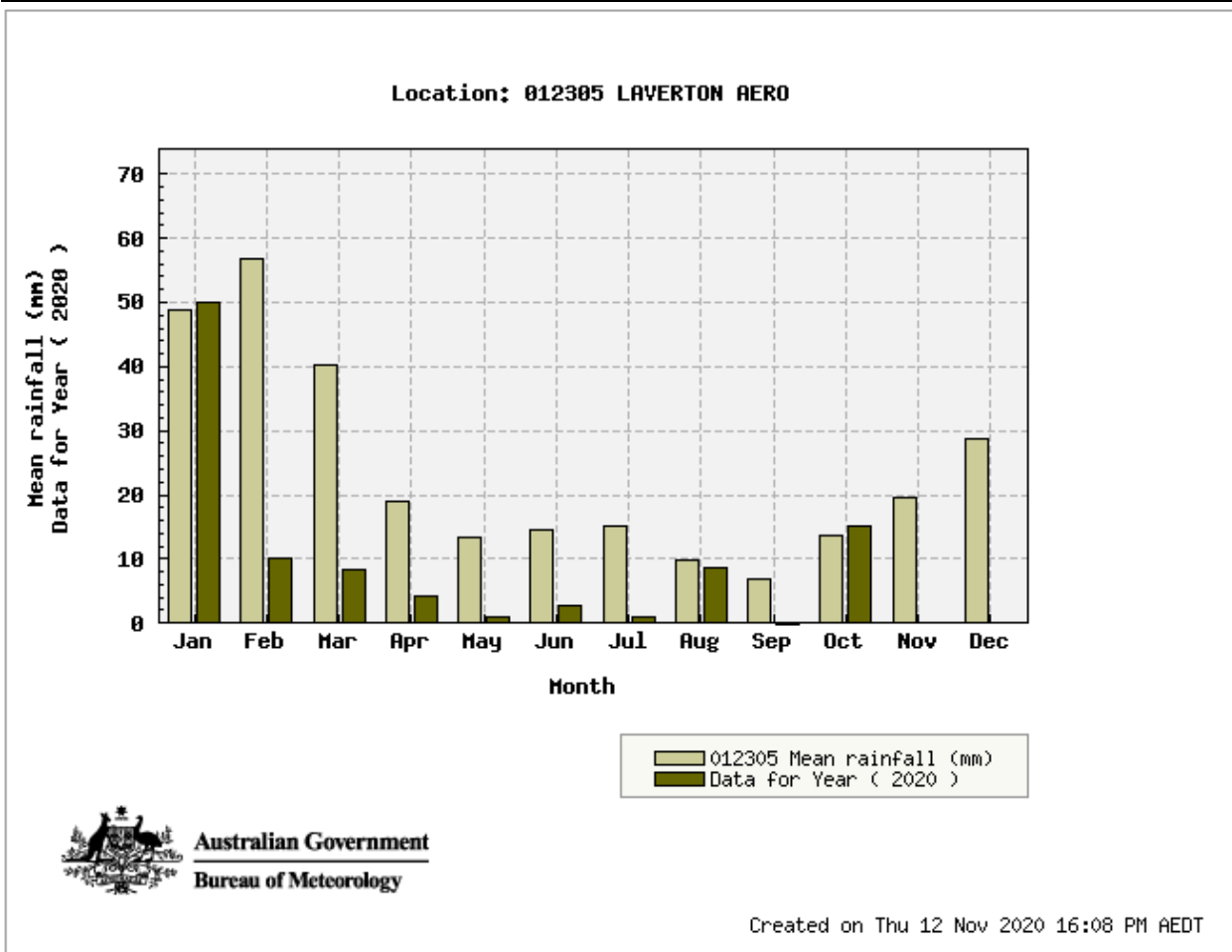


Figure 3: Rainfall data for the Laverton Aero Meteorological Station (BOM, 2020)

Looking at the Edjudina Meteorological Station (012027), which lies only 40km to the south of the survey area, rainfall recorded above average in January and March 2020 prior to the survey, with other months receiving below average (Figure 4).

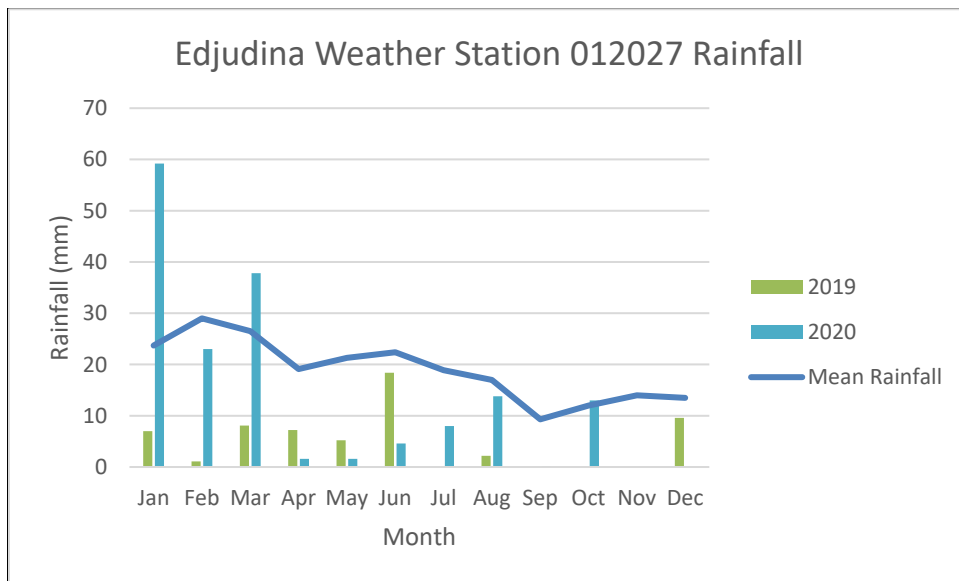


Figure 4: Rainfall data for the Edjudina Meteorological Station (BOM, 2020)

2.2 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA (IBRA) REGION

The IBRA recognises 89 bioregions within Australia and 419 subregions (DAWE, 2020). The project is located in the Eastern Murchison IBRA subregion (MUR01) which totals over 7.8 million hectares (CALM, 2002). The Eastern Murchison subregion is characterised by its internal drainage, and extensive areas of elevated red desert sandplains with minimal dune development. Salt lake systems are normally associated with the occluded Paleodrainage system.

2.3 LANDFORMS AND SOILS

The Eastern Murchison comprises the northern parts of the craton's 'Southern Cross' and 'Eastern Goldfields' Terrains, and is characterised by internal drainage and extensive areas of elevated red desert sandplains with minimal dune development. Salt lake systems are associated with the occluded paleodrainage system. Broad plains of red-brown soils and breakaway complexes as well as red sandplains are widespread (CALM, 2002).

2.4 BOTANICAL SUBREGION AND EXISTING VEGETATION

The vegetation of the Eastern Murchison botanical subregion is dominated by mulga woodlands and is often rich in ephemerals, hummock grasslands, saltbush shrublands and *Tecticornia* shrublands (CALM, 2002).

3 METHODS

3.1 PERSONNEL AND REPORTING

The following personnel were involved in part 1 of the detailed flora and vegetation survey (June 2020):

- Mr Eren Reid (BSc- Biological Science), Principal Botanist, Native Vegetation Solutions (NVS), undertook field work of part 1 of the detailed survey in June 2020, vegetation mapping, data collation, identification of flora during field work and preparation and review of the report; and
- Mr Frank Obbens (BSc) Consultant Botanist, Bushtech Consultancy, undertook the identification of unknown flora samples collected by NVS in the field.

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 3.2.6, and Appendices A & D) 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 A) with a 1km buffer (DAWE, 2020a).

(<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 90km radial area of the survey area shapefile (Reference: 07-0650FL).

The presence of Threatened and Priority Ecological Communities (TECs & PECs) was determined by examining Geographic Information System (GIS) data supplied by the DBCA upon request within a 50km buffer of the survey area shapefile (Reference: 23-0620EC).

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.

DBCA's Statewide Vegetation Statistics (DBCA, 2019) 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, 2020).

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.

3.3 SITE INVESTIGATION

The first stage of the field survey was conducted by Mr. Eren Reid, Botanist of Native Vegetation Solutions (NVS), from the 3rd to 8th June 2020. NVS established 43 quadrats within the survey area, recording one hundred and twenty-three vascular plant species within 12 vegetation types.

A total of 58 hours was spent on site traversing the survey area in June 2020. While a vehicle was used to reach the site, all traverses were made on foot or via Yamaha Viking.

The survey was conducted in accordance with relevant EPA's Statements and Guidelines (Section 1.2).

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 scale and nature of the proposed disturbance as well as the existing disturbance, and that the survey area is located within the Murchison IBRA region, a detailed flora and vegetation survey was deemed adequate.

3.3.1 Licenses

Flora was collected for identification under the Scientific Collection License FB62000171, held by Mr Eren Reid with expiry 08/10/2022.

3.3.2 Field Methods

Prior to the field work, the aerial photography was examined and representative sample sites for quadrat locations were chosen to provide coverage over all viable vegetation types.

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 ± 4 m accuracy, using Universal Transverse Mercator location on GDA94 datum. Digital photographs were taken of each quadrat site.

Data collected at each of the 43 quadrats included:

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

A complete list of all species encountered was also recorded, detailing the average height and estimated coverage of the dominant species from the three stratum levels (Tallest, Mid and Lower).

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

The vegetation structure was assessed using the method developed by Muir (1977). Definitions of the vegetation structure are presented in Appendix B.

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

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.

3.3.3 Post-Field Methods

Unknown specimens collected in the field were identified post field work by Eren Reid and Frank Obbens 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).

3.3.4 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.

GPS tracks and waypoints recorded during field work are presented in Appendix C. Vegetation Health Condition was assessed in the field with reference to Keighery (1994).

3.3.5 IBSA Data Package

The Environmental Protection Authority (EPA), Department of Water and Environmental Regulation (DWER) and Department of Mines, Industry Regulation and Safety (DMIRS) require Index of Biodiversity Surveys for Assessments (IBSA) Data Packages to be submitted to support assessment and compliance under the *Environmental Protection Act 1986*.

An IBSA data package is a single file in .zip format, containing:

- one **Metadata and Licensing Statement** in .pdf format;
- one **survey report** in .pdf format;
- one **plain-text survey report** in .txt format; and
- a set of electronic data files, comprising:
 - one **survey details** spatial dataset in shapefile (.shp, etc.) or Mapinfo (.tab, etc.) format; and
 - one or more **survey data** spatial datasets, as required, in shapefile (.shp, etc.) or Mapinfo (.tab, etc.) format.

The IBSA Data package for this survey has been submitted via the DWER IBSA Submission Portal.

3.4 NOMENCLATURE AND TAXONOMY

Nomenclature follows that used by the WAHERB.

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.

3.5 LIMITATIONS

Table 1 lists potential limitations that may have affected the survey. As shown, this survey may have been limited by drier than average conditions, which affected most of the State of Western Australia in 2019 and 2020.

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 16 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.
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 or Frank Obbens. 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 June 2020. Local rainfall never exceeded monthly averages in 2020 with the exception of January and March. Timing would have been ideal earlier in April/May for the first 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 detailed survey according to EPA (2016) 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 detailed 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 Murchison subregion is readily available. Adequate information was able to be accessed from available databases.

4 RESULTS

4.1 PRELIMINARY DESKTOP ASSESSMENT

4.1.1 EPBC Protected Matters Search Tool

The EPBC Protected Matters Search Tool revealed that the survey area may contain habitat for the invasive weed species *Carrichtera annua* (Ward's Weed) and *Cenchrus ciliaris* (Buffel Grass) (DAWE, 2020).

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). This species is not listed as a declared plant by DPIRD (2020), however according to the EPBC search tool this invasive weed species is considered a threat to the rangeland biodiversity within the Southern Australian Sheep and Cattle Grazing Land Management Zone (DAWE, 2020).

Cenchrus ciliaris is native to Africa and India, was widely planted in Western Australian pastoral regions as a pasture grass, and has become a widespread weed of roadsides, creeklines, river edges and most vegetation types from Geraldton to the Pilbara, Kimberley and adjacent desert (Hussey *etc.* 2007). In the Murchison region it often colonises roadside table drains, excluding native everlastings. It seriously alters the fire characteristics of invaded plant cover by generating highly flammable fuel that is prone to more frequent fires.

The EPBC Protected Matters report indicated no TECs or Commonwealth Reserves within the requested search area.

The results of the EPBC Protected Matters search are included in Appendix A.

4.1.2 Threatened Flora and Communities

The DBCA database searches revealed a potential for no Threatened and 10 Priority Flora species to occur within a 50km radius of the survey area (DBCA, 2020a). No known locations of these Flora occur within the survey area, while the closest location occurs approximately 5.8 km southwest of the survey area.

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

The PEC/TEC search (DBCA, 2020) 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, 2020).

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 Table 2 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 18 within the survey area

Factor	Value				
Beard Vegetation Association*	18				
Vegetation Association Description*	Low woodland; mulga (<i>Acacia aneura</i>)				
Pre-European Extent (ha)	Scale				
	By Association (WA)	By Association (WA)	By IBRA Region (Murchison)	By IBRA Sub-region (Eastern Murchison)	By Shire (Shire of Menzies)
	22,029,557*	19,892,306**	12,403,172**	10,269,896**	2,010,840**
% Pre-European Extent Remaining	100.00%*	99.75%**	99.68%**	99.66%**	99.94%**
Surrounding Land Use***	Mining, Exploration, Pastoral Lease				
Weed prevalence***	Low				

* Source: Shepherd *et al.* (2002) Appendix 2

**Source: DBCA, (2019)

*** Source: Field Assessment

4.1.5 Wetlands

No water bodies were identified within the survey area via the CPS Map Viewer (DWER, 2020).

4.1.6 Dieback

The survey area lies south of the 26th parallel, however receives average annual rainfall of approximately 284.8 mm (BOM, 2020), 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.

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 description above in section 4.1.4.

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

Descriptions of all 43 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

Twelve vegetation groups were identified during this survey, largely following topographical features and dominant species. Mapping of the 12 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. Mulga over *Maireana sedifolia* and mixed sclerophyll shrubland

Open Shrub Mallee (Muir, 1977) of *Acacia aneura*, *Acacia mulganeura*, *Casuarina pauper* and *Acacia ayersiana* over *Acacia ligulata*, *Senna artemisioides* subsp. *filifolia*, *Dodonaea lobulata*, *Acacia burkittii* and *Hakea preissii* over *Maireana sedifolia*, *Ptilotus obovatus* and occasional *Maireana pyramidata*.

Quadrats: 1, 2, 8, 19 and 28

B. Mulga shrubland (sandy substrates)

Open Shrub Mallee (Muir, 1977) of *Acacia incurvaneura*, *Acacia aneura*, *Acacia mulganeura* and occasional *Eucalyptus kingsmillii* and *Eucalyptus oleosa* subsp. *oleosa* over *Acacia ramulosa* var. *ramulosa*, *Eremophila forrestii* subsp. *forrestii*, *Senna artemisioides* subsp. *filifolia* and *Acacia burkittii* over *Ptilotus obovatus* and occasional grasses.

Quadrats: 4, 5, 13, 21, and 27

C. Open Mulga shrubland (sandy substrate)

Very Open Shrub Mallee (Muir, 1977) of *Acacia mulganeura*, *Acacia incurvaneura* and *Acacia aneura* over *Acacia ramulosa* var. *ramulosa*, *Senna artemisioides* subsp. *filifolia* and *Acacia ligulata* over *Ptilotus obovatus* and *Eragrostis eriopoda*.

Quadrats: 3, 6 and 23

D. Mulga shrubland on rocky ironstone hills

Open Shrub Mallee (Muir, 1977) of *Acacia aneura*, *Acacia incurvaneura*, *Acacia mulganeura* and *Casuarina pauper* over *Scaevola spinescens*, *Eremophila latrobei* subsp. *latrobei* and *Dodonaea lobulata* over *Ptilotus obovatus*.

Quadrats: 7, 9, 10, 12, 20 and 26

E. *Acacia aneura* and *Acacia burkittii* on greenstone hills

Open Shrub Mallee (Muir, 1977) of *Acacia aneura* and *Acacia mulganeura* over *Acacia burkittii*, *Scaevola spinescens* and *Senna artemisioides* subsp. *filifolia* over *Ptilotus obovatus* and occasional grasses.

Quadrats: 11, 14, 15 and 18

F. Mulga over small rocky outcrops

Very Open Shrub Mallee (Muir, 1977) of *Acacia aneura* and *Acacia mulganeura* over *Philothecca brucei* subsp. *brucei*, *Scaevola spinescens*, *Eremophila latrobei* subsp. *latrobei* and *Sida ectogama* over *Ptilotus obovatus* and *Enneapogon caerulescens*.

Quadrats: 16 and 30

G. Mulga over Chenopod shrubland

Very Open Shrub Mallee (Muir, 1977) of *Acacia aneura*, *Acacia ayersiana* and occasional *Eucalyptus lesouefii* over *Acacia caesaneura*, *Senna artemisioides* subsp. *filifolia*, and occasional *Acacia burkittii* over *Maireana pyramidata*, *Ptilotus obovatus*, and occasional *Frankenia setosa* and *Atriplex bunburyana*.

Quadrats: 17, 22 and 35

H. Mulga Thicket- Drainage

Tree/Shrub Mallee (Muir, 1977) of *Acacia ayersiana* and *Acacia incurvaneura* over *Acacia burkittii*, *Acacia ramulosa* var. *ramulosa* and *Acacia aneura* over *Ptilotus obovatus*, *Acacia tetragonophylla* and *Eremophila forrestii* subsp. *forrestii*.

Quadrats: 24, 25 and 29

I. Open Mulga shrubland on ironstone flats

Very Open Shrub Mallee (Muir, 1977) of *Acacia aneura*, *Acacia mulganeura* and *Acacia ayersiana* over *Acacia tetragonophylla* and *Acacia burkittii* over *Scaevola spinescens*, *Ptilotus obovatus*, *Senna artemisioides* subsp. *helmsii* and *Senna artemisioides* subsp. *artemisioides*.

Quadrats: 31 and 32

J. *Acacia quadrimarginea* shrubland over granite bedrock

Very Open Shrub Mallee (Muir, 1977) of *Acacia quadrimarginea* and *Acacia mulganeura* over *Acacia tetragonophylla*, *Acacia burkittii* and occasional *Acacia aneura* over *Eremophila forrestii* subsp. *forrestii* and *Ptilotus obovatus*.

Quadrats: 33 and 34

K. *Casuarina pauper* and *Acacia aneura* over sclerophyll shrubland on rocky laterite hills

Very Open Tree Mallee (Muir, 1977) of *Casuarina pauper*, *Acacia aneura*, *Eucalyptus salubris* and *Eucalyptus lesouefii* over *Dodonaea lobulata* and *Eremophila pantonii* over *Ptilotus obovatus* and *Maireana sedifolia*.

Quadrats: 36, 37, 38, 39, 40 and 41

L. Mulga over *Eremophila forrestii* on large rocky granite/basalt hills

Open Shrub Mallee (Muir, 1977) of *Acacia aneura*, *Acacia mulganeura* and *Acacia incurvaneura* over *Eremophila forrestii* subsp. *forrestii*, *Philothecca brucei* subsp. *brucei* over *Ptilotus obovatus*.

Quadrats: 42 and 43

Table 3: Vegetation Group Extent within Survey Area

Vegetation Group	Vegetation Group Code	Quadrats	Family	Genus	Species	Area (ha)	Percentage of Survey Area (%)
Mulga over <i>Maireana sedifolia</i> and mixed sclerophyll shrubland	A	Q1, Q2, Q8, Q19, Q28	14	25	52	291.39	17.18 %
Mulga shrubland (sandy substrate)	B	Q4, Q5, Q13, Q21, Q27	15	24	45	547.98	32.31 %
Open Mulga shrubland (sandy substrate)	C	Q3, Q6, Q23	12	19	31	36.37	2.14 %
Mulga shrubland on rocky ironstone hills	D	Q7, Q9, Q10, Q12, Q20, Q26	13	22	49	211.81	12.49 %
<i>Acacia aneura</i> and <i>Acacia burkittii</i> on rocky basalt hills	E	Q11, Q14, Q15, Q18	18	30	54	32.90	1.94 %
Mulga over small rocky outcrops	F	Q16, Q30	15	24	35	8.32	0.49 %
Mulga over Chenopod shrubland	G	Q17, Q22, Q35	13	23	42	108.13	6.38 %
Mulga Thicket- Drainage	H	Q24, Q25, Q29	17	28	42	180.02	10.62 %
Open Mulga shrubland on ironstone flats	I	Q31, Q32	12	17	32	199.58	11.77 %
<i>Acacia quadrimarginea</i> shrubland over granite bedrock	J	Q33, Q34	10	15	21	11.55	0.68 %
<i>Casuarina pauper</i> and <i>Acacia aneura</i> over sclerophyll shrubland on rocky laterite hills	K	Q36, Q37, Q38, Q39, Q40, Q41	17	24	44	54.98	3.24 %
Mulga over <i>Eremophila forrestii</i> on large rocky granite/basalt hills	L	Q42, Q43	11	16	23	12.87	0.76 %
		Total	29*	57*	123*	1695.90[#]	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 most vegetation groups. In most cases one or two dominant 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 when assessed by the PATN Analysis.

Vegetation Group A was well represented via dominant species with Q1, Q2, Q19 and Q28 grouped together in the PATN Analysis. Q8 was an outlier and compared more similarly to Q10 which was also an outlier of Vegetation Group D. When all species were analysed via PATN, only Q2, Q19 and Q28 were significantly grouped together.

Vegetation Group B was quite an expansive and varied vegetation group, hence only significantly represented by the grouping of Q21 and Q27 in the dominant species PATN analysis. Q4, Q5 and Q13 were also grouped together, however were compared more similarly with Q6 and Q23 and Q32 from Vegetation Groups C and I.

Vegetation Group C was represented by the grouping of Q6 and Q23 via the dominant species and all species PATN analysis. Q3 was an outlier.

Vegetation Group D was well represented with the grouping of Q7, Q9, Q20 and Q26 via all species and dominant species PATN analysis. Q10 and Q12 were considered outliers with some slight variations in the dominant species.

Vegetation Group E was represented with the grouping of Q11 and Q14 via all species and Q11 and Q15 via the dominant species PATN analysis. Q18 was considered an outlier in both instances.

Vegetation Group F was well represented via both all species and dominant species PATN analysis.

Vegetation Group G was not well represented via either analysis with only Q35 being segregated in both instances. Whilst Q17 and Q22 were grouped together in both analysis, they were similarly related to other quadrats of different vegetation groups.

Vegetation Group H was well represented via all species PATN analysis with the grouping of Q24 and Q25. However, was not represented well via dominant species PATN analysis, as the dominant vegetation did vary in this vegetation group.

Vegetation Group I was not well represented by either dominant species or all species PATN analysis, however Q31 was considered a separate vegetation group when dominant species were subject to PATN analysis.

Vegetation Group J was well represented by all species and dominant species via PATN analysis.

Vegetation Group K was well represented by all species and dominant species via PATN analysis.

Vegetation Group L was well represented by all species, however Q42 and Q43 were not grouped together by the dominant species via the PATN analysis, suggesting some variation in the dominant species.

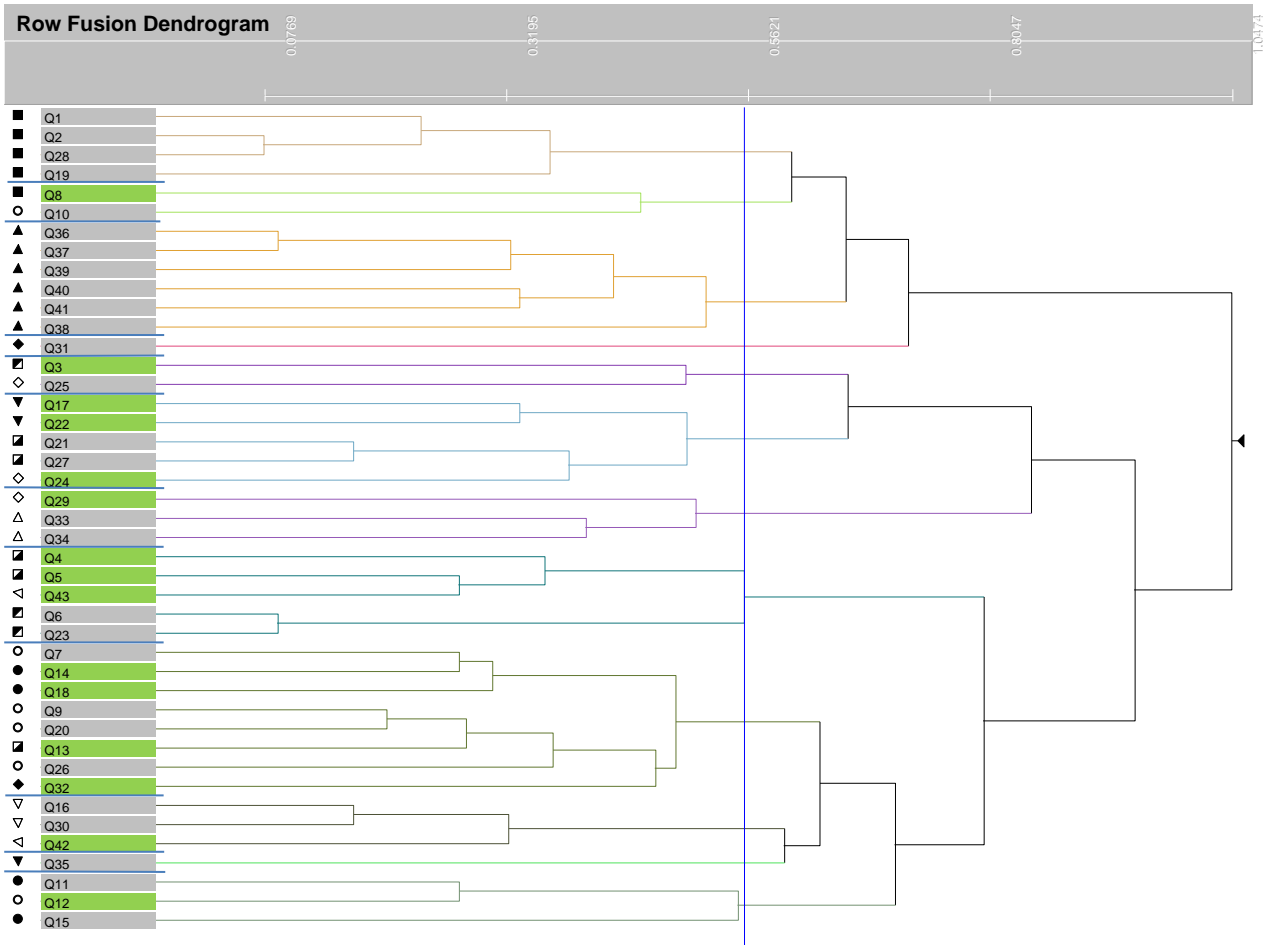


Figure 5: PATN Analysis of Dominant Species into 12 groups

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 several outliers, and these are highlighted in green (Figure 5). Most of the quadrats depicted as outliers are representative of similar vegetation groups, which have been segregated by NVS based on differing plant density, topographical features or lithology. The PATN analysis (off all species present) demonstrates that some of these quadrats are very similar in species composition, and not necessarily distinct, when predetermined by topographical/litological variations.

When comparing outliers of the PATN analysis of all species versus dominant species, there are greater outliers in the later. Therefore, the vegetation groups mapped by NVS demonstrate a reliance on all species within the quadrat as opposed to dominants, suggesting some variation of dominant species between quadrats of similar vegetation groups.

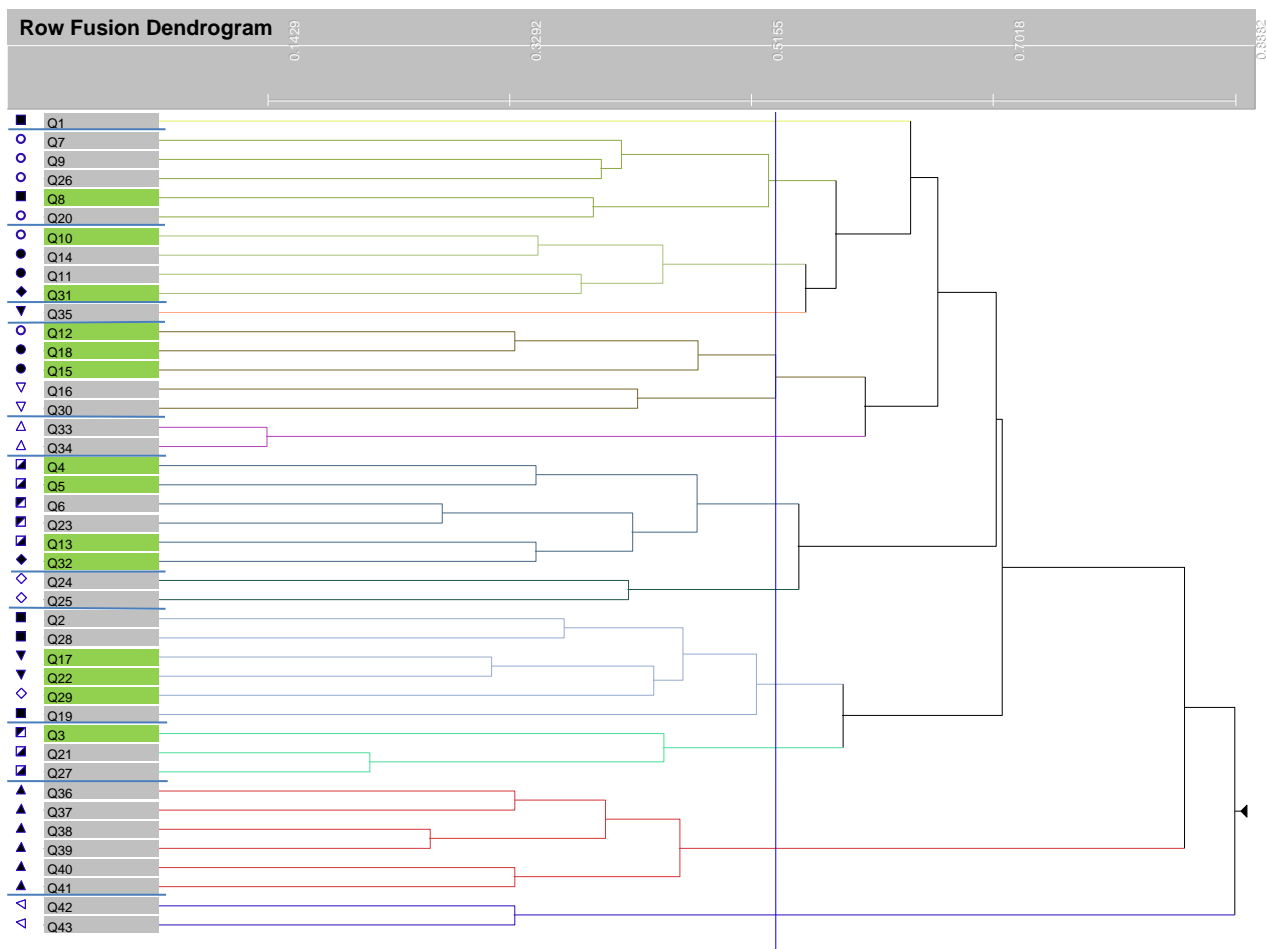


Figure 6: PATN Analysis of All Species into 12 groups

4.2.1.3 Vegetation Condition

Vegetation in the survey area has been subjected to historic 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 three non-native species recorded in the quadrats, with four additional non-native species recorded near the old Mt Celia homestead.

4.2.2 Flora of the Survey Area

4.2.2.1 General

One hundred and twenty-three species were recorded within the survey area with 115 species recorded within quadrats. Twenty-nine families and 57 genera were found. These are listed in Appendix E, per Quadrat as well as per vegetation group. Of the native species, Fabaceae had the highest representation, with 25 species from 3 genera, dominated by *Acacia*. Chenopodiaceae and Poaceae were the next best represented families with 20 species and 15 species respectively.

Of the 123 taxa recorded seven of these were introduced weed species. *Citrullus amarus* (Pie Melon) *Cucumis myriocarpus* (Prickly Paddy Melon) and *Cenchrus ciliaris* (Buffel Grass) were captured within the quadrat sampling, whilst *Schinus mollee* var. *areira* (Pepper Tree), *Nerium oleander* (Oleander Tree), *Yucca aloifolia* (Yucca Tree), and *Tamarix aphylla* (Athel pine) were recorded from a single location within the vicinity of the the old Mt Celia homestead.

Of the seven non-native species above, only *Tamarix aphylla* (Athel pine) is a declared pest-22(2) in the state of Western Australia.

The most common and widespread species was *Ptilotus obovatus*, which was recorded within all 43 quadrats. Its canopy cover was 10-30%. The next most common and widespread species was *Acacia aneura*, recorded in 34 quadrats, with a canopy cover between 10-30%.

There were 29 taxa recorded from within a single site, Q15. Of these, two were weed species.

4.2.2.2 Species Accumulation Curve

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 R² 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 R² 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 28 quadrats, at which the extrapolated total accumulated number of species is 100. Therefore the 115 species collected within the 43 quadrats represents 114.23% of the projected asymptote.

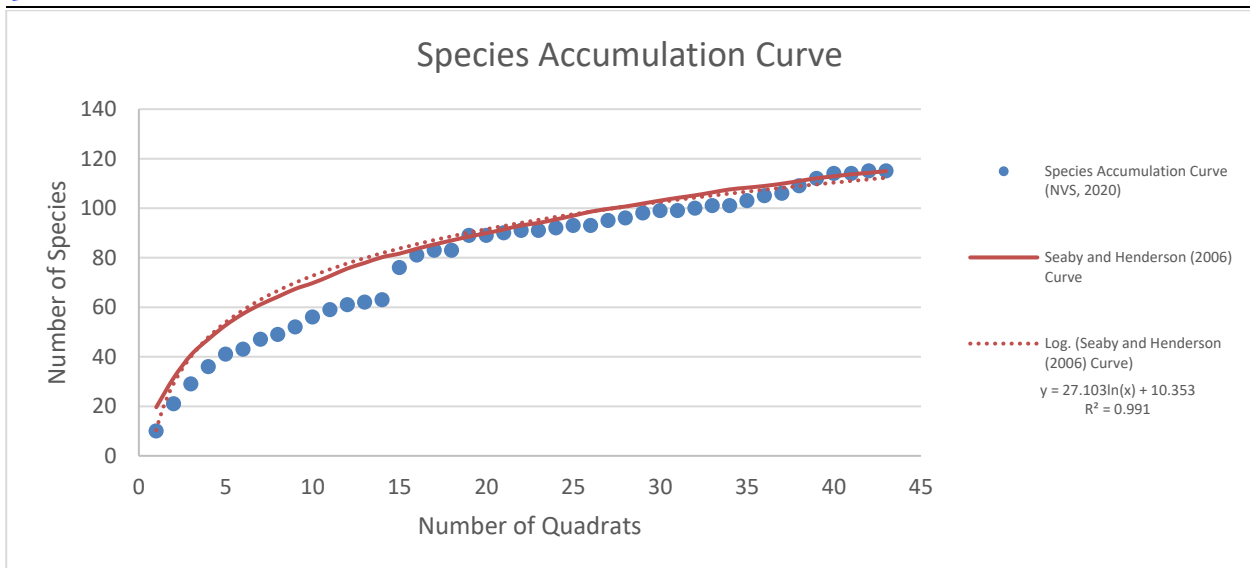


Figure 7: Species Accumulation Curve for the 43 sampled quadrats

4.2.2.3 Conservation significant species

No Threatened species were recorded during the survey.

No Priority species were identified in the survey area.

4.2.2.4 Introduced species

Seven introduced species recorded in the survey area are listed below;

- *Citrullus amarus* (Pie Melon)- Q15
- *Cucumis myriocarpus* (Prickly Paddy Melon)- Q15 and Q30
- *Cenchrus ciliaris* (Buffel Grass)- Q29
- *Schinus mollee* var. *areira* (Pepper Tree)- old Mt Celia Homestead
- *Nerium oleander* (Oleander Tree)- old Mt Celia Homestead
- *Yucca aloifolia* (Yucca Tree)- old Mt Celia Homestead
- *Tamarix aphylla* (Athel pine)- old Mt Celia Homestead

Of the seven non-native species above, only *Tamarix aphylla* (Athel pine) is a declared pest-s22(2) in the state of Western Australia.

5 DISCUSSION

The survey area is located within the Eastern Murchison subregion (CALM, 2002). This survey established that mostly, the flora within the project area is not unique, and is in fact common throughout the Eastern Murchison subregion and adjoining regions.

One hundred and twenty-three species were recorded within the survey area with 115 species recorded within quadrats. Twenty-nine families and 57 genera were found. These are listed in Appendix E, per Quadrat as well as per vegetation group. Of the native species, Fabaceae had the highest representation, with 25 species from 3 genera, dominated by *Acacia*. Chenopodiaceae and Poaceae were the next best represented families with 20 species and 15 species respectively.

Of the 123 taxa recorded seven of these were introduced weed species. *Citrullus amarus* (Pie Melon) *Cucumis myriocarpus* (Prickly Paddy Melon) and *Cenchrus ciliaris* (Buffel Grass) were captured within the quadrat sampling, whilst *Schinus mollee* var. *areira* (Pepper Tree), *Nerium oleander* (Oleander Tree), *Yucca aloifolia* (Yucca Tree), and *Tamarix aphylla* (Athel pine) were recorded from a single location within the vicinity of the the old Mt Celia homestead.

Of the seven non-native species above, only *Tamarix aphylla* (Athel pine) is a declared pest-s22(2) in the state of Western Australia.

The most common and widespread species was *Ptilotus obovatus*, which was recorded within all 43 quadrats. Its canopy cover was 10-30%. The next most common and widespread species was *Acacia aneura*, recorded in 34 quadrats, with a canopy cover between 10-30%.

There were 29 taxa recorded from within a single site, Q15. Of these, two were weed species.

No Threatened Flora were recorded in the survey area.

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

No Priority Flora were identified in the survey area.

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 existing 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.

No Priority Flora were recorded the survey area.

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 Murchison 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 a detailed flora and vegetation survey.

The following recommendations arise from the current flora survey:

- Any disturbance/clearing be minimised as much as practicable to reduce the loss of individual species;
- Weed control measures should be implemented during and post construction activities- it is recommended that any works within the vicinity of the old Mt Celia homestead be conducted in a manner where it incorporates the removal of non-native species nearby, particularly the delared pest *Tamarix aphylla*.
- 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.

8 REFERENCES

- Beard, J.S. (1990). *Plant life of Western Australia*. Kangaroo Press, NSW
- Belbin, L. (1994). *PATN: pattern analysis package: Technical reference*, Division of Wildlife and Ecology, CSIRO
- BOM, (2020), *Climate Data Online*, Bureau of Meteorology
<http://www.bom.gov.au/climate/data/>
Accessed: 12/11/2020
- CALM, (2002), *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002 (MUR1 – Eastern Murchison Subregion synopsis)*, Department of Conservation and Land Management
- CALM, (2003), *Phytophthora cinnamomi and Diseases Caused By It, Volume 1-Management Guidelines*, Department of Conservation and Land Management
http://www.dpaw.wa.gov.au/images/documents/conservation-management/pests-diseases/disease-risk-areas/Phytophthora_cinnamomi_and_disease_caused_by_it-Vol.1_Management_Guidelines_.pdf
Accessed: 12/11/2020
- DAWE, (2020), *Interim Biogeographic Regionalisation for Australia (IBRA)*, Department of Agriculture, Water and the Environment, Australian Government
<https://www.environment.gov.au/land/nrs/science/ibra>
Accessed: 12/11/2020
- DAWE, (2020a), *Protected Matters Search Tool*, Department of Agriculture, Water and the Environment
<http://www.environment.gov.au/webgis-framework/apps/pmst/pmst-coordinate.jsf>
Accessed: 12/11/2020
- DBCA, (2019), *2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report)- Current as of March 2019*, WA Department of Biodiversity, Conservation and Attractions, Perth,
<https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics>
Accessed: 12/11/2020
- DBCA, (2020), *TEC/PEC Database Results Ref: 23-0620EC*, Department of Biodiversity, Conservation and Attractions
- DBCA, (2020a), *Threatened Flora Database Results Ref: 07-0650FL*, Department of Biodiversity, Conservation and Attractions
- DPIRD, (2020), *Declared Plants Database*, Department of Primary Industries and Regional Development, Western Australia
<https://www.agric.wa.gov.au/pests-weeds-diseases/weeds/declared-plants>
Accessed: 12/11/2020
- DWER, (2020), *Clearing Permit System Map Viewer*, Department of Water and Environmental Regulation
<https://cps.der.wa.gov.au/main.html>
Accessed: 12/11/2020
- EPA, (2016), *Environmental Factor Guideline: Flora and Vegetation*, Environmental Protection Authority, Western Australia

EPA (2016a), *Technical Guidance- Flora and Vegetation Surveys for Environmental Impact Assessment*, Environmental Protection Authority, Western Australia

Hussey, B M J, G J, Cousens, R D Dodd, J and Lloyd S G, (2007), *Western Weeds- A guide to the Weeds of Western Australia (Second Edition)*, The Weed Society of Western Australia, Perth WA

Keighery, B.J., (1994), *Bushland Plant Survey; A guide to plant community survey for the Community*, Wildflower Society of Western Australia (Inc.) Nedlands

Muir, B.G. (1977), *Biological Survey of the Western Australian Wheatbelt. Pt. 2. Vegetation and habitat of the Bendering Reserve*. Records of the Western Australian Museum Supplement 3

Seaby R. M. & Henderson, P. A., (2006), *Species Diversity and Richness Version 4.1.2*, Pisces Conservation Ltd., Lymington, England.

Shepherd, D.P., Beeston, G.R., and A.J.M. Hopkins, (2002), *Land-Use and Vegetation in Western Australia- National Land and Water Resources Audit Report*, Technical Report 250, Department of Agriculture Western Australia

WAHERB, (2020), *FloraBase- the Western Australian Flora*, Department of Parks and Wildlife
<http://florabase.dpaw.wa.gov.au/>

Accessed: 12/11/2020

9 GLOSSARY

Acronyms:

BOM	Bureau of Meteorology, Australian Government
BSc	Bachelor of Science
CALM	Department of Conservation and Land Management (now DBCA)
CPS	Clearing Permit System (DWER)
DAWE	Department of Agriculture, Water and the Environment, Australian Government
DBCA	Department of Biodiversity, Conservation and Attractions, Western Australia
DMIRS	Department of Mines, Industry Regulation and Safety, Western Australia
DPAW	Department of Parks and Wildlife, Western Australia (now DBCA)
DPIRD	Department of Primary Industries and Regional Development, Western Australia
DRF	Declared Rare Flora
DWER	Department of Water and Environmental Regulation, Western Australia
EPA	Environmental Protection Authority, Western Australia
EP Act	<i>Environmental Protection Act 1986</i> , Western Australia
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth Act)
ESA	Environmentally Sensitive Area
GIS	Geographical Information System
ha	Hectare (10,000 square metres)
IBRA	Interim Biogeographic Regionalisation for Australia, DAWE
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union
km	Kilometres
m	Metres
MUR	Murchison Bioregion, IBRA
MUR01	Eastern Murchison Subregion, IBRA
NVS	Native Vegetation Solutions
PEC	Priority Ecological Community, Western Australia
Ramsar	A wetland site designated of international importance under the Ramsar Convention (UNESCO)
TEC	Threatened Ecological Community
UNESCO	United Nations Educational, Scientific and Cultural Organization
WA	Western Australia
WAHERB	Western Australian Herbarium, DBCA

Definitions:

{DBCA (2019) Conservation Codes for Western Australian Flora and Fauna. Department of Biodiversity, Conservation and Attractions, Western Australia, January 2019}: -

T Threatened species:

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

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 in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*”.

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

EN Endangered species

Threatened species considered to be “*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*”.

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU Vulnerable species

Threatened species considered to be “*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*”.

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora..

Extinct species:

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

EX Extinct species

Species where “*there is no reasonable doubt that the last member of the species has died*”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW Extinct in the wild species

Species that “*is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory species

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes 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 fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

CD Species of special conservation interest (conservation dependent fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

OS Other specially protected species

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

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 fauna or flora.

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.

Priority 1: 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.

Priority 2: 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.

Priority 3: 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.

Priority 4: 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 - EPBC and Other Government Database Search Results



Australian Government
Department of Agriculture,
Water and 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 case-study at the end of the report.

Information is available about [Environmental Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 12/11/20 17:31:59

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Case-study](#)

[Acknowledgements](#)



This map may contain data which are
©Commonwealth of Australia
(Geoscience Australia) ©PSMA 2015

[Coordinates](#)

[Buffer: 2.0km](#)



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:	8
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	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:	10
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		
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Ptilinopus alexandros Princess Parrot, Alexandria's Parrot [758]	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasypus septentrionalis Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may 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 [676]		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
Motacilla flava Yellow Wagtail [644]		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 [574]		Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [658]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Mammal 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 [673]		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
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysocolaptes osculans		
Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [870]		Species or species habitat may occur within area
Motacilla cinerea		
Grey Wagtail [842]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		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 Resources Audit, 2001.

Name	Status	Type of Presence
Mammals		
Camelus dromedarius		
Dromedary, Camel [7]		Species or species

Name	Status	Type of Presence
Canis lupus familiaris Domestic Dog [82E54]		habitat likely to occur within area Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species 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
Caprolagus 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		
Conchocoma arthusa Wand's Weed [55] [1]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may 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 species which may be relevant to determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It lists mapped locations of listed and National Heritage properties, Wedge-tailed Shearwaters and National Operations, 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 compiled from a range of sources as stated in section 1.1.

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 as 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 survey teams. State vegetation maps, which include strategic and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and other 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 past periods, maps are derived using other thematic spatial data (i.e. vegetation, soil, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat, or environmental modelling (such as DSE or BIOCLIM habitat modelling) using point locations and environmental data sets.

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 1:50,000 or 1:250,000 scale maps, as an unrefined process using polygon overlays between either 1:50,000 or 1:250,000 scale maps, with 1:50,000 and 1:250,000 scale maps or modified availability of by using topographic features, regional park boundaries, easels, etc. In the early stages of the distribution mapping process (2019-early 2021) distributions were defined by 1:50,000 or 1:250,000 map sheets. Typically, state distribution maps. Most remote distribution mapping projects are used to update these distributions as time permits.

Only selected species listed by the relevant 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 prepared from this information:

- threatened species listed as extinct or considered as, vulnerable
- some species and ecological communities that have only recently been listed
- some terrestrial species that occur in the Commonwealth marine zone
- migratory species that are very widespread, abundant or only occur in small numbers.

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

- non-threatened species where have only been mapped for associated breeding sites
- birds which have only been mapped for breeding sites near the Australian coastline.

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

Coordinates

29-444° 150-438E -29-42450E 152-4200E -29-4070E 152-39150E -29-40277E 152-36000E -29-444° 152-438E

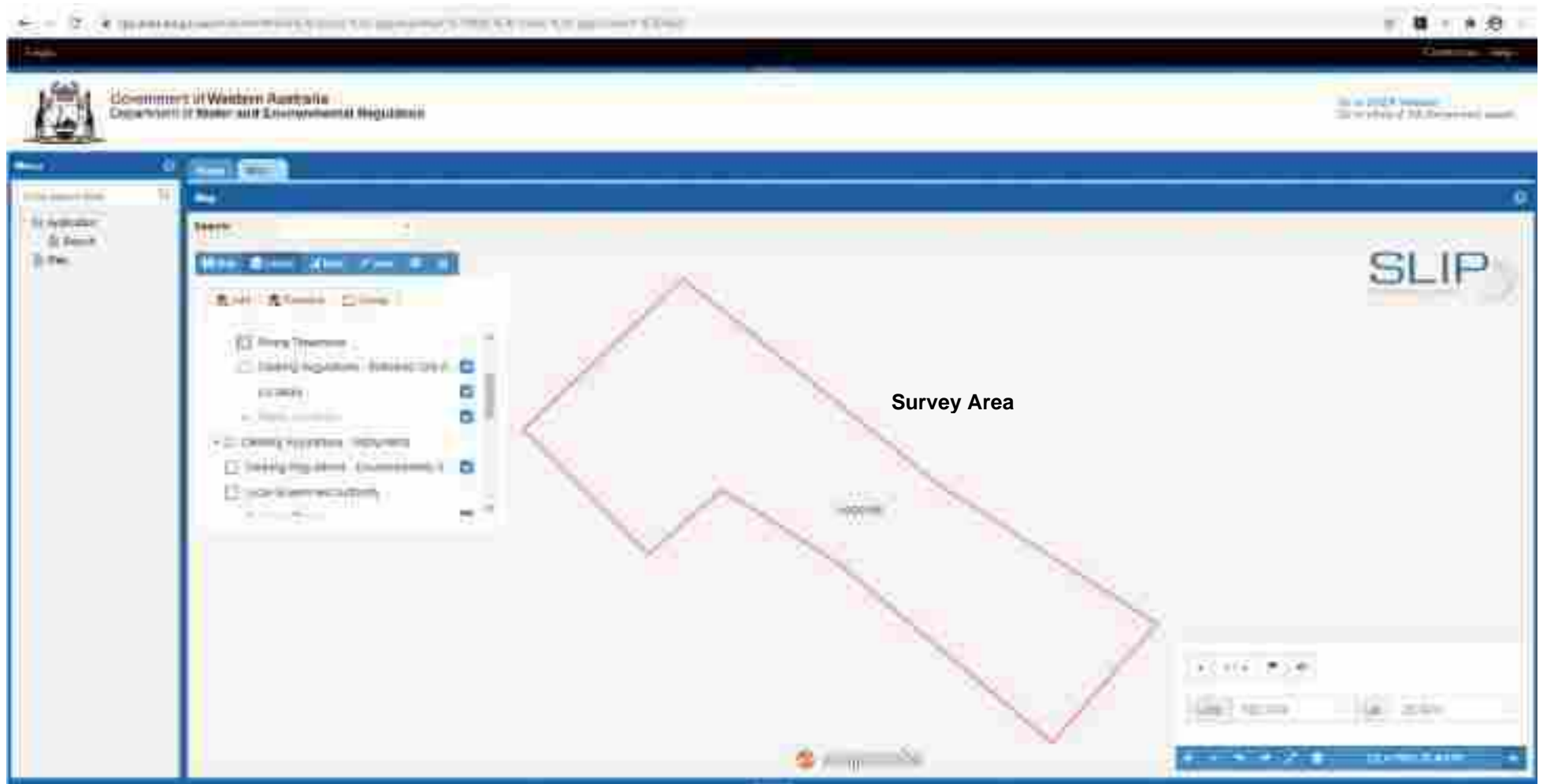
Acknowledgements

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

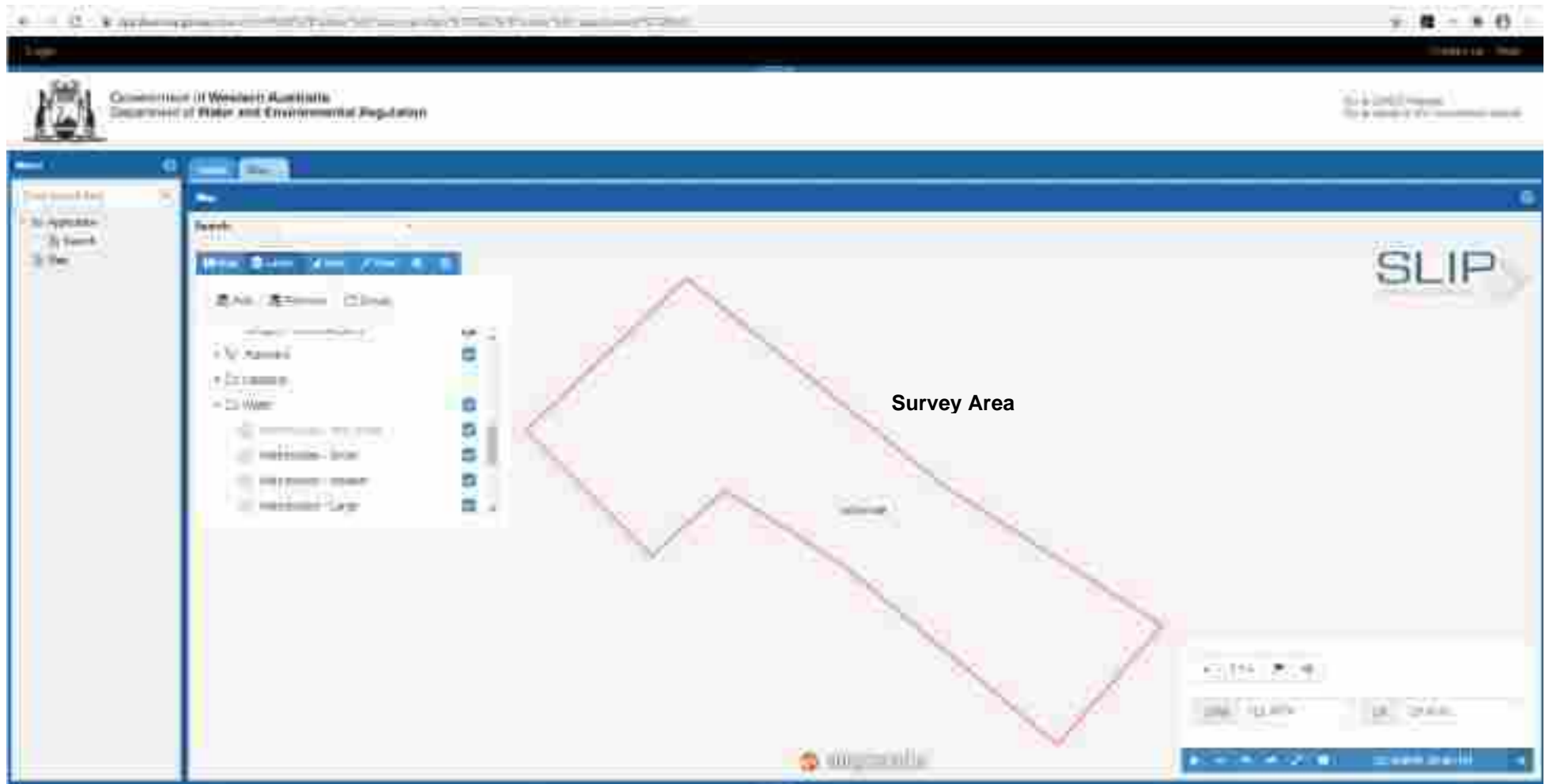
- [Office of Environment and Heritage, New South Wales](#)
- [Department of Environment and Primary Industries, Victoria](#)
- [Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [Department of Environment, Water and Natural Resources, South Australia](#)
- [Department of 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 Naborial 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](#)
- [CGIRO](#)
- [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, Inverack, 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.

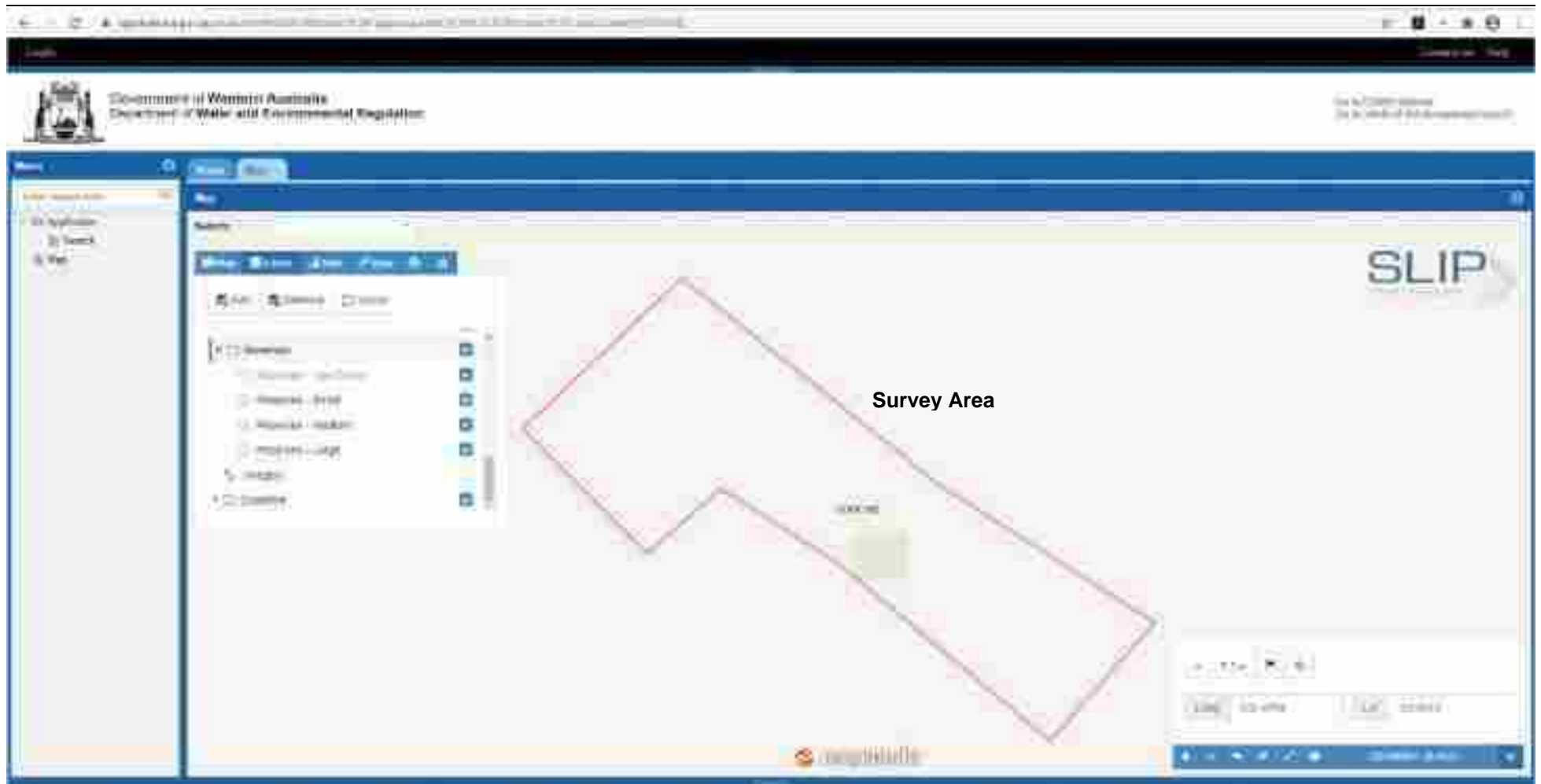
Please feel free to provide feedback via the [Contact Us](#) page.



DWER CPS Map Viewer - showing no ESA's (dark green shaded areas) within the survey area (pink polygon) (DWER, 2020)



DWER CPS Map Viewer - showing no water bodies within the survey area (pink polygon) (DWER, 2020)



DWER CPS Map Viewer - showing a small water Reserve (R11185) within the survey area (pink polygon) (DWER, 2020)

Appendix B - Vegetation Definitions

Vegetation Condition Definitions (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.

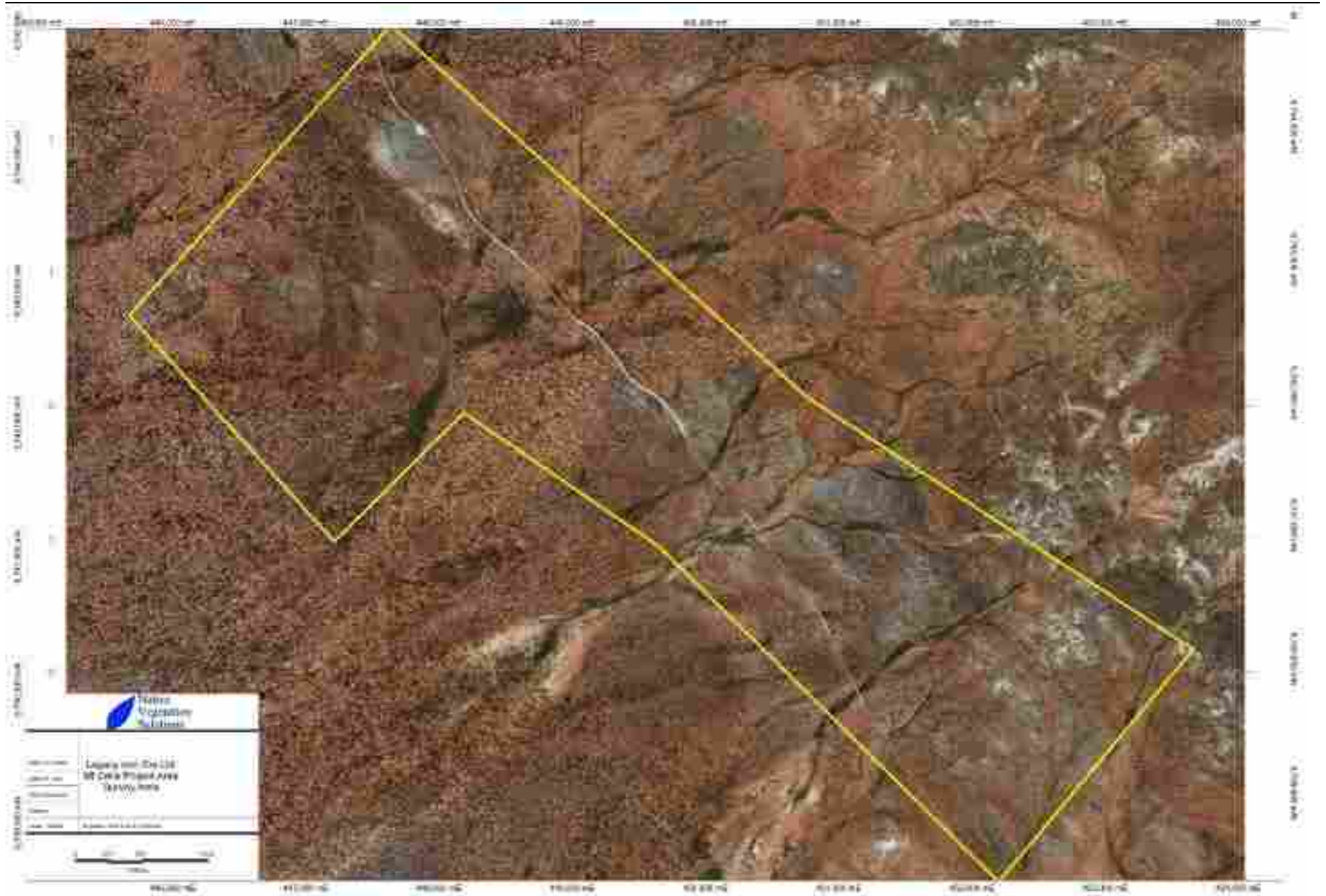
Completely Degraded (6) The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.

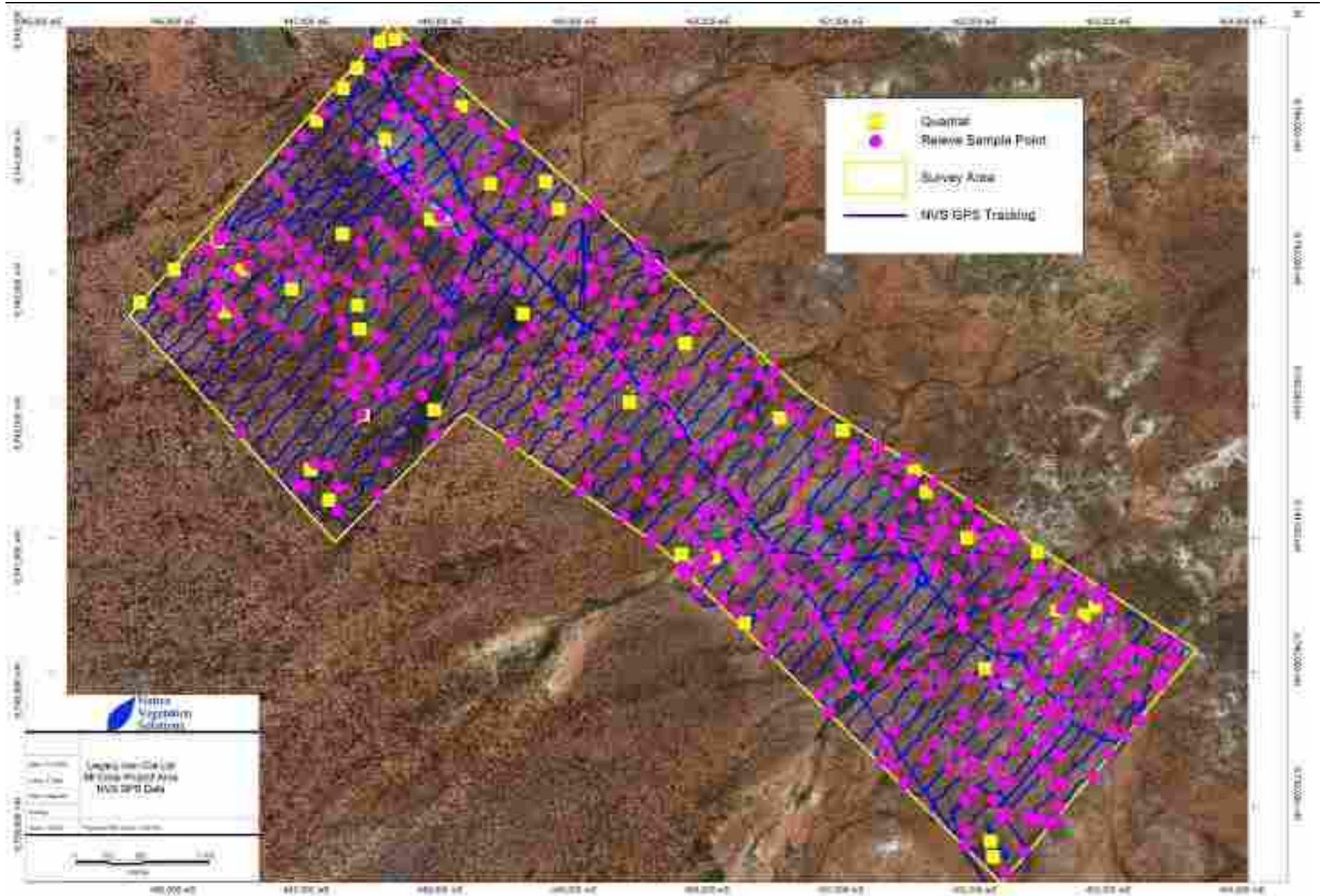
These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated trees or shrubs.

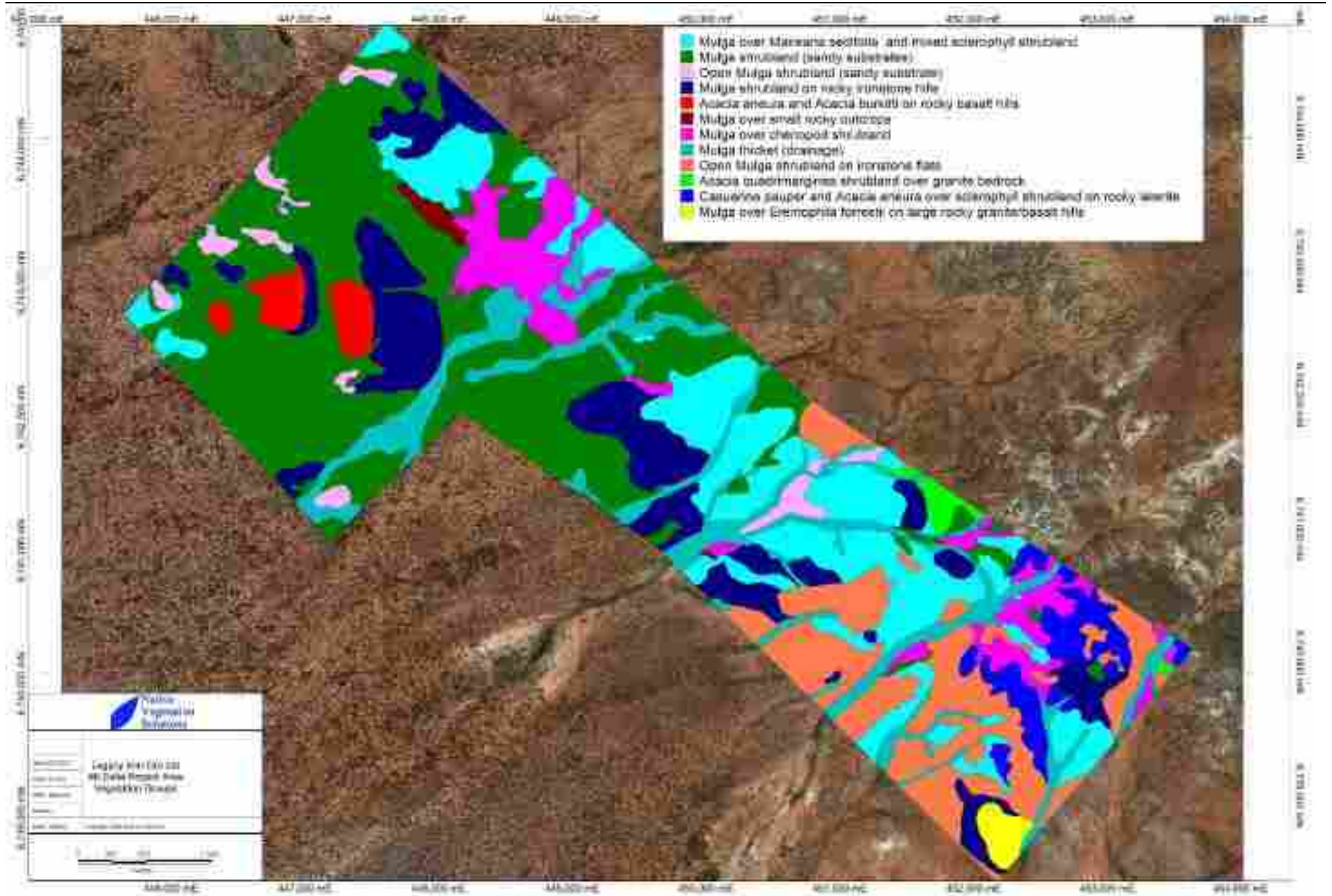
Vegetation Structure Definitions (Muir, 1977)

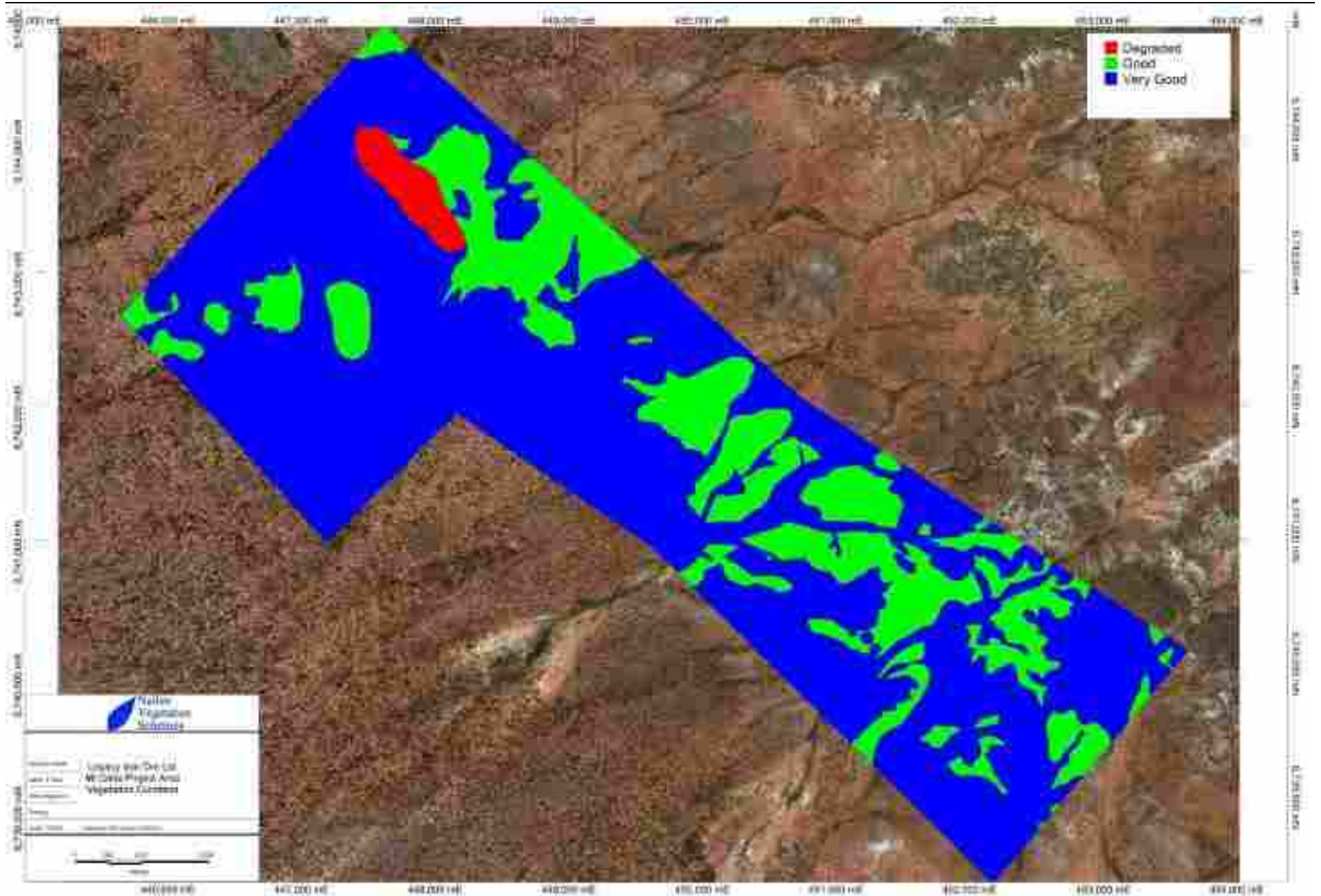
Dise Structure Height Class	Canopy Cover			
	Dense 10-100%	Mid-Dense 30-70%	Sparse 10-30%	Very Sparse 2-10%
	d	c	i	f
T Trees >30m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
M Trees 15-30m	Dense Forest	Forest	Woodland	Open Woodland
LA Trees 5-15m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
LB Trees 5m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
MT Mallee tree forms	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
MS Mallee shrub forms	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
S Scribbles	Dense Thicket	Thicket	Scrubb	Open Scrubb
SA Scribbles 1.5-2.0m	Dense Heath A	Heath A	Low Scrubb A	Open Low Scrubb A
SB Scribbles 1.0-1.5m	Dense Heath B	Heath B	Low Scrubb B	Open Low Scrubb B
SC Scribbles 0.5-1.0m	Dense Low Heath C	Low Heath C	Dwarf Scrubb C	Open Dwarf Scrubb C
SD Scribbles 0.2-0.5m	Dense Low Heath D	Low Heath D	Dwarf Scrubb D	Open Dwarf Scrubb D
P Mat plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
H Hummock Grass	Dense Hummock Grass	Mid-Dense Hummock Grass	Hummock Grass	Open Hummock Grass
HT Blanch-grass 142-5m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
GL Blanch-grass 0.5-2m	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
J Herbaceous ssp.	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
VT Sedges >1.5m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
VL Sedges <1.5m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
F Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
M Mosses, Liverworts	Dense Mosses	Mosses	Open Mosses	Very Open Mosses

Appendix C - Mapping









Appendix D - Threatened Flora Database Search Results

Taxon	Cons_Code	Likelihood of occurring in survey area	Comment
Acacia eremophila var. Numerous-nerved variant (A.S.George 11924)	P3	Unlikely	Known records within 50km, Lack of suitable habitat
Calandrinia sp. Menzies (F. Hort et al. FH 4100)	P3	Unlikely	Possible suitable habitat, habitat searched extensively
Eremophila mirabilis	P2	Unlikely	Known records within 50km, Lack of suitable habitat
Hemigenia exilis	P4	Possible	Possible suitable habitat in the survey area, habitat searched extensively
Hybanthus floribundus subsp. chloroxanthus	P3	Possible	Suitable habitat in the survey area, habitat searched extensively
Melaleuca apostiba	P3	Unlikely	Known records within 50km, Lack of suitable habitat
Placynthium nigrum	P3	Unlikely	Known records within 50km, Lack of suitable habitat
Tecticornia mellarium	P1	Unlikely	Known records within 50km, Lack of suitable habitat
Tecticornia sp. Lake Way (P. Armstrong 05/961)	P1	Unlikely	Known records within 50km, Lack of suitable habitat
Thryptomene eremaea	P2	Unlikely	Known records within 50km, Lack of suitable habitat

Likely – suitable habitat, close (<10km) records and/or field survey completed in sub-optimal season, suggest species is likely to occur

Possible- suitable habitat, record(<50km) and/or field survey completed in sub-optimal season.

Unlikely- Lack of suitable habitat and/or no records(<50km) and /or field survey completed in optimal season, suggests species is unlikely to occur

Appendix E - Species Recorded During the June 2020 Survey

Family	Genus	Taxon	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	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40	Q41	Q42	Q43							
Malvaceae	<i>Alyogyne</i>	<i>Alyogyne pinoniana</i>						*									*																																			
Malvaceae	<i>Brachychiton</i>	<i>Brachychiton gregorii</i>						*																		*	*																									
Malvaceae	<i>Sida</i>	<i>Sida calyxhymenia</i>						*			*						*					*	*																													
Malvaceae	<i>Sida</i>	<i>Sida ectogama</i>			*	*	*	*										*											*						*	*		*	*	*	*	*	*	*	*							
Malvaceae	<i>Sida</i>	<i>Sida</i> sp. Golden calyces glabrous			*	*	*	*																																												
Myrtaceae	<i>Eucalyptus</i>	<i>Eucalyptus kingsmillii</i>				*																																														
Myrtaceae	<i>Eucalyptus</i>	<i>Eucalyptus lesouefii</i>				*																																														
Myrtaceae	<i>Eucalyptus</i>	<i>Eucalyptus oleosa</i> subsp. <i>oleosa</i>				*																																														
Myrtaceae	<i>Eucalyptus</i>	<i>Eucalyptus salubris</i>																																																		
Poaceae	<i>Aristida</i>	<i>Aristida contorta</i>		*	*	*	*	*						*					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*			
Poaceae	<i>Austrostipa</i>	<i>Austrostipa elegantissima</i>																																																		
Poaceae	<i>Austrostipa</i>	<i>Austrostipa eremophila</i>		*	*	*	*	*				*	*					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
Poaceae	<i>Austrostipa</i>	<i>Austrostipa scabra</i>							*	*																				*	*																					
Poaceae	<i>Cenchrus</i>	<i>Cenchrus cilians</i> *																																																		
Poaceae	<i>Enneapogon</i>	<i>Enneapogon caeruleascens</i>		*	*	*	*	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
Poaceae	<i>Enteropogon</i>	<i>Enteropogon ramosus</i>												*				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
Poaceae	<i>Eragrostis</i>	<i>Eragrostis eriopoda</i>		*	*	*	*	*					*										*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
Poaceae	<i>Eragrostis</i>	<i>Eragrostis pergracilis</i>				*																																														
Poaceae	<i>Eragrostis</i>	<i>Eragrostis setifolia</i>												*																																						
Poaceae	<i>Eriachne</i>	<i>Eriachne helmsii</i>											*	*						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
Poaceae	<i>Eriachne</i>	<i>Eriachne pulchella</i> subsp. <i>pulchella</i>											*	*																																		*	*	*	*	
Poaceae	<i>Monachather</i>	<i>Monachather paradoxus</i>																										*																								
Poaceae	<i>Paspalidium</i>	<i>Paspalidium clementii</i>																*																															*	*		
Portulacaceae	<i>Portulaca</i>	<i>Portulaca oleracea</i>																*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Proteaceae	<i>Grevillea</i>	<i>Grevillea acuaria</i>																																																		
Proteaceae	<i>Grevillea</i>	<i>Grevillea berryana</i>				*																																														
Proteaceae	<i>Hakea</i>	<i>Hakea lorea</i> subsp. <i>lorea</i>																						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
Proteaceae	<i>Hakea</i>	<i>Hakea preissii</i>		*	*	*	*	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Proteaceae	<i>Hakea</i>	<i>Hakea recurva</i> subsp. <i>recurva</i>																																																		
Pteridaceae	<i>Cheilanthes</i>	<i>Cheilanthes lasiophylla</i>															*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Pteridaceae	<i>Cheilanthes</i>	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>																																																		
Rubiaceae	<i>Psyrax</i>	<i>Psyrax rigidula</i>																*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Rubiaceae	<i>Psyrax</i>	<i>Psyrax suaveolens</i>																*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Rutaceae	<i>Philotheca</i>	<i>Philotheca brucei</i> subsp. <i>brucei</i>																*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Santalaceae	<i>Exocarpos</i>	<i>Exocarpos aphyllus</i>																																																		
Sapindaceae	<i>Dodonaea</i>	<i>Dodonaea lobulata</i>		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Sapindaceae	<i>Dodonaea</i>	<i>Dodonaea rigida</i>				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila clarkei</i>																*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila exilifolia</i>																																																		
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila longifolia</i>						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila metallicorum</i>																																																		
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i>						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila oppositifolia</i> subsp. <i>angustifolia</i>																																																		
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila pantonii</i>											*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Solanaceae	<i>Solanum</i>	<i>Solanum lasiophyllum</i>		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Solanaceae	<i>Solanum</i>	<i>Solanum nummularium</i>																																																		
Thymelaeaceae	<i>Pimelea</i>	<i>Pimelea microcephala</i> subsp. <i>microcephala</i>						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

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

Family	Genus	Taxon	a	b	c	d	e	f	g	h	i	j	k	l
Amaranthaceae	<i>Ptilotus</i>	<i>Ptilotus obovatus</i>	*	*	*	*	*	*	*	*	*	*	*	*
Amaranthaceae	<i>Ptilotus</i>	<i>Ptilotus schwartzii</i>				*					*			*
Anacardiaceae	<i>Schinus</i>	<i>Schinus molle</i> var. <i>areira</i> *								*				
Apocynaceae	<i>Marsdenia</i>	<i>Marsdenia australis</i>	*	*	*	*	*			*	*			*
Apocynaceae	<i>Nerium</i>	<i>Nerium oleander</i> *								*				
Asparagaceae	<i>Yucca</i>	<i>Yucca aloifolia</i> *								*				
Asteraceae	<i>Chrysocephalum</i>	<i>Chrysocephalum puteale</i>				*	*					*		
Asteraceae	<i>Olearia</i>	<i>Olearia muelleri</i>											*	
Asteraceae	<i>Podolepis</i>	<i>Podolepis capillaris</i>		*										
Casuarinaceae	<i>Casuarina</i>	<i>Casuarina pauper</i>	*			*							*	
Chenopodiaceae	<i>Atriplex</i>	<i>Atriplex bunburyana</i>	*						*				*	
Chenopodiaceae	<i>Chenopodium</i>	<i>Chenopodium gaudichaudianum</i>											*	
Chenopodiaceae	<i>Dysphania</i>	<i>Dysphania kalpari</i>					*	*		*				
Chenopodiaceae	<i>Enchylaena</i>	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>	*	*	*	*	*	*	*	*	*		*	
Chenopodiaceae	<i>Maireana</i>	<i>Maireana carnosa</i>	*											
Chenopodiaceae	<i>Maireana</i>	<i>Maireana georgei</i>	*	*	*	*	*	*	*	*	*		*	
Chenopodiaceae	<i>Maireana</i>	<i>Maireana glomerifolia</i>	*						*				*	
Chenopodiaceae	<i>Maireana</i>	<i>Maireana planifolia</i>	*		*									
Chenopodiaceae	<i>Maireana</i>	<i>Maireana pyramidata</i>	*	*			*		*	*			*	
Chenopodiaceae	<i>Maireana</i>	<i>Maireana sedifolia</i>	*			*	*		*	*			*	
Chenopodiaceae	<i>Maireana</i>	<i>Maireana tomentosa</i>	*	*		*	*		*	*			*	
Chenopodiaceae	<i>Maireana</i>	<i>Maireana trichoptera</i>	*			*	*		*	*			*	
Chenopodiaceae	<i>Maireana</i>	<i>Maireana triptera</i>	*	*	*	*	*	*	*	*	*		*	
Chenopodiaceae	<i>Rhagodia</i>	<i>Rhagodia drummondii</i>	*	*	*	*	*	*		*	*		*	
Chenopodiaceae	<i>Rhagodia</i>	<i>Rhagodia eremaea</i>	*											
Chenopodiaceae	<i>Salsola</i>	<i>Salsola australis</i>						*	*					
Chenopodiaceae	<i>Sclerolaena</i>	<i>Sclerolaena cuneata</i>	*						*					
Chenopodiaceae	<i>Sclerolaena</i>	<i>Sclerolaena densiflora</i>	*										*	
Chenopodiaceae	<i>Sclerolaena</i>	<i>Sclerolaena diacantha</i>						*					*	
Chenopodiaceae	<i>Sclerolaena</i>	<i>Sclerolaena patenticuspis</i>	*											
Convolvulaceae	<i>Duperreya</i>	<i>Duperreya sericea</i>					*							
Cucurbitaceae	<i>Citrullus</i>	<i>Citrullus amarus</i> *					*			*				
Cucurbitaceae	<i>Cucumis</i>	<i>Cucumis myriocarpus</i> *					*	*						
Cupressaceae	<i>Callitris</i>	<i>Callitris preissii</i>											*	
Fabaceae	<i>Acacia</i>	<i>Acacia aneura</i>	*	*	*	*	*	*	*	*	*	*	*	*
Fabaceae	<i>Acacia</i>	<i>Acacia ayersiana</i>	*	*		*	*	*	*	*	*	*	*	
Fabaceae	<i>Acacia</i>	<i>Acacia burkittii</i>	*	*		*	*	*	*	*	*	*	*	
Fabaceae	<i>Acacia</i>	<i>Acacia caesaneura</i>	*		*	*			*				*	
Fabaceae	<i>Acacia</i>	<i>Acacia craspedocarpa</i>		*	*	*					*			*
Fabaceae	<i>Acacia</i>	<i>Acacia hemiteles</i>					*							
Fabaceae	<i>Acacia</i>	<i>Acacia incurvaneura</i>	*	*	*	*	*		*	*				*
Fabaceae	<i>Acacia</i>	<i>Acacia kempeana</i>							*					
Fabaceae	<i>Acacia</i>	<i>Acacia ligulata</i>	*	*	*	*	*	*	*	*	*			
Fabaceae	<i>Acacia</i>	<i>Acacia mulganeura</i>	*	*	*	*	*	*	*	*	*	*	*	*
Fabaceae	<i>Acacia</i>	<i>Acacia murrayana</i>					*			*				
Fabaceae	<i>Acacia</i>	<i>Acacia oswaldii</i>	*											
Fabaceae	<i>Acacia</i>	<i>Acacia pteraneura</i>		*	*	*	*	*	*		*			
Fabaceae	<i>Acacia</i>	<i>Acacia quadrimarginea</i>										*		
Fabaceae	<i>Acacia</i>	<i>Acacia ramulosa</i> var. <i>ramulosa</i>	*	*	*	*	*		*	*			*	
Fabaceae	<i>Acacia</i>	<i>Acacia sibirica</i>				*								
Fabaceae	<i>Acacia</i>	<i>Acacia tetragonophylla</i>	*	*	*	*	*	*	*	*	*	*	*	*
Fabaceae	<i>Daviesia</i>	<i>Daviesia aphylla</i>	*	*		*								
Fabaceae	<i>Senna</i>	<i>Senna artemisioides</i> subsp. <i>xsturtii</i>				*								
Fabaceae	<i>Senna</i>	<i>Senna artemisioides</i> subsp. <i>artemisioides</i>	*	*	*	*	*	*	*	*	*	*	*	*
Fabaceae	<i>Senna</i>	<i>Senna artemisioides</i> subsp. <i>filifolia</i>	*	*	*	*	*	*	*	*	*	*	*	*
Fabaceae	<i>Senna</i>	<i>Senna artemisioides</i> subsp. <i>helmsii</i>				*	*				*			

Family	Genus	Taxon	a	b	c	d	e	f	g	h	i	j	k	l
Fabaceae	<i>Senna</i>	<i>Senna cardiosperma</i>				*							*	
Fabaceae	<i>Senna</i>	<i>Senna glutinosa subsp. chatelainiana</i>					*	*	*		*			
Fabaceae	<i>Senna</i>	<i>Senna sp. Meekatharra</i>											*	*
Frankeniaceae	<i>Frankenia</i>	<i>Frankenia ?fecunda</i>											*	
Frankeniaceae	<i>Frankenia</i>	<i>Frankenia setosa</i>							*					
Goodeniaceae	<i>Goodenia</i>	<i>Goodenia sp. (sterile)</i>					*							
Goodeniaceae	<i>Scaevola</i>	<i>Scaevola spinescens</i>	*	*	*	*	*	*	*	*	*	*	*	*
Lamiaceae	<i>Prostanthera</i>	<i>Prostanthera albiflora</i>					*							
Lamiaceae	<i>Teucrium</i>	<i>Teucrium teucriiflorum</i>		*	*			*	*		*			
Loranthaceae	<i>Amyema</i>	<i>Amyema gibberula var. gibberula</i>								*				
Loranthaceae	<i>Amyema</i>	<i>Amyema sp. Dead</i>		*										
Malvaceae	<i>Abutilon</i>	<i>Abutilon otocarpum</i>					*							
Malvaceae	<i>Abutilon</i>	<i>Abutilon oxycarpum</i>					*	*						
Malvaceae	<i>Alyogyne</i>	<i>Alyogyne pinoniana</i>						*						
Malvaceae	<i>Brachychiton</i>	<i>Brachychiton gregorii</i>			*					*		*		
Malvaceae	<i>Sida</i>	<i>Sida calyhymentia</i>	*	*		*	*							
Malvaceae	<i>Sida</i>	<i>Sida ectogama</i>		*	*	*	*	*			*		*	
Malvaceae	<i>Sida</i>	<i>Sida sp. Golden calyces glabrous</i>		*	*	*	*							
Myrtaceae	<i>Eucalyptus</i>	<i>Eucalyptus ewartiana</i>												*
Myrtaceae	<i>Eucalyptus</i>	<i>Eucalyptus kingsmillii</i>		*										
Myrtaceae	<i>Eucalyptus</i>	<i>Eucalyptus lesouefii</i>							*				*	
Myrtaceae	<i>Eucalyptus</i>	<i>Eucalyptus oleosa subsp. oleosa</i>	*	*										
Myrtaceae	<i>Eucalyptus</i>	<i>Eucalyptus salubris</i>											*	
Poaceae	<i>Aristida</i>	<i>Aristida contorta</i>	*	*	*	*	*	*	*	*	*	*	*	*
Poaceae	<i>Austrostipa</i>	<i>Austrostipa elegantissima</i>									*			
Poaceae	<i>Austrostipa</i>	<i>Austrostipa eremophila</i>	*	*	*	*	*	*	*	*	*	*	*	*
Poaceae	<i>Austrostipa</i>	<i>Austrostipa scabra</i>	*			*					*			
Poaceae	<i>Cenchrus</i>	<i>Cenchrus ciliaris*</i>								*				
Poaceae	<i>Enneapogon</i>	<i>Enneapogon caeruleus</i>	*	*	*	*	*	*	*	*	*	*	*	*
Poaceae	<i>Enteropogon</i>	<i>Enteropogon ramosus</i>	*			*	*	*	*	*	*	*	*	*
Poaceae	<i>Eragrostis</i>	<i>Eragrostis eriopoda</i>	*	*	*	*	*	*	*	*	*	*	*	*
Poaceae	<i>Eragrostis</i>	<i>Eragrostis pergracilis</i>		*										
Poaceae	<i>Eragrostis</i>	<i>Eragrostis setifolia</i>					*							
Poaceae	<i>Eriachne</i>	<i>Eriachne helmsii</i>				*	*				*		*	*
Poaceae	<i>Eriachne</i>	<i>Eriachne pulchella subsp. pulchella</i>					*		*					*
Poaceae	<i>Monachather</i>	<i>Monachather paradoxus</i>								*				
Poaceae	<i>Paspalidium</i>	<i>Paspalidium clementii</i>					*							*
Poaceae	<i>Triodia</i>	<i>Triodia basedowii</i>		*										
Portulacaceae	<i>Portulaca</i>	<i>Portulaca oleracea</i>	*				*		*					
Proteaceae	<i>Grevillea</i>	<i>Grevillea acuaria</i>											*	
Proteaceae	<i>Grevillea</i>	<i>Grevillea berryana</i>	*	*										
Proteaceae	<i>Hakea</i>	<i>Hakea lorea subsp. lorea</i>							*	*	*			
Proteaceae	<i>Hakea</i>	<i>Hakea preissii</i>	*	*		*	*		*				*	
Proteaceae	<i>Hakea</i>	<i>Hakea recurva subsp. recurva</i>	*				*							
Pteridaceae	<i>Cheilanthes</i>	<i>Cheilanthes lasiophylla</i>					*	*			*	*	*	*
Pteridaceae	<i>Cheilanthes</i>	<i>Cheilanthes sieberi subsp. sieberi</i>												*
Rubiaceae	<i>Psyrax</i>	<i>Psyrax rigidula</i>						*		*				*
Rubiaceae	<i>Psyrax</i>	<i>Psyrax suaveolens</i>			*		*	*	*	*				*
Rutaceae	<i>Philotheca</i>	<i>Philotheca brucei subsp. brucei</i>						*						*
Santalaceae	<i>Exocarpos</i>	<i>Exocarpos aphyllus</i>											*	
Sapindaceae	<i>Dodonaea</i>	<i>Dodonaea lobulata</i>	*	*		*	*		*		*	*	*	*
Sapindaceae	<i>Dodonaea</i>	<i>Dodonaea rigida</i>		*		*	*	*	*		*	*	*	*
Sapindaceae	<i>Dodonaea</i>	<i>Dodonaea viscosa subsp. angustissima</i>		*										
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila clarkei</i>					*			*				
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila exilifolia</i>	*		*					*				
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila forrestii subsp. forrestii</i>		*						*	*	*	*	*
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila georgei</i>	*											

Family	Genus	Taxon	a	b	c	d	e	f	g	h	i	j	k	l
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	*			*	*	*		*			*	*
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila longifolia</i>	*	*		*	*		*	*	*			
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila metallicorum</i>											*	
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i>	*			*	*	*			*			
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila oppositifolia</i> subsp. <i>angustifolia</i>											*	
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila pantonii</i>				*			*				*	
Solanaceae	<i>Solanum</i>	<i>Solanum lasiophyllum</i>	*	*	*	*	*	*	*	*	*	*	*	*
Solanaceae	<i>Solanum</i>	<i>Solanum nummularium</i>	*	*										
Tamaricaceae	<i>Tamarix</i>	<i>Tamarix aphylla</i> *								*				
Thymelaeaceae	<i>Pimelea</i>	<i>Pimelea microcephala</i> subsp. <i>microcephala</i>			*			*		*				

Appendix F - Site Descriptions

Project Name: Mt Celia					
Date:	8/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q43		
Quadrat size:	20x20				
Vegetation group:	Mulga over Eremophila forrestii on large rocky granite/basalt hills				
WP:	489				
Photo number:			159		
Landform:			Lower slope/Hillslope		
Land surface/disturbance:			No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):			Very; abundant/Cobbly; or cobbles/Subangular		
Rock outcrop (abundance/runoff):			Very slightly rocky/Rapid		
Soil (profile/field texture/soil surface):			Uniform/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:	1-3m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia incurvaneura		Eremophila forrestii subsp. forrestii		Ptilotus obovatus	
Acacia mulganeura					
ALL SPECIES					
Acacia incurvaneura					
Acacia mulganeura					
Eremophila forrestii subsp. forrestii					
Ptilotus obovatus					
Eremophila latrobei subsp. latrobei					
Senna sp. Meekeatharra					
Solanum lasiophyllum					
Ptilotus schwartzii					
Acacia aneura					
Cheilanthes sieberi subsp. sieberi					
Austrostipa eremophila					
Aristida contorta					
Paspalidium clementii					
Enteropogon ramosus					
Eriachne helmsii					
Outside					



Project Name: Mt Celia			
Date:	8/06/2020	Botanist:	Eren Reid
Location:	Mt Celia	Quadrat:	Q2
Quadrat size:	20x20		
Vegetation group:	Mulga over Maireana sedifolia (calcrete)		
WP:	2		
Photo number:			69
Landform:			Flat/Plain
Land surface/disturbance:			No effective disturbance
Coarse fragments on the surface (abundance/size/shape):			Slightly; few/Medium gravelly; medium pebbles/Subrounded
Rock outcrop (abundance/runoff):			No bedrock exposed/Slow
Soil (profile/field texture/soil surface):			Uniform/Loamy sand/Firm
% Cover leaf litter:			20
% Cover bare ground:			60
Tallest stratum		Mid-stratum	
Growth form:	Shrub Mallee (< 8m)	Growth form:	Shrub
Height:	6-12m	Height:	1-3m
Crown cover %:	10-30	Crown cover %:	10-30
Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia ligulata	Maireana sedifolia
		Acacia burkittii	Ptilotus obovatus
		Senna artemisioides subsp. filifolia	Dodonaea lobulata
ALL SPECIES			
Acacia aneura			
Acacia ligulata			
Acacia burkittii			
Senna artemisioides subsp. filifolia			
Maireana sedifolia			
Ptilotus obovatus			
Dodonaea lobulata			
Eremophila latrobei subsp. latrobei			
Hakea preissii			
Maireana georgei			
Solanum lasiophyllum			
Rhagodia drummondii			
Aristida contorta			
Acacia ramulosa var. ramulosa			
Acacia caesaneura			
Austrostipa eremophila			
Enneapogon caeruleus			
Acacia tetragonophylla			
Outside			
Acacia incurvaneura			
Acacia mulganeura			
Eremophila longifolia			
Scaevola spinescens			
Maireana pyramidata			



Project Name: Mt Celia					
Date:	3/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q3		
Quadrat size:	20x20				
Vegetation group:	Mulga Shrubland				
WP:	4				
Photo number:					40
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):					Uniform/Loamy sand/Hard setting
% Cover leaf litter:					40
% 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:	3-6m	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:	
Acacia aneura		Acacia ramulosa var. ramulosa		Ptilotus obovatus	
Acacia incurvaneura					
Acacia caesaneura					
ALL SPECIES					
Acacia aneura					
Acacia incurvaneura					
Acacia caesaneura					
Acacia ramulosa var. ramulosa					
Ptilotus obovatus					
Eragrostis eriopoda					
Sida ectogama					
Sida sp. Golden calyces glabrous					
Maireana georgei					
Maireana planifolia					
Rhagodia drummondii					
Marsdenia australis					
Aristida contorta					
Austrostipa eremophila					
Enchylaena tomentosa var. tomentosa					
Solanum lasiophyllum					
Maireana triptera					
Outside					
Acacia ligulata					
Teucrium teucriiflorum					



Project Name: Mt Celia					
Date:	3/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q4		
Quadrat size:	20x20				
Vegetation group:	Mulga Shrubland				
WP:	5				
Photo number:			41		
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):		Uniform/Loamy sand/Hard setting			
% Cover leaf litter:		40			
% 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:	5-12m	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:	
Acacia incurvaneura		Acacia ramulosa var. ramulosa		Ptilotus obovatus	
Acacia mulganeura		Eremophila forrestii subsp. forrestii			
Eucalyptus kingsmillii		Senna artemisioides subsp. artemisioides			
ALL SPECIES					
Acacia incurvaneura					
Acacia mulganeura					
Eucalyptus kingsmillii					
Acacia ramulosa var. ramulosa					
Eremophila forrestii subsp. forrestii					
Senna artemisioides subsp. artemisioides					
Ptilotus obovatus					
Maireana pyramidata					
Acacia craspedocarpa					
Acacia aneura					
Solanum lasiophyllum					
Eragrostis eriopoda					
Teucrium teucriiflorum					
Rhagodia drummondii					
Aristida contorta					
Scaevola spinescens					
Outside					
Acacia ligulata					



Project Name: Mt Celia			
Date:	3/06/2020	Botanist:	Eren Reid
Location:	Mt Celia	Quadrat:	06
Quadrat size:	20x20		
Vegetation group:	Open Mulga shrubland on sandy soils		
WP:	11		
Photo number:			#3
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):			Gradational/Loamy sand/Hard setting
% Cover leaf litter:			20
% Cover bare ground:			70
Tallest stratum	Mid-stratum	Lower stratum	
Growth form:	Shrub Mallee (< 8m)	Growth form:	Shrub
Height:	3-6m	Height:	0.25-0.5m
Crown cover %:	<10	Crown cover %:	10-30
Dominant taxa:	Senna artemisioides subsp. filifolia Acacia ramulosa var. ramulosa Acacia ligulata	Dominant taxa:	Ptilotus obovatus Eragrostis eriopoda
Acacia mulganeura			
ALL SPECIES			
Acacia mulganeura			
Senna artemisioides subsp. filifolia			
Acacia ramulosa var. ramulosa			
Acacia ligulata			
Ptilotus obovatus			
Eragrostis eriopoda			
Brachychiton gregorii			
Acacia tetragonophylla			
Acacia craspedocarpa			
Acacia incurvaneura			
Pimelea microcephala subsp. microcephala			
Rhagodia drummondii			
Maireana triptera			
Solanum lasiophyllum			
Aristida contorta			
Marsdenia australis			
Senna artemisioides subsp. artemisioides			
Enneapogon caeruleus			
Outside			
Acacia aneura			
Acacia pteraneura			



Project Name: Mt Celia					
Date:	4/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q7		
Quadrat size:	20x20				
Vegetation group:	Mulga shrubland on rocky ironstone				
WP:	12				
Photo number:			44		
Landform:			Hillock/Mound		
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):			No bedrock exposed/Moderately rapid		
Soil (profile/field texture/soil surface):			Uniform/Sandy clay loam/Hard setting		
% Cover leaf litter:			20		
% Cover bare ground:			65		
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	§ Shrub	Growth form:	§ Shrub	Growth form:	§ Shrub
Height:	1-3m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	√ <10	Crown cover %:	§ 10-30	Crown cover %:	√ <10
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Scaevola spinescens		Ptilotus obovatus	
Acacia mulganeura		Senna artemisioides subsp. filifolia			
		Eremophila latrobei subsp. latrobei			
ALL SPECIES					
Acacia aneura					
Acacia mulganeura					
Scaevola spinescens					
Senna artemisioides subsp. filifolia					
Eremophila latrobei subsp. latrobei					
Ptilotus obovatus					
Dodonaea lobulata					
Eremophila oldfieldii subsp. angustifolia					
Senna artemisioides subsp. artemisioides					
Sida ectogama					
Acacia tetragonophylla					
Rhagodia drummondii					
Acacia craspedocarpa					
Hakea preissii					
Solanum lasiophyllum					
Sida calyxhymenia					
Dodonaea rigida					
Austrostipa scabra					
Sida sp. Golden calyces glabrous					
Eremophila longifolia					
Maireana triptera					
Outside					
Acacia incurvaneura					
Acacia ligulata					



Project Name: Mt Celia					
Date:	4/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q8		
Quadrat size:	20x20				
Vegetation group:	Cas Pauper over Acacia ligulata, senna art fil and Dod lob				
WP:	13				
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/Slow				
Soil (profile/field texture/soil surface):	Gradational/Loamy sand/Hard setting				
% Cover leaf litter:	40				
% Cover bare ground:	40				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	M Tree Mallee (> 8m)	Growth form:	S Shrub	Growth form:	r Shrub Mallee (< 8m)
Height:	6-12m	Height:	1-3m	Height:	0.25-0.5m
Crown cover %:	<1	Crown cover %:	M 30-70	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Casuarina pauper		Acacia ligulata		Ptilotus obovatus	
		Senna artemisioides subsp. filifolia		Maireana pyramidata	
		Dodonaea lobulata			
ALL SPECIES					
Casuarina pauper					
Acacia ligulata					
Senna artemisioides subsp. filifolia					
Dodonaea lobulata					
Ptilotus obovatus					
Maireana pyramidata					
Daviesia aphylla					
Scaevola spinescens					
Acacia tetragonophylla					
Rhagodia drummondii					
Austrostipa scabra					
Maireana planifolia					
Maireana tomentosa					
Enchylaena tomentosa var. tomentosa					
Maireana triptera					
Marsdenia australis					
Solanum lasiophyllum					
Outside					
Eucalyptus oleosa subsp. oleosa					
Hakea preissii					



Project Name: Mt Celia	
Date:	4/06/2020
Location:	Mt Celia
Quadrat size:	20x20
Vegetation group:	Mulga shrubland on rocky ironstone hills
WP:	46
Photo number:	47
Landform:	Hillock/Mound
Land surface/disturbance:	No effective disturbance
Coarse fragments on the surface (abundance/size/shape):	Very; abundant/Cobbly; or cobbles/Angular tabular
Rock outcrop (abundance/runoff):	Rocky/Moderately rapid
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Hard setting
% 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:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	V <10
Dominant taxa:	Acacia incurvaneura	Dominant taxa:	Senna artemisioides subsp. helmsii	Dominant taxa:	Ptilotus obovatus
			Dodonaea lobulata		
			Senna artemisioides subsp. filifolia		

- ALL SPECIES**
- Acacia incurvaneura
 - Senna artemisioides subsp. helmsii
 - Dodonaea lobulata
 - Senna artemisioides subsp. filifolia
 - Ptilotus obovatus
 - Eremophila pantonii
 - Eremophila oldfieldii subsp. angustifolia
 - Senna artemisioides subsp. artemisioides
 - Scaevola spinescens
 - Senna artemisioides subsp. xsturtii
 - Acacia mulganeura
 - Acacia burkittii
 - Enneapogon caeruleus
 - Maireana triptera
 - Solanum lasiophyllum
 - Maireana trichoptera
 - Acacia tetragonophylla
 - Austrostipa eremophila
 - Enchylaena tomentosa var. tomentosa

Outside



Project Name: Mt Celia					
Date:	4/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q11		
Quadrat size:	20x20				
Vegetation group:	Acacia aneura and Acacia burkittii on rocky basalt hills				
WP:	52				
Photo number:			48		
Landform:	Hillock/Mound				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Very: abundant/Cobbly: or cobbles/Subrounded				
Rock outcrop (abundance/runoff):	Rocky/Moderately rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Hard setting				
% Cover leaf litter:	10				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	
Height:	1-3m	Height:	0.5-1m	Height:	
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia burkittii		Ptilotus obovatus	
Acacia pteraneura				Chrysocephalum puteale	
ALL SPECIES					
Acacia aneura					
Acacia pteraneura					
Acacia burkittii					
Ptilotus obovatus					
Chrysocephalum puteale					
Acacia ligulata					
Acacia incurvaneura					
Scaevola spinescens					
Acacia mulganeura					
Acacia hemiteles					
Dodonaea rigida					
Senna artemisioides subsp. filifolia					
Maireana triptera					
Solanum lasiophyllum					
Enneapogon caerulescens					
Acacia ramulosa var. ramulosa					
Austrostipa eremophila					
Eriachne pulchella subsp. pulchella					
Maireana georgei					
Marsdenia australis					
Outside					
Hakea preissii					
Acacia tetragonophylla					
Eremophila latrobei subsp. latrobei					



Project Name: Mt Celia			
Date:	4/06/2020	Botanist:	Eren Reid
Location:	Mt Celia	Quadrat:	Q12
Quadrat size:	20x20		
Vegetation group:	Mulga shrubland on rocky ironstone hills		
WP:	64		
Photo number:	52		
Landform:	Hillock/Mound		
Land surface/disturbance:	No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):	Very; abundant/Cobbly; or cobbles/Subrounded tabular		
Rock outcrop (abundance/runoff):	Rocky/Moderately rapid		
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Hard setting		
% Cover leaf litter:	20		
% Cover bare ground:	70		

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:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia burkittii		Ptilotus obovatus	
Acacia mulganeura		Eremophila latrobei subsp. latrobei		Chrysocephalum puteale	

ALL SPECIES

Acacia aneura
Acacia mulganeura

Acacia burkittii
Eremophila latrobei subsp. latrobei

Ptilotus obovatus
Chrysocephalum puteale

Acacia incurvaneura
Acacia tetragonophylla
Scaevola spinescens
Dodonaea rigida
Dodonaea lobulata
Senna artemisioides subsp. helmsii
Solanum lasiophyllum
Enchylaena tomentosa var. tomentosa
Enneapogon caeruleus
Eriachne helmsii
Enteropogon ramosus
Maireana triptera

Outside



Project Name: Mt Celia					
Date:	4/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q13		
Quadrat size:	20x20				
Vegetation group:	Mulga shrubland (sandy)				
WP:	68				
Photo number:			53		
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/Clayey sand/Soft		
% Cover leaf litter:			20		
% 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:	3-6m	Height:	1-3m	Height:	0.25-0.5m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Scaevola spinescens		Ptilotus obovatus	
Acacia incurvaneura		Dodonaea lobulata			
Acacia mulganeura					
ALL SPECIES					
Acacia aneura					
Acacia incurvaneura					
Acacia mulganeura					
Scaevola spinescens					
Dodonaea lobulata					
Ptilotus obovatus					
Acacia ayersiana					
Acacia craspedocarpa					
Acacia pteraneura					
Solanum lasiophyllum					
Acacia tetragonophylla					
Senna artemisioides subsp. artemisioides					
Marsdenia australis					
Maireana tomentosa					
Eragrostis eriopoda					
Aristida contorta					
Enchylaena tomentosa var. tomentosa					
Outside					
Acacia ligulata					
Grevillea berryana					
Sida calyxhymenia					



Project Name: Mt Celia					
Date:	4/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q14		
Quadrat size:	20x20				
Vegetation group:	Acacia aneura and Acacia burkittii on rocky basalt hills				
WP:	71				
Photo number:	54-quadrat, 55 is general veg				
Landform:	Hillock/Mound				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Extremely; very abundant/Cobbly; or cobbles/Subrounded				
Rock outcrop (abundance/runoff):	Slightly rocky/Moderately rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	20				
% 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 %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia mulganeura		Ptilotus obovatus	
		Acacia burkittii			
		Scaevola spinescens			
		Ptilotus obovatus			
ALL SPECIES					
Acacia aneura					
Acacia mulganeura					
Acacia burkittii					
Scaevola spinescens					
Ptilotus obovatus					
Eremophila oldfieldii subsp. angustifolia					
Acacia tetragonophylla					
Acacia pteraneura					
Senna artemisioides subsp. filifolia					
Maireana trichoptera					
Maireana triptera					
Enneapogon caeruleus					
Solanum lasiophyllum					
Chrysocephalum puteale					
Maireana sedifolia					
Eragrostis setifolia					
Austrostipa eremophila					
Maireana tomentosa					
Outside					
Acacia ligulata					
Senna artemisioides subsp. artemisioides					
Hakea recurva subsp. recurva					



Project Name: Mt Celia					
Date:	5/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q15		
Quadrat size:	20x20				
Vegetation group:	Acacia aneura and Acacia burkittii on rocky basalt hills				
WP:	92				
Photo number:	60-63				
Landform:	Crest/Hill Crest				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Extremely; very abundant/Cobbly; or cobbles/Subrounded				
Rock outcrop (abundance/runoff):	Rockland/Very rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	10				
% Cover bare ground:	70				
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:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia mulganeura		Senna artemisioides subsp. artemisioides		Ptilotus obovatus	
		Acacia burkittii		Prostanthera albiflora	
ALL SPECIES					
Acacia mulganeura					
Senna artemisioides subsp. artemisioides					
Acacia burkittii					
Ptilotus obovatus					
Prostanthera albiflora					
Acacia aneura					
Psychrax suaveolens					
Acacia tetragonophylla					
Scaevola spinescens					
Senna artemisioides subsp. helmsii					
Eremophila latrobei subsp. latrobei					
Rhagodia drummondii					
Solanum lasiophyllum					
Enchylaena tomentosa var. tomentosa					
Abutilon otocarpum					
Abutilon oxycarpum					
Goodenia sp. (sterile)					
Portulaca oleracea					
Citrullus amarus*					
Enteropogon ramosus					
Cucumis myriocarpus*					
Cheilanthes lasiophylla					
Enneapogon caeruleus					
Maireana pyramidata					
Duperreya sericea					
Paspalidium clementii					
Dysphania kalpari					
Sida calyxhymenia					
Eremophila clarkei					
Outside					
Acacia murrayana					
Maireana triptera					



Project Name: Mt Celia					
Date:	5/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q16		
Quadrat size:	20x20				
Vegetation group:	Mulga over small rocky outcrops				
WP:	97				
Photo number:			70		
Landform:			Crest/Hill Crest		
Land surface/disturbance:			Limited clearing		
Coarse fragments on the surface (abundance/size/shape):			Very; abundant/Stony; stones/Subangular tabular		
Rock outcrop (abundance/runoff):			Rockland/Very rapid		
Soil (profile/field texture/soil surface):			Uniform/Sandy clay loam/Hard setting		
% Cover leaf litter:			40		
% Cover bare ground:			50		
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:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Philotheca brucei subsp. brucei		Ptilotus obovatus	
Acacia mulganeura		Sida ectogama			
		Scaevola spinescens			
ALL SPECIES					
Acacia aneura					
Acacia mulganeura					
Philotheca brucei subsp. brucei					
Sida ectogama					
Scaevola spinescens					
Ptilotus obovatus					
Acacia ayersiana					
Acacia pteraneura					
Acacia tetragonophylla					
Psychodax rigidula					
Rhagodia drummondii					
Dodonaea rigida					
Eremophila latrobei subsp. latrobei					
Psychodax suaveolens					
Senna glutinosa subsp. chatelainiana					
Acacia ligulata					
Acacia burkittii					
Eremophila oldfieldii subsp. angustifolia					
Cheilanthes lasiophylla					
Pimelea microcephala subsp. microcephala					
Enneapogon caeruleus					
Sclerolaena diacantha					
Alyogyne pinoniana					
Maireana triptera					
Outside					



Project Name: Mt Celia					
Date:	5/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q18		
Quadrat size:	20x20				
Vegetation group:	Acacia aneura and Acacia 79urkittii on rocky basalt hills				
WP:	112				
Photo number:	77				
Landform:	Hillock/Mound				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Very: abundant/Coarse gravelly: large pebbles/Subrounded tabular				
Rock outcrop (abundance/runoff):	Very rocky/Rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Hard setting				
% 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:	0.25-0.5m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia mulganeura		Acacia burkittii		Ptilotus obovatus	
		Senna artemisioides subsp. filifolia		Enneapogon caeruleus	
		Scaevola spinescens			
ALL SPECIES					
Acacia mulganeura					
Acacia burkittii					
Senna artemisioides subsp. filifolia					
Scaevola spinescens					
Ptilotus obovatus					
Enneapogon caeruleus					
Dodonaea lobulata					
Acacia tetragonophylla					
Senna artemisioides subsp. helmsii					
Senna artemisioides subsp. artemisioides					
Eremophila longifolia					
Hakea preissii					
Acacia aneura					
Maireana sedifolia					
Dodonaea rigida					
Senna glutinosa subsp. chatelainiana					
Maireana triptera					
Enchylaena tomentosa var. tomentosa					
Prostanthera albiflora					
Eriachne helmsii					
Enteropogon ramosus					
Cheilanthes lasiophylla					
Eremophila clarkii					
Abutilon oxycarpum					
Outside					
Psydraz suaveolens					



Project Name: Mt Celia					
Date:	5/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q19		
Quadrat size:	20x20				
Vegetation group:	Mulga over Maireana sedifolia and mixed sclerophyll shrubland				
WP:	124				
Photo number:			78		
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):			Uniform/Loamy sand/Firm		
% Cover leaf litter:			15		
% 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 %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia oswaldii		Acacia burkittii		Maireana sedifolia	
Acacia aneura		Hakea preissii		Senna artemisioides subsp. filifolia	
				Ptilotus obovatus	
ALL SPECIES					
Acacia oswaldii					
Acacia aneura					
Acacia burkittii					
Hakea preissii					
Maireana sedifolia					
Senna artemisioides subsp. filifolia					
Ptilotus obovatus					
Acacia ligulata					
Hakea recurva subsp. recurva					
Maireana pyramidata					
Atriplex bunburyana					
Marsdenia australis					
Sida calyxymenia					
Maireana tomentosa					
Aristida contorta					
Eragrostis eriopoda					
Austrostipa eremophila					
Enteropogon ramosus					
Solanum lasiophyllum					
Maireana glomerifolia					
Eremophila exilifolia					
Portulaca oleracea					
Sclerolaena cuneata					
Sclerolaena patentiscuspis					
Outside					



Project Name: Mt Celia					
Date:	5/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q20		
Quadrat size:	20x20				
Vegetation group:	Mulga shrubland on rocky ironstone hills				
WP:	135				
Photo number:			81		
Landform:			Hillock/Mound		
Land surface/disturbance:			No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):			Very: abundant/Cobbly; or cobbles/Subangular		
Rock outcrop (abundance/runoff):			Very slightly rocky/Slow		
Soil (profile/field texture/soil surface):			Uniform/Sandy clay loam/Firm		
% Cover leaf litter:			40		
% 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:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia mulganeura		Dodonaea lobulata		Ptilotus obovatus	
		Scaevola spinescens			
		Acacia tetragonophylla			
ALL SPECIES					
Acacia mulganeura					
Dodonaea lobulata					
Scaevola spinescens					
Acacia tetragonophylla					
Ptilotus obovatus					
Acacia ayersiana					
Senna artemisioides subsp. artemisioides					
Rhagodia drummondii					
Senna artemisioides subsp. filifolia					
Acacia ligulata					
Acacia caesaneura					
Maireana tomentosa					
Enneapogon caerulescens					
Marsdenia australis					
Austrostipa eremophila					
Enchylaena tomentosa var. tomentosa					
Outside					
Acacia burkittii					



Project Name: Mt Celia					
Date:	5/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q21		
Quadrat size:	20x20				
Vegetation group:	Mulga shrubland (sandy substrates)				
WP:	138				
Photo number:			92		
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):			Uniform/Loamy sand/Loose		
% Cover leaf litter:			70		
% 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 %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia ayersiana		Ptilotus obovatus	
Acacia incurvaneura		Acacia burkittii			
		Senna artemisioides subsp. filifolia			
ALL SPECIES					
Acacia aneura					
Acacia incurvaneura					
Acacia ayersiana					
Acacia burkittii					
Senna artemisioides subsp. filifolia					
Ptilotus obovatus					
Acacia ligulata					
Scaevola spinescens					
Rhagodia drummondii					
Amyema sp. Dead					
Solanum lasiophyllum					
Eragrostis eriopoda					
Sida calyxhymenia					
Enchylaena tomentosa var. tomentosa					
Maireana georgei					
Maireana triptera					
Marsdenia australis					
Outside					



Project Name: Mt Celia					
Date:	5/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q22		
Quadrat size:	20x20				
Vegetation group:	Mulga over chenopod shrubland				
WP:	145				
Photo number:			93		
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):			Uniform/Loamy sand/Loose		
% Cover leaf litter:			10		
% Cover bare ground:			70		
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 %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia ayersiana		Acacia caesaneura		Senna artemisioides subsp. filifolia	
Acacia aneura				Maireana pyramidata	
				Ptilotus obovatus	
ALL SPECIES					
Acacia ayersiana					
Acacia aneura					
Acacia caesaneura					
Senna artemisioides subsp. filifolia					
Maireana pyramidata					
Ptilotus obovatus					
Acacia incurvaneura					
Hakea lorea subsp. lorea					
Acacia pteraneura					
Maireana sedifolia					
Maireana triptera					
Eragrostis eriopoda					
Enneapogon caeruleus					
Atriplex bunburyana					
Solanum lasiophyllum					
Aristida contorta					
Enteropogon ramosus					
Austrostipa eremophila					
Dodonaea lobulata					
Acacia tetragonophylla					
Outside					
Acacia ligulata					



Project Name: Mt Celia					
Date:	5/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q23		
Quadrat size:	20x20				
Vegetation group:	Open Mulga shrubland (sandy substrate)				
WP:	153				
Photo number:			95		
Landform:			flat/pl		
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):			Uniform/Clayey sand/Loose		
% Cover leaf litter:			40		
% Cover bare ground:			70		
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:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	V <10	Crown cover %:	V <10
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia mulganeura		Acacia ramulosa var. ramulosa		Ptilotus obovatus	
		Senna artemisioides subsp. filifolia		Eragrostis eriopoda	
ALL SPECIES					
Acacia mulganeura					
Acacia ramulosa var. ramulosa					
Senna artemisioides subsp. filifolia					
Ptilotus obovatus					
Eragrostis eriopoda					
Acacia aneura					
Acacia incurvaneura					
Acacia pteraneura					
Acacia tetragonophylla					
Senna artemisioides subsp. artemisioides					
Eremophila exilifolia					
Psydrax suaveolens					
Brachychiton gregorii					
Solanum lasiophyllum					
Enneapogon caerulescens					
Scaevola spinescens					
Marsdenia australis					
Aristida contorta					
Outside					
Acacia ligulata					



Project Name: Mt Celia					
Date:	5/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q24		
Quadrat size:	20x20				
Vegetation group:	mulga thicket -drainage				
WP:	160				
Photo number:			96-104		
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/Slow		
Soil (profile/field texture/soil surface):			Uniform/Clay loam/Cracking		
% Cover leaf litter:			80		
% Cover bare ground:			20		
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 %:	M 30-70	Crown cover %:	M 30-70	Crown cover %:	M 30-70
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia incurvaneura		Acacia burkittii		Maireana pyramidata	
Acacia ayersiana				Ptilotus obovatus	
ALL SPECIES					
Acacia incurvaneura					
Acacia ayersiana					
Acacia burkittii					
Maireana pyramidata					
Ptilotus obovatus					
Eremophila longifolia					
Hakea lorea subsp. lorea					
Acacia tetragonophylla					
Eremophila clarkei					
Eremophila exilifolia					
Brachychiton gregorii					
Acacia mulganeura					
Senna artemisioides subsp. artemisioides					
Senna artemisioides subsp. filifolia					
Rhagodia drummondii					
Marsdenia australis					
Amyema gibberula var. gibberula					
Enchylaena tomentosa var. tomentosa					
Scaevola spinescens					
Psychotria suaveolens					
Aristida contorta					
Outside					



Project Name: Mt Celia					
Date:	5/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q25		
Quadrat size:	20x20				
Vegetation group:	Mulga thicket- drainage				
WP:	162				
Photo number:			107		
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/Slow		
Soil (profile/field texture/soil surface):			Uniform/Loamy sand/Loose		
% Cover leaf litter:			80		
% 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 %:	M 30-70	Crown cover %:	M 30-70
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia ayersiana		Acacia ramulosa var. ramulosa		Ptilotus obovatus	
ALL SPECIES					
Acacia ayersiana					
Acacia ramulosa var. ramulosa					
Ptilotus obovatus					
Senna artemisioides subsp. artemisioides					
Senna artemisioides subsp. filifolia					
Acacia incurvaneura					
Acacia mulganeura					
Psychodax rigidula					
Acacia aneura					
Acacia burkittii					
Eremophila latrobei subsp. latrobei					
Rhagodia drummondii					
Psychodax suaveolens					
Pimelea microcephala subsp. microcephala					
Monachather paradoxus					
Marsdenia australis					
Acacia tetragonophylla					
Outside					



Project Name: Mt Celia					
Date:	6/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q26		
Quadrat size:	20x20				
Vegetation group:	Mulga shrubland on rocky ironstone hills				
WP:	206				
Photo number:			122		
Landform:			Hillock/Mound		
Land surface/disturbance:			No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):			Very; abundant/Coarse gravelly; large pebbles/Angular		
Rock outcrop (abundance/runoff):			Very rocky/Slow		
Soil (profile/field texture/soil surface):			Uniform/Sandy clay loam/Firm		
% Cover leaf litter:			40		
% 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:	
Casuarina pauper		Acacia ramulosa var. ramulosa		Sida ectogama	
Acacia mulganeura		Scaevola spinescens		Dodonaea lobulata	
				Ptilotus obovatus	
ALL SPECIES					
Casuarina pauper					
Acacia mulganeura					
Acacia ramulosa var. ramulosa					
Scaevola spinescens					
Sida ectogama					
Dodonaea lobulata					
Ptilotus obovatus					
Eremophila oldfieldii subsp. angustifolia					
Rhagodia drummondii					
Hakea preissii					
Acacia tetragonophylla					
Senna artemisioides subsp. filifolia					
Maireana triptera					
Maireana sedifolia					
Eragrostis eriopoda					
Maireana georgei					
Maireana tomentosa					
Enchylaena tomentosa var. tomentosa					
Solanum lasiophyllum					
Aristida contorta					
Outside					
Acacia aneura					
Acacia ligulata					
Daviesia aphylla					
Eremophila longifolia					
Eremophila latrobei subsp. latrobei					
Dodonaea rigida					
Enneapogon caerulescens					



Project Name: Mt Celia					
Date:	6/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q28		
Quadrat size:	20x20				
Vegetation group:	Mulga over Maireana sedifolia and mixed sclerophyll shrubland				
WP:	245				
Photo number:	126				
Landform:	Flat/Plain				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	No qualifier; common/Coarse gravelly; large pebbles/Subrounded				
Rock outcrop (abundance/runoff):	No bedrock exposed/Slow				
Soil (profile/field texture/soil surface):	Uniform/Loamy sand/Firm				
% Cover leaf litter:	40				
% Cover bare ground:	70				
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 %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia burkittii		Maireana sedifolia	
		Acacia ligulata		Ptilotus obovatus	
				Dodonaea lobulata	
				Senna artemisioides subsp. filifolia	
				Enneapogon caeruleus	
				Solanum lasiophyllum	
				Austrostipa eremophila	
				Enchylaena tomentosa var. tomentosa	
				Eragrostis eriopoda	
				Maireana triptera	
				Solanum nummularium	
				Austrostipa scabra	
				Sclerolaena densiflora	
				Aristida contorta	
ALL SPECIES					
Acacia aneura					
Acacia burkittii					
Acacia ligulata					
Maireana sedifolia					
Ptilotus obovatus					
Dodonaea lobulata					
Senna artemisioides subsp. filifolia					
Enneapogon caeruleus					
Solanum lasiophyllum					
Austrostipa eremophila					
Enchylaena tomentosa var. tomentosa					
Eragrostis eriopoda					
Maireana triptera					
Solanum nummularium					
Austrostipa scabra					
Sclerolaena densiflora					
Aristida contorta					
Outside					
Casuarina pauper					
Acacia ayersiana					
Eremophila longifolia					



Project Name: Mt Celia					
Date:	6/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q29		
Quadrat size:	20x20				
Vegetation group:	Mulga thicket (drainage)				
WP:	254				
Photo number:	127				
Landform:	Open depression (vale)/Drainage depression				
Land surface/disturbance:	No effective disturbance except grazing by hoofed animals				
Coarse fragments on the surface (abundance/size/shape):	No coarse fragments				
Rock outcrop (abundance/runoff):	No bedrock exposed/Moderately rapid				
Soil (profile/field texture/soil surface):	Uniform/Loamy sand/Firm				
% Cover leaf litter:	50				
% Cover bare ground:	40				
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 %:	V <10	Crown cover %:	M 30-70	Crown cover %:	M 30-70
Dominant taxa:		Dominant taxa:		Dominant taxa:	
	Hakea lorea subsp. lorea		Acacia burkittii		Eremophila forrestii subsp. forrestii
	Acacia ayersiana		Acacia aneura		Acacia tetragonophylla
					Enchylaena tomentosa var. tomentosa
ALL SPECIES					
Hakea lorea subsp. lorea					
Acacia ayersiana					
Acacia burkittii					
Acacia aneura					
Eremophila forrestii subsp. forrestii					
Acacia tetragonophylla					
Enchylaena tomentosa var. tomentosa					
Eremophila longifolia					
Senna artemisioides subsp. artemisioides					
Senna artemisioides subsp. filifolia					
Acacia ligulata					
Rhagodia drummondii					
Acacia murrayana					
Solanum lasiophyllum					
Enteropogon ramosus					
Enneapogon caerulescens					
Ptilotus obovatus					
Cenchrus ciliaris*					
Maireana pyramidata					
Eragrostis eriopoda					
Dysphania kalpari					
Aristida contorta					
Austrostipa eremophila					
Outside					



Project Name: Mt Celia					
Date:	6/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q30		
Quadrat size:	20x20				
Vegetation group:	Mulga over small rocky outcrops				
WP:	259				
Photo number:			128		
Landform:			Hillock/Mound		
Land surface/disturbance:			No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):			Very; abundant/Coarse gravelly; large pebbles/Subangular tabular		
Rock outcrop (abundance/runoff):			Rockland/Rapid		
Soil (profile/field texture/soil surface):			Uniform/Sandy clay loam/Firm		
% Cover leaf litter:			20		
% Cover bare ground:			70		
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:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Philotheca brucei subsp. brucei		Ptilotus obovatus	
Acacia mulganeura		Sida ectogama			
		Eremophila latrobei subsp. latrobei			
ALL SPECIES					
Acacia aneura					
Acacia mulganeura					
Philotheca brucei subsp. brucei					
Sida ectogama					
Eremophila latrobei subsp. latrobei					
Ptilotus obovatus					
Senna artemisioides subsp. artemisioides					
Acacia tetragonophylla					
Psyrax suaveolens					
Dodonaea rigida					
Senna artemisioides subsp. filifolia					
Acacia burkittii					
Solanum lasiophyllum					
Maireana triptera					
Enneapogon caerulescens					
Psyrax rigidula					
Cheilanthes lasiophylla					
Enchylaena tomentosa var. tomentosa					
Teucrium teucriiflorum					
Maireana georgei					
Abutilon oxycarpum					
Aristida contorta					
Dysphania kalpari					
Salsola australis					
Cucumis myriocarpus*					
Outside					



Project Name: Mt Celia					
Date:	6/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q31		
Quadrat size:	20x20				
Vegetation group:	Open Mulga shrubland on ironstone flats				
WP:	266				
Photo number:			137		
Landform:			Flat/Plain		
Land surface/disturbance:			No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):			Moderately; many/Coarse gravelly; large pebbles/Subangular		
Rock outcrop (abundance/runoff):			No bedrock exposed/Slow		
Soil (profile/field texture/soil surface):			Uniform/Sandy clay loam/Firm		
% Cover leaf litter:			10		
% Cover bare ground:			70		
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 %:	V <10	Crown cover %:	S 10-30	Crown cover %:	V <10
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia burkittii		Scaevola spinescens	
				Senna artemisioides subsp. helmsii	
				Dodonaea lobulata	
				Acacia tetragonophylla	
				Acacia pteraneura	
				Senna artemisioides subsp. artemisioides	
				Aristida contorta	
				Senna artemisioides subsp. filifolia	
				Solanum lasiophyllum	
				Maireana triptera	
				Hakea lorea subsp. lorea	
				Ptilotus obovatus	
				Enneapogon caerulescens	
				Eremophila forrestii subsp. forrestii	
				Dodonaea rigida	
				Marsdenia australis	
				Maireana georgei	
ALL SPECIES					
Acacia aneura					
Acacia burkittii					
Scaevola spinescens					
Senna artemisioides subsp. helmsii					
Dodonaea lobulata					
Acacia tetragonophylla					
Acacia pteraneura					
Senna artemisioides subsp. artemisioides					
Aristida contorta					
Senna artemisioides subsp. filifolia					
Solanum lasiophyllum					
Maireana triptera					
Hakea lorea subsp. lorea					
Ptilotus obovatus					
Enneapogon caerulescens					
Eremophila forrestii subsp. forrestii					
Dodonaea rigida					
Marsdenia australis					
Maireana georgei					
Outside					
Acacia ligulata					



Project Name: Mt Celia					
Date:	7/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q32		
Quadrat size:	20x20				
Vegetation group:	Open Mulga shrubland on ironstone flats				
WP:	295				
Photo number:	138				
Landform:	Flat/Plain				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Very: abundant/Coarse gravelly; large pebbles/Subrounded				
Rock outcrop (abundance/runoff):	No bedrock exposed/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	10				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia mulganeura		Scaevola spinescens		Ptilotus obovatus	
Acacia ayersiana		Senna glutinosa subsp. chatelainiana			
		Acacia tetragonophylla			
ALL SPECIES					
Acacia mulganeura					
Acacia ayersiana					
Scaevola spinescens					
Senna glutinosa subsp. chatelainiana					
Acacia tetragonophylla					
Ptilotus obovatus					
Sida ectogama					
Acacia ligulata					
Senna artemisioides subsp. artemisioides					
Teucrium teucriflorum					
Acacia aneura					
Senna artemisioides subsp. filifolia					
Eremophila forrestii subsp. forrestii					
Rhagodia drummondii					
Maireana triptera					
Aristida contorta					
Ptilotus schwartzii					
Solanum lasiophyllum					
Acacia craspedocarpa					
Acacia pteraneura					
Marsdenia australis					
Enchylaena tomentosa var. tomentosa					
Austrostipa elegantissima					
Outside					
Eremophila oldfieldii subsp. angustifolia					
Eremophila longifolia					
Acacia burkittii					



Project Name: Mt Celia					
Date:	7/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q33		
Quadrat size:	20x20				
Vegetation group:	Acacia quadrimarginea shrubland over granite bedrock				
WP:	305				
Photo number:		139 and 140			
Landform:		Hillock/Mound			
Land surface/disturbance:		No effective disturbance			
Coarse fragments on the surface (abundance/size/shape):		No qualifier; common/Cobbly; or cobbles/Subangular			
Rock outcrop (abundance/runoff):		Rockland/Slow			
Soil (profile/field texture/soil surface):		Uniform/Loamy sand/Loose			
% Cover leaf litter:		10			
% Cover bare ground:		80			
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:	0.25-0.5m
Crown cover %:	I <1	Crown cover %:	V <10	Crown cover %:	V <10
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia quadrimarginea		Acacia tetragonophylla		Eremophila forrestii subsp. forrestii	
Acacia mulganeura		Acacia aneura			
ALL SPECIES					
Acacia quadrimarginea					
Acacia mulganeura					
Acacia tetragonophylla					
Acacia aneura					
Eremophila forrestii subsp. forrestii					
Acacia burkittii					
Solanum lasiophyllum					
Eragrostis eriopoda					
Eriachne helmsii					
Aristida contorta					
Enneapogon caerulescens					
Ptilotus obovatus					
Scaevola spinescens					
Dodonaea rigida					
Dodonaea lobulata					
Chrysocephalum puteale					
Austrostipa scabra					
Outside					



Project Name: Mt Celia					
Date:	7/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q34		
Quadrat size:	20x20				
Vegetation group:	Acacia quadrimarginea shrubland over granite bedrock				
WP:	326				
Photo number:	141				
Landform:	Hillock/Mound				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	No qualifier; common/Coarse gravelly; large pebbles/Subangular				
Rock outcrop (abundance/runoff):	Rockland/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	10				
% 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 %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia quadrimarginea		Acacia aneura		Eremophila forrestii subsp. forrestii	
		Acacia burkittii		Ptilotus obovatus	
ALL SPECIES					
Acacia quadrimarginea					
Acacia aneura					
Acacia burkittii					
Eremophila forrestii subsp. forrestii					
Ptilotus obovatus					
Acacia tetragonophylla					
Enneapogon caerulescens					
Solanum lasiophyllum					
Dodonaea lobulata					
Aristida contorta					
Eragrostis eriopoda					
Senna artemisioides subsp. filifolia					
Dodonaea rigida					
Eriachne helmsii					
Senna artemisioides subsp. artemisioides					
Cheilanthes lasiophylla					
Austrostipa scabra					
Chrysocephalum puteale					
Outside					



Project Name: Mt Celia					
Date:	7/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q35		
Quadrat size:	20x20				
Vegetation group:	Mulga over chenopod shrubland				
WP:	349				
Photo number:			142		
Landform:			Open depression (vale)/Drainage depression		
Land surface/disturbance:			No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):			Very slightly: very few/Fine gravelly; small pebbles/Subrounded		
Rock outcrop (abundance/runoff):			No bedrock exposed/Moderately rapid		
Soil (profile/field texture/soil surface):			Uniform/Clay loam/Loose		
% Cover leaf litter:			20		
% 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:	3-6m	Height:	1-3m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	V <10	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia mulganeura		Frankenia setosa	
		Hakea preissii		Maireana pyramidata	
		Acacia ligulata		Ptilotus obovatus	
ALL SPECIES					
Acacia aneura					
Acacia mulganeura					
Hakea preissii					
Acacia ligulata					
Frankenia setosa					
Maireana pyramidata					
Ptilotus obovatus					
Senna artemisioides subsp. filifolia					
Acacia burkittii					
Eremophila pantonii					
Scaevola spinescens					
Maireana sedifolia					
Acacia ayersiana					
Acacia pteraneura					
Sclerolaena cuneata					
Atriplex bunburyana					
Dodonaea lobulata					
Maireana glomerifolia					
Maireana georgei					
Maireana tomentosa					
Enneapogon caeruleus					
Eriachne pulchella subsp. pulchella					
Senna glutinosa subsp. chatelainiana					
Maireana triptera					
Salsola australis					
Teucrium teucriiflorum					
Maireana trichoptera					
Eucalyptus lesouefii					
Outside					



Project Name: Mt Celia					
Date:	7/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q36		
Quadrat size:	20x20				
Vegetation group:	Casuarina pauper and Acacia aneura over sclerophyll shrubland on rocky laterite hills				
WP:	389				
Photo number:	146				
Landform:	Crest/Hill Crest				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Very; abundant/Coarse gravelly; large pebbles/Subrounded				
Rock outcrop (abundance/runoff):	Rocky/Rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	10				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Dodonaea lobulata		Ptilotus obovatus	
Casuarina pauper		Maireana sedifolia			
ALL SPECIES					
Acacia aneura					
Casuarina pauper					
Dodonaea lobulata					
Maireana sedifolia					
Ptilotus obovatus					
Sida ectogama					
Senna artemisioides subsp. artemisioides					
Senna artemisioides subsp. filifolia					
Rhagodia drummondii					
Acacia mulganeura					
Acacia tetragonophylla					
Scaevola spinescens					
Eremophila latrobei subsp. latrobei					
Atriplex bunburyana					
Maireana trichoptera					
Maireana georgei					
Chenopodium gaudichaudianum					
Enchylaena tomentosa var. tomentosa					
Senna sp. Meekatharra					
Aristida contorta					
Sclerolaena diacantha					
Sclerolaena densiflora					
Outside					
Acacia burkittii					
Acacia ramulosa var. ramulosa					



Project Name: Mt Celia					
Date:	7/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q37		
Quadrat size:	20x20				
Vegetation group:	Casuarina pauper and Acacia aneura over sclerophyll shrubland on rocky laterite hills				
WP:	404				
Photo number:	148				
Landform:	Mid slope/Hillslope				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Very; abundant/Stone; stones/Subrounded				
Rock outcrop (abundance/runoff):	Rocky/Rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	20				
% 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:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Casuarina pauper		Dodonaea lobulata		Sida ectogama	
Acacia aneura		Maireana sedifolia		Ptilotus obovatus	
ALL SPECIES					
Casuarina pauper					
Acacia aneura					
Dodonaea lobulata					
Maireana sedifolia					
Sida ectogama					
Ptilotus obovatus					
Eremophila latrobei subsp. latrobei					
Acacia tetragonophylla					
Eremophila oppositifolia subsp. angustifolia					
Scaevola spinescens					
Senna artemisioides subsp. filifolia					
Senna artemisioides subsp. artemisioides					
Rhagodia drummondii					
Maireana pyramidata					
Cheilanthes lasiophylla					
Dodonaea rigida					
Atriplex bunburyana					
Outside					



Project Name: Mt Celia					
Date:	7/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q38		
Quadrat size:	20x20				
Vegetation group:	Casuarina pauper and Acacia aneura over sclerophyll shrubland on rocky laterite hills				
WP:	415				
Photo number:	151				
Landform:	Mid slope/Hillslope				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Very; abundant/Coarse gravelly; large pebbles/Subangular				
Rock outcrop (abundance/runoff):	Rockland/Rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	10				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	Y Shrub Mallee (< 8m)	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Casuarina pauper		Dodonaea lobulata		Frankenia ?fecunda	
Acacia aneura		Eremophila pantonii			
		Grevillea acuaria			
ALL SPECIES					
Casuarina pauper					
Acacia aneura					
Dodonaea lobulata					
Eremophila pantonii					
Grevillea acuaria					
Frankenia ?fecunda					
Acacia mulganeura					
Senna sp. Meekeatharra					
Scaevola spinescens					
Exocarpos aphyllus					
Maireana sedifolia					
Maireana pyramidata					
Senna artemisioides subsp. artemisioides					
Acacia tetragonophylla					
Eremophila oppositifolia subsp. angustifolia					
Eremophila latrobei subsp. latrobei					
Sida ectogama					
Maireana glomerifolia					
Ptilotus obovatus					
Outside					



Project Name: Mt Celia					
Date:	8/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q39		
Quadrat size:	20x20				
Vegetation group:	Casuarina pauper and Acacia aneura over sclerophyll shrubland on rocky laterite hills				
WP:	437				
Photo number:		152-153			
Landform:		Hillock/Mound			
Land surface/disturbance:		No effective disturbance			
Coarse fragments on the surface (abundance/size/shape):		Very: abundant/Coarse gravelly; large pebbles/Subrounded			
Rock outcrop (abundance/runoff):		Rocky/Rapid			
Soil (profile/field texture/soil surface):		Uniform/Sandy clay loam/Firm			
% Cover leaf litter:		10			
% Cover bare ground:		70			
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	Y Shrub Mallee (< 8m)	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Casuarina pauper		Eremophila pantonii		Dodonaea lobulata	
Acacia aneura		Eremophila oppositifolia subsp. angustifolia		Maireana sedifolia	
ALL SPECIES					
Casuarina pauper					
Acacia aneura					
Eremophila pantonii					
Eremophila oppositifolia subsp. angustifolia					
Dodonaea lobulata					
Maireana sedifolia					
Sida ectogama					
Acacia tetragonophylla					
Senna artemisioides subsp. artemisioides					
Eremophila latrobei subsp. latrobei					
Callitris preissii					
Grevillea acurata					
Senna artemisioides subsp. filifolia					
Scaevola spinescens					
Ptilotus obovatus					
Olearia muelleri					
Frankenia ?fecunda					
Maireana trichoptera					
Maireana glomerifolia					
Hakea preissii					
Enchylaena tomentosa var. tomentosa					
Eremophila metallicorum					
Outside					



Project Name: Mt Celia					
Date:	8/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q40		
Quadrat size:	20x20				
Vegetation group:	Casuarina pauper and Acacia aneura over sclerophyll shrubland on rocky laterite hills				
WP:	441				
Photo number:		154-155			
Landform:		Hillock/Mound			
Land surface/disturbance:		No effective disturbance			
Coarse fragments on the surface (abundance/size/shape):		Very: abundant/Coarse gravelly; large pebbles/Subangular			
Rock outcrop (abundance/runoff):		Rocky/Moderately rapid			
Soil (profile/field texture/soil surface):		Uniform/Sandy clay loam/Firm			
% Cover leaf litter:		10			
% 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 %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Casuarina pauper		Acacia burkittii		Ptilotus obovatus	
Eucalyptus salubris		Eremophila pantonii		Maireana sedifolia	
Acacia mulganeura				Dodonaea lobulata	
ALL SPECIES					
Casuarina pauper					
Eucalyptus salubris					
Acacia mulganeura					
Acacia burkittii					
Eremophila pantonii					
Ptilotus obovatus					
Maireana sedifolia					
Dodonaea lobulata					
Eremophila oppositifolia subsp. angustifolia					
Acacia caesaneura					
Eremophila latrobei subsp. latrobei					
Sida ectogama					
Senna sp. Meekatharra					
Senna cardiosperma					
Scaevola spinescens					
Senna artemisioides subsp. filifolia					
Maireana triptera					
Maireana tomentosa					
Senna artemisioides subsp. artemisioides					
Rhagodia drummondii					
Frankenia ?fecunda					
Outside					



Project Name: Mt Celia					
Date:	8/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q41		
Quadrat size:	20x20				
Vegetation group:	Casuarina pauper and Acacia aneura over sclerophyll shrubland on rocky laterite hills				
WP:	442				
Photo number:		156 and 157			
Landform:		Simple slope/Hillslope			
Land surface/disturbance:		No effective disturbance			
Coarse fragments on the surface (abundance/size/shape):		Very: abundant/Coarse gravelly; large pebbles/Subrounded			
Rock outcrop (abundance/runoff):		Rocky/Moderately rapid			
Soil (profile/field texture/soil surface):		Uniform/Sandy clay loam/Firm			
% Cover leaf litter:		20			
% 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:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Casuarina pauper		Eremophila pantonii		Maireana sedifolia	
Eucalyptus lesouefii		Acacia caesaneura		Dodonaea lobulata	
				Ptilotus obovatus	
ALL SPECIES					
Casuarina pauper					
Eucalyptus lesouefii					
Eremophila pantonii					
Acacia caesaneura					
Maireana sedifolia					
Dodonaea lobulata					
Ptilotus obovatus					
Acacia tetragonophylla					
Senna artemisioides subsp. artemisioides					
Senna artemisioides subsp. filifolia					
Senna sp. Meekeatharra					
Senna cardiosperma					
Olearia muelleri					
Sida ectogama					
Scaevola spinescens					
Maireana triptera					
Solanum lasiophyllum					
Maireana trichoptera					
Outside					



Project Name: Mt Celia					
Date:	8/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q42		
Quadrat size:	20x20				
Vegetation group:	Mulga over Eremophila forrestii on large rocky granite/basalt hills				
WP:	488				
Photo number:			158		
Landform:			Upper 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 rocky/Rapid		
Soil (profile/field texture/soil surface):			Uniform/Sandy clay loam/Firm		
% Cover leaf litter:			30		
% Cover bare ground:			70		
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	Y Shrub Mallee (< 8m)	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Phllotheca brucei subsp. brucei		Eremophila forrestii subsp. forrestii	
Acacia incurvaneura		Eremophila latrobei subsp. latrobei		Ptilotus obovatus	
Acacia mulganeura					
ALL SPECIES					
Acacia aneura					
Acacia incurvaneura					
Acacia mulganeura					
Phllotheca brucei subsp. brucei					
Eremophila latrobei subsp. latrobei					
Eremophila forrestii subsp. forrestii					
Ptilotus obovatus					
Acacia craspedocarpa					
Solanum lasiophyllum					
Cheilanthes sieberi subsp. sieberi					
Eriachne pulchella subsp. pulchella					
Marsdenia australis					
Paspalidium clementii					
Enteropogon ramosus					
Dodonaea rigida					
Psydrax rigidula					
Psydrax suaveolens					
Eriachne helmsii					
Outside					



Project Name: Mt Celia					
Date:	8/06/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q43		
Quadrat size:	20x20				
Vegetation group:	Mulga over Eremophila forrestii on large rocky granite/basalt hills				
WP:	489				
Photo number:			159		
Landform:	Lower slope/Hillslope				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Very; abundant/Cobbly; or cobbles/Subangular				
Rock outcrop (abundance/runoff):	Very slightly rocky/Rapid				
Soil (profile/field texture/soil surface):	Uniform/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:	1-3m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia incurvaneura		Eremophila forrestii subsp. forrestii		Ptilotus obovatus	
Acacia mulganeura					
ALL SPECIES					
Acacia incurvaneura					
Acacia mulganeura					
Eremophila forrestii subsp. forrestii					
Ptilotus obovatus					
Eremophila latrobei subsp. latrobei					
Senna sp. Meekatharra					
Solanum lasiophyllum					
Ptilotus schwartzii					
Acacia aneura					
Cheilanthes sieberi subsp. sieberi					
Austrostipa eremophila					
Aristida contorta					
Paspalidium clementii					
Enteropogon ramosus					
Eriachne helmsii					
Outside					



APPENDIX F2 – 2020 Detailed Flora and Vegetation Survey Part 2



DETAILED FLORA AND
VEGETATION SURVEY OF THE MT
CELIA PROJECT AREA
Part 2- September 2020

Prepared for:



Prepared by: **Native Vegetation Solutions**
PO Box 41
KALGOORLIE WA 6430
Telephone: 08 9021 5818
Mobile: 0407 998 953
E-mail: eren@nativevegsolutions.com.au
ABN: 63 584 896 400

FINAL
V2.0
December 2020

EXECUTIVE SUMMARY

Legacy Iron Ore Ltd (ASX: LCY) has gold interests and is the operator of its Mt Celia Project in the Murchison Region of Western Australia. LCY provided Native Vegetation Solutions (NVS) with a survey area which encompasses the main mining areas as well as other infrastructure related to mining the Mt Celia mineral resource. The location of this survey area is approximately 169 km northeast of Kalgoorlie-Boulder, and approximately 89km south of Laverton in Western Australia.

The survey area, for the purposes of this report, encompasses an area totalling approximately 2,029 ha, which intersects Mining Tenements M39/1123, M39/1125, M39/1126, M39/1127, M39/1128 and Exploration License E39/1443. The stage 1 survey in June 2020 only covered an area of 1,696 hectares. LCY increased the survey area for the second stage of the survey to enable additional area for infrastructure layout. At this stage, the final footprint of mining related disturbances is yet to be finalised, however will be encompassed entirely within the survey area, and is expected to be approximately 400 hectares.

The survey area is located in the Eastern Murchison IBRA subregion. The vegetation of the Eastern Murchison botanical subregion is dominated by mulga woodlands and is often rich in ephemerals, hummock grasslands, saltbush shrublands and *Tecticornia* shrublands (CALM, 2002).

The EPBC Protected Matters Search Tool revealed that the survey area may contain habitat for the invasive weed species *Carrichtera annua* (Ward's Weed) and *Cenchrus ciliaris* (Buffel Grass) (DAWE, 2020). The EPBC Protected Matters report also indicated no TECs or Conservation Reserves within the requested search area.

The DBCA database searches revealed a potential for no Threatened and 10 Priority Flora species to occur within a 50km radius of the survey area (DBCA, 2020a). No known locations of these Flora occur within the survey area, while the closest location occurs approximately 5.8 km southwest of the survey area.

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

The PEC/TEC search (DBCA, 2020) 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, 2020).

No water bodies were identified within the survey area via the CPS Map Viewer (DWER, 2020).

The survey area lies south of the 26th parallel, however receives average annual rainfall of approximately 284.8mm (BOM, 2020), 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.

Twelve vegetation groups were identified during this survey, largely following topographical features and dominant species. Mapping of the 12 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.

One hundred and twenty-five species were recorded within the survey area with 117 species recorded within quadrats. Twenty-nine families and 58 genera were found. These are listed in Appendix E, per Quadrat as well as per vegetation group. Of the native species, Fabaceae had the highest representation, with 26 species from 3 genera, dominated by *Acacia*. Chenopodiaceae and Poaceae were the next best represented families with 20 species and 16 species respectively.

Of the 125 taxa recorded seven of these were introduced weed species. *Citrullus amarus* (Pie Melon) *Cucumis myriocarpus* (Prickly Paddy Melon) and *Cenchrus ciliaris* (Buffel Grass) were captured within the quadrat sampling, whilst *Schinus mollee* var. *areira* (Pepper Tree), *Nerium oleander* (Oleander Tree), *Yucca aloifolia* (Yucca Tree), and *Tamarix aphylla* (Athel pine) were recorded from a single location within the vicinity of the the old Mt Celia homestead.

Of the seven non-native species above, only *Tamarix aphylla* (Athel pine) is a declared pest- s22(2) in the state of Western Australia.

The most common and widespread species was *Ptilotus obovatus*, which was recorded within all 43 quadrats. Its canopy cover was 10-30%. The next most common and widespread species was *Acacia aneura*, recorded in 34 quadrats, with a canopy cover between 10-30%.

There were 30 taxa recorded from within a single site, Q15. Of these, two were non-native species.

No Threatened species were recorded during the survey.

No Priority species were identified in the survey area.

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 Murchison 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 stage of the detailed flora and vegetation survey, incorporating the Winter and Spring surveys of 2020.

TABLE OF CONTENTS

Page No.

EXECUTIVESUMMARY	i
1 INTRODUCTION	5
1.1 BACKGROUND.....	5
1.2 PURPOSE AND SCOPE.....	7
2 EXISTING ENVIRONMENT	8
2.1 CLIMATE.....	8
2.1.1 Temperature.....	8
2.1.2 Rainfall.....	8
2.2 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA (IBRA) REGION.....	10
2.3 LANDFORMS AND SOILS.....	10
2.4 BOTANICAL SUBREGION AND EXISTING VEGETATION.....	10
3 METHODS	10
3.1 PERSONNEL AND REPORTING.....	10
3.2 PRELIMINARY DESKTOP STUDY.....	10
3.2.1 Environment Protection and Biodiversity Conservation Act Protected Matters.....	11
3.2.2 Threatened Flora and Communities.....	11
3.2.3 Environmentally Sensitive Areas (ESAs) and Conservation Reserves.....	11
3.2.4 Vegetation Type, Extent and Status.....	11
3.2.5 Wetlands.....	11
3.2.6 Dieback.....	11
3.3 SITE INVESTIGATION.....	11
3.3.1 Licenses.....	12
3.3.2 Field Methods.....	12
3.3.3 Post-Field Methods.....	13
3.3.4 Mapping.....	13
3.3.5 IBSA Data Package.....	13
3.4 NOMENCLATURE AND TAXONOMY.....	14
3.5 LIMITATIONS.....	14
4 RESULTS	15
4.1 PRELIMINARY DESKTOP ASSESSMENT.....	15
4.1.1 EPBC Protected Matters Search Tool.....	15
4.1.2 Threatened Flora and Communities.....	15
4.1.3 Environmentally Sensitive Areas and Conservation Reserves.....	15
4.1.4 Vegetation Type, Extent and Status.....	15
4.1.5 Wetlands.....	16
4.1.6 Dieback.....	16
4.2 FIELD ASSESSMENT.....	16
4.2.1 Vegetation of the Survey Area.....	16
4.2.2 Flora of the Survey Area.....	25
5 DISCUSSION	27
6 IMPACT ASSESSMENT	28
6.1 THREATENING PROCESSES.....	28
7 CONCLUSIONS AND RECOMMENDATIONS	29
8 REFERENCES	30
9 GLOSSARY	32

FIGURES

Figure 1: Regional Location of the Mt Celia Project Area 6
Figure 2: Mean temperature ranges for Laverton Aero Meteorological Station (BOM, 2020)..... 8
Figure 3: Rainfall data for the Laverton Aero Meteorological Station (BOM, 2020) 9
Figure 4: Rainfall data for the Edjudina Meteorological Station (BOM, 2020) 9
Figure 5: PATN Analysis of Dominant Species into 12 groups 22
Figure 6: PATN Analysis of All Species into 12 groups 24
Figure 7: Species Accumulation Curve for the 43 sampled quadrats 26

TABLES

Table 1: List of potential survey limitations 14
Table 2: Summary of information regarding Pre-European and current vegetation extent of
vegetation association 18 within the survey area 16
Table 3: Vegetation Group Extent within Survey Area..... 19

APPENDICES

Appendix A - EPBC and Other Government Database Search Results 35
Appendix B - Vegetation Definitions 46
Appendix C - Mapping 49
Appendix D - Threatened Flora Database Search Results 55
Appendix E - Species Recorded During the June and September 2020 Survey 57
Appendix F - Site Descriptions..... 63

1 INTRODUCTION

1.1 BACKGROUND

Legacy Iron Ore Ltd (ASX: LCY) has gold interests and is the operator of its Mt Celia Project in the Murchison Region of Western Australia. LCY provided Native Vegetation Solutions (NVS) with a survey area which encompasses the main mining areas as well as other infrastructure related to mining the Mt Celia mineral resource. The location of this survey area is approximately 169 km northeast of Kalgoorlie-Boulder, and approximately 89km south of Laverton in Western Australia (Figure 1).

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

The survey area, for the purposes of this report, encompasses an area totalling approximately 2,029 ha, which intersects Mining Tenements M39/1123, M39/1125, M39/1126, M39/1127, M39/1128 and Exploration License E39/1443. The stage 1 survey in June 2020 only covered an area of 1,696 hectares. LCY increased the survey area for the second stage of the survey to enable additional area for infrastructure layout. At this stage, the final footprint of mining related disturbances is yet to be finalised, however will be encompassed entirely within the survey area, and is expected to be approximately 400 hectares.

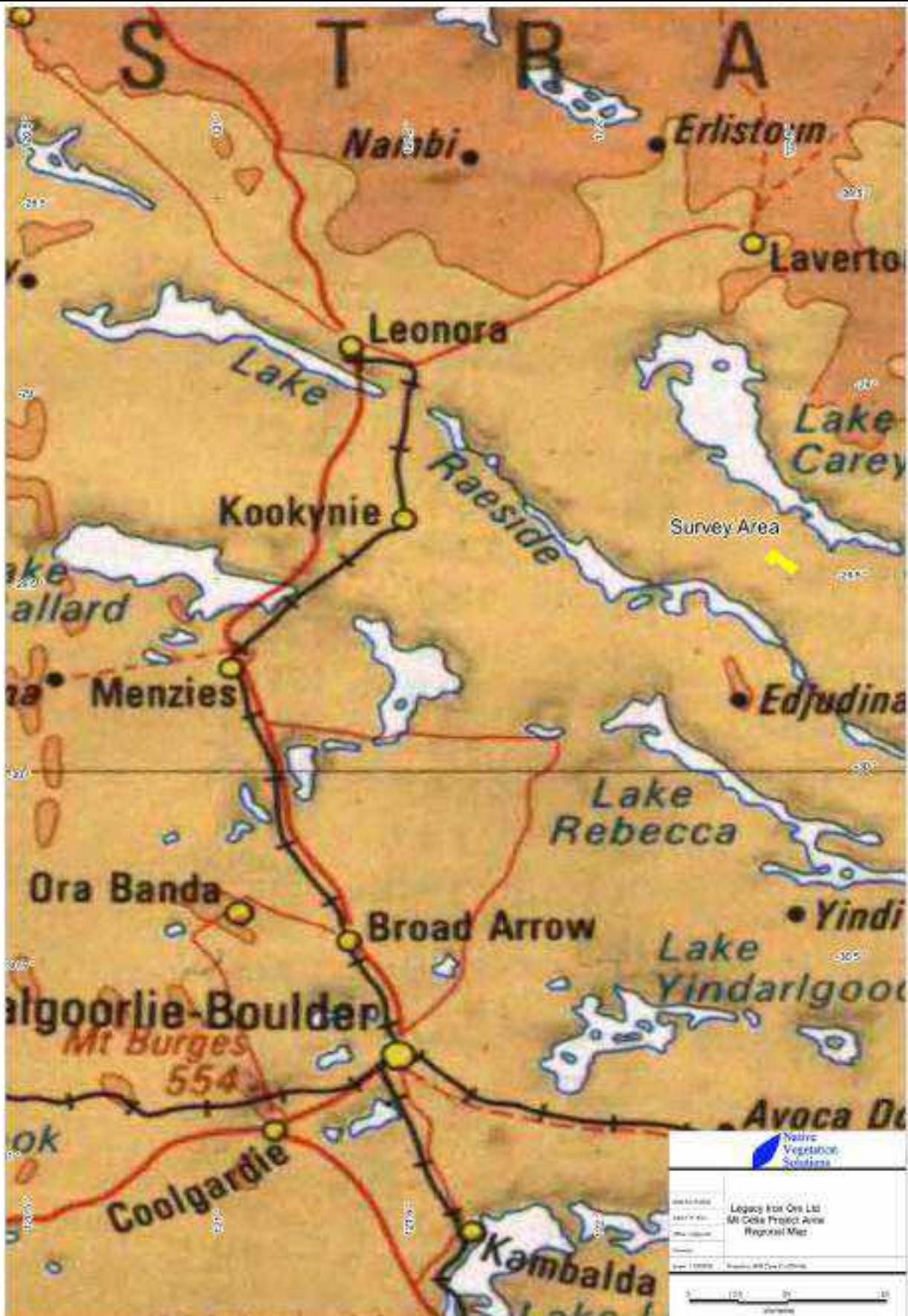


Figure 1: Regional Location of the Mt Celia Project Area

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 Detailed assessment conducted in accordance with the following documents:

- *Environmental Factor Guideline- Flora and Vegetation* (EPA, 2016); and
- *Technical Guidance- Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016a).

A Detailed Flora and Vegetation Survey has two components:

- 1) Reconnaissance 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 Detailed 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 of the general survey area 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 Laverton Aero (station number 012305), which is located approximately 92 km north of the survey area.

2.1.1 Temperature

Mean annual minimum temperature at Laverton Aero is 14.1°C and mean annual maximum temperature is 27.2°C (BOM, 2020). The coldest temperatures occur in July (mean minimum temperature 5.9°C), the hottest is January (mean maximum temperature 35.6°C) and diurnal temperature variations are relatively consistent throughout the year (Figure 2).

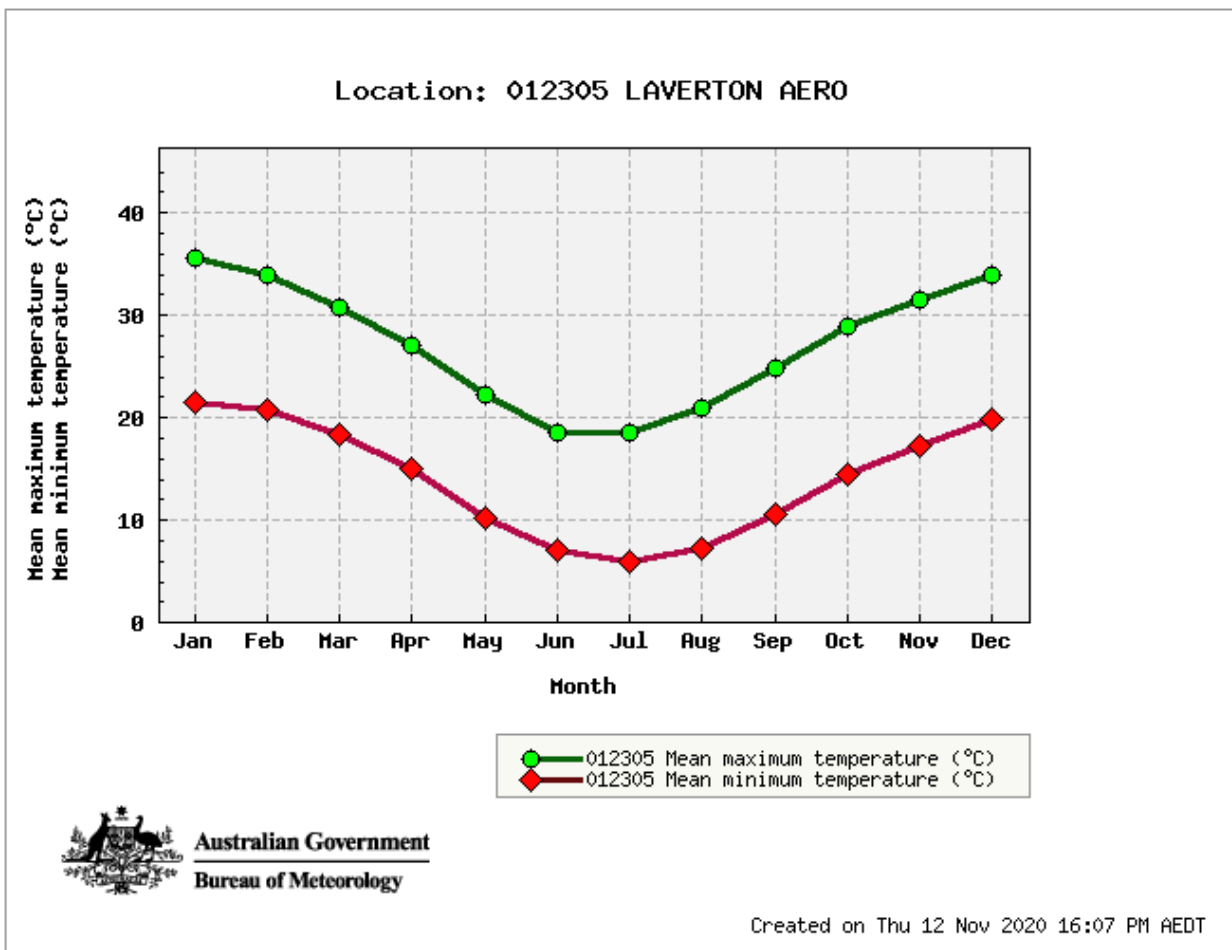


Figure 2: Mean temperature ranges for Laverton Aero Meteorological Station (BOM, 2020)

2.1.2 Rainfall

The annual average rainfall at Laverton Aero is 284.8mm over an average of 35 rain days (BOM, 2020). Average rainfall varies across the months, with slightly larger rainfall events falling between December to March (Figure 3), and the least rainfall received in September. Rainfall for 2020 was below average for all months prior to the survey with the exception of January.

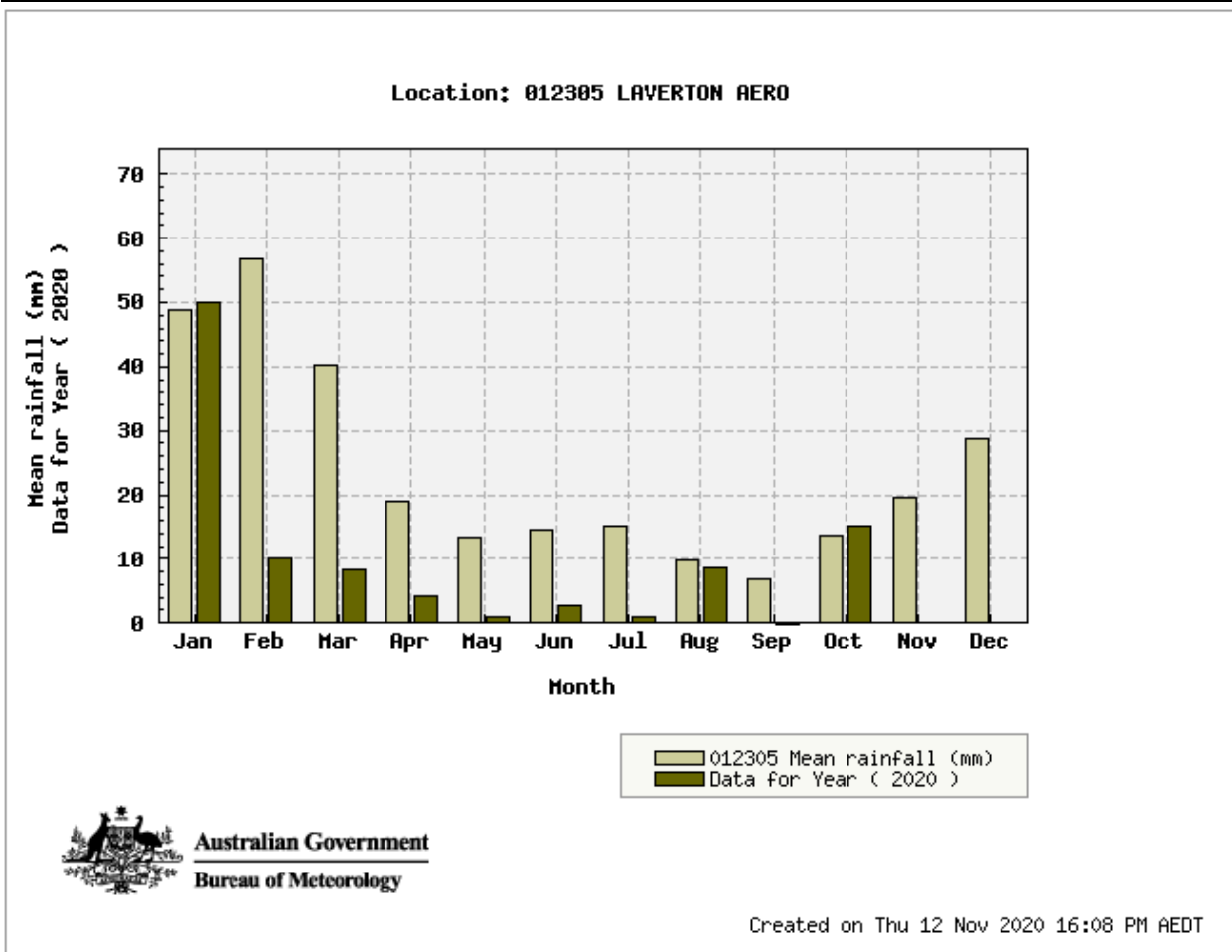


Figure 3: Rainfall data for the Laverton Aero Meteorological Station (BOM, 2020)

Looking at the Edjudina Meteorological Station (012027), which lies only 40km to the south of the survey area, rainfall recorded above average in January and March 2020 prior to the survey, with other months receiving below average (Figure 4).

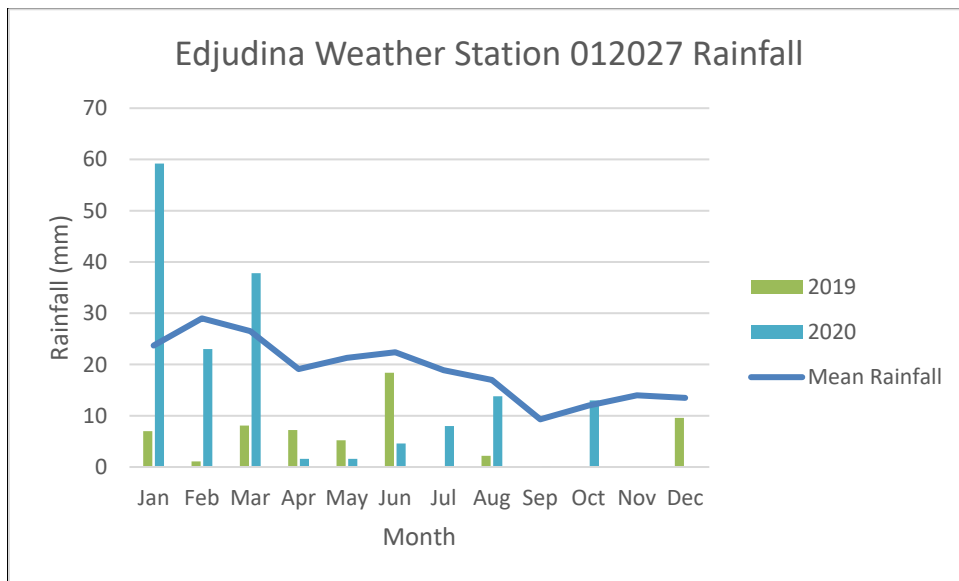


Figure 4: Rainfall data for the Edjudina Meteorological Station (BOM, 2020)

2.2 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA (IBRA) REGION

The IBRA recognises 89 bioregions within Australia and 419 subregions (DAWE, 2020). The project is located in the Eastern Murchison IBRA subregion (MUR01) which totals over 7.8 million hectares (CALM, 2002). The Eastern Murchison subregion is characterised by its internal drainage, and extensive areas of elevated red desert sandplains with minimal dune development. Salt lake systems are normally associated with the occluded Paleodrainage system.

2.3 LANDFORMS AND SOILS

The Eastern Murchison comprises the northern parts of the craton's 'Southern Cross' and 'Eastern Goldfields' Terrains, and is characterised by internal drainage and extensive areas of elevated red desert sandplains with minimal dune development. Salt lake systems are associated with the occluded paleodrainage system. Broad plains of red-brown soils and breakaway complexes as well as red sandplains are widespread (CALM, 2002).

2.4 BOTANICAL SUBREGION AND EXISTING VEGETATION

The vegetation of the Eastern Murchison botanical subregion is dominated by mulga woodlands and is often rich in ephemerals, hummock grasslands, saltbush shrublands and *Tecticornia* shrublands (CALM, 2002).

3 METHODS

3.1 PERSONNEL AND REPORTING

The following personnel were involved in part 1 of the detailed flora and vegetation survey (June 2020):

- Mr Eren Reid (BSc- Biological Science), Principal Botanist, Native Vegetation Solutions (NVS), undertook field work of part 1 of the detailed survey in June 2020, vegetation mapping, data collation, identification of flora during field work and preparation and review of the report; and
- Mr Frank Obbens (BSc) Consultant Botanist, Bushtech Consultancy, undertook the identification of unknown flora samples collected by NVS in the field.

The following personnel were involved in part 2 of the detailed flora and vegetation survey (September 2020):

- Mr Eren Reid (BSc- Biological Science), Principal Botanist, Native Vegetation Solutions (NVS), undertook field work of part 2 of the detailed survey in September 2020, vegetation mapping, data collation, identification of flora during field work and preparation and review of the report; and
- Mr Frank Obbens (BSc) Consultant Botanist, Bushtech Consultancy, undertook the identification of unknown flora samples collected by NVS in the field.

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 3.2.6, and Appendices A & D) 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 A) with a 1km buffer (DAWE, 2020a).

(<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 90km radial area of the survey area shapefile (Reference: 07-0650FL).

The presence of Threatened and Priority Ecological Communities (TECs & PECs) was determined by examining Geographic Information System (GIS) data supplied by the DBCA upon request within a 50km buffer of the survey area shapefile (Reference: 23-0620EC).

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.

DBCA's Statewide Vegetation Statistics (DBCA, 2019) 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, 2020).

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.

3.3 **SITE INVESTIGATION**

The first stage of the field survey was conducted by Mr. Eren Reid, Botanist of Native Vegetation Solutions (NVS), from the 3rd to 8th June 2020. NVS established 43 quadrats within the survey area, recording one hundred and twenty-three vascular plant species within 12 vegetation types.

A total of 58 hours was spent on site traversing the survey area in June 2020. While a vehicle was used to reach the site, all traverses were made on foot or via Yamaha Viking.

The second stage of the field survey was conducted by Mr. Eren Reid, Botanist of Native Vegetation Solutions (NVS), from the 8th to 9th September 2020. NVS resurveyed the already established 43 quadrats within the survey area, recording one hundred and twenty-five vascular plant species within 12 vegetation types.

A total of 20 hours was spent on site traversing the survey area in September 2020. While a vehicle was used to reach the site, all traverses were made on foot or via Yamaha Viking.

Additional areas were added to the survey area in September 2020 by LCY. These areas were covered within the two days, as these areas were extensions of previously mapped vegetation groups.

The surveys were conducted in accordance with relevant EPA's Statements and Guidelines (Section 1.2).

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 scale and nature of the proposed disturbance as well as the existing disturbance, and that the survey area is located within the Murchison IBRA region, a detailed flora and vegetation survey was deemed adequate.

3.3.1 Licenses

Flora was collected for identification under the Scientific Collection License FB62000171, held by Mr Eren Reid with expiry 08/10/2022.

3.3.2 Field Methods

Prior to the field work, the aerial photography was examined and representative sample sites for quadrat locations were chosen to provide coverage over all viable vegetation types.

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 ± 4 m accuracy, using Universal Transverse Mercator location on GDA94 datum. Digital photographs were taken of each quadrat site.

Data collected at each of the 43 quadrats included:

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

A complete list of all species encountered was also recorded, detailing the average height and estimated coverage of the dominant species from the three stratum levels (Tallest, Mid and Lower).

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

The vegetation structure was assessed using the method developed by Muir (1977). Definitions of the vegetation structure are presented in Appendix B.

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

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.

3.3.3 Post-Field Methods

Unknown specimens collected in the field were identified post field work by Eren Reid and Frank Obbens 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).

3.3.4 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.

GPS tracks and waypoints recorded during field work are presented in Appendix C. Vegetation Health Condition was assessed in the field with reference to Keighery (1994).

3.3.5 IBSA Data Package

The Environmental Protection Authority (EPA), Department of Water and Environmental Regulation (DWER) and Department of Mines, Industry Regulation and Safety (DMIRS) require Index of Biodiversity Surveys for Assessments (IBSA) Data Packages to be submitted to support assessment and compliance under the *Environmental Protection Act 1986*.

An IBSA data package is a single file in .zip format, containing:

- one **Metadata and Licensing Statement** in .pdf format;
- one **survey report** in .pdf format;
- one **plain-text survey report** in .txt format; and
- a set of electronic data files, comprising:
 - one **survey details** spatial dataset in shapefile (.shp, etc.) or Mapinfo (.tab, etc.) format; and
 - one or more **survey data** spatial datasets, as required, in shapefile (.shp, etc.) or Mapinfo (.tab, etc.) format.

The IBSA Data package for this survey has been submitted via the DWER IBSA Submission Portal.

3.4 NOMENCLATURE AND TAXONOMY

Nomenclature follows that used by the WAHERB.

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.

3.5 LIMITATIONS

Table 1 lists potential limitations that may have affected the survey. As shown, this survey may have been limited by drier than average conditions, which affected most of the State of Western Australia in 2019 and 2020.

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 16 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.
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 or Frank Obbens. 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 June and September 2020. Local rainfall never exceeded monthly averages in 2020 with the exception of January and March. Timing would have been ideal earlier in April/May for the first part of the survey, however ideal conditions were observed 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 detailed survey according to EPA (2016) 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 detailed 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 Murchison subregion is readily available. Adequate information was able to be accessed from available databases.

4 RESULTS

4.1 PRELIMINARY DESKTOP ASSESSMENT

4.1.1 EPBC Protected Matters Search Tool

The EPBC Protected Matters Search Tool revealed that the survey area may contain habitat for the invasive weed species *Carrichtera annua* (Ward's Weed) and *Cenchrus ciliaris* (Buffel Grass) (DAWE, 2020).

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). This species is not listed as a declared plant by DPIRD (2020), however according to the EPBC search tool this invasive weed species is considered a threat to the rangeland biodiversity within the Southern Australian Sheep and Cattle Grazing Land Management Zone (DAWE, 2020).

Cenchrus ciliaris is native to Africa and India, was widely planted in Western Australian pastoral regions as a pasture grass, and has become a widespread weed of roadsides, creeklines, river edges and most vegetation types from Geraldton to the Pilbara, Kimberley and adjacent desert (Hussey *etc.* 2007). In the Murchison region it often colonises roadside table drains, excluding native everlastings. It seriously alters the fire characteristics of invaded plant cover by generating highly flammable fuel that is prone to more frequent fires.

The EPBC Protected Matters report indicated no TECs or Commonwealth Reserves within the requested search area.

The results of the EPBC Protected Matters search are included in Appendix A.

4.1.2 Threatened Flora and Communities

The DBCA database searches revealed a potential for no Threatened and 10 Priority Flora species to occur within a 50km radius of the survey area (DBCA, 2020a). No known locations of these Flora occur within the survey area, while the closest location occurs approximately 5.8 km southwest of the survey area.

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

The PEC/TEC search (DBCA, 2020) 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, 2020).

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 Table 2 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 18 within the survey area

Factor	Value				
Beard Vegetation Association*	18				
Vegetation Association Description*	Low woodland; mulga (<i>Acacia aneura</i>)				
Pre-European Extent (ha)	Scale				
	By Association (WA)	By Association (WA)	By IBRA Region (Murchison)	By IBRA Sub-region (Eastern Murchison)	By Shire (Shire of Menzies)
	22,029,557*	19,892,306**	12,403,172**	10,269,896**	2,010,840**
% Pre-European Extent Remaining	100.00%*	99.75%**	99.68%**	99.66%**	99.94%**
Surrounding Land Use***	Mining, Exploration, Pastoral Lease				
Weed prevalence***	Low				

* Source: Shepherd *et al.* (2002) Appendix 2

**Source: DBCA, (2019)

*** Source: Field Assessment

4.1.5 Wetlands

No water bodies were identified within the survey area via the CPS Map Viewer (DWER, 2020).

4.1.6 Dieback

The survey area lies south of the 26th parallel, however receives average annual rainfall of approximately 284.8 mm (BOM, 2020), 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.

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 description above in section 4.1.4.

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

Descriptions of all 43 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

Twelve vegetation groups were identified during this survey, largely following topographical features and dominant species. Mapping of the 12 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. Mulga over *Maireana sedifolia* and mixed sclerophyll shrubland

Open Shrub Mallee (Muir, 1977) of *Acacia aneura*, *Acacia mulganeura*, *Casuarina pauper* and *Acacia ayersiana* over *Acacia ligulata*, *Senna artemisioides* subsp. *filifolia*, *Dodonaea lobulata*, *Acacia burkittii* and *Hakea preissii* over *Maireana sedifolia*, *Ptilotus obovatus* and occasional *Maireana pyramidata*.

Quadrats: 1, 2, 8, 19 and 28

B. Mulga shrubland (sandy substrates)

Open Shrub Mallee (Muir, 1977) of *Acacia incurvaneura*, *Acacia aneura*, *Acacia mulganeura* and occasional *Eucalyptus kingsmillii* and *Eucalyptus oleosa* subsp. *oleosa* over *Acacia ramulosa* var. *ramulosa*, *Eremophila forrestii* subsp. *forrestii*, *Senna artemisioides* subsp. *filifolia* and *Acacia burkittii* over *Ptilotus obovatus* and occasional grasses.

Quadrats: 4, 5, 13, 21, and 27

C. Open Mulga shrubland (sandy substrate)

Very Open Shrub Mallee (Muir, 1977) of *Acacia mulganeura*, *Acacia incurvaneura* and *Acacia aneura* over *Acacia ramulosa* var. *ramulosa*, *Senna artemisioides* subsp. *filifolia* and *Acacia ligulata* over *Ptilotus obovatus* and *Eragrostis eriopoda*.

Quadrats: 3, 6 and 23

D. Mulga shrubland on rocky ironstone hills

Open Shrub Mallee (Muir, 1977) of *Acacia aneura*, *Acacia incurvaneura*, *Acacia mulganeura* and *Casuarina pauper* over *Scaevola spinescens*, *Eremophila latrobei* subsp. *latrobei* and *Dodonaea lobulata* over *Ptilotus obovatus*.

Quadrats: 7, 9, 10, 12, 20 and 26

E. *Acacia aneura* and *Acacia burkittii* on greenstone hills

Open Shrub Mallee (Muir, 1977) of *Acacia aneura* and *Acacia mulganeura* over *Acacia burkittii*, *Scaevola spinescens* and *Senna artemisioides* subsp. *filifolia* over *Ptilotus obovatus* and occasional grasses.

Quadrats: 11, 14, 15 and 18

F. Mulga over small rocky outcrops

Very Open Shrub Mallee (Muir, 1977) of *Acacia aneura* and *Acacia mulganeura* over *Philothecca brucei* subsp. *brucei*, *Scaevola spinescens*, *Eremophila latrobei* subsp. *latrobei* and *Sida ectogama* over *Ptilotus obovatus* and *Enneapogon caerulescens*.

Quadrats: 16 and 30

G. Mulga over Chenopod shrubland

Very Open Shrub Mallee (Muir, 1977) of *Acacia aneura*, *Acacia ayersiana* and occasional *Eucalyptus lesouefii* over *Acacia caesaneura*, *Senna artemisioides* subsp. *filifolia*, and occasional *Acacia burkittii* over *Maireana pyramidata*, *Ptilotus obovatus*, and occasional *Frankenia setosa* and *Atriplex bunburyana*.

Quadrats: 17, 22 and 35

H. Mulga Thicket- Drainage

Tree/Shrub Mallee (Muir, 1977) of *Acacia ayersiana* and *Acacia incurvaneura* over *Acacia burkittii*, *Acacia ramulosa* var. *ramulosa* and *Acacia aneura* over *Ptilotus obovatus*, *Acacia tetragonophylla* and *Eremophila forrestii* subsp. *forrestii*.

Quadrats: 24, 25 and 29

I. Open Mulga shrubland on ironstone flats

Very Open Shrub Mallee (Muir, 1977) of *Acacia aneura*, *Acacia mulganeura* and *Acacia ayersiana* over *Acacia tetragonophylla* and *Acacia burkittii* over *Scaevola spinescens*, *Ptilotus obovatus*, *Senna artemisioides* subsp. *helmsii* and *Senna artemisioides* subsp. *artemisioides*.

Quadrats: 31 and 32

J. *Acacia quadrimarginea* shrubland over granite bedrock

Very Open Shrub Mallee (Muir, 1977) of *Acacia quadrimarginea* and *Acacia mulganeura* over *Acacia tetragonophylla*, *Acacia burkittii* and occasional *Acacia aneura* over *Eremophila forrestii* subsp. *forrestii* and *Ptilotus obovatus*.

Quadrats: 33 and 34

K. *Casuarina pauper* and *Acacia aneura* over sclerophyll shrubland on rocky laterite hills

Very Open Tree Mallee (Muir, 1977) of *Casuarina pauper*, *Acacia aneura*, *Eucalyptus salubris* and *Eucalyptus lesouefii* over *Dodonaea lobulata* and *Eremophila pantonii* over *Ptilotus obovatus* and *Maireana sedifolia*.

Quadrats: 36, 37, 38, 39, 40 and 41

L. Mulga over *Eremophila forrestii* on large rocky granite/basalt hills

Open Shrub Mallee (Muir, 1977) of *Acacia aneura*, *Acacia mulganeura* and *Acacia incurvaneura* over *Eremophila forrestii* subsp. *forrestii*, *Philothecca brucei* subsp. *brucei* over *Ptilotus obovatus*.

Quadrats: 42 and 43

Table 3: Vegetation Group Extent within Survey Area

Vegetation Group	Vegetation Group Code	Quadrats	Family	Genus	Species	Area (ha)	Percentage of Survey Area (%)
Mulga over <i>Maireana sedifolia</i> and mixed sclerophyll shrubland	A	Q1, Q2, Q8, Q19, Q28	14	25	52	305.49	15.06
Mulga shrubland (sandy substrate)	B	Q4, Q5, Q13, Q21, Q27	15	24	50	635.26	32.20
Open Mulga shrubland (sandy substrate)	C	Q3, Q6, Q23	12	19	31	37.77	1.86
Mulga shrubland on rocky ironstone hills	D	Q7, Q9, Q10, Q12, Q20, Q26	13	23	51	216.93	10.69
<i>Acacia aneura</i> and <i>Acacia burkittii</i> on rocky basalt hills	E	Q11, Q14, Q15, Q18	18	31	55	32.90	1.62
Mulga over small rocky outcrops	F	Q16, Q30	15	24	35	8.32	0.41
Mulga over Chenopod shrubland	G	Q17, Q22, Q35	14	24	45	167.24	8.24
Mulga Thicket- Drainage	H	Q24, Q25, Q29	17	28	43	201.44	9.93
Open Mulga shrubland on ironstone flats	I	Q31, Q32	12	17	32	241.39	11.90
<i>Acacia quadrimarginea</i> shrubland over granite bedrock	J	Q33, Q34	10	15	21	39.99	1.97
<i>Casuarina pauper</i> and <i>Acacia aneura</i> over sclerophyll shrubland on rocky laterite hills	K	Q36, Q37, Q38, Q39, Q40, Q41	17	24	44	110.72	5.46
Mulga over <i>Eremophila forrestii</i> on large rocky granite/basalt hills	L	Q42, Q43	11	16	23	13.23	0.65
Total			29*	58*	125*	2028.66#	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 most vegetation groups. In most cases one or two dominant 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 when assessed by the PATN Analysis.

Vegetation Group A was well represented via dominant species with Q1, Q2, Q19 and Q28 grouped together in the PATN Analysis. Q8 was an outlier and compared more similarly to Q10 which was also an outlier of Vegetation Group D. When all species were analysed via PATN, Q1, Q2, Q8 and Q28 were significantly grouped together.

Vegetation Group B was quite an expansive and varied vegetation group, hence only significantly represented by the grouping of Q21 and Q27 in the dominant species PATN analysis. Q4, Q5 and Q13 were considered outliers as these quadrat locations were chosen to represent small, isolated pockets containing Eucalypts and a slightly different species composition. However, these small pockets were not considered large enough to segregate into separate vegetation groups. Similarly, the variation in species composition of all species was too large to significantly segregate these Quadrats into a separate vegetation group.

Vegetation Group C was well represented by the grouping of Q6 and Q23 via the dominant species and all species PATN analysis. Q3 was an outlier, grouped more similarly with Q25. When all species were analysed via PATN, Q3, Q6 and Q23 were grouped together.

Vegetation Group D was well represented with the grouping of Q7, Q9, Q20 and Q26 via the dominant species PATN analysis. Q10 and Q12 were considered outliers with some slight variations in the dominant species. When all species were analysed via PATN, only Q9 and Q10 were grouped together, with Q7 also representing a standalone group.

Vegetation Group E was represented with the grouping of Q11 and Q15 via the dominant species PATN analysis. Q14 and Q18 was considered outliers. When all species were analysed via PATN, only Q15 was considered representative. Q11 and Q14 were grouped together, however were also grouped with other quadrats from different vegetation groups.

Vegetation Group F was well represented via dominant species, and all species when subjected to PATN analysis, with the grouping of Q16 and Q30 in both instances.

Vegetation Group G was not well represented via dominant species, as Q25 was the only segregated quadrat for the vegetation group. However, Vegetation Group G was represented well via all species via PATN analysis, with Q17 and Q22 grouped together.

Vegetation Group H was not well represented via dominant species but was represented well via all species via PATN analysis, with Q24 and Q25 grouped together.

Vegetation Group I was not well represented by either dominant species or all species PATN analysis, however Q31 was considered a separate vegetation group when dominant species were subject to PATN analysis.

Vegetation Group J was well represented by all species and dominant species via PATN analysis.

Vegetation Group K was well represented by all species and dominant species via PATN analysis, with all quadrats grouped together as a separate group.

Vegetation Group L was well represented by all species, however Q42 and Q43 were not grouped together by the dominant species via the PATN analysis, suggesting some variation in the dominant species.

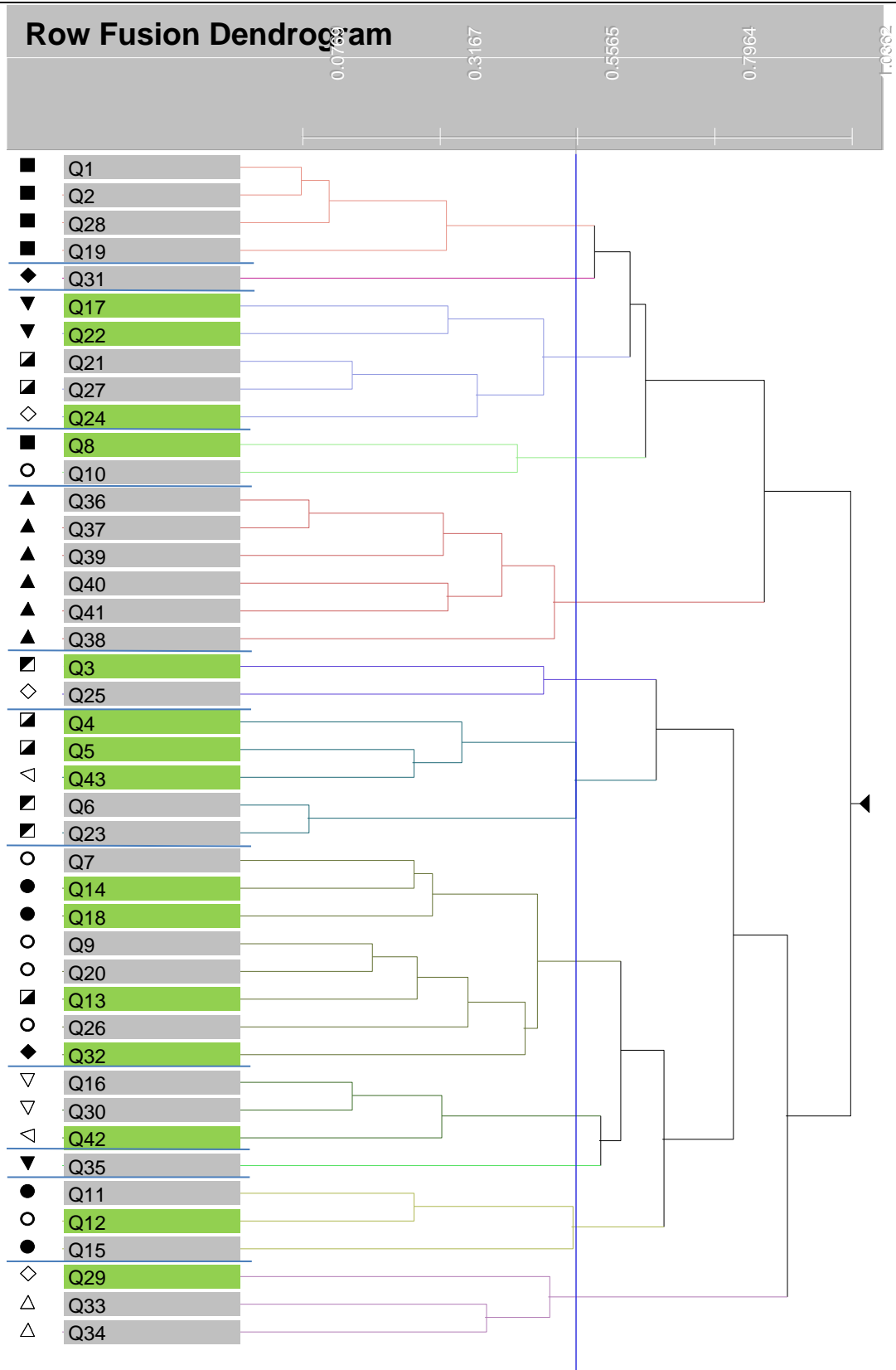


Figure 5: PATN Analysis of Dominant Species into 12 groups

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 several outliers, and these are highlighted in green (Figure 5). Most of the quadrats depicted as outliers are representative of similar vegetation groups, which have been segregated by NVS based on differing plant density, topographical features or lithology. The PATN analysis (off all species present) demonstrates that some of these quadrats are very similar in species composition, and not necessarily distinct, when predetermined by topographical/litological variations.

When comparing outliers of the PATN analysis of dominant species versus all species, there were similar outliers in both. However more reliant vegetation grouping was determined via the analysis of all species within the quadrats. Therefore, the vegetation groups mapped by NVS demonstrate a greater reliance on all species within the quadrat as opposed to the dominant, suggesting some variation in dominant species between vegetation groups, and less variation in the non-dominant species.

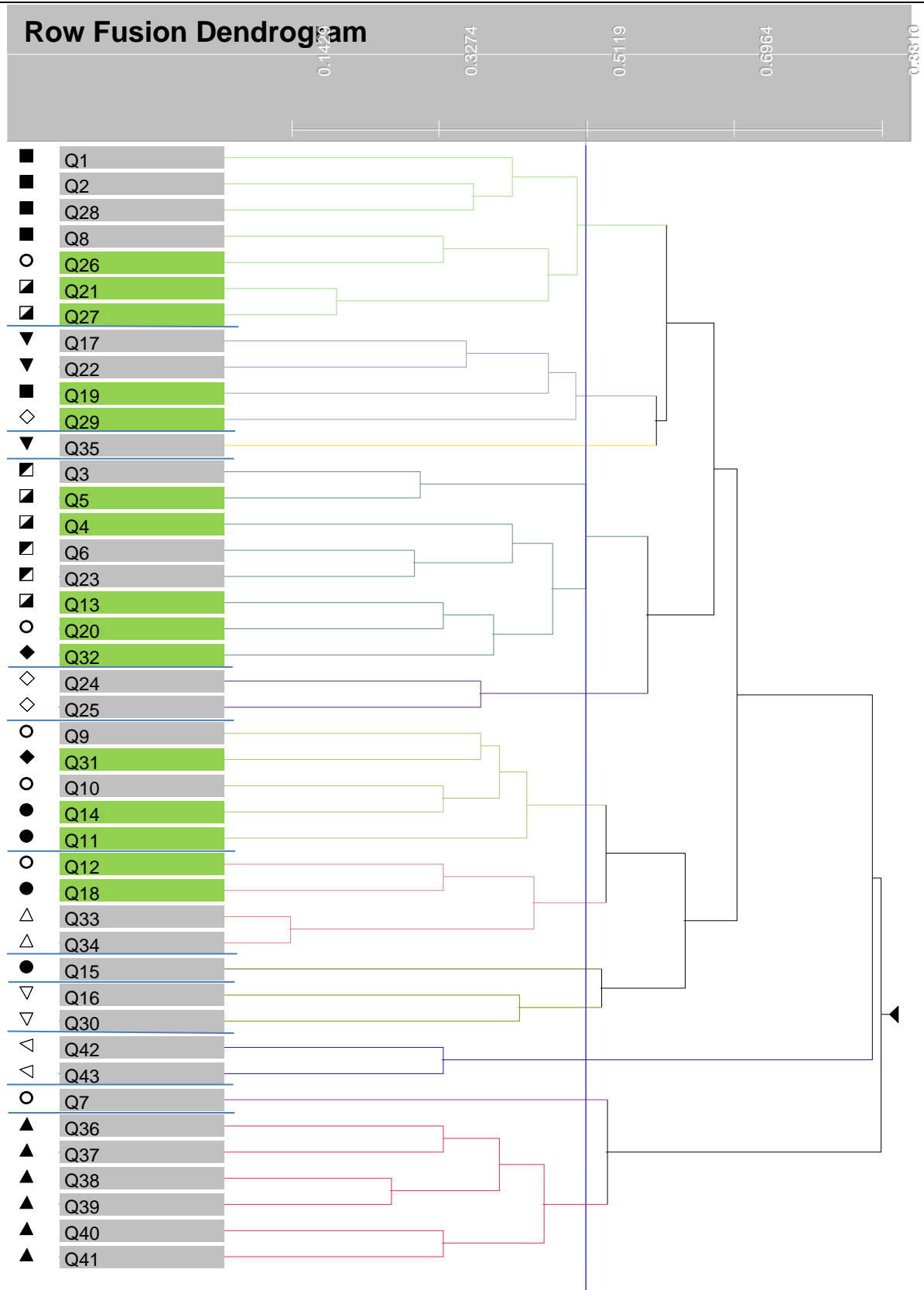


Figure 6: PATN Analysis of All Species into 12 groups

4.2.1.3 Vegetation Condition

Vegetation in the survey area has been subjected to historic 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 three non-native species recorded in the quadrats, with four additional non-native species recorded near the old Mt Celia homestead.

4.2.2 Flora of the Survey Area

4.2.2.1 General

One hundred and twenty-five species were recorded within the survey area with 117 species recorded within quadrats. Twenty-nine families and 58 genera were found. These are listed in Appendix E, per Quadrat as well as per vegetation group. Of the native species, Fabaceae had the highest representation, with 26 species from 3 genera, dominated by *Acacia*. Chenopodiaceae and Poaceae were the next best represented families with 20 species and 16 species respectively.

Of the 125 taxa recorded seven of these were introduced weed species. *Citrullus amarus* (Pie Melon) *Cucumis myriocarpus* (Prickly Paddy Melon) and *Cenchrus ciliaris* (Buffel Grass) were captured within the quadrat sampling, whilst *Schinus mollee* var. *areira* (Pepper Tree), *Nerium oleander* (Oleander Tree), *Yucca aloifolia* (Yucca Tree), and *Tamarix aphylla* (Athel pine) were recorded from a single location within the vicinity of the the old Mt Celia homestead.

Of the seven non-native species above, only *Tamarix aphylla* (Athel pine) is a declared pest-s22(2) in the state of Western Australia.

The most common and widespread species was *Ptilotus obovatus*, which was recorded within all 43 quadrats. Its canopy cover was 10-30%. The next most common and widespread species was *Acacia aneura*, recorded in 34 quadrats, with a canopy cover between 10-30%.

There were 30 taxa recorded from within a single site, Q15. Of these, two were non-native species.

4.2.2.2 Species Accumulation Curve

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 R² value (0.99) 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 R² 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 28 quadrats, at which the extrapolated total accumulated number of species was 103. Therefore the 117 species collected within the 43 quadrats represents 113.40% of the projected asymptote.

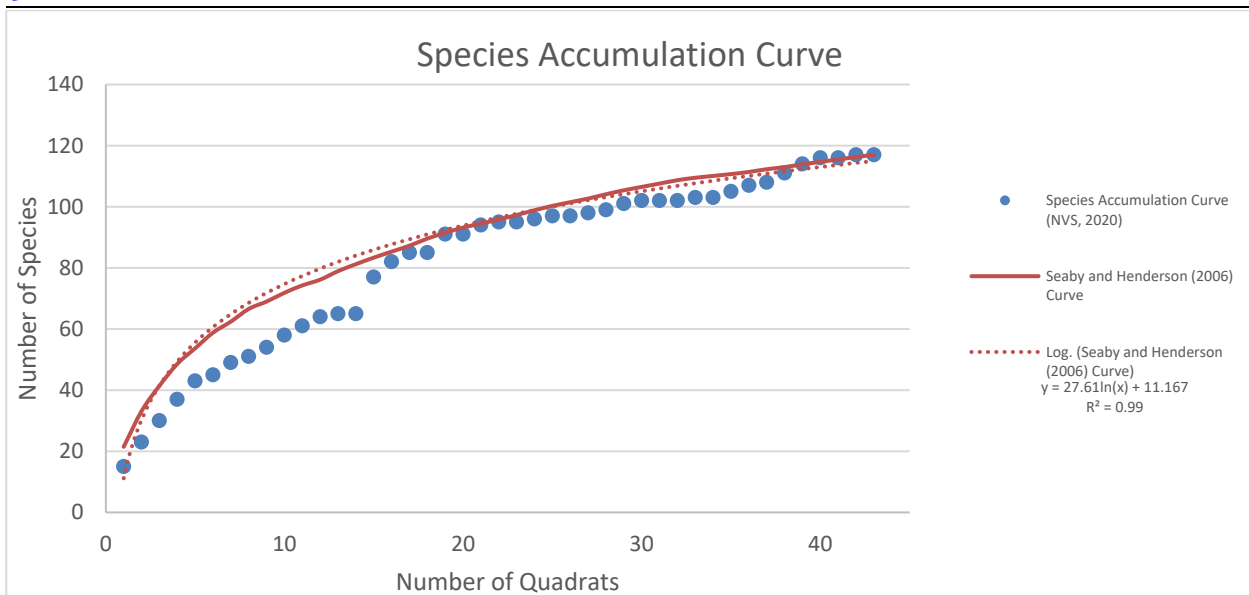


Figure 7: Species Accumulation Curve for the 43 sampled quadrats

4.2.2.3 Conservation significant species

No Threatened species were recorded during the survey.

No Priority species were identified in the survey area.

4.2.2.4 Introduced species

Seven introduced species recorded in the survey area are listed below;

- *Citrullus amarus* (Pie Melon)- Q15
- *Cucumis myriocarpus* (Prickly Paddy Melon)- Q15 and Q30
- *Cenchrus ciliaris* (Buffel Grass)- Q29
- *Schinus mollee* var. *areira* (Pepper Tree)- old Mt Celia Homestead
- *Nerium oleander* (Oleander Tree)- old Mt Celia Homestead
- *Yucca aloifolia* (Yucca Tree)- old Mt Celia Homestead
- *Tamarix aphylla* (Athel pine)- old Mt Celia Homestead

Of the seven non-native species above, only *Tamarix aphylla* (Athel pine) is a declared pest-s22(2) in the state of Western Australia.

5 DISCUSSION

The survey area is located within the Eastern Murchison subregion (CALM, 2002). This survey established that mostly, the flora within the project area is not unique, and is in fact common throughout the Eastern Murchison subregion and adjoining regions.

One hundred and twenty-five species were recorded within the survey area with 117 species recorded within quadrats. Twenty-nine families and 58 genera were found. These are listed in Appendix E, per Quadrat as well as per vegetation group. Of the native species, Fabaceae had the highest representation, with 26 species from 3 genera, dominated by *Acacia*. Chenopodiaceae and Poaceae were the next best represented families with 20 species and 16 species respectively.

Of the 125 taxa recorded seven of these were introduced weed species. *Citrullus amarus* (Pie Melon) *Cucumis myriocarpus* (Prickly Paddy Melon) and *Cenchrus ciliaris* (Buffel Grass) were captured within the quadrat sampling, whilst *Schinus mollee* var. *areira* (Pepper Tree), *Nerium oleander* (Oleander Tree), *Yucca aloifolia* (Yucca Tree), and *Tamarix aphylla* (Athel pine) were recorded from a single location within the vicinity of the the old Mt Celia homestead.

Of the seven non-native species above, only *Tamarix aphylla* (Athel pine) is a declared pest-s22(2) in the state of Western Australia.

The most common and widespread species was *Ptilotus obovatus*, which was recorded within all 43 quadrats. Its canopy cover was 10-30%. The next most common and widespread species was *Acacia aneura*, recorded in 34 quadrats, with a canopy cover between 10-30%.

There were 30 taxa recorded from within a single site, Q15. Of these, two were non-native species.

No Threatened Flora were recorded in the survey area.

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

No Priority Flora were identified in the survey area.

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 existing 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.

No Priority Flora were recorded the survey area.

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 Murchison 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 stage of a detailed flora and vegetation survey.

The following recommendations arise from the current flora survey:

- Any disturbance/clearing be minimised as much as practicable to reduce the loss of individual species;
- Weed control measures should be implemented during and post construction activities- it is recommended that any works within the vicinity of the old Mt Celia homestead be conducted in a manner where it incorporates the removal of non-native species nearby, particularly the delared pest *Tamarix aphylla*.
- 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.

8 REFERENCES

- Beard, J.S. (1990). *Plant life of Western Australia*. Kangaroo Press, NSW
- Belbin, L. (1994). *PATN: pattern analysis package: Technical reference*, Division of Wildlife and Ecology, CSIRO
- BOM, (2020), *Climate Data Online*, Bureau of Meteorology
<http://www.bom.gov.au/climate/data/>
Accessed: 12/11/2020
- CALM, (2002), *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002 (MUR1 – Eastern Murchison Subregion synopsis)*, Department of Conservation and Land Management
- CALM, (2003), *Phytophthora cinnamomi and Diseases Caused By It, Volume 1-Management Guidelines*, Department of Conservation and Land Management
http://www.dpaw.wa.gov.au/images/documents/conservation-management/pests-diseases/disease-risk-areas/Phytophthora_cinnamomi_and_disease_caused_by_it-Vol.1_Management_Guidelines_.pdf
Accessed: 12/11/2020
- DAWE, (2020), *Interim Biogeographic Regionalisation for Australia (IBRA)*, Department of Agriculture, Water and the Environment, Australian Government
<https://www.environment.gov.au/land/nrs/science/ibra>
Accessed: 12/11/2020
- DAWE, (2020a), *Protected Matters Search Tool*, Department of Agriculture, Water and the Environment
<http://www.environment.gov.au/webgis-framework/apps/pmst/pmst-coordinate.jsf>
Accessed: 12/11/2020
- DBCA, (2019), *2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report)- Current as of March 2019*, WA Department of Biodiversity, Conservation and Attractions, Perth,
<https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics>
Accessed: 12/11/2020
- DBCA, (2020), *TEC/PEC Database Results Ref: 23-0620EC*, Department of Biodiversity, Conservation and Attractions
- DBCA, (2020a), *Threatened Flora Database Results Ref: 07-0650FL*, Department of Biodiversity, Conservation and Attractions
- DPIRD, (2020), *Declared Plants Database*, Department of Primary Industries and Regional Development, Western Australia
<https://www.agric.wa.gov.au/pests-weeds-diseases/weeds/declared-plants>
Accessed: 12/11/2020
- DWER, (2020), *Clearing Permit System Map Viewer*, Department of Water and Environmental Regulation
<https://cps.der.wa.gov.au/main.html>
Accessed: 12/11/2020
- EPA, (2016), *Environmental Factor Guideline: Flora and Vegetation*, Environmental Protection Authority, Western Australia

EPA (2016a), *Technical Guidance- Flora and Vegetation Surveys for Environmental Impact Assessment*, Environmental Protection Authority, Western Australia

Hussey, B M J, G J, Cousens, R D Dodd, J and Lloyd S G, (2007), *Western Weeds- A guide to the Weeds of Western Australia (Second Edition)*, The Weed Society of Western Australia, Perth WA

Keighery, B.J., (1994), *Bushland Plant Survey; A guide to plant community survey for the Community*, Wildflower Society of Western Australia (Inc.) Nedlands

Muir, B.G. (1977), *Biological Survey of the Western Australian Wheatbelt. Pt. 2. Vegetation and habitat of the Bendering Reserve*. Records of the Western Australian Museum Supplement 3

Seaby R. M. & Henderson, P. A., (2006), *Species Diversity and Richness Version 4.1.2*, Pisces Conservation Ltd., Lymington, England.

Shepherd, D.P., Beeston, G.R., and A.J.M. Hopkins, (2002), *Land-Use and Vegetation in Western Australia- National Land and Water Resources Audit Report*, Technical Report 250, Department of Agriculture Western Australia

WAHERB, (2020), *FloraBase- the Western Australian Flora*, Department of Parks and Wildlife
<http://florabase.dpaw.wa.gov.au/>

Accessed: 12/11/2020

9 GLOSSARY

Acronyms:

BOM	Bureau of Meteorology, Australian Government
BSc	Bachelor of Science
CALM	Department of Conservation and Land Management (now DBCA)
CPS	Clearing Permit System (DWER)
DAWE	Department of Agriculture, Water and the Environment, Australian Government
DBCA	Department of Biodiversity, Conservation and Attractions, Western Australia
DMIRS	Department of Mines, Industry Regulation and Safety, Western Australia
DPAW	Department of Parks and Wildlife, Western Australia (now DBCA)
DPIRD	Department of Primary Industries and Regional Development, Western Australia
DRF	Declared Rare Flora
DWER	Department of Water and Environmental Regulation, Western Australia
EPA	Environmental Protection Authority, Western Australia
EP Act	<i>Environmental Protection Act 1986</i> , Western Australia
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth Act)
ESA	Environmentally Sensitive Area
GIS	Geographical Information System
ha	Hectare (10,000 square metres)
IBRA	Interim Biogeographic Regionalisation for Australia, DAWE
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union
km	Kilometres
m	Metres
MUR	Murchison Bioregion, IBRA
MUR01	Eastern Murchison Subregion, IBRA
NVS	Native Vegetation Solutions
PEC	Priority Ecological Community, Western Australia
Ramsar	A wetland site designated of international importance under the Ramsar Convention (UNESCO)
TEC	Threatened Ecological Community
UNESCO	United Nations Educational, Scientific and Cultural Organization
WA	Western Australia
WAHERB	Western Australian Herbarium, DBCA

Definitions:

{DBCA (2019) Conservation Codes for Western Australian Flora and Fauna. Department of Biodiversity, Conservation and Attractions, Western Australia, January 2019}: -

T Threatened species:

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

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 in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*”.

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

EN Endangered species

Threatened species considered to be “*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*”.

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU Vulnerable species

Threatened species considered to be “*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*”.

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora..

Extinct species:

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

EX Extinct species

Species where “*there is no reasonable doubt that the last member of the species has died*”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW Extinct in the wild species

Species that “*is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory species

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes 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 fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

CD Species of special conservation interest (conservation dependent fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

OS Other specially protected species

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

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 fauna or flora.

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.

Priority 1: 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.

Priority 2: 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.

Priority 3: 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.

Priority 4: 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 - EPBC and Other Government Database Search Results



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: 12/11/20 17:31:59

[Summary](#)

[Details](#)

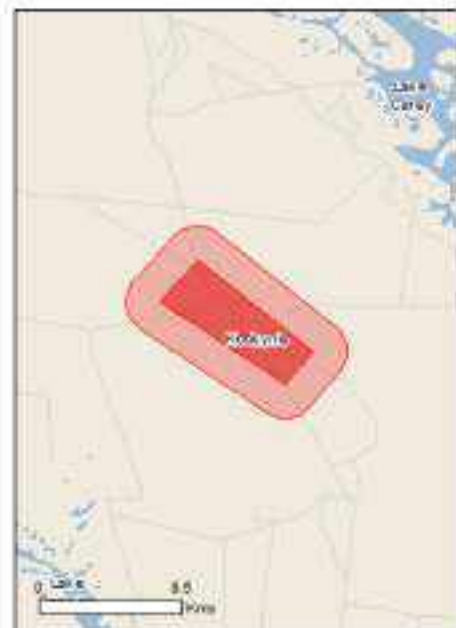
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

[Coordinates](#)
[Buffer: 2.0Km](#)



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
Australian Marine Parks:	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:	10
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		
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasysurus geoffroyi Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may 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 [676]		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
Motacilla flava Yellow Wagtail [644]		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 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 [676]		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
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysocolaptes ocellatus Black-eared Cuckoo [705]		Species or species habitat likely to 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
Motacilla flava Yellow Wagtail [644]		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 Resources Audit, 2001.

Name	Status	Type of Presence
Mammals		
Camelus dromedarius Dromedary, Camel [7]		Species or species

Name	Status	Type of Presence
Canis lupus familiaris Domestic Dog [82654]		habitat likely to occur within area Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species 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 may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may 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 BIOTRIM habitat modeling) 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

-29.4441 122.4389 -29.424552 122.45929 -29.467079 122.521208 -39.482777 122.500058 -29.4441 122.4389

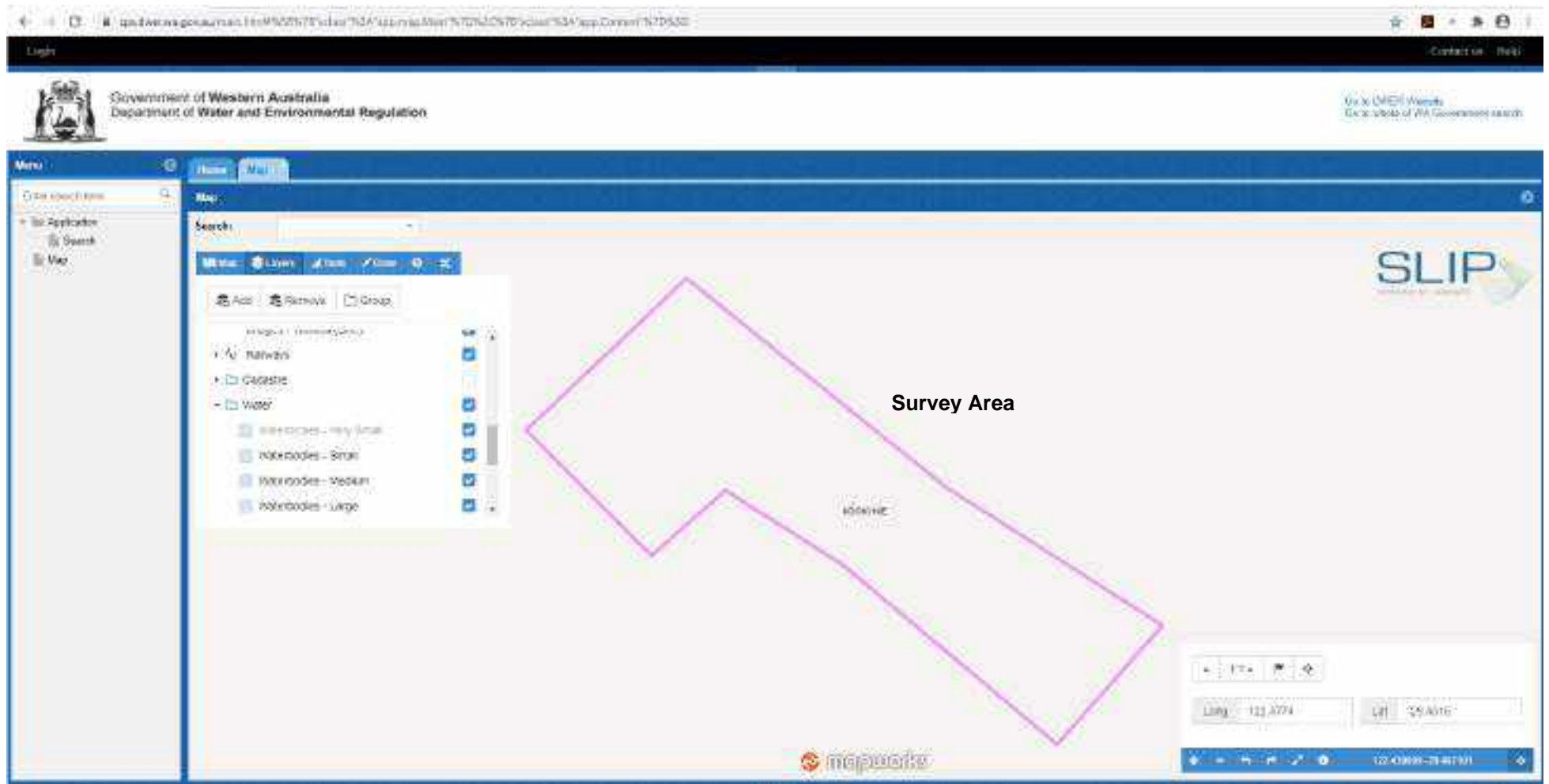
Acknowledgements

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

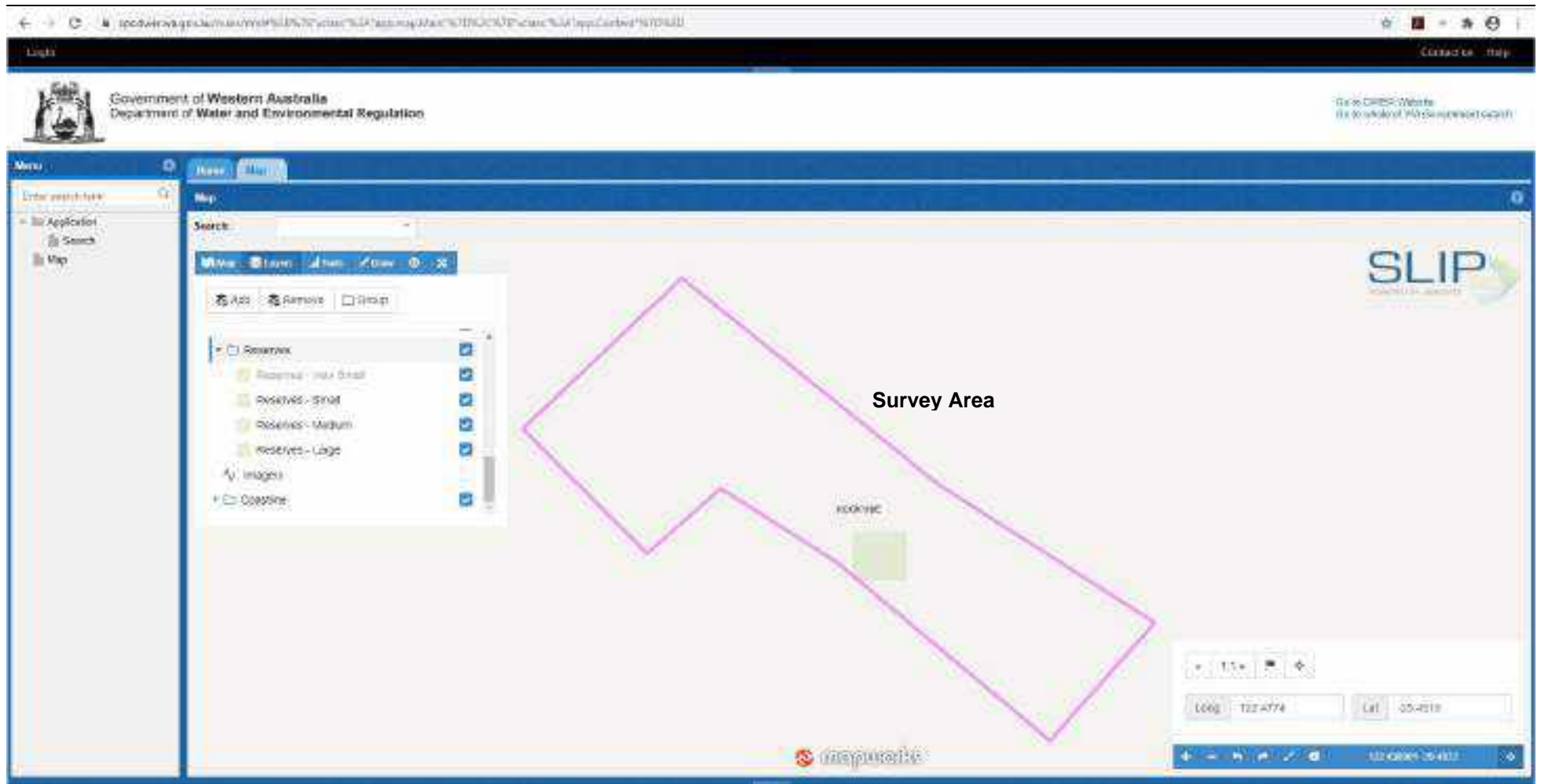
- [Office of Environment and Heritage, New South Wales](#)
- [Department of Environment and Primary Industries, Victoria](#)
- [Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [Department of Environment, Water and Natural Resources, South Australia](#)
- [Department of 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 water bodies within the survey area (pink polygon) (DWER, 2020)



DWER CPS Map Viewer - showing a small water Reserve (R11185) within the survey area (pink polygon) (DWER, 2020)

Appendix B - Vegetation Definitions

Vegetation Condition Definitions (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.

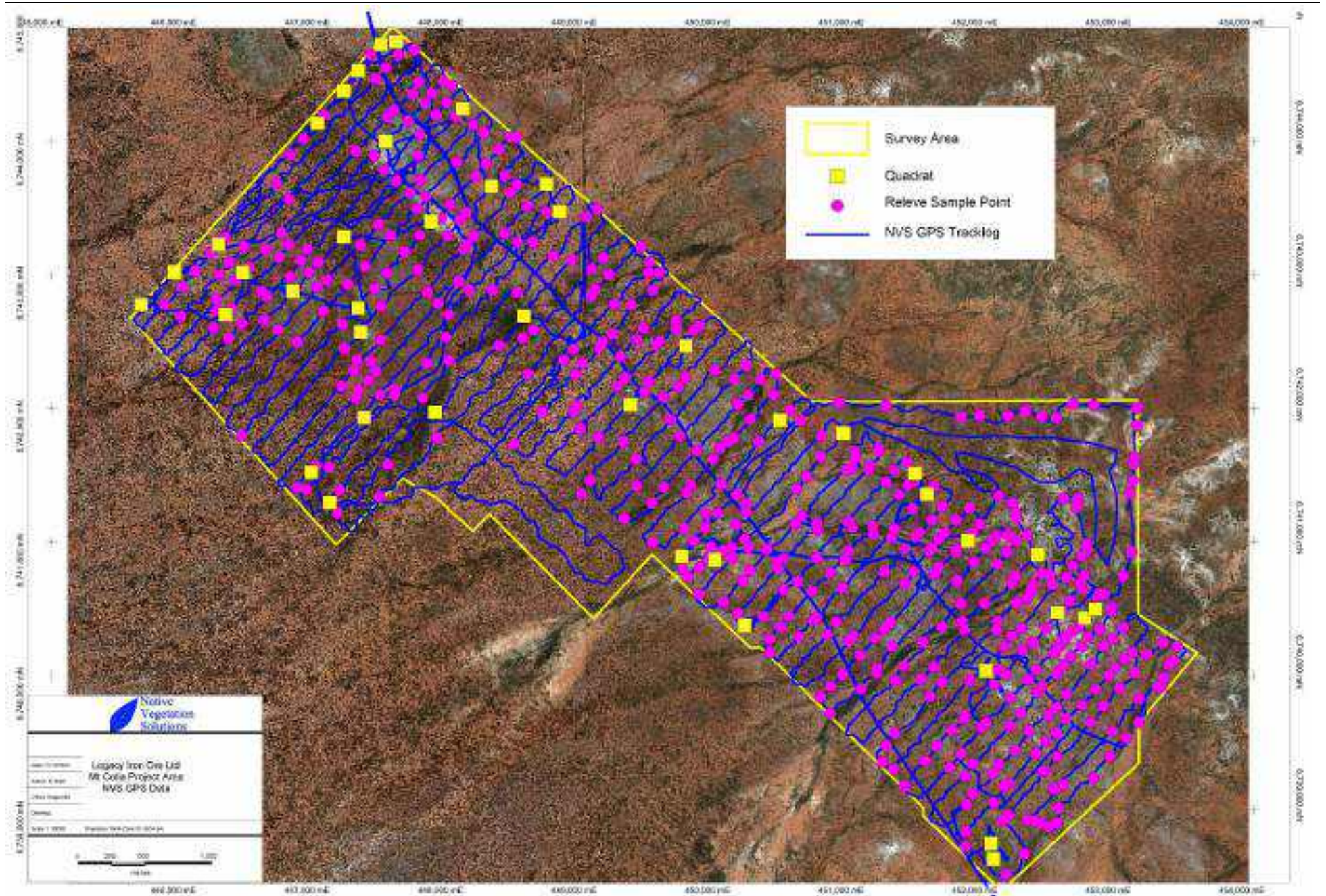
These areas are often described as 'parkland cleared' with the flora compromising weed or crop species with isolated trees or shrubs.

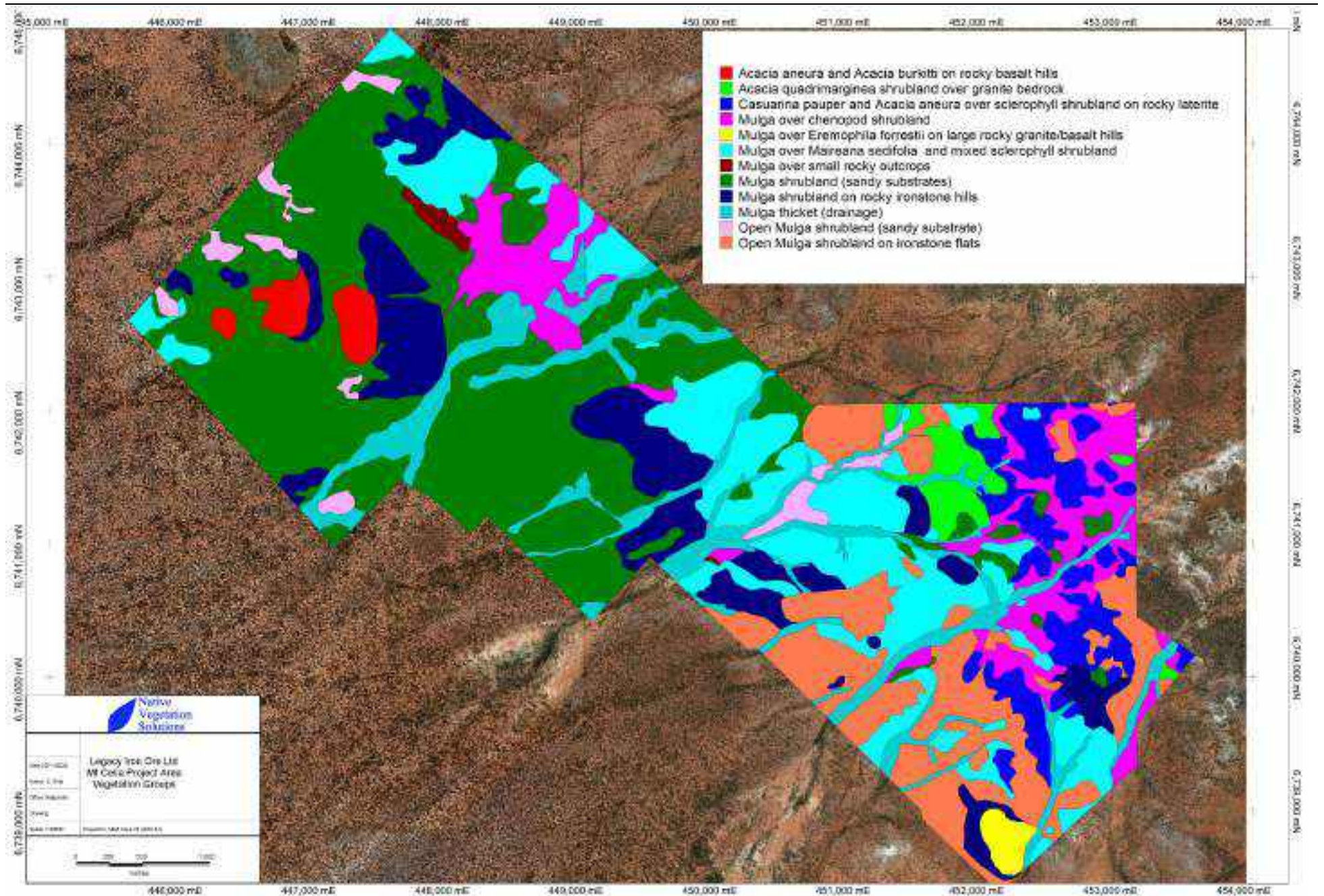
Vegetation Structure Definitions (Muir, 1977)

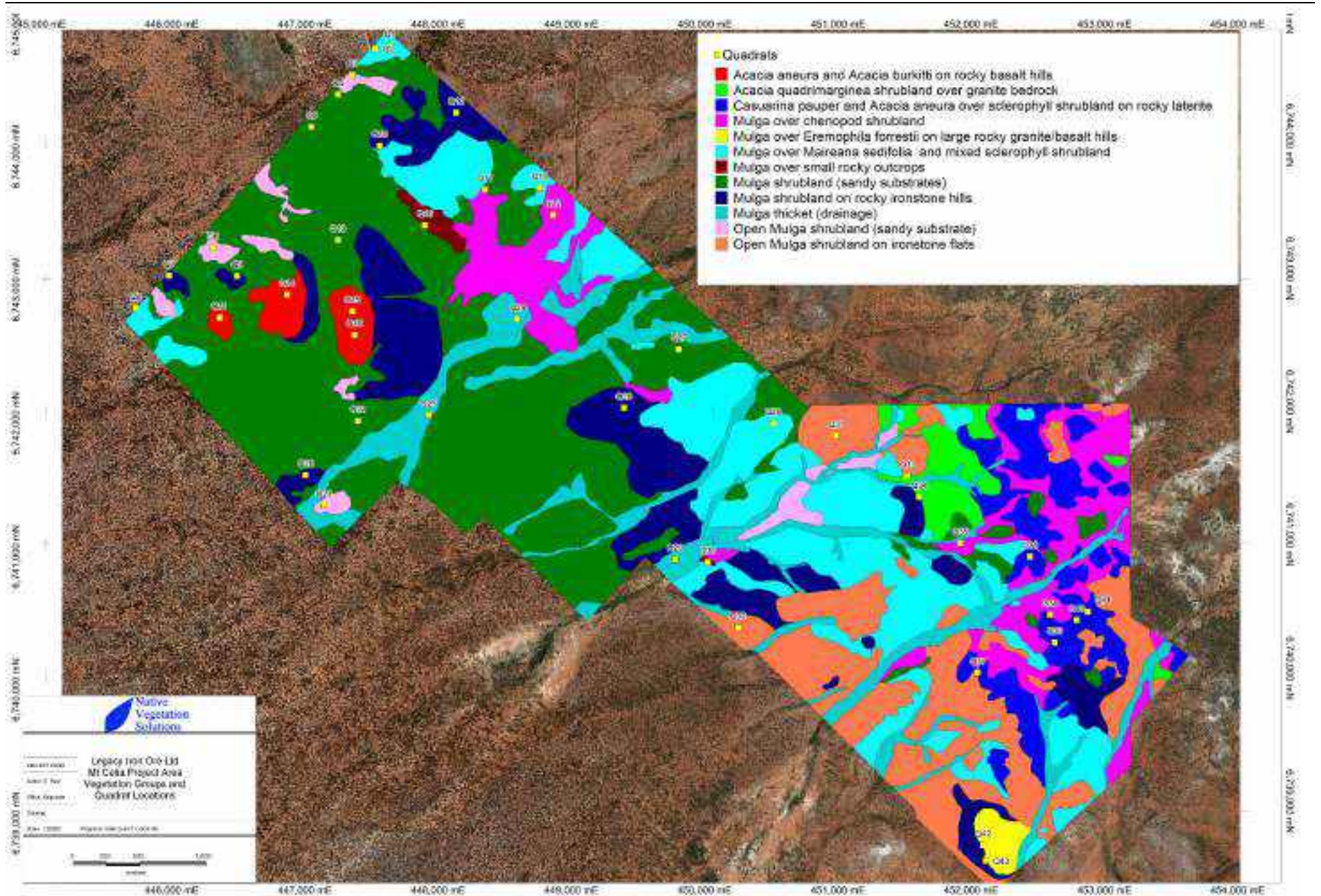
Life Form/Height Class	Canopy Cover:			
	Dense 70-100% d	Mid-Dense 30-70% c	Sparse 10-30% f	Very Sparse 2-10% r
T Trees >30m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
M Trees 15-30m	Dense Forest	Forest	Woodland	Open Woodland
LA Trees 5-15m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
LB Trees <5m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
KT Mallee tree form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
KS Mallee shrub form	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
S Shrubs >2m	Dense Thicket	Thicket	Scrub	Open Scrub
SA Shrubs 1.5-2.0m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
SB Shrubs 1.0-1.5m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
SC Shrubs 0.5-1.0m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
SD Shrubs 0.0-0.5m	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
P Mat plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
H Hummock Grass	Dense Hummock Grass	Mid-Dense Hummock Grass	Hummock Grass	Open Hummock Grass
GT Bunch grass >0.5m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
GL Bunch grass <0.5m	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
J Herbaceous spp.	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
VT Sedges >0.5m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
VL Sedges <0.5m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
X Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
Mosses, liverwort	Dense Mosses	Mosses	Open Mosses	Very Open Mosses

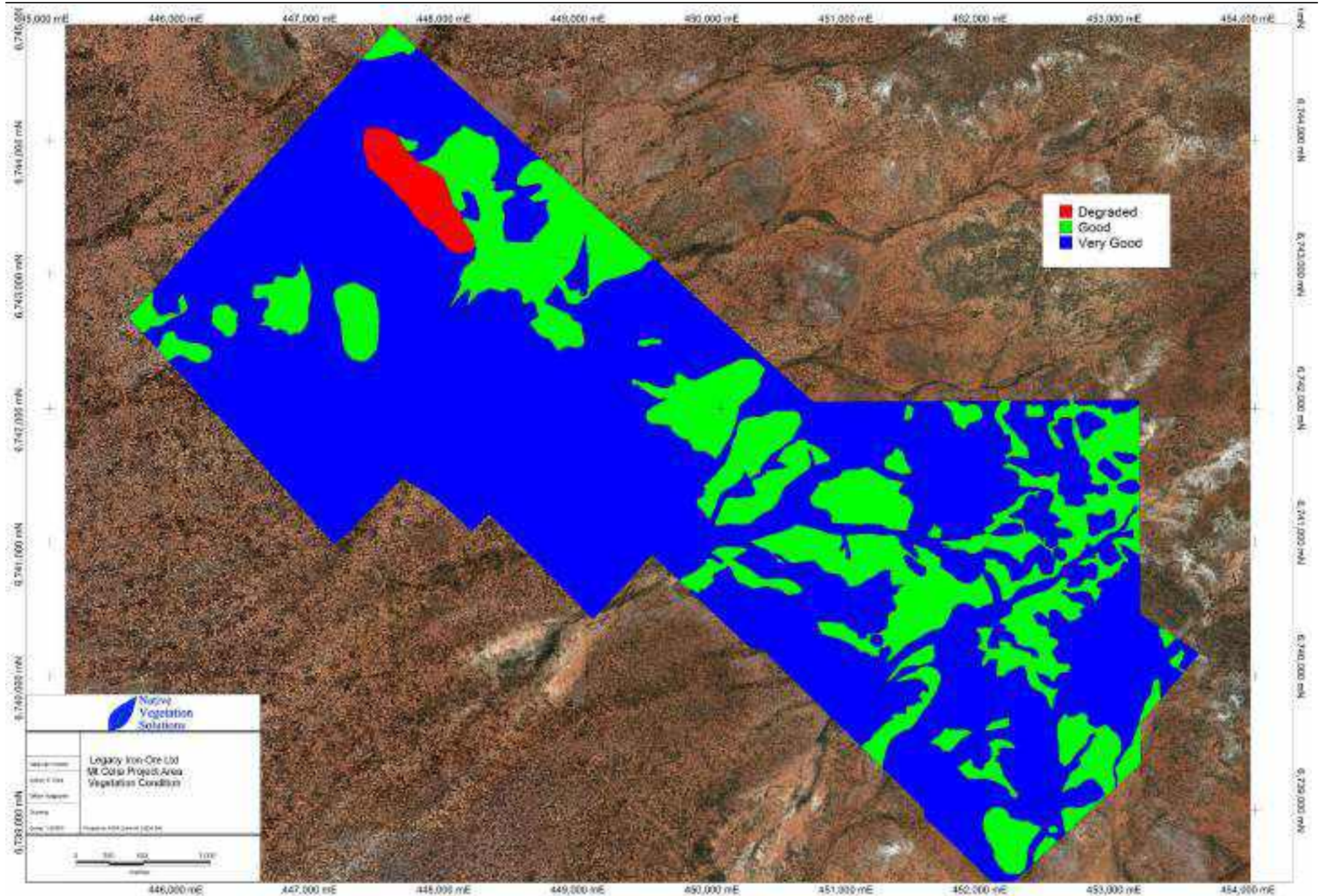
Appendix C - Mapping











Appendix D - Threatened Flora Database Search Results

Taxon	Cons_Code	Likelihood of occurring in survey area	Comment
Acacia eremophila var. Numerous-nerved variant (A.S.George 11924)	P3	Unlikely	Known records within 50km, Lack of suitable habitat
Calandrinia sp. Menzies (F. Hort et al. FH 4100)	P3	Unlikely	Possible suitable habitat, habitat searched extensively
Eremophila mirabilis	P2	Unlikely	Known records within 50km, Lack of suitable habitat
Hemigenia exilis	P4	Possible	Possible suitable habitat in the survey area, habitat searched extensively
Hybanthus floribundus subsp. chloroxanthus	P3	Possible	Suitable habitat in the survey area, habitat searched extensively
Melaleuca apostiba	P3	Unlikely	Known records within 50km, Lack of suitable habitat
Placynthium nigrum	P3	Unlikely	Known records within 50km, Lack of suitable habitat
Tecticornia mellarium	P1	Unlikely	Known records within 50km, Lack of suitable habitat
Tecticornia sp. Lake Way (P. Armstrong 05/961)	P1	Unlikely	Known records within 50km, Lack of suitable habitat
Thryptomene eremaea	P2	Unlikely	Known records within 50km, Lack of suitable habitat

Likely – suitable habitat, close (<10km) records and/or field survey completed in sub-optimal season, suggest species is likely to occur

Possible- suitable habitat, record(<50km) and/or field survey completed in sub-optimal season.

Unlikely- Lack of suitable habitat and/or no records(<50km) and /or field survey completed in optimal season, suggests species is unlikely to occur

Appendix E - Species Recorded During the June and September 2020 Survey

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

Family	Genus	Taxon	a	b	c	d	e	f	g	h	i	j	k	l
Amaranthaceae	Ptilotus	Ptilotus obovatus	*	*	*	*	*	*	*	*	*	*	*	*
Amaranthaceae	Ptilotus	Ptilotus schwartzii				*					*			*
Anacardiaceae	Schinus	Schinus molle var. areira*								*				
Apocynaceae	Marsdenia	Marsdenia australis	*	*	*	*	*		*	*	*			*
Apocynaceae	Nerium	Nerium oleander*								*				
Asparagaceae	Yucca	Yucca aloifolia*								*				
Asteraceae	Chrysocephalum	Chrysocephalum puteale				*	*					*		
Asteraceae	Olearia	Olearia muelleri											*	
Asteraceae	Podolepis	Podolepis capillaris		*						*				
Casuarinaceae	Casuarina	Casuarina pauper	*			*							*	
Chenopodiaceae	Atriplex	Atriplex bunburyana	*						*				*	
Chenopodiaceae	Chenopodium	Chenopodium gaudichaudianum												*
Chenopodiaceae	Dysphania	Dysphania kalpari					*	*		*				
Chenopodiaceae	Enchylaena	Enchylaena tomentosa var. tomentosa	*	*	*	*	*	*	*	*	*			*
Chenopodiaceae	Maireana	Maireana carnososa	*											
Chenopodiaceae	Maireana	Maireana georgei	*	*	*	*	*	*	*		*			*
Chenopodiaceae	Maireana	Maireana glomerifolia	*						*					*
Chenopodiaceae	Maireana	Maireana planifolia	*		*									
Chenopodiaceae	Maireana	Maireana pyramidata	*	*		*	*		*	*				*
Chenopodiaceae	Maireana	Maireana sedifolia	*	*		*	*		*					*
Chenopodiaceae	Maireana	Maireana tomentosa	*	*		*	*		*					*
Chenopodiaceae	Maireana	Maireana trichoptera				*	*		*					*
Chenopodiaceae	Maireana	Maireana triptera	*	*	*	*	*	*	*		*			*
Chenopodiaceae	Rhagodia	Rhagodia drummondii	*	*	*	*	*	*		*	*			*
Chenopodiaceae	Rhagodia	Rhagodia eremaea	*											
Chenopodiaceae	Salsola	Salsola australis						*	*					
Chenopodiaceae	Sclerolaena	Sclerolaena cuneata	*						*					
Chenopodiaceae	Sclerolaena	Sclerolaena densiflora	*											*
Chenopodiaceae	Sclerolaena	Sclerolaena diacantha						*						*
Chenopodiaceae	Sclerolaena	Sclerolaena patenticuspis	*											
Convolvulaceae	Duperreya	Duperreya sericea					*							
Cucurbitaceae	Citrullus	Citrullus amarus*					*							
Cucurbitaceae	Cucumis	Cucumis myriocarpus*					*	*						
Cupressaceae	Callitris	Callitris preissii												*
Fabaceae	Acacia	Acacia aneura	*	*	*	*	*	*	*	*	*	*	*	*
Fabaceae	Acacia	Acacia ayersiana	*	*		*		*	*	*	*			
Fabaceae	Acacia	Acacia burkittii	*	*		*	*	*	*	*	*	*	*	
Fabaceae	Acacia	Acacia caesaneura	*	*	*	*			*	*				*
Fabaceae	Acacia	Acacia craspedocarpa		*	*	*					*			*
Fabaceae	Acacia	Acacia hemiteles					*							
Fabaceae	Acacia	Acacia incurvaneura	*	*	*	*	*		*	*				*

Family	Genus	Taxon	a	b	c	d	e	f	g	h	i	j	k	l
Fabaceae	Acacia	Acacia kempeana							*					
Fabaceae	Acacia	Acacia ligulata	*	*	*	*	*	*	*	*	*			
Fabaceae	Acacia	Acacia minyura							*					
Fabaceae	Acacia	Acacia mulganeura	*	*	*	*	*	*	*	*	*	*	*	*
Fabaceae	Acacia	Acacia murrayana					*			*				
Fabaceae	Acacia	Acacia oswaldii	*											
Fabaceae	Acacia	Acacia pteraneura		*	*	*	*	*	*		*			
Fabaceae	Acacia	Acacia quadrimarginea										*		
Fabaceae	Acacia	Acacia ramulosa var. ramulosa	*	*	*	*	*		*	*			*	
Fabaceae	Acacia	Acacia sibirica				*			*					
Fabaceae	Acacia	Acacia tetragonophylla	*	*	*	*	*	*	*	*	*	*	*	*
Fabaceae	Daviesia	Daviesia aphylla	*	*		*								
Fabaceae	Senna	Senna artemisioides subsp. xsturtii				*								
Fabaceae	Senna	Senna artemisioides subsp. artemisioides	*	*	*	*	*	*		*	*	*	*	*
Fabaceae	Senna	Senna artemisioides subsp. filifolia	*	*	*	*	*	*	*	*	*	*	*	*
Fabaceae	Senna	Senna artemisioides subsp. helmsii				*	*				*			
Fabaceae	Senna	Senna cardiosperma				*							*	
Fabaceae	Senna	Senna glutinosa subsp. chatelainiana					*	*	*		*			
Fabaceae	Senna	Senna sp. Meekatharra											*	*
Frankeniaceae	Frankenia	Frankenia ?fecunda											*	
Frankeniaceae	Frankenia	Frankenia setosa							*					
Goodeniaceae	Goodenia	Goodenia sp.					*							
Goodeniaceae	Scaevola	Scaevola spinescens	*	*	*	*	*	*	*	*	*	*	*	*
Lamiaceae	Prostanthera	Prostanthera albiflora					*							
Lamiaceae	Teucrium	Teucrium teucriiflorum		*	*			*	*		*			
Loranthaceae	Amyema	Amyema gibberula var. gibberula								*				
Loranthaceae	Amyema	Amyema sp. Dead		*										
Malvaceae	Abutilon	Abutilon otocarpum					*							
Malvaceae	Abutilon	Abutilon oxycarpum					*	*						
Malvaceae	Alyogyne	Alyogyne pinoniana						*						
Malvaceae	Brachychiton	Brachychiton gregorii			*					*		*		
Malvaceae	Sida	Sida calyxhymenia	*	*		*	*							
Malvaceae	Sida	Sida ectogama		*	*	*		*			*		*	
Malvaceae	Sida	Sida sp. Golden calyces glabrous		*	*	*								
Myrtaceae	Eucalyptus	Eucalyptus ewartiana												*
Myrtaceae	Eucalyptus	Eucalyptus kingsmillii		*										
Myrtaceae	Eucalyptus	Eucalyptus lesouefii							*				*	
Myrtaceae	Eucalyptus	Eucalyptus oleosa subsp. oleosa	*	*										
Myrtaceae	Eucalyptus	Eucalyptus salubris											*	
Poaceae	Aristida	Aristida contorta	*	*	*	*	*	*	*	*	*	*	*	*
Poaceae	Austrostipa	Austrostipa elegantissima		*							*			
Poaceae	Austrostipa	Austrostipa eremophila	*	*	*	*	*		*	*				*
Poaceae	Austrostipa	Austrostipa scabra	*			*						*		

Family	Genus	Taxon	a	b	c	d	e	f	g	h	i	j	k	l
Poaceae	Cenchrus	Cenchrus ciliaris*								*				
Poaceae	Cymbopogon	Cymbopogon ambiguus				*								
Poaceae	Enneapogon	Enneapogon caerulescens	*	*	*	*	*	*	*	*	*	*		
Poaceae	Enteropogon	Enteropogon ramosus	*			*	*		*	*				*
Poaceae	Eragrostis	Eragrostis eriopoda	*	*	*	*			*	*		*		
Poaceae	Eragrostis	Eragrostis pergracilis		*										
Poaceae	Eragrostis	Eragrostis setifolia		*			*							
Poaceae	Eriachne	Eriachne helmsii				*	*					*		*
Poaceae	Eriachne	Eriachne pulchella subsp. pulchella					*		*					*
Poaceae	Monachather	Monachather paradoxus								*				
Poaceae	Paspalidium	Paspalidium clementii					*							*
Poaceae	Triodia	Triodia basedowii		*										
Portulacaceae	Portulaca	Portulaca oleracea	*				*		*					
Proteaceae	Grevillea	Grevillea acuaria											*	
Proteaceae	Grevillea	Grevillea berryana	*	*										
Proteaceae	Hakea	Hakea lorea subsp. lorea							*	*	*			
Proteaceae	Hakea	Hakea preissii	*	*		*	*		*				*	
Proteaceae	Hakea	Hakea recurva subsp. recurva	*				*							
Pteridaceae	Cheilanthes	Cheilanthes lasiophylla					*	*				*	*	
Pteridaceae	Cheilanthes	Cheilanthes sieberi subsp. sieberi												*
Rubiaceae	Psyrax	Psyrax rigidula						*		*				*
Rubiaceae	Psyrax	Psyrax suaveolens			*		*	*		*				*
Rutaceae	Philotheca	Philotheca brucei subsp. brucei						*						*
Santalaceae	Exocarpos	Exocarpos aphyllus											*	
Sapindaceae	Dodonaea	Dodonaea lobulata	*	*		*	*		*		*	*	*	
Sapindaceae	Dodonaea	Dodonaea rigida		*		*	*	*			*	*	*	*
Sapindaceae	Dodonaea	Dodonaea viscosa subsp. angustissima		*										
Scrophulariaceae	Eremophila	Eremophila clarkei					*			*				
Scrophulariaceae	Eremophila	Eremophila exilifolia	*	*	*					*				
Scrophulariaceae	Eremophila	Eremophila forrestii subsp. forrestii		*						*	*	*		*
Scrophulariaceae	Eremophila	Eremophila georgei	*											
Scrophulariaceae	Eremophila	Eremophila latrobei subsp. latrobei	*			*	*	*		*			*	*
Scrophulariaceae	Eremophila	Eremophila longifolia	*	*		*	*		*	*	*			
Scrophulariaceae	Eremophila	Eremophila metallicorum											*	
Scrophulariaceae	Eremophila	Eremophila oldfieldii subsp. angustifolia	*			*	*	*			*			
Scrophulariaceae	Eremophila	Eremophila oppositifolia subsp. angustifolia											*	
Scrophulariaceae	Eremophila	Eremophila pantonii				*			*				*	
Solanaceae	Solanum	Solanum lasiophyllum	*	*	*	*	*	*	*	*	*	*	*	*
Solanaceae	Solanum	Solanum nummularium	*	*										
Tamaricaceae	Tamarix	Tamarix aphylla*								*				
Thymelaeaceae	Pimelea	Pimelea microcephala subsp. microcephala			*			*		*				

Appendix F - Site Descriptions

Project Name: Mt Celia					
Date:	3/06/2020 & 8/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q1		
Quadrat size:	20x20				
Vegetation group:	Mulga over Maireana sedifolia (calcrete)				
WP:	1				
Photo number:			35		
Landform:			Flat/Plain		
Land surface/disturbance:			No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):			Very slightly; very few/Fine gravelly; small pebbles/Rounded		
Rock outcrop (abundance/runoff):			No bedrock exposed/Slow		
Soil (profile/field texture/soil surface):			Uniform/Loamy sand/Firm		
% Cover leaf litter:			10		
% 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 %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Dodonaea lobulata		Maireana sedifolia	
		Acacia burkittii		Ptilotus obovatus	
		Senna artemisioides subsp. filifolia			
ALL SPECIES					
Acacia aneura					
Dodonaea lobulata					
Acacia burkittii					
Senna artemisioides subsp. filifolia					
Maireana sedifolia					
Ptilotus obovatus					
Maireana carmosa					
Maireana georgei					
Rhagodia eremaea					
Scaevola spinescens					
Solanum lasiophyllum					
Enchylaena tomentosa var. tomentosa					
Aristida contorta					
Hakea preissii					
Marsdenia australis					
Outside					
Acacia ligulata					
Acacia mulganeura					
Acacia tetragonophylla					
Eremophila georgei					
Eremophila longifolia					
Eremophila oldfieldii subsp. angustifolia					
Grevillea berryana					
Senna artemisioides subsp. artemisioides					
Solanum nummularium					



Project Name: Mt Celia					
Date:	3/06/2020 & 8/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q3		
Quadrat size:	20x20				
Vegetation group:	Mulga Shrubland				
WP:	4				
Photo number:	40				
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):	Uniform/Loamy sand/Hard setting				
% Cover leaf litter:	40				
% 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:	3-8m	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:	Acacia ramulosa var. ramulosa	Dominant taxa:	Ptilotus obovatus
Acacia aneura					
Acacia incurvaneura					
Acacia caesaneura					
ALL SPECIES					
Acacia aneura					
Acacia incurvaneura					
Acacia caesaneura					
Acacia ramulosa var. ramulosa					
Ptilotus obovatus					
Eragrostis eriopoda					
Sida ectogama					
Sida sp. Golden calyces glabrous					
Maireana georgei					
Maireana planifolia					
Rhagodia drummondii					
Marsdenia australis					
Aristida contorta					
Austrostipa eremophila					
Enchylaena tomentosa var. tomentosa					
Psychrax suaveolens					
Solanum lasiophyllum					
Maireana triptera					
Outside					
Acacia liquilata					
Teucrium teucriflorum					



Project Name: Mt Celia					
Date:	3/06/2020 & 8/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q4		
Quadrat size:	20x20				
Vegetation group:	Mulga Shrubland				
WP:	5				
Photo number:	41				
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):	Uniform/Loamy sand/Hard setting				
% Cover leaf litter:	40				
% 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 %:	S 10-30	Crown cover %:	V <10
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia incurvaneura		Acacia ramulosa var. ramulosa		Ptilotus obovatus	
Acacia mulganeura		Eremophila forrestii subsp. forrestii			
Eucalyptus kingsmillii		Senna artemisioides subsp. artemisioides			
ALL SPECIES					
Acacia incurvaneura					
Acacia mulganeura					
Eucalyptus kingsmillii					
Acacia ramulosa var. ramulosa					
Eremophila forrestii subsp. forrestii					
Senna artemisioides subsp. artemisioides					
Ptilotus obovatus					
Maireana pyramidata					
Acacia craspedocarpa					
Acacia aneura					
Solanum lasiophyllum					
Eragrostis eriopoda					
Teucrium teucriiflorum					
Rhagodia drummondii					
Aristida contorta					
Scaevola spinescens					
Enchylaena tomentosa var. tomentosa					
Outside					
Acacia liquilata					
Hakea preissii					



Project Name: Mt Celia					
Date:	4/06/2020 & 8/09/2020		Botanist:	Eren Reid	
Location:	Mt Celia		Quadrat:	Q7	
Quadrat size:	20x20				
Vegetation group:	Mulga shrubland on rocky ironstone				
WP:	12				
Photo number:	44				
Landform:	Hillock/Mound				
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):	No bedrock exposed/Moderately rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Hard setting				
% Cover leaf litter:	20				
% Cover bare ground:	65				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	1-3m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	V <10
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Scaevola spinescens		Ptilotus obovatus	
Acacia mulganeura		Senna artemisioides subsp. filifolia			
		Eremophila latrobei subsp. latrobei			
		Eremophila latrobei subsp. latrobei			
		ALL SPECIES			
		Acacia aneura			
		Acacia mulganeura			
		Scaevola spinescens			
		Senna artemisioides subsp. filifolia			
		Eremophila latrobei subsp. latrobei			
		Ptilotus obovatus			
		Dodonaea lobulata			
		Eremophila oldfieldii subsp. angustifolia			
		Senna artemisioides subsp. artemisioides			
		Sida ectogama			
		Acacia tetragonophylla			
		Rhagodia drummondii			
		Acacia craspedocarpa			
		Hakea preissii			
		Solanum lasiophyllum			
		Sida calyxhymenia			
		Dodonaea rigida			
		Austrostipa scabra			
		Sida sp. Golden calyces glabrous			
		Eremophila longifolia			
		Maireana triptera			
		Acacia caesaneura			
		Outside			
		Acacia incurvaneura			
		Acacia ligulata			



Project Name: Mt Celia					
Date:	4/06/2020 & 8/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q8		
Quadrat size:	20x20				
Vegetation group:	Cas Pauper over Acacia ligulata, senna art fil and Dod lob				
WP:	13				
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/Slow				
Soil (profile/field texture/soil surface):	Gradational/Loamy sand/Hard setting				
% Cover leaf litter:	40				
% Cover bare ground:	40				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	M Tree Mallee (> 8m)	Growth form:	S Shrub	Growth form:	Y Shrub Mallee (< 8m)
Height:	6-12m	Height:	1-3m	Height:	0.25-0.5m
Crown cover %:	1 <1	Crown cover %:	M 30-70	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Casuarina pauper		Acacia ligulata		Ptilotus obovatus	
		Senna artemisioides subsp. filifolia		Maireana pyramidata	
		Dodonaea lobulata			
ALL SPECIES					
Casuarina pauper					
Acacia ligulata					
Senna artemisioides subsp. filifolia					
Dodonaea lobulata					
Ptilotus obovatus					
Maireana pyramidata					
Daviesia aphylla					
Scaevola spinescens					
Acacia tetragonophylla					
Rhagodia drummondii					
Austrostipa scabra					
Maireana planifolia					
Maireana tomentosa					
Enchylaena tomentosa var. tomentosa					
Maireana triptera					
Marsdenia australis					
Solanum lasiophyllum					
Aristida contorta					
Eragrostis eriopoda					
Outside					
Eucalyptus oleosa subsp. oleosa					
Hakea preissii					



Project Name: Mt Celia				
Date:	4/06/2020 & 8/09/2020		Botanist:	Eren Reid
Location:	Mt Celia		Quadrat:	Q11
Quadrat size:	20x20			
Vegetation group:	Acacia aneura and Acacia burkittii on rocky basalt hills			
WP:	52			
Photo number:			48	
Landform:	Hillock/Mound			
Land surface/disturbance:	No effective disturbance			
Coarse fragments on the surface (abundance/size/shape):	Very: abundant/Cobbly; or cobbles/Subrounded			
Rock outcrop (abundance/runoff):	Rocky/Moderately rapid			
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Hard setting			
% Cover leaf litter:	10			
% Cover bare ground:	70			
Tallest stratum		Mid-stratum		Lower stratum
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:
Height:	1-3m	Height:	0.5-1m	Height:
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:
Dominant taxa:		Dominant taxa:		Dominant taxa:
Acacia aneura		Acacia burkittii		Ptilotus obovatus
Acacia pteraneura				Chrysocephalum puteale
ALL SPECIES				
Acacia aneura				
Acacia pteraneura				
Acacia burkittii				
Ptilotus obovatus				
Chrysocephalum puteale				
Acacia ligulata				
Acacia incurvaneura				
Scaevola spinescens				
Acacia mulganeura				
Acacia hemiteles				
Dodonaea rigida				
Senna artemisioides subsp. filifolia				
Maireana triptera				
Solnanum lasiophyllum				
Enneapogon caeruleus				
Acacia ramulosa var. ramulosa				
Austrostipa eremophila				
Eriachne pulchella subsp. pulchella				
Maireana georgei				
Marsdenia australis				
Outside				
Hakea preissii				
Acacia tetragonophylla				
Eremophila latrobei subsp. latrobei				



Project Name: Mt Celia					
Date:	4/06/2020 & 08/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q12		
Quadrat size:	20x20				
Vegetation group:	Mulga shrubland on rocky ironstone hills				
WP:	64				
Photo number:	52				
Landform:	Hillock/Mound				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Very: abundant/Cobbly: or cobbles/Subrounded tabular				
Rock outcrop (abundance/runoff):	Rocky/Moderately rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Hard setting				
% Cover leaf litter:	20				
% Cover bare ground:	70				
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:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia burkittii		Ptilotus obovatus	
Acacia mulganeura		Eremophila latrobei subsp. latrobei		Chrysocephalum puteale	
ALL SPECIES					
Acacia aneura					
Acacia mulganeura					
Acacia burkittii					
Eremophila latrobei subsp. latrobei					
Ptilotus obovatus					
Chrysocephalum puteale					
Acacia incurvaneura					
Acacia tetragonophylla					
Scaevola spinescens					
Dodonaea rigida					
Dodonaea lobulata					
Senna artemisioides subsp. helmsii					
Solium lasiophyllum					
Enchylaena tomentosa var. tomentosa					
Enneapogon caeruleus					
Eriachne helmsii					
Enteropogon ramosus					
Maireana triptera					
Cymbopogon ambiguus					
Outside					



Project Name: Mt Celia					
Date:	4/06/2020 & 8/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q13		
Quadrat size:	20x20				
Vegetation group:	Mulga shrubland (sandy)				
WP:	68				
Photo number:			53		
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/Clayey sand/Soft		
% Cover leaf litter:			20		
% 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:	3-6m	Height:	1-3m	Height:	0.25-0.5m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Scaevola spinescens		Ptilotus obovatus	
Acacia incurvaneura		Dodonaea lobulata			
Acacia mulganeura					
ALL SPECIES					
Acacia aneura					
Acacia incurvaneura					
Acacia mulganeura					
Scaevola spinescens					
Dodonaea lobulata					
Ptilotus obovatus					
Acacia ayersiana					
Acacia craspedocarpa					
Acacia pteraneura					
Solanum lasiophyllum					
Acacia tetragonophylla					
Senna artemisioides subsp. artemisioides					
Marsdenia australis					
Maireana tomentosa					
Eragrostis eriopoda					
Aristida contorta					
Acacia caesaneura					
Austrostipa eremophila					
Enchylaena tomentosa var. tomentosa					
Outside					
Acacia ligulata					
Grevillea berryana					
Sida calyxhymenia					



Project Name: Mt Celia					
Date:	4/06/2020 & 8/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q14		
Quadrat size:	20x20				
Vegetation group:	Acacia aneura and Acacia burkittii on rocky basalt hills				
WP:	71				
Photo number:	54-quadrat, 55 is general veg				
Landform:	Hillock/Mound				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Extremely: very abundant/Cobbly; or cobbles/Subrounded				
Rock outcrop (abundance/runoff):	Slightly rocky/Moderately rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	20				
% 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 %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia mulganeura		Ptilotus obovatus	
		Acacia burkittii			
		Scaevola spinescens			
		ALL SPECIES			
		Acacia aneura			
		Acacia mulganeura			
		Acacia burkittii			
		Scaevola spinescens			
		Ptilotus obovatus			
		Eremophila oldfieldii subsp. angustifolia			
		Acacia tetragonophylla			
		Acacia pteraneura			
		Senna artemisioides subsp. filifolia			
		Maireana trichoptera			
		Maireana triptera			
		Enneapogon caeruleus			
		Solanum lasiophyllum			
		Chrysocephalum puteale			
		Maireana sedifolia			
		Eragrostis setifolia			
		Austrostipa eremophila			
		Maireana tomentosa			
		Aristida contorta			
		Outside			
		Acacia ligulata			
		Senna artemisioides subsp. artemisioides			
		Hakea recurva subsp. recurva			



Project Name: Mt Celia			
Date:	5/06/2020 & 8/09/2020	Botanist:	Eren Reid
Location:	Mt Celia	Quadrat:	Q16
Quadrat size:	20x20		
Vegetation group:	Mulga over small rocky outcrops		
WP:	97		
Photo number:			70
Landform:			Crest/Hill Crest
Land surface/disturbance:			Limited clearing
Coarse fragments on the surface (abundance/size/shape):			Very: abundant/Stony; stones/Subangular tabular
Rock outcrop (abundance/runoff):			Rockland/Very rapid
Soil (profile/field texture/soil surface):			Uniform/Sandy clay loam/Hard setting
% Cover leaf litter:			40
% Cover bare ground:			50
Tallest stratum	Mid-stratum		Lower stratum
Growth form:	Y Shrub Mallee (< 8m)	S Shrub	S Shrub
Height:	6-12m	1-3m	0.25-0.5m
Crown cover %:	V <10	S 10-30	S 10-30
Dominant taxa:			
Acacia aneura	Philothea brucei subsp. brucei		Ptilotus obovatus
Acacia mulganeura	Sida ectogama		
	Scaevola spinescens		
	ALL SPECIES		
	Acacia aneura		
	Acacia mulganeura		
	Philothea brucei subsp. brucei		
	Sida ectogama		
	Scaevola spinescens		
	Ptilotus obovatus		
	Acacia ayersiana		
	Acacia pteraneura		
	Acacia tetragonophylla		
	Psyrax rigidula		
	Rhagodia drummondii		
	Dodonaea rigida		
	Eremophila latrobei subsp. latrobei		
	Psyrax suaveolens		
	Senna glutinosa subsp. chatelainiana		
	Acacia liquata		
	Acacia burkittii		
	Eremophila oldfieldii subsp. angustifolia		
	Cheilanthes lasiophylla		
	Pimelea microcephala subsp. microcephala		
	Enneapogon caeruleascens		
	Sclerolaena diacantha		
	Alyogyne pinoniana		
	Maireana triptera		
	Outside		



Project Name: Mt Celia			
Date:	05/06/2020 & 08/09/2020	Botanist:	Eren Reid
Location:	Mt Celia	Quadrat:	Q17
Quadrat size:	20x20		
Vegetation group:	Mulga over chenopod shrubland		
WP:	106		
Photo number:	76		
Landform:	Open depression (vale)/Drainage depression		
Land surface/disturbance:	No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):	Moderately many/Medium gravelly; medium pebbles/Rounded		
Rock outcrop (abundance/runoff):	No bedrock exposed/Slow		
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Cracking		
% Cover leaf litter:	10		
% Cover bare ground:	60		
Tallest stratum	Mid-stratum	Lower stratum	
Growth form:	Y Shrub Mallee (< 8m)	S Shrub	S Shrub
Height:	3-6m	1-3m	0.5-1m
Crown cover %:	V <10	V <10	S 10-30
Dominant taxa:	Senna artemisioides subsp. filifolia	Maireana pyramidata	
Acacia aneura	Acacia burkittii	Atriplex bunburyana	
	Acacia caesaneura		
	ALL SPECIES		
	Acacia aneura		
	Senna artemisioides subsp. filifolia		
	Acacia burkittii		
	Acacia caesaneura		
	Maireana pyramidata		
	Atriplex bunburyana		
	Acacia kempeana		
	Acacia pteraneura		
	Enneapogon caeruleus		
	Enchylaena tomentosa var. tomentosa		
	Maireana triptera		
	Austrostipa eremophila		
	Enteropogon ramosus		
	Portulaca oleracea		
	Ptilotus obovatus		
	Solanum lasiophyllum		
	Maireana tomentosa		
	Aristida contorta		
	Acacia minvura		
	Acacia sibirica		
	Marsdenia australis		
	Outside		
	Eremophila longifolia		
	Acacia ramulosa var. ramulosa		
	Acacia ligulata		
	Acacia tetragonophylla		
	Scaevola spinescens		



Project Name: Mt Celia					
Date:	5/06/2020 & 8/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q18		
Quadrat size:	20x20				
Vegetation group:	Acacia aneura and Acacia burkittii on rocky basalt hills				
WP:	112				
Photo number:			77		
Landform:			Hillock/Mound		
Land surface/disturbance:			No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):			Very; abundant/Coarse gravelly; large pebbles/Subrounded tabular		
Rock outcrop (abundance/runoff):			Very rocky/Rapid		
Soil (profile/field texture/soil surface):			Uniform/Sandy clay loam/Hard setting		
% 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:	0.25-0.5m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia mulganeura		Acacia burkittii		Ptilotus obovatus	
		Senna artemisioides subsp. filifolia		Enneapogon caeruleus	
		Scaevola spinescens			
ALL SPECIES					
Acacia mulganeura					
Acacia burkittii					
Senna artemisioides subsp. filifolia					
Scaevola spinescens					
Ptilotus obovatus					
Enneapogon caeruleus					
Dodonaea lobulata					
Acacia tetragonophylla					
Senna artemisioides subsp. helmsii					
Senna artemisioides subsp. artemisioides					
Eremophila longifolia					
Hakea preissii					
Acacia aneura					
Maireana sedifolia					
Dodonaea rigida					
Senna glutinosa subsp. chatelainiana					
Maireana triptera					
Enchylaena tomentosa var. tomentosa					
Prostanthera albiflora					
Eriachne helmsii					
Enteropogon ramosus					
Cheilanthes lasiophylla					
Eremophila clarkei					
Abutilon oxycarpum					
Chrysocephalum puteale					
Aristida contorta					
Outside					
Psychodax suaveolens					



Project Name: Mt Celia					
Date:	5/06/2020 & 8/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q19		
Quadrat size:	20x20				
Vegetation group:	Mulga over Maireana sedifolia and mixed sclerophyll shrubland				
WP:	124				
Photo number:			78		
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):			Uniform/Loamy sand/Firm		
% Cover leaf litter:			15		
% 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 %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia oswaldii		Acacia burkittii		Maireana sedifolia	
Acacia aneura		Hakea preissii		Senna artemisioides subsp. filifolia	
				Ptilotus obovatus	
ALL SPECIES					
Acacia oswaldii					
Acacia aneura					
Acacia burkittii					
Hakea preissii					
Maireana sedifolia					
Senna artemisioides subsp. filifolia					
Ptilotus obovatus					
Acacia ligulata					
Hakea recurva subsp. recurva					
Maireana pyramidata					
Atriplex bunburyana					
Marsdenia australis					
Sida calythymeria					
Maireana tomentosa					
Aristida contorta					
Eragrostis eriopoda					
Austrostipa eremophila					
Enteropogon ramosus					
Solanum lasiophyllum					
Maireana glomerifolia					
Eremophila exilifolia					
Portulaca oleracea					
Sclerolaena cuneata					
Sclerolaena patentiscuspis					
Outside					



Project Name: Mt Celia					
Date:	5/06/2020 & 9/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q21		
Quadrat size:	20x20				
Vegetation group:	Mulga shrubland (sandy substrates)				
WP:	138				
Photo number:			92		
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):			Uniform/Loamy sand/Loose		
% Cover leaf litter:			70		
% 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 %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia ayersiana		Ptilotus obovatus	
Acacia incurvaneura		Acacia burkittii			
		Senna artemisioides subsp. filifolia			
ALL SPECIES					
Acacia aneura					
Acacia incurvaneura					
Acacia ayersiana					
Acacia burkittii					
Senna artemisioides subsp. filifolia					
Ptilotus obovatus					
Acacia ligulata					
Scaevola spinescens					
Rhagodia drummondii					
Amyema sp. Dead					
Solanum lasiophyllum					
Eragrostis eriopoda					
Sida calythyenia					
Enchylaena tomentosa var. tomentosa					
Maireana georgei					
Maireana triptera					
Marsdenia australis					
Austrostipa elegantissima					
Podolepis capillaris					
Aristida contorta					
Maireana tomentosa					
Outside					
Eremophila exilifolia					



Project Name: Mt Celia					
Date:	5/06/2020 & 8/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q22		
Quadrat size:	20x20				
Vegetation group:	Mulga over chenopod shrubland				
WP:	145				
Photo number:			93		
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):			Uniform/Loamy sand/Loose		
% Cover leaf litter:			10		
% Cover bare ground:			70		
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 %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia ayersiana		Acacia caesaneura		Senna artemisioides subsp. filifolia	
Acacia aneura				Maireana pyramidata	
				Ptilotus obovatus	
ALL SPECIES					
Acacia ayersiana					
Acacia aneura					
Acacia caesaneura					
Senna artemisioides subsp. filifolia					
Maireana pyramidata					
Ptilotus obovatus					
Acacia incurvaneura					
Hakea lorea subsp. lorea					
Acacia pteraneura					
Maireana sedifolia					
Maireana triptera					
Eragrostis eriopoda					
Enneapogon caeruleascens					
Atriplex bunburyana					
Solanum lasiophyllum					
Aristida contorta					
Enteropogon ramosus					
Austrostipa eremophila					
Dodoniaea lobulata					
Acacia tetragonophylla					
Acacia minyura					
Acacia mulganeura					
Hakea preissii					
Outside					
Acacia ligulata					



Project Name: Mt Celia					
Date:	5/06/2020 & 9/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q24		
Quadrat size:	20x20				
Vegetation group:	mulga thicket -drainage				
WP:	160				
Photo number:	96-104				
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/Slow				
Soil (profile/field texture/soil surface):	Uniform/Clay loam/Cracking				
% Cover leaf litter:	80				
% Cover bare ground:	20				
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 %:	M 30-70	Crown cover %:	M 30-70	Crown cover %:	M 30-70
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia incurvaneura		Acacia burkittii		Maireana pyramidata	
Acacia ayersiana				Ptilotus obovatus	
ALL SPECIES					
Acacia incurvaneura					
Acacia ayersiana					
Acacia burkittii					
Maireana pyramidata					
Ptilotus obovatus					
Eremophila longifolia					
Hakea lorea subsp. lorea					
Acacia tetragonophylla					
Eremophila clarkei					
Eremophila exilifolia					
Brachychiton gregorii					
Acacia mulganeura					
Senna artemisioides subsp. artemisioides					
Senna artemisioides subsp. filifolia					
Rhapodia drummondii					
Marsdenia australis					
Amyema gibberula var. gibberula					
Enchylaena tomentosa var. tomentosa					
Scaevola spinescens					
Psychotria suaveolens					
Aristida contorta					
Podolepis capillaris					
Outside					



Project Name: Mt Celia					
Date:	5/06/2020 & 9/09/2020		Botanist:	Eren Reid	
Location:	Mt Celia		Quadrat:	Q25	
Quadrat size:	20x20				
Vegetation group:	Mulga thicket- drainage				
WP:	162				
Photo number:	107				
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/Slow				
Soil (profile/field texture/soil surface):	Uniform/Loamy sand/Loose				
% Cover leaf litter:	80				
% 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 %:	M 30-70	Crown cover %:	M 30-70
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia ayersiana		Acacia ramulosa var. ramulosa		Ptilotus obovatus	
ALL SPECIES					
Acacia ayersiana					
Acacia ramulosa var. ramulosa					
Ptilotus obovatus					
Senna artemisioides subsp. artemisioides					
Senna artemisioides subsp. filifolia					
Acacia incurvaneura					
Acacia mulganeura					
Psychdrax rigidula					
Acacia aneura					
Acacia burkittii					
Eremophila latrobei subsp. latrobei					
Rhagodia drummondii					
Psychdrax suaveolens					
Pimelea microcephala subsp. microcephala					
Monachather paradoxus					
Marsdenia australis					
Acacia tetragonophylla					
Podolepis capillaris					
Hakea lorea subsp. lorea					
Acacia caesaneura					
Outside					



Project Name: Mt Celia					
Date:	6/06/2020 & 9/09/2020		Botanist:	Eren Reid	
Location:	Mt Celia		Quadrat:	Q26	
Quadrat size:	20x20				
Vegetation group:	Mulga shrubland on rocky ironstone hills				
WP:	206				
Photo number:	122				
Landform:	Hillock/Mound				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Very: abundant/Coarse gravelly; large pebbles/Angular				
Rock outcrop (abundance/runoff):	Very rocky/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	40				
% 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:	
Casuarina pauper		Acacia ramulosa var. ramulosa		Sida ectogama	
Acacia mulganeura		Scaevola spinescens		Dodonaea lobulata	
				Ptilotus obovatus	
ALL SPECIES					
Casuarina pauper					
Acacia mulganeura					
Acacia ramulosa var. ramulosa					
Scaevola spinescens					
Sida ectogama					
Dodonaea lobulata					
Ptilotus obovatus					
Eremophila oldfieldii subsp. angustifolia					
Rhaqodia drummondii					
Hakea preissii					
Acacia tetragonophylla					
Senna artemisioides subsp. filifolia					
Maireana triptera					
Maireana sedifolia					
Eragrostis eriopoda					
Maireana georgei					
Maireana tomentosa					
Enchylaena tomentosa var. tomentosa					
Solanum lasiophyllum					
Aristida contorta					
Outside					
Acacia aneura					
Acacia ligulata					
Daviesia aphylla					
Eremophila longifolia					
Eremophila latrobei subsp. latrobei					
Dodonaea rigida					
Enneapogon caerulescens					



Project Name: Mt Celia					
Date:	6/06/2020 & 9/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q28		
Quadrat size:	20x20				
Vegetation group:	Mulga over Maireana sedifolia and mixed sclerophyll shrubland				
WP:	245				
Photo number:			126		
Landform:			Flat/Plain		
Land surface/disturbance:			No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):			No qualifier; common/Coarse gravelly; large pebbles/Subrounded		
Rock outcrop (abundance/runoff):			No bedrock exposed/Slow		
Soil (profile/field texture/soil surface):			Uniform/Loamy sand/Firm		
% Cover leaf litter:			40		
% Cover bare ground:			70		
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 %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia burkittii		Maireana sedifolia	
		Acacia liquilata		Ptilotus obovatus	
				Dodonaea lobulata	
ALL SPECIES					
Acacia aneura					
Acacia burkittii					
Acacia liquilata					
Maireana sedifolia					
Ptilotus obovatus					
Dodonaea lobulata					
Senna artemisioides subsp. filifolia					
Enneapogon caeruleus					
Solanum lasiophyllum					
Austrostipa eremophila					
Enchylaena tomentosa var. tomentosa					
Eragrostis eriopoda					
Maireana triptera					
Solanum nummularium					
Austrostipa scabra					
Sclerolaena densiflora					
Aristida contorta					
Outside					
Casuarina pauper					
Acacia ayersiana					
Eremophila longifolia					



Project Name: Mt Celia					
Date:	6/06/2020 & 9/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q29		
Quadrat size:	20x20				
Vegetation group:	Mulga thicket (drainage)				
WP:	254				
Photo number:			127		
Landform:	Open depression (vale)/Drainage depression				
Land surface/disturbance:	No effective disturbance except grazing by hoofed animals				
Coarse fragments on the surface (abundance/size/shape):	No coarse fragments				
Rock outcrop (abundance/runoff):	No bedrock exposed/Moderately rapid				
Soil (profile/field texture/soil surface):	Uniform/Loamy sand/Firm				
% Cover leaf litter:	50				
% Cover bare ground:	40				
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 %:	V <10	Crown cover %:	M 30-70	Crown cover %:	M 30-70
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Hakea lorea subsp. lorea		Acacia burkittii		Eremophila forrestii subsp. forrestii	
Acacia ayersiana		Acacia aneura		Acacia tetragonophylla	
				Enchylaena tomentosa var. tomentosa	
ALL SPECIES					
Hakea lorea subsp. lorea					
Acacia ayersiana					
Acacia burkittii					
Acacia aneura					
Eremophila forrestii subsp. forrestii					
Acacia tetragonophylla					
Enchylaena tomentosa var. tomentosa					
Eremophila longifolia					
Senna artemisioides subsp. artemisioides					
Senna artemisioides subsp. filifolia					
Acacia ligulata					
Rhagodia drummondii					
Acacia murrayana					
Solanum lasiophyllum					
Enteropogon ramosus					
Enneapogon caerulescens					
Ptilotus obovatus					
Cenchrus ciliaris*					
Maireana pyramidata					
Eragrostis eriopoda					
Dysphania kalpari					
Aristida contorta					
Austrostipa eremophila					
Outside					



Project Name: Mt Celia					
Date:	6/06/2020 & 9/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q30		
Quadrat size:	20x20				
Vegetation group:	Mulga over small rocky outcrops				
WP:	259				
Photo number:			128		
Landform:			Hillock/Mound		
Land surface/disturbance:			No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):			Very: abundant/Coarse gravelly; large pebbles/Subangular tabular		
Rock outcrop (abundance/runoff):			Rockland/Rapid		
Soil (profile/field texture/soil surface):			Uniform/Sandy clay loam/Firm		
% Cover leaf litter:			20		
% Cover bare ground:			70		
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:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Philothea brucei subsp. brucei		Ptilotus obovatus	
Acacia mulganeura		Sida ectogama			
		Eremophila latrobei subsp. latrobei			
ALL SPECIES					
Acacia aneura					
Acacia mulganeura					
Philothea brucei subsp. brucei					
Sida ectogama					
Eremophila latrobei subsp. latrobei					
Ptilotus obovatus					
Senna artemisioides subsp. artemisioides					
Acacia tetragonophylla					
Psyrax suaveolens					
Dodonaea rigida					
Senna artemisioides subsp. filifolia					
Acacia burkittii					
Solanum lasiophyllum					
Maireana triptera					
Enneapogon caeruleascens					
Psyrax rigidula					
Cheilanthes lasiophylla					
Enchylaena tomentosa var. tomentosa					
Teucrium teucriiflorum					
Maireana georgei					
Abutilon oxycarpum					
Aristida contorta					
Dysphania kalpari					
Salsola australis					
Cucumis myriocarpus*					
Outside					



Project Name: Mt Celia					
Date:	7/06/2020 & 9/09/2020		Botanist:	Eren Reid	
Location:	Mt Celia		Quadrat:	Q32	
Quadrat size:	20x20				
Vegetation group:	Open Mulga shrubland on ironstone flats				
WP:	295				
Photo number:	138				
Landform:	Flat/Plain				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Very: abundant/Coarse gravelly; large pebbles/Subrounded				
Rock outcrop (abundance/runoff):	No bedrock exposed/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	10				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia mulganeura		Scaevola spinescens		Ptilotus obovatus	
Acacia ayersiana		Senna glutinosa subsp. chatelainiana			
		Acacia tetragonophylla			
ALL SPECIES					
Acacia mulganeura					
Acacia ayersiana					
Scaevola spinescens					
Senna glutinosa subsp. chatelainiana					
Acacia tetragonophylla					
Ptilotus obovatus					
Sida ectogama					
Acacia ligulata					
Senna artemisioides subsp. artemisioides					
Teucrium teucriflorum					
Acacia aneura					
Senna artemisioides subsp. filifolia					
Eremophila forrestii subsp. forrestii					
Rhapodia drummondii					
Maireana triptera					
Aristida contorta					
Ptilotus schwartzii					
Solanum lasiophyllum					
Acacia craspedocarpa					
Acacia pteraneura					
Marsdenia australis					
Enchylaena tomentosa var. tomentosa					
Austrostipa elegantissima					
Outside					
Eremophila oldfieldii subsp. angustifolia					
Eremophila longifolia					
Acacia burkittii					



Project Name: Mt Celia					
Date:	7/06/2020 & 9/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q33		
Quadrat size:	20x20				
Vegetation group:	Acacia quadrimarginea shrubland over granite bedrock				
WP:	305				
Photo number:		139 and 140			
Landform:	Hillock/Mound				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	No qualifier: common/Cobbly; or cobbles/Subangular				
Rock outcrop (abundance/runoff):	Rockland/Slow				
Soil (profile/field texture/soil surface):	Uniform/Loamy sand/Loose				
% Cover leaf litter:	10				
% Cover bare ground:	80				
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:	0.25-0.5m
Crown cover %:	1 <1	Crown cover %:	V <10	Crown cover %:	V <10
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia quadrimarginea		Acacia tetragonophylla		Eremophila forrestii subsp. forrestii	
Acacia mulganeura		Acacia aneura			
ALL SPECIES					
Acacia quadrimarginea					
Acacia mulganeura					
Acacia tetragonophylla					
Acacia aneura					
Eremophila forrestii subsp. forrestii					
Acacia burkittii					
Solanum lasiophyllum					
Eragrostis eriopoda					
Eriachne helmsii					
Aristida contorta					
Enneapogon caerulescens					
Ptilotus obovatus					
Scaevola spinescens					
Dodonaea rigida					
Dodonaea lobulata					
Chrysocephalum puteale					
Austrostipa scabra					
Outside					



Project Name: Mt Celia					
Date:	7/06/2020 & 9/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q34		
Quadrat size:	20x20				
Vegetation group:	Acacia quadrimarginea shrubland over granite bedrock				
WP:	326				
Photo number:			141		
Landform:			Hillock/Mound		
Land surface/disturbance:			No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):			No qualifier; common/Coarse gravelly; large pebbles/Subangular		
Rock outcrop (abundance/runoff):			Rockland/Slow		
Soil (profile/field texture/soil surface):			Uniform/Sandy clay loam/Firm		
% Cover leaf litter:			10		
% 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 %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia quadrimarginea		Acacia aneura		Eremophila forrestii subsp. forrestii	
		Acacia burkittii		Ptilotus obovatus	
ALL SPECIES					
Acacia quadrimarginea					
Acacia aneura					
Acacia burkittii					
Eremophila forrestii subsp. forrestii					
Ptilotus obovatus					
Acacia tetragonophylla					
Enneapogon caerulescens					
Solanum lasiophyllum					
Dodonaea lobulata					
Aristida contorta					
Eragrostis eriopoda					
Senna artemisioides subsp. filifolia					
Dodonaea rigida					
Eriachne helmsii					
Senna artemisioides subsp. artemisioides					
Cheilanthes lasiophylla					
Austrostipa scabra					
Chrysocephalum puteale					
Outside					



Project Name: Mt Celia					
Date:	7/06/2020 & 9/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q35		
Quadrat size:	20x20				
Vegetation group:	Mulga over chenopod shrubland				
WP:	349				
Photo number:			142		
Landform:			Open depression (vale)/Drainage depression		
Land surface/disturbance:			No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):			Very slightly; very few/Fine gravelly; small pebbles/Subrounded		
Rock outcrop (abundance/runoff):			No bedrock exposed/Moderately rapid		
Soil (profile/field texture/soil surface):			Uniform/Clay loam/Loose		
% Cover leaf litter:			20		
% 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:	3-6m	Height:	1-3m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	V <10	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia mulganeura		Frankenia setosa	
		Hakea preissii		Maireana pyramidata	
		Acacia ligulata		Ptilotus obovatus	
ALL SPECIES					
Acacia aneura					
Acacia mulganeura					
Hakea preissii					
Acacia ligulata					
Frankenia setosa					
Maireana pyramidata					
Ptilotus obovatus					
Senna artemisioides subsp. filifolia					
Acacia burkittii					
Eremophila pantonii					
Scaevola spinescens					
Maireana sedifolia					
Acacia ayersiana					
Acacia pteraneura					
Sclerolaena cuneata					
Atriplex bunburyana					
Dodonaea lobulata					
Maireana glomerifolia					
Maireana georgei					
Maireana tomentosa					
Enneapogon caerulescens					
Eriachne pulchella subsp. pulchella					
Senna glutinosa subsp. chatelainiana					
Maireana triptera					
Salsola australis					
Teucrium teucriflorum					
Maireana trichoptera					
Eucalyptus lesouefii					
Outside					



Project Name: Mt Celia					
Date:	7/06/2020 & 9/09/2020		Botanist:	Eren Reid	
Location:	Mt Celia		Quadrat:	Q36	
Quadrat size:	20x20				
Vegetation group:	Casuarina pauper and Acacia aneura over sclerophyll shrubland on rocky laterite hills				
WP:	389				
Photo number:	146				
Landform:	Crest/Hill Crest				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Very; abundant/Coarse gravelly; large pebbles/Subrounded				
Rock outcrop (abundance/runoff):	Rocky/Rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	10				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Dodonaea lobulata		Ptilotus obovatus	
Casuarina pauper		Maireana sedifolia			
ALL SPECIES					
Acacia aneura					
Casuarina pauper					
Dodonaea lobulata					
Maireana sedifolia					
Ptilotus obovatus					
Sida ectogama					
Senna artemisioides subsp. artemisioides					
Senna artemisioides subsp. filifolia					
Rhagodia drummondii					
Acacia mulganeura					
Acacia tetragonophylla					
Scaevola spinescens					
Eremophila latrobei subsp. latrobei					
Atriplex bunburyana					
Maireana trichoptera					
Maireana georgei					
Chenopodium gaudichaudianum					
Enchylaena tomentosa var. tomentosa					
Senna sp. Meekatharra					
Aristida contorta					
Sclerolaena diacantha					
Sclerolaena densiflora					
Outside					
Acacia burkittii					
Acacia ramulosa var. ramulosa					



Project Name: Mt Celia					
Date:	7/06/2020 & 9/09/2020		Botanist:	Eren Reid	
Location:	Mt Celia		Quadrat:	Q37	
Quadrat size:	20x20				
Vegetation group:	Casuarina pauper and Acacia aneura over sclerophyll shrubland on rocky laterite hills				
WP:	404				
Photo number:	148				
Landform:	Mid slope/Hillslope				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Very; abundant/Stony; stones/Subrounded				
Rock outcrop (abundance/runoff):	Rocky/Rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	20				
% 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:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Casuarina pauper		Dodonaea lobulata		Sida ectogama	
Acacia aneura		Maireana sedifolia		Ptilotus obovatus	
ALL SPECIES					
Casuarina pauper					
Acacia aneura					
Dodonaea lobulata					
Maireana sedifolia					
Sida ectogama					
Ptilotus obovatus					
Eremophila latrobei subsp. latrobei					
Acacia tetragonophylla					
Eremophila oppositifolia subsp. angustifolia					
Scaevola spinescens					
Senna artemisioides subsp. filifolia					
Senna artemisioides subsp. artemisioides					
Rhapodia drummondii					
Maireana pyramidata					
Cheilanthes lasiophylla					
Dodonaea rigida					
Atriplex bunburyana					
Outside					



Project Name: Mt Celia					
Date:	7/06/2020 & 9/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q38		
Quadrat size:	20x20				
Vegetation group:	Casuarina pauper and Acacia aneura over sclerophyll shrubland on rocky laterite hills				
WP:	415				
Photo number:			151		
Landform:			Mid slope/Hillslope		
Land surface/disturbance:			No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):			Very: abundant/Coarse gravelly; large pebbles/Subangular		
Rock outcrop (abundance/runoff):			Rockland/Rapid		
Soil (profile/field texture/soil surface):			Uniform/Sandy clay loam/Firm		
% Cover leaf litter:			10		
% Cover bare ground:			70		
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	Y Shrub Mallee (< 8m)	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Casuarina pauper		Dodonaea lobulata		Frankenia ?fecunda	
Acacia aneura		Eremophila pantonii			
		Grevillea acuaria			
ALL SPECIES					
Casuarina pauper					
Acacia aneura					
Dodonaea lobulata					
Eremophila pantonii					
Grevillea acuaria					
Frankenia ?fecunda					
Acacia mulganeura					
Senna sp. Meekatharra					
Scaevola spinescens					
Exocarpos aphyllus					
Maireana sedifolia					
Maireana pyramidata					
Senna artemisioides subsp. artemisioides					
Acacia tetragonophylla					
Eremophila oppositifolia subsp. angustifolia					
Eremophila latrobei subsp. latrobei					
Sida ectogama					
Maireana glomerifolia					
Ptilotus obovatus					
Outside					



Project Name: Mt Celia					
Date:	8/06/2020 & 9/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q39		
Quadrat size:	20x20				
Vegetation group:	Casuarina pauper and Acacia aneura over sclerophyll shrubland on rocky laterite hills				
WP:	437				
Photo number:		152-153			
Landform:		Hillock/Mound			
Land surface/disturbance:		No effective disturbance			
Coarse fragments on the surface (abundance/size/shape):		Very: abundant/Coarse gravelly; large pebbles/Subrounded			
Rock outcrop (abundance/runoff):		Rocky/Rapid			
Soil (profile/field texture/soil surface):		Uniform/Sandy clay loam/Firm			
% Cover leaf litter:		10			
% Cover bare ground:		70			
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	Y Shrub Mallee (< 8m)	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Casuarina pauper		Eremophila pantonii		Dodonaea lobulata	
Acacia aneura		Eremophila oppositifolia subsp. angustifolia		Maireana sedifolia	
ALL SPECIES					
Casuarina pauper					
Acacia aneura					
Eremophila pantonii					
Eremophila oppositifolia subsp. angustifolia					
Dodonaea lobulata					
Maireana sedifolia					
Sida ectogama					
Acacia tetragonophylla					
Senna artemisioides subsp. artemisioides					
Eremophila latrobei subsp. latrobei					
Callitris preissii					
Grevillea acuaria					
Senna artemisioides subsp. filifolia					
Scaevola spinescens					
Ptilotus obovatus					
Olearia muelleri					
Frankenia 2facunda					
Maireana trichoptera					
Maireana glomerifolia					
Hakea preissii					
Enchylaena tomentosa var. tomentosa					
Eremophila metallicorum					
Outside					



Project Name: Mt Celia					
Date:	8/06/2020 & 9/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q40		
Quadrat size:	20x20				
Vegetation group:	Casuarina pauper and Acacia aneura over sclerophyll shrubland on rocky laterite hills				
WP:	441				
Photo number:			154-155		
Landform:	Hillock/Mound				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Very: abundant/Coarse gravelly; large pebbles/Subangular				
Rock outcrop (abundance/runoff):	Rocky/Moderately rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	10				
% 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 %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Casuarina pauper		Acacia burkittii		Ptilotus obovatus	
Eucalyptus salubris		Eremophila pantonii		Maireana sedifolia	
Acacia mulganeura				Dodonaea lobulata	
ALL SPECIES					
Casuarina pauper					
Eucalyptus salubris					
Acacia mulganeura					
Acacia burkittii					
Eremophila pantonii					
Ptilotus obovatus					
Maireana sedifolia					
Dodonaea lobulata					
Eremophila oppositifolia subsp. angustifolia					
Acacia caesaneura					
Eremophila latrobei subsp. latrobei					
Sida ectogama					
Senna sp. Meekatharra					
Senna cardiosperma					
Scaevola spinescens					
Senna artemisioides subsp. filifolia					
Maireana triptera					
Maireana tomentosa					
Senna artemisioides subsp. artemisioides					
Rhagodia drummondii					
Frankenia ?fecunda					
Outside					



Project Name: Mt Celia					
Date:	8/06/2020 & 9/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q41		
Quadrat size:	20x20				
Vegetation group:	Casuarina pauper and Acacia aneura over sclerophyll shrubland on rocky laterite hills				
WP:	442				
Photo number:	156 and 157				
Landform:	Simple slope/Hillslope				
Land surface/disturbance:	No effective disturbance				
Coarse fragments on the surface (abundance/size/shape):	Very: abundant/Coarse gravelly; large pebbles/Subrounded				
Rock outcrop (abundance/runoff):	Rocky/Moderately rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	20				
% 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:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Casuarina pauper		Eremophila pantonii		Maireana sedifolia	
Eucalyptus lesouefii		Acacia caesaneura		Dodonaea lobulata	
				Ptilotus obovatus	
ALL SPECIES					
Casuarina pauper					
Eucalyptus lesouefii					
Eremophila pantonii					
Acacia caesaneura					
Maireana sedifolia					
Dodonaea lobulata					
Ptilotus obovatus					
Acacia tetragonophylla					
Senna artemisioides subsp. artemisioides					
Senna artemisioides subsp. filifolia					
Senna sp. Meekatharra					
Senna cardiosperma					
Olearia muelleri					
Sida ectogama					
Scaevola spinescens					
Maireana triptera					
Solanum lasiophyllum					
Maireana trichoptera					
Outside					



Project Name: Mt Celia					
Date:	8/06/2020 & 9/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q42		
Quadrat size:	20x20				
Vegetation group:	Mulga over Eremophila forrestii on large rocky granite/basalt hills				
WP:	488				
Photo number:			158		
Landform:	Upper 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 rocky/Rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	30				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	Y Shrub Mallee (< 8m)	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Philothea brucei subsp. brucei		Eremophila forrestii subsp. forrestii	
Acacia incurvaneura		Eremophila latrobei subsp. latrobei		Ptilotus obovatus	
Acacia mulganeura					
ALL SPECIES					
Acacia aneura					
Acacia incurvaneura					
Acacia mulganeura					
Philothea brucei subsp. brucei					
Eremophila latrobei subsp. latrobei					
Eremophila forrestii subsp. forrestii					
Ptilotus obovatus					
Acacia craspedocarpa					
Solanum lasiophyllum					
Cheilanthes sieberi subsp. sieberi					
Eriachne pulchella subsp. pulchella					
Marsdenia australis					
Paspalidium clementii					
Enteropogon ramosus					
Dodonaea rigida					
Psychotria rigida					
Psychotria suaveolens					
Eriachne helmsii					
Outside					



Project Name: Mt Celia					
Date:	8/06/2020 & 9/09/2020	Botanist:	Eren Reid		
Location:	Mt Celia	Quadrat:	Q43		
Quadrat size:	20x20				
Vegetation group:	Mulga over Eremophila forrestii on large rocky granite/basalt hills				
WP:	489				
Photo number:			159		
Landform:			Lower slope/Hillslope		
Land surface/disturbance:			No effective disturbance		
Coarse fragments on the surface (abundance/size/shape):			Very: abundant/Cobbly: or cobbles/Subangular		
Rock outcrop (abundance/runoff):			Very slightly rocky/Rapid		
Soil (profile/field texture/soil surface):			Uniform/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:	1-3m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia incurvaneura		Eremophila forrestii subsp. forrestii		Ptilotus obovatus	
Acacia mulganeura					
ALL SPECIES					
Acacia incurvaneura					
Acacia mulganeura					
Eremophila forrestii subsp. forrestii					
Ptilotus obovatus					
Eremophila latrobei subsp. latrobei					
Senna sp. Meekatharra					
Solanum lasiophyllum					
Ptilotus schwartzii					
Acacia aneura					
Cheilanthes sieberi subsp. sieberi					
Austrostipa eremophila					
Aristida contorta					
Paspalidium clementii					
Enteropogon ramosus					
Eriachne helmsii					
Outside					



APPENDIX G – 2021 BASIC FAUNA SURVEY