APPENDIX C: FLORA & VEGETATION SURVEY REPORTS

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

umwelt

Inspired people | Dedicated team
Quality outcomes



MINERAL RESOURCES

LAMB CREEK PROJECT

Detailed and Targeted
Flora and Vegetation Survey

FINAL

November 2022

LAMB CREEK PROJECT

Detailed and Targeted
Flora and Vegetation Survey

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Mineral Resources Limited

Project Director:	Greg Woodman
Project Manager:	Cielito Marbus
Report No.	22187/R03
Date:	November 2022

Perth
PO Box 255
South Perth WA 6951
T | 1300 793 267
E | info@umwelt.com.au
www.umwelt.com.au

This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

Disclaimer

This document has been prepared for the sole use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by Umwelt (Australia) Pty Ltd (Umwelt). No other party should rely on this document without the prior written consent of Umwelt.

Umwelt undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. Umwelt assumes no liability to a third party for any inaccuracies in or omissions to that information. Where this document indicates that information has been provided by third parties, Umwelt has made no independent verification of this information except as expressly stated.

©Umwelt (Australia) Pty Ltd

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
V1	Cielito Marbus; Catherine Godden	9/8/2022	Greg Woodman	9/8/2022
V2	Cielito Marbus	10/11/2022	Greg Woodman	11/11/2022
Final	Cielito Marbus	24/11/2022	Greg Woodman	24/11/2022

Definitions

Term	Definition
BAM Act	Biosecurity and Agriculture Management Act 2007
BC Act	Biodiversity Conservation Act 2016
BC Regs	Biodiversity Conservation Regulations 2018
BIF	Banded Iron Formation
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DE	Development Envelope
DPIRD	Department of Primary Industries and Regional Development
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
EPBC Act	Environment Protection Biodiversity Conservation Act 1999
GIS	Geographic Information System
GDA94	Geocentric Datum of Australia 1994
GDE	Groundwater Dependent Ecosystem
GNHI	Great Northern Highway Intersection
GPS	Global Positioning System
ha	Hectares
INDVAL	Indicator Taxon Analysis, a measure of taxon fidelity to a given VT
km	Kilometres
IBRA	Interim Biogeographic Regionalisation for Australia
listed	Pertaining to listed taxa or vegetation - those that are formally listed as conservation significant under the *Environment Protection and Biodiversity Conservation Act 1999*, or the *Biodiversity Conservation Act 2016*.
m	Metres
m2	Metres squared
mbgl	Metres below ground level
mm	Millimetres
MNES	Matters of National Environmental Significance
MINRES	Mineral Resources Limited
NT	Northern Territory
NVIS	National Vegetation Information System
P	Priority
PEC	Priority Ecological Community
Population	A discrete group of individuals of a taxon separated by more than 500 m from the nearest discrete group of individuals (as per DBCA (2017))
Qld	Queensland
Significant flora	As defined in **section 3.9.1**
Significant vegetation	As defined in **section 3.9.2**

Term	Definition
SPRAT	Species Profile and Threats database – a database produced by DAWE to enable identification of MNES listed under the EPBC Act within a given area
T	Threatened
TEC	Threatened Ecological Community
The Desktop Study Area	Area encompassing the Study Area with a 40 km buffer. Used for the purposes of elements of the desktop assessment, including interrogation of databases and searches for relevant literature
The Development Envelope	Proposed development envelope, approximately 890.5 ha in size
The Footprint	Proposed indicative footprint, approximately 656.7 ha.
The Project	Mining opportunities associated with the Lamb Creek Deposit
The Study Area	The Study Area is the extent to which detailed vegetation survey was conducted, encompassing all of the proposed development envelope and additional areas for context
TPFL	Threatened and Priority Flora Database
UCL	Unallocated Crown Land
Umwelt	Umwelt (Australia) Pty Ltd
VSA	Vegetation System Association
VT	Vegetation Type
WA	Western Australia
WA Herb	Western Australian Herbarium
WoNS	Weeds of National Significance
Woodman Environmental	Woodman Environmental Consulting Pty Ltd (now Umwelt (Australia) Pty Ltd)

Executive Summary

Mineral Resources Limited (MINRES) are exploring mining opportunities associated with the Lamb Creek Deposit (the Project), located approximately 120 kilometres (km) northwest of Newman. A number of flora and vegetation surveys have previously been undertaken for the Project, and a gap analysis and peer review of previous survey work recommended additional targeted survey and a detailed flora and vegetation survey. MINRES commissioned Umwelt (Australia) Pty Ltd to undertake a flora and vegetation survey of the Project to support the Environmental Impact Assessment (EIA) process for the Project.

The current survey comprised three field visits over March, April and June-July 2022. A total of 116 quadrats and five relevés were surveyed. Targeted searching for all significant flora previously recorded in the Study Area or considered to potentially occur within the Study Area, was undertaken over areas of the Development Envelope not previously surveyed in 2021. There were no survey limitations that are considered to have significantly influenced the results of the 2022 survey.

A total of 328 discrete vascular flora taxa representing 45 families and 137 genera were recorded in the Study Area, including seven introduced taxa. One Threatened taxon (*Seringia exastia*) was recorded within the Study Area however its status is currently under review and it will be delisted in the near future. A further seven significant flora taxa were recorded within the Study Area including five Department of Biodiversity, Conservation and Attractions (DBCA) listed Priority (P) taxa, and two potentially undescribed taxa, as listed below:

- *Aristida jerichoensis* var. *subspinulifera* (P3)
- *Aristida lazaridis* (P2)
- *Corchorus* sp. (Potentially undescribed)
- *Eremophila naaykensii* (P3)
- *Euphorbia ferdinandi* s. lat. (Potentially undescribed)
- *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
- *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)

An assessment of the likelihood of occurrence of further significant taxa within the Study Area and Targeted Survey Area identified a total of 42 taxa which could potentially occur within the Study Area, and no taxa which could potentially occur within the Targeted Survey Area.

Ten VTs were defined in the Study Area via floristic composition classification and subsequent examination of quadrat data. The VTs described and mapped within the Study Area are not considered to represent any listed Threatened or Priority Ecological Communities, nor are they considered to be significant for reasons other than formal listing. All VTs mapped in the Study Area are either known to, or considered likely to, extend outside the Study Area to some extent, and are not considered to be restricted in distribution. None of the vegetation within the Study Area is considered to represent Groundwater Dependant Vegetation. The majority of the vegetation within the Study Area (90.5 %) was rated as Excellent, with no obvious signs of damage caused by human activities. The remainder of the vegetation was rated as Very Good and Good, with some historical mechanical disturbance, introduced flora taxa dominating the lower stratum in some flowlines, and otherwise low levels of introduced flora taxa across the Study Area.

Table of Contents

Definitions 4

Executive Summary 6

1.0 Introduction 1

1.1 Project Overview 1

1.2 Project and Study Area Definitions 1

1.2.1 Development Envelope and Disturbance Footprint 1

1.2.2 Desktop Study Area 1

1.2.3 Study Area 2

1.2.4 Targeted Survey Area 2

1.3 Aims and Objectives 5

1.4 Levels of Assessment 6

2.0 Background 7

2.1 Climate 7

2.2 Geology, Soils and Landscape 9

2.3 Groundwater and Surface Water Values 9

2.4 Land Tenure 10

2.5 Fire History 12

3.0 Methods 14

3.1 Desktop Study 14

3.2 Personnel and Licensing 15

3.3 Aerial Photography Interpretation and Survey Design 16

3.4 Field Survey Methods 16

3.4.1 Survey Timing 16

3.4.2 Sample Sites 16

3.4.3 Vegetation Notes 18

3.4.4 Targeted Survey for Significant Flora and Vegetation 18

3.4.5 Introduced Flora 21

3.5 Plant Collection and Identification 21

3.6 Floristic Classification Analysis 21

3.7 Vegetation Type Definition, Mapping and Description 22

3.8 Vegetation Condition Mapping 23

3.9 Significant Flora and Vegetation 23

3.9.1 Significant Flora 23

3.9.2 Significant Vegetation 24
4.0 Adequacy and Limitations of Survey 25
4.1 Adequacy of Survey 25
4.2 Limitations of Assessment 27
5.0 Results and Discussion 31
5.1 Desktop Assessment 31
5.1.1 Regional Flora 31
5.1.2 Regional Vegetation 33
5.1.3 Local Flora and Vegetation Surveys 38
5.1.4 Summary of Significant Flora 52
5.1.5 Summary of Significant Vegetation 60
5.2 Field Survey 63
5.2.1 Vascular Flora Census 63
5.2.2 Summary of Significant Flora 63
5.2.3 Listed Significant Flora Taxa 66
5.2.4 Other Flora Taxa of Interest 71
5.2.5 Likelihood of Occurrence of Further Significant Flora Taxa 73
5.2.6 Introduced Flora Taxa 86
5.2.7 Flora Classification Results 88
5.2.8 Vegetation Types 88
5.2.9 Significant Vegetation 105
5.2.10 Surface and Groundwater Dependent Vegetation 106
5.2.11 Vegetation Condition 108
6.0 Conclusions 111
7.0 References 112

Figures

Figure 1.1 Project Location 3
Figure 1.2 Study Area and Targeted Survey Area 4
Figure 2.1 Land Tenure and Tenements Relevant to the Lamb Creek Project 11
Figure 2.2 Burn History of the Study Area 13
Figure 3.1 Survey effort: Track logs, Quadrats and Relevés from the 2022 Field Surveys 20
Figure 5.1 Soil Landscape Mapping of the Study Area 35
Figure 5.2 Vegetation Systems Associations of the Study Area 37

Figure 5.3 Flora and Vegetation Surveys Previously Conducted Within the Desktop Study Area 50
Figure 5.4 Flora and Vegetation Surveys Previously Conducted for the Lamb Creek Project 51
Figure 5.5 Existing Significant Flora Records of the Desktop Study Area 58
Figure 5.6 Existing Significant Vegetation Records of the Desktop Study Area 62
Figure 5.7 Significant Flora Recorded by the 2021 and 2022 Field Surveys 65
Figure 5.8 Introduced Flora Recorded by the 2022 Field Surveys 87
Figure 5.9 Overview of Vegetation Types of the Study Area 103
Figure 5.10 Overview of Vegetation Condition of the Study Area 110

Photos

Photo 5-1: *Aristida jerichoensis* var. *subspinulifera* (P3) (Photos: Umwelt) 66
Photo 5-2: *Aristida lazaridis* (P2) (Photo: Umwelt) 67
Photo 5-3: *Eremophila naaykensii* (P3) (Photos: Umwelt) 68
Photo 5-5: *Hibiscus* sp. Gurrinbiddy Range (M.E. Trudgen MET 15708) (P2) (Photos: Umwelt) 69
Photo 5-6: *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) (Photos: Umwelt) 70
Photo 5-7: *Euphorbia ferdinandi* s. lat. (Potentially undescribed) (Photos: Umwelt) 72
Photo 5-8: *Corchorus* sp. (Potentially undescribed) (Photos: Umwelt) 73
Photo 5-9: VT 1 (Quadrat C08) 90
Photo 5-10: VT 1 (Quadrat C21) 90
Photo 5-11: VT 2 (Quadrat C41) 91
Photo 5-12: VT 2 (Quadrat C47) 92
Photo 5-13: VT 3 (Quadrat R01) 92
Photo 5-14: VT 3 (Quadrat K50) 93
Photo 5-15: VT 4 (Quadrat C24) 93
Photo 5-16: VT 4 (Quadrat C52) 94
Photo 5-17: VT 5 (Quadrat K04) 95
Photo 5-18: VT 5 (Quadrat K05) 95
Photo 5-19: VT 6 (Quadrat C37) 96
Photo 5-20: VT 6 (Quadrat K51) 96
Photo 5-21: VT 7 (Quadrat C11) 97
Photo 5-22: VT 7 (Quadrat K07) 98
Photo 5-23: VT 8 (Quadrat Q19) 99
Photo 5-24: VT 8 (Quadrat Q24) 99
Photo 5-25: VT 9 (Quadrat K52) 100
Photo 5-26: VT 9 (Quadrat K38) 100
Photo 5-27: VT 10 (Quadrat C45) 101
Photo 5-28: VT 10 (Quadrat K18) 102

Graphs

Graph 2.1	Long term precipitation (1971 to 2022) and mean maximum temperature (1996 to 2022), and recent (Jul-21 to Jun-22) precipitation (mm) and mean maximum temperature (°C) for Newman Aero #007176 (BoM, 2022a).	8
Graph 2.2	Long term precipitation (1950 to 2019) and mean maximum temperature (1951 to 2019) for Wittenoom #005026, and recent (Jul-21 to Jun-22) precipitation (mm) and mean maximum temperature (°C) for Karijini North #005098 (BoM, 2022a).	8
Graph 4.1	Study Area Quadrata Data Taxon Accumulation Curve	26

Tables

Table 3.1	Searches undertaken for the Desktop Assessment of the Study Area	14
Table 3.2	Personnel and Licensing Information	15
Table 4.1	Limitations of the Flora and Vegetation Survey	27
Table 5.1	Listed Significant Flora Taxa Returned from DBCA Database Searches (DBCA 2007-, 2022b)	31
Table 5.2	Soil Landscape Mapping of the Study Area (DPIRD 2019; van Vreeswyk *et al*., 2004)	34
Table 5.3	Bioregional Statistics of Vegetation System Associations of the Desktop Study Area (DPIRD 2019)	36
Table 5.4	Summary of Results of Flora and Vegetation Surveys Previously Conducted Within and in the Vicinity of the Study Area	40
Table 5.5	Significant Flora Taxa Known from or Potentially Occurring Within the Desktop Study Area	53
Table 5.6	Listed Significant Vegetation Known from or Potentially Occurring Within the Desktop Study Area	60
Table 5.7	Summary of Significant Flora Taxa Recorded by the 2022 Survey Within the Study Area	64
Table 5.8	Likelihood of Occurrence of Further Significant Flora Taxa in the Study Area and Targeted Survey Area	75
Table 5.9	Introduced Flora Taxa Recorded in the Study Area	86
Table 5.10	Summary of VTs Mapped in the Study Area	90
Table 5.11	Vegetation Condition Ratings for VTs Described in the Study Area	109

Appendices

Appendix A	Vegetation Condition Scale for the Eremaean and Northern Botanical Provinces (EPA 2016b)
Appendix B	Vascular Plant Taxa Omitted from and Amalgamated in the Classification Analysis
Appendix C	Results of Search of the Department of the Agriculture, Water and the Environment Species Profile and Threats (SPRAT) Database (DAWE 2021b)
Appendix D	Vascular Plant Taxa Recorded in the Study Area
Appendix E	Raw Data Recorded in Quadrats and Relevés
Appendix F	Locations Details of Significant and Introduced Flora Taxa Recorded in the Study Area in 2022
Appendix G	Classification Analysis Dendrogram of Quadrats Assessed in the Study Area
Appendix H	Taxon Group Matrix of Quadrats Assessed in the Study Area
Appendix I	Summary of Misclassified and Manually Reassigned Quadrats Assessed in the Study Area
Appendix J	Detailed Mapping of Vegetation Types and Significant Flora Locations of the Study Area
Appendix K	Matrix of Vascular Plant Taxa Recorded within Each VT Described in the Study Area
Appendix L	Results of Indicator Species Analysis for VTs Described in the Study Area
Appendix M	Detailed Vegetation Condition Mapping and Introduced Flora Locations of the Study Area

1.0 Introduction

1.1 Project Overview

Mineral Resources Limited (MINRES) are actively exploring mining opportunities associated with the Lamb Creek Deposit (the Project), located approximately 120 kilometres (km) northwest of Newman in Western Australia (WA). The exploration area consists of a proposed mining area and associated infrastructure corridor linking the proposed mining area to Great Northern Highway.

Several flora and vegetation surveys conforming to different levels of survey under various Environmental Protection Authority (EPA) Guidance Statements (EPA, 2004, 2016b) have been conducted for the Project. A gap analysis and peer review of previous survey work, as undertaken by Umwelt (Australia) Pty Ltd (Umwelt) (2022), recommended additional targeted survey and a detailed flora and vegetation survey (as per Sections 4.2 and 4.3 of EPA (2016b)).

MINRES commissioned Umwelt to undertake a flora and vegetation survey of the Project to support the Environmental Impact Assessment (EIA) process for the Project.

1.2 Project and Study Area Definitions

The Lamb Creek Project is located in the Shire of East Pilbara, near the junction with the Shire of Ashburton, within the Pilbara region, approximately 120 km northwest of Newman and 270 km south of Port Hedland (**Figure 1.1**).

1.2.1 Development Envelope and Disturbance Footprint

MINRES have defined a Proposed Development Envelope and Proposed Disturbance Footprint for the Project (version October 2022). The Proposed Development Envelope is nominally defined by a 70 metre (m) buffer of the infrastructure design, from which avoidance areas (heritage places, known locations of priority flora taxa) have been excised. The Proposed Development Envelope is approximately 894 hectares (ha) in size and encompasses the Proposed Disturbance Footprint, which is approximately 661 ha in size (**Figure 1.1**).

The development envelope is composed of three parts: the Great Northern Highway Intersection Development Envelope (GNHI DE); the Access Road Development Envelope (Access Rd DE); and the Mine Development Envelope (Mine DE), containing the waste rock dumps, pit area, crushing and screening plant and other infrastructure relevant to the mining operations. These three areas are displayed on **Figure 1.2.**

1.2.2 Desktop Study Area

A Desktop Study Area has been defined for the purposes of interrogation of databases and searches for relevant literature. The Desktop Study Area was defined as a 40 km buffer around the Proposed Development Envelope as supplied by MINRES on 2nd September 2021. Although the previous version of the Proposed Development Envelope was used to define the Desktop Study Area (superseded by the version provided in October 2022 as discussed above (Section 1.2.1)), the change to this area is minor, and therefore it is not considered necessary to update the Desktop Study Area. The location of the Desktop

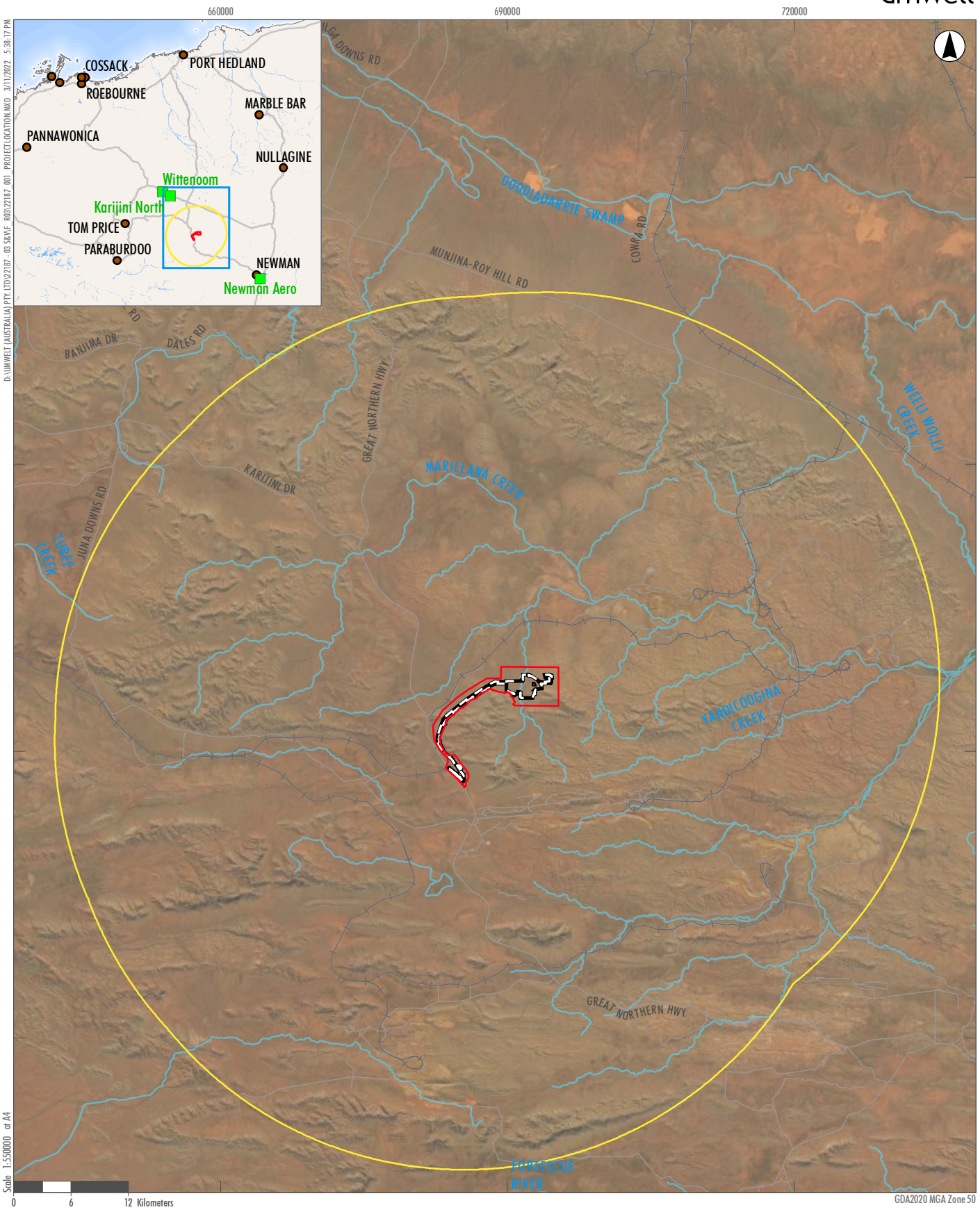
Study Area in relation to the Proposed Development Envelope and Proposed Disturbance Footprint is presented on **Figure 1.1**.

1.2.3 Study Area

A Study Area of 3,785 ha has been defined in consultation with MINRES and represents a buffered area on the Proposed Development Envelope and MINRES tenements, sufficient to provide contextual information relevant to interpreting impacts. Detailed vegetation survey was undertaken within the Study Area, as presented on **Figure 1.2**.

1.2.4 Targeted Survey Area

A targeted survey area of 355 ha has been defined as the Proposed Development Envelope, excluding areas over which targeted searching has been completed by Rapallo (2021b). The Targeted Survey Area is presented on **Figure 1.2**.



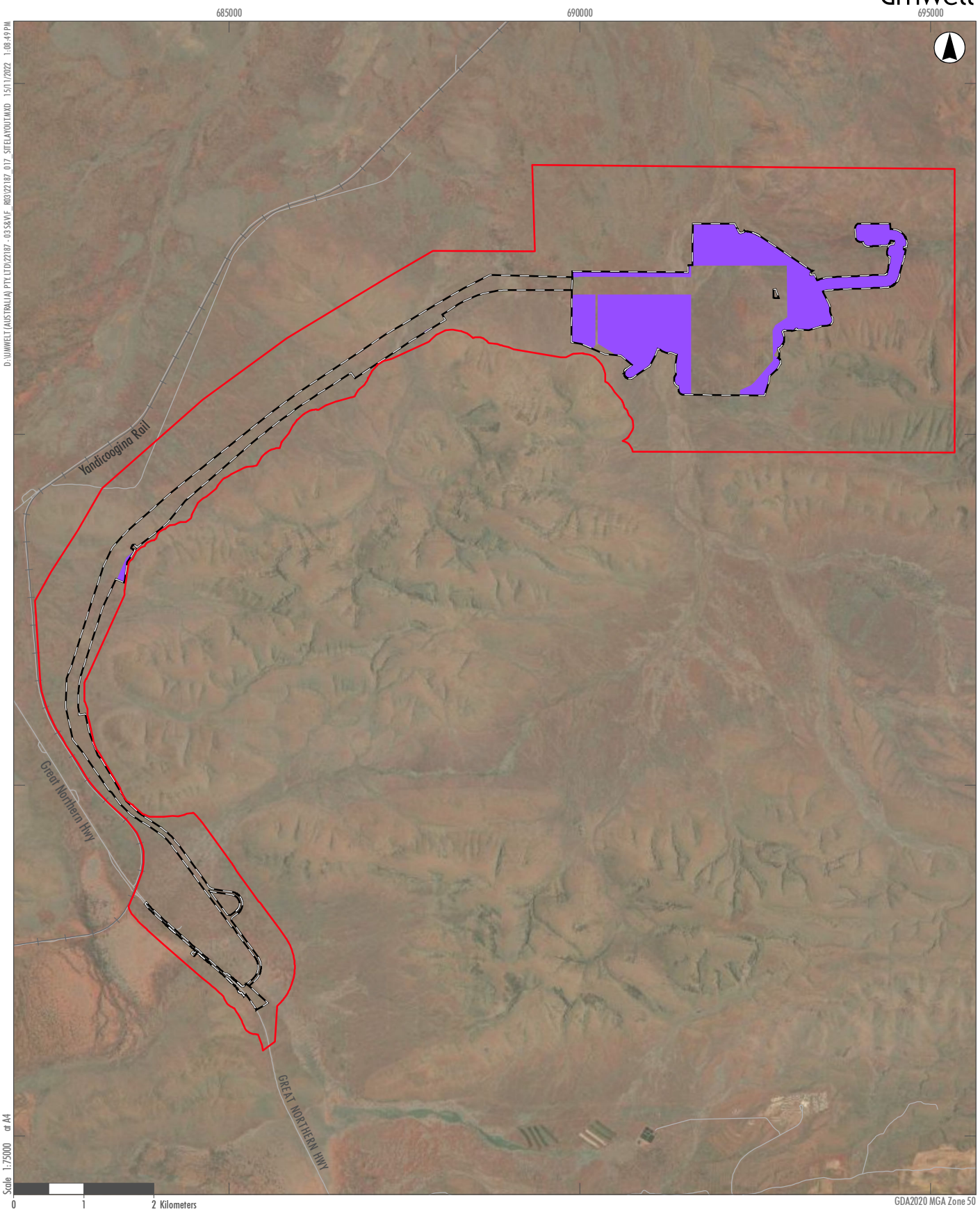
Legend

- Desktop Study Area
- Study Area
- Proposed Development Envelope
- Roads
- Rail
- Drainage Line
- Weather Stations

FIGURE 1.1

Project Location

Image Source: ESRI Basemap (2021) Data source: Landgate (2022)



Legend

- Study Area
- Proposed Development Envelope
- Targeted Survey Area
- Roads
- Rail

FIGURE 1.2

Study Area and Targeted Survey Area

Image Source: ESRI Basemap (2021) Data source: Landgate (2022), MRL (2022)

1.3 Aims and Objectives

The primary aim of this assessment was to characterise the flora and vegetation values of the Study Area to provide MINRES relevant and defendable data and documentation to support the Environmental Impact Assessment (EIA) process for the Project.

The overall objectives of the assessment were to:

- Compile an inventory of vascular flora taxa that occur in the Study Area.
- Search for and census populations of the following taxa (hereafter referred to as significant flora taxa) identified as occurring or potentially occurring within the Targeted Survey Area, as well as opportunistically within the wider Study Area.
    - Listed Threatened Species (T) under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (Commonwealth).
    - Threatened Flora (T) under the Biodiversity Conservation Act 2016 (BC Act) (WA).
    - Priority Flora taxa (P) as classified by the WA Department of Biodiversity, Conservation and Attractions (DBCA).
    - Other significant flora taxa as defined by the Environmental Protection Authority (EPA) (2016a, 2016b).
- Identify locations and determine the extent of introduced vascular flora taxa, with particular focus on those that are Weeds of National Significance (WoNS), or Declared Pests under the Biosecurity and Agriculture Management Act 2007 (BAM Act).
- Identify, map and describe Vegetation Types (VTs) that occur within the Study Area.
- Identify, map and describe vegetation that occurs within the Study Area that is one of the following (hereafter referred to as significant vegetation), to provide context for impact assessment:
    - Listed Threatened Ecological Communities (TECs) under the EPBC Act.
    - TECs as classified by DBCA and endorsed by the WA Minister for the Environment.
    - Priority Ecological Communities (PECs) as classified by DBCA.
    - Other significant vegetation as defined by EPA (2016a, 2016b).
- Map the condition of the vegetation in accordance with EPA (2016b).

The survey and reporting works comply with the following documents:

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

1.4 Levels of Assessment

The flora and vegetation survey of the Study Area involved targeted survey and a detailed survey as defined in Sections 4.2 and 4.3 of the '*Technical Guidance for Flora and Vegetation Surveys for Environmental Impact Assessment*' (EPA 2016b). This level of survey is considered appropriate for the Project, based on the location of the Project (located within the Pilbara - known to support a moderate diversity of flora and vegetation relative to other areas of the state, including significant flora taxa and vegetation types (EPA 2016b)) and the level of previous survey effort undertaken within the area (as assessed within the gap analysis for the Project (Umwelt 2022)).

It should be noted that this survey builds on previous work conducted to inform the EIA process for the Project, as detailed in **Section 3.0**.

2.0 Background

2.1 Climate

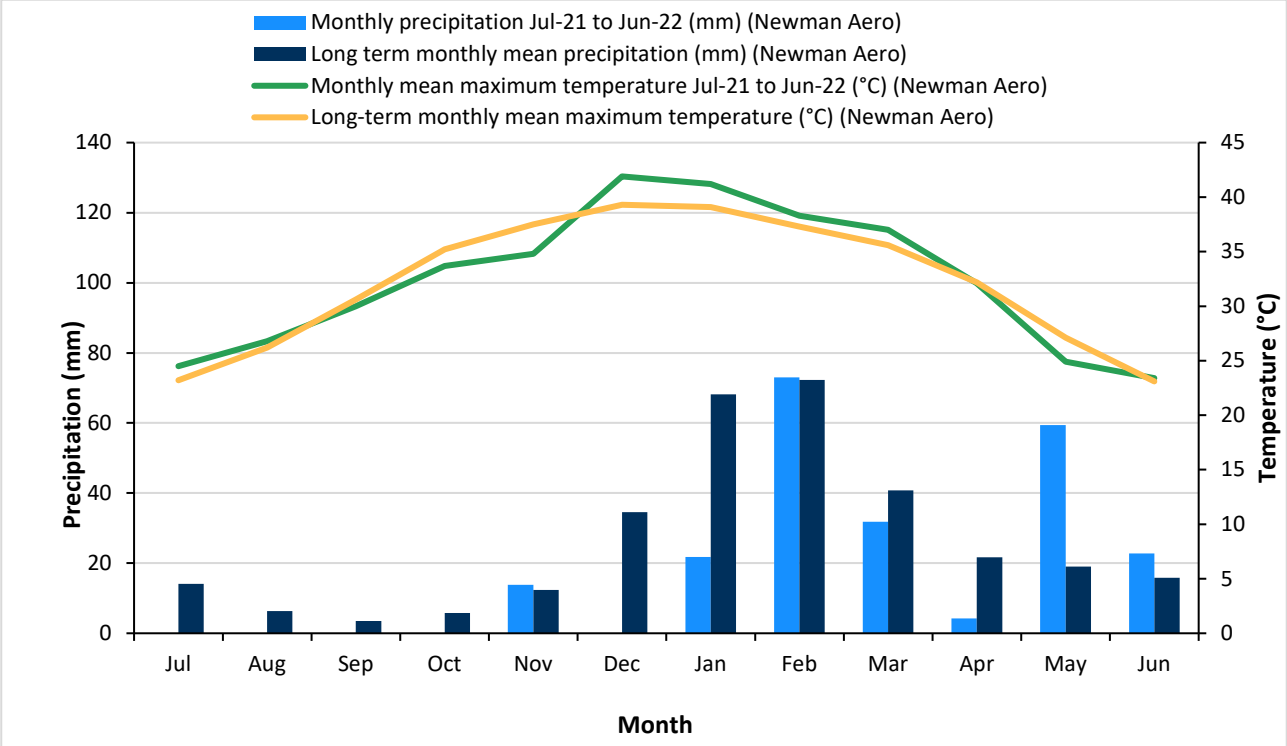
The Study Area is located in the Pilbara region (Fortescue Botanical District) as defined by Beard (1975, 2015). The climate of the Pilbara Bioregion is classified as arid tropical, with precipitation received primarily over the summer months. Average annual precipitation for the region is 250-300 millimetres (mm); this is generally slightly higher than most of the Eremaean Province of WA due to the influence of relatively frequent tropical cyclones that occur from November to April (Beard 2015; Bureau of Meteorology (BoM) 2018).

Graph 2.1 displays monthly precipitation and monthly maximum temperature statistics for the twelve months preceding the survey (July 2021 to June 2022), alongside long term averages for Newman Aero (Station number 007176). Graph 2.2 displays monthly data for the year preceding the survey for Karijini North (Station number 005098) alongside long term data for the now closed Wittenoom station (Station number 005026) which is 13 km from Karijini North station and at similar elevation (BoM, 2022a). These three stations provide the most relevant recent and long-term climate data. Karijini North and Wittenoom stations are located 68 and 79 km respectively northwest of the Study Area, while Newman Aero is located 113 km southeast of the Study Area, providing context for the Pilbara region.

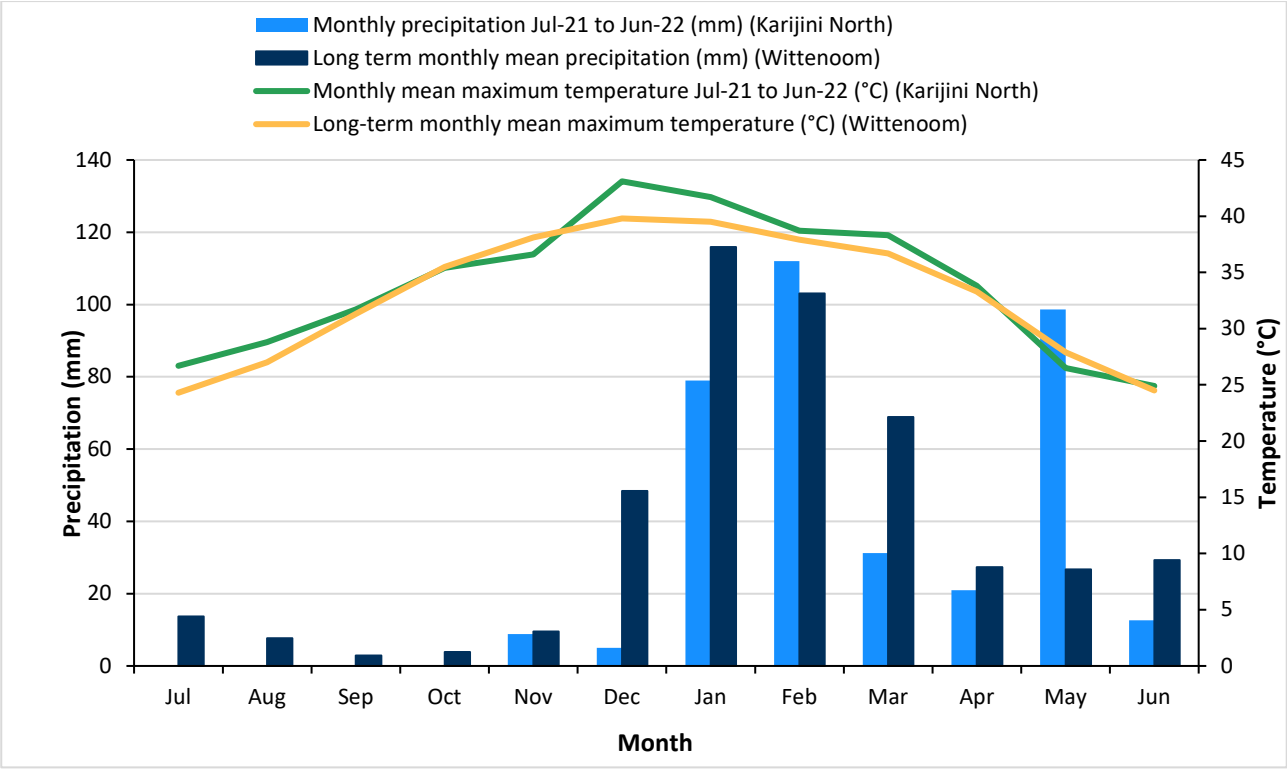
Long term averages indicate that the bulk of the annual rainfall occurs in January and February-68 and 72 mm respectively for Neman Aero, which receives 324 mm annually, and 116 and 103 mm respectively for Wittenoom, which receives 462 mm annually.

Although precipitation was below average in December 2021 and January 2022, precipitation was slightly above average for February 2022. Precipitation in March and April 2022 were again below-average, followed by above-average precipitation in May 2022 (three times the average for that month and similar to the volumes normally seen in February).

Mean maximum monthly temperatures were one to three degrees warmer than average in the five months leading up to and during Trips 1 and 2 (December 2021-April 2022), however were cooler than the average in May 2022.



Graph 2.1 Long term precipitation (1971 to 2022) and mean maximum temperature (1996 to 2022), and recent (Jul-21 to Jun-22) precipitation (mm) and mean maximum temperature (°C) for Newman Aero #007176 (BoM, 2022a).



Graph 2.2 Long term precipitation (1950 to 2019) and mean maximum temperature (1951 to 2019) for Wittenoom #005026, and recent (Jul-21 to Jun-22) precipitation (mm) and mean maximum temperature (°C) for Karijini North #005098 (BoM, 2022a).

2.2 Geology, Soils and Landscape

The Study Area is located in the Pilbara region as defined by Beard (1975; 2015). The Pilbara region is formed of a basement of Archaean granite and volcanics, overlain by massive deposits of Proterozoic sediments and volcanics (Beard 2015). This region is generally mountainous, rising to 1250 metres (m), with hard alkaline red soils on plains and pediments, and shallow and skeletal soils on ranges. The Study Area traverses one physiographic unit as defined by Beard (1975), being the Hamersley physiographic unit.

The Hamersley physiographic unit is a plateau bounded by a well-marked, abrupt escarpment on its northern, western and eastern flanks; on its southern edge the escarpment is more irregular (Beard 1975). It is composed of Lower Proterozoic rocks, which are predominantly jaspilite and dolomite with some shale, siltstone and volcanics. Above the escarpment, the plateau landscape is of rounded hills and ranges rising to around 900 m above sea level, and locally to 1250 m. There is often little soil on these hills, with cap rock abundant at the surface. Where the rock is mainly jaspilite and dolomite, there are ranges, steep hills and deeply dissected pediments with narrow, winding valley plains, however wider alluvial plains occur locally. The soils of the hills are predominantly stony and shallow, with non-coherent sands on the steeper slopes, and shallow brown loams. Neutral and hard alkaline red soils occur on the lower slopes, with deep coherent loams and clays in the valleys; in the wider alluvial valleys, deep, earthy loams with small areas of neutral red earths, and deep-cracking clays and earthy clays, both occur. Where the rock is basalt, there are valley plains and dissected stony pediments with steep, stony hills. Soils are predominantly hard alkaline red soils with significant areas of hard, neutral red soils and shallow brown loams (Beard 1975).

2.3 Groundwater and Surface Water Values

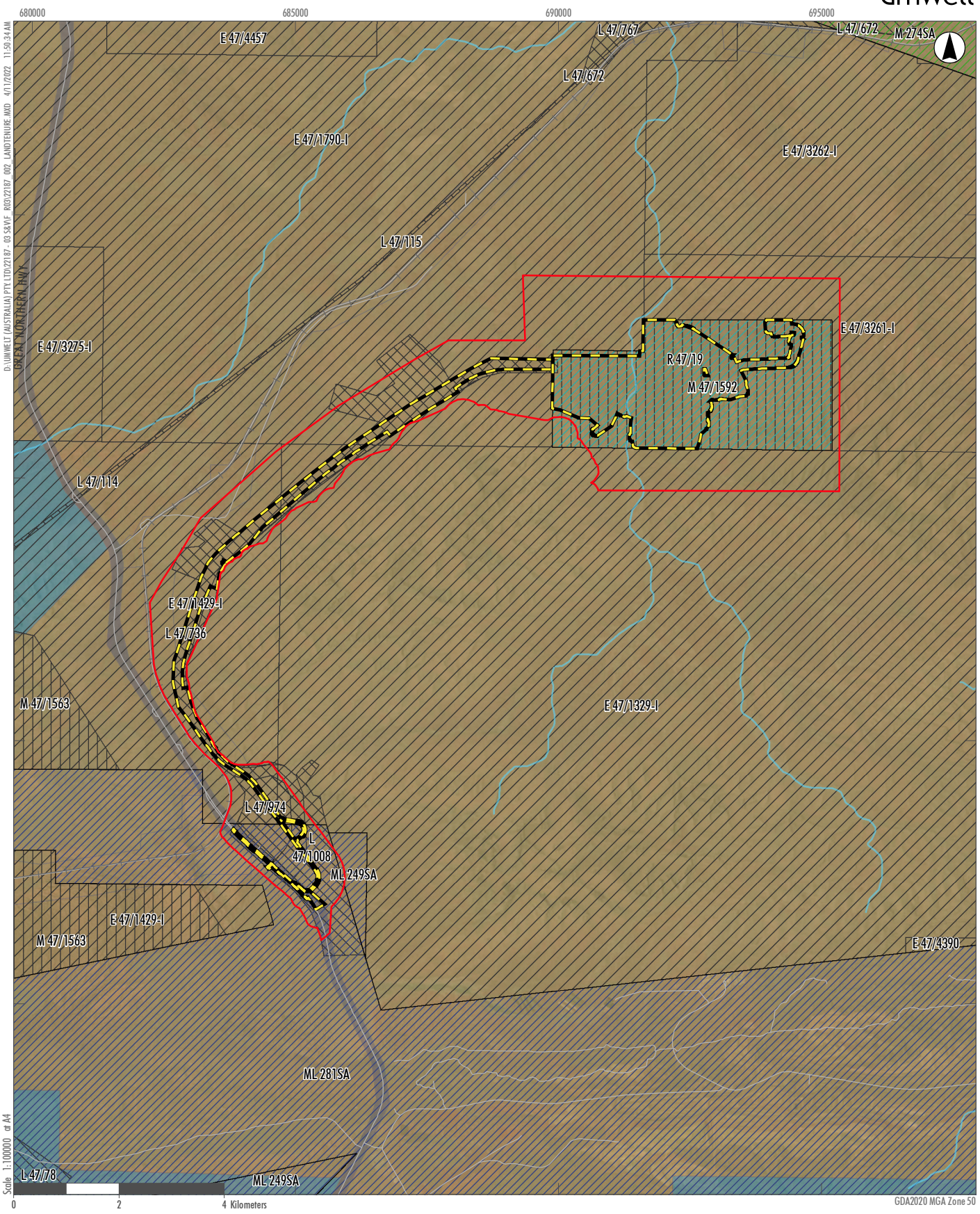
Broadscale mapping of potential Groundwater Dependent Ecosystems (GDEs) is available via the Groundwater Dependent Ecosystem Atlas which includes mapping of potential aquatic GDEs and terrestrial GDEs (BoM 2022b). A terrestrial GDE is a GDE which accesses subsurface groundwater to meet all or some of its water requirements, including terrestrial vegetation. An aquatic GDE refers to a GDE which interacts with rivers, springs, and wetland ecosystems and includes ecosystems that rely on groundwater that has been discharged to the surface, for example, as baseflow or spring flow.

The majority of the Study Area has been identified (BoM 2022b) as low potential terrestrial GDE, with minor areas of moderate potential terrestrial GDE also present. No aquatic GDEs have been mapped within the Study Area. There are no major rivers or creeks mapped within the Study Area. The nearest creeks include Marillana Creek to the north and Pebble Mouse Creek to the south-east which have been mapped as low to moderate aquatic GDEs (BoM 2022b).

The Mine DE is situated in the upper reaches of the Marillana Creek Catchment. PSM (2021) determined that the 'Mine creek' of the Study Area is characterised by sparse riparian vegetation, and that water table settings in the project area are comparatively deep (>10m), indicting unlikely groundwater dependency. Groundwater discharge zones, including shallow groundwater table environments, are expected to be present further downstream (northwards) at the confluence of 'Mine Creek' and Marillana Creek. Known GDE is present at Flat Rocks, approximately 24km downstream of the project. Known stands of *Melaleuca argentea*, *Eucalyptus camaldulensis*, *Eucalyptus victrix* are present further downstream in Marillana Creek, Yandicoogina and Weeli Wolli Creek systems, dependent to some extent on water stored in the alluvial aquifer (PSM 2021).

2.4 Land Tenure

The majority of the Study Area is within Juna Downs Pastoral Station (freehold tenure), with small areas of road (Great Northern Highway) also present (**Figure 2.1**)**.** There is one conservation reserve within the Desktop Study Area, being Karijini National Park (R 30082), which is located approximately 20 km west of the Study Area (DBCA, 2021a). Extensive areas of pastoral stations, including Juna Downs and Marillana Stations, as well as Unallocated Crown Land (UCL), also occur within the Desktop Study Area (Landgate, 2021).



Legend

- Study Area
- Proposed Development Envelope
- Roads
- Rail
- Drainage Line

Tenement

- Exploration Licence
- Mineral Lease S.A.
- Mining Lease
- Mining Lease S.A.
- Miscellaneous Licence
- Retention Licence

Land Tenure

- Freehold
- Leasehold
- Unallocated Crown Land
- Road

FIGURE 2.1

Land Tenure and Tenements relevant to the Lamb Creek Project

Image Source: ESRI Basemap (2021) Data source: Landgate (2022), DMIRS (2022)

2.5 Fire History

Fire is a regular and dynamic process in the Pilbara, either naturally caused by phenomena such as lightning strikes or otherwise by human intervention. Fire management of pastoral and rangeland areas is generally undertaken by land managers, to improve the palatability of grasslands or otherwise to avoid high intensity natural fires. As noted by van Vreeswyck (1994), hummock grasslands are particularly susceptible to fires (either by lightning strikes or prescribed burning); a range of herbaceous plants often emerges after rain in recently burnt areas but are usually succeeded by spinifex. Burbidge (1942) reported a succession of herbaceous annual and/or other short lived taxa in the first two seasons following fire, with regrowth being related to the amount of soil-water; after the third season, the competition in growth seemingly being between the perennial *Triodia pungens* individuals with the annual taxa forming a minor component of the lower stratum. Some species such as Mulga (*Acacia aneura*) are fire sensitive and too-frequent burns can affect the persistence of the species.

Figure 2.2 presents fire history of the Study Area and surrounding areas, as per publicly available data held by the DBCA (DBCA 2022e). Although the vegetation of the Study Area has for the most part been subject to fire in the past 10 years, areas in the north-west portion near the Mine Development Envelope, and smaller areas in the infrastructure corridor and Great Northern Highway intersection portions of the Study Area have not been burnt in the last 10 years. The eastern half of the Study Area surrounding the Mine Development Envelope was burnt in January 2014; portions of this area was then re-burnt in November 2017). The November 2017 burn also extended further west into this portion of the Study Area, also affecting portions of the infrastructure corridor. A separate burn in October 2015 (six and a half years since fire) affected portions of the Great Northern Highway intersection area and the infrastructure area (**Figure 2.2**).

None of the Study Area has been burnt more recently than four and a half years prior to survey (data as per DBCA 2022e), with no recent burns evident whilst undertaking survey.

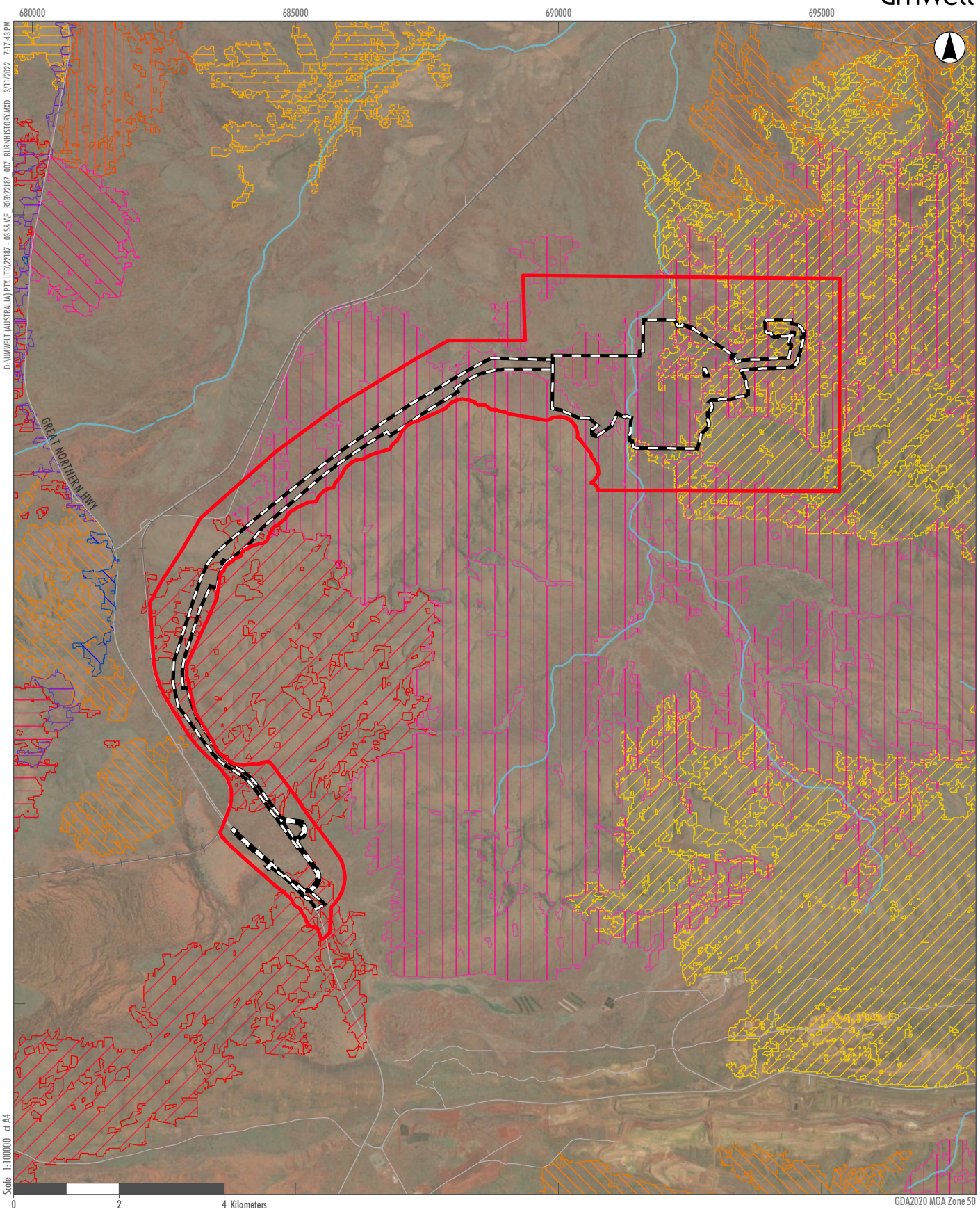


FIGURE 2.2

Burn History of the Study Area

Image Source: ESRI Basemap (2021) Data source: Landgate (2022), DBCA (2019)

3.0 Methods

3.1 Desktop Study

Prior to commencement of the 2022 field survey, a review of all publicly available flora and vegetation data relevant to the Study Area was undertaken. This included obtaining and reviewing copies of reports of previous biological surveys carried out within the vicinity of the Study Area (including studies assessed as part of the gap analysis for the Project (Umwelt 2022)) and interrogation of relevant databases and other sources as listed in **Table 3.1** within the Desktop Study Area (**Figure 1.1**). The results of the desktop assessment were updated prior to the 2022 field survey as per **Table 3.1**. Where TECs or PECs were identified by the desktop assessment, appropriate nomination / listing descriptions and recovery plans of the TEC or PEC were also reviewed prior to field survey.

Table 3.1 Searches undertaken for the Desktop Assessment of the Study Area

Source	Search Attributes	Search Purpose
Department of Agriculture, Water and the Environment (DAWE) Species Profile and Threats (SPRAT) Database (interrogated using the Protected Matters Search Tool) (DAWE 2021b)	Database interrogated using Desktop Study Area boundary. No additional buffer applied	Identify Matters of National Environmental Significance (MNES), including Threatened flora and TECs listed under the EPBC Act, that occur or have the potential to occur within the Desktop Study Area
DBCA Significant Flora Database (WA Herbarium Specimen Database and Threatened and Priority Flora (TPFL) Database) (DBCA 2022c)	Database interrogated using Desktop Study Area boundary. No additional buffer applied. Search conducted in 2020	Obtain records of DBCA-listed significant flora within the Desktop Study Area
DBCA NatureMap (WA Herbarium and TPFL records) (DBCA, 2007-2021)	Database interrogated using three points at the northern, centre and southern extents of the Desktop Study Area with a 40 km buffer (exact boundary cannot be used). Coordinates were: 22°48'10 S, 118°53'57 E 22°49'43 S, 118°47'39 E 22°53'39 S, 118°48'07 E	Obtain records of DBCA-listed significant flora within the Desktop Study Area
DBCA Threatened and Priority Ecological Communities Database (DBCA 2022d)	Database interrogated using Desktop Study Area boundary. No additional buffer applied.	Obtain records of DBCA-classified TECs and/or PECs within the Desktop Study Area
DBCA NatureMap (TEC and PEC records) (DBCA, 2007-2021)	Review of DBCA-classified TECs and PECs mapped in proximity to the Study Area	Identify whether there are any DBCA-classified TECs or PECs that could occur within the Desktop Study Area
DBCA TEC and PEC lists (DBCA 2018; 2022a)	Review of DBCA-classified TECs and PECs mapped in proximity to the Study Area	Identify whether there are any additional DBCA-classified TECs or PECs that could occur within the Desktop Study Area
Previous flora and vegetation surveys conducted within or in the vicinity of the Study Area (various sources)	Desktop Study Area	Identify records of significant flora and vegetation

Source	Search Attributes	Search Purpose
2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Government of Western Australia 2019)	Study Area	Identify extent of Vegetation System Associations (pre-European vegetation mapping) within the Study Area

3.2 Personnel and Licensing

Table 3.2 lists the personnel involved in both fieldwork and plant identifications for the flora and vegetation assessment. The Project Manager has previous experience in conducting flora and vegetation surveys in the Pilbara (> 3 years) and was supported in the role by the Project Director and Principal Botanist, both with in excess of 10 years experience in conducting field surveys, including in the Pilbara region. Remaining field team leaders have considerable previous experience in conducting flora and vegetation surveys in the Pilbara (> 10 years). Other personnel have previous experience in assisting with flora and vegetation surveys in the region. All plant material was collected under the relevant Flora Taking (Biological Assessment) Licence (under Regulation 62 of the Biodiversity Conservation Regulations 2018 (BC Regs)) and Authorisation to Take or Disturb Threatened Species (pursuant to Section 40 of the BC Act) as outlined in **Table 3.2**. Personnel managing plant identifications have had extensive previous experience (>10 years) in plant identifications of flora of the Pilbara.

Table 3.2 Personnel and Licensing Information

Personnel and Role	Qualifications	Field Trips*			Taxonomy	Reporting	Flora Collecting Permit (BC Act)
		1	2	3			
Greg Woodman (Project Director)	BSc (Biology) (Hons)					•	N/A
Catherine Godden	BSc (Biology) (Hons)					•	N/A
Cielito Marbus (Project Manager / Team Leader)	BSc (Biotechnology) (Hons), BComm (Management)	•	•	•	•	•	FB62000066-2 TFL90-2021
Kim Kershaw (Team Leader/Field Member)	Bsc (Science)	•		•			FB62000054-2 TFL133-2122
Kelli McCreery (Team Leader/Field Member)	Msc (Environmental Management)		•				FB62000185-2 TFL27-1920
Kyler Rowson (Field Member)	Bsc (Marine Biology and Biological Sciences)	•	•		•	•	FB62000399
Emalyn Loudon (Field Member)	BAgrib (Agriculture) (Hons)	•	•				N/A
David Coultas	BSc (Environmental Biology) (Hons)				•		N/A
Bethea Loudon	BSc (Biology)				•		N/A
Jaroslav Hruban	Mgr (MSc equiv.) (Botany) BSc (Botany) (Hons)				•		N/A
Leah Firth	Bsc (Conservation Biology)				•		N/A

* Field trip dates presented in **Section 3.4.1**

3.3 Aerial Photography Interpretation and Survey Design

Initial interpretation of ortho-rectified aerial photography (at a scale of 1:10,000) was conducted to determine preliminary vegetation patterns present within the Study Area (including areas of restricted or unusual landforms and types), with quadrats allocated based on these patterns. A minimum of three quadrats were allocated to each major discernible vegetation pattern where possible; for smaller patterns, fewer quadrats were allocated based on the size of the pattern, while for widespread vegetation patterns, quadrats were allocated across their geographic range.

Quadrats were allocated across the Study Area, excluding the GNHI DE area that was the focus of Rapallo's (2021a) field survey, as this area was already well sampled. A selection of quadrats sampled by Rapallo (2021a) were revisited during the current survey in order to determine compatibility of Rapallo (2021a) data for inclusion in floristic analyses.

3.4 Field Survey Methods

The survey design for the 2022 survey of the Study Area complies with the requirements of EPA (2016b) and is consistent with the methods used by other similar flora and vegetation assessments conducted within the vicinity of the Study Area (**Section 5.1.3**) and the wider Pilbara Bioregion.

3.4.1 Survey Timing

Flora and vegetation field surveys were undertaken over three survey periods in 2022, as outlined below (the 2022 field surveys):

- 14-23 March 2022: flora and vegetation quadrat assessment.
- 4-14 April 2022: flora and vegetation quadrat assessment, targeted significant flora searching.
- 29 June-1 July 2022: targeted flora searching.

The timing of the field surveys was selected to coincide with the most appropriate time to survey in the Pilbara Bioregion; approximately six to eight weeks post wet season (generally March to June) (EPA 2016) as most of the taxa in this region flowers at this time. This includes the majority of significant taxa that potentially occur in the Study Area (see **Section 5.1.4**). Above-average rainfall in May 2022, coupled with moderate temperatures lengthened the flowering season, allowing for further targeted survey in June 2022.

The Study Area was accessed by helicopter and vehicle using existing access tracks, and via foot transects. Appropriate landholder/manager permissions were obtained prior to undertaking the 2022 surveys.

3.4.2 Sample Sites

A total of 116 non-permanent flora and vegetation quadrats and five relevés were surveyed in the Study Area (**Figure 3.1**).

Of the 116 quadrats, 108 were new quadrats established by this survey and eight were re-scores of quadrats established by Rapallo (2021a). A further 11 quadrats established by Rapallo (2021a) in the Study Area were not re-scored during this survey.

The quadrat size utilised for the flora and vegetation survey of the Study Area is the indicative size for flora and vegetation surveys in the Pilbara IBRA Bioregion, as outlined in Table 1 of the Technical Guidance (EPA 2016b). All quadrats encompassed a total area of 2500 metres squared (m^2); most measured 50 m × 50 m squares; however, occasionally rectangular quadrats with different dimensions (e.g. 100 m × 25 m) were established in narrower vegetation patterns such as those along creek lines. Quadrat locations were selected to ensure that at least three quadrats were surveyed within each vegetation pattern initially identified from aerial photography interpretation, where possible (as per **Section 3.3**). The final quadrat locations were adjusted from the initial proposed locations if variations in floristic patterning were observed in the field, or if access or safety issues were encountered. Vegetation boundaries or transition zones were avoided. Additional quadrats were established in areas that were not identified by the initial aerial photography interpretation but were observed in the field to differ from pre-identified areas, or areas of unusual habitat. Quadrat boundaries were demarcated using handheld Global Positioning System (GPS) units and surveying tape measures.

All vascular flora taxa (native and introduced) that were visually identifiable within each quadrat were recorded. At least one reference specimen of most taxa encountered (excluding common, distinctive taxa) was collected for verification and identification purposes (see Section 3.5).

The following information was recorded at each quadrat:

- Unique quadrat number (Site Name).
- Survey date.
- Global Positioning System (GPS) coordinates at start corner of quadrat (recorded using handheld GPS units) (Geocentric Datum of Australia (GDA94), Zone 50).
- Size and dimensions of quadrat.
- Site photograph, taken diagonally from start corner.
- Compass bearing for two sides of quadrat that commence at start corner of quadrat.
- Topography (including landform type and slope class).
- Soil colour and type (including the presence of any rock outcropping and surface stones).
- Vegetation condition (EPA 2016b; scale presented in **Appendix A**) and a description of disturbances (where relevant).
- Approximate time since fire.
- Foliage cover (%) (for each taxon, native and introduced, including cover within the quadrat of individuals rooted outside of the quadrat).
- Height (m) (average for each taxon, native and introduced, excluding climbers/aerial shrubs).
- Additional flora taxa present immediately outside of the quadrat.

Flora and vegetation survey quadrats are not considered to be the most appropriate sampling method in all instances. Where areas of vegetation in relatively degraded condition are encountered, or if areas of vegetation are too narrow to allow for the establishment of quadrats (e.g. narrow road verges), the establishment and survey of relevés rather than quadrats is considered more appropriate. A total of five non-permanent flora and vegetation survey relevés were established and surveyed within the Study Area during the 2022 field surveys. Each relevé surveyed an area approximately within a radius of 20 m around a central point. All data recorded for quadrats (as listed above) was also recorded for the relevé; however, only dominant taxa of each stratum level were recorded, as well as any taxa not previously observed elsewhere.

3.4.3 Vegetation Notes

Notes on vegetation pattern boundaries and distribution were also taken while traversing the Study Area. These notes included a GPS location at the point where the notes were taken (GDA94, Zone 50), and a brief description of the vegetation, including dominant and characteristic taxa. The notes were used to aid in mapping polygons of vegetation patterns that were not allocated quadrats or relevés. Not all vegetation pattern polygons received quadrats or relevés due to the size of the Study Area in combination with reasonable time constraints; however, polygons could be confidently allocated to a final vegetation type (VT) using a combination of field mapping notes and aerial photograph interpretation. Additional flora taxa were also recorded opportunistically in the Study Area during traverses, with GPS locations of such taxa recorded (GDA94, Zone 50).

3.4.4 Targeted Survey for Significant Flora and Vegetation

Targeted survey for significant flora taxa was undertaken during 2022 over the Targeted Survey Area (**Section 1.2**). Targeted survey was undertaken via transects spaced approximately 50 m apart. Where plants of significant flora taxa were encountered, survey was undertaken between transects. Where the current Development Envelope boundary exceeded the previously searched (Rapallo 2021) Targeted Study Area by less than 25 m, these small areas were not traversed during the 2022 survey.

The majority of taxa identified by the desktop assessment as potentially occurring within the Study Area were considered to be identifiable during the survey, and therefore the majority of such taxa were targeted (Section 5.1.5). Limitations to the survey are provided in **Section 4.2**. Information relating to identifying characteristics, flowering period and habitat of these taxa was provided to all field team members prior to undertaking targeted survey.

The following information was recorded along traverses (where significant flora were encountered):

- Location.
- GPS coordinates (recorded using handheld GPS units) (GDA94, Zone 50).
- Taxon encountered.
- Detailed count of individuals of taxon at location.
- Comments on landform, aspect, soil type, vegetation condition, time since fire, and disturbance, where relevant.

Targeted significant flora searching was also undertaken opportunistically while traversing to quadrat and relevé locations. If new populations of significant flora taxa were identified, a representative collection of material was made (**Section 3.5**). Information recorded at such locations was the same as that recorded during targeted searching.

A potentially undescribed entity (*Euphorbia* aff. *ferdinandi*) recorded by Rapallo (2021b), represented a gap in previous survey coverage. To address this, targeted survey outside the Targeted Survey Area was conducted to determine the presence of this entity within the Development Envelope. Efforts across the current Targeted Survey Area included searching for this entity.

Targeted survey in the GNHI DE, and in the vicinity of, was undertaken in June for *Aristida jerichoensis* var. *subspinulifera* in response to identification of this taxon in the 2022 plant identification process from a Rapallo (2021a) rescored quadrat.

A second potentially undescribed entity (*Corchorus* sp). was identified from a quadrat during the 2022 survey, representing a gap in survey coverage. To address this, further targeted survey outside of the Targeted Survey Area, was undertaken in late June-early July 2021 to determine presence of this entity within the Development Envelope.

No targeted searching for significant vegetation was undertaken in 2022 as the desktop assessment did not identify any listed significant vegetation likely to be present in the Study Area (**Section 5.1.5**).

All traverses made during the 2022 field surveys are mapped as track logs on **Figure 3.1**.

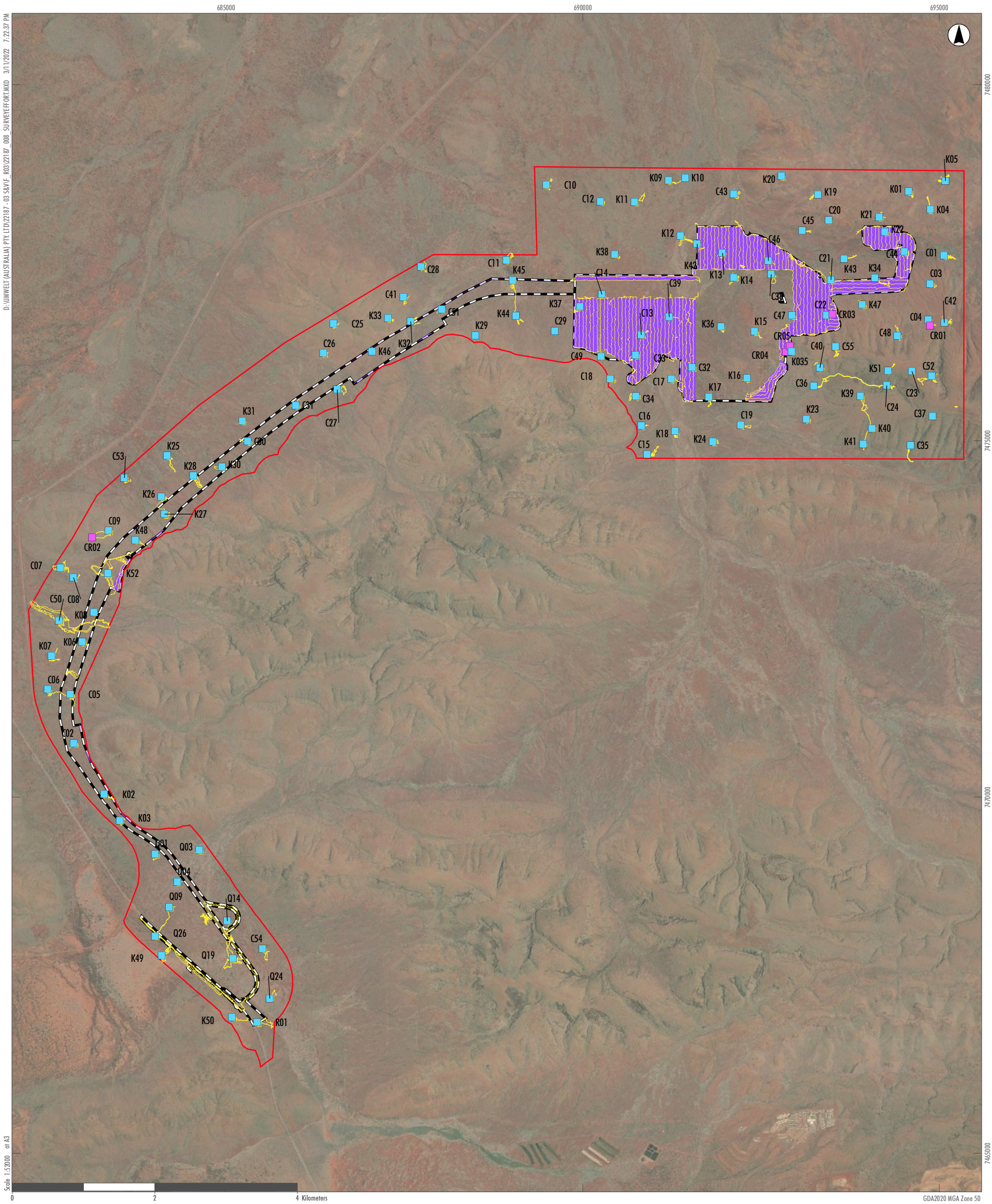


FIGURE 3.1

Survey effort: Track logs, Quadrats and Relevés from the 2022 Field Surveys

Image Source: ESRI Basemap (2022) Data source: Umwelt (2022)

3.4.5 Introduced Flora

Opportunistic locations of introduced flora taxa encountered while traversing between quadrats and relevés, and while conducting targeted searching for significant flora taxa, were recorded using the same method as for significant flora taxa, with particular emphasis given to WoNS and Declared Pests.

3.5 Plant Collection and Identification

Specimens of any unknown taxa encountered during the field survey were collected and pressed as per Western Australian Herbarium (WA Herbarium) guidelines. Plant identifications were undertaken at the WA Herbarium and were overseen by a Principal Botanist with extensive previous experience (> 10 years) in plant identifications for flora of the Pilbara (**Section 3.2**). The identification of all taxa (including significant taxa) used the most up to date information available (including taxonomic keys published in books, journals and online, comparison with herbarium specimens, and consultation with taxonomic experts). External experts of particular families or genera were consulted for any specimens considered to be difficult to identify or of taxonomic interest, including botanists at the WA Herbarium.

Taxon nomenclature generally follows *FloraBase* (WA Herbarium 1998-) with all names checked against the current DBCA Max database to ensure their validity. However, in cases where names of plant taxa have been published recently in scientific literature but have not yet been adopted on *FloraBase* due to time constraints, nomenclature in the published literature is followed. The conservation status of each taxon was checked against *FloraBase*, which provides the most up-to-date information regarding the conservation status of flora taxa in WA.

Specimens of interest, including significant flora taxa, taxa representing range extensions, potential new taxa, and key species in new occurrences of TECs and PECs will be sent to the WA Herbarium for consideration for vouchering as soon as practicable. However, this process is via donation, and the WA Herbarium may not voucher all specimens, in accordance with its own requirements. The specimen vouchering will be supported by completed Threatened and Priority Flora Report Forms submitted to DBCA (Species and Communities Branch) in the case of listed significant flora (i.e. Threatened and Priority flora taxa).

3.6 Floristic Classification Analysis

Floristic classification analysis of 127 quadrats established in 2021 and 2022 (Section 3.4.2) was performed to inform the final grouping of VTs in the Study Area. The floristic classification analysis was undertaken by a senior botanist with previous experience (> 3yrs) in undertaking and interpreting floristic analysis results, and was reviewed by a principal botanist with extensive previous experience (> 10 years) in Pilbara analyses. The taxa recorded in each of the 11 quadrats sampled by Rapallo (2021b) were reviewed and relevant changes to the data were made with regards to the field survey and plant identification process relevant to the quadrat re-score process undertaken during this survey (re-score of eight Rapallo (2021b) quadrats during 2022). These taxon changes are listed in **Appendix B.**

Taxa belonging to the below categories were removed prior to the classification analysis:

- Introduced taxa - introduced taxa were removed as their distributions are generally by the presence of disturbance (e.g. clearing, animal movement) rather than natural ecological drivers. Vegetation type must be determined independently of vegetation condition for the purposes of EIA; therefore,

including weeds in the classification analysis introduces the risk of VTs allocated by the analysis being based on condition (presence/absence of introduced species) rather than native taxon presence/absence.

- Hybrids – hybrids are usually the result of random reproductive events that produce small numbers (often only one) of sterile offspring and are often not associated with particular habitat types. As an exception, the hybrids *Senna glutinosa* subsp. x *luerssenii* and *Senna artemisioides* subsp. x *artemisioides* were retained due to their repetitive nature in the dataset.

- Taxa where identification was unclear – taxa were removed from the analysis where identification was unclear due to poor available material in the field. However, if such a taxon was known to be unique within the dataset (i.e. although not identifiable to species level, there was enough material to indicate it representing a unique taxon), and the taxon had multiple records in the dataset, it was included in the analysis.

- Singletons – taxa that occur only once in the dataset were removed, as published studies indicate that they provide little information in the dataset (e.g. Markey and Dillon 2008).

All taxa removed from the classification analysis (excluding taxa belonging to the abovementioned categories) are presented in **Appendix B**. Also presented in **Appendix B** are taxa that were amalgamated in the classification analysis; this was done, for example, where different infra-taxa could not be consistently positively identified at all quadrats due to inadequate material.

The final dataset contained 239 taxa following the removal and/or amalgamation of the above-noted taxa.

A single-layer data matrix using presence/absence species data was used in the classification analysis, with PATN (V4.0) (Belbin and Collins 2013) utilised to perform the classification and ordination analysis of the data matrix. The Bray-Curtis coefficient was used to generate an association matrix for the classification analysis. This association matrix consisted of pairwise coefficients of similarities between quadrats based on floristic data. Agglomerative hierarchical clustering, using flexible Unweighted Pair Group Method with Arithmetic Mean (UPGMA) (ß = - 0.1), was used to generate a quadrat classification dendrogram (Sneath and Sokal 1973).

3.7 Vegetation Type Definition, Mapping and Description

The classification analysis of the Study Area floristic data (**Section 3.6**) aggregated quadrats and taxa, with the number of groups equivalent to the square root of the number of quadrats/taxa (Belbin and Collins 2013). The resulting dendrogram and taxon group matrix were initially examined at this level to determine the plausibility of groups with regard to taxon groups, in combination with field observations. This process determined a final number of groups, which are considered to represent VTs.

Following this process, floristic and structural data recorded at relevés was examined to determine whether vegetation sampled by such relevés was analogous to any of the VTs defined by floristic composition classification.

VT descriptions have been adapted from the National Vegetation Information System (NVIS) Australian Vegetation Attribute Manual Version 6.0 (ESCAVI 2003), as stipulated by EPA (2016b). This model follows nationally-agreed guidelines to describe and represent VTs, so that comparable and consistent data are produced nation-wide. It should be noted that the NVIS system utilises vegetation descriptions derived

from structural characteristics of the individual community units, while VTs presented in this report are defined based on the results of a floristic classification analysis, excluding any structural data. Such VTs therefore may include multiple structural types. Considering the effect of disturbance factors such as fire on vegetation structure, this approach is designed to provide a map of VTs that reflect taxon composition and the influences of the physical and chemical environment rather than disturbance history.

The vegetation was described according to the stratum and dominant taxa present in each stratum upon review of the quadrat data for each VT. This report has described VTs at the NVIS Association level rather than the NVIS Sub-Association level, in accordance with the stratum present and consistently-dominant taxa recorded.

For each VT, indicator taxa were defined via Indicator Taxon Analysis (INDVAL). This was conducted using PC-Ord (V6.08) (McCune and Mefford 2011) via the method of Dufrêne and Legendre (1997). This generates INDVAL values (a measure of taxon fidelity to a given VT) that range from 0 to 100; an INDVAL value of 100 indicates that a taxon is present in all quadrats within a particular VT, and absent from all other quadrats included in the analysis. The INDVAL values were then tested for significance of the indicator taxa using a Monte Carlo permutation test. Indicator taxa were defined as taxa with a significance p value of either < 0.05, < 0.01 or < 0.001. The same taxa exclusions (i.e. introduced taxa, hybrids and singletons) and amalgamations (as per **Appendix B**) were employed for the indicator species analysis as per the floristic classification analysis (**Section 3.6**). Note that only VTs sampled with more than one quadrat were analysed for indicator species.

Locations of quadrats and/or relevés within each VT were used in conjunction with aerial photograph interpretation and field notes taken during the field survey to develop VT mapping polygon boundaries. VT mapping boundaries were developed using aerial photography on a scale of 1:10,000 and reflected changes in vegetation patterns visible at this scale. The VT mapping polygon boundaries were then digitised using Geographic Information System (GIS) software.

3.8 Vegetation Condition Mapping

Vegetation condition was described using the vegetation condition scale presented in EPA (2016b) for the Eremaean and Northern Botanical Provinces (**Appendix A)**. Notes on vegetation condition were taken via vehicle traverses along access tracks, and during foot traverses undertaken within the Study Area. Vegetation condition was also recorded at all quadrats and relevés. Vegetation condition category polygon boundaries were developed using this information and were digitised using GIS software as for VT polygon boundaries.

3.9 Significant Flora and Vegetation

3.9.1 Significant Flora

As per EPA (2016a, 2016b), flora taxa may be significant for a range of reasons, including, but not limited to the following:

- Being identified as a Threatened or Priority species (formally listed significant taxa – includes taxa listed under both State and Commonwealth legislation, and classified as Priority by DBCA).

- Being locally endemic or associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems (GDEs)).
- Being a new species or having anomalous features that indicate a potential new species.
- Being representative of the range of a species (particularly at the extremes of range, recently discovered range extensions, or isolated outliers of the main range).
- Being an unusual species, including restricted subspecies, varieties or naturally occurring hybrids.
- Having a relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

Significant flora taxa recorded within the Study Area are discussed in **Sections 5.2.2**, with reference to the above categories. Numbers of point locations and individuals recorded of significant flora known from the Study Area are presented in **section 5.2.2.**

3.9.2 Significant Vegetation

As per EPA (2016a, 2016b), vegetation may be significant for a range of reasons, including, but not limited to the following:

- Being identified as a TEC or PEC (formally listed significant vegetation – includes vegetation listed under Commonwealth or State legislation, or classified as a PEC by DBCA).
- Having restricted distribution.
- Having a degree of historical impact from threatening processes.
- Playing a role as a refuge.
- Providing an important function required to maintain ecological integrity of a significant ecosystem.

To determine the presence of TECs and PECs defined from quadrat-derived data, EPA (2016b) requires comparison of the quadrat data with that of the survey in which the TEC or PEC was originally described. However, limited information is available for TECs and PECs of the Pilbara region. Generally, only broad descriptions are provided in the respective TEC and PEC lists to allow for diagnosis. The vegetation of the Study Area was therefore manually compared to such descriptions to determine whether any vegetation may represent a TEC or PEC; specifically, comparisons of dominant taxa, soils, topography and geographical distribution of VTs were made to those of any relevant TEC or PEC. A similar process was followed for TECs listed under the EPBC Act, with comparisons made to the appropriate listing and conservation advice for any TECs likely to occur in the Study Area.

The remaining significant vegetation criteria other than “being identified as a TEC and PEC” were applied to VTs mapped in the Study Area to determine whether a VT was significant in a local or regional context. In a regional context, limited information is available for comparison with VTs in the Study Area. This is discussed further in **Section 5.2.9**.

An assessment of the likelihood of groundwater dependent vegetation occurring in the Study Area was undertaken using a combination of known depth to groundwater (within 10m of the surface) taken from other studies prepared for the project (PSM 2021), combined with an assessment of the presence and extent of known phreatophytic taxa from the Pilbara region.

4.0 Adequacy and Limitations of Survey

4.1 Adequacy of Survey

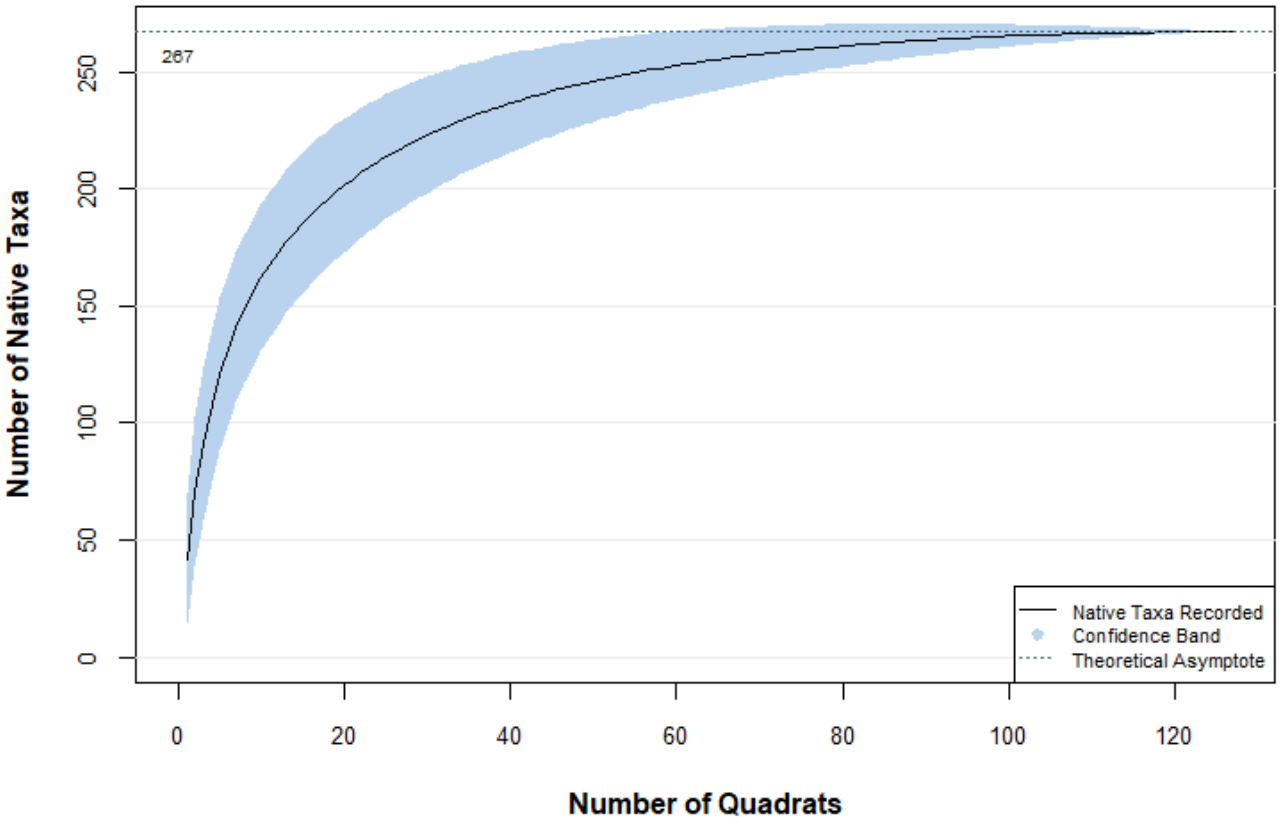
The Study Area covers 3,785.7 ha, with a total of 127 quadrats (including 108 newly established quadrats, eight re-scored Rapallo (2021a) quadrats and 11 Rapallo (2021a) quadrats which were not revisited) established within the Study Area. Quadrats were established in all preliminary vegetation patterns discernible by initial aerial photograph interpretation (**Section 3.3**), both to adequately sample variation in vegetation throughout the Study Area, and to ensure adequacy of sampling for vascular plant taxa.

The number of quadrats established within the Study Area is considered to be acceptable given the moderate diversity of topography and soil types noted in it, as well as the extent of native vegetation mapped in, the size of, and extent of native vegetation in the Study Area (approximately 1(99.9% of the Study Area). One quadrat was established per 30 ha of Study Area.

To provide an indication of the adequacy of this survey, a taxon accumulation curve was produced with the 'vegan' R package (Oksanen *et al.* 2020) using R Statistical Software (R Core Team 2022). Taxon accumulation curves represent a theoretical model of the relationship between sampling intensity and taxon accumulation; when sampling intensity is increased, taxon accumulation is reduced, and a taxon accumulation curve becomes asymptotic.

The taxon accumulation curve for quadrat data recorded in the Study Area was generated using all native taxa (both annual and perennial) recorded within each quadrat. Taxon accumulation calculations were then undertaken using the 'SpadeR' R package (Chao *et al.* 2016), utilising the Chao-2 estimator for species richness (bias corrected form) (Chao 1987) and compared to the actual number of taxa recorded in the Study Area. This provides an indication as to whether sufficient quadrats were surveyed to adequately sample the species richness in the Study Area. As the generation of taxon accumulation curves includes quadrat data only, and not opportunistically recorded taxa, the indication of adequacy of survey is considered to be conservative.

Graph 4.1 presents the taxon accumulation curve generated from quadrat data from the Study Area. Using the Chao-2 estimator, the recorded number of taxa within quadrats (267 taxa) has become asymptotic and is equivalent to 100 % of the estimated taxon richness in the Study Area, indicating that the Study Area was well-sampled. Interestingly, as per the flora census results (**Section 5.2.1**), a total of 320 discrete vascular native flora taxa, three known hybrids (as per WA Herbarium (1998)) and one putative hybrid were recorded in the Study Area by the 2022 survey. Therefore, in this case the Chao-2 estimator appears to have underestimated the native taxon richness of the Study Area.



Graph 4.1 Study Area Quadrata Data Taxon Accumulation Curve

Another adequacy of survey measure is that developed by Mueller-Dombois and Ellenberg (1974), who suggest that a cut-off point might be when a 10 % increase in quadrats surveyed results in a ≤ 5 % increase in taxa recorded. This measure was also calculated using all native taxa recorded within each quadrat. The number of quadrats established by the field survey satisfies this adequacy measure, with the final taxon increase value of 0 % recorded following a 10 % increase in quadrats.

Figure 3.1 presents the location of all quadrats and relevés sampled during the survey. Track logs of Targeted Flora survey intensity are also presented. Track logs between quadrats are presented only where quadrats were accessed via foot; due to poor access the majority of quadrats were accessed via helicopter and these logs are not presented.

4.2 Limitations of Assessment

Table 4.1 Limitations of the Flora and Vegetation Survey

Limitation	Limitation of Survey	Comment
Effort and extent	No	Detailed survey was undertaken encompassing the entire Study Area. At least three quadrats were established in each vegetation pattern identified through initial aerial photography interpretation and on-ground field survey in the Study Area. Re-score of an appropriate sample of existing quadrats (Rapallo 2021a) was undertaken during the survey. Mapping of VT boundaries was undertaken using a combination of aerial photography (scale 1:10,000) and information collected during traverses between quadrats and relevés. Field verification of VT boundaries post-analysis was not undertaken. Targeted survey for significant flora taxa identified by the desktop assessment and during quadrat sampling was conducted in 2022 across all areas identified as requiring such survey (Targeted survey area; see **section 1.2.4; and outside of this to address gaps; see section 3.4.4**) within the most appropriate time to survey in the Pilbara Bioregion (six to eight weeks post wet season). Targeted survey was undertaken using transects spaced approximately 50m apart, with finer scale transects employed where significant flora taxa were identified. Opportunistic targeted survey for significant flora taxa was also undertaken while traversing the Study Area to establish quadrats and relevés during the 2022 survey (see **Sections 3.4.4**). Detailed and Targeted Survey was conducted over a total of 90 person days in 2022. No constraints prevented appropriate sampling techniques (quadrat/relevé establishment, foot transects) being employed. Access within the Study Area enabled detailed VT and condition mapping to be undertaken throughout the Study Area via foot, vehicle and helicopter. Mapping and data reliability is therefore considered to be relatively high.

Limitation	Limitation of Survey	Comment
Competency/experience of the team carrying out the survey	No	The Project Manager and field lead has had over 3 years of experience in conducting flora and vegetation surveys in the Pilbara Region, as well as conducting systematic sampling and analysis, and worked with personnel with significant experience in field surveys of the region (> 10 years). The Project Manager also had previous experience in undertaking flora surveys in the local area. Other field team leaders have previous experience (> 14 years) in conducting flora and vegetation surveys in the Pilbara Region, and field team personnel have previous experience assisting in flora and vegetation surveys. Senior personnel provided guidance to less experienced botanists throughout the 2022 survey where necessary. Information relating to identifying characteristics, flowering period and habitat of significant flora taxa identified by the desktop assessment as potentially occurring in the Study Area were provided to all field team members prior to undertaking the 2022 field survey. Personnel overseeing plant identifications have had > 10 years' experience in plant identification in the Pilbara Region. Relevant taxonomic experts (including botanists at the WA Herbarium) were consulted for any specimens considered to be difficult to identify or of taxonomic interest.
Proportion of flora recorded and/or collected and identified	No	All vascular groups that were present in the Study Area were sampled. At least one reference specimen of all taxa encountered (excluding common, distinctive taxa) was collected for verification and identification purposes during the 2022 survey. A relatively high proportion of annual and ephemeral vascular taxa were recorded in 2022 based on the intensity and method of survey and the above-average precipitation received prior to the 2022 survey. Almost all ephemeral and perennial flora taxa could be positively identified. All unknown vascular taxa were collected, with specimens identified at the WA Herbarium. Adequacy of survey measures indicate that the Study Area was well sampled (**section 4.1**).
Sources of information e.g. previously available information (whether historic or recent) as distinct from new data	No	Reasonable contextual information for the Study Area was available prior to the 2022 survey. Sources of information used included government databases (DAWE, DBCA), previous unpublished reports and data from within and in the vicinity of the Study Area (**Section 5.1.3**), as well as numerous general sources pertaining to the climate, geomorphology, flora and vegetation of the Pilbara Region. All data sources used for the desktop assessment were considered to have high reliability.

Limitation	Limitation of Survey	Comment
Survey timing and weather/season/cycle	Partial	The 2022 field survey was conducted within the most appropriate time to survey in the Pilbara Region (approximately six to eight weeks post wet season – March to June). Above-average precipitation was received during the wet-post wet season 2021/2022, with significant above-average precipitation received in February and May 2022 (**Section 2.1**). This significant rainfall in May 2022 combined with reasonably warm temperatures allowed for further follow-up targeted survey in late June-July 2022. The 2022 survey was conducted mid-to end of season and the flowering season was considered to be good, with a relatively high proportion of annual and ephemeral vascular taxa recorded and many perennial taxa in flower. All perennial taxa were at least in good condition. All significant flora taxa known to occur or potentially occurring in the Study Area based on the desktop assessment results were considered to be identifiable during the 2022 survey with the exception of two taxa. *Arthropodium vanleeuwenii* (P2) is considered visible only when flowering in September, as it grows up through *Triodia.* This taxon could occur within the Study Area and Targeted Survey Area based on the habitats present (see **Section 5.2.5**). *Rhodanthe ascendens* (P1) was also potentially unidentifiable at the time of survey based the known flowering time. However, this taxon is unlikely to occur in the Study Area based on a combination of the habitat present, extent of targeted searching undertaken, and that the Study Area is outside of the known range (discussed in **Section 5.2.5**). One significant flora taxon (*Euphorbia clementii*) (P2) is a known fire responder; otherwise, fire response of significant flora from desktop review unknown or presumed not to be fire responders. The majority of the targeted flora survey area was either long-unburnt (>10 years), or otherwise subject to burn approximately 4.5 years ago. Unlikely that *Euphorbia clementii* (P2) is present in Study Area due to being outside of the known range of the taxon.

Limitation	Limitation of Survey	Comment
Disturbances (e.g. fire, flood, accidental human intervention etc.) that may have affected results of survey	No	Very minor historical clearing has occurred in the Study Area, mainly associated with tracks, historical mining exploration and associated clearing. The vegetation condition mapping reflects these impacts with regards to some of the larger areas of historical exploration clearing, however the overall vegetation type mapping was not affected. More recent minor clearing associated with exploration activities was underway (by a separate mining company) during the field survey in the Study Area in the vicinity of the Great Northern Highway. Various ages since fire have been mapped over the Study Area (**Figure 2.2**). These ages ranged from long unburnt (>10 years), January 2014 burn (8.5 years since fire) (affecting the eastern half of the Study Area associated with the Mine Development Envelope); October 2015 burn (6.5 years since fire) (affecting the western half of the Study Area associated with the Access Road and GNH intersection); and November 2017 burn (4.5 years since fire) (affecting extensive portions of the Study Area associated with the Access Road and Mine Development Envelope). Some areas have been affected by fire more than once in the last ten years. However, no vegetation was recently affected by fire, with at least four wet-season cycles allowing sufficient time for germination and regrowth of vegetation, with no effect of the burning regime on ability to identify vascular plant taxa at quadrats.
Remoteness and/or access restrictions	No	Some areas were somewhat difficult to reach due to large distances from available access tracks, or steep, rocky or unsafe terrain, however, significant access/remoteness issues were overcome with the use of a helicopter during field trips 1 and 2 during the 2022 survey, allowing high intensity of sampling across the Study Area. Access was not permitted to a number of relatively small areas that have been identified as Indigenous Australian Heritage Sites, both within the Footprint and in the wider Study Area. Therefore, such sites, in particular those within the Footprint, could not be surveyed for significant flora taxa. Such sites could also not be directly sampled in a vegetation context; however, most sites were relatively small and the vegetation could be observed from outside the site, and therefore it is considered that this did not affect the results of the VT mapping within the Study Area.

5.0 Results and Discussion

5.1 Desktop Assessment

5.1.1 Regional Flora

The interrogation of the DBCA TPFL Database and WA Herbarium (WA Herb) Specimen Database (DBCA 2022c) returned a total of 59 listed significant vascular flora taxa that have records in the Desktop Study Area. Of these, one taxon, *Thryptomene wittweri*, is listed as Threatened under the EPBC Act and BC Act, while the remaining 58 taxa are DBCA-classified Priority flora (**Table 5.1**). None of the taxa returned from the DBCA TPFL and WA Herbarium database interrogations have known records within the Study Area.

According to DAWE (2021b), *Thryptomene wittweri* (T) (or habitat for the taxon) is likely to occur within the Desktop Study Area (**Table 3.1**). As discussed above, according to DBCA databases this taxon has known records within the Desktop Study Area, with the closest record being approximately 23 km southwest of the Study Area. The full results of the DAWE database search are presented in **Appendix C**.

An interrogation of DBCA databases using NatureMap (DBCA 2007-2021) was also undertaken as part of the desktop assessment, to check for any recently added records and confirm the records returned from the DBCA TPFL and WA Herbarium Specimen Database searches. The NatureMap search did not return any additional listed significant flora taxa (**Table 5.1**). Conservation codes for Western Australia flora are presented on the DBCA Threatened species and communities website (DBCA 2020), with a full list of Threatened and Priority flora taxa available on the DBCA Threatened Plants website (current to 27 June 2022 (DBCA 2022a)).

Table 5.1 Listed Significant Flora Taxa Returned from DBCA Database Searches (DBCA 2007-, 2022b)

Taxon	Status (WA)	Status (EPBC Act)	Source			
			DAWE	TPFL	WA Herb	NM
Acacia bromilowiana	P4			x	x	x
Acacia daweana	P3			x	x	x
Acacia effusa	P3			x	x	x
Acacia subtiliformis	P3			x	x	x
Amaranthus centralis	P3				x	x
Aristida jerichoensis var. *subspinulifera*	P3				x	x
Aristida lazaridis	P2				x	x
Arthropodium vanleeuwenii (previously *Arthropodium* sp. Ironstone (J. Bull & J. Waters ONS PJ 36.01))	P2				x	x
Cladium procerum	P2				x	x
Dampiera metallorum	P3			x	x	x
Dolichocarpa sp. Hamersley Station (A.A. Mitchell PRP 1479) (previously *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479))	P3				x	x
Eragrostis crateriformis	P3				x	

Taxon	Status (WA)	Status (EPBC Act)	Source			
			DAWE	TPFL	WA Herb	NM
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	P1			x	x	x
Eremophila magnifica subsp. *magnifica*	P4				x	x
Eremophila magnifica subsp. *velutina*	P3			x	x	x
Eremophila pusilliflora	P2			x	x	x
Eremophila spongiocarpa	P3				x	x
Eremophila naaykensii	P3				x	x
Eremophila sp. West Angelas (S. van Leeuwen 4068)	P1				x	x
Euphorbia australis var. *glabra*	P3				x	x
Euphorbia clementii	P3			x		x
Euphorbia inappendiculata var. *queenslandica*	P2				x	x
Euphorbia stevenii	P3				x	x
Fimbristylis sieberiana	P3			x	x	x
Glycine falcata	P3			x	x	x
Goodenia lyrata	P3			x	x	x
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	P3			x	x	x
Grevillea saxicola	P3				x	x
Gymnanthera cunninghamii	P3				x	x
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	P2				x	x
Indigofera gilesii	P3			x	x	x
Iotasperma sessilifolium	P3				x	x
Ipomoea racemigera	P2				x	x
Isotropis parviflora	P2				x	x
Kohautia australiensis	P2				x	x
Lepidium catapycnon	P4			x	x	x
Olearia mucronata	P3			x	x	x
Oxalis sp. Pilbara (M.E. Trudgen 12725)	P2				x	x
Pilbara trudgenii	P3			x	x	x
Ptilotus mollis	P4				x	x
Rhagodia sp. Hamersley (M. Trudgen 17794)	P3			x	x	x
Rhodanthe ascendens	P1			x	x	x
Rhynchosia bungarensis	P4				x	x
Rostellularia adscendens var. latifolia	P3				x	x
Sida sp. Barlee Range (S. van Leeuwen 1642)	P3				x	x
Sida sp. Hamersley Range (K. Newbey 10692)	P3				x	x
Solanum kentrocaule	P3				x	x
Stackhousia clementii	P3				x	x
Stylidium weeliwolli	P3			x	x	x
Swainsona thompsoniana	P3				x	x

Taxon	Status (WA)	Status (EPBC Act)	Source			
			DAWE	TPFL	WA Herb	NM
Synostemon hamersleyensis	P1				x	x
Tetratheca fordiana	P2			x	x	x
Teucrium pilbaranum	P2				x	x
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	P3				x	x
Thryptomene wittweri	T	Vulnerable	x	x	x	x
Triodia sp. Karijini (S. van Leeuwen 4111)	P1				x	x
Triodia sp. Mt Ella (M.E. Trudgen 12739)	P3				x	x
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)	P1				x	x
Xerochrysum boreale	P3				x	x

* Sources are: DAWE: DAWE (2021b), WA Herb (1998-), TPFL: DBCA (2022c), NM (NatureMap) DBCA: (2007-2021).

The search of the DAWE SPRAT database with regard to MNES listed under the EPBC Act identified one significant invasive introduced flora taxon, or habitat for this taxon, as likely to occur within the Desktop Study Area, being **Cenchrus ciliaris* (Buffel Grass) (DAWE 2021b). **Cenchrus ciliaris* is known to be widespread and common in the Pilbara (WA Herbarium 1998-). This taxon is considered by the States and Territories to pose a particularly significant threat to biodiversity as it is known to be invasive under certain conditions (Hussey *et al.* 2007). This taxon is not listed as a Declared Pest under the BAM Act (DPIRD 2022). The full results of the DAWE database searches are presented in **Appendix C** (DAWE 2021b).

5.1.2 Regional Vegetation

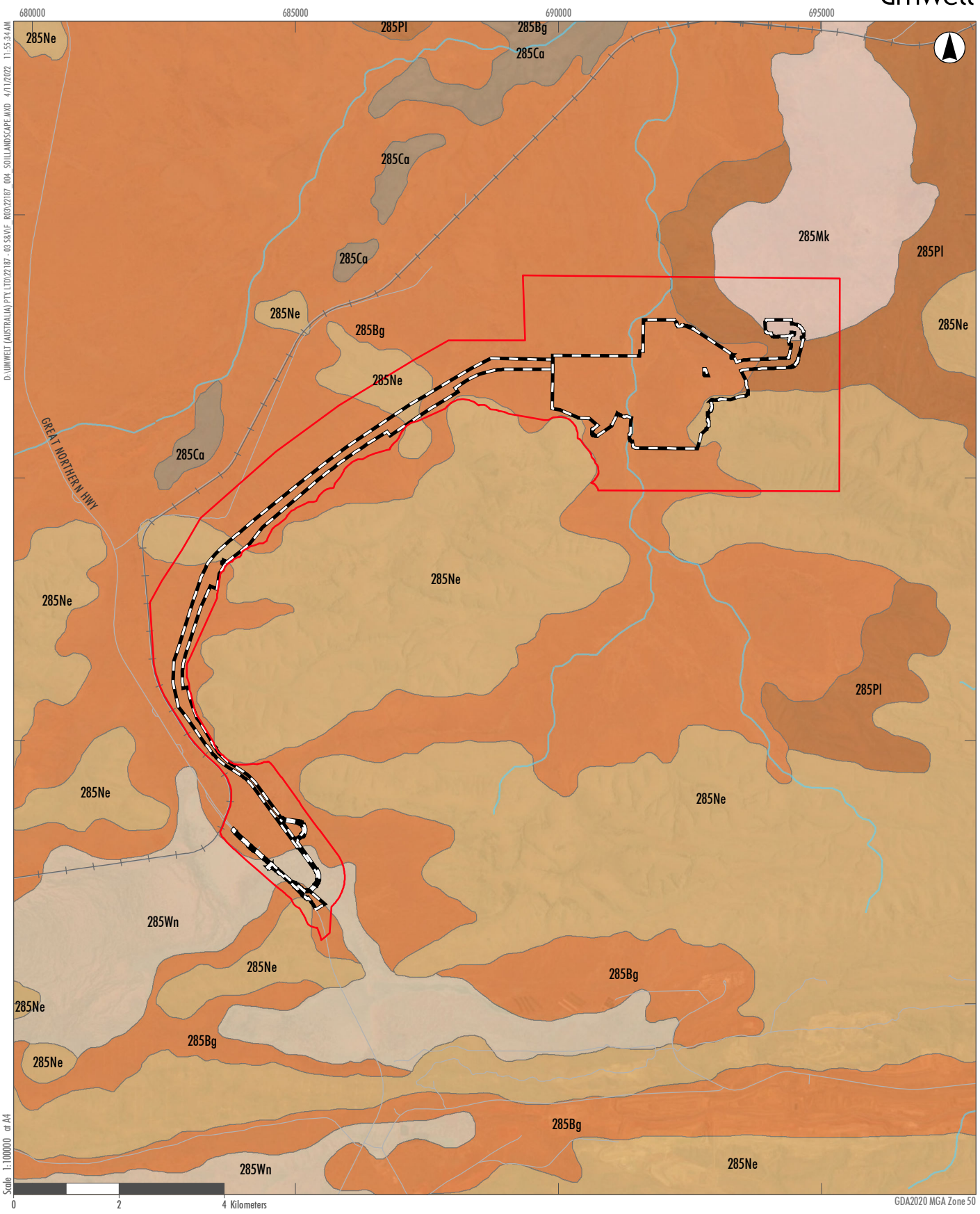
The Study Area is located within the Pilbara Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion, and specifically within the Hamersley IBRA Subregion (PIL3) (DAWE 2020). The Hamersley Subregion comprises mainly of mulga low woodland over bunch grasses on fine textured soils in valley floors, and *Eucalyptus leucophloia* over *Triodia brizoides* on skeletal soils of the ranges (Kendrick 2001).

Soil landscape mapping of WA (previously referred to as land system mapping) has been compiled from the results of various surveys across the state by the Department of Agriculture (now the Department of Primary Industries and Regional Development (DPIRD)) (DPIRD 2019). Data from van Vreeswyk *et al.* (2004) has been used to map soil landscape units in the region within which the Desktop Study Area is located. This data includes general ecological information, vegetation physiognomy and composition, patterns of variation, conservation status, gradational association and land system representation (van Vreeswyk *et al*., 2004).

The Study Area occurs across five soil landscape systems, as summarised in **Table 5.2** and presented on **Figure 5.1**. None of these soil landscape systems are listed as TECs under the EPBC Act (DAWE 2021a) or as TECs or PECs under the BC Act (DBCA 2018; 2022a), and all are detailed as being common in the Pilbara landscape mapping Study Area (van Vreeswyk *et al.* 2004).

Table 5.2 Soil Landscape Mapping of the Study Area (DPIRD 2019; van Vreeswyk *et al.*, 2004)

Soil Landscape System	Description	Area and % of van Vreeswyk Study Area	Area and % of Study Area
Boolgeeda (285Bg)	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands and mulga shrublands Predominantly colluvium on gently sloping plains; widespread and common Stony lower slopes, level stony plains and narrow sub-parallel drainage floors, relief up to 20 m. A common system in shallow valleys below hill systems such as Newman and Rocklea Noted to be subject to fairly frequent burning.	774,800 ha 4.3%	2510.3 ha 66.3%
McKay (285Mk)	Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands Predominantly sedimentary rocks on hills; widespread and common Erosional surfaces; hill tracts, ridges, plateaux remnants and breakaways with steep upper slopes and more gently inclined lower footslopes, restricted stony plains and interfluves; moderately spaced tributary drainage patterns incised in narrow valleys in upper parts becoming broader and more widely spaced downstream. Relief up to 100 m.	420,200 ha 2.3%	213.1 ha 5.6
Newman (285Ne)	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands Predominantly jaspilite on ridges and plateaux; very common in the southern half of the Landscape mapping Study Area Rugged high mountains, ridges and plateaux with near vertical escarpments of jaspilite, chert and shale, the second largest system in the survey area and prominent in southern parts (e.g. Ophthalmia Range, Hamersley Range), relief up to 450 m.	1,458,000 ha 8.0%	654.3 ha 17.3 %
Platform (285Pl)	Dissected slopes and raised plains supporting hard spinifex grasslands Predominantly colluvium on incised slopes; common in the central and south-west of the Landscape mapping Study Area Narrow, raised plains and highly dissected slopes on partly consolidated colluvium below the footslopes of hill systems such as Newman, relief mostly up to about 30 m but occasionally considerably greater.	1,570,00 ha 0.9%	301.2 ha 8.0 %
Wannamunna (285Wn)	Hardpan plains and internal drainage tracts supporting mulga shrublands and woodlands (and occasionally Eucalypt woodlands) Predominately alluvium on hardpan plains, internal drainage flats; common in the central and south of the Landscape mapping Study Area Level alluvial plains with prominent grove patterns of vegetation and shallow loamy soils over hardpan and broad internal drainage plains with deeper more clayey soils, relief up to 5 m. The system is found in south central parts of the survey area as broad flats within the Hamersley Ranges (Newman land system).	57,700 ha 0.3%	106.8 ha 2.8 %



Legend

- Study Area
- Proposed Development Envelope
- Roads
- Rail
- Drainage Line

Soil Landscape Units

- 285Bg, Boolgeeda System
- 285Ca, Calcrete System
- 285Mk, McKay System
- 285Ne, Newman System
- 285Pl, Platform System
- 285Wn, Wannamunna System

FIGURE 5.1

Soil Landscape Mapping of the Study Area

Image Source: ESRI Basemap (2021) Data source: Landgate (2022), DPIRD (2019)

The vegetation of WA as it was presumed to have existed prior to European settlement has been mapped at a scale of 1:250,000 as vegetation system associations (VSAs) (DBCA, 2019), with the pre-European Vegetation spatial database subsequently created (DPIRD, 2019). The Study Area occurs across two VSAs, as summarised in **Table 5.3** and presented on **Figure 5.2**. **Table 5.3** also presents the current extent of each VSA in relation to its pre-European extent within the Hamersley IBRA Subregion, and the percentage of the current extent of each VSA currently protected for conservation in all DBCA-managed land (as a proportion of the current extent) within the Hamersley IBRA Subregion (Government of Western Australia 2019), as well as area (ha) and extent (as percentage) in the Study Area.

There is over 99 % of the pre-European extent of both VSAs remaining, and both have some areas protected for conservation (**Table 5.3**).

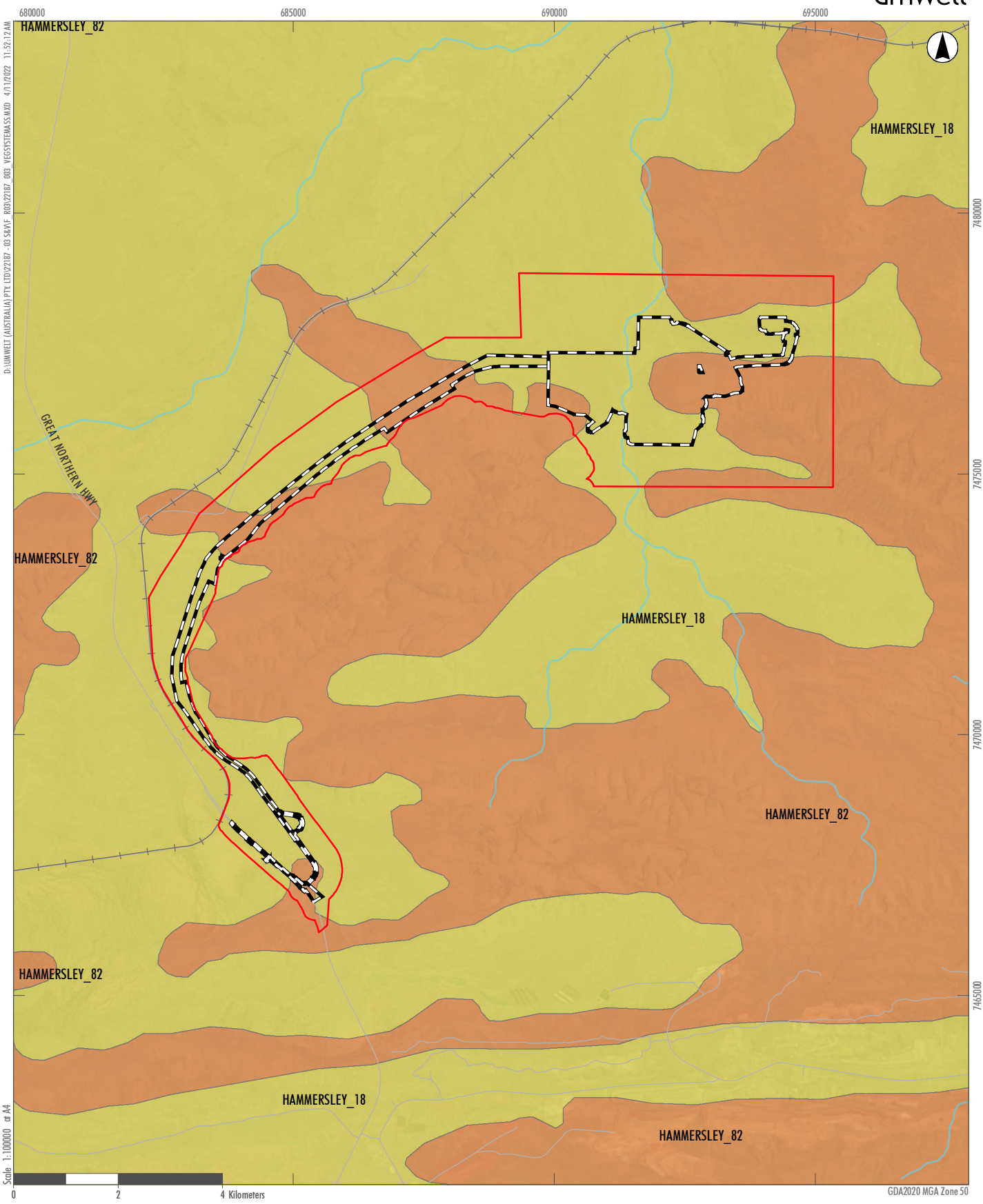
Table 5.3 Bioregional Statistics of Vegetation System Associations of the Desktop Study Area (DPIRD 2019)

Vegetation System Association	Description	Current Extent (ha)	Pre-European Extent Remaining (%)	Current Extent Protected for Conservation (%)	Area and Extent in Study Area
Hamersley_18	Low woodland, open low woodland or sparse woodland	575,808	99.2	29.6	2432.9 ha 64.3%
Hamersley_82	Low tree-steppe	2,146,708	99.4	13.7	1352.8 ha 35.7%

Three main vegetation descriptions for the Hamersley Plateau were provided by Beard (1975), of which two are pertinent to the Study Area:

- The Ranges: vegetation on jaspilite and dolerite ranges is characteristically tree-steppe of *Eucalyptus brevifolia-Triodia wiseana*; few *E. gamophylla* may be present. There are generally few shrubs but a rich flora of small shrubs and forbs. On the summits the tree layer is replaced by *E. kingsmilli*, *E. gamophylla* and *E. brevifolia*. Representative of Hamersley_82.

- Valley Plains: mulga is dominant (*Acacia aneura* low woodland); can develop to open grassland in the wider and flatter areas. *Astroleba pectinata* is dominant on red cracking clays, with a variety of other grasses and forbs. Representative of Hamerlsey_18.



Legend

- Study Area
- Proposed Development Envelope
- Roads
- Rail
- Drainage Line

Vegetation System Association

- HAMMERSLEY_18
- HAMMERSLEY_82

FIGURE 5.2

Vegetation System Associations of the Study Area

Image Source: ESRI Basemap (2021) Data source: Landgate (2022), DBCA (2019)

5.1.3 Local Flora and Vegetation Surveys

Flora and vegetation surveys undertaken for the Project or within the vicinity of the Study Area are summarised in **Table 5.4.** The locations of relevant surveys undertaken in the vicinity of the Desktop Study Area are presented on **Figure 5.3** (subject to the availability of survey boundary files) and those historical studies relevant to the Lamb Creek project area are displayed on **Figure 5.4**. Note that there have been numerous historical surveys undertaken in the general area and region, primarily due to the relatively extensive nature of mining interests; however, only more recent surveys (those undertaken in the last ten years; i.e. since 2011) have been summarised in **Table 5.4.**

Note that some previous surveys summarised in **Table 5.4** recorded locations of *Seringia exastia*, which despite being no longer recognised as Threatened under WA's BC ACT, remains listed as Threatened under the EPBC Act (Department of Premier and Cabinet (DPC) 2018). Binks *et al.* (2020) determined that material considered to represent *Seringia exastia*, which was thought to be restricted to a few locations near Broome and to the south of Broome in the Great Sandy Desert, should be considered conspecific with material considered to be *Seringia elliptica*, a taxon widespread across northern and central WA. Consequently, *Seringia elliptica* and *Seringia exastia* were synonymised under the oldest valid name, being *Seringia exastia*. This synonymisation has created an anomalous situation whereby *Seringia exastia* as now circumscribed is a common, widespread species that clearly does not meet the criteria for Threatened status under either of the aforementioned acts.

Detailed vegetation survey was undertaken in the GNH Intersection Area (Rapallo 2021a) and six vegetation types were mapped in this area:

A: Low open *Eucalyptus gamophylla* woodland over *Triodia melvillei* and *T. pungens* on stony plain.

B: Mulga and acacia low open woodland over open tussock grassland on gently sloping (drainage) plain with variable rock cover.

C: Mulga and acacia low open woodland over open spinifex and tussock grassland on flat plain with medium rock cove.

D: Mulga, *Hakea lorea*, and *Eucalyptus xerothermica* low open woodland over closed tussock grassland on gently sloping clay-loam plain (no rocks).

E: Low mulga woodland over sparse understorey on stony plain.

F: *Triodia wiseana* hummock grassland with emergent shrubs and low trees on gently sloping stony plain.

Likewise, six vegetation communities were mapped and described across the broader survey area of Rapallo (2012) as a result of a Level 2 survey:

1: *Eucalyptus gamophylla* woodland over hummock grassland.

2: *Eucalyptus leucophloia* subsp. *leucophloia* woodland over mixed shrubs over *Triodia wiseana* grassland.

3: Acacia shrubland over hummock grassland.

4: *Acacia tumida* var. *pilbarensis* scrub in creeklines.

5: Wannamunna Mulga grove.

6: *Acacia aptaneura* over hummock grassland.

Table 5.4 Summary of Results of Flora and Vegetation Surveys Previously Conducted Within and in the Vicinity of the Study Area

Project and Source	Size and Location of Survey Area	Survey Timing	Survey Scope and Parameters	No. Taxa Recorded	Vegetation	Significant Flora Taxa^
Flora and Vegetation Survey: Area C and Surrounds (Onshore 2011)	Approx. 29,411 ha. Located 1.4 km south of Study Area	• November to December 2009 • February 2010 • June 2010	Level 2 flora and vegetation assessment (now a Detailed Survey) and targeted survey. 204 quadrats assessed, incorporated data from 306 additional quadrats established from 1997 to 2010	479 taxa 166 genera 53 families over wider study area: Northern Study Area 206 species 45 families 97 genera Southern Study Area: 219 species 36 families 99 genera	37 vegetation associations described. One PEC recorded: • Weeli Wolli Spring Community (P1). Vegetation condition ranged from 'Excellent' to 'Completely Degraded' (majority mapped as 'Excellent' to 'Very Good')*	• *Acacia subtiliformis* (P3) • *Aristida jerichoensis* var. *subspinulifera* (P3) • *Aristida lazaridis* (P2) • *Eremophila magnifica* subsp. *magnifica* (P4) • *Euphorbia inappendiculata var. queenslandica* (P2) • *Fimbristylis sieberiana* (P3) • *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) (P3) • *Nicotiana umbratica* (P3) (see note under **Section 5.1.4**) • *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) • *Rostellularia adscendens* var. *latifolia* (P3) • *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P3) • *Vittadinia* sp. Coondewanna Flats (S. van Leeuwen 4684) (P1) • *Stylidium weeliwolli* (P3)

Project and Source	Size and Location of Survey Area	Survey Timing	Survey Scope and Parameters	No. Taxa Recorded	Vegetation	Significant Flora Taxa^
Botanical Survey for an Exploration Drilling Program at Juna Downs South E47/1943 and Supporting Document to a Native Vegetation Clearing Permit Application (Rio Tinto 2011)	Approx. 181.4 ha. Located 20 km west of Study Area	• May and July 2009 • October 2010	Flora and vegetation survey. Assessed via foot traverses using a grid search technique (methodology to record vegetation types and significant flora taxa is not clear)	225 taxa 97 genera 35 families	18 vegetation types described. No TECs or PECs identified. Vegetation condition ranged from 'Very Good' to 'Poor'	• *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P3) • *Triodia* sp. Mt Ella (M.E. Trudgen 12739) (P3)
Level 1 Flora and Fauna Surveys along the Great Northern Highway for Jimblebar Mine Module Transport (Eco Logical 2012)	Multiple survey areas; most relevant (Site 3) approx. 17 km south of Study Area	• August 2011	Level 1 flora and vegetation assessment (now a Reconnaissance and Targeted Survey). Eight quadrats/relevés assessed	52 taxa 26 genera 14 families	Four vegetation communities described at Site 3. No TECs or PECs identified. Vegetation condition at Site 3 ranged from 'Excellent' to 'Good' (majority mapped as 'Excellent')*	No significant flora taxa recorded

Project and Source	Size and Location of Survey Area	Survey Timing	Survey Scope and Parameters	No. Taxa Recorded	Vegetation	Significant Flora Taxa^
Level 2 Flora and Vegetation Survey: South Flank (Onshore 2012)	Approx. 18,627 ha. Located 7 km south of Study Area	• March to May 2010 • September 2010 • June 2011	Level 2 flora and vegetation assessment (now a Detailed Survey). 220 quadrats assessed	386 taxa 160 genera 50 families (known to date from study area)	34 vegetation associations described. Two PECs recorded: • Coolibah-lignum flats: *Eucalyptus victrix* over lignum community in the Pilbara - sub type 1: Coolibah and mulga (*Acacia aneura*) woodland over lignum and tussock grasses on clay plains (Coondewanna Flats and Wanna Munna Flats) (P3) • Coolibah-lignum flats: *Eucalyptus victrix* over lignum community in the Pilbara - sub type 2: Coolibah woodlands over lignum (*Duma florulenta*) over swamp wanderrie (Lake Robinson) (P1). Vegetation condition ranged from 'Excellent' to 'Degraded' (majority mapped as 'Excellent')*	• *Acacia bromilowiana* (P4) • *Aristida jerichoensis* var. *subspinulifera* (P3) • *Aristida lazaridis* (P2) • *Eremophila magnifica* subsp. *magnifica* (P4) • *Dampiera metallorum* (P3) • *Lepidium catapycnon* (P4) • *Pilbara trudgenii* (P3) • *Ptilotus mollis* (P4) • *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) • *Rostellularia adscendens* var. *latifolia* (P3) • *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P3) • *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3) • *Triodia* sp. Mt Ella (M.E. Trudgen 12739) (P3)

Project and Source	Size and Location of Survey Area	Survey Timing	Survey Scope and Parameters	No. Taxa Recorded	Vegetation	Significant Flora Taxa^
Level 2 Flora and Vegetation Survey of Lamb Creek Project Area (Rapallo 2012)	Approx. 2,068 ha. Overlaps majority of Development Envelope / part of Study Area	• March to April 2012	Level 2 flora and vegetation assessment (now a Detailed Survey). 46 quadrats assessed	230 taxa 110 genera 42 families	Six vegetation types described. No TECs or PECs identified. Vegetation condition ranged from 'Pristine' to 'Good'*	• *Aristida calycina* var. *calycina* (P2) (see note under **Section 5.1.4**) • *Aristida lazaridis* (P2)
Greater West Angelas Vegetation and Flora Assessment (ecologia 2013)	Approx. 17,596 ha. Located 26 km south of Study Area	• August 2011 • July 2012	Level 2 flora and vegetation assessment (now a Detailed Survey). 150 quadrats assessed	441 taxa 163 genera 48 families	22 vegetation communities described. One PEC recorded: • West Angelas Cracking-Clays (P1). Vegetation condition ranged from 'Excellent' to 'Poor' (majority mapped as 'Excellent')	• *Aristida jerichoensis* var. *subspinulifera* (P3) • *Aristida lazaridis* (P2) • *Eremophila pusilliflora* (P2) • *Lepidium catapycnon* (P4) • *Indigofera gilesii* (P3) • *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) • *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P3) • *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3) • *Triodia* sp. Mt Ella (M.E. Trudgen 12739) (P3)

Project and Source	Size and Location of Survey Area	Survey Timing	Survey Scope and Parameters	No. Taxa Recorded	Vegetation	Significant Flora Taxa^
Baby Hope Downs Flora and Vegetation Survey (Biota 2014)	Approx. 1,652 ha. Located 25 km southeast of Study Area	• October to November 2014	Level 2 flora and vegetation assessment (now a Detailed Survey). 17 quadrats and 8 relevés assessed, incorporated data from additional 13 quadrats and 5 relevés established in 2012	354 taxa 150 genera 53 families	12 vegetation units described. No TECs or PECs identified. Vegetation condition ranged from 'Excellent' to 'Completely Degraded' (majority mapped as 'Excellent')	• *Eremophila magnifica* subsp. *magnifica* (P4) • *Eremophila magnifica* subsp. *velutina* (P3) • *Eremophila* sp. Hamersley Range (K. Walker KW 136) (P3) • *Goodenia lyrata* (P3) • *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
Karijini National Park Tenements Flora and Vegetation Risk Assessment (Onshore 2015a)	Approx. 13,465 ha. Located 25 km southwest of Study Area	• November 2014	Reconnaissance and Targeted Survey. 50 relevés assessed	Not indicated	12 vegetation associations were described. No TECs or PECs identified; however there is an occurrence of the 'Brockman Iron cracking clay communities of the Hamersley Range' PEC (P1) in the southeast extent of the survey area. Three vegetation associations were determined to be of particular interest	• *Grevillea saxicola* (P3) • *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2) • *Lepidium catapycnon* (P4) • *Olearia mucronata* (P3) • *Pilbara trudgenii* (P3) • *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) • *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P3) • *Triodia* sp. Mt Ella (M.E. Trudgen 12739) (P3)

Project and Source	Size and Location of Survey Area	Survey Timing	Survey Scope and Parameters	No. Taxa Recorded	Vegetation	Significant Flora Taxa^
Riparian Flora and Vegetation Survey Marillana Creek (Onshore 2015b)	Approx. 1,028 ha. Located 8 km north of Study Area	• June 2015	Level 2 flora and vegetation assessment (now a Detailed Survey) along a 32 km section of Marillana Creek. 40 quadrats and 237 relevés assessed	399 taxa 186 genera 58 families	22 vegetation associations described. No TECs or PECs identified. Vegetation condition ranged from 'Excellent' to 'Degraded' (majority mapped as 'Very Good')*	• *Amaranthus centralis* (P3) • *Aristida lazaridis* (P2) • *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) (P3) • *Ipomoea racemigera* (P2) • *Rostellularia adscendens* var. *latifolia* (P3)
Targeted Rare and Priority Flora Survey to Meet Conditions of CPS 4442 (Strategic Rail NVCP) (Rio Tinto 2015)	Multiple survey areas, totalling approx. 88 ha. Closest survey area on SW boundary of Study Area	• June 2015	Targeted Survey along railway	NA	NA	• *Aristida jerichoensis* var. *subspinulifera* (P3) • *Aristida lazaridis* (P2) • *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) (P3) • *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) • *Rostellularia adscendens* var. *latifolia* (P3) • *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3)

Project and Source	Size and Location of Survey Area	Survey Timing	Survey Scope and Parameters	No. Taxa Recorded	Vegetation	Significant Flora Taxa^
Flora, Vegetation and Fauna Habitat Assessment at Juna Downs: Native Vegetation Clearing Permit – Supporting Report (Rio Tinto 2016a)	Approx. 546 ha. Located 25 km west of Study Area	• October to November 2014 • April 2015	Reconnaissance Survey. 23 relevés assessed, incorporated data from six additional relevés established in 2013	186 taxa 81 genera 38 families	Six vegetation associations described. No TECs or PECs identified. Vegetation condition mapped as 'Excellent'	• *Acacia bromilowiana* (P4) • *Eremophila magnifica* subsp. *magnifica* (P4) • *Eremophila* sp. Hamersley Range (K. Walker KW 136) (P3) (now known as *E. naaykensii*) (P3) • *Rostellularia adscendens* var. *latifolia* (P3) • *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P3) • *Solanum kentrocaule* (P3) • *Tetratheca fordiana* (P2) • *Triodia* sp. Mt Ella (M.E. Trudgen 12739) (P3)
Flora, Vegetation and Fauna Habitat Assessment at Koodaideri: Native Vegetation Clearing Permit – Supporting Report (Rio Tinto 2016b)	Approx. 1,313 ha. Located 33 km northeast of Study Area	• May 2016	Reconnaissance and Targeted Survey. 63 relevés assessed	135 taxa 68 genera 31 families	12 vegetation units described. No TECs or PECs identified. Vegetation condition ranged from 'Excellent' to 'Poor' (majority mapped as 'Excellent')	• *Acacia bromilowiana* (P4) • *Synostemon hamersleyensis* (P1)
Ministers North to Yandi Corridor Single Phase Level 2 Fauna and Detailed Flora/Vegetation Survey (Biologic 2017)	Approx. 2,025 ha. Located 14 km east of Study Area	• October 2017	Detailed Survey. 32 quadrats assessed	260 taxa 127 genera 44 families	12 vegetation associations described. No TECs or PECs identified. Vegetation condition ranged from 'Excellent' to 'Very Good' (majority mapped as 'Excellent')	• *Rostellularia adscendens* var. *latifolia* (P3) • *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P3)

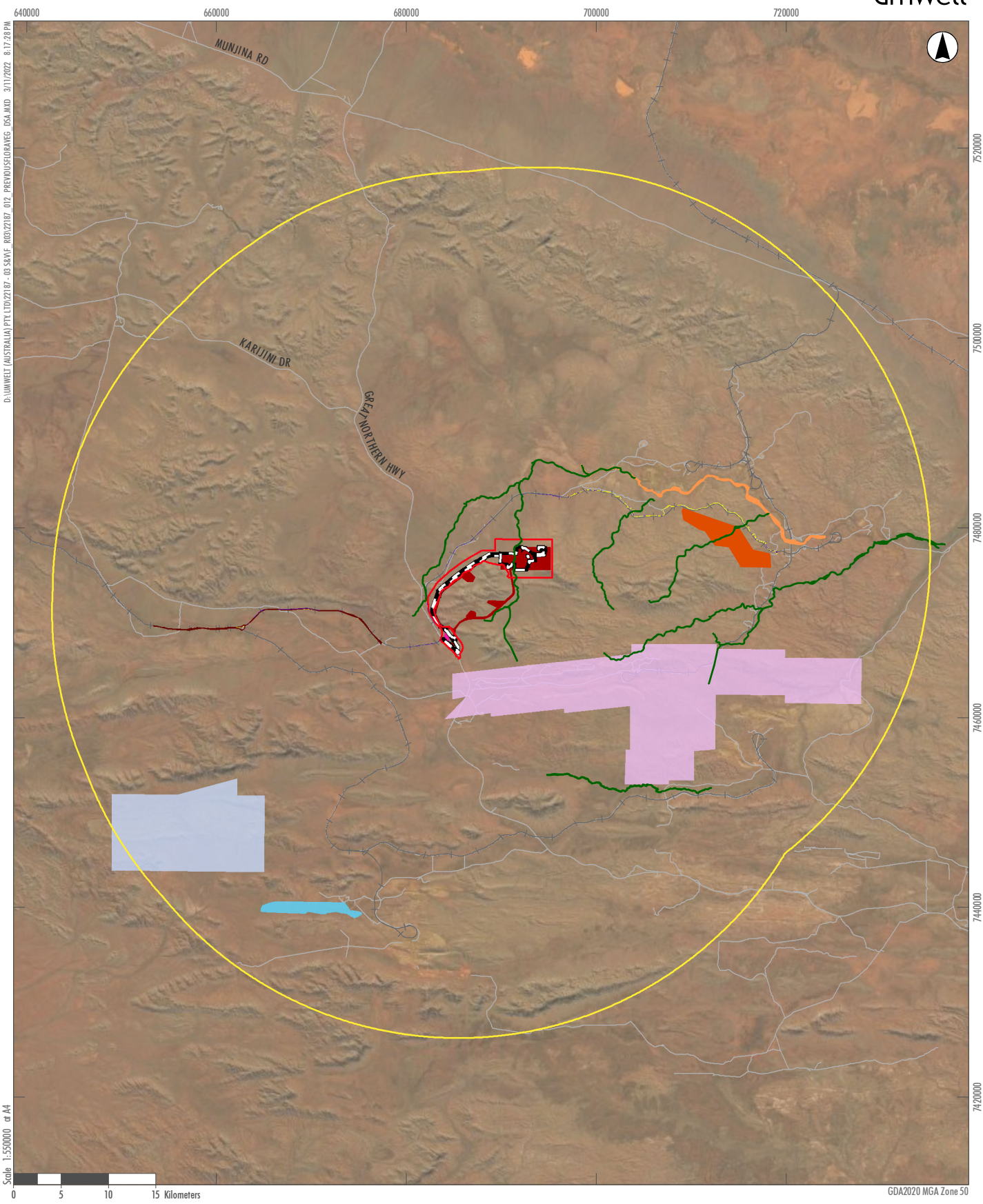
Project and Source	Size and Location of Survey Area	Survey Timing	Survey Scope and Parameters	No. Taxa Recorded	Vegetation	Significant Flora Taxa^
Area C West to Yandi Flora and Vegetation Assessment (Astron 2019)	Approx. 3,729 ha. Part of survey area overlaps Study Area	• November 2018	Reconnaissance Survey of four riparian systems (five creeklines: Marillana, Pebble Mouse, Yandicoogina, Lamb and Area C Mine Creeks). 24 relevés assessed	102 taxa 54 genera 21 families	38 vegetation associations described. No TECs or PECs identified. Vegetation condition ranged from 'Excellent' to 'Poor'. Eight vegetation associations potentially represent GDEs	• *Eremophila* sp. Hamersley Range (K. Walker KW 136) (P3) (now known as *E. naaykensii*) (P3)
West Angelas Gas Pipeline Native Vegetation Clearing Permit (B-2018-007) (Biota 2019)	Approx. 1,150 ha. Located 28 km south-southwest of Study Area	• October 2016	Reconnaissance and Targeted Survey. 56 relevés assessed	343 taxa 130 genera 41 families	18 vegetation units described. One PEC recorded: • West Angelas Cracking-Clays (P1). Vegetation condition ranged from 'Excellent' to 'Completely Degraded' (majority mapped as 'Excellent' to 'Very Good')	• *Aristida lazaridis* (P2) • *Eremophila pusilliflora* (P2) • *Isotropis parviflora* (P2) • *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) • *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3)
Stock Proof Fence Phase III Juna Rail Surveys to meet CPS 4442 Conditions, RTIO-HSE-0335913 (Rio Tinto 2019)	Approx. 412 ha. Located 6 km west of Study Area	• July 2019	Targeted Survey along Stock Proof Fence	NA	NA	• *Aristida jerichoensis* var. *subspinulifera* (P3) • *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) • *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3)

Project and Source	Size and Location of Survey Area	Survey Timing	Survey Scope and Parameters	No. Taxa Recorded	Vegetation	Significant Flora Taxa^
Detailed Flora and Vegetation Survey of the Great Northern Highway Intersection – Lamb Creek Project (Rapallo 2021a)	Approx. 254 ha. Overlaps southern extent of Study Area	• May 2021	Detailed Survey. 19 quadrats and 1 relevé assessed Vegetation Types defined using floristic analysis	187 taxa 35 families	Six vegetation types described. No TECs or PECs identified. All vegetation types assessed as having 'Moderate' significance, primarily due to the presence of *Aristida lazaridis* (P2). Vegetation condition ranged from 'Very Good' to 'Degraded' (majority mapped as 'Good')	• *Aristida lazaridis* (P2) • *Euphorbia* aff. *ferdinandi* (potentially undescribed) • *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
Targeted Conservation Significant Flora Survey of the Lamb Creek Project Area (Rapallo 2021b)	Approx. 872 ha. Overlaps majority of Development Envelope / part of Study Area	• April 2020 • May 2021	Targeted Survey	NA	NA	• *Aristida jerichoensis var. subspinulifera* (P3) • *Aristida lazaridis* (P2) • *Eremophila* sp. Hamersley Range (K. Walker KW 136) (P3) (now known as *E. naaykensii*) (P3) • *Euphorbia* aff. *ferdinandi* (potentially undescribed) • *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) • *Rostellularia adscendens* var. *latifolia* (P3)

Project and Source	Size and Location of Survey Area	Survey Timing	Survey Scope and Parameters	No. Taxa Recorded	Vegetation	Significant Flora Taxa^
ICSS Phase 2 Rail Project: Desktop Assessment and Targeted Significant Flora Survey (Stantec 2021)	Multiple survey areas, totalling approx. 311 ha. Closest survey area 6 km west of Study Area	• June 2021	Targeted Survey along railway	NA	Vegetation not described. No TECs or PECs identified.	• *Acacia subtiliformis* (P3) • *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) (P3) • *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) • *Rostellularia adscendens* var. *latifolia* (P3) • *Seringia exastia* (T)

^ Currently listed significant flora taxa only.

* Vegetation condition described using the scale for the South West and Interzone Botanical Provinces (**Appendix A**).



Legend

- Desktop Study Area
- Study Area
- Proposed Development Envelope

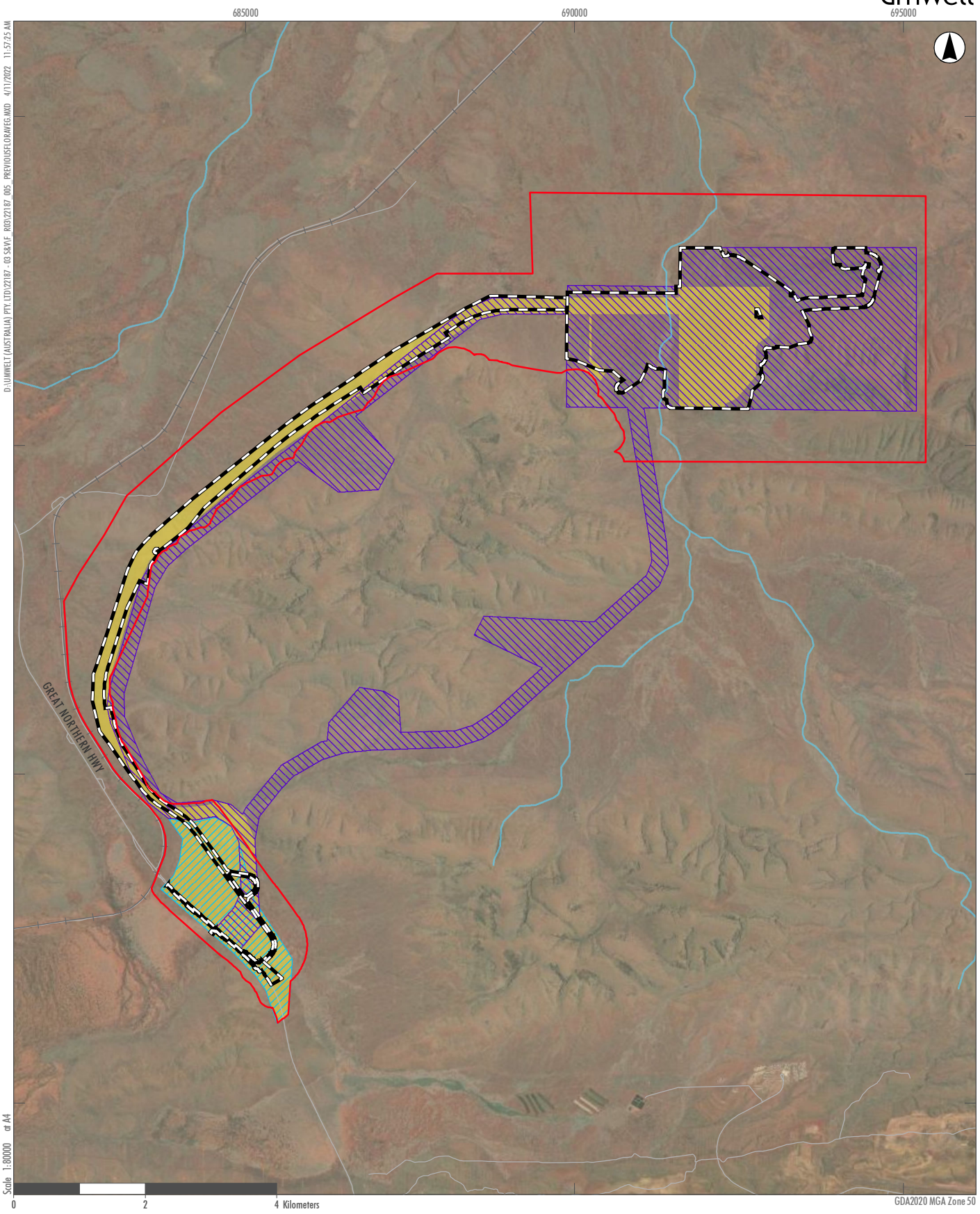
Previous Surveys

- Rapallo (2012) - Lamb Creek
- Rapallo (2021a) - Lamb Creek Detailed Survey
- Rapallo (2021b) - Lamb Creek Targeted Survey
- Astron (2019) - Area C to Yandi
- Biologic (2017) - Ministers North to Yandi
- Biota (2019) - West Angelas
- Onshore (2011) - Area C and Surrounds
- Onshore (2015a) - Karijini National Park
- Onshore (2015b) - Marillana Creek
- Rio Tinto (2015) - Strategic Rail
- Rio Tinto (2019) - Juna Rail
- Stantec (2021) - ICSS Phase 2 Rail Project

FIGURE 5.3

Flora and Vegetation Surveys Previously Conducted Within the Desktop Study Area

Image Source: ESRI Basemap (2022) Data source: Astron (2019), Biologic (2017), Onshore (2011, 2015a, 2015b), Rapallo (2012, 2021a, 2021b), Rio Tinto (2015, 2016b, 2019), Stantec (2021)



Legend

- Study Area
- Proposed Development Envelope
- Roads
- Rail
- Drainage Line

Previous Surveys

- Rapallo 2012 (L2)
- Rapallo 2021a (Detailed)
- Rapallo 2021b (Targeted)

FIGURE 5.4

Flora and Vegetation Surveys Previously Conducted for the Lamb Creek Project

Image Source: ESRI Basemap (2021) Data source: Rapallo (2012, 2021a, 2021b)

5.1.4 Summary of Significant Flora

Table 5.5 presents a summary of significant flora taxa known from or potentially occurring within the Desktop Study Area. This list has been compiled from the results of desktop searches of DBCA's Threatened Flora Databases (TPFL and WA Herbarium) (DBCA, 2022b), DAWE's SPRAT Database (DAWE 2021b), and the results of previous surveys as summarised in **Section 5.1.3**. **Table 5.5** also presents known information on the flowering period and habitat for each taxon (WA Herbarium, 1998-). **Figure 5.5** presents the known historical locations of significant flora taxa from within the Desktop Study Area (subject to the availability of spatial data).

A total of 61 significant flora taxa are known from the Desktop Study Area. This comprises two Threatened flora taxa listed under the EPBC Act and BC Act (*Thryptomene wittweri* and *Seringia exastia*, the latter of which will be delisted in the near future, as discussed in **Section 5.1.3**), 58 DBCA-classified Priority flora taxa, and one potentially undescribed taxon (discussed further below) (**Table 5.5**). Two taxa have records within the Study Area, being *Aristida lazaridis* (P2) and *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) (shaded in blue in **Table 5.5**) (**Figure 5.5**).

Rapallo (2021a, 2021b) recorded four locations of an entity *Euphorbia* aff. *ferdinandi* that was noted as being potentially undescribed. Rapallo (2021b) stated that material of this entity was reviewed by Steve Dillon from the WA Herbarium, who remarked that the specimen differs from typical *Euphorbia ferdinandi* in its broader seeds and a stigma 'opposite from what has been described for this species'. This latter statement is somewhat difficult to interpret, and no further detail was provided on whether further advice was sought or action taken to resolve this taxonomic uncertainty, including whether a representative specimen was submitted to the WA Herbarium for lodgement. At the time of writing of this report, no specimens of *Euphorbia ferdinandi* or *Euphorbia* aff. *ferdinandi* collected in 2021 from the Lamb Creek area have been submitted to the WA Herbarium (WA Herbarium, 1998-). However, as a precaution, this taxon has been included in **Table 5.5**.

Note that *Aristida calycina* var. *calycina* (P2) was recorded by the Rapallo 2012 Survey (**Table 5.5**); however, this taxon does not occur in WA according to the WA Herbarium (1998-), and accordingly, the specimen lodged to the WA Herbarium by Rapallo (2012) has since been redetermined as *Aristida lazaridis* (S. Dillon, *pers. comm.* May 2013). *Nicotiana umbratica* (P3) was recorded by Onshore (2011) approximately 21 km south of the Study Area; however, according to DBCA databases this taxon does not occur in the area (WA Herbarium, 1998-), and no records of the taxon were returned from the DBCA TPFL and WA Herbarium database searches (DBCA, 2022b). Therefore, *Aristida calycina* var. *calycina* (P2) and *Nicotiana umbratica* (P3) are not considered to occur in the Desktop Study Area and are not considered further in this assessment.

Table 5.5 Significant Flora Taxa Known from or Potentially Occurring Within the Desktop Study Area

Taxon	Status (WA)	Status (EPBC Act)	Flowering Period (WA Herbarium, 1998-)	Habitat (WA Herbarium, 1998-)	Source*
Acacia bromilowiana	P4		July to August	Rocky hills, breakaways, scree slopes, gorges, creek beds. Rocky red-brown loam with ironstone or laterite	DBCA, Onshore, Rio Tinto
Acacia daweana	P3		July to September	Low rocky rises, along drainage lines. Red stony clay loam	DBCA
Acacia effusa	P3		May to August	Scree slopes of low ranges. Red-brown silty clay or clay loam with ironstone and quartz stones and pebbles	DBCA
Acacia subtiliformis	P3		May to June	Rocky ridges, hills and slopes, often with calcrete. Light brown or brown loam or silty clay	DBCA, Onshore, Stantec
Amaranthus centralis	P3		May to July	Plains, flats and granite outcrops. Gritty red clay loam	DBCA, Onshore
Aristida jerichoensis var. *subspinulifera*	P3		likely after significant rainfall	Plains and flats. Red-brown loamy clay or cracking clay	DBCA, ecologia, Onshore, Rapallo, Rio Tinto
Aristida lazaridis	P2		likely after significant rainfall	Floodplains, drainage areas and plains. Red or red-brown clay loam, sometimes with ironstone	Biota, DBCA, ecologia, Onshore, Rapallo, Rio Tinto
Arthropodium vanleeuwenii	P2		September	Steep hill slopes and gorges. Red-brown or orange-brown loam, often with banded ironstone	DBCA
Cladium procerum	P2		likely year-round	Major creeks and gorges. Red gravelly sand	DBCA
Dampiera metallorum	P3		June to October	High in the landscape on steep slopes, summits of hills. Red-brown stony clay loam over banded ironstone	DBCA, Onshore
Dolichocarpa sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3		May to September	Floodplains and crabhole plains. Red-brown or brown cracking clay	DBCA

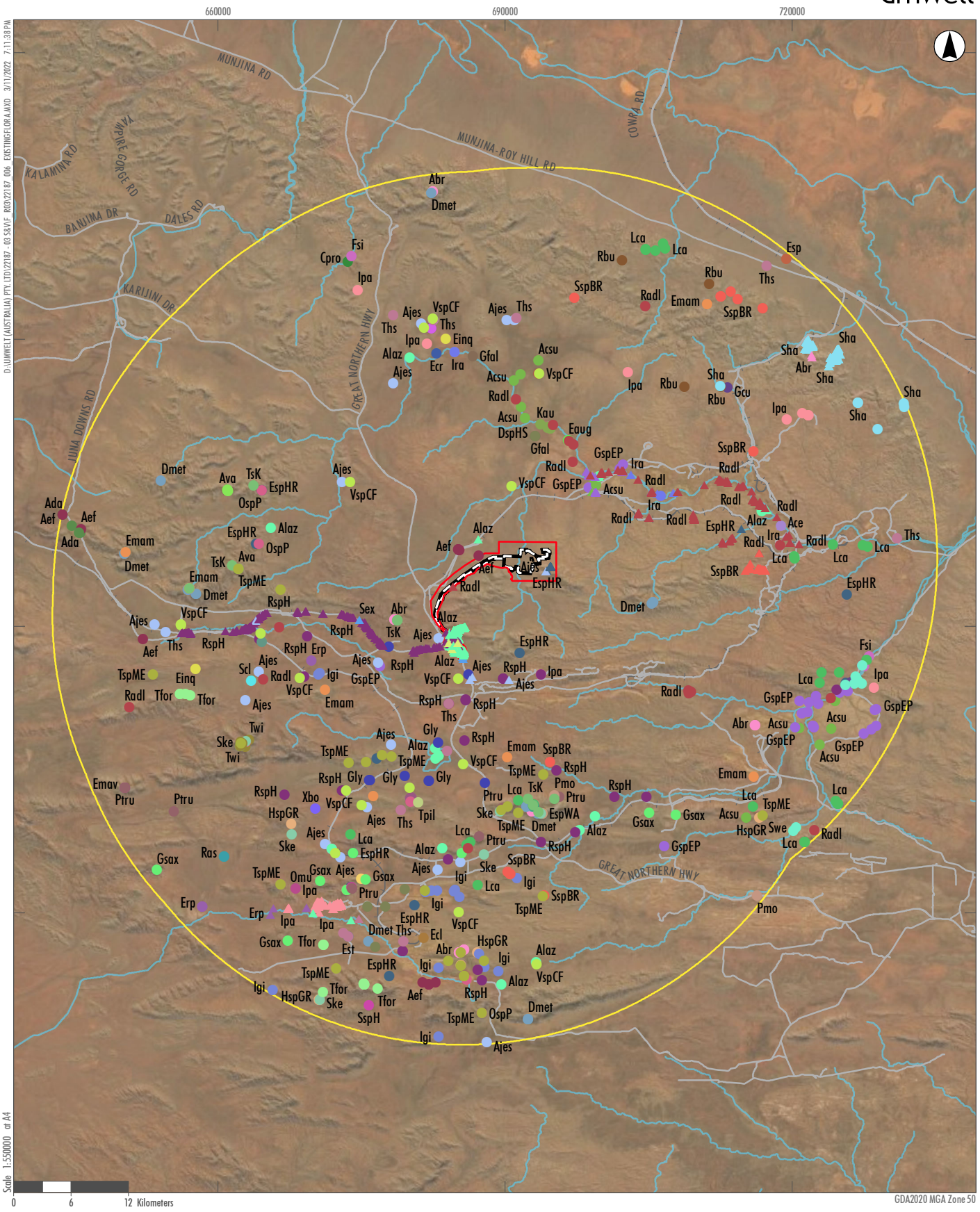
Taxon	Status (WA)	Status (EPBC Act)	Flowering Period (WA Herbarium, 1998-)	Habitat (WA Herbarium, 1998-)	Source*
Eragrostis crateriformis	P3		likely after significant rainfall	Creek banks, depressions. Gritty or gravelly brown sandy loam, red-brown clay loam	DBCA
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	P1		likely after significant rainfall	Steep slopes, summits. Brown or red-brown silty loam, often with banded ironstone	DBCA
Eremophila magnifica subsp. *magnifica*	P4		August to November	Hillslopes and gullies. Rocky red-brown or brown sandy loam, often with ironstone	Biota, DBCA, Onshore, Rio Tinto
Eremophila magnifica subsp. *velutina*	P3		August to September	Hillslopes and ridges. Red stony loam, often with ironstone or banded ironstone	Biota, DBCA
Eremophila pusilliflora	P2		March to July	Flats and plains. Red-brown sandy loam, often with ironstone	Biota, DBCA, ecologia
Eremophila spongiocarpa	P3		May to September	Weakly saline alluvial plains and dune slopes on margins of marshes and saline flats. Red-brown clay loam	DBCA
Eremophila naaykensii (previously *Eremophila* sp. Hamersley Range (K. Walker KW 136))	P3		June to August	Rocky hill slopes, crests and gorges. Rocky red-brown clay loam, sometimes over banded ironstone	Astron, Biota, DBCA, Rapallo, Rio Tinto
Eremophila sp. West Angelas (S. van Leeuwen 4068)	P1		August to September	Hill slopes and crests. Brown or red silty loam over banded ironstone	DBCA
Euphorbia australis var. *glabra*	P3		likely after significant rainfall	Drainage lines and flats. Red-brown clay loam, sometimes with calcrete or silcrete	DBCA
Euphorbia clementii	P3		likely after significant rainfall	Fire responder. Recently burnt hills, slopes and undulating plains. Red-brown clay loam	DBCA
Euphorbia aff. *ferdinandi*	Potentially Undescribed		likely after significant rainfall	-	Rapallo
Euphorbia inappendiculata var. *queenslandica*	P2		likely after significant rainfall	Flats and plains. Brown cracking clay, gilgai	DBCA, Onshore
Euphorbia stevenii	P3		likely after significant rainfall	Gentle slopes and plains. Brown or red-brown clay and cracking clay	DBCA

Taxon	Status (WA)	Status (EPBC Act)	Flowering Period (WA Herbarium, 1998-)	Habitat (WA Herbarium, 1998-)	Source*
Fimbristylis sieberiana	P3		May to June	Pool edges, sandstone cliffs and major creek lines. Brown or red-brown gritty sand	DBCA, Onshore
Glycine falcata	P3		May to September	Along drainage depressions in crabhole plains and clay plains. Brown or red cracking clay	DBCA
Goodenia lyrata	P3		likely after significant rainfall	Claypans and plains. Red or brown sandy loam or clay loam	Biota, DBCA
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	P3		likely after significant rainfall	Low undulating plains, swampy plains. Red-brown clay soil, calcrete pebbles	DBCA, Onshore, Rio Tinto, Stantec
Grevillea saxicola	P3		February to June	Rocky hills, slopes and gullies. Red-brown sandy loam	DBCA, Onshore
Gymnanthera cunninghamii	P3		February to May, October to December	Drainage lines. Brown or red-brown sand or sandy loam	DBCA
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	P2		April to August, October	Rocky gullies, drainage lines and gorges. Loamy skeletal soil	Biota, DBCA, Onshore
Indigofera gilesii	P3		May, August	Rocky slopes, hills, creeklines and outcrops. Red or orange loam, often with ironstone	DBCA, ecologia
Iotasperma sessilifolium	P3		August to September	Edges of waterholes, plains, Cracking clay, black loam	DBCA
Ipomoea racemigera	P2		April to June	Drainage lines and flats. Brown silty loam	DBCA, Onshore
Isotropis parviflora	P2		June to August	Rocky hills, slopes and undulating plains. Red or brown sandy loam, often with ironstone	Biota, DBCA
Kohautia australiensis	P2		likely after significant rainfall	Plains and hills. Brown or orange clay with calcrete	DBCA
Lepidium catapycnon	P4		September	Rocky hills and slopes. Red or brown loam or sandy loam, often with ironstone	DBCA, ecologia, Onshore
Olearia mucronata	P3		July to August	Rocky hills, gullies and creeklines. Red-brown or orange-brown silty clay or sandy clay loam with ironstone	DBCA, Onshore

Taxon	Status (WA)	Status (EPBC Act)	Flowering Period (WA Herbarium, 1998-)	Habitat (WA Herbarium, 1998-)	Source*
Oxalis sp. Pilbara (M.E. Trudgen 12725)	P2		May to July	Gorges, gullies, drainage lines and slopes. Red loam or sandy loam, often with ironstone	DBCA
Pilbara trudgenii	P3		September to October	Hill summits, steep slopes, screes, cliff faces. Skeletal red stony soil over ironstone	DBCA, Onshore
Ptilotus mollis	P4		July to September	Rocky hills and screes with red or brown clay loam, often with ironstone	DBCA, Onshore
***Rhagodia* sp. Hamersley (M. Trudgen 17794)**	P3		March to May, September	Plains and alluvial plains. Red or brown clay loam, often with ironstone gravel	Biota, DBCA, ecologia, Onshore, Rapallo, Rio Tinto, Stantec
Rhodanthe ascendens	P1		September	Flats. Cracking clay and sand over clay	DBCA
Rhynchosia bungarensis	P4		May to November	Rocky hill slopes, drainage lines, gorges. Orange brown loam, often with ironstone	DBCA
Rostellularia adscendens var. *latifolia*	P3		April to May	Rocky hills, gullies, floodplains and drainage lines. Red/brown sandy loam	Biologic, DBCA, Onshore, Rapallo, Rio Tinto, Stantec
Seringia exastia	T	Critically Endangered	July to September	Sandplains, pindan plain, rangelands. Orange or red sand	Rapallo, Stantec
Sida sp. Barlee Range (S. van Leeuwen 1642)	P3		likely after significant rainfall	Rocky hills, gullies and gorges. Red or brown sandy loam, often with ironstone	Biologic, DBCA, ecologia, Onshore, Rio Tinto
Sida sp. Hamersley Range (K. Newbey 10692)	P3		likely after significant rainfall	Ironstone gullies, slopes and breakaways. Skeletal red loam	DBCA
Solanum kentrocaule	P3		May to September	Steep rocky gullies, slopes, gorges. Skeletal red loam	DBCA, Rio Tinto
Stackhousia clementii	P3		April to September	Floodplains and flats. Clay loam, sometimes saline or with calcrete	DBCA
Stylidium weeliwolli	P3		March to September	Drainage lines, pool edges, seepage areas. Sandy loam or clay	DBCA, Onshore
Swainsona thompsoniana	P3		April to August	Floodplains and flats. Red or brown cracking clay, clay loam	DBCA

Taxon	Status (WA)	Status (EPBC Act)	Flowering Period (WA Herbarium, 1998-)	Habitat (WA Herbarium, 1998-)	Source*
Synostemon hamersleyensis	P1		August to November	Steep hills, slopes, screes. Rocky red or brown sandy loam with ironstone or banded ironstone	DBCA, Rio Tinto
Tetratheca fordiana	P2		April to July	Cliffs, ridges and breakaways. Skeletal soil with ironstone	DBCA, Rio Tinto
Teucrium pilbaranum	P2		April to September	Flats, clay pans and crabhole plains. Red or brown sandy loam, clay or cracking clay, sometimes with calcrete	DBCA
***Themeda* sp. Hamersley Station (M.E. Trudgen 11431)**	P3		May to July	Floodplains, drainage lines and flats. Red or brown clay loam, clay or cracking clay	Biota, DBCA, ecologia, Onshore, Rio Tinto
Thryptomene wittweri	T	Vulnerable	April to August	Breakaways and cliffs. Skeletal red-brown soil with sandstone or ironstone	DAWE, DBCA
***Triodia* sp. Karijini (S. van Leeuwen 4111)**	P1		likely after significant rainfall	Hill crests, moderate to steep hill slopes. Grey, brown or red sandy loam or silty loam, often with ironstone	DBCA
***Triodia* sp. Mt Ella (M.E. Trudgen 12739)**	P3		likely after significant rainfall	Rocky slopes, gullies, ridges gorges and associated drainage lines/floodplains. Red or brown sandy clay loam, often with ironstone	DBCA, ecologia, Onshore, Rio Tinto
***Vittadinia* sp. Coondewanna Flats (S. van Leeuwen 4684)**	P1		March to September	Floodplains and drainage areas. Red or brown clay loam or silty loam	DBCA, Onshore
Xerochrysum boreale	P3		July, September	Stony plains and flats. Red or brown clay or clay loam	DBCA

* Sources are: Astron: Astron (2019), Biologic: Biologic (2017), Biota: Biota (2014, 2019), DAWE: DAWE (2021b), DBCA: DBCA (2022c, 2007-), ecologia: ecologia (2013), Onshore: Onshore (2011, 2012, 2015a, 2015b), Rapallo: Rapallo (2012, 2021a, 2021b), Rio Tinto: Rio Tinto (2011, 2015, 2016a, 2016b, 2019), Stantec: Stantec (2021).



Legend

- Desktop Study Area
- Study Area
- Proposed Development Envelope
- Roads
- Rail
- Drainage Line

FIGURE 5.5

Existing Formally Listed Flora Records in the Desktop Study Area

Image Source: ESRI Basemap (2021) Data source: Landgate (2022), DBCA (2021)

D:\UMWELT (AUSTRALIA) PTY LTD\72187 - 03 S&WF R03\72187_006_EXISTINGFLORALEGEND.MXD 3/11/2022 7:08:23 PM

Legend

Significant Flora (Previous Local Studies)

- Abr, *Acacia bromilowiana* (P4)
- Ace, *Amaranthus centralis* (P3)
- Acsu, *Acacia subtiliformis* (P3)
- Ajes, *Aristida jerichoensis* var. *subspinulifera* (P3)
- Alaz, *Aristida lazaridis* (P2)
- Eafe, *Euphorbia aff. ferdinandi* (Potentially undescribed)
- Erp, *Eremophila pusilliflora* (P2)
- EspHR, *Eremophila* sp. Hamersley Range (K. Walker KW 136) (P3)
- GspEP, *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) (P3)
- Ira, *Ipomoea racemigera* (P2)
- Ipa, *Isotropis parviflora* (P2)
- RspH, *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl, *Rostellularia adscendens* var. *latifolia* (P3)
- Sex, *Seringia exastia* (T)
- SspBR, *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P3)
- Sha, *Synostemon hamersleyensis* (P1)
- Ths, *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3)

Significant Flora (DBCA)

- Abr, *Acacia bromilowiana* (P4)
- Ada, *Acacia daweana* (P3)
- Aef, *Acacia effusa* (P3)
- Acsu, *Acacia subtiliformis* (P3)
- Ace, *Amaranthus centralis* (P3)
- Ajes, *Aristida jerichoensis* var. *subspinulifera* (P3)
- Alaz, *Aristida lazaridis* (P2)
- Ava, *Arthropodium vanleeuwenii* (P2)
- Cpro, *Cladium procerum* (P2)
- Dmet, *Dampiera metallorum* (P3)
- DspHS, *Dolichocarpa* sp. Hamersley Station (A.A. Mitchell PRP 1479) (P3)
- Ecr, *Eragrostis crateriformis* (P3)
- EspMR, *Eragrostis* sp. Mt Robinson (S. van Leeuwen 4109) (P1)
- Emam, *Eremophila magnifica* subsp. *magnifica* (P4)
- Emav, *Eremophila magnifica* subsp. *velutina* (P3)
- Erp, *Eremophila pusilliflora* (P2)
- Esp, *Eremophila spongiocarpa* (P3)
- EspHR, *Eremophila* sp. Hamersley Range (K. Walker KW 136) (P3)
- EspWA, *Eremophila* sp. West Angelas (S. van Leeuwen 4068) (P1)
- Eaug, *Euphorbia australis* var. *glabra* (P3)
- Ecl, *Euphorbia clementii* (P3)
- Einq, *Euphorbia inappendiculata* var. *queenslandica* (P2)
- Est, *Euphorbia stevenii* (P3)
- Fsi, *Fimbristylis sieberiana* (P3)
- Gfal, *Glycine falcata* (P3)
- Gly, *Goodenia lyrata* (P3)
- GspEP, *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) (P3)
- Gsax, *Grevillea saxicola* (P3)
- Gcu, *Gymnanthera cunninghamii* (P3)
- HspGR, *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
- Igi, *Indigofera gilesii* (P3)
- Ise, *Iotasperma sessilifolium* (P3)
- Ira, *Ipomoea racemigera* (P2)
- Ipa, *Isotropis parviflora* (P2)
- Kau, *Kohautia australiensis* (P2)
- Lca, *Lepidium catapycnon* (P4)
- Omu, *Olearia mucronata* (P3)
- OspP, *Oxalis* sp. Pilbara (M.E. Trudgen 12725) (P2)
- Ptru, *Pilbara trudgenii* (P3)
- Pmo, *Ptilotus mollis* (P4)
- RspH, *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Ras, *Rhodanthe ascendens* (P1)
- Rbu, *Rhynchosia bungarensis* (P4)
- Radl, *Rostellularia adscendens* var. *latifolia* (P3)
- SspBR, *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P3)
- SspH, *Sida* sp. Hamersley Range (K. Newbey 10692) (P3)
- Ske, *Solanum kentrocaule* (P3)
- Scl, *Stackhousia clementii* (P3)
- Swe, *Stylidium weeliwolli* (P3)
- Swt, *Swainsona thompsoniana* (P3)
- Sha, *Synostemon hamersleyensis* (P1)
- Tfor, *Tetratheca fordiana* (P2)
- Tpil, *Teucrium pilbaranum* (P2)
- Ths, *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3)
- Twi, *Thryptomene wittweri* (T)
- TsK, *Triodia* sp. Karijini (S. van Leeuwen 4111) (P1)
- TspME, *Triodia* sp. Mt Ella (M.E. Trudgen 12739) (P3)
- VspCF, *Vittadinia* sp. Coondewanna Flats (S. van Leeuwen 4684) (P1)
- Xbo, *Xerochrysum boreale* (P3)

FIGURE 5.5

LEGEND - Existing Formally Listed Flora Records in the Desktop Study Area

5.1.5 Summary of Significant Vegetation

Table 5.6 presents a summary of listed significant vegetation communities known from or potentially occurring within the Desktop Study Area. This list has been compiled from the results of searches of DBCA's Threatened and Priority Ecological Communities Database (DBCA, 2022c) and the results of previous surveys as summarised in **Section 5.1.3**. **Figure 5.6** presents the known historical locations of significant vegetation from within the Desktop Study Area (subject to the availability of spatial data). Note that DBCA records of significant vegetation communities presented on **Figure 5.6** consist of DBCA-applied buffers (ranging from 500 m to 5 km) surrounding known locations, as per the metadata from the DBCA Threatened and Priority Ecological Communities Database interrogation (DBCA, 2022c).

A total of eight significant vegetation communities have records within the Desktop Study Area. All communities are DBCA-classified PECs, with no TECs listed under the EPBC Act or BC Act identified by the desktop assessment (**Table 5.6**).

There are no known records of significant vegetation communities within the Study Area, with the closest record being 'Coolibah-lignum flats: *Eucalyptus victrix* over lignum community in the Pilbara - sub type 2: Coolibah woodlands over lignum (*Duma florulenta*) over swamp wanderrie (Lake Robinson)' PEC (P1); the edge of this PEC's buffer polygon is approximately 3 km south of the Study Area (**Figure 5.6**).

According to the DBCA Threatened and Priority Ecological Communities Database interrogation results (DBCA 2022c), there are no records of the 'Coolibah-lignum flats: *Eucalyptus victrix* over lignum community in the Pilbara - sub type 1: Coolibah and mulga (*Acacia aneura*) woodland over lignum and tussock grasses on clay plains (Coondewanna Flats and Wanna Munna Flats)' PEC (P3) in the Desktop Study Area. However, as discussed in **Section 3.9.2**, a review of current DBCA PEC lists (DBCA 2022a) identified this PEC as having the potential to occur in the Desktop Study Area as the Coondewanna Flats are located within the Desktop Study Area. According to Rapallo (2021a), Onshore undertook a review of vegetation mapping within the Coodewanna Flats and Lake Robinson areas in 2013 and confirmed fine-scale mapping for sub types 1 and 2 of the Coolibah-lignum flats PECs. Onshore concluded that sub type 2 lies at the lowest point of the Coondewanna Flats associated with Lake Robinson, and sub type 1 occurs on alluvial flats (Coondewanna Flats) around Lake Robinson (Onshore (2013), cited in Rapallo (2021a)). Therefore, this PEC has been included in **Table 5.6**; however, the report and associated data from Onshore (2013) could not be acquired, and therefore this PEC is not presented on **Figure 5.6**.

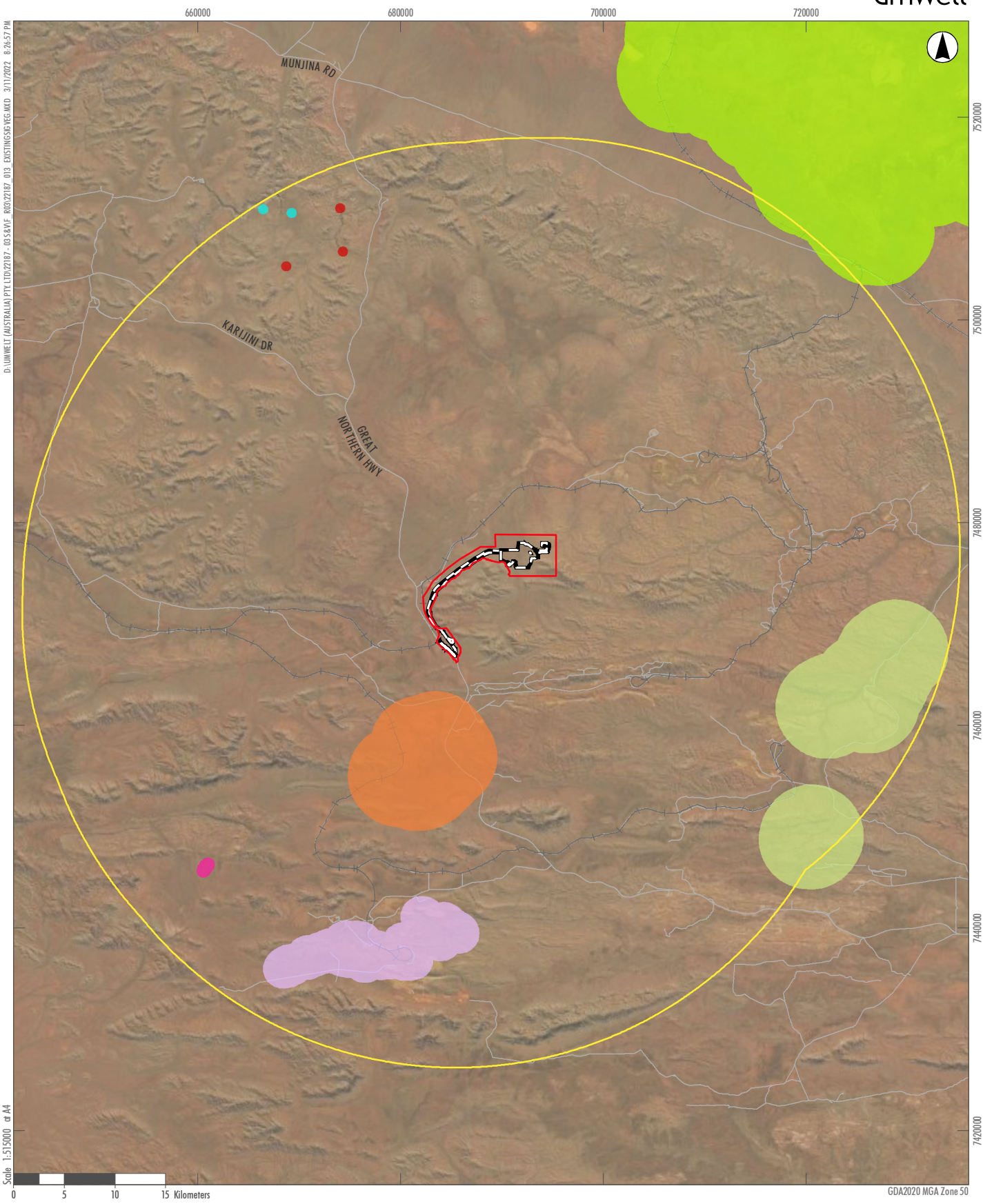
The definitions, categories and criteria for TECs and PECs are presented on the DBCA Threatened species and communities website (DBCA 2013).

Table 5.6 Listed Significant Vegetation Known from or Potentially Occurring Within the Desktop Study Area

Community	Status (WA)	Status (EPBC Act)	Source*
Brockman Iron cracking clay communities of the Hamersley Range	PEC (P1)		DBCA, Onshore
Coolibah-lignum flats: *Eucalyptus victrix* over lignum community in the Pilbara - sub type 1: Coolibah and mulga (*Acacia aneura*) woodland over lignum and tussock grasses on clay plains (Coondewanna Flats and Wanna Munna Flats)	PEC (P3)		DBCA, Onshore

Community	Status (WA)	Status (EPBC Act)	Source*
Coolibah-lignum flats: *Eucalyptus victrix* over lignum community in the Pilbara - sub type 2: Coolibah woodlands over lignum (*Duma florulenta*) over swamp wanderrie (Lake Robinson)	PEC (P1)		DBCA, Onshore
Fortescue Marsh (Marsh Land System)	PEC (P1)		DBCA
Kumina Land System	PEC (P3)		DBCA
Riparian flora and plant communities of springs and river pools with high water permanence of the Pilbara Region	PEC (P2)		DBCA
Weeli Wolli Spring Community	PEC (P1)		DBCA, Onshore
West Angelas Cracking-Clays	PEC (P1)		Biota, DBCA, ecologia

* Sources are: Biota: Biota (2019), DBCA: DBCA (2018, 2022a, 2022d), ecologia: ecologia (2013), Onshore: Onshore (2011, 2012, 2015a).



Legend

- Desktop Study Area
- Study Area
- Proposed Development Envelope

Significant Vegetation (DBCA, 2020a)

- Brockman Iron cracking clay communities of the Hamersley Range
- Coolibah - Lignum Flats: sub type 2: Coolibah woodlands over lignum (*Duma florulenta*) over swamp wanderrie (Lake Robinson)
- Fortescue Marsh (Marsh Land System)
- Kumina Land System
- Riparian flora and plant communities of springs and river pools with high water permanence of the Pilbara Region
- Weeli Wolli Spring Community
- West Angelas Cracking-Clays

FIGURE 5.6

Existing Significant Vegetation Records of the Desktop Study Area

Image Source: Landgate (2021) Data source: DBCA (2020a)

5.2 Field Survey

5.2.1 Vascular Flora Census

A total of 328 discrete vascular flora taxa, three known hybrids (as per WA Herbarium (1998-)) and one putative hybrid were recorded in the Study Area by the 2022 survey. The taxa and hybrids represent 45 families and 137 genera. The most well-represented families were Fabaceae (64 discrete taxa, three known hybrids), Poaceae (56 taxa), Malvaceae (45 taxa) and Amaranthaceae (16 taxa). A total of seven taxa are introduced (see **Section 5.2.6**).

Within quadrats established by the 2022 survey, average taxon richness per quadrat was 42.3 (± 14.8), with the greatest number of taxa recorded in a single quadrat being 89 (C19), and the lowest number being 12 (K39) (excluding hybrid, introduced and opportunistic taxa).

A full list of taxa recorded by the 2022 survey is presented in **Appendix D**, with raw quadrat and relevé data and parameters presented in **Appendix E**.

Note that several collections could not be identified to species level due to poor material. Some are known to be distinct taxa relative to other taxa recorded by the survey, and therefore have been included in the totals presented above and **Appendix D** (e.g. ?*Enchylaena tomentosa*). Other collections may represent distinct taxa relative to other taxa recorded by the survey; however, it is more likely that they represent taxa already recorded elsewhere, with the quality of the material such that this distinction cannot be made (e.g. *Ptilotus* ?*exaltatus*). Such collections are not included in the totals above or presented in **Appendix F**. None of these collections are considered to represent significant flora taxa.

5.2.2 Summary of Significant Flora

Table 5.7 presents a summary of data relating to significant flora taxa recorded in the Study Area by the 2022 survey. A total of eight significant flora taxa were recorded by the 2022 survey; this includes one Threatened taxon, five DBCA-listed Priority flora taxa and two taxa considered significant under the 'new species or species with anomalous features that indicate a potential new species' reason from EPA (2016a, 2016b) (**Section 3.9.1**); these taxa are subsequently referred to as 'potentially undescribed'. Locations of significant flora taxa recorded in the Study Area by the 2022 survey are presented on **Figure 5.7**. A detailed description and summary of information for each taxon recorded by the 2022 survey is provided in **Sections 5.2.3** and **5.2.4**, with specific location details presented in **Figure 5.7** and **Appendix F**.

Three significant taxa were recorded in the Development Envelope: *Aristida jerichoensis* var. *subspinulifera* (single record with single individual); *Aristida lazaridis* (P2) (three records with a total of four individuals); and *Seringia exastia* (T) (14 records with a total of 222 individuals). *Rhagodia* sp. Hamersley (M. Trudgen 17794) was not further recorded in the Development Envelope (recorded previously by Rapallo (2021b)).

Table 5.7 includes a summary of the VTs within which each significant flora taxon was recorded. Preferred habitat for each taxon has been determined based on proportional location representation and landforms/soils and is indicated with '~'. However, it must be qualified that some taxa recorded by the 2022 survey were recorded from few locations; and this in combination with the limited area of the Targeted survey area (and the targeted survey area of Rapallo (2021b)) within the Study Area concludes that there may not be sufficient data to confidently assign preferred habitat in terms of VTs for these taxa.

Note that assessment of VT habitat includes record information from Rapallo (2021b). Further qualification is provided for each taxon in **sections 5.2.3** and **5.2.4**

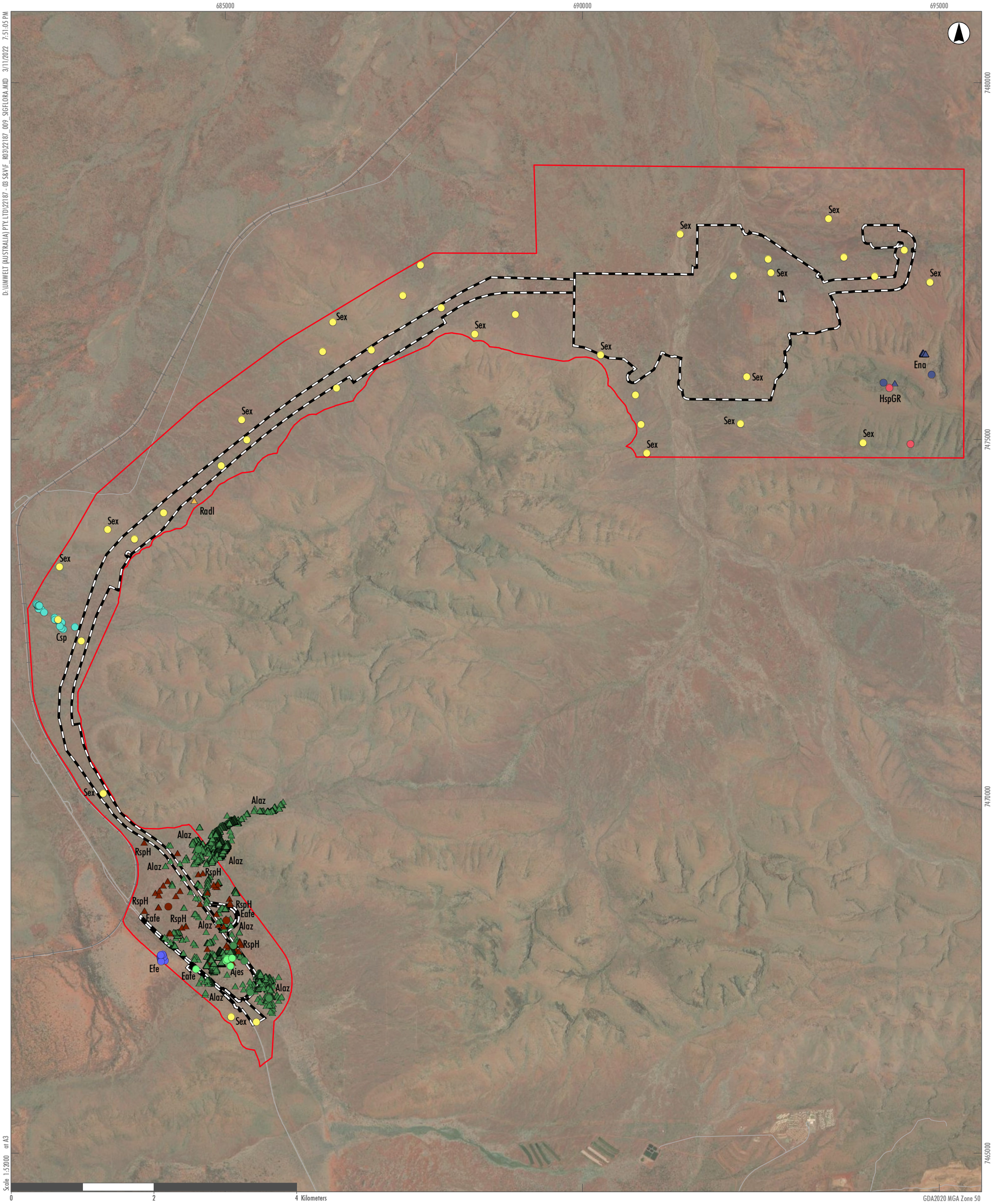
Note that the 2022 survey recorded locations of *Seringia exastia*, a taxon currently listed as Threatened under the EPBC Act. As described in **Section 5.1.3**, the conservation status of this taxon will not be revised until both the Threatened Species Scientific Committee meet to formalise the delisting and the name is formally removed from the published listing (W.A. Government Gazette). Further information is provided in **section 5.2.3.7**.

Table 5.7 Summary of Significant Flora Taxa Recorded by the 2022 Survey Within the Study Area

Taxon	Status (WA)	Study Area		Vegetation Types*
		Number of Locations	Number of Individuals	
Aristida jerichoensis* var. *subspinulifera	P3	8	97	8~
Aristida lazaridis	P2	5	264	7~; 8~; 3, 9
***Corchorus* sp.**	Potentially undescribed	21	33	9~
***Euphorbia ferdinandi* s. lat.**	Potentially undescribed	12	53	8~, 7
Eremophila naaykensii	P3	2	38	4~
***Hibiscus* sp. Gurrinbiddy Range (M.E. Trudgen MET 15708)**	P2	2	17	4~
***Rhagodia* sp. Hamersley (M. Trudgen 17794)**	P3	3	7	7~; 8; 9
Seringia exastia	T	37	783	1~, 2, 3, 6, 9, 10

* Refer to **Section 5.2.8** for VT descriptions.

~ Designates preferred habitat, based on proportional location representation and landforms/soils. Counts not undertaken for taxon.



Legend

- Study Area
- Proposed Development Envelope

Significant Flora (Umwelt, 2022)

- Ajes *Aristida jerichoensis* var. *subspinulifera* (P3)
- Alaz *Aristida lazaridis* (P2)
- Csp *Corchorus* sp. (Potentially Undescribed)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* S. lat (Potentially Undescribed)
- HspGR *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)
- Sex *Seringia exastia* (T)

Significant Flora (Rapallo, 2021b)

- Alaz *Aristida lazaridis* (P2)
- Ena *Eremophila naaykensii* (P3)
- Eafe *Euphorbia aff. ferdinandi* (Potentially Undescribed)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)

FIGURE 5.7

Significant Flora Recorded by the 2021 and 2022 Field Surveys

5.2.3 Listed Significant Flora Taxa

5.2.3.1 *Aristida jerichoensis* var. *subspinulifera* (P3)

Aristida jerichoensis var. *subspinulifera* (P3) is a perennial tussock grass growing to 0.8 m high (**Photo 5-1**), occurring on flats with red-brown clay over ironstone (WA Herbarium 1998-). In WA it has a range of over 1,000 km from near Gill Pinnacle (close to the WA / Northern Territory (NT) border) in the east, to north-west of Tom Price in the west; the Study Area is in the known range of this taxon. This taxon is known from 42 WA Herbarium records across approximately 38 broad regional locations, three of which occur within DBCA-managed tenure within Karijini National Park (WA Herbarium 1998-). The nearest WA Herbarium specimen record of this taxon is in close proximity to the GNHI area (within one kilometre of the Study Area, located on the western side of the GNH – specimen PERTH08694265 (WA Herbarium 1998-), recorded as occurring in Mulga woodland over closed sedges and open tussock grassland on orange light clay.

WA Herbarium records include three locations from outside of WA, including one location in the Northern Territory (NT) (north of Alice Springs) and two locations within Queensland (Qld) (north of Capella and west of St George). There are considerably more locations of this taxon across the NT, South Australia (SA), Qld, New South Wales (NSW) and Victoria (Vic) (over 1,800 records across Australia) according to records presented by the Atlas of Living Australia (ALA) (2022).



Photo 5-1: *Aristida jerichoensis* var. *subspinulifera* (P3) (Photos: Umwelt)

Rapallo (2021b) previously recorded this taxon within the Study Area; however, this record was not lodged at the WA Herbarium and inspection of this location during the survey in 2022 has determined this to be erroneous (considered to be a misidentification, with *Aristida burbidgeae* recorded at the given location during the 2022 survey). This record occurred on a south-facing rocky slope of a gorge/gully a high

elevation, which was noted as being odd by Rapallo (2021b) due to this habitat not being typical of the taxon.

A total of 97 individuals of *Aristida jerichoensis* var. *subspinulifera* (P3) were recorded at eight locations within the Study Area in 2022 within VT 8 (**Figure 5.7**; Sheet 10 and 11 of **Appendix F**); one of these locations was recorded in the DE. This taxon was not otherwise recorded within the Targeted Survey Area during the 2022 survey; no other locations were recorded within the Development Envelope by Rapallo (2021b). All records were returned from areas mapped as VT 8, which is considered to be the preferred habitat of this taxon in the Study Area.

Note that this taxon was recorded at Area C and South Flank by Onshore Environmental (2011; 2012); Greater West Angeles (ecological 2013), and surveys conducted on behalf of Rio Tinto including the stock proof fence and Rail NVCP (2019 and 2015 respectively) (**Table 5.4**).

5.2.3.2 *Aristida lazaridis* (P2)

Aristida lazaridis (P2) is a perennial tussock grass growing to 1.5 m high (**Photo 5-2**), occurring on flats with red-brown clay loam, sometimes in floodplains and minor drainage areas (WA Herbarium 1998-). This taxon occurs over a range of approximately 130 km within WA, from north-east of Newman in the south-east, to south-east of Wittenoom in the north-west, and the Study Area is within the known range of this taxon. *Aristida lazaridis* (P2) is known from 22 WA Herbarium records across approximately 17 broad regional locations, one of which occurs within DBCA-managed tenure within Karijini National Park (WA Herbarium 1998-). This taxon is also known from two records in the NT and 78 records in Qld (ALA 2022).



Photo 5-2: *Aristida lazaridis* (P2) (Photo: Umwelt)

Rapallo (2021a; b) undertook extensive survey to map the extent of the *Aristida lazaridis* (P2) population in the vicinity of the GNHI, recording an estimated population of 12,773 plants from 6,757 point locations over the 2020 and 2021 survey periods combined (71 locations, representing 85 individuals, of which occur

within the Development Envelope). A further 264 individuals of *Aristida lazaridis* (P2) were recorded at five locations within the Study Area in 2022; three of these locations (total four plants) were in the Development Envelope (**Figure 5.7**; **Appendix F**).

This taxon was recorded mainly in VTs 7 and 8, with less representation in VTs 3 and 9 (as mapped on Sheets 10 and 11 of **Appendix K).** The representative habitat of this taxon in the Study Area can be considered VTs 7 and 8 in the GNHI DE area only; this taxon was not otherwise recorded in other areas mapped as VT 7, despite targeted survey effort by both Rapallo (2021b) and Umwelt (2022 survey) in these areas.

5.2.3.3 *Eremophila naaykensii* (P3)

Eremophila naaykensii (P3) (previously *Eremophila* sp. Hamersley Range (K. Walker KW 136)) is a perennial shrub or tree growing to 3 m high (**Photo 5-3**), characterised by large, silver-green leaves and pale grey-brown bark. This taxon occurs in gorges, breakaways, and clifftops of ironstone, often growing out of seemingly solid rock walls (WA Herbarium 1998-). This taxon is endemic to WA (ALA 2022), known from a range of approximately 200 km from near Newman in the east to east of Paraburdoo in the west, with the Study Area in the known range of this taxon.

This taxon is known from 21 WA Herbarium records across approximately 19 broad regional locations, one of which occurs within DBCA-managed tenure within Karijini National Park (WA Herbarium 1998-). The nearest WA Herbarium record of this taxon is located south of these records, on a range of hills between the Lamb Creek Study Area and Area C (PERTH09105972; two plants recorded on rocky hill slopes, hills crests and upper hill slopes, 2018 record).



Photo 5-3: *Eremophila naaykensii* (P3) (Photos: Umwelt)

Rapallo (2021b) recorded 35 locations (representing 35 individuals) of *Eremophila naaykensii* (P3) within the VT 4 and VT6. A total of 38 individuals of *Eremophila naaykensii* (P3) were recorded at two locations within the Study Area in 2022 within VT 4 (**Figure 5.7**; **Appendix F**). VTs 4 and 6 are considered to be the preferred habitat of this taxon within the Study Area. This taxon was not recorded within the Targeted Survey Area in 2022, nor otherwise in the Development Envelope.

5.2.3.4 Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)

Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2) is a slender shrub growing to 2 m high (**Photo 5-5**), occurring on rocky gullies, drainage lines and gorges with loamy skeletal soil (WA Herbarium 1998-). It is endemic to WA (ALA 2022), known from a range of approximately 180 km from north of Newman in the east to north-east of Paraburdoo in the west. The Study area is located on the northern extent of its known range. This taxon is known from 24 WA Herbarium records across 10 broad regional locations, two of which occur within DBCA-managed tenure within Karijini National Park (WA Herbarium 1998-); no records are within 10km of the Study Area.

Rapallo (2021a; b) did not record *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2) during the targeted or detailed survey. A total of 17 individuals of *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2) were recorded at two locations within the Study Area in 2022 within VT 4 (**Figure 5.7**; **Appendix F**). VT 4 is considered to be the preferred habitat of this taxon in the Study Area. This taxon was not recorded within the Targeted Survey Area in 2022 and was not otherwise recorded in the Development Envelope. This record of *Hibiscus* sp. Gurinbiddy Range (M.E. Trudge MET 15708) (p2) is a slight range extension of the known range of this taxon to the north.



Photo 5-4: *Hibiscus* sp. Gurrinbiddy Range (M.E. Trudgen MET 15708) (P2) (Photos: Umwelt)

5.2.3.5 *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)

Rhagodia sp. Hamersley (M. Trudgen 17794) (P3) is an erect shrub growing to 2 m high (**Photo 5-6**), occurring on plains and alluvial plains with red or brown clay loam, often with ironstone gravel (WA Herbarium 1998-). It is endemic to WA (ALA 2022), known from a range of approximately 330 km from west of Jigalong in the east to north-east of Tom Price in the west. The Study Area in in the northern extent of the known range of this taxon.

This taxon is known from 72 WA Herbarium records across more than 50 broad regional locations, two of which occur within DBCA-managed tenure including Jigalong Aboriginal Reserve and Karijini National Park (WA Herbarium 1998-). A total of five records are known from within 10km of the Study Area, with nearby records confirming preferred habitat for this taxon.

Rapallo (2021a; b) recorded 50 individuals of *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) during the targeted and detailed surveys. A total of seven individuals of this taxon were recorded at three locations within the Study Area during the current survey in 2022 within VT 7 (**Figure 5.7**; **Appendix F**). This taxon was not recorded within the Targeted Survey Area or otherwise further in the Development Envelope in 2022.

All records are located in the GNHI section of the Study Area (Sheets 10 and 11 of **Appendix K**). The mapped areas of VT 7 in the GNHI section of the Study Area is considered preferred habitat for this taxon, due to the majority of known records occurring in this area combined with soil and landform descriptions.



Photo 5-5: *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) (Photos: Umwelt)

5.2.3.6 Seringia exastia

The Threatened taxon *Seringia exastia* has been recorded within the Development Envelope and wider Study Area, which despite being no longer recognised as Threatened under WA's BC ACT, remains listed as Threatened under the EPBC Act (Department of Premier and Cabinet (DPC) 2018). Correspondence with DBCA Species and Communities Assessment Team (dated 4th August 2022) has provided clarity with regards to the treatment of this taxon. It is understood that the synonymisation of *S. elliptica* under *S. exastia* means that *S. exastia* is now considered common and widespread. However, until changes are officially made to the threatened species list, *S. exastia* should still be treated as Threatened flora, however the new understanding of the taxon's distribution would be considered in the EIA process.

A total of 37 locations with 783 individuals were recorded within the Study Area, of which 22 locations and 222 individuals are located in the Development Envelope. This taxon was recorded across a range of VTs **Figure 5.7**; **Appendix F**, however was predominantly recorded in VT1 which can be considered preferred habitat. This taxon now has a very wide range across Western Australia, extending from Giralia Station in the west through to the border with the NT, and from Broome in the north to Mt Manning Range NR in the south. The Study Area is within the known range of this taxon.

5.2.4 Other Flora Taxa of Interest

5.2.4.1 Euphorbia ferdinandi s. lat. (potentially undescribed)

Euphorbia ferdinandi s. lat. (**Photo 5-7**) is considered conspecific with the entity *Euphorbia* aff *ferdinandi* recorded by Rapallo (2021a; b). It was recorded at 12 locations consisting of 53 individuals within the Study Area in 2022 within VTs 7 and 8 (**Figure 5.7**; **Appendix F**). This taxon was not recorded within the Targeted Survey Area in 2022, otherwise further in the Development Envelope.

Rapallo (2021a; b) recorded this entity at four locations in 2021 and treated it as a potentially undescribed taxon based on discussions with personnel from the WA Herbarium (see **Section 5.1.4**). The specimens collected during the current survey are considered to represent the same taxon previously collected in the area by Rapallo (2021a; b). The taxonomic status of this entity is currently under review by the WA Herbarium; it has been segregated by the WA Herbarium in the main collection, though still housed under the name *E. ferdinandi* var. *ferdinandi*. It appears to have been distinguished by the broader seeds (0.8-0.9mm), longer capsules (to 2.4mm) and bifid styles, although styles are apparently only just bifid on the segregated material, as per the collection taken in 2022. The specimen collected in April 2022 required mature fruit to confirm the status; that specimen and those collected in June 2022 have been submitted to the WA Herbarium to confirm the taxonomic status of this entity. In the interim, a precautionary approach would see this entity treated as potentially significant.



Photo 5-6: *Euphorbia ferdinandi* s. lat. (Potentially undescribed) (Photos: Umwelt)

5.2.4.2 *Corchorus* sp. (potentially undescribed)

Corchorus sp. (**Photo 5-8**) does not match reference specimens of any published species and has potential taxonomic significance. This entity is distinct in having elongated fruit. Fruiting specimens were collected in April and June 2022, indicating approximately a March-May flowering period. Flowering specimens were also collected in late June, though this could be considered a response to the unseasonably late rains of May 2022 rather than an indicator of usual flowering time.

Targeted survey in June 2022 recorded a single population of 35 plants, restricted to one drainage line in VT 9, between the hills and the railway line (**Figure 5.7**; Sheets 5 and 9 of **Appendix F**). The habitat of the recorded population was restricted to drainage lines of sandy loam soils, with no or very few stones, and an open lower stratum of tussock grasses and low shrubs. Nearby drainage lines were searched and further individuals were not located; these drainage lines did not represent the same micro-habitat, with differing percentage cover of surface stones, density of the understory stratum, and differing species composition. No plants were recorded within the Development Envelope.

A review of the quadrat data for VT 9 in the mine area DE shows it is unlikely that this taxon would occur in other areas of VT9, based on absence of habitat features.

There are no other known populations of this entity, which may indicate that it is geographically restricted. A precautionary approach would see it regarded as a taxon of potential conservation significance, though this is not yet able to be formally assessed.



Photo 5-7: ***Corchorus*** **sp. (Potentially undescribed) (Photos: Umwelt)**

No other flora taxa were recorded that are potentially significant in terms of being representative of significant extensions of their known ranges, however it is of general interest that there is a relative lack of representative flora specimens housed in the WA Herbarium from the general project area.

5.2.5 Likelihood of Occurrence of Further Significant Flora Taxa

Table 5.8 presents an assessment of the likelihood of occurrence of significant taxa within the Study Area and Targeted Survey Area. This list includes significant taxa identified as occurring (or potentially occurring) within the Desktop Study Area prior to survey (listed in **Table 5.5**) as well as any additional significant taxa recorded by the survey (listed in **Table 5.7**). The assessment considered whether a taxon was identifiable at the time of survey, the known range of the taxon, if habitat is present in the Study Area and/or Targeted Survey Area, proximity of known records to the Study Area and the extent of targeted survey undertaken within the Study Area and Targeted Survey Area, when determining the potential for a taxon to occur in the Study Area and Targeted Survey Area.

A total of 62 taxa have been assessed within **Table 5.8** including two Threatened taxa, 58 Priority listed taxa and two potentially undescribed taxa**.** Of these, eight taxa were recorded within the Study Area by the 2022 survey, and two taxa are considered potentially not identifiable during the survey. *Arthropodium vanleeuwenii* (P2) is considered visible only when flowering in September as it grows up through *Triodia*. *Rhodanthe ascendens* (P1) is an annual taxon known from a limited number of records all of which were collected in August or September. It is possible that this taxon is present (and therefore identifiable) after significant rainfall; however, this cannot be confirmed based on the current existing information. It is considered that the 60 remaining taxa were identifiable during the 2022 survey, either because the survey period coincides with the taxon's flowering period, or the taxon can be identified reliably when in fruit or sterile.

The likelihood of occurrence assessment identified a total of 42 taxa which could Possibly occur within the Study Area due to suitable habitat occurring within the Study Area and the Study Area being within the known range of the taxon or within close proximity to its known range. All of these taxa were identifiable at the time of survey with the exception of *Arthropodium vanleeuwenii* (P2). Suitable habitat for this taxon is described as elevations above 900 m on south-facing hillslopes of Brockman Iron Formation (Dillon and Macfarlane 2020). This habitat occurs within the Study Area, at the highest elevation areas of VTs 4 and 6. The areas of VT 4 and 6 within the Targeted Survey Area are not considered to represent suitable habitat; these areas occur at or below 750 m elevation and are north and north-west facing.

It is worthy of note that 'suitable habitat' as used to inform the assessment has been determined using details recorded at known locations. However, for many of the taxa known from the general vicinity of the Study Area, suitable habitat is difficult to define, as available habitat information is often vague or very broad and difficult to interpret; for example an area described as a stony plains and flats with red or brown clay or clay loam could feasibly occur almost anywhere in the Pilbara. Therefore, a precautionary approach has been adopted when assessing whether suitable habitat for a species is present in the Study Area.

All 62 taxa assessed are considered unlikely to occur within the Targeted Survey Area due to their known range, the extent of targeted survey undertaken and/or the absence of suitable habitat within the Targeted Survey Area.

Table 5.8 Likelihood of Occurrence of Further Significant Flora Taxa in the Study Area and Targeted Survey Area

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Targeted Survey Area
Acacia bromilowiana	P4	July to August	Rocky hills, breakaways, scree slopes, gorges, creek beds. Rocky red-brown loam with ironstone or laterite	Yes	3.9 km W of Study Area	**Possible** – known record in close proximity to Study Area, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Acacia daweana	P3	July to September	Low rocky rises, along drainage lines. Red stony clay loam	Yes	37 km W of Study Area	**Possible** – Study Area occurs outside of known range of taxon; however, suitable habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Acacia effusa	P3	May to August	Scree slopes of low ranges. Red-brown silty clay or clay loam with ironstone and quartz stones and pebbles	Yes	1.6 km NW of Study Area	**Possible** – known record in close proximity to Study Area, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Acacia subtiliformis	P3	May to June	Rocky ridges, hills and slopes, often with calcrete. Light brown or brown loam or silty clay	Yes	7.1 km NE of Study Area	Unlikely –potential habitat unlikely to be present in Study Area	Unlikely – potential habitat unlikely to be present in Targeted Survey Area, all potential habitat searched
Amaranthus centralis	P3	May to July	Plains, flats and granite outcrops. Gritty red clay loam	Yes	23.5 km E of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Aristida jerichoensis var. *subspinulifera*	P3	likely after significant rainfall	Plains and flats. Red-brown loamy clay or cracking clay	Yes	0.6 km W of Study Area	**Recorded in the Study Area**	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Aristida lazaridis	P2	likely after significant rainfall	Floodplains, drainage areas and plains. Red or red-brown clay loam, sometimes with ironstone	Yes	Within Study Area	**Recorded in the Study Area**	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Targeted Survey Area
Arthropodium vanleeuwenii	P2	September	Steep hill slopes and gorges. Red-brown or orange-brown loam, often with banded ironstone	No	20.4 km W of Study Area	**Possible** – Study Area occurs outside of the known range of taxon; however, suitable habitat present in Study Area and taxon not identifiable during the survey	**Unlikely** –taxon not identifiable during the survey however suitable habitat not present in Targeted Survey Area.
Cladium procerum	P2	likely year-round	Major creeks and gorges. Red gravelly sand	Yes	33.2 km NNE of Study Area	Unlikely –Study Area occurs within known range of taxon; however, potential habitat unlikely to be present in Study Area	Unlikely - potential habitat unlikely to be present in Targeted Survey Area
Corchorus sp.	-	No data on *FloraBase* but flowering during the survey	No data on *FloraBase* (not formally described)*;* in the Study Area this entity was recorded within a drainage line in VT10 on sandy loam soils	Yes	NA	**Recorded in the Study Area**	Unlikely - all potential habitat has been searched within the Targeted Survey area.
Dampiera metallorum	P3	June to October	High in the landscape on steep slopes, summits of hills. Red-brown stony clay loam over banded ironstone	Yes	10.3 km E of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Dolichocarpa sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3	May to September	Floodplains and crabhole plains. Red-brown or brown cracking clay	Yes	11 km N of Study Area	Unlikely –Study Area occurs within known range of taxon, west of Study Area is area of cracking clay which extends into the western edge of VT 9; however the area of cracking clay has been searched	Unlikely - potential habitat unlikely to be present in Targeted Survey Area

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Targeted Survey Area
Eragrostis crateriformis	P3	likely after significant rainfall	Creek banks, depressions. Gritty or gravelly brown sandy loam, red-brown clay loam	Yes	20.7 km N of Study Area	**Possible** – Study Area occurs outside of the known range of taxon; however, suitable habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	P1	likely after significant rainfall	Steep slopes, summits. Brown or red-brown silty loam, often with banded ironstone	Yes	16.7 km S of Study Area	**Possible** – Study Area occurs outside of the known range of taxon; however, suitable habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Eremophila magnifica subsp. *magnifica*	P4	August to November	Hillslopes and gullies. Rocky red-brown or brown sandy loam, often with ironstone	Yes	11 km S of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Eremophila magnifica subsp. *velutina*	P3	August to September	Hillslopes and ridges. Red stony loam, often with ironstone or banded ironstone	Yes	15.1 km SW of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Eremophila naaykensii	P3	June to August	Rocky hill slopes, crests and gorges. Rocky red-brown clay loam, sometimes over banded ironstone	Yes	5.6 km E of Study Area	**Recorded in the Study Area**	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Eremophila pusilliflora	P2	March to July	Flats and plains. Red-brown sandy loam, often with ironstone	Yes	13.9 km W of Study Area	**Possible** –Study Area occurs on eastern edge of range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Targeted Survey Area
Eremophila spongiocarpa	P3	May to September	Weakly saline alluvial plains and dune slopes on margins of marshes and saline flats. Red-brown clay loam	Yes	38.2 km NE of Study Area	Unlikely –Study Area occurs outside of known range of taxon (known from plains adjacent to Fortescue Marsh), potential habitat unlikely to be present in Study Area	Unlikely - potential habitat unlikely to be present in Targeted Survey Area
Eremophila sp. West Angelas (S. van Leeuwen 4068)	P1	August to September	Hill slopes and crests. Brown or red silty loam over banded ironstone	Yes	17.9 km S of Study Area	**Possible** – Study Area occurs outside of the known range of taxon; however, suitable habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Euphorbia australis var. *glabra*	P3	likely after significant rainfall	Drainage lines and flats. Red-brown clay loam, sometimes with calcrete or silcrete	Yes	10.7 km N of Study Area	**Possible** – Study Area occurs outside of the known range of taxon; however, suitable habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Euphorbia clementii	P3	likely after significant rainfall	Fire responder. Recently burnt hills, slopes and undulating plains. Red-brown clay loam	Yes	29.1 km S of Study Area	Unlikely –Study Area is outside of known range of taxon according to FloraBase (WA Herbarium (1998-)); the record of this taxon near the Study Area is potentially erroneous given it is not verified by a vouchered specimen and is a significantly disjunct record	Unlikely – record near Study Area potentially erroneous, all potential habitat searched, however area not recently burnt.
Euphorbia ferdinandi s. lat	-	No data on *FloraBase* but flowering during the survey	No data on *FloraBase* (not formally described); recorded on VTs 7 and 8 on red-brown clay to clay loam with ironstone pebbles on plains in the Study Area	Yes	Unknown	**Recorded in the Study Area**	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Targeted Survey Area
Euphorbia inappendiculata var. *queenslandica*	P2	likely after significant rainfall	Flats and plains. Brown cracking clay, gilgai	Yes	26 km W of Study Area	Unlikely –Study Area occurs within known range of taxon, west of Study Area is area of cracking clay which extends into the western edge of VT 9; however the area of cracking clay has been searched	Unlikely - potential habitat unlikely to be present in Targeted Survey Area
Euphorbia stevenii	P3	likely after significant rainfall	Gentle slopes and plains. Brown or red-brown clay and cracking clay	Yes	31 km SSW of Study Area	**Possible** –Study Area occurs on eastern edge of range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Fimbristylis sieberiana	P3	May to June	Pool edges, sandstone cliffs and major creek lines. Brown or red-brown gritty sand	Yes	33.7 km E of Study Area	Unlikely –Study Area occurs within known range of taxon; however, potential habitat unlikely to be present in Study Area	Unlikely - potential habitat unlikely to be present in Targeted Survey Area
Glycine falcata	P3	May to September	Along drainage depressions in crabhole plains and clay plains. Brown or red cracking clay	Yes	11 km N of Study Area	Unlikely –Study Area occurs outside of known range of taxon, west of Study Area is area of cracking clay which extends into the western edge of VT 9; however the area of cracking clay has been searched	Unlikely - potential habitat unlikely to be present in Targeted Survey Area
Goodenia lyrata	P3	likely after significant rainfall	Claypans and plains. Red or brown sandy loam or clay loam	Yes	1.5 km S of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Targeted Survey Area
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	P3	likely after significant rainfall	Low undulating plains, swampy plains. Red-brown clay soil, calcrete pebbles	Yes	6.6 km NE of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Grevillea saxicola	P3	February to June	Rocky hills, slopes and gullies. Red-brown sandy loam	Yes	20 km S of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Gymnanthera cunninghamii	P3	February to May, October to December	Drainage lines. Brown or red-brown sand or sandy loam	Yes	24.1 km NE of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	P2	April to August, October	Rocky gullies, drainage lines and gorges. Loamy skeletal soil	Yes	26.6 km SW of Study Area	**Recorded in the Study Area**	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Indigofera gilesii	P3	May, August	Rocky slopes, hills, creeklines and outcrops. Red or orange loam, often with ironstone	Yes	13.3 km W of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Iotasperma sessilifolium	P3	May to September	Edges of waterholes, plains, Cracking clay, black loam	Yes	23.3 km N of Study Area	Unlikely –Study Area occurs outside of known range of taxon, west of Study Area is area of cracking clay which extends into the western edge of VT 9; however the area of cracking clay has been searched	Unlikely - potential habitat unlikely to be present in Targeted Survey Area

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Targeted Survey Area
Ipomoea racemigera	P2	April to June	Drainage lines and flats. Brown silty loam	Yes	11.9 km NE of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Isotropis parviflora	P2	June to August	Rocky hills, slopes and undulating plains. Red or brown sandy loam, often with ironstone	Yes	8.2 km SE of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Kohautia australiensis	P2	likely after significant rainfall	Plains and hills. Brown or orange clay with calcrete	Yes	11.8 km N of Study Area	Unlikely – Study Area occurs outside the known range of taxon, potential habitat unlikely to be present in the Study Area	Unlikely – potential habitat unlikely to be present in Targeted Survey Area
Lepidium catapycnon	P4	September	Rocky hills and slopes. Red or brown loam or sandy loam, often with ironstone	Yes	15.6 km S of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Olearia mucronata	P3	July to August	Rocky hills, gullies and creeklines. Red-brown or orange-brown silty clay or sandy clay loam with ironstone	Yes	26.1 km SW of Study Area	**Possible** –Study Area occurs on eastern edge of range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Oxalis sp. Pilbara (M.E. Trudgen 12725)	P2	May to July	Gorges, gullies, drainage lines and slopes. Red loam or sandy loam, often with ironstone	Yes	15.6 km S of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Pilbara trudgenii	P3	September to October	Hill summits, steep slopes, screes, cliff faces. Skeletal red stony soil over ironstone	Yes	15.8 km S of Study Area	**Possible** –Study Area occurs north of known range of taxon; however, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Targeted Survey Area
Ptilotus mollis	P4	July to September	Rocky hills and screes with red or brown clay loam, often with ironstone	Yes	16.9 km S of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Rhagodia sp. Hamersley (M. Trudgen 17794)	P3	March to May, September	Plains and alluvial plains. Red or brown clay loam, often with ironstone gravel	Yes	Within Study Area	**Recorded in the Study Area**	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Rhodanthe ascendens	P1	August to September	Flats. Cracking clay and sand over clay	Unknown – limited information	32.1 km SW of Study Area	Unlikely –Study Area occurs within known range of taxon, west of Study Area is area of cracking clay which extends into the western edge of VT 8; however the area of cracking clay has been searched	Unlikely - potential habitat unlikely to be present in Targeted Survey Area. Study Area is outside known range.
Rhynchosia bungarensis	P4	May to November	Rocky hill slopes, drainage lines, gorges. Orange brown loam, often with ironstone	Yes	21 km NE of Study Area	**Possible** –Study Area occurs on southern edge of known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Rostellularia adscendens var. latifolia	P3	April to May	Rocky hills, gullies, floodplains and drainage lines. Red/brown sandy loam	Yes	8.6 km NNE of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Seringia exastia	T		Sandy soils on plains, creeks, rocky areas	Yes	5 km south of the Study Area	**Recorded in the Study Area**	**Recorded in the Targeted Survey Area**
Sida sp. Barlee Range (S. van Leeuwen 1642)	P3	likely after significant rainfall	Rocky hills, gullies and gorges. Red or brown sandy loam, often with ironstone	Yes	13.9 km S of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Targeted Survey Area
Sida sp. Hamersley Range (K. Newbey 10692)	P3	likely after significant rainfall	Ironstone gullies, slopes and breakaways. Skeletal red loam	Yes	37.4 km SSW of Study Area	**Possible** –Study Area occurs outside of known range of taxon; however, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Solanum kentrocaule	P3	May to September	Steep rocky gullies, slopes, gorges. Skeletal red loam	Yes	16.1 km S of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Stackhousia clementii	P3	April to September	Floodplains and flats. Clay loam, sometimes saline or with calcrete	Yes	20.6 km W of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Stylidium weeliwolli	P3	March to September	Drainage lines, pool edges, seepage areas. Sandy loam or clay	Yes	32.2 km E of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Swainsona thompsoniana	P3	April to August	Floodplains and flats. Red or brown cracking clay, clay loam	Yes	18.1 km W of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Synostemon hamersleyensis	P1	April to November	Steep hills, slopes, screes. Rocky red or brown sandy loam with ironstone or banded ironstone	Yes	23.7 km NE of Study Area	**Possible** –Study Area occurs outside (south) of known range of taxon; however, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Tetratheca fordiana	P2	April to July	Cliffs, ridges and breakaways. Skeletal soil with ironstone	Yes	26.8 km W of Study Area	**Possible** –Study Area occurs outside (east) of known range of taxon; however, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Targeted Survey Area
Teucrium pilbaranum	P2	April to September	Flats, clay pans and crabhole plains. Red or brown sandy loam, clay or cracking clay, sometimes with calcrete	Yes	15.4 km SSW of Study Area	Unlikely –Study Area occurs within known range of taxon, west of Study Area is area of cracking clay which extends into the western edge of VT 9; however the area of cracking clay has been searched	Unlikely - potential habitat unlikely to be present in Targeted Survey Area
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	P3	May to July	Floodplains, drainage lines and flats. Red or brown clay loam, clay or cracking clay	Yes	4.6 km S of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Thryptomene wittweri	T	April to August	Breakaways and cliffs. Skeletal red-brown soil with sandstone or ironstone	Yes	22.9 km SW of Study Area	**Possible** –Study Area occurs outside (east) of known range of taxon; however, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Triodia sp. Karijini (S. van Leeuwen 4111)	P1	likely after significant rainfall	Hill crests, moderate to steep hill slopes. Grey, brown or red sandy loam or silty loam, often with ironstone	Yes	3.7 km W of Study Area	**Possible** –Study Area occurs on eastern edge of known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Triodia sp. Mt Ella (M.E. Trudgen 12739)	P3	likely after significant rainfall	Rocky slopes, gullies, ridges gorges and associated drainage lines/floodplains. Red or brown sandy clay loam, often with ironstone	Yes	12.3 km SW of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)	P1	March to September	Floodplains and drainage areas. Red or brown clay loam or silty loam	Yes	1.7 km S of Study Area	**Possible** –Study Area occurs within known range of taxon, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Targeted Survey Area
Xerochrysum boreale	P3	July, September	Stony plains and flats. Red or brown clay or clay loam	Yes	21.6 km SW of Study Area	**Possible** –Study Area occurs outside (north) of known range of taxon; however, potential habitat present in Study Area	Unlikely – potential habitat present in Targeted Survey Area; however, all potential habitat searched

*Source: WA Herbarium (1998-)

5.2.6 Introduced Flora Taxa

Seven introduced flora taxa were recorded within the Study Area by the current survey. **Table 5.9** lists location information and comments regarding the significance of these taxa, including ecological impact and invasiveness ratings for each introduced taxon under Ecological Impact and Invasiveness Ratings from the Department of Parks and Wildlife for the Pilbara Region (DBCA 2014). None of the recorded introduced flora taxa are Declared Pests under the BAM Act (DPIRD 2022) or WoNS (Weeds Australia 2022).

Four introduced flora taxa recorded in the Study Area by the survey are rated as having 'High' ecological impact (**Table 5.9**). Taxa with this ecological impact rating are considered significant weeds capable of causing acute disruption of ecological processes, as well as dominating and/or significantly altering the vegetation structure, composition and function of ecosystems (DBCA 2014).

Five introduced flora taxa recorded in the Study Area by the current survey are rated as having 'Rapid' invasiveness in native vegetation (**Table 5.9**) (DBCA 2014). These taxa are typically disturbance opportunists and are relatively common around disturbance areas, and as well as along drainage lines and other areas of periodic inundation.

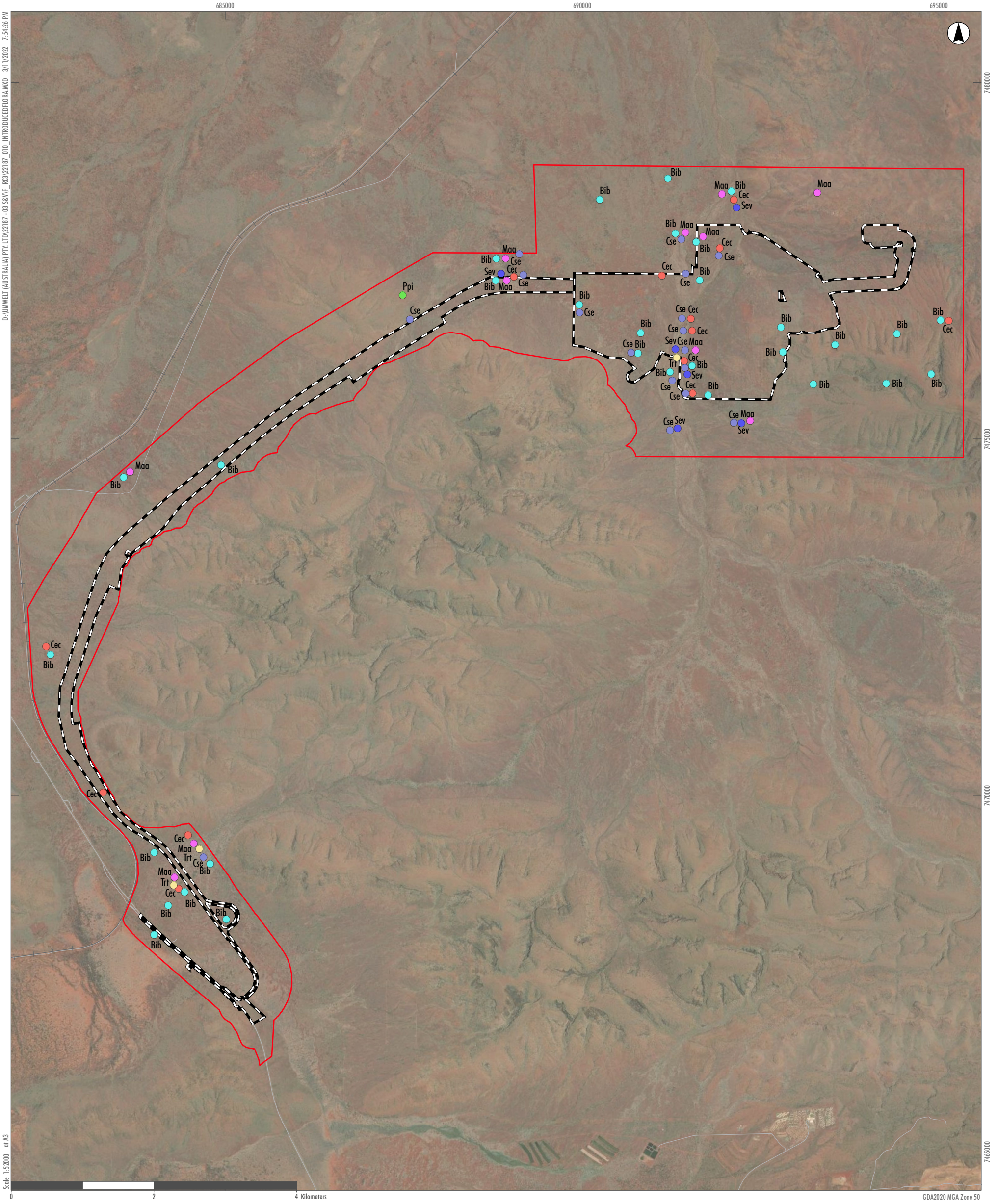
It is worthy of note that despite the High/Rapid ecological impact and invasiveness ratings of the introduced flora taxa recorded in the Study Area, no introduced taxa were widespread in the Study Area, and the vegetation of the Study Area was considered to be in mostly Excellent condition (**Section 5.2.11**). *Bidens bipinnata*, *Cenchrus ciliaris* and *C. setigera* were the most common introduced taxa in terms of numbers of locations and individuals recorded; these taxa were likewise identified in the top 20 most common weed taxa in terms of presence records assessed in a Pilbara weed risk assessment (Webber *et al.* 2017). Introduced flora were most commonly recorded in drainage areas, and presented further in section **5.2.11**.

Locations of introduced flora taxa are presented on **Figure 5.8**.

Table 5.9 Introduced Flora Taxa Recorded in the Study Area

Taxon	Common Name	Number of Locations	Number of Individuals	VTs	Ecological Impact*	Invasiveness*
Bidens bipinnata	Bipinnate Begger's Tick	31	824	1, 2, 4, 6, 7, 9, 10	Unknown	Rapid
Cenchrus ciliaris	Buffel Grass	13	149	1, 4, 7, 10	High	Rapid
Cenchrus setiger	Birdwood Grass	17	2,654	1, 7, 10	High	Rapid
Malvastrum americanum	Spiked Malvastrum	11	70	1, 7, 10	High	Rapid
Portulaca pilosa	Pink Purslane	1	1	2	Not rated	Not rated
Setaria verticillata	Whorled Pigeon Grass	6	20	1, 7, 10	High	Rapid
Tribulus terrestris	Caltrop	3	5	7, 10	Unknown	Moderate

* Data from DBCA (2014)



Legend

- Study Area
- Proposed Development Envelope

Introduced Flora Taxa (Umwelt 2022)

- Bib **Bidens bipinnata*
- Cec **Cenchrus ciliaris*
- Cse **Cenchrus setiger*
- Maa **Malvastrum americanum*
- Ppi **Portulaca pilosa*
- Sev **Setaria verticillata*
- Trt **Tribulus terrestris*

FIGURE 5.8

Introduced Flora Recorded by the 2022 Field Surveys

5.2.7 Flora Classification Results

The PATN software package (Belbin and Collins 2013) initially suggested that classification of quadrats into 11 groups may be appropriate for the data analysed. The resulting dendrogram (**Appendix G**) and taxon group matrix (**Appendix H**) were therefore initially examined at this level, to determine the plausibility of groups with regard to taxon groups and field observations. This process identified one group of quadrats (containing two quadrats) that did not represent a plausible VT based on field observations and site knowledge. Both quadrats were manually reassigned to related groups, as indicated in **Appendix I**, based on detailed investigation of their species composition, as well as other characteristics including topography, soils, and geographic location.

The examination of the dendrogram also identified an additional two quadrats that were considered to have been misclassified, for similar reasons. These quadrats were also reassigned, as presented in **Appendix I**.

It was ultimately determined that there were 10 plausible groups that are considered to represent VTs in the Study Area; these groups were resolved at differing levels of similarity. The groups are labelled in the dendrogram in **Appendix G** and taxon group matrix in **Appendix H**. The initial 11 groups identified by the analysis are also indicated on the dendrogram in **Appendix G** and taxon group matrix in **Appendix H**.

5.2.8 Vegetation Types

As noted above, 10 VTs were defined in the Study Area via floristic composition classification and subsequent examination of quadrat data. The VTs are considered to belong to three broad vegetation groups based on soils and topography, and are also separated on the analysis dendrogram (**Appendix G**):

- Group 1: VTs 1, 2 and 3

  Woodlands over sparse shrublands and hummock grasslands on gentle lower to upper slopes on red-brown clay loams. This supergroup was mapped on the gentle foot slopes associated with the hill relevant to the Gaguna heritage area (Study Area associated with the GNHI DE; Access Rd DE and Mine DE), and areas of lower relief between the steeper ranges present in the south of the Study Area associated with the Mine DE and vegetation associated with the McKay land system. Representative taxa are from species groups L and O, with common species from species groups D, B and C, and lacking in representation of species groups E-J (representative of group 3) and Q (representative of group 2) (**Appendix H**).

- Group 2: VTs 4, 5 and 6

  Open Woodlands over sparse shrublands and tussock and hummock grasslands on steep slopes, crests, gullies and gorges with exposed ironstone and skeletal soils. This supergroup was mapped on areas of higher relief, steep, rocky areas with exposed ironstone on the range within the eastern portion of the Study Area associated with the Mine DE, associated with the Newman and McKay land systems in this area. Representative taxa are from species groups K and Q, with common representation of species groups B and D and lacking species from species groups E-J (**Appendix H**).

- Group 3: VTs 7, 8, 9 and 10

  Mulga Woodlands over tussock grasslands and open woodlands over sparse shrublands over hummock grasslands on red-brown clay-loam on plains; and open woodlands over shrublands over hummock grasslands on major and minor drainage lines. This group was mapped on plains within the Study Area

associated with the GNHI DE, the Access Rd DE and in the vicinity of the western part of the Mine DE, as well as Mine Creek and associated tributaries in the vicinity of the Mine DE. Representative taxa are from species groups E-J, with common taxa from species groups B-D (and minor from A) and lacking in representation from species groups K-Q (**Appendix H**).

The review of the relevé data did not identify any additional VTs in the Study Area. Relevé sites were therefore assigned to one of the 10 VTs defined by the floristic classification analysis, following detailed investigation of their species composition, topography, soils, and geographic location.

The locations of quadrats and/or relevés within each VT were used in conjunction with examination of aerial photography and field notes taken during the 2022 survey to develop VT mapping polygon boundaries across the Study Area.

Table 5.10 presents a description of each of the VTs mapped in the Study Area, including location, area mapped, sampling regime, significant flora taxa ('^' denotes preferred habitat for a significant taxon, significant flora taxa recorded in 2022 and by previous surveys), average taxon richness and a description of variation found within the VT. **Figure 5.9** presents an overview of the distribution of VTs. Raw quadrat and relevé data and parameters are presented in **Appendix E**. Detailed VT mapping with locations of quadrats and relevés established by the 2020 and 2021 surveys are presented in **Appendix J**. **Appendix K** presents a taxon-VT matrix and **Appendix L** presents the results of the indicator taxon analysis.

VTs 1, 7 and 9 had the greatest extents within the Study Area (combined VTs covering 67.5% of the Study Area); of these, they were also dominant in the Development Envelope (76.9 % of the DE).

Table 5.10 Summary of VTs Mapped in the Study Area

VT	Summary	Representative Photograph
1	**Description:** Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and/or *E. gamophylla* with isolated *Corymbia deserticola* subsp. *deserticola* over low to mid sparse to open shrubland dominated by species including *Acacia atkinsiana* and *A. ancistrocarpa* over low open hummock grassland of *Triodia pungens*, *T. vanleeuwenii* and *T. wiseana* and low open tussock grassland of *Themeda* sp. Mt Barricade (M.E. Trudgen 2471) and *Paraneurachne muelleri* on red-brown sandy clay loam to clay loam on gently inclined mid to lower slopes and associated drainage lines **Area mapped:** Study Area – 1429.2 ha (37.8 % of Study Area); Development Envelope – 445.0 ha (50% of the DE) **Sampling:** 33 quadrats (C01, C02, C03, C08, C09, C15, C16, C18, C21, C27, C29, C30, C31, C34, C44, C46, C49, C51, K02, K03, K06, K10, K14, K20, K21, K22, K24, K27, K28, K30, K31, K36, K44) **Indicator taxa:** *Ptilotus rotundifolius*, *Senna glutinosa* subsp. x *luerssenii* **Significant taxa:** *Rostellularia adscendens* var. *latifolia* (P3)^;*Seringia exastia* (T) **Average taxon richness per quadrat:** 37 ± 10 **Notes:** VT 1 was mapped on undulating plains (**Photo 5-9**), gently inclined slopes **(Photo 5-10**) and occasionally minor associated drainage lines, with no outcropping, mainly associated with the Boolgeeda and Platform land systems (DPIRD 2019), and the Hamersley_18 VSA. VT 1 had the greatest mapped extent in the Study Area and correspondingly had the highest number of representative quadrats, which is reflective of the relatively widespread nature of these land systems. Despite a relatively high species richness of annual and perennial shrubs and forbs they provided relatively little foliage cover and were not dominant in any stratum. Quadrats of VT 1 had a variety of burn ages, ranging from >10 years, 5-10 years (Photo 5-9) and <5 years, with the greatest portion of quadrats subject to burn in November 2017 (**Figure 2.2**; DBCA 2022). VT 1 is represented by two branches on the analysis dendrogram (**Appendix G**); which roughly represent VT 1 quadrats located in the far north-east of the Study Area (Sheet 4 of **Appendix J**) (top dendrogram branch) and the quadrats downslope of the hills representing the Gaguna heritage area and within the Study Area associated with the Mine DE (Sheets 2, 3, 5, 6, 9 of **Appendix J)**. The two indictor taxa are	 **Photo 5-8: VT 1 (Quadrat C08)**  **Photo 5-9: VT 1 (Quadrat C21)**

VT	Summary	Representative Photograph
	commonly recorded on stony or rocky hills, however are also associated with more sandy soils (WA Herbarium 1998-). VT 1 is represented strongly by taxa from species group D, which were also common to VTs 2 and 3 (**Appendix H**). Although VT 1 is most closely related to VTs 2 and 3, differences include greater representation of taxa such as *Eucalyptus gamophylla*, *Duperreya commixta* and *Themeda* sp. Mt Barricade (M.E. Trudgen 2471) (species group C), and reduced representation of taxa such as *Acacia hilliana*, *Fimbristylis simulans*, *Acacia adoxa* subsp. *adoxa*, *Goodenia stobbsiana* and *G. triodiophylla*.	
2	**Description:** Low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia* with occasional *Corymbia deserticola* subsp. *deserticola* and *C. hamersleyana* over low sparse shrubland of *Acacia hilliana* and *Hakea chordophylla* over open hummock grassland of *Triodia vanleeuwenii* and *T. wi*seana on red-brown clay loam with ironstone pebbles on gently inclined lower to upper slopes **Area mapped:** Study Area – 382.3 ha (10.1 % of Study Area), Development Envelope – 85.6 ha (9.6 % of the DE) **Sampling:** 16 quadrats (C04, C20, C22, C25, C26, C41, C47, K15, K16, K23, K26, K29, K33, K46, K47, K48) **Indicator taxa:** *Acacia adoxa* var. *adoxa*, *Acacia hilliana*, *Fimbristylis simulans*, *Goodenia stobbsiana*, *Goodenia triodiophila*, *Ptilotus calostachyus*, *Triodia vanleeuwenii* **Significant taxa:** *Seringia exastia* (T) **Average taxon richness per quadrat:** 36 ± 8 **Notes:** VT 2 was mapped in areas mainly adjoining VT 1 on the Boolgeeda land system and extended onto slopes associated with the Newman land system; it is also associated with the Hamersley_82 VSA. VT 2 was represented by a relatively large number of quadrats, reflecting the widespread nature of this vegetation and landform type (Sheets 1-5 and 7-8 of **Appendix J**). Similar to VT 1, few of the taxa recorded dominated the existing strata, with the majority of taxa contributing limited foliage cover. The indicator taxa are commonly recorded on a variety of soils, including sandplains, rocky rises and stony hills. Floristics of VT 2 were represented by taxa mainly from species group D, which was common to group 1 (and indeed, more widely throughout the Study Area); however had a greater representation of taxa such as *Acacia adoxa* var. *adoxa*, *Goodenia stobbsiana*, *Goodenia triodiophylla*, *Triodia vanleeuwenii* and	 **Photo** 5-10: VT 2 (Quadrat C41)

VT	Summary	Representative Photograph
	Ptilotus calostachyus in comparison to VT 1. VT 2 also had representation from taxa of species group L including *Acacia hilliana*, *Fimbristylis simulans* and *Gompholobium oreophilusm* (**Appendix H)**. The majority of quadrats in this VT had experienced a burn in the preceding 10 years, most of them within 5 years (November 2017) (**Photo 5-11**; quadrat on foothills), and others approximately 8.5 years ago (January 2014) (**Photo 5-12**; quadrat on lower slope); two quadrats had no data and therefore had not been burnt in excess	 **Photo 5-11: VT 2 (Quadrat C47)**
3	**Description:** Isolated trees of *Corymbia hamersleyana*, *Eucalyptus leucophloia* subsp. *leucophloia* and *E. gamophylla* over low sparse shrubland of mixed Acacia species over low hummock grassland of *Triodia pungens* and *T. wiseana* on red-brown sandy clay loam on mid to lower slopes with ironstone pebbles **Area mapped:** Study Area – 48.2 ha (1.3 % of Study Area); Development Envelope – 7.3 ha (0.8% of the DE) **Sampling:** 2 quadrats (K50; R01) **Indicator taxa:** *Acacia adsurgens*, *Acacia atkinsiana*, *Acacia minyura*, *Acacia tenuissima*, *Acacia pachyacra*, *Amphipogon sericeus*, *Gompholobium oreophilum*, *Schizachyrium fragile*, *Senna glutinosa* subsp. *pruinosa*, *Senna pleurocarpa* var. *angustifolia*, *Senna pleurocarpa* var. *pleurocarpa*, *Seringia exastia* (T), *Triodia pungens* **Significant taxa:** *Aristida lazaridis* (P2); *Seringia exastia* (T) **Average taxon richness per quadrat:** 33 ± 3 VT 3 is mapped on one area on the far southern end of the Study Area in the Great Northern Highway Intersection area (Sheet 11 of **Appendix J). This area corresponds to that mapped by Rapallo (2021a) as**	 **Photo 5-12: VT 3 (Quadrat R01)**

VT	Summary	Representative Photograph
	VT 'A'. It is associated with the Boolgeeda land system and the Hamersley_83 VSA. In the analysis dendrogram two further quadrats (C23 and K01) were grouped into this VT, however it was determined that re-allocation of these quadrats was warranted (see Appendix I). A relatively high number of indicator species were determined for VT 3, however many of these taxa had been recorded in other VTs from group 1. The species richness of this VT is less than that of the other VTs in this group; partially due to the lower number of quadrats, but also the quadrats themselves recorded generally fewer taxa. Taxa recorded were predominantly those from species group D (**Appendix H**). One of the quadrats was long unburnt (>10 years) (**Photo 5-13**, quadrat on a lower slope); the other was burnt in October 2015 (6.5 years since fire) (**Photo 5-14**, quadrat on a midslope).	 **Photo 5-13: VT 3 (Quadrat K50)**
4	**Description:** Low open woodland of *Corymbia ferriticola* or *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* with *Ficus brachypoda* occurring on gorge and gully areas, over low sparse shrubland of mixed species dominated by *Corchorus laniflorus*, *Dodonaea viscosa* subsp. *mucronata* and *Gossypium robinsonii* over sparse hummock grassland dominated by *Triodia pungens* with *T. wiseana* and tussock grasses including *Cymbopogon ambiguus* and *Aristida burbidgeae* on red brown clay loam on steep upper slopes, gullies, breakaways and gorges with significant ironstone outcropping **Area mapped:** Study Area – 95.3 ha (2.5 % of Study Area), Development Envelope – 1.0 ha (0.1% of the DE) **Sampling:** Six quadrats (C24; C35; C36; C42; C52; C55) and two relevés (CR04; CR05) **Indicator taxa:** *Abutilon* sp. Dioicum (A.A. Mitchell PRP 1618), *Amaranthus undulatus*, *Aristida burbidgeae*, *Astrotricha hamptonii*, *Brachychiton acuminatus*, *Capparis mitchellii*, *Capparis spinosa* subsp. *nummularia*, *Corymbia ferriticola*, *Corchorus laniflorus*, *Cucumis variabilis*, *Cymbopogon ambiguus*, *Cynanchum pedunculatum*, *Cyperus cunninghamii* subsp. *cunninghamii*, *Dodonaea pachyneura*, *Dodonaea viscosa* subsp. *mucronata*, *Eremophila naaykensii* (P3), *Eremophila petrophila* subsp. *petrophila*, *Euphorbia trigonosperma*, *Ficus brachypoda*, *Gomphrena cunninghamii*, *Hibiscus* sp. Gurinbiddy Range	 **Photo 5-14: VT 4 (Quadrat C24)**

VT	Summary	Representative Photograph
	(M.E. Trudgen MET 15708) (P2), *Paspalidium clementii*, *Ptilotus astrolasius*, *Senna venusta*, *Sida* sp. Shovelanna Hill (S. van Leeuwen 3842), *Solanum cleistogamum*, *Solanum gabrielae*, *Stylobasium spathulatum*, *Tinospora smilacina*, *Triodia biflora*, *Triumfetta leptacantha*, *Triumfetta maconochieana* **Significant taxa:** *Eremophila naaykensii* (P3)^, *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)^ **Average taxon richness per quadrat:** 53 ± 12 VT 4 was mapped on steep, rocky areas associated with the range present in the south-eastern corner of the Study Area associated with the Mine DE, corresponding to the Newman land system (**Figure 5.1;** Sheets 4 and 8 of **Appendix J).** VT 4 was species richness in comparison to the other VTs in this group and had the highest species richness per quadrat, however relatively few taxa contributed significantly to the foliage cover to the stratum present. Although significant representation of taxa from species groups B, D and K were present (similar to the other VTs of group 2), VT 4 represents the almost exclusive presence of taxa from species group Q, which include the taxa as listed above as indicator taxa. These taxa are known to occur on rocky sites, including gorges, gullies, rocky hills and screen slopes. Other common taxa to VT 4 which were not commonly recorded in other VTs include *Cucumis variabilis*, *Pterocaulon sphacelatum*, *Arivela viscosa* (species group O) and *Solanum cleistogamum*. This clear species differentiation is due to the landform upon which it occurs, including rocky gorge areas. The vegetation associated with VT 4 was mostly burnt 8.5 years prior to survey (October 2014 burn) (**Photo 5-15**; quadrat in a gorge); however one representative quadrat was burnt 4.5 years prior to survey (November 2017) (**Photo 5-16**; quadrat on a breakaway).	 **Photo 5-15: VT 4 (Quadrat C52)**

VT	Summary	Representative Photograph
5	**Description:** Occasional *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* over mixed isolated shrubs including *Acacia inaequilatera* and *Senna artemisioides* subsp. *glutinosa* over low hummock grassland of *Triodia wiseana* on steep upper slopes and associated drainage lines on red-brown clay loam with exposed ironstone and dolerite **Area mapped:** Study Area – 523.4 ha (13.8 % of Study Area), Development Envelope – not mapped in the DE **Sampling:** Three quadrats (K04; K05; K01) **Indicator taxa:** *Acacia inaequilatera*; *Fimbristylis dichotoma*; *Tephrosia* sp. Newman (A.A. Mitchell PRP 29) **Significant taxa:** NA **Average taxon richness per quadrat:** 27 ± 10 VT 5 is comprised of three quadrats, two of which grouped in the analysis dendrogram, and one of which was manually grouped (K01). VT 5 is mapped in the far north-eastern corner of the Study Area associated with the Mine DE, on an area of higher relief (Sheet 4 of **Appendix J)**. This area is associated with the McKay land system, which although is not extensive in the Study Area extends further northwards (**Figure 5.1**). Although the indicator taxa are widespread in the Pilbara, they commonly occur on stony areas. VT 5 is most closely associated to VT 4, however fewer taxa were recorded in VT 5 and it is lacking the presence of taxa associated with species group Q (representative of VT 4) and K (representative of VTs 4 and 6). Although moderately diverse, most flora taxa provided little cover and the structure of the vegetation was dominated by the few taxa listed in the description. This VT was sampled both on upper slopes (**Photo 5-17**) and associated small drainage lines **(Photo 5-18**). VT 5 was burnt over two occasions in the last ten years; in October 2014 (8.5 years prior to survey) and November 2017 (4.5 years prior to survey). It is unlikely that this fire history has influenced the separation of this VT from the VTs 4 and 6 (group 2), due to the differing land system which this VT occurs and associated differences in geology, soil and microhabitats.	 **Photo 5-16: VT 5 (Quadrat K04)**  **Photo 5-17: VT 5 (Quadrat K05)**

VT	Summary	Representative Photograph
6	**Description:** Low woodland to open woodland of *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* and occasional *E. kingsmillii* over mid isolated shrubs of *Acacia hamersleyensis* and *Grevillea wickhamii* ?subsp. *hispidula* over low hummock grassland of *Triodia wiseana* on red brown sandy clay loam on steep mid to upper slopes with exposed ironstone **Area mapped:** Study Area – 316.6 ha (8.4 % of Study Area), Development Envelope – 3.7 ha (0.4% of the DE) **Sampling:** Nine quadrats (C23; C37; C40; C48; K35; K39; K40; K41; K51); one relevé (CR01) **Indicator taxa:** *Cassytha capillaris*, *Cheilanthes brownii*, *Eucalyptus kingsmillii*, *Scaevola browniana* subsp. *browniana* **Significant taxa:** *Seringia exastia* (T) **Average taxon richness per quadrat:** 25 ± 9 VT 6 was mapped in the same landscape as VT 4, on the range present in the south-eastern corner of the Study Area surrounding the Mine DE, in association with the Newman land system (Sheets 4 and 8 of **Appendix J**). However, VT 6 was recorded and mapped on the steep upper slopes of this range, with VT 4 mapped on the associated gorges and gullies. Quadrat C23 was manually grouped into VT 6, and one relevé was also allocated to VT 6. The species richness was generally less than that recorded in VT 4, however as with previous VTs relatively few of the taxa present contributed significant cover the stratum of the VT. Taxa commonly occurring in VT 6 are from species groups K, B and D, which were all common in VTs in group 2. VT 6 was floristically most similar to VT 4, which is expected as they occur on similar habitats on the same range of hills; however, there was no or little representation of taxa from species group Q, nor some others common to VT 4, for example *Cymbopogon ambiguus* or *Jasminium didymium* subsp lineare (species group C). The indicator taxa of VT 6 are commonly found on hillslopes and ironstone areas, however *Tephrosia* sp. Newman (A.A. Mitchell PSP 29) is also commonly recorded on basalt plains and drainage lines (WA Herbarium 1998-). Of note is *Eucalyptus kingsmillii*, which was not recorded in any other VT, and is mentioned by Beard (1975) as occurring on summits.	 **Photo 5-18: VT** 6 **(Quadrat** C37)  **Photo 5-19: VT 6 (Quadrat K51)**

VT	Summary	Representative Photograph
	The vegetation of this VT was mainly burnt in January 2014 (8.5 years prior to survey) (**Photo 5-19; Photo 5-20**; both quadrats on upper slopes); however, several quadrats were also more recently burnt in November 2017 (4.5 years prior to survey).	
7	**Description:** Isolated trees of *Corymbia hamersleyana*, *Eucalyptus leucophloia* subsp. *leucophloia* and *Eucalyptus xerothermica* over low open to sparse shrubland dominated by *Acacia aptaneura*, *A. aneura* and *A. pruinocarpa* over low tussock grassland to sparse tussock grassland dominated by *Themeda* sp. Mt Barricade (M.E. Trudgen 2471), *Enneapogon polyphyllus*, *Chrysopogon fallax* and *Aristida* spp. with occasional *Triodia pungens* on red brown clay loam with some ironstone pebbles on plains **Area mapped:** Study Area – 523.4 ha (13.8 % of Study Area), Development Envelope – 171.9 ha (19.3 % of the DE) **Sampling:** 16 quadrats (C05; C11; C13; C32; C33; C53; K07; K17; K37; K42; K45; Q03; Q04; Q09; Q14; Q26); 11 quadrats recorded by Rapallo (2021a)) (Q02-Rap; Q05-Rap; Q06-Rap; Q09-Rap; Q10-Rap; Q11- Rap; Q12 -Rap; Q13-Rap; Q14-Rap; Q17-Rap) **Indicator taxa:** *Acacia aptaneura*, *Acacia aneura*, *Acacia ayersiana*, *Acacia acradenia*, *Acacia* ?*ayersiana*, *Acacia pruinocarpa*, *Dactyloctenium radulans*, *Duperreya commixta*, *Enneapogon polyphyllus*, *Enneapogon robustissimus*, *Maireana villosa*, *Perotis rara*, *Ptilotus helipteroides*, *Salsola australis*, *Sclerolaena cornishiana* **Significant taxa:** *Aristida lazaridis* (P2), *Euphorbia ferdinandi* s. lat. (potentially undescribed), *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)^ **Average taxon richness per quadrat:** 52 ± 10 VT7 broadly represents the mulga woodlands and shrublands within the Study Area. Although isolated *Corymbia* and *Eucalyptus* trees were recorded, the dominant upper stratum is the tall shrubland which was typically dominated by mulga species (*A. aptaneura* and *A. aneura* in the Study Area), although other taxa such as *A. pruinocarpa*, *A. atkinsoniana* and *A. ayersiana* were generally present. The lower stratum also differed from the grasslands of the majority of the other VTs, being dominated by taxa other than the ubiquitous *Triodia*. However, common to other VTs presented each stratum were dominated by relatively few taxa.	 **Photo 5-20: VT 7 (Quadrat C11)**

VT	Summary	Representative Photograph
	Several indicator taxa, including *Maireana villosa*, *Salsola australis* and *Sclerolaena cornishiana* highlight the higher salinity of the soils on which this VT was mapped. VT 7 contained taxa from species groups F-J which were not well represented in other VTs; however, common taxa were those from species group C (**Appendix H**). The average species richness of this VT was higher than all others recorded in group 3. VT 7 was mapped on the Boolgeeda land system and in association with the Hamersley_18 VSA. VT 7 was mapped relatively widespread in the Study Area adjacent to the GNHI DE (Sheets 10 and 11 of **Appendix J**), in the Access Rd DE (Sheets 2, 5 and 9 of **Appendix J**) and in the section of the Mine DE west of the ranges in the Study Area, on plains downslope of areas of mapped VT 1 and in the vicinity of Mine Creek which occurs in this area (VT 10) (Sheets 2 and 3 of **Appendix J**). The mapped area in the vicinity of the GNHI DE is at the upper reaches of a drainage system which flows north-eastwards around the hills associated with the Gaguna heritage area towards the Mine DE within the Study Area. The majority of quadrats of VT 7 have not been burnt in the past 10 years (**Photo 5-21)**; several were burnt in October 2015 (6.5 years prior to survey) (**Photo 5-22**; quadrat showing recovery after the last burn, approximately 6.5 years prior to survey); and one quadrat was burnt in November 2017 (4.5 years prior to survey). A split in the analysis dendrogram for VT 7 separates the quadrats near the GNHI DE and Access Rd DE apart from those in the Study Area associated with the Mine DE (Appendix G), however, floristic differences are minor and do not warrant further splitting of this VT.	 **Photo 5-21: VT 7 (Quadrat K07)**

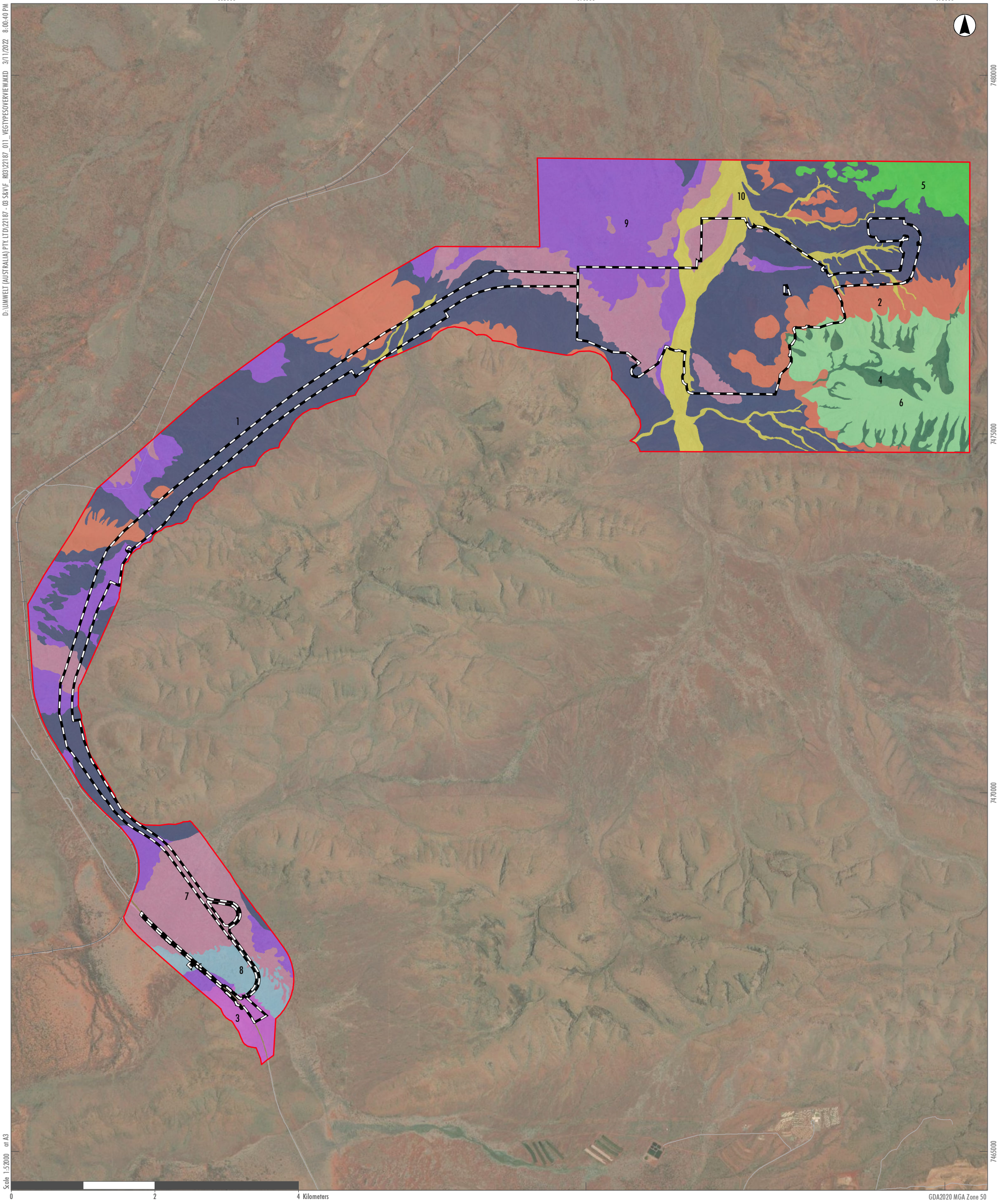
VT	Summary	Representative Photograph
8	**Description:** Isolated trees of *Eucalyptus xerothermica* over tall open to sparse shrubland of *Hakea lorea* subsp. *lorea* and *Acacia aptaneura* over low open tussock grassland of *Aristida contorta*, *A. inaequiglumis* and *Themeda triandra* on red-brown sandy clay to clay on plains **Area mapped:** Study Area – 68.9 ha (1.8 % of Study Area), Development Envelope – 3.6 ha (0.4% of the DE) **Sampling:** Three quadrats (K49; Q19; Q24); two Rapallo quadrats (Q23-Rap; Q27-Rap) **Indicator taxa:** *Abutilon otocarpum*, *Alternanthera nana*, *Aristida inaequiglumis*, *Chrysopogon fallax*, *Digitaria ammophila*, *Eremophila lanceolata*, *Goodenia nuda*, *Panicum effusum*, *Panicum decompositum*, *Ptilotus obovatus*, *Sida platycalyx*, *Sida* sp. L (A.M. Ashby 4202) **Significant taxa:** *Aristida jerichoensis* var. *subspinulifera* (P3)^, *Aristida lazaridis* (P2)^, *Euphorbia Euphorbia ferdinandi* s.lat (potentially undescribed)^, *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) **Average taxon richness per quadrat:** 31 ± 4 VT 8 is most closely floristically related to VT 7 and is mapped in proximity to that VT in the southern end of the Study Area, adjacent to the GNHI DE (Sheets 10 and 11 of **Appendix J**). Both the species richness per quadrat and diversity were lower in comparison to VT 7, generally lacking in taxa in species groups D – I, and a portion of C, which were common to VT 7. A variety of mid stratum taxa were present, however as with other described VTs foliage covers were generally very low. Indicator taxa generally occur on a variety of stony loams, plains, mulga hardplain and stony flats. VT 8 is most closely associated with the Wannamunna land system, which although poorly represented in the Study Area extends outside of the Study Area in both a westerly and easterly direction (**Figure 5.1**). One quadrat in this VT (K49) was established in a small area of cracking clay, on the south-western side of the Great Northern Highway; the cracking clay is limited to this side of the GNH in the Study Area, however extends further to the west outside of the Study Area (by review of aerial photography). The vegetation in this area is generally long unburnt (>10 years) (**Photo 5-23)**, although one quadrat in this VT was burnt in October 2015 (6.5 years prior to survey) (**Photo 5-24).**	 **Photo 5-22: VT 8 (Quadrat Q19)**  **Photo 5-23: VT 8 (Quadrat Q24)**

VT	Summary	Representative Photograph
9	**Description:** Low open woodland of *Corymbia hamersleyana*, *C. deserticola* subsp. *deserticola*, *Eucalyptus gamophylla* and *Eucalyptus leucophloia* subsp. *leucophloia* over tall sparse shrubland of *Acacia atkinsoniana* and occasional *A. ancistrocarpa* and *A. aptaneura* over low hummock grassland dominated by *Triodia pungens* and occasional *T. wiseana* with *Paraneurachne muelleri* also dominant on red-brown clay loam with ironstone pebbles on plains **Area mapped:** Study Area – 600.8 ha (15.9 % of Study Area), Development Envelope – 102.1ha (11.5 % of the DE) **Sampling:** 17 quadrats (C06; C07; C10; C12; C14; C28; C38; C39; C50; C54; K08; K09; K11; K25; K38; K52: Q01) **Indicator taxa:** *Goodenia microptera*, *Hibiscus burtonii*, *Hibiscus sturtii* var. *platychlamys*, *Paraneurachne muelleri*, *Vincetoxicum lineare* **Significant taxa:** *Aristida lazaridis* (P2), *Corchorus* sp. (potentially undescribed)^, *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) **Average taxon richness per quadrat:** 49 ± 11 VT9 is mapped on the Boolgeeda land system, and the Hamersley_18 VSA, on plains in the Study Area to the north-west of the Mine DE (Sheets 2 and 3 of **Appendix J**), along the Access Rd DE (Sheets 1, 2, 5,9 and 10 of **Appendix J**) and in the GNHI DE portions of the Study Area (Sheets 10 and 11 of **Appendix J**). It is associated with areas mapped as VT 7, and mulga was recorded as commonly occurring within this VT (*A. aptaneura* and *A. aneura*), however the lower stratum is dominated by *Triodia* species. Floristically it is most similar to VT 10, however having less representation of taxa from species groups A and B and greater representation from species group C; with taxa in group D also commonly present (**Appendix H**). A variety of forbs and shrubs were recorded in this VT, however the vast majority had little foliage cover and did not dominate any stratum. Indicator taxa for VT 9 are commonly recorded on a variety of habitats including plains, drainage lines, sandplains and footslopes. A split in the analysis dendrogram roughly separates quadrats located on the Access Rd DE (lower branch) from those quadrats occurring in and northwards of the Mine DE (upper branch) portions of the Study Area, however floristic differences between the two branches are minor and do not warrant further separation and may be related to differences in burn age. Approximately half of this VT is long unburnt	 **Photo 5-24: VT 9 (Quadrat K52)**  **Photo 5-25: VT 9 (Quadrat K38)**

VT	Summary	Representative Photograph
	(more than 10 years) (Study Area in the vicinity of the Mine DE) (**Photo 5-25)**; the rest had a scattering of burn ages, between January 2014 (8.5 years prior to survey) and November 2017 (4.5 years prior to survey) (**Photo 5-26).**.	
10	**Description:** Low open woodland of *Corymbia hamersleyana* with occasional *Eucalyptus gamophylla*, *E. leucophloia* subsp. *leucophloia* and *E. xerothermica* over tall open shrubland dominated by taxa including *Acacia cowleana*, *A. tumida* var. *pilbarensis*, *Gossypium robinsonii* and *A. pyrifolia* over low open hummock grassland of *Triodia pungens* and tussock grassland dominated by *Themeda* sp. Mt Barricade (M.E. Trudgen 2471) and *Aristida* spp. on red-brown clay loams on major and minor drainage lines **Area mapped:** Study Area – 215.5 ha (5.7 % of Study Area), Development Envelope – 67.5 ha (7.6 % of the DE) **Sampling:** 17 quadrats (C06; C07; C10; C12; C14; C28; C38; C39; C50; C54; K08; K09; K11; K25; K38; K52: Q01) **Indicator taxa:** *Afrohybanthus aurantiacus*, *Androcalva luteiflora*, ?*Androcalva loxophylla*, *Bonamia erecta*, *Corchorus crozophorifolius*, *Corymbia hamersleyana*, *Crotalaria medicaginea* var. *neglecta*, *Dodonaea lanceolata* var. *lanceolata*, *Euphorbia australis* var. *subtomentosa*, *Evolvulus alsinoides* var. *decumbens*, *Evolvulus alsinoides* var. *villosicalyx*, *Gomphrena canescens* subsp. *canescens*, *Gossypium australe*, *Indigofera monophylla*, *Melhania oblongifolia*, *Nellica maderaspatensis*, *Polymeria ambigua*, *Senna artemisioides* subsp. *oligophylla*, *Setaria surgens*, *Sida* sp. spiciform panicles (E. Leyland s.n. 14/8/90), *Themeda* sp. Mt Barricade (M.E. Trudgen 2471), *Themeda triandra*, *Waltheria indica* **Significant taxa:** NA **Average taxon richness per quadrat:** 63 ± 13 VT10 is mapped on the Boolgeeda land system, and the Hamersley_18 VSA, on drainage lines in the centre of the Study Area associated with the Mine DE (Sheets 3, 4, 7 and 8 of **Appendix J**). Floristically it similar to VT 9, however it has greater representation of taxa from species groups A and B (**Appendix H)**. The indicator species were representative of taxa which commonly occur on drainage lines, flats and broad plains, with some taxa recorded on drainage lines associated with rocky areas.	 **Photo 5-26: VT 10 (Quadrat C45)**

VT	Summary	Representative Photograph
	A split in the analysis dendrogram roughly separates quadrats located on and near Mine Creek in the centre of the Mine DE (**Photo 5-28)** from those on smaller tributaries feeding into Mine Creek (**Photo 5-27)**; however, differences are minor and do not warrant splitting the VT. All quadrats had been burnt in November 2017 (4.5 years since fire). Although the majority of the VTs of the Study Area had relatively small areas of less than Excellent condition, VT 10 had the greatest extent of vegetation mapped as either Very Good or Good. This is due to the nature of drainage areas which both tend to collect seed from upstream areas, and also attract animals which may have been feeding in or otherwise inhabiting or crossing through areas of greater weed loading associated with water gaining areas.	 **Photo 5-27: VT 10 (Quadrat K18)**

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&V\F_R03\22187_011_VEGTYPESOVERVIEW.MXD 3/11/2022 8:00:40 PM



Legend

Study Area

Proposed Development Envelope

Vegetation Types

1
2
3
4
5
6
7
8
9
10
C

FIGURE 5.9

Overview of Vegetation Types of the Study Area

D:\UMWELT (AUSTRALIA) PTY LTD\22187 - 03 S&V\F_R03\22187_011_VEGTYPESOVERVIEWLEGEND.MXD 3/11/2022 8:02:23 PM

Legend

Vegetation Types

1 Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and/or *E. gamophylla* with isolated *Corymbia deserticola* subsp. *deserticola* over low to mid sparse to open shrubland dominated by species including *Acacia atkinsiana* and *A. ancistrocarpa* over low open hummock grassland of *Triodia pungens, T. vanleeuwenii* and *T. wiseana* and low open tussock grassland of *Themeda* sp. Mt Barricade (M.E. Trudgen 2471) and *Paraneurachne muelleri* on red-brown sandy clay loam to clay loam on gently inclined mid to lower slopes and associated drainage lines

2 Low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia* with occasional *Corymbia deserticola* subsp. *deserticola* and *C. hamersleyana* over low sparse shrubland of *Acacia hilliana* and *Hakea chordophylla* over open hummock grassland of *Triodia vanleeuwenii* and *T. wi*seana on red-brown clay loam with ironstone pebbles on gently inclined lower to upper slopes

3 Isolated trees of *Corymbia hamersleyana, Eucalyptus leucophloia* subsp. *leucophloia* and *E. gamophylla* over low sparse shrubland of mixed Acacia species over low hummock grassland of *Triodia pungens* and *T. wiseana* on red-brown sandy clay loam on mid to lowerslopes with ironstone pebbles

4 Low open woodland of *Corymbia ferriticola* or *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* with *Ficus brachypoda* occurring on gorge and gully areas, over low sparse shrubland of mixed species dominated by *Corchorus laniflorus, Dodonaea viscosa* subsp. *mucronata* and *Gossypium robinsonii* over sparse hummock grassland dominated by *Triodia pungens* with *T. wiseana* and tussock grasses including *Cymbopogon ambiguus* and *Aristida burbidgeae* on red brown clay loam on steep upperslopes, gullies, breakaways and gorges with significant ironstone outcropping

5 Occasional *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* over mixed isolated shrubs including *Acacia inaequilatera* and *Senna artemisioides* subsp. *glutinosa* over low hummock grassland of *Triodia wiseana* on steep upperslopes and associated drainage lines on red-brown clay loam with exposed ironstone and dolerite

6 Low woodland to open woodland of *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* and occasional *E. kingsmillii* over mid isolated shrubs of *Acacia hamersleyensis* and *Grevillea wickhamii* ?subsp. *hispidula* over low hummock grassland of *Triodia wiseana* on red brown sandy clay loam on steep mid to upperslopes with exposed ironstone

7 Isolated trees of *Corymbia hamersleyana, Eucalyptus leucophloia* subsp. *leucophloia* and *Eucalyptus xerothermica* over low open to sparse shrubland dominated by *Acacia aptaneura, A. aneura* and *A. pruinocarpa* over low tussock grassland to sparse tussock grassland dominated by *Themeda* sp. Mt Barricade (M.E. Trudgen 2471), *Enneapogon polyphyllus, Chrysopogon fallax* and *Aristida* spp. with occasional *Triodia pungens* on red brown clay loam with some ironstone pebbles on plains

8 Isolated trees of *Eucalyptus xerothermica* over tall open to sparse shrubland of *Hakea lorea* subsp. *lorea* and *Acacia aptaneura* over low open tussock grassland of *Aristida contorta, A. inaequiglumis* and *Themeda triandra* on red-brown sandy clay to clay on plains

9 Low open woodland of *Corymbia hamersleyana, C. deserticola* subsp. *deserticola, Eucalyptus gamophylla* and *Eucalyptus leucophloia* subsp. *leucophloia* over tall sparse shrubland of *Acacia atkinsoniana* and occasional *A. ancistrocarpa* and *A. aptaneura* over low hummock grassland dominated by *Triodia pungens* and occasional *T. wiseana* with *Paraneurachne muelleri* also dominant on red-brown clay loam with ironstone pebbles on plains

10 Low open woodland of *Corymbia hamersleyana* with occasional *Eucalyptus gamophylla, E. leucophloia* subsp. *leucophloia* and *E. xerothermica* over tall open shrubland dominated by taxa including *Acacia cowleana, A. tumida* var. *pilbarensis, Gossypium robinsonii* and *A. pyrifolia* over low open hummock grassland of *Triodia pungens* and tussock grassland dominated by *Themeda* sp. Mt Barricade (M.E. Trudgen 2471) and *Aristida* spp. on red-brown clay loams on major and minor drainage lines

C Cleared Land (road and verge)

FIGURE 5.9

LEGEND - Overview of Vegetation Types of the Study Area

5.2.9 Significant Vegetation

The desktop assessment did not identify any EPBC or DBCA-listed significant vegetation communities with records within the Desktop Study Area (**Section 5.1.5**). The closest significant vegetation record to the Study Area is an occurrence of the 'Coolibah-lignum flats: *Eucalyptus victrix* over lignum community in the Pilbara - sub type 2: Coolibah woodlands over lignum (*Duma florulenta*) over swamp wanderrie (Lake Robinson)' PEC (P1); the edge of this PEC's buffer polygon is approximately 3 km south of the Study Area (**Figure 5.6**). In addition, sub type 1: Coolibah and mulga (*Acacia aneura*) woodland over lignum and tussock grasses on clay plains (Coondewanna Flats and Wanna Munna Flats)' PEC (P3) may occur in the Desktop Study Area (see **Section 5.1.5**). Lake Robinson is the only known occurrence of sub type 2 (DBCA 2022a) and mapping by Onshore indicates both sub types are restricted to flats associated with Lake Robinson (see **Section 5.1.5**). In addition, there were no occurrences of *Eucalyptus victrix* or *Duma florulenta* within the Study Area, this PEC is not considered to occur in the Study Area. Likewise, the VTs mapped within the Study Area are not considered to represent any other listed PECs (DBCA 2022a) or TECs (DAWE 2021a; DBCA 2018).

One small area of cracking clay was recorded in the Study Area; this area was mapped within a polygon of VT 8 on the southern side of the Great Northern Highway. This area was too small to be sampled by a quadrat. It is possible that if the Study Area were to extend further to the west to capture larger areas of cracking clay, and these areas were sampled with quadrats, floristic analysis may determine that the vegetation occurring on this cracking clay would represent a VT discrete from VT 8. The PEC 'Brockman Iron cracking clay communities of the Hamersley Range' is known to occur in the wider region surrounding the Study Area; however, the dominant taxon associated with this PEC (*Astrebla lappacea* (P3)) was not identified in this area; this area is also not located on the Brockman land system. The small area of cracking clay identified in the Study Area is therefore not considered to represent this PEC.

None of the VTs described in the Study Area by the 2022 survey are considered to be significant for reasons other than formal listing (**Section 3.9.2**). No vegetation is considered to have a significant degree of historical impact due to threatening processes; historical clearing for exploration has been limited in the Study Area, and weeds are not widespread. Likewise, no VTs are considered to be providing important functions required to maintain ecological integrity of a significant ecosystem. VT 4 could be considered to provide a role as a refuge, due to the presence of gorges, gullies and steep cliffs which could provide both micro habitats for refuge species to occur, and also protect from significant, repeated burning. No flora taxa recorded in the survey in VT 4 are considered restricted across the region, and both Priority flora known to occur in VT 4 have widespread regional extents (*Eremohila naaykensii* (P3) and *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)), although they are restricted to similar habitats such as those characteristic to VT 4. As such, although VT 4 does contain refugia-type habitat it is not considered significant in a regional context.

Based on field observations and aerial photography interpretation, all VTs mapped in the Study Area are either known to, or considered likely to, extend outside the Study Area to some extent, and are not considered to be restricted in distribution. All are associated with both soil landscape systems and VSAs which are not restricted in the region.

VTs 3, 4, 5 and 8 can be considered locally restricted within the Study Area, each being mapped over less than 3 % of the total area of the Study Area; this is considered an artefact of the location and extent of the Study Area:

- VT 4 is associated with the steep cliffs and gorges in the hills in Study area to the south-east of the Mine DE. It is considered likely that similar vegetation occurs on ranges to the east of the Study Area.
- VT 5 is associated with the hills in the north-east of the Study Area associated with the McKay soil landscape system which is poorly represented in the Study Area. It is considered that this VT extends further outside of the Study Area to the north and east, and that the limited representation is an artefact of the Study Area extent and location.
- VT 3 was mapped in the far southern extent of the GNHI section of the Study Area and was associated with the area mapped as 'A' (Low open *Eucalyptus gamophylla* woodland over *Triodia melvillei* and *T. pungens* on stony plain) by Rapallo (2021a). It is considered likely that this VT extends further to the south-west based on review of aerial photography, and its association with Boolgeeda land system.
- VT 8 is associated with mulga on the Wannamunna land system, corresponding with the area mapped as VT 'D' (Mulga, *Hakea lorea* and *Eucalyptus xerothermica* low open woodland over closed tussock grassland on gently-sloping clay-loam plain) by Rapallo (2021a). The Wannamunna land system is restricted within the Study Area, extending to the south and west. It is considered that this VT extends in these directions outside of the Study Area.

As no Pilbara-wide vegetation dataset defined at the same scale at which the Study Area VTs were defined is available, it is not possible to conclusively assess the significance of VTs in a regional context. However, based on the overall taxon composition of the VTs mapped, it is likely that these would be relatively widespread in the general region surrounding the Study Area; additionally, the landforms and geology with which the VTs are associated are known to occur widely in the region (**Section 5.1.2**). Although several VTs are considered preferred habitat for significant flora taxa, none of the listed taxa have particularly restricted distributions; the most restricted is *Aristida lazaridis* (P2) with a known range of 130km (**Section 5.2.3.2**). This taxon is associated with VTs 7 and 8 in and near the Study Area in the vicinity of the GNHI; Rapallo (2021b) recorded this taxon as occurring further northwards outside of the Study Area, and therefore it is likely that this habitat extends outside the Study Area.

5.2.10 Surface and Groundwater Dependent Vegetation

The main surface water feature of the Study Area is located in association with the Mine DE (Mine Creek, a tributary flowing northwards to Marillana Creek). This drainage feature allows for drainage around the hills associated with the Gaguna heritage area, as well as the range present in the south-east and north-east of the Study Area associated with the Mine DE. Other minor ephemeral drainage features direct water from rain events (including cyclones) from the hills crossing into both the GNHI DE and Access Rd DE portions of the Study Area. None of the drainage features in the Study Area hold permanent water, and are ephemeral creeklines during and post-wet season, particularly after larger rainfall events. The vegetation downstream of these ephemeral creeklines, in particular the Mine Creek, may be reliant on periodic inundation after such events.

Groundwater dependent terrestrial vegetation (GDV) is a component of Groundwater Dependent Ecosystems (GDEs), and is at least partly composed of phreatophytic species - those that use groundwater to meet some or all of their water requirements (Clifton *et al*., 2007a). As a minimum groundwater is usually relied upon during seasonal or episodically dry periods such as droughts. Phreatophytes are usually deep-rooted perennial species that rely on groundwater sources for water uptake (Busch *et al*., 1992). These species are often found within the riparian zones of permanent and ephemeral rivers, creeks and

wetlands where water tables are often very close to the ground surface. Phreatophytes are divided into 2 main groups:

- Obligate phreatophytic vegetation is completely reliant on access to groundwater to survive, including riverine species such as *Melaleuca argentea* and *Eucalyptus camaldulensis* (Loomes & Braimbridge, 2010). This reliance can be continual, seasonal or episodic and is often highly sensitive to alterations in groundwater regimes.

- Facultative phreatophytes rely on groundwater only during extended periods of drought. These are generally deep-rooted species occurring on floodplains and higher in the landscape away from very shallow groundwater aquifers. These species tend to be less sensitive to changes in groundwater regimes, however may suffer stress during prolonged periods of drought.

Vegetation can be considered as a candidate for GDV when the groundwater is 0-10 mbgl, based on the known habitat preferences and apparent drawdown susceptibility of phreatophytic taxa (Loomes and Braimbridge, 2010; Braimbridge & Loomes, 2013). As the depth to groundwater in the Study Area is presumed to be >10m (as referred to by PSM 2021), the vegetation is unlikely to be groundwater dependent. The presence of phreatophytic taxa from the Pilbara region is used to assist in determination of likelihood of associated vegetation being GDV; a number of phreatophytic flora species are known from the Pilbara region including:

- *Melaleuca argentea* (obligate phreatophyte): occurs along rivers and creeklines in the Pilbara, and can also be associated with permanent pools (Department of Water, 2009). *Melaleuca argentea* is an obligate phreatophyte at all locations where it occurs; however, it will utilise surface water sources such as floodwaters and river flows when available (O'Grady *et al*., 2002). *M. argentea* appears to be the most sensitive to changes in groundwater regimes according to literature, due to its shallow planiform root system adapted to areas of very shallow groundwater (2-3m below ground level) (Graham (2001); it has difficulty adjusting to short periods of dry conditions (Loomes & Braimbridge, 2010).

- *Eucalyptus camaldulensis* (obligate phreatophyte when in close proximity to groundwater, facultative in areas with deeper groundwater resources): a riparian tree species of the Pilbara and is commonly found on rivers and creeklines mostly occurring where the groundwater is less than 10 mbgl (Loomes, 2010). As such, *Eucalyptus camaldulensis* is treated as an obligate phreatophyte in situations where the groundwater source is within 10m of the surface, though its reliance on groundwater is likely to be less in areas where surface water (such as floodwaters and river flows) is the primary source of water.

- *Sesbania formosa* is also considered likely to be an obligate phreatophyte, as it is restricted to alluvial soils in rivers or major creeks, potentially indicating high groundwater use (Department of Water 2010). No published data was available that describes this taxon's reliance on groundwater or sensitivity to drawdown.

- *Eucalyptus victrix* (facultative phreatophyte): known to occur on drier locations in comparison to *E. camaldulensis* or *M. argentea*; it is treated as a facultative phreatophyte in most situations but is a vadophyte due to its ability to access water in the unsaturated vadose soil zone above the water table. It is worth noting that the vadose zone is itself dependent on the presence of a groundwater layer.

- *Melaleuca glomerata*, *Atalaya hemiglauca*, *Acacia ampliceps* and *Melaleuca linophylla* appear to generally be considered at least partially facultative phreatophytes, primarily based on their presence

in major river channels where groundwater is known to be close to the surface (Loomes 2010a, 2010b; Loomes and Braimbridge 2010). However, this appears to not have been substantiated by any specific investigation; only Loomes (2010a) has investigated depth to water ranges for some of these species, however this investigation considered a limited number of sample sites, all of which were in significant drainage channels.

No obligate phreatophytes were recorded in the Study Area, and likewise *Eucalyptus victrix* was not recorded. The only potential facultative-phreatophyte listed above recorded in the Study Area is *Atalaya hemiglauca*, which typically occurs on floodplains and creeklines higher in the topography where groundwater levels exceed 3-5 mbgl; it can also be found on sandstone ridges (Loomes, 2010; WA Herbarium, 1998). Although this species requires moist soil conditions it is more tolerant of prolonged periods of drought and are likely to access other sources of moisture such as clays within the soil profile (Loomes & Braimbridge, 2010). This taxon may only rely upon groundwater during extended drought periods and may suffer stress if a significant dry period coincides with a period of groundwater drawdown, if indeed those individuals are relying on a groundwater source. Observations by Woodman Environmental Consulting (unpublished) of vegetation being supported by shallow groundwater in the Pilbara subjected to drawdown saw impacts to obligate phreatophytes *Melaleuca argentea* and *Eucalyptus camaldulensis*; however, co-occurring individuals of *Atalaya hemiglauca* were not affected.

Atalaya hemiglauca was recorded in one quadrat in VT 5 (associated with a minor drainage line), and three quadrats in VT 10, associated with Mine Creek, the main drainage line in the centre of the Study Area associated with the Mine DE. It is unlikely that this system represents GDV, as no other phreatophytic taxa were recorded, and *A. hemiglauca* was present only in low densities (percentage foliage cover ranged between 0.1-1%). The presence of *Atalaya hemiglauca* alone is not considered justification for categorising this area as GDV.

5.2.11 Vegetation Condition

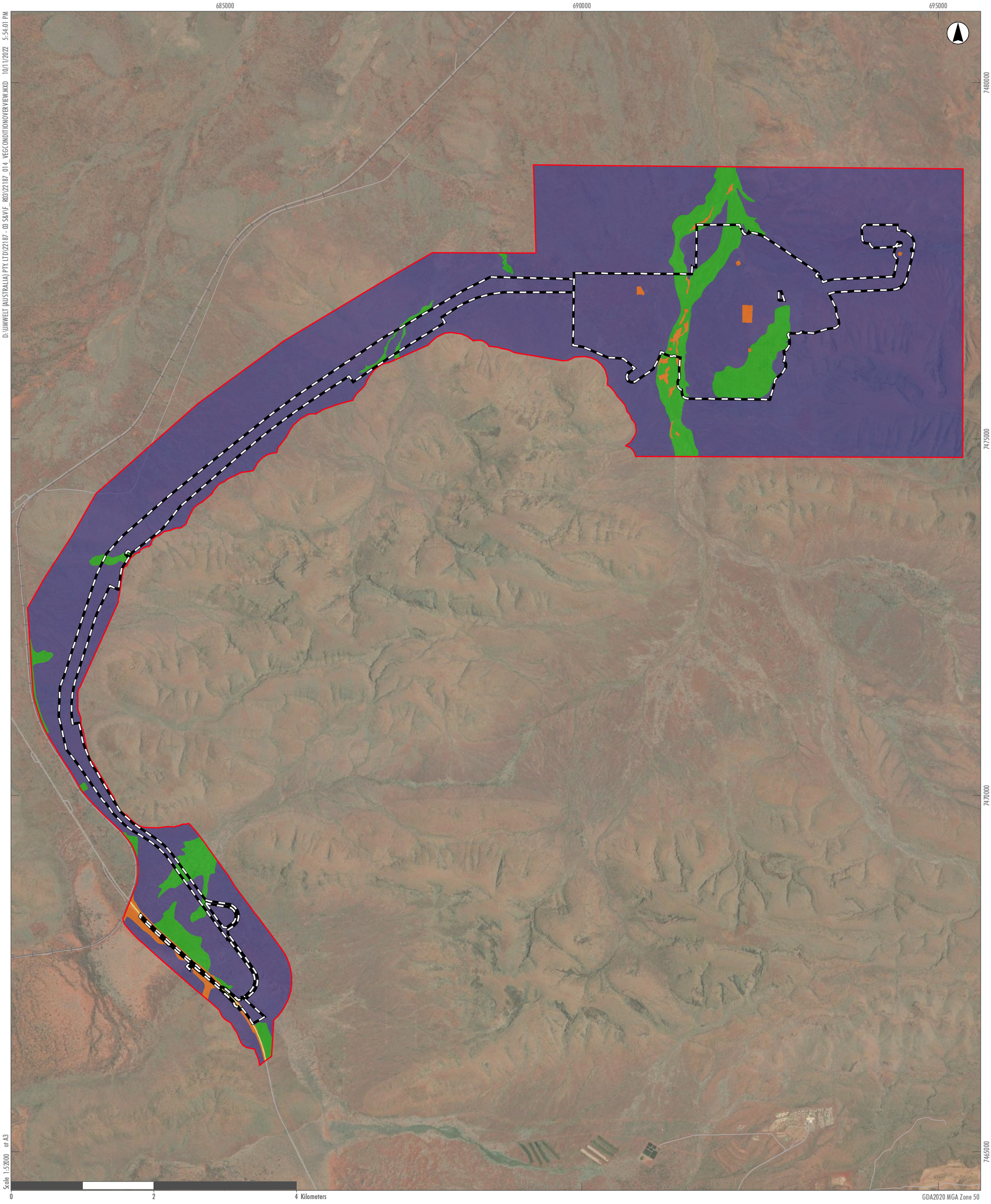
Table 5.11 presents the area (ha) of each VT and corresponding condition rating (as per EPA 2016b; **Appendix A**) mapped in the Study Area by the 2022 survey. An overview of vegetation condition mapping is presented in **Figure 5.10**, with detailed vegetation condition mapping, including locations of introduced flora taxa recorded in the Study Area, presented in **Appendix M**.

The condition of the vegetation in the Study Area was rated Good to Excellent. The majority of the vegetation (90.5 %) rated as Excellent, with no obvious signs of damage caused by human activities. The remainder of the vegetation was rated as Very Good and Good (8.2 % and 1.2 % respectively), with some historical mechanical disturbance, introduced flora taxa dominating the lower stratum in some flowlines, and otherwise low levels of introduced flora taxa across the Study Area. Areas where natural vegetation has been completely and apparently permanently removed, with no native taxa remaining were mapped as 'Cleared' (C) and not subjected to rating under the condition scale. Areas mapped as cleared included Great Northern Highway only, with small, potentially temporary cleared areas such as minor tracks and clearing associated with exploration, not mapped as cleared. Less than 1 % of the Study Area (4.6 ha) was mapped as cleared.

Occasional weeds only were present in VTs 2, 4, 6 and 9. There were higher levels of aggressive weed taxa including *Cenchrus ciliaris* and *Cenchrus setiger*, generally present in high numbers within flowlines in VT 10, and disturbed areas within VT 7 to a lesser extent. VT 10 was most impacted by disturbance with the majority of this VT (over 70 %) rated as Very Good.

Table 5.11 Vegetation Condition Ratings for VTs Described in the Study Area

VT	Excellent (ha)	Very Good (ha)	Good (ha)	Poor (ha)	Degraded (ha)	Completely Degraded (ha)	Cleared
1	1387.6	37.6	3.9	-	-	-	
2	355.1	27.3	-	-	-	-	
3	35.5	6.8	5.8	-	-	-	
4	94.6	0.7	-	-	-	-	
5	100.9	-	-	-	-	-	
6	315.8	0.8	-	-	-	-	
7	441.6	66.3	15.5	-	-	-	
8	61.9	4.1	2.9	-	-	-	
9	585.3	10.1	5.4	-	-	-	
10	48.9	155.3	11.3	-	-	-	
Cleared	-	-	-	-	-	-	4.6
Total	**3427.3**	**309.0**	**44.8**	**0**	**0**	**-**	**4.6**
Percentage of Study Area	**90.5**	**8.2**	**1.2**				**0.1**



Legend

- Study Area
- Proposed Development Envelope

Vegetation Condition

- Excellent
- Very Good
- Good
- Cleared

FIGURE 5.10

Overview of Vegetation Condition of the Study Area

6.0 Conclusions

The species diversity (328 taxa across the Study Area) is moderately diverse in comparison to other Pilbara flora studies conducted across the region and is commensurate with those recorded in nearby ranges; for example, Onshore Environmental (2011; 2012) reported totals of 479 and 386 flora taxa known to date at Area C and South Flank respectively, both study areas of which are located in relatively close proximity to the south of the Study Area. A total of 206 flora taxa, and 219 flora taxa were recorded by Onshore Environmental (2011) in their northern and southern study areas within Area C respectively during that particular survey. The species diversity of the Study Area is comprised of a number of annual, short-lived perennial and perennial forbs and small shrubs and grasses which may be associated with the large-scale burns which affected the Study Area within the last five years. The highest mean species richness per quadrat were recorded in VTs 10 (major and associated minor drainage lines), VT 4 (gorges and steep rocky gullies) and VT 7 (predominantly mulga woodlands).

A diversity of Vegetation Types (VTs) were recorded across the 3,785 ha study area, due to the variety of landforms and soil types present. No VTs are considered to represent any listed PEC or TEC, nor are they considered regionally significant vegetation for any other reason, and are likely to be represented elsewhere. The gorges, gullies and steep cliffs of VT4 could be considered locally significant in providing refuge and protection from significant repeated burning, however permanent water in the form of pools or creeks was not observed at time of survey. The significant taxa known from VT 4 are restricted to such gorge habitat, however these taxa and habitats have widespread regional extents. Three VTs (3, 5, and 8) have limited extents within the Study Area, however this is considered an artifact of the location and extent of the Study Area.

The potentially undescribed *Corchorus* sp. is considered taxonomically significant as it is not able to be matched to any other specimen within the WA Herbarium collection. The WA Herbarium has advised that a precautionary approach would also see it regarded as a plant of conservation significance, whilst noting that its poorly collected nature and potential geographical restriction make this difficult to formally assess (M. Hislop, *pers. comm*. June 2022). Six specimens of *Corchorus* sp. from the 2022 survey have been submitted for lodgement with the WA Herbarium to facilitate this assessment going forward.

The potentially undescribed entity *Euphorbia ferdinandi* s. lat is currently under review by the WA Herbarium, with a comparison to an Eastern Australia species of similar morphology underway. In response to consultation the WA Herbarium have advised in the interim to treat the entity as a plant of taxonomic significance (M. Hislop, *pers. comm.* August 2022).

7.0 References

Astron Environmental Services Pty Ltd (Astron) (2019)
Area C West to Yandi Flora and Vegetation Assessment. Unpublished report (2465-18-BISR-1Rev0_190329, Rev 0) prepared for BHP Billiton Iron Ore Pty Ltd; p. 256.

Atlas of Living Australia (ALA) (2022)
The Australasian Virtual Herbarium. Council of Heads of Australasian Herbaria. Available: http://avh.chah.org.au. Accessed August, 2022.

Beard, J.S. (1975)
Vegetation Survey of Western Australia, Pilbara 1:1 000 000. Map and Explanatory Notes to Sheet 7. University of Western Australia Press, Perth.

Beard, J.S. (2015)
Plant Life of Western Australia. 2nd edn. Rosenberg Publishing Pty Ltd, Sydney.

Belbin, L. and Collins, A. (2013)
PATN. Version 4.0, Blatant Fabrications Pty Ltd. Griffith University, Brisbane, Queensland.

Binks, R. M., Wilkins, C. F., Markey, A. S., Lyons, M. N., & Byrne, M. (2020)
Genomic data and morphological re-assessment reveals synonymy and hybridisation among Seringia taxa (Lasiopetaleae, Malvaceae) in remote north-western Australia. *Taxon*, *69*(2), 307–320. https://doi.org/10.1002/tax.12233

Biologic Environmental Survey Pty Ltd (Biologic) (2017)
Ministers North to Yandi Corridor Single Phase Level 2 Fauna and Detailed Flora/Vegetation Survey. Unpublished report (Final) prepared for BHP Billiton Iron Ore Pty Ltd; p. 36.

Biota Environmental Sciences Pty Ltd (Biota) (2014)
Baby Hope Downs Flora and Vegetation Survey. Unpublished report (1049, V10) prepared for Rio Tinto Ltd; p. 194.

Biota Environmental Sciences Pty Ltd (Biota) (2019)
West Angelas Gas Pipeline Native Vegetation Clearing Permit (B-2018-007). Unpublished report (1361, Rev 1) prepared for Rio Tinto Ltd; p. 134.

Braimbridge, M., & Loomes, R. (2013).
Ecological water requirements of the Yule River aquifer (Report no. 24; Environmental Water Report Series). Department of Water.

Burbidge, Nancy (1942)
Ecological succession observed during regeneration of *Triodia pungens*, R. Br. After burning. In: *Journal of the Royal Society of Western Australia*. Vol. 18: pages 149-156, published 1942.

Busch, D., Ingraham, N., & Smith, S. (1992).
Water uptake in woody riparian phreatophytes in the southwestern United States: A Stable Isotope Study. *Ecological Applications*, *2*(4).

Bureau of Meteorology (BoM) (2018)
Frequently Asked Questions – Tropical Cyclones. Available: http://www.bom.gov.au/cyclone/faq/index.shtml#definitions.

Bureau of Meteorology (BoM) (2022a)
Climate Statistics for Australian Locations – Karijini North / Newman Aero. Available: http://www.bom.gov.au/climate/data/. Accessed July 2022.

Bureau of Meteorology (BoM) (2022b)
Groundwater Dependent Ecosystems Atlas. Available: http://www.bom.gov.au/water/groundwater/gde/map.shtml. Accessed April 2020. Accessed July 2022.

Chao, A. (1987)
Estimating the population size for capture-recapture data with unequal catchability. Biometrics 43:783-791.

Chao, A., Ma, K. H., Hsieh, T. C. and Chiu, C.-H. (2016)
SpadeR: Species-Richness Prediction and Diversity Estimation with R (version 0.1.1). https://CRAN.R-project.org/package=SpadeR

Clifton, C., Resource and Environmental Management Pty Ltd., CSIRO. Land and Water, Sinclair Knight Merz (Firm), & Land and Water Australia. (2007a).
A Framework for assessing the Environmental Water Requirements of Groundwater dependent Ecosystems (Report 1: Assessment Toolbox). Resource and Environment Management.

Clifton, C., Resource and Environmental Management Pty Ltd., CSIRO. Land and Water, Sinclair Knight Merz (Firm), & Land and Water Australia. (2007b)
A Framework for assessing the Environmental Water Requirements of Groundwater dependent Ecosystems (Report 3: Implementation). Resource and Environment Management.

Department of Agriculture, Water and the Environment (DAWE) (2020)
Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions). Spatial data. Last updated 27 October 2020. Available: http://www.environment.gov.au/fed/catalog/main/home.page

Department of Agriculture, Water and the Environment (DAWE) (2021a)
Threatened species and ecological communities. Available: https://www.dcceew.gov.au/environment/biodiversity/threatened. Updated October 2021.

Department of Agriculture, Water and the Environment (DAWE) (2021b)
Interrogation of Species Profile and Threats (SPRAT) Database using Protected Matters Search Tool. Queried 11/11/2021, Available: https://www.awe.gov.au/environment/epbc/protected-matters-search-tool.

Department of Biodiversity, Conservation and Attractions (DBCA) (2007–2021)
NatureMap: Mapping Western Australia's Biodiversity. Available: https://naturemap.dbca.wa.gov.au/.

Department of Biodiversity, Conservation and Attractions (DBCA) (as Department of Environment and Conservation) (2013)
Definitions, Categories and Criteria for Threatened and Priority Ecological Communities. Current January 2013. Available: https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/definitions_categories_and_criteria_for_threatened_and_priority_ecological_communities.pdf.

Department of Biodiversity, Conservation and Attractions (DBCA) (2014)
Ecological Impact and Invasiveness Ratings from the Department of Parks and Wildlife Pilbara Region Species Prioritisation Process 2014. Available: https://www.dpaw.wa.gov.au/plants-and-animals/plants/weeds/156-how-does-dpaw-manage-weeds. Accessed August 2022.

Department of Biodiversity, Conservation and Attractions (DBCA) (2018)
List of Threatened Ecological Communities (TECs) endorsed by the Western Australian Minister for Environment. Species and Communities Branch, 28th June 2018

Department of Biodiversity, Conservation and Attractions (DBCA) (2020)
Conservation Codes for Western Australian Flora and Fauna. Current 10 December 2020. Available: https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities

Department of Biodiversity, Conservation and Attractions (DBCA) (2021a)
DBCA - Legislated Lands and Waters (DBCA-011) Spatial data. Last updated 11 October 2021. Available: https://catalogue.data.wa.gov.au/dataset/dbca-legislated-lands-and-waters

Department of Biodiversity, Conservation and Attractions (DBCA) (2021b)
Priority Ecological Communities for Western Australia Version 32. Species and Communities Program, 15 July 2021. Department of Biodiversity, Conservation and Attractions (DBCA). https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatened-ecological-communities

Department of Biodiversity, Conservation and Attractions (DBCA) (2022a)
Priority Ecological Communities for Western Australia Version 33. Species and Communities Branch, 1 June 2022

Department of Biodiversity, Conservation and Attractions (DBCA) (2022b)
Department of Biodiversity, Conservation and Attractions Threatened and Priority Flora List 27 June 2022. Available: https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants.

Department of Biodiversity, Conservation and Attractions (DBCA) (2022c)
Interrogation of the DBCA Western Australian Herbarium specimen database, Threatened and Priority Flora database and Threatened and Priority Flora List, performed 30/6/2022. Reference: 58-0622FL.

Department of Biodiversity, Conservation and Attractions (DBCA) (2022d)
Interrogation of the DBCA Threatened Ecological Communities and Priority Ecological Communities database, performed 4/7/2022. Reference: 41_0622EC.

Department of Biodiversity, Conservation and Attractions (DBCA) (2022e)
DBCA Fire History (DBCA-060). Publicly available dataset: DBCA Fire History (DBCA-060) - Datasets - data.wa.gov.au

Department of Premier and Cabinet (DPC) (2018)
Threatened Flora – Rare Flora Notice 2018. Published in the Western Australian Government Gazette, 11 September 2018, page 3226. Published by Department of Premier and Cabinet – Government Gazette, West Perth, Western Australia.

Department of Primary Industries and Regional Development (DPIRD) (2018)
Soil Landscape Mapping—Best Available (DPIRD-027). Spatial data. Last updated 2 August 2018. https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-best-available

Department of Primary Industries and Regional Development (DPIRD) (2019)
Pre-European Vegetation (DPIRD-006). Spatial data. Last updated 23 September 2019. https://catalogue.data.wa.gov.au/dataset/pre-european-dpird-006.

Department of Primary Industry and Regional Development (2022)
Declared Organism Search. Available: http://www.agric.wa.gov.au/organisms. Accessed July 2022.

Department of Water (DoW) (2009)
Environmental considerations for groundwater management in the Northern Perth Basin (Report no. 8; Environmental Water Report Series). Government of Western Australia.

Dillon, S.J. and Macfarlane, T.D. (2020)
Leeuwen's Lily (*Arthropodium vanleeuwenii:* Asparagaceae) a remarkable new discovery from the Pilbara, Western Australia. *Nuytsia* 31:265-269

Dufrêne, M. and Legendre, P. (1997)
Species Assemblages and Indicator Species: the Need for a Flexible Asymmetrical Approach. *Ecological Monographs*, 67(3), 345–366.

Eco Logical Australia Pty Ltd (Eco Logical) (2012)
Level 1 Flora and Fauna Surveys along the Great Northern Highway for Jimblebar Mine Module Transport. Unpublished report (11PERECO-0026, Rev 0) prepared for BHP Billiton Iron Ore Pty Ltd; p. 74.

ecologia Environment Pty Ltd (ecologia) (2013)
Greater West Angelas Vegetation and Flora Assessment. Unpublished report (Rev 2) prepared for Rio Tinto Ltd; p. 97

Environmental Protection Authority (EPA) (2004)
Guidance for the Assessment of Environmental Factors—Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia. Guidance Statement No. 51. June 2004.

Environmental Protection Authority (EPA) (2016a)
Environmental Factor Guideline – Flora and Vegetation. Published 13th December 2016 (www.epa.wa.gov.au/).

Environmental Protection Authority (EPA) (2016b)
Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment. EPA, Western Australia, December 2016.

Executive Steering Committee for Australian Vegetation Information (ESCAVI) (2003)
Australian Vegetation Attribute Manual: National Vegetation Information System, Version 6.0. Executive Steering Committee for Australian Vegetation Information (ESCAVI). Department of the Environment and Heritage. Canberra, Australian Capital Territory.

Government of Western Australia (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. Available: https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics

Graham, J. (2001)
The root hydraulic architecture of Melaleuca argentea [PhD Thesis]. The University of Western Australia.

Hussey, B.M.J, Keighery, G.J., Dodd, J. Lloyd, S.G. and Cousens, R.D. (2007)
Western Weeds – A Guide to the Weeds of Western Australia (2nd Ed.). The Weeds Society of Western Australia (Inc.), Victoria Park, Western Australia.

Kendrick, P. (2001)
Pilbara 3 (PIL3 – Hamersley subregion) (A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002, p. 13). Department of Conservation and Land Management. Available: https://www.dpaw.wa.gov.au/about-us/science-and-research/biological-surveys/117-a-biodiversity-audit-of-wa.

Landgate (2021)
Spatial Cadastral Database. Spatial data, SLIP subscription service. Western Australian Land Information Authority. Available: https://www0.landgate.wa.gov.au/business-and-government/land-data/cadastral-data

Loomes, R. (2010a)
Determining water level ranges of Pilbara riparian species (Report no. 17; Environmental Water Report Series). Department of Water, Government of Western Australia.

Loomes, R., (2010b)
Lower Fortescue River - ecological values and issues, Environmental water report series, Report No. 15 Department of Water, Government of Western Australia, Perth.

Loomes, R., & Braimbridge, M. (2010)
Lower De Grey River: Ecological values and issues (Report No. 12; Environmental Water Report Series). Department of Water, Government of Western Australia.

Markey, A.S. and Dillon, S.J. (2008)
Flora and vegetation of the banded iron formations of the Yilgarn Craton: the central Tallering Land System. Conservation Science Western Australia 7 (1): 121-149.

McCune, B. and Mefford, M.J. (2011)
PC-ORD. Multivariate Analysis of Ecological Data (version 6.08). MjM Software, Gleneden Beach, Oregon USA.

Mueller-Dombois, D. and Ellenberg, H. (1974)
Aims and Methods of Vegetation Ecology. Wiley and Sons, Canada.

O'Grady, A., Eamus, D., Cook, P., Lamontagne, S., Kelley, G., & Hutley, L. (2002).
Tree Water Use and Sources of transpired Water in Riparian Vegetation along the Daly River, Northern Territory (pp. 1–116). Department of Environment and Heritage.

Oksanen, J., Blanchet, F. G., Friendly, M., Kindt, R., Legendre, P., McGlinn, D., Minchin, P. R., O'Hara, R. B., Simpson, G. L., Solymos, P., Stevens, M. H. H., Szoecs, E. and Wagner, H. (2020)
vegan: Community Ecology Package (version 2.5-7). https://CRAN.R-project.org/package=vegan

Onshore Environmental Consultants Pty Ltd (Onshore) (2011)
Flora and Vegetation Survey: Area C and Surrounds. Unpublished report (Rev 3) prepared for BHP Billiton Iron Ore Pty Ltd; p. 761.

Onshore Environmental Consultants Pty Ltd (Onshore) (2012)
Level 2 Flora and Vegetation Survey: South Flank. Unpublished report (Rev 4) prepared for BHP Billiton Iron Ore Pty Ltd; p. 801.

Onshore Environmental Consultants Pty Ltd (Onshore) (2015a)
Karijini National Park Tenements Flora and Vegetation Risk Assessment. Unpublished report (Rev 4) prepared for BHP Billiton Iron Ore Pty Ltd; p. 64.

Onshore Environmental Consultants Pty Ltd (Onshore) (2015b)
Riparian Flora and Vegetation Survey Marillana Creek. Unpublished report (Rev 3) prepared for BHP Billiton Iron Ore Pty Ltd; p. 209.

PSM (2021)
Lamb Creek Iron Ore Project Hydrogeological Assessment. Unpublished report (PSM4241-004R) dated 24 May 2021.

R Core Team (2022)
R: A language and environment for statistical computing (version 4.1.3). R Foundation for Statistical Computing. Vienna, Austria. Available: https://www.R-project.org/

Rapallo Pty Ltd (Rapallo) (2012)
Level 2 Flora and Vegetation Survey of Lamb Creek Project Area. Unpublished report (Final) prepared for Process Minerals International Pty Ltd; p. 131

Rapallo Pty Ltd (Rapallo) (2021a)
Detailed Flora and Vegetation Survey of the Great Northern Highway Intersection – Lamb Creek Project. Unpublished report (Report reference: J021158, Final) prepared for Mineral Resources Ltd; p. 108

Rapallo Pty Ltd (Rapallo) (2021b)
Targeted Conservation Significant Flora Survey of the Lamb Creek Project Area. Unpublished report (Report reference: J020347, V3) prepared for Mineral Resources Ltd; p. 65.

Rio Tinto Ltd (Rio Tinto) (2011)
Botanical Survey for an Exploration Drilling Program at Juna Downs South E47/1943 & Supporting Document to a Native Vegetation Clearing Permit Application. Unpublished report (RTIO-HSE-0106538, Rev B); p. 61.

Rio Tinto Ltd (Rio Tinto) (2015)
Targeted Rare and Priority Flora Survey to Meet Conditions of CPS 4442 (Strategic Rail NVCP). Metadata statement; p. 15.

Rio Tinto Ltd (Rio Tinto) (2016a)
Flora, Vegetation and Fauna Habitat Assessment at Juna Downs: Native Vegetation Clearing Permit – Supporting Report. Unpublished report (RTIO-HSE-0284378, Rev A) prepared on behalf of Hamersley Iron Pty Ltd; p. 142.

Rio Tinto Ltd (Rio Tinto) (2016b)
Flora, Vegetation and Fauna Habitat Assessment at Koodaideri: Native Vegetation Clearing Permit – Supporting Report. Unpublished report (RTIO-HSE-0289898, Rev B) prepared on behalf of Hamersley Iron Pty Ltd; p. 198.

Rio Tinto Ltd (Rio Tinto) (2019)
Stock Proof Fence Phase III Juna Rail Surveys to meet CPS 4442 Conditions, RTIO-HSE-0335913. Metadata statement (RTIO-HSE-0335913); p. 5.

Sneath, P.H.A. and Sokal, R.R. (1973)
Numerical Taxonomy: The Principles and Practice of Numerical Classification. W H Freeman & Co. San Francisco, California USA.

Stantec Australia Pty Ltd (Stantec) (2021)
ICSS Phase 2 Rail Project: Desktop Assessment and Targeted Significant Flora Survey. Unpublished report (Rev 3.0) prepared for Rio Tinto Ltd; p. 97.

Umwelt (Australia) Pty Ltd (Umwelt) (2022)
Flora and Vegetation Peer Review and Gap Analysis Lamb Creek Project. Unpublished report (Report reference: 21838/R01, Final) prepared for Mineral Resources Ltd, January 2022.

Van Vreeswyk, A.M.E., Payne, A.L., Leighton, K.A. and Hennig, P. (2004)
An Inventory and Condition Survey of the Pilbara Region of Western Australia. Technical Bulletin 92. Government of Western Australia, Department of Agriculture, Perth.

Webber, B.L, Batchelor, K., Jucker, T., Ota, N. and Scott, J. (2017)
Weed data aggregation and risk assessment for the Pilbara region of Western Australia. Final report, CSIRO Australia, 2017.

Weeds Australia (2022)
Weeds of National Significance. Available: https://weeds.org.au/weeds-profiles/. Accessed August 2022.

Western Australian Herbarium (WA Herbarium) (1998-)
Florabase: The Western Australian Flora. Available: https://florabase.dpaw.wa.gov.au/. Accessed July 2022.

APPENDIX A

Vegetation Condition Scale for the Eremaean and Northern Botanical Provinces (EPA 2016b)

Condition Ranking	Description
Excellent (E)	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement
Very Good (VG)	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks
Good (G)	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds
Poor (P)	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds
Degraded (D)	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species
Completely Degraded (CD)	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs



APPENDIX B

Vascular Plant Taxa Omitted from and Amalgamated in the Classification Analysis

Action	Taxon	Data Source	Reasoning
Amalgamated	*Abutilon fraseri*	Rapallo	Taxon identified to differing levels between different surveys
	Abutilon fraseri subsp. *fraseri*	Umwelt	
Amalgamated	*Acacia aneura*	Rapallo/Umwelt	Potential for taxa not to be consistently identified due to inadequate material
	Acacia ?aneura	Umwelt	
	Acacia aptaneura	Rapallo/Umwelt	
Amalgamated	*Acacia acradenia*	Rapallo	Taxa not be consistently positively identified due to inadequate material; Inconsistencies in identifications between different surveys (potential misidentification of *A. acradenia*)
	Acacia ayersiana	Umwelt	
	Acacia ?ayersiana	Umwelt	
Amalgamated	*Acacia cowleana*	Rapallo/Umwelt	Taxa not consistently identified due to inadequate material; difficult to separate these entities in the field leading to potential misidentification (require juvenile growth)
	Acacia elachantha	Rapallo/Umwelt	
	Acacia ?elachantha	Umwelt	
Amalgamated	*Acacia pachyacra*	Rapallo/Umwelt	Potential for taxa not consistently identified due to inadequate material within and between datasets
	Acacia tenuissima	Rapallo/Umwelt	
Amalgamated	*Acacia hamersleyensis*	Umwelt	Taxa not consistently identified due to inadequate material
	Acacia ?hamersleyensis	Umwelt	
Amalgamated	*Androcalva luteiflora*	Umwelt	Taxa not consistently identified due to inadequate material; potential misidentification between surveys
	?Androcalva loxophylla	Umwelt	
Amalgamated	*Convolvulus clementii*	Rapallo	Inconsistencies in identifications between different surveys; potential misidentification of *Convolvulus clementii* as young individuals look very similar in a field environment
	Ipomoea polymorpha	Umwelt	
Amalgamated	*Corchorus lasiocarpus* subsp. *parvus*	Umwelt	Taxa not consistently identified due to inadequate material
	Corchorus ?lasiocarpus subsp. *parvus*	Umwelt	
Amalgamated	*Dysphania rhadinostachya* subsp. *inflata*	Rapallo	Subspecies not consistently identified due to inadequate material; potential misidentification of subspecies between different surveys
	Dysphania rhadinostachya	Umwelt	
	Dysphania ?rhadinostachya	Umwelt	
Amalgamated	*Eriachne pulchella* subsp. *dominii*	Umwelt	Inconsistencies in identification to subspecies between different surveys
	Eriachne pulchella subsp. *pulchella*	Rapallo	
Amalgamated	*Euphorbia coghlanii*	Rapallo	Taxa not consistently identified due to inadequate material; potential misidentification between surveys
	Euphorbia biconvexa	Umwelt	
	Euphorbia ?biconvexa	Umwelt	
Amalgamated	*Euphorbia* aff. *ferdinandi*	Rapallo	Considered to represent the same potentially undescribed taxon
	Euphorbia ?aff. ferdinandi subsp. *ferdinandi*	Umwelt	
Amalgamated	*Evolvulus alsinoides*	Umwelt	Variants could not be consistently identified due to inadequate material (requires flowering material to identify to variant level)
	Evolvulus alsinoides var. *decumbens*	Umwelt	
	Evolvulus alsinoides var *villosicalyx*	Rapallo/Umwelt	

Action	Taxon	Data Source	Reasoning
Amalgamated	*Glycine* sp.	Rapallo	Inconsistencies in identifications between different surveys
	Glycine canescens	Umwelt	
Amalgamated	*Grevillea wickhamii* subsp. *hispidula*	Umwelt	Subspecies not consistently identified due to inadequate material
	Grevillea wickhamii subsp. ?*hispidula*	Umwelt	
Amalgamated	*Iseilema macratherum*	Rapallo	Inconsistencies in identifications between different surveys
	Iseilema membranaceum	Umwelt	
Amalgamated	*Panicum decompositum*	Rapallo	Inconsistencies in identifications between different surveys; *P. effusum* consistently recorded during 2022 survey in same habitats
	Panicum effusum	Umwelt	
Amalgamated	*Polycarpaea corymbosa*	Rapallo	Taxon identified to differing levels between different surveys
	Polycarpaea corymbosa var. *corymbosa*	Umwelt	
Amalgamated	*Portulaca oleracea*	Rapallo	Taxon not consistently identified due to inadequate material
	Portulaca ?*oleracea*	Umwelt	
Amalgamated	*Ptilotus* ?*exaltatus*	Umwelt	Taxa not consistently identified due to juvenile material
	Ptilotus ?*carinatus*	Umwelt	
	Ptilotus exaltatus	Rapallo	
Amalgamated	*Ptilotus obovatus*	Rapallo	Taxon identified to differing levels between different surveys
	Ptilotus obovatus var. *obovatus*	Umwelt	
Amalgamated	*Scaevola parvifolia* subsp. *parvifolia*	Rapallo	Inconsistencies in identifications between different surveys. The two subspecies are difficult to tell apart in the field and there is an overlap in their ranges.
	Scaevola parvifolia subsp. *pilbarae*	Umwelt	
Amalgamated	*Senna ferraria*	Umwelt	Taxon not consistently identified due to inadequate material
	Senna ?*ferraria*	Umwelt	
Amalgamated	*Senna pleurocarpa* var. *angustifolia*	Umwelt	Variants potentially not consistently identified due to inadequate material
	Senna pleurocarpa var. *pleurocarpa*	Umwelt	
Amalgamated	*Sida* sp. L (A.M. Ashby 4202)	Umwelt	Taxon not consistently identified due to inadequate material
	Sida ?L (A.M. Ashby 4202)	Rapallo	
Amalgamated	*Themeda* sp. Mt Barricade (M.E. Trudgen	Umwelt	Taxa potentially not consistently identified within/between surveys
	Themeda triandra	Rapallo/Umwelt	
Amalgamated	*Tribulus macrocarpus*	Umwelt	Taxon not consistently identified due to inadequate material
	Tribulus ?*macrocarpus*	Umwelt	
Amalgamated	*Trichodesma zeylanicum* var. *zeylanicum*	Umwelt	Taxon identified to differing levels between different surveys
	Trichodesma zeylanicum	Rapallo	
Omitted	?*Enchylaena tomentosa*	Umwelt	Identification unclear due to poor material
Omitted	*Euphorbia* ?*trigonosperma*	Umwelt	Identification unclear due to poor material

Action	Taxon	Data Source	Reasoning
Omitted	Poaceae sp.	Umwelt	Identification unclear due to poor material
Taxon Change	*Acacia pachyacra* changed to *A. tenuissima* at Quadrat 09	Rapallo	Field collection confirmed different species to be present at this location
Taxon Change	*Acacia* sp. changed to *A. aneura* at Quadrat 03	Rapallo	Field collection confirmed different species to be present at this location
Taxon Change	*Acacia* ?*sibirica* changed to *A. aneura* at Quadrat 26	Rapallo	Field collection confirmed different species to be present at this location
Taxon Change	*Enneapogon lindleyanus* changed to *E. robustissimus* at Quadrat 26	Rapallo	Field collection confirmed different species to be present at this location

APPENDIX C

Results of Search of the Department of the Agriculture, Water and the Environment Species Profile and Threats (SPRAT) Database (DAWE 2021b)

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. Please see the caveat for interpretation of information provided here.

Report created: 14-Nov-2021

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment 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 (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	10
Listed Migratory Species:	9

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

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 Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	13
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	2
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	24
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Status of Conservation Dependent and Extinct are not MNES under the EPBC Act. Number is the current name ID.		
Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
MAMMAL		
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Breeding known to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Roosting known to occur within area
PLANT		

Scientific Name	Threatened Category	Presence Text
Thryptomene wittweri		
Mountain Thryptomene [16645]	Vulnerable	Species or species habitat likely to occur within area
REPTILE		
Liasis olivaceus barroni		
Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundo rustica		
Barn Swallow [662]		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
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Chalcites osculans as Chrysococcyx osculans		
Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area
Hirundo rustica		
Barn Swallow [662]		Species or species habitat may occur within area overfly marine area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato)		
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area

Extra Information

State and Territory Reserves		[Resource Information]
Protected Area Name	Reserve Type	State
Karijini	National Park	WA
Unnamed WA41696	5(1)(g) Reserve	WA

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Baralaba Train Load Out and Rail Loop	2012/6548	Controlled Action	Post-Approval
Brockman Railway	2011/5833	Controlled Action	Post-Approval
Cloud Break Open Pit Iron Ore Mine	2005/2205	Controlled Action	Post-Approval
construction of iron ore mine & associated infrastructure	2013/6945	Controlled Action	Completed
FerrAus Pilbara Project - mine & Rail Pilbara Region WA	2011/6036	Controlled Action	Post-Approval
Iron ore mine expansion, West Angelas Revised Project	2021/8923	Controlled Action	Assessment Approach
Jinidi Iron Ore Mine	2012/6299	Controlled Action	Post-Approval
Koodaideri Iron Ore Mine & Infrastructure Project, WA	2012/6422	Controlled Action	Post-Approval
Marillana Iron Ore Project	2011/5892	Controlled Action	Post-Approval
Phil's Creek Iron Ore Project	2009/5107	Controlled Action	Post-Approval
West Angelas Iron Ore Mine Deposits C, D and G, Pilbara, WA	2018/8299	Controlled Action	Post-Approval
Yandicoogina Junction South West and Oxbow Iron Ore Project	2011/5815	Controlled Action	Post-Approval
Not controlled action			
Baiting Efficacy Trial of Feral Cat Bait and PAPP Toxicant	2012/6381	Not Controlled Action	Completed
Development of iron ore resources in eastern Pilbara region, including port at P	2004/1562	Not Controlled Action	Completed
Development of the Hope Downs 4 Iron Ore Mine and Associated Infrastructure	2008/4636	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
Iron Valley Iron Ore Project	2012/6458	Not Controlled Action	Completed
Lamb Creek Iron Ore Project, East Pilbara, WA	2012/6666	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Pilbara Bulk Ore Transport System Project, WA	2016/7637	Not Controlled Action	Completed
Railway Iron Ore Project, to develop and operate mine, plant and supporting infrastructure, Central Pilbara, WA	2009/5005	Not Controlled Action	Completed
Roy Hill Iron Ore Project	2008/4624	Not Controlled Action	Completed
Yandicoogina Pocket and Billiard South, Iron ore mine, WA	2014/7343	Not Controlled Action	Completed
Referral decision			
Baiting Efficiency of Feral cat bait and PAPP Toxicant	2012/6363	Referral Decision	Completed
Iron ore mine, Hope Downs 2 Proposal	2021/9035	Referral Decision	Referral Publication

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

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

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

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:

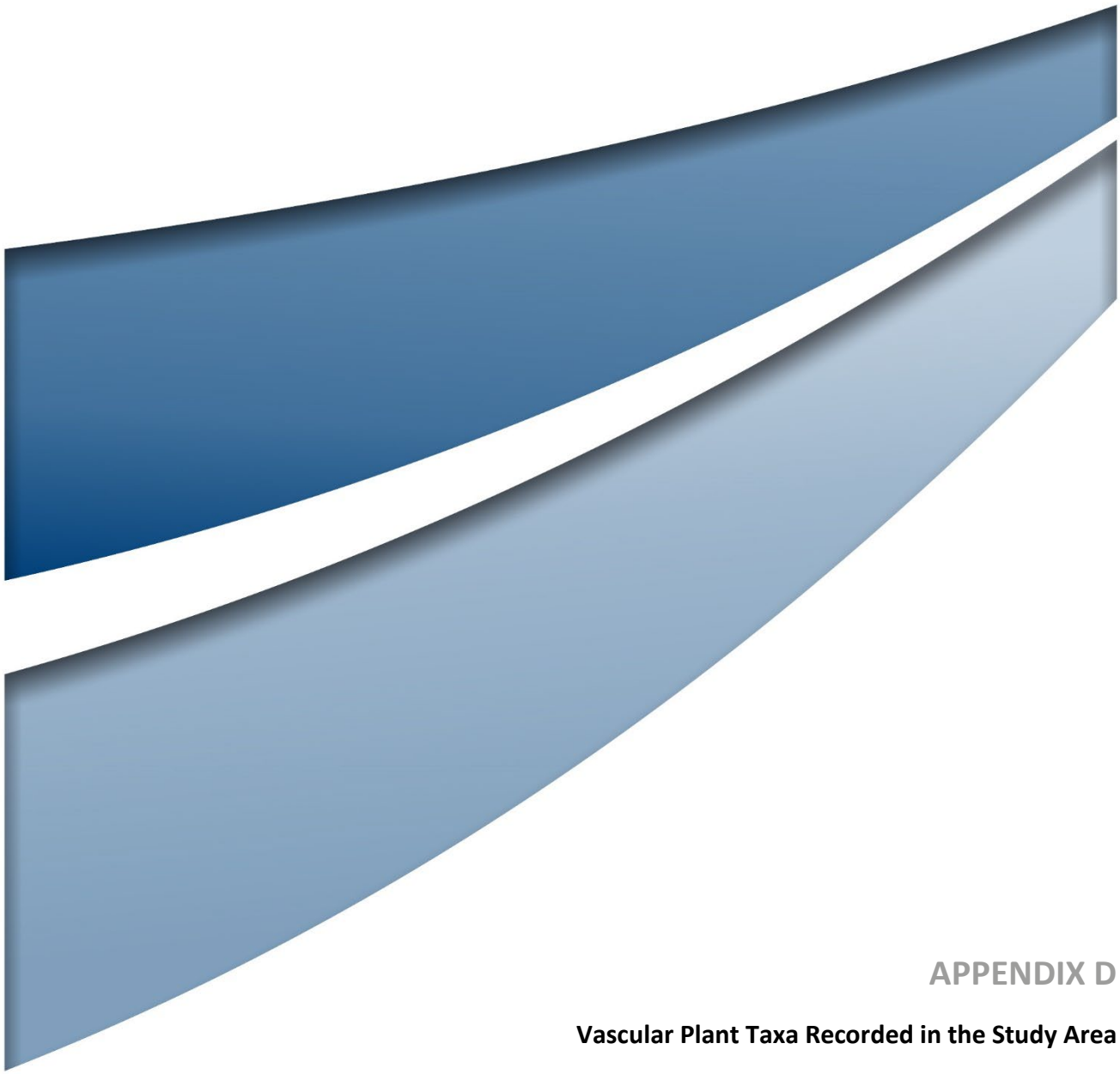
-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, 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.

© Commonwealth of Australia

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111



APPENDIX D

Vascular Plant Taxa Recorded in the Study Area

Family	Taxon
Aizoaceae	*Trianthema glossostigmum*
Amaranthaceae	*Alternanthera nana*
	Amaranthus cuspidifolius
	Amaranthus undulatus
	Gomphrena canescens subsp. *canescens*
	Gomphrena cunninghamii
	Gomphrena kanisii
	Ptilotus astrolasius
	Ptilotus calostachyus
	Ptilotus ?carinatus
	Ptilotus clementii
	Ptilotus exaltatus
	Ptilotus fusiformis
	Ptilotus helipteroides
	Ptilotus obovatus var. *obovatus*
	Ptilotus rotundifolius
	Ptilotus schwartzii var. *schwartzii*
Apocynaceae	*Cynanchum pedunculatum*
	Cynanchum viminale subsp. *australe*
	Vincetoxicum flexuosum
	Vincetoxicum lineare
Araliaceae	*Astrotricha hamptonii*
	Trachymene oleracea subsp. *oleracea*
Asteraceae	**Bidens bipinnata*
	Leiocarpa semicalva subsp. *semicalva*
	Olearia xerophila
	Peripleura obovata
	Pluchea dentex
	Pluchea tetranthera
	Pterocaulon serrulatum var. *velutinum*
	Pterocaulon sphacelatum
	Streptoglossa bubakii
	Streptoglossa decurrens
Boraginaceae	*Euploca cunninghamii*
	Euploca pachyphylla
	Euploca tanythrix
	Trichodesma zeylanicum
Brassicaceae	*Lepidium pedicellosum*
Capparaceae	*Capparis lasiantha*
	Capparis mitchellii

Family	Taxon
Capparaceae cont.	*Capparis spinosa* subsp. *nummularia*
Caryophyllaceae	*Polycarpaea corymbosa* var. *corymbosa*
	Polycarpaea holtzei
	Polycarpaea longiflora
Celastraceae	*Maytenus* sp. Mt Windell (S. van Leeuwen 846)
	Stackhousia sp. swollen gynophore (W.R. Barker 2041)
Chenopodiaceae	*Dysphania rhadinostachya*
	?*Enchylaena tomentosa*
	Maireana planifolia
	Maireana villosa
	Rhagodia eremaea
	Rhagodia sp. Hamersley (M. Trudgen 17794) (P3)
	Salsola australis
	Sclerolaena cornishiana
	Sclerolaena tetragona
Cleomaceae	*Areocleome oxalidea*
	Arivela viscosa
Commelinaceae	*Commelina ensifolia*
Convolvulaceae	*Bonamia erecta*
	Bonamia pilbarensis
	Duperreya commixta
	Evolvulus alsinoides var. *decumbens*
	Evolvulus alsinoides var. *villosicalyx*
	Ipomoea polymorpha
	Polymeria ambigua
Cucurbitaceae	*Cucumis variabilis*
Cyperaceae	*Bulbostylis barbata*
	Cyperus cunninghamii subsp. *cunninghamii*
	Fimbristylis dichotoma
	Fimbristylis simulans
Euphorbiaceae	*Euphorbia ferdinandi* s. lat. (potentially underscribed)
	Euphorbia australis var. hispidula
	Euphorbia australis var. subtomentosa
	Euphorbia biconvexa
	Euphorbia drummondii
	Euphorbia tannensis subsp. *eremophila*
	Euphorbia trigonosperma
Fabaceae	*Acacia adoxa* var. *adoxa*
	Acacia adsurgens
	Acacia ancistrocarpa

Family	Taxon
Fabaceae cont.	*Acacia aneura*
	Acacia aptaneura
	Acacia atkinsiana
	Acacia ayersiana
	Acacia bivenosa
	Acacia cowleana
	Acacia dictyophleba
	Acacia elachantha
	Acacia hamersleyensis
	Acacia hilliana
	Acacia inaequilatera
	Acacia maitlandii
	Acacia marramamba
	Acacia minyura
	Acacia monticola
	Acacia pachyacra
	Acacia pruinocarpa
	Acacia pyrifolia var. *pyrifolia*
	Acacia rhodophloia x *sibirica*
	Acacia sericophylla
	Acacia sibirica
	Acacia steedmanii subsp. *borealis*
	Acacia synchronicia
	Acacia tenuissima
	Acacia tetragonophylla
	Acacia tumida var. *pilbarensis*
	Crotalaria medicaginea var. neglecta
	Crotalaria novae-hollandiae DC. subsp. *novae-hollandiae*
	Cullen leucochaites
	Glycine canescens
	Gompholobium oreophilum
	Indigofera fractiflexa subsp. *fractiflexa*
	Indigofera georgei
	Indigofera linnaei
	Indigofera monophylla
	Indigofera rugosa
	Isotropis iophyta
	Mirbelia viminalis
	Petalostylis labicheoides
	Rhynchosia minima

Family	Taxon
Fabaceae cont.	*Senna artemisioides* subsp. *helmsii*
	Senna artemisioides subsp. *oligophylla*
	Senna artemisioides subsp. x *artemisioides*
	Senna ferraria
	Senna glaucifolia
	Senna glutinosa subsp. *glutinosa*
	Senna glutinosa subsp. *pruinosa*
	Senna glutinosa subsp. x *luerssenii*
	Senna notabilis
	Senna pleurocarpa var. *angustifolia*
	Senna pleurocarpa var. *pleurocarpa*
	Senna sericea
	Senna stricta
	Senna symonii
	Senna venusta
	?*Swainsona decurrens*
	Tephrosia densa
	Tephrosia oxalidea
	Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)
	Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)
	Tephrosia sp. Newman (A.A. Mitchell PRP 29)
	Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)
	Tephrosia virens
	Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)
Goodeniaceae	*Dampiera candicans*
	Goodenia cusackiana
	Goodenia microptera
	Goodenia muelleriana
	Goodenia nuda
	Goodenia prostrata
	Goodenia stellata
	Goodenia stobbsiana
	Goodenia triodiophila
	Scaevola amblyanthera var. *centralis*
	Scaevola browniana subsp. *browniana*
	Scaevola parvifolia subsp. *pilbarae*
	Scaevola spinescens
Gyrostemonaceae	*Codonocarpus cotinifolius*
Lamiaceae	*Clerodendrum floribundum* var. *angustifolium*
	Newcastelia clavipetala

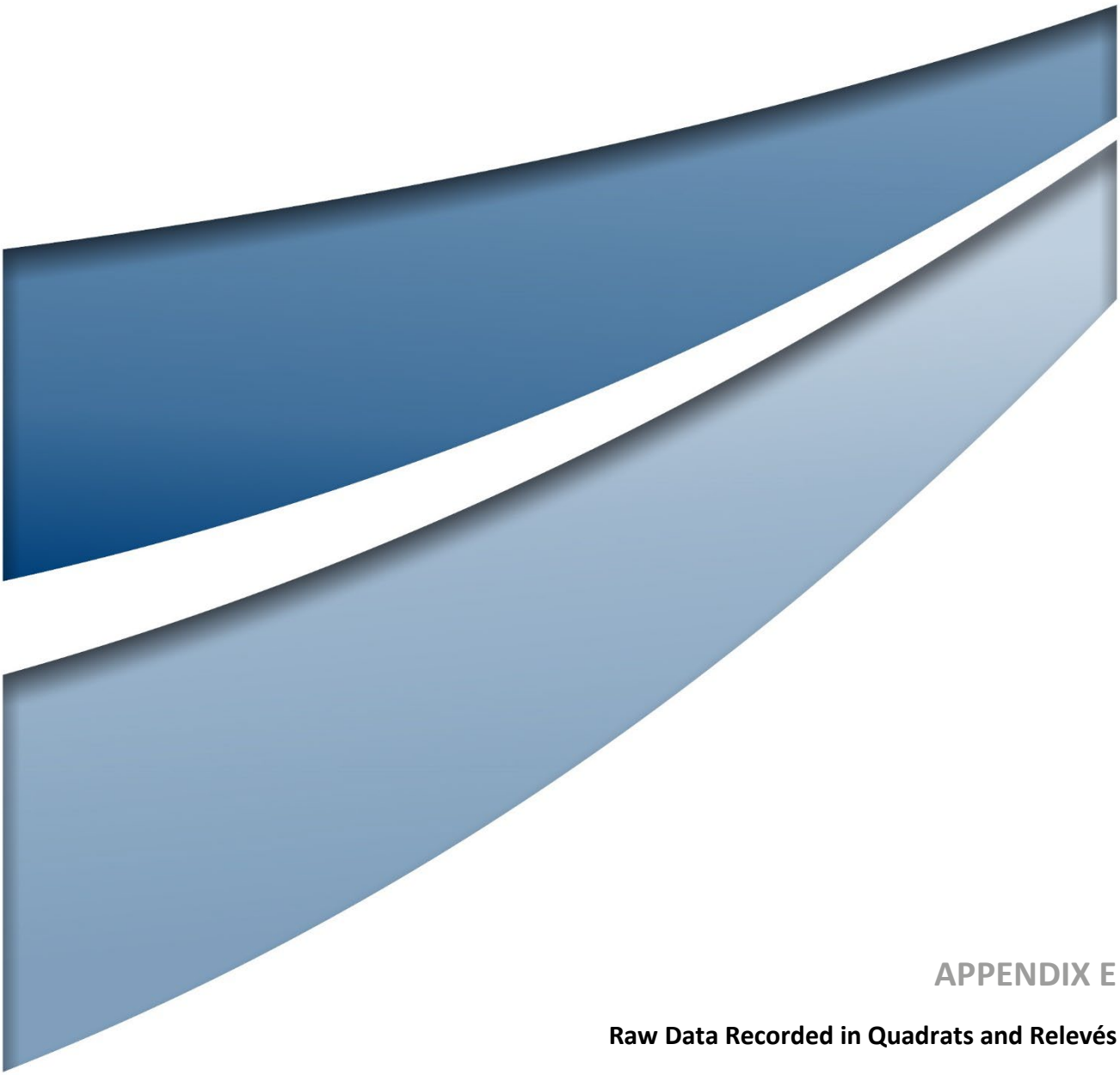
Family	Taxon
Lamiaceae cont.	*Prostanthera albiflora*
	Teucrium teucriiflorum
Lauraceae	*Cassytha capillaris*
Loranthaceae	*Amyema bifurcata*
	Diplatia grandibractea
	Lysiana murrayi
Malvaceae	*Abutilon amplum*
	Abutilon cunninghamii
	Abutilon fraseri subsp. *fraseri*
	Abutilon lepidum
	Abutilon macrum
	Abutilon otocarpum
	Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)
	?*Androcalva loxophylla*
	Androcalva luteiflora
	Brachychiton acuminatus
	Corchorus crozophorifolius
	Corchorus incanus subsp. *lithophilus*
	Corchorus laniflorus
	Corchorus lasiocarpus subsp. *parvus*
	Corchorus sp. (potentially undescribed)
	Corchorus sp. (sterile)
	Corchorus tridens
	Gossypium australe
	Gossypium robinsonii
	Hibiscus burtonii
	Hibiscus coatesii
	Hibiscus leptocladus
	Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
	Hibiscus sturtii var. *campylochlamys*
	Hibiscus sturtii var. *platychlamys*
	**Malvastrum americanum*
	Melhania oblongifolia
	Seringia exastia (T)
	Sida arenicola
	Sida cardiophylla
	Sida echinocarpa
	Sida ectogama
	Sida fibulifera
	Sida platycalyx

Family	Taxon
Malvaceae cont.	*Sida* sp. Articulation below (A.A. Mitchell PRP 1605)
	Sida sp. dark green fruits (S. van Leeuwen 2260)
	Sida sp. Excedentifolia (J.L. Egan 1925)
	Sida sp. L (A.M. Ashby 4202)
	Sida sp. Pilbara (A.A. Mitchell PRP 1543)
	Sida sp. Shovelanna Hill (S. van Leeuwen 3842)
	Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)
	Sida sp. Supplejack Station (T.S. Henshall 2345)
	Triumfetta leptacantha
	Triumfetta maconochieana
	Waltheria indica
Menispermaceae	*Tinospora smilacina*
Moraceae	*Ficus brachypoda*
Myrtaceae	*Calytrix carinata*
	Corymbia deserticola subsp. *deserticola*
	Corymbia ferriticola
	Corymbia hamersleyana
	Eucalyptus gamophylla
	Eucalyptus kingsmillii
	Eucalyptus leucophloia subsp. *leucophloia*
	Eucalyptus xerothermica
Nyctaginaceae	*Boerhavia burbidgeana*
	Boerhavia coccinea
	Boerhavia repleta
Oleaceae	*Jasminum didymum* subsp. *lineare*
Phyllanthaceae	*Dendrophyllanthus erwinii*
	Nellica maderaspatensis
	Notoleptopus decaisnei
Plantaginaceae	*Stemodia grossa*
Poaceae	*Amphipogon sericeus*
	Aristida burbidgeae
	Aristida contorta
	Aristida holathera var. *holathera*
	Aristida inaequiglumis
	Aristida jerichoensis var. *subspinulifera* (P3)
	Aristida lazaridis (P2)
	Aristida obscura
	Aristida pruinosa
	Bothriochloa ewartiana
	**Cenchrus ciliaris*

Family	Taxon
Poaceae cont.	**Cenchrus setiger*
	Chrysopogon fallax
	Cymbopogon ambiguus
	Cymbopogon obtectus
	Dactyloctenium radulans
	Digitaria ammophila
	Digitaria brownii
	Digitaria ctenantha
	Enneapogon caerulescens
	Enneapogon lindleyanus
	Enneapogon polyphyllus
	Enneapogon robustissimus
	Eragrostis cumingii
	Eragrostis eriopoda
	Eragrostis setifolia
	Eragrostis tenellula
	Eriachne aristidea
	Eriachne lanata
	Eriachne mucronata
	Eriachne pulchella subsp. *dominii*
	Eriachne sp. Dugald River (B.K. Simon+ 3007)
	Eriachne tenuiculmis
	Eulalia aurea
	Iseilema membranaceum
	Mnesithea formosa
	Panicum effusum
	Paraneurachne muelleri
	Paspalidium clementii
	Paspalidium rarum
	Paspalidium tabulatum
	Perotis rara
	Schizachyrium fragile
	Setaria surgens
	**Setaria verticillata*
	Sporobolus australasicus
	Themeda sp. Mt Barricade (M.E. Trudgen 2471)
	Themeda triandra
	Tragus australianus
	Triodia biflora
	Triodia melvillei

Family	Taxon
Poaceae cont.	*Triodia pungens*
	Triodia vanleeuwenii
	Triodia wiseana
	Tripogonella loliiformis
	Urochloa occidentalis var. *ciliata*
Polygalaceae	*Polygala glaucifolia*
Portulacaceae	*Portulaca* ?*oleracea*
	**Portulaca pilosa*
Proteaceae	*Grevillea berryana*
	Grevillea pyramidalis subsp. *leucadendron*
	Grevillea wickhamii subsp. *hispidula*
	Hakea chordophylla
	Hakea loreus subsp. *loreus*
Pteridaceae	*Cheilanthes brownii*
	Cheilanthes contigua
	Cheilanthes sieberi subsp. *sieberi*
Rubiaceae	*Dolichocarpa crouchiana*
	Psydrax latifolia
	Psydrax rigidula
	Psydrax suaveolens
	Spermacoce brachystema
	Synaptantha tillaeacea var. *tillaeacea*
Santalaceae	*Anthobolus leptomerioides*
	Santalum lanceolatum
Sapindaceae	*Atalaya hemiglauca*
	Dodonaea coriacea
	Dodonaea lanceolata var. *lanceolata*
	Dodonaea pachyneura
	Dodonaea petiolaris
	Dodonaea viscosa subsp. *mucronata*
Scrophulariaceae	*Eremophila forrestii* subsp. *forrestii*
	Eremophila fraseri subsp. *fraseri*
	Eremophila jucunda subsp. *pulcherrima*
	Eremophila lanceolata
	Eremophila latrobei subsp. *filiformis*
	Eremophila latrobei × *forrestii*
	Eremophila longifolia
	Eremophila naaykensii (P3)
	Eremophila petrophila subsp. *petrophila*
Solanaceae	*Nicotiana benthamiana*

Family	Taxon
Solanaceae cont.	*Solanum cleistogamum*
	Solanum ferocissimum
	Solanum gabrielae
	Solanum lasiophyllum
	Solanum phlomoides
Surianaceae	*Stylobasium spathulatum*
Thymelaeaceae	*Pimelea forrestiana*
Violaceae	*Afrohybanthus aurantiacus*
Zygophyllaceae	*Tribulus astrocarpus*
	Tribulus macrocarpus
	Tribulus suberosus
	**Tribulus terrestris*



APPENDIX E

Raw Data Recorded in Quadrats and Relevés

Site Name:	C01
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	14/03/2022
GPS Location:	GDA94 Zone 50 695066.75E 7477598.34N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Other, Undulating plain (other)
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	E
Soil Type:	Clay Loam
Soil Colour:	Brown, Orange (other)
Rock Outcrop:	Ironstone, <2% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone, Quartz
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years
Habitat:	Low open woodland over open shrubland over open hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.3	0.1
Acacia aptaneura	0.9	0.1
Acacia atkinsiana	2.1	0.1
Acacia bivenosa	1.2	7
Acacia cowleana	1.5	0.1
Acacia monticola	1.8	0.1
Acacia synchronicia	0.3	0.1
Acacia tetragonophylla	1.4	1.5
Aristida contorta	0.3	1
Capparis lasiantha	0.4	0.1
Cassytha capillaris		0.1
Corchorus lasiocarpus subsp. *parvus*	0.5	0.1
Cymbopogon ambiguus	0.9	0.2
Dampiera candicans	0.2	0.1
Dodonaea lanceolata var. *lanceolata*	0.6	0.2
Duperreya commixta		0.01
Eriachne mucronata	0.4	1
Eucalyptus leucophloia subsp. *leucophloia*	7	10
Goodenia microptera	0.1	0.1
Goodenia muelleriana	0.25	0.1
Goodenia stobbsiana	0.1	0.1
Gossypium robinsonii	1.1	0.5
Hibiscus burtonii	0.3	0.1
Hibiscus coatesii	0.3	0.1
Indigofera monophylla	0.15	0.1
Jasminum didymum subsp. *lineare*	1.1	0.1
Paraneurachne muelleri	0.4	0.2
Pluchea dentex	0.2	0.1
Psydrax suaveolens	0.9	0.1
Ptilotus astrolasius	0.4	0.1
Ptilotus calostachyus	0.2	0.1
Ptilotus ?exaltatus	0.05	0.1
Ptilotus rotundifolius	0.2	0.1

Rhynchosia minima	0.3	0.1
Santalum lanceolatum	1.8	1.5
Senna glutinosa subsp. *glutinosa*	0.8	0.1
Senna glutinosa subsp. *x luerssenii*	0.9	0.5
Senna stricta	0.6	1
Sida arenicola	0.8	0.1
Sida sp. Articulation below (A.A. Mitchell PRP 1605)	0.5	0.1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.25	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.5	0.1
Solanum lasiophyllum	0.4	0.1
Streptoglossa bubakii	0.2	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.7	1
Triodia pungens	0.4	10
Triodia vanleeuwenii	0.6	15
Triodia wiseana	0.8	1.5

PHOTOS



Site Name:	C02
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	15/03/2022
GPS Location:	GDA94 Zone 50 682864.53E 7470751.5N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Flat
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	(other) - track nearby
Fire:	5-10 Years
Habitat:	Low open mallee woodland over tall sparse shrubland over open hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia atkinsiana	1.5	5
Acacia bivenosa	1.5	0.2
Acacia dictyophleba	0.3	0.1
Acacia tenuissima	1.5	0.2
Corymbia deserticola subsp. *deserticola*	3	0.5
Cymbopogon ambiguus	0.8	0.1
Duperreya commixta		0.2
Eremophila forrestii subsp. *forrestii*	0.8	1
Eucalyptus gamophylla	4	12
Eucalyptus leucophloia subsp. *leucophloia*	5	4
Euphorbia tannensis subsp. *eremophila*	0.2	0.1
Evolvulus alsinoides	0.15	0.1
Hibiscus burtonii	0.4	0.1
Hibiscus sturtii var. *campylochlamys*	0.5	0.1
Indigofera georgei	0.5	0.2
Paraneurachne muelleri	0.4	0.1
Ptilotus rotundifolius	1	2
Rhynchosia minima		0.1
Senna artemisioides subsp. *oligophylla*	1	1
Senna glutinosa subsp. *x luerssenii*	0.9	1
Sida echinocarpa	0.6	0.1
Sida echinocarpa		0.1
Sida sp. L (A.M. Ashby 4202)	0.2	0.1
Solanum lasiophyllum	0.8	0.1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.01	0.1
Triodia pungens	0.5	17
Triodia vanleeuwenii	0.3	1

PHOTOS



Site Name:	C03
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	16/03/2022
GPS Location:	GDA94 Zone 50 694872.82E 7477202.99N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Mid Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	NW
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Isolated trees over sparse low shrubland over sparse hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.25	0.1
Acacia cowleana		
Acacia hilliana		
Acacia monticola	0.6	0.1
Amphipogon sericeus	0.25	1
Aristida holathera var. *holathera*	0.2	0.1
Clerodendrum floribundum var. *angustifolium*		
Codonocarpus cotinifolius	0.25	0.1
Corchorus incanus subsp. *lithophilus*	0.3	0.1
Corymbia deserticola subsp. *deserticola*	4	2
Corymbia hamersleyana		
Cucumis variabilis	0.02	0.1
Dodonaea coriacea		
Eucalyptus leucophloia subsp. *leucophloia*		0.1
Fimbristylis simulans	0.07	1
Goodenia stobbsiana	0.15	1
Goodenia triodiophila	0.3	0.1
Hakea chordophylla	1.2	0.5
Hibiscus coatesii	0.15	0.1
Hibiscus sturtii var. *platychlamys*	0.25	0.1
Ptilotus astrolasius		
Ptilotus astrolasius	0.1	0.1
Ptilotus calostachyus	0.5	2
Santalum lanceolatum		
Schizachyrium fragile	0.2	0.1
Senna artemisioides subsp. *oligophylla*	0.8	0.1
Senna ?*ferraria*	0.4	0.1
Senna glutinosa subsp. *x luerssenii*	0.8	0.1
Seringia exastia (T)		0.1
Sida arenicola	0.8	0.1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.3	0.1
Solanum lasiophyllum	0.5	0.1
Solanum phlomoides	0.9	0.1

Trachymene oleracea subsp. *oleracea*	0.01	0.1
Triodia vanleeuwenii	0.2	10
Triodia wiseana	0.25	1

PHOTOS



Site Name:	C04
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	16/03/2022
GPS Location:	GDA94 Zone 50 694846.81E 7476696.72N
Orientation:	90/180
Vegetation Type:	2
Landform Type:	Mid Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	NW
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Isolated trees over isolated low shrubs over open hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.2	0.2
Acacia hilliana	0.3	1
Aristida holathera var. *holathera*	0.5	0.1
Dolichocarpa crouchiana	0.1	0.1
Eucalyptus leucophloia subsp. *leucophloia*	6	1
Euphorbia australis var. *hispidula*	0.1	0.1
Fimbristylis simulans	0.07	0.2
Goodenia stobbsiana	0.2	0.2
Goodenia triodiophila	0.3	0.1
Hakea chordophylla	1.8	1
Hibiscus sturtii var. *campylochlamys*	0.25	0.1
Paraneurachne muelleri	0.4	0.1
Paspalidium clementii	0.15	0.1
Ptilotus astrolasius	0.3	0.1
Ptilotus calostachyus	0.8	1
Ptilotus rotundifolius	0.6	0.1
Senna artemisioides subsp. *oligophylla*	0.3	0.1
Senna glaucifolia	0.7	0.1
Senna glutinosa subsp. *glutinosa*	0.4	0.1
Senna glutinosa subsp. *pruinosa*	0.7	0.1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.4	0.1
Solanum phlomoides	0.3	0.1
Triodia vanleeuwenii	0.2	15
Triodia wiseana	0.3	0.5

PHOTOS



Site Name:	C05
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	16/03/2022
GPS Location:	GDA94 Zone 50 682816.6E 7471439.63N
Orientation:	90/180
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	(other) - old tracks on edge
Fire:	>10 Years
Habitat:	Low open woodland over sparse low shrubland over sparse hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.4	0.1
Abutilon macrum		
Acacia ancistrocarpa	2	1
Acacia aneura	2.5	1
Acacia aptaneura	2.5	7
Acacia inaequilatera	1.5	0.2
Acacia pruinocarpa	3	1
Acacia pyrifolia var. *pyrifolia*	2	0.2
Anthobolus leptomerioides	2	0.1
Aristida holathera var. *holathera*	0.4	1
Aristida inaequiglumis	0.9	2
Arivela viscosa	0.05	0.1
Boerhavia coccinea	0.2	0.2
Capparis lasiantha	1	0.1
Corymbia deserticola subsp. *deserticola*	6	2
Cucumis variabilis	0.05	0.1
Duperreya commixta		0.1
?*Enchylaena tomentosa*	0.3	0.3
Enneapogon polyphyllus	0.07	0.1
Enneapogon robustissimus	0.4	0.5
Eragrostis eriopoda	0.4	0.1
Eremophila forrestii subsp. *forrestii*	1	0.5
Eremophila longifolia	2	0.2
Eulalia aurea	0.6	0.1
Evolvulus alsinoides	0.1	0.1
Gossypium australe	0.04	0.1
Hibiscus burtonii	0.2	0.1
Hibiscus sturtii var. *platychlamys*	0.3	0.1
Perotis rara	0.07	0.1
?*Pterocaulon* sp.	0.04	0.1
Pterocaulon sphacelatum	0.5	0.2
Ptilotus astrolasius	0.8	1
Ptilotus ?*exaltatus*	0.5	0.1
Ptilotus obovatus var. *obovatus*	0.5	0.1

Rhynchosia minima	0.2	0.1
Sclerolaena cornishiana	0.2	0.1
Senna artemisioides subsp. *helmsii*	0.9	0.1
Senna artemisioides subsp. *oligophylla*	1.3	1
Senna glutinosa subsp. *x luerssenii*	1.2	0.5
Senna notabilis	0.04	0.1
Sida sp. L (A.M. Ashby 4202)	0.25	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.5	0.1
Tribulus macrocarpus	0.25	0.1
Tribulus suberosus	0.6	1

PHOTOS



Site Name:	C06
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	17/03/2022
GPS Location:	GDA94 Zone 50 682495.74E 7471506.85N
Orientation:	90/180
Vegetation Type:	9
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	>10 Years
Habitat:	Low open woodland over tall shrubland over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia aptaneura	2.5	0.5
Acacia atkinsiana	2.5	15
Acacia pruinocarpa		
Acacia tenuissima	0.8	0.1
Anthobolus leptomerioides	1.5	0.2
Aristida holathera var. *holathera*	0.3	0.5
Aristida inaequiglumis	0.5	0.2
Boerhavia coccinea	0.1	0.1
Duperreya commixta		0.2
Enneapogon polyphyllus	0.15	0.5
Eremophila forrestii subsp. *forrestii*	1	0.1
Eremophila longifolia	0.4	0.1
Eriachne mucronata		
Eucalyptus gamophylla	4	2
Eucalyptus leucophloia subsp. *leucophloia*	6	1
Euphorbia tannensis subsp. *eremophila*	0.5	0.2
Evolvulus alsinoides		
Goodenia microptera	0.3	0.1
Goodenia stobbsiana	0.07	0.1
Hibiscus burtonii	0.5	0.1
Hibiscus coatesii	1.1	0.1
Indigofera monophylla	0.3	0.1
Paraneurachne muelleri	0.5	0.1
Ptilotus astrolasius	0.8	0.5
Ptilotus calostachyus	0.9	0.2
Ptilotus rotundifolius	1.1	1
Rhynchosia minima		
Scaevola parvifolia subsp. *pilbarae*		0.2
Senna artemisioides subsp. *oligophylla*	0.8	0.2
Senna glutinosa subsp. *x luerssenii*	1.8	0.5
Sida arenicola	0.4	0.1
Sida sp. L (A.M. Ashby 4202)	0.5	
Solanum lasiophyllum	0.5	0.2
Triodia pungens	0.6	2

Triodia vanleeuwenii	0.3	30
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	C07
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	17/03/2022
GPS Location:	GDA94 Zone 50 682677.34E 7473210.23N
Orientation:	90/180
Vegetation Type:	9
Landform Type:	Drainage Line
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	10-20%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	>10 Years
Habitat:	Woodland over tall shrubland over closed tussock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon macrum	0.9	0.2
Abutilon otocarpum	0.5	0.5
Acacia ancistrocarpa	4	12
Acacia atkinsiana	1.6	1
Acacia bivenosa	1.3	0.1
Acacia cowleana	7	1
Acacia dictyophleba	1.9	0.5
Acacia maitlandii	1.2	0.1
Acacia monticola	1.2	0.2
Acacia tenuissima	1.6	0.1
Afrohybanthus aurantiacus	0.8	0.5
?*Androcalva loxophylla*	0.1	0.1
Anthobolus leptomerioides	1.2	0.5
Boerhavia coccinea	0.2	0.1
Bonamia erecta	0.7	1
Capparis lasiantha	1	0.1
Chrysopogon fallax	1.4	5
Corchorus lasiocarpus subsp. *parvus*	0.3	0.5
Corymbia hamersleyana	9	3
Cymbopogon obtectus	1.1	2
Duperreya commixta		1
Eremophila longifolia	2	0.5
Eucalyptus gamophylla	9	10
Eulalia aurea	1	30
Evolvulus alsinoides	0.15	0.2
Glycine canescens		0.1
Goodenia microptera	0.4	0.1
Goodenia stellata	0.2	0.3
Gossypium robinsonii	1.7	2
Hakea loreus subsp. *loreus*	1.2	0.1
Hibiscus sturtii var. *platychlamys*	0.6	0.2
Indigofera georgei	0.4	0.1
Jasminum didymum subsp. *lineare*		0.5
Paraneurachne muelleri	0.6	1

Pterocaulon sphacelatum	0.7	0.3
Ptilotus astrolasius	1	2
Ptilotus calostachyus	0.4	0.1
Rhynchosia minima	0.2	0.5
Santalum lanceolatum	1.5	1
Scaevola parvifolia subsp. *pilbarae*	0.5	0.2
Senna artemisioides subsp. *oligophylla*	1.3	0.5
Seringia exastia (T)	0.8	1
Sida sp. L (A.M. Ashby 4202)	0.2	1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.6	0.1
Solanum lasiophyllum	0.4	0.1
Tephrosia densa	1	0.2
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.9	10
Triodia pungens	0.5	2
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)	0.1	0.2
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	C08
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	17/03/2022
GPS Location:	GDA94 Zone 50 682858.18E 7473080.24N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Other, Undulating plain (other)
Slope Class:	Gently Inclined (3 degrees)
Aspect:	W
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years
Habitat:	Sparse low woodland over isolated shrubs over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia atkinsiana	1.8	2
Acacia bivenosa	1.2	0.1
Acacia dictyophleba	1.2	1
Aristida holathera var. *holathera*	0.4	0.1
Capparis lasiantha	0.25	0.1
Chrysopogon fallax	1	1
Cymbopogon ambiguus	0.9	0.1
Eriachne mucronata	0.4	0.2
Eucalyptus gamophylla	4	2
Eucalyptus leucophloia subsp. *leucophloia*	8	1.5
Gossypium australe	0.2	0.1
Grevillea wickhamii subsp. ?*hispidula*	0.7	0.1
Hakea loreus subsp. *loreus*	0.2	0.1
Indigofera monophylla	0.4	0.1
Paraneurachne muelleri	0.4	0.1
Ptilotus calostachyus	0.6	0.1
Ptilotus rotundifolius	0.9	1
Scaevola parvifolia subsp. *pilbarae*	0.4	0.1
Senna artemisioides subsp. *oligophylla*	0.2	0.1
Senna glutinosa subsp. *pruinosa*	1.3	0.2
Senna glutinosa subsp. *x luerssenii*	1.1	0.5
Sida echinocarpa	0.2	0.1
Triodia pungens	0.6	1
Triodia vanleeuwenii	0.3	20

PHOTOS



Site Name:	C09
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	18/03/2022
GPS Location:	GDA94 Zone 50 683353.41E 7473736.1N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Mid Slope
Slope Class:	Moderately Inclined (10 degrees)
Aspect:	NE
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 2-10% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None, (other) - wallaby poo
Fire:	>10 Years
Habitat:	Sparse low woodland over sparse shrubland over closed grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.6	1.1
Acacia ancistrocarpa	2.2	0.2
Acacia dictyophleba	1.5	0.5
Acacia inaequilatera	2	2
Acacia monticola	2.5	3
Acacia pruinocarpa	1.5	0.1
?*Androcalva loxophylla*	0.05	0.1
Aristida holathera var. *holathera*	0.4	0.1
Corymbia hamersleyana		
Cymbopogon ambiguus	1	0.1
Dampiera candicans	0.6	2
Eriachne mucronata	0.4	10
Eucalyptus leucophloia subsp. *leucophloia*	5	5
Goodenia triodiophila	0.3	0.1
Gossypium robinsonii		
Grevillea wickhamii subsp. *hispidula*	1.5	2
Hakea chordophylla	1.5	0.5
Hibiscus coatesii	0.8	0.1
Indigofera monophylla	0.4	0.1
Paraneurachne muelleri	0.4	0.5
Perotis rara	0.1	0.2
Petalostylis labicheoides		
Ptilotus astrolasius	0.5	0.2
Ptilotus calostachyus	1.1	1.5
Ptilotus clementii	0.2	0.1
Ptilotus rotundifolius	0.9	0.5
Senna artemisioides subsp. *oligophylla*	0.8	0.1
Senna glaucifolia	1.5	0.1
Senna glutinosa subsp. *glutinosa*	2	2
Senna glutinosa subsp. *pruinosa*	1.3	1
Senna glutinosa subsp. *x luerssenii*	0.1	0.1
Seringia exastia (T)	0.4	1
Solanum lasiophyllum	0.8	0.1

Solanum phlomoides	0.3	0.1
Tephrosia oxalidea	0.01	0.1
Triodia wiseana	1	40

PHOTOS



Site Name:	C10
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	18/03/2022
GPS Location:	GDA94 Zone 50 689488.03E 7478587.75N
Orientation:	90/180
Vegetation Type:	9
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	>10 Years
Habitat:	Low sparse woodland over tall open shrubland over open grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia ancistrocarpa	1.5	0.2
Acacia aptaneura	3	2
Acacia atkinsiana	2.5	20
Acacia pruinocarpa	2	0.5
Acacia tenuissima	0.4	0.1
Anthobolus leptomerioides		
Aristida holathera var. *holathera*	0.4	1
Aristida inaequiglumis	1.5	2
Boerhavia coccinea	0.1	0.1
Corchorus lasiocarpus subsp. *parvus*	0.6	0.1
Corymbia deserticola subsp. *deserticola*	9	3
Corymbia hamersleyana	6	1.5
Cymbopogon obtectus	0.8	0.1
Digitaria ammophila	0.3	0.2
Digitaria brownii	0.8	1
Duperreya commixta		1
Enneapogon polyphyllus	0.7	1
Enneapogon robustissimus	0.9	2
Eragrostis eriopoda	0.4	0.5
Eriachne mucronata	0.3	0.1
Eucalyptus gamophylla	4	1.5
Eucalyptus leucophloia subsp. *leucophloia*	5	4
Evolvulus alsinoides	0.1	0.1
Goodenia microptera	0.3	0.1
Goodenia stobbsiana	0.15	0.1
Hibiscus burtonii	0.7	0.2
Hibiscus coatesii		
Hibiscus sturtii var. *platychlamys*	0.5	0.1
Indigofera monophylla	0.5	0.1
Jasminum didymum subsp. *lineare*		0.1
Maireana villosa	2	0.1
Panicum effusum	0.25	0.1
Paraneurachne muelleri	0.4	3
Psydrax latifolia		

Ptilotus astrolasius	0.6	1
Ptilotus calostachyus	1	1
Ptilotus ?exaltatus	0.9	0.5
Santalum lanceolatum	2	0.2
Scaevola parvifolia subsp. *pilbarae*	0.3	1
Senna artemisioides subsp. *oligophylla*	1.1	0.1
Sida cardiophylla	0.3	0.1
Sida echinocarpa	0.2	0.1
Solanum lasiophyllum	0.4	0.1
Triodia wiseana	1	15
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	C11
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	18/03/2022
GPS Location:	GDA94 Zone 50 688929.7E 7477533.13N
Orientation:	90/180
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Sizes:	2-6mm, 6-20mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Exotic Weeds
Fire:	>10 Years
Habitat:	Low woodland over tall shrubland over closed tussock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon macrum	1.3	0.5
Abutilon otocarpum	0.8	1
Acacia aneura	3	3
Acacia aptaneura	5	13
Acacia pruinocarpa	2.5	5
Acacia tenuissima	2.5	0.1
Alternanthera nana	0.15	0.1
Anthobolus leptomerioides	0.9	0.1
Aristida holathera var. *holathera*	0.4	8
Aristida inaequiglumis	1.8	10
Arivela viscosa	0.2	2
**Bidens bipinnata*	0.5	1
Boerhavia coccinea	0.1	2
Boerhavia repleta	0.2	0.2
**Cenchrus setiger*	0.5	0.1
Chrysopogon fallax	1.8	15
Clerodendrum floribundum var. *angustifolium*	1.4	0.1
Corymbia deserticola subsp. *deserticola*	2	0.2
Corymbia hamersleyana	6	1
Cucumis variabilis		2
Dactyloctenium radulans	0.2	0.1
Digitaria ctenantha	0.2	0.1
Dodonaea petiolaris	1.2	0.2
Duperreya commixta		3
Enneapogon polyphyllus	0.7	25
Enneapogon robustissimus	1.2	10
Eremophila longifolia	2.5	3
Eucalyptus leucophloia subsp. *leucophloia*	3	0.1
Eucalyptus xerothermica	4	0.5
Eulalia aurea	1	0.1
Euphorbia biconvexa	0.4	0.2
Evolvulus alsinoides var. *villosicalyx*	0.2	0.3
Glycine canescens		0.1
Gomphrena canescens subsp. *canescens*	0.2	0.1
Goodenia stellata	0.1	0.5

Hibiscus burtonii	0.5	1
Hibiscus sturtii var. *platychlamys*	1	0.5
Indigofera georgei		0.1
Isotropis iophyta	0.5	0.1
Maireana villosa	0.6	1
**Malvastrum americanum*	1	0.5
Melhania oblongifolia	1	0.1
Perotis rara	0.2	2
Pterocaulon sphacelatum	1.3	8
Ptilotus astrolasius	0.8	2
Ptilotus calostachyus	0.8	0.5
Ptilotus helipteroides	0.1	0.1
Rhynchosia minima	0.2	0.3
Senna artemisioides subsp. *oligophylla*	0.9	0.2
Senna glaucifolia	1.4	0.2
Senna notabilis		0.1
Sida sp. L (A.M. Ashby 4202)	0.2	3
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.6	0.2
Streptoglossa decurrens	1.4	0.5
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	1.6	20
Tribulus macrocarpus	0.2	0.1
Triodia pungens	0.5	0.5

PHOTOS



Site Name:	C12
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	19/03/2022
GPS Location:	GDA94 Zone 50 690248.24E 7478356.06N
Orientation:	90/180
Vegetation Type:	9
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	>10 Years
Habitat:	Low open woodland over tall shrubland over closed tall hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.5	0.2
Acacia aneura	3.5	12
Acacia aptaneura	3.5	11
Acacia atkinsiana	3.5	1
Acacia pruinocarpa	3	1
Acacia sibirica	3.5	10
Alternanthera nana	0.15	0.1
Aristida holathera var. *holathera*	0.5	1
**Bidens bipinnata*		
Boerhavia coccinea	0.1	0.1
Boerhavia repleta	0.2	0.2
Corchorus lasiocarpus subsp. *parvus*	0.3	0.1
Corymbia deserticola subsp. *deserticola*	7	2
Cucumis variabilis		0.2
Cymbopogon obtectus	1.2	0.1
Digitaria brownii	0.9	0.1
Duperreya commixta		5
Enneapogon polyphyllus	0.6	12
Eremophila forrestii subsp. *forrestii*	1.5	0.1
Eremophila latrobei subsp. *filiformis*	1.5	1
Eucalyptus leucophloia subsp. *leucophloia*	3	0.5
Euphorbia australis var. *hispidula*	0.01	0.1
Euphorbia tannensis subsp. *eremophila*	0.1	0.1
Euploca cunninghamii	0.3	0.5
Evolvulus alsinoides var. *decumbens*	0.2	0.1
Evolvulus alsinoides var. *villosicalyx*	0.1	0.1
Goodenia microptera	0.4	0.1
Goodenia muelleriana	0.3	0.1
Goodenia stobbsiana	0.3	0.2
Hibiscus burtonii	1.2	5
Hibiscus sturtii var. *platychlamys*	0.6	1
Indigofera monophylla	0.5	5
Maireana villosa	0.6	0.5
Panicum effusum	0.4	0.5

Paraneurachne muelleri	0.7	15
Peripleura obovata	0.9	2
Polygala glaucifolia	0.01	0.1
Psydrax latifolia	2	0.5
Psydrax suaveolens	4	0.5
Pterocaulon sphacelatum	1.2	2
Ptilotus astrolasius	0.7	1
Ptilotus calostachyus	1.3	0.5
Ptilotus ?exaltatus	0.7	0.1
Rhynchosia minima	0.1	0.1
Scaevola parvifolia subsp. *pilbarae*	0.3	0.1
Senna notabilis	0.15	0.1
Sida echinocarpa	0.5	2
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.2	0.1
Solanum ferocissimum	0.15	0.5
Solanum lasiophyllum	0.5	0.1
Solanum phlomoides	1	0.1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.3	0.1
Triodia pungens	0.7	0.1
Triodia wiseana	1.5	50
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	C13
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	19/03/2022
GPS Location:	GDA94 Zone 50 690820.11E 7476485.2N
Orientation:	90/180
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	(other) - tracks nearby
Fire:	>10 Years
Habitat:	Isolated trees over tall open shrubland over open tussock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon lepidum	0.7	0.1
Abutilon otocarpum	0.3	0.1
Acacia aneura	3	2
Acacia aptaneura	8	6
Acacia ayersiana	2.5	0.3
Acacia pruinocarpa	3.5	5
Aristida holathera var. *holathera*	0.4	5
Aristida inaequiglumis	1.5	1
Arivela viscosa	0.1	0.1
**Bidens bipinnata*	0.1	0.1
Boerhavia coccinea	0.2	0.2
Capparis lasiantha	1.1	0.2
Chrysopogon fallax	1.4	1
Dodonaea petiolaris	2	4
Duperreya commixta		0.2
Enneapogon polyphyllus	0.4	1
Enneapogon robustissimus	0.8	0.2
Eremophila fraseri subsp. *fraseri*	2.5	7
Eremophila latrobei subsp. *filiformis*	1.7	0.5
Eriachne mucronata	0.5	0.5
Eulalia aurea	0.9	0.1
Evolvulus alsinoides	0.1	0.1
Gomphrena canescens subsp. *canescens*	0.2	0.1
Hibiscus burtonii	0.7	1
Hibiscus sturtii var. *platychlamys*	0.5	0.5
Maireana villosa	0.7	1
Melhania oblongifolia	0.4	0.1
Paraneurachne muelleri	0.4	1.5
Psydrax suaveolens	1.5	0.1
Pterocaulon sphacelatum	0.9	0.1
Ptilotus astrolasius	0.6	0.5
Ptilotus ?exaltatus	0.8	0.1
Santalum lanceolatum	2.5	0.2
Sclerolaena cornishiana	0.3	0.1

Senna artemisioides subsp. *helmsii*	1.3	0.5
Senna artemisioides subsp. *oligophylla*	0.2	0.1
Senna glaucifolia	1.2	0.1
Sida ectogama	1.8	0.5
Sida sp. L (A.M. Ashby 4202)	0.3	0.5
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.5	0.1
Solanum cleistogamum	0.7	0.1
Solanum lasiophyllum	0.8	0.1
Streptoglossa decurrens	1.4	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	1.2	7
Triodia pungens	0.5	2

PHOTOS



Site Name:	C14
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	19/03/2022
GPS Location:	GDA94 Zone 50 690269.77E 7477051.54N
Orientation:	90/180
Vegetation Type:	9
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	(other) - old track through quadrat
Fire:	<5 Years
Habitat:	Isolated trees and mallees over open hummock grassland over low shrubs

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon lepidum	0.5	0.1
Abutilon otocarpum	0.5	0.1
Acacia ancistrocarpa	2.5	1
Acacia aptaneura	0.9	0.1
Acacia atkinsiana	1.5	1
Acacia ?elachantha	2	0.2
Acacia pruinocarpa	2	1
Alternanthera nana	0.1	0.1
Anthobolus leptomerioides	2	0.2
Aristida holathera var. *holathera*	0.4	2
Aristida inaequiglumis	1.2	1
Arivela viscosa	0.1	0.1
Capparis lasiantha	0.9	0.1
Corymbia deserticola subsp. *deserticola*	6	2
Corymbia hamersleyana	4	0.5
Cucumis variabilis		0.1
Cymbopogon obtectus	0.9	0.3
Dodonaea petiolaris	1.2	0.5
Duperreya commixta		1
Enneapogon polyphyllus	0.5	1
Eucalyptus gamophylla	2	3
Eulalia aurea	0.9	0.5
Gossypium australe	1.5	0.2
Gossypium robinsonii	1.8	0.5
Hibiscus burtonii	0.8	0.1
Hibiscus sturtii var. *platychlamys*	0.8	0.5
Indigofera monophylla	0.5	1
Panicum effusum	0.6	0.2
Paraneurachne muelleri	0.4	1
Psydrax suaveolens	0.9	0.1
Pterocaulon sphacelatum	0.5	0.1
Ptilotus astrolasius	0.6	1
Ptilotus calostachyus	1	0.1
Ptilotus rotundifolius	1.1	0.2

Rhynchosia minima	0.5	0.5
Senna artemisioides subsp. *helmsii*	0.7	1
Senna glaucifolia	1.2	0.2
Senna glutinosa subsp. *glutinosa*	1.5	0.2
Sida echinocarpa	1	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.9	0.1
Sida sp. Supplejack Station (T.S. Henshall 2345)	0.4	0.2
Solanum cleistogamum	0.4	0.1
Solanum lasiophyllum	0.4	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	1.1	1
Triodia pungens	0.5	7

PHOTOS



Site Name:	C15
Site Type:	QUADRAT
Dimensions:	25m x 100m
Survey Date:	20/03/2022
GPS Location:	GDA94 Zone 50 690902.98E 7474806.1N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	(other) - track nearby
Fire:	<5 Years
Habitat:	Low open woodland over closed tall shrubland over low shrubs and grasses

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon macrum	0.8	0.1
Acacia adoxa var. *adoxa*	0.4	0.1
Acacia ancistrocarpa	0.4	0.2
Acacia atkinsiana	0.8	2
Acacia monticola	1.5	10
Acacia tenuissima	0.6	0.1
Acacia tumida var. *pilbarensis*	2.5	45
Afrohybanthus aurantiacus	0.7	2
?*Androcalva loxophylla*	0.15	0.1
Aristida holathera var. *holathera*	0.7	4
Bonamia erecta	0.6	0.4
Corchorus incanus subsp. *lithophilus*	0.4	0.1
Corymbia hamersleyana	7	1
Dampiera candicans	0.3	0.1
Dodonaea lanceolata var. *lanceolata*	1.5	1
Duperreya commixta		0.5
Eriachne mucronata	0.6	2
Eucalyptus leucophloia subsp. *leucophloia*	7	2
Evolvulus alsinoides	0.1	0.1
Fimbristylis simulans	0.1	0.1
Goodenia microptera	0.4	0.1
Goodenia stobbsiana	0.2	0.1
Goodenia triodiophila	0.4	0.1
Hibiscus sturtii var. *campylochlamys*	0.7	7
Indigofera monophylla	0.5	0.3
Jasminum didymum subsp. *lineare*		0.5
Paraneurachne muelleri	0.6	3
Ptilotus astrolasius	0.8	2
Ptilotus calostachyus	1.1	1
Santalum lanceolatum	2.2	0.5
Scaevola parvifolia subsp. *pilbarae*	0.3	1
Senna artemisioides subsp. *oligophylla*	0.9	0.1
Senna glutinosa subsp. *glutinosa*	1.8	0.5
Senna glutinosa subsp. *pruinosa*	1	0.1

Senna glutinosa subsp. *x luerssenii*	1.3	0.2
Seringia exastia (T)	0.6	1.5
Sida arenicola	1.5	0.3
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.5	0.1
Solanum lasiophyllum	0.7	0.2
Tephrosia densa	0.9	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	1.5	1
Triodia pungens	0.8	6
Triodia vanleeuwenii	0.3	2
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	C16
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	20/03/2022
GPS Location:	GDA94 Zone 50 690825.79E 7475206.9N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Lower Slope
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	E
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Low open woodland over sparse shrubland over open hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia ancistrocarpa	1.1	0.1
Acacia tenuissima	0.9	0.1
Acacia tumida var. *pilbarensis*	1.1	0.1
Amphipogon sericeus	0.3	0.1
Aristida holathera var. *holathera*	0.6	0.2
Capparis lasiantha	1	0.5
Clerodendrum floribundum var. *angustifolium*	0.8	0.1
Eriachne mucronata	0.4	0.1
Eucalyptus gamophylla	3	3
Eucalyptus leucophloia subsp. *leucophloia*	8	6
Euploca pachyphylla	0.3	0.1
Evolvulus alsinoides	0.1	0.1
Goodenia microptera	0.2	0.1
Goodenia triodiophila	0.3	0.1
Hibiscus coatesii	0.3	0.1
Indigofera monophylla	0.4	1
Paraneurachne muelleri	0.4	2
Ptilotus astrolasius	0.5	1
Ptilotus calostachyus	1	1
Ptilotus rotundifolius	0.9	1
Scaevola parvifolia subsp. *pilbarae*	0.4	0.3
Senna artemisioides subsp. *helmsii*	0.5	0.2
Senna artemisioides subsp. *oligophylla*	1	0.5
Senna glutinosa subsp. *pruinosa*	1.1	0.1
Senna glutinosa subsp. *x luerssenii*	1.2	0.5
Seringia exastia (T)	0.5	1.5
Sida arenicola	1.1	0.1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.6	0.1
Solanum lasiophyllum	0.7	0.1
Triodia pungens	0.4	0.1
Triodia vanleeuwenii	0.3	15

PHOTOS



Site Name:	C17
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	20/03/2022
GPS Location:	GDA94 Zone 50 691240.76E 7475863.77N
Orientation:	90/180
Vegetation Type:	10
Landform Type:	Other, Flow Line (other)
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	N
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - G - Good
Disturbance:	Exotic Weeds
Fire:	<5 Years
Habitat:	low open woodland over sparse shrubland over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon macrum	0.7	0.1
Acacia aptaneura	3	0.5
Acacia maitlandii	0.5	0.1
Acacia pyrifolia var. *pyrifolia*	1.5	2
Acacia tumida var. *pilbarensis*	1.8	0.5
Afrohybanthus aurantiacus	0.8	1
Alternanthera nana	0.2	0.1
Aristida holathera var. *holathera*	0.5	5.2
Aristida inaequiglumis	1.2	0.2
Arivela viscosa	0.2	0.2
Atalaya hemiglauca	2.5	0.2
**Bidens bipinnata*	0.2	0.5
Boerhavia coccinea	0.15	0.5
**Cenchrus setiger*	0.8	7
Chrysopogon fallax	1.2	0.2
Clerodendrum floribundum var. *angustifolium*	1.4	0.2
Corchorus crozophorifolius	0.4	0.4
Corchorus lasiocarpus subsp. *parvus*	0.5	0.5
Corymbia hamersleyana	8	6
Crotalaria medicaginea var. *neglecta*	0.25	0.2
Cucumis variabilis		0.5
Enneapogon polyphyllus	0.5	3
Enneapogon robustissimus	0.9	1
Eragrostis eriopoda	0.5	1
Eremophila longifolia	1.6	0.1
Eriachne mucronata	0.4	2
Eulalia aurea	0.9	0.5
Euphorbia australis var. *subtomentosa*	0.2	0.2
Euphorbia biconvexa	0.5	0.1
Euploca cunninghamii	0.3	3
Euploca pachyphylla	0.4	0.7
Evolvulus alsinoides	0.1	0.1
Evolvulus alsinoides var. *decumbens*	0.2	0.1

Gomphrena canescens subsp. *canescens*	0.25	0.2
Goodenia microptera	0.3	0.1
Gossypium australe	0.9	0.3
Gossypium robinsonii	1.8	2
Grevillea wickhamii subsp. ?*hispidula*	1.2	0.1
Indigofera georgei	1	0.1
Indigofera monophylla	0.7	0.2
Jasminum didymum subsp. *lineare*		0.2
Maireana villosa	0.4	0.1
Melhania oblongifolia	0.8	0.1
Nellica maderaspatensis	0.2	0.1
Paraneurachne muelleri	0.8	1
Paspalidium rarum	0.25	0.1
Perotis rara	0.15	0.2
Polymeria ambigua	0.1	0.5
Pterocaulon sphacelatum	1.2	0.2
Ptilotus astrolasius		
Ptilotus ?*carinatus*	0.2	0.1
Rhynchosia minima	0.3	0.3
Scaevola amblyanthera var. *centralis*		
Senna artemisioides subsp. *helmsii*	0.9	0.1
Senna artemisioides subsp. *oligophylla*	1.2	0.5
Senna ?*ferraria*	1.3	1
Senna glaucifolia	1.2	0.3
Senna glutinosa subsp. *x luerssenii*	1.2	0.1
Senna notabilis		
Setaria surgens	0.4	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.4	0.2
Streptoglossa decurrens	1.2	0.4
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.4	0.1
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.6	5
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	1.5	3
Trichodesma zeylanicum	0.4	0.1
Triodia pungens	0.7	18
Vincetoxicum lineare		0.2
Waltheria indica	0.4	0.5

PHOTOS



Site Name:	C18
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	20/03/2022
GPS Location:	GDA94 Zone 50 690390.11E 7475864.84N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Lower Slope
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	NE
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, <2% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Isolated trees over isolated tall shrubs over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.3	0.1
Acacia adsurgens	0.8	0.1
Acacia atkinsiana	0.4	1
Acacia bivenosa	1	0.1
Acacia hilliana	0.3	0.3
Acacia inaequilatera	4	2
Acacia tenuissima	1	0.1
Acacia tumida var. *pilbarensis*	1.3	0.7
Amphipogon sericeus	0.3	0.1
Aristida holathera var. *holathera*	0.3	0.1
Clerodendrum floribundum var. *angustifolium*	1.3	0.1
Corchorus lasiocarpus subsp. *parvus*	0.6	0.1
Corymbia deserticola subsp. *deserticola*	1.1	0.5
Digitaria brownii	0.9	0.1
Duperreya commixta		0.1
Eremophila fraseri subsp. *fraseri*	0.4	0.1
Eucalyptus leucophloia subsp. *leucophloia*	7	2
Fimbristylis simulans	0.07	1
Goodenia stobbsiana	0.25	0.2
Goodenia triodiophila	0.3	0.1
Hakea chordophylla	0.4	0.1
Hibiscus coatesii	0.1	0.1
Indigofera monophylla	0.3	0.5
Paraneurachne muelleri	0.3	1
Psydrax rigidula		
Ptilotus astrolasius	0.5	0.1
Ptilotus calostachyus	1	1.5
Ptilotus ?*carinatus*	0.05	0.1
Ptilotus rotundifolius	1.2	1
?*Ptilotus* sp.	0.02	0.1
Senna glutinosa subsp. *glutinosa*	1.6	0.2
Senna glutinosa subsp. *pruinosa*	0.9	0.5
Sida arenicola	1.2	0.1

Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.2	0.1
Solanum lasiophyllum	0.7	0.1
Triodia pungens		
Triodia vanleeuwenii	0.2	25

PHOTOS



Site Name:	C19
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	21/03/2022
GPS Location:	GDA94 Zone 50 692214.16E 7475218.37N
Orientation:	90/180
Vegetation Type:	10
Landform Type:	Other, Flow Line (other)
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	W
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Exotic Weeds
Fire:	<5 Years
Habitat:	Low open woodland over tall shrubland over grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon lepidum	0.8	0.1
Acacia adoxa var. *adoxa*	0.3	0.2
Acacia bivenosa	0.45	0.1
Acacia pruinocarpa	1.8	0.2
Acacia pyrifolia var. *pyrifolia*	0.4	0.7
Acacia tumida var. *pilbarensis*	2.5	12
Afrohybanthus aurantiacus	0.7	1
Alternanthera nana	0.25	0.4
Androcalva luteiflora	1	2
Aristida holathera var. *holathera*	0.4	1.5
Arivela viscosa	0.15	1
Boerhavia coccinea	0.05	2
Bonamia erecta	0.6	3.5
**Cenchrus setiger*	0.7	0.1
Corchorus crozophorifolius	0.6	0.1
Corchorus lasiocarpus subsp. *parvus*	0.5	0.2
Corymbia hamersleyana	10	10
Crotalaria medicaginea var. *neglecta*	0.3	0.3
Cucumis variabilis		0.2
Cymbopogon ambiguus	1.2	0.1
Digitaria ctenantha	0.3	0.1
Dodonaea lanceolata var. *lanceolata*	1.1	0.1
Duperreya commixta		1
Enneapogon lindleyanus	0.6	0.1
Enneapogon polyphyllus	0.4	6
Enneapogon robustissimus	0.75	1
Eragrostis eriopoda	0.6	2
Eremophila longifolia	1.2	2
Eriachne aristidea	0.25	0.1
Eriachne mucronata	0.5	2
Eriachne pulchella subsp. *dominii*	0.2	0.2
Eriachne tenuiculmis	0.5	0.1
Eucalyptus gamophylla	3	4

Eucalyptus leucophloia subsp. *leucophloia*		
Euphorbia australis var. *subtomentosa*	0.05	0.1
Euphorbia ?*biconvexa*	0.05	0.1
Euploca cunninghamii	0.2	0.5
Euploca pachyphylla	0.3	0.2
Evolvulus alsinoides	0.08	0.1
Evolvulus alsinoides var. *decumbens*	0.2	0.1
Gomphrena canescens subsp. *canescens*	0.15	0.5
Goodenia microptera	0.3	0.1
Goodenia stellata	0.25	0.1
Goodenia stobbsiana	0.4	0.1
Gossypium australe	0.9	0.2
Gossypium robinsonii	2	3
Grevillea wickhamii subsp. ?*hispidula*	3	10
Hibiscus coatesii	0.4	0.1
Hibiscus sturtii var. *campylochlamys*	0.3	0.2
Hibiscus sturtii var. *platychlamys*	0.3	1
Indigofera monophylla	0.3	3
Jasminum didymum subsp. *lineare*		1
Leiocarpa semicalva subsp. *semicalva*	0.4	0.1
**Malvastrum americanum*	0.5	0.1
Melhania oblongifolia	0.7	1
Nellica maderaspatensis	0.4	0.1
Notoleptopus decaisnei	0.2	0.1
Paraneurachne muelleri	0.45	3
Perotis rara	0.05	0.5
Polymeria ambigua	0.08	0.3
Portulaca ?*oleracea*	0.05	0.1
Ptilotus astrolasius	0.45	8
Ptilotus calostachyus	0.5	0.5
Ptilotus ?*carinatus*	0.05	0.5
Ptilotus helipteroides	0.15	0.5
Rhynchosia minima		0.2
Santalum lanceolatum	1.5	0.5
Scaevola parvifolia subsp. *pilbarae*	0.45	0.5
Scaevola spinescens	0.6	0.2
Senna artemisioides subsp. *oligophylla*	0.5	0.5
Senna glaucifolia	0.45	1
Senna glutinosa subsp. *glutinosa*	0.75	0.1
Senna glutinosa subsp. *pruinosa*	1.2	0.4
Senna glutinosa subsp. *x luerssenii*	1.2	0.1
Seringia exastia (T)	0.5	1
Setaria surgens	0.35	0.1
**Setaria verticillata*	0.5	0.1
Sida echinocarpa	0.6	0.2
Sida sp. L (A.M. Ashby 4202)	0.3	2.5
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.6	0.5
Solanum phlomoides	0.4	0.1
Streptoglossa decurrens	0.45	0.5
Stylobasium spathulatum	1.2	0.1
Tephrosia densa	0.6	5
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	0.45	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	1.7	16
Tribulus macrocarpus	0.15	0.1

Trichodesma zeylanicum	0.05	0.1
Triodia pungens	0.7	15
Triodia vanleeuwenii	0.5	0.1
Triodia wiseana	0.5	0.1
Vincetoxicum lineare		0.3
Waltheria indica	0.5	0.2

PHOTOS



Site Name:	C20
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	21/03/2022
GPS Location:	GDA94 Zone 50 693450.65E 7478092.08N
Orientation:	90/180
Vegetation Type:	2
Landform Type:	Upper Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	NW
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, <2% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Isolated trees over sparse low shrubland over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.3	0.1
Acacia ancistrocarpa	0.5	0.1
Acacia atkinsiana	0.4	0.1
Acacia cowleana	0.3	0.1
Acacia hilliana	0.3	1
Amphipogon sericeus	0.3	0.1
Aristida holathera var. *holathera*	0.3	0.1
Clerodendrum floribundum var. *angustifolium*	1.5	0.1
Corchorus incanus subsp. *lithophilus*	0.5	0.2
Corymbia deserticola subsp. *deserticola*		
Corymbia hamersleyana	7	0.5
Eriachne mucronata	0.4	0.2
Eucalyptus leucophloia subsp. *leucophloia*		
Euploca cunninghamii	0.25	0.2
Fimbristylis simulans	0.1	0.2
Gompholobium oreophilum	0.4	1
Goodenia stobbsiana	0.1	0.3
Goodenia triodiophila	0.3	0.1
Hakea chordophylla	4	2
Hibiscus sturtii var. *campylochlamys*	0.4	0.1
Indigofera monophylla	0.3	0.2
Jasminum didymum subsp. *lineare*		
Paraneurachne muelleri		
Ptilotus calostachyus	0.8	0.5
Santalum lanceolatum		
Scaevola parvifolia subsp. *pilbarae*	0.2	0.2
Senna glutinosa subsp. *glutinosa*	0.8	0.5
Senna glutinosa subsp. *pruinosa*	0.2	0.1
Senna glutinosa subsp. *x luerssenii*		
Seringia exastia (T)	0.3	0.2
Solanum lasiophyllum	0.4	0.1
Triodia vanleeuwenii	0.2	20
Triodia wiseana	0.3	5

PHOTOS



Site Name:	C21
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	21/03/2022
GPS Location:	GDA94 Zone 50 693479.41E 7477255.27N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Lower Slope
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years
Habitat:	Isolated trees over sparse shrubland over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.3	0.1
Acacia ancistrocarpa	1.8	1
Acacia atkinsiana	0.8	0.1
Acacia bivenosa	1	0.4
Acacia dictyophleba	1.2	0.3
Acacia pruinocarpa		
Acacia tumida var. *pilbarensis*	0.8	0.1
Afrohybanthus aurantiacus	0.4	0.1
Capparis lasiantha	1.1	0.5
Cymbopogon obtectus	0.6	0.1
Duperreya commixta		0.1
Eriachne mucronata	0.45	0.4
Eucalyptus leucophloia subsp. *leucophloia*	9	3
Euphorbia australis var. *hispidula*	0.05	0.1
Fimbristylis dichotoma	0.05	0.1
Fimbristylis simulans	0.05	0.1
Hakea chordophylla	3	2
Indigofera monophylla	0.6	0.5
Paraneurachne muelleri	0.4	0.2
Ptilotus astrolasius	0.5	0.1
Ptilotus rotundifolius	0.6	1
Senna artemisioides subsp. *oligophylla*	0.6	0.1
Senna glutinosa subsp. *glutinosa*	1.1	0.1
Senna glutinosa subsp. *pruinosa*	1	0.5
Senna glutinosa subsp. *x luerssenii*	1.2	1
Senna symonii	0.8	0.2
Solanum lasiophyllum	0.7	0.1
Triodia vanleeuwenii	0.4	30
Triodia wiseana	0.9	1

PHOTOS



Site Name:	C22
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	21/03/2022
GPS Location:	GDA94 Zone 50 693416.65E 7476762.65N
Vegetation Type:	2
Landform Type:	Lower Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	N
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Isolated trees over isolated shrubs over open hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.3	0.5
Acacia ancistrocarpa	0.7	0.1
Acacia hilliana	0.3	0.3
Corymbia deserticola subsp. *deserticola*	2	0.2
Cymbopogon ambiguus	1.1	0.1
Eriachne mucronata	0.4	0.1
Eucalyptus leucophloia subsp. *leucophloia*	1.5	0.5
Evolvulus alsinoides	0.1	0.1
Fimbristylis simulans	0.1	0.3
Gompholobium oreophilum	0.6	0.2
Goodenia stobbsiana	0.2	0.2
Goodenia triodiophila	0.3	0.1
Hakea chordophylla	4	2
Hibiscus coatesii	0.3	0.1
Paraneurachne muelleri	0.3	0.2
Ptilotus calostachyus	1	0.5
Senna artemisioides subsp. *oligophylla*	0.4	0.1
Senna glaucifolia	0.9	0.1
Senna glutinosa subsp. *glutinosa*	0.6	0.1
Senna glutinosa subsp. *pruinosa*	0.9	0.2
Sida arenicola	1.1	0.1
Solanum lasiophyllum	0.5	0.1
Triodia vanleeuwenii	0.15	15
Triodia wiseana	0.5	1

PHOTOS



Site Name:	C23
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	21/03/2022
GPS Location:	GDA94 Zone 50 694615.12E 7475974.34N
Orientation:	90/180
Vegetation Type:	6
Landform Type:	Crest
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 20-50% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Low open woodland over sparse shrubland over open hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adsurgens	0.7	0.1
Acacia ?hamersleyensis	0.6	0.1
Acacia tenuissima	0.6	0.1
Acacia tumida var. *pilbarensis*	0.5	0.1
Aristida holathera var. *holathera*	0.4	0.1
Codonocarpus cotinifolius	1.2	0.5
Corymbia hamersleyana	3	1
Eriachne mucronata	0.35	0.2
Eucalyptus kingsmillii	1.5	1
Eucalyptus leucophloia subsp. *leucophloia*	2.5	2
Goodenia muelleriana	0.35	0.1
Goodenia stobbsiana	0.3	1.5
Goodenia triodiophila	0.3	0.3
Hibiscus coatesii	0.8	0.1
Paraneurachne muelleri	0.4	0.6
Ptilotus calostachyus	0.7	0.3
Scaevola browniana subsp. *browniana*	0.2	0.1
Senna artemisioides subsp. *helmsii*	0.1	0.1
Senna artemisioides subsp. *oligophylla*	0.6	0.1
Senna glutinosa subsp. *glutinosa*	1.2	0.5
Senna glutinosa subsp. *pruinosa*	1.3	0.1
Sida sp. Excedentifolia (J.L. Egan 1925)	0.3	1
Solanum phlomoides	1.1	0.2
Triodia wiseana	0.25	0.15

PHOTOS



Site Name:	C24
Site Type:	QUADRAT
Dimensions:	25m x 100m
Survey Date:	22/03/2022
GPS Location:	GDA94 Zone 50 694263.1E 7475775.2N
Orientation:	90/180
Vegetation Type:	4
Landform Type:	Other, Gorge (other)
Slope Class:	Very Steep (37 degrees)
Aspect:	W
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, >50% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm, 600-2000mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years
Habitat:	low woodland over shrubland over open grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia pruinocarpa	12	4
Acacia tumida var. *pilbarensis*	2	0.2
Aristida burbidgeae	0.5	5
Arivela viscosa	0.6	0.2
Astrotricha hamptonii	2.5	1
**Bidens bipinnata*	0.1	0.1
Brachychiton acuminatus	8	0.2
Bulbostylis barbata	0.03	0.1
Capparis mitchellii	0.9	0.4
Capparis spinosa subsp. *nummularia*	0.3	0.1
Clerodendrum floribundum var. *angustifolium*	1.5	0.1
Corchorus laniflorus	1.2	3
Corymbia ferriticola	6	17
Cucumis variabilis		0.1
Cymbopogon ambiguus	0.9	3
Cynanchum pedunculatum		0.5
Cyperus cunninghamii subsp. *cunninghamii*	0.7	0.1
Dodonaea pachyneura	1.2	0.1
Dodonaea viscosa subsp. *mucronata*	2.2	0.5
Duperreya commixta		0.6
Eremophila naaykensii (P3)	5	2
Eremophila petrophila subsp. *petrophila*	0.5	0.1
Eriachne mucronata	0.4	2
Eucalyptus leucophloia subsp. *leucophloia*	1.5	0.4
Euphorbia trigonosperma	0.25	0.1
Evolvulus alsinoides		
Ficus brachypoda	10	8
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)	1.1	0.3
Jasminum didymum subsp. *lineare*		1
Olearia xerophila	0.4	0.1
Paspalidium clementii	0.2	0.1
Paspalidium tabulatum	0.3	0.1

Pimelea forrestiana	1.3	0.2
Prostanthera albiflora	1.5	5
Psydrax latifolia	1.5	0.3
Pterocaulon serrulatum var. *velutinum*	0.5	0.1
Pterocaulon sphacelatum	0.8	0.5
Ptilotus astrolasius	0.6	2
Santalum lanceolatum	2	0.2
Senna ferraria	1.1	0.1
Senna venusta		
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	0.6	0.1
Solanum cleistogamum	0.3	0.2
Solanum gabrielae	0.6	0.1
Tinospora smilacina		0.4
Triodia biflora	1.2	1
Triodia pungens	0.8	10
Triumfetta maconochieana	0.5	0.1

PHOTOS



Site Name:	C25
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	22/03/2022
GPS Location:	GDA94 Zone 50 686503.49E 7476641.79N
Orientation:	90/180
Vegetation Type:	2
Landform Type:	Upper Slope
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 20-50% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	isolated trees over sparse shrubland over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.3	0.3
Acacia aptaneura	2.5	0.2
Acacia hilliana	0.5	4
Acacia pyrifolia var. *pyrifolia*	1.2	0.5
Aristida holathera var. *holathera*	0.4	0.1
Corchorus lasiocarpus subsp. *parvus*	0.4	0.1
Corymbia hamersleyana	3	0.6
Cymbopogon ambiguus	0.9	0.1
Dampiera candicans	0.3	0.1
Eremophila jucunda subsp. *pulcherrima*	1.1	0.2
Eriachne mucronata	0.3	4
Eucalyptus leucophloia subsp. *leucophloia*	6	2
Gompholobium oreophilum	0.4	0.1
Goodenia stobbsiana	0.25	0.3
Goodenia triodiophila	0.3	0.1
Grevillea wickhamii subsp. ?*hispidula*	2	0.2
Hakea chordophylla	3.5	0.4
Hibiscus sturtii var. *campylochlamys*	0.3	0.1
Indigofera monophylla	0.3	0.2
Paraneurachne muelleri	0.4	0.2
Petalostylis labicheoides	2	0.2
Ptilotus calostachyus	0.8	0.3
Senna artemisioides subsp. *oligophylla*	0.3	0.1
Senna glaucifolia	2.5	0.5
Senna glutinosa subsp. *glutinosa*	1.3	0.2
Senna glutinosa subsp. *pruinosa*	0.8	0.5
Seringia exastia (T)	0.2	0.2
Sida cardiophylla	0.4	0.1
Sida sp. Articulation below (A.A. Mitchell PRP 1605)	1.1	0.1
Solanum phlomoides	0.5	0.1
Triodia vanleeuwenii	0.3	10
Triodia wiseana	0.9	15

PHOTOS



Site Name:	C26
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	22/03/2022
GPS Location:	GDA94 Zone 50 686365.83E 7476227.28N
Orientation:	90/180
Vegetation Type:	2
Landform Type:	Lower Slope
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 10-20% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Isolated trees over sparse low shrubland over open hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.4	0.2
Acacia atkinsiana	0.5	0.1
Acacia hilliana	0.3	6
Acacia pyrifolia var. *pyrifolia*	1.1	0.2
Acacia tenuissima	0.3	0.1
Androcalva luteiflora	0.1	0.1
Aristida holathera var. *holathera*	0.4	0.2
Aristida inaequiglumis		
Corchorus lasiocarpus subsp. *parvus*	0.5	2
Corymbia deserticola subsp. *deserticola*	5	0.2
Corymbia hamersleyana	4	0.3
Enneapogon polyphyllus	0.3	0.3
Eriachne mucronata	0.3	3
Eucalyptus leucophloia subsp. *leucophloia*	6	0.1
Fimbristylis simulans	0.1	0.1
Gompholobium oreophilum	0.4	0.1
Goodenia stobbsiana	0.2	0.4
Goodenia triodiophila	0.3	0.1
Gossypium robinsonii		
Grevillea wickhamii subsp. ?*hispidula*	2	0.1
Hakea chordophylla	1.5	0.3
Indigofera monophylla	0.4	0.3
Paraneurachne muelleri	0.4	1
Petalostylis labicheoides	1.3	0.2
Ptilotus calostachyus	0.9	0.1
Santalum lanceolatum		
Senna artemisioides subsp. *oligophylla*	0.6	0.1
Senna glutinosa subsp. *glutinosa*	0.6	0.2
Senna glutinosa subsp. *pruinosa*	1.2	0.2
Seringia exastia (T)	0.4	4
Triodia vanleeuwenii	0.2	6
Triodia wiseana	0.4	8

PHOTOS



Site Name:	C27
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	23/03/2022
GPS Location:	GDA94 Zone 50 686559.06E 7475717.43N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Other, Outwash (other)
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	N
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Sparse low trees over sparse low shrubland over open hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.4	0.5
Acacia ancistrocarpa	1.3	0.5
Acacia atkinsiana	1.7	2
Acacia bivenosa	1	0.1
Acacia pruinocarpa		
Acacia tumida var. *pilbarensis*	0.8	0.1
Aristida contorta	0.3	0.1
Aristida holathera var. *holathera*	0.6	1
Aristida inaequiglumis	1.2	0.1
Bonamia erecta	0.5	1.5
Corchorus lasiocarpus subsp. *parvus*	0.8	0.5
Corymbia deserticola subsp. *deserticola*	3.5	1
Dampiera candicans	0.6	0.1
Duperreya commixta		
Eragrostis eriopoda	0.3	0.1
Eriachne mucronata	0.3	0.2
Eucalyptus gamophylla	2	6
Euploca pachyphylla	0.4	0.1
Evolvulus alsinoides	0.15	0.1
Gompholobium oreophilum	0.8	1
Goodenia microptera	0.6	0.1
Grevillea wickhamii subsp. ?*hispidula*	1.5	0.3
Hakea chordophylla		
Hibiscus sturtii var. *campylochlamys*	0.3	0.1
Hibiscus sturtii var. *platychlamys*	0.7	0.1
Indigofera monophylla	0.5	0.3
Jasminum didymum subsp. *lineare*		0.1
Paraneurachne muelleri	0.4	2
Ptilotus astrolasius	0.7	0.1
Ptilotus calostachyus	0.9	1
Ptilotus ?*carinatus*	0.1	0.1
Ptilotus rotundifolius	0.9	0.2
Scaevola parvifolia subsp. *pilbarae*	0.4	0.5

Scaevola spinescens		
Senna artemisioides subsp. *helmsii*	0.7	0.1
Senna artemisioides subsp. *oligophylla*	0.5	1
Senna glutinosa subsp. *x luerssenii*	1.3	0.1
Seringia exastia (T)	0.3	1.5
Sida arenicola	2.2	0.5
Sida cardiophylla	1.4	0.5
Sida echinocarpa	1.7	1
Sida sp. L (A.M. Ashby 4202)	0.3	0.5
Solanum lasiophyllum	0.6	0.1
Tephrosia densa	0.5	0.4
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	0.3	0.1
Triodia pungens	0.5	10
Triodia vanleeuwenii	0.2	9

PHOTOS



Site Name:	C28
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	23/03/2022
GPS Location:	GDA94 Zone 50 687731.96E 7477440.68N
Orientation:	90/180
Vegetation Type:	9
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	N
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone, Quartz
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	>10 Years
Habitat:	Tall open shrubland over sparse shrubland over sparse grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.2	0.1
Acacia ancistrocarpa	3.5	2
Acacia atkinsiana	3.5	7
Acacia pruinocarpa	4	1.5
Acacia tumida var. *pilbarensis*	2.5	0.2
Afrohybanthus aurantiacus	0.5	0.5
Alternanthera nana	0.2	0.1
Androcalva luteiflora	0.1	0.1
Anthobolus leptomerioides	1.1	0.1
Aristida holathera var. *holathera*	0.6	2
Aristida inaequiglumis	1	0.2
Chrysopogon fallax	0.9	0.1
Codonocarpus cotinifolius	2.3	0.2
Corchorus lasiocarpus subsp. *parvus*	0.6	1
Cymbopogon ambiguus	1	0.1
Duperreya commixta		0.2
Enneapogon polyphyllus	0.3	0.1
Eragrostis eriopoda	0.5	0.2
Eremophila forrestii subsp. *forrestii*	1.3	0.2
Eremophila longifolia	1.2	0.1
Eriachne mucronata	0.4	3
Eucalyptus gamophylla		
Eucalyptus leucophloia subsp. *leucophloia*	3	0.5
Eulalia aurea	0.8	0.1
Evolvulus alsinoides	0.1	0.1
Goodenia microptera	0.05	0.1
Goodenia stobbsiana	0.15	0.1
Gossypium australe	1.2	0.5
Hakea chordophylla	1.2	0.1
Hibiscus burtonii	0.25	0.1
Hibiscus coatesii	0.4	0.5
Hibiscus sturtii var. *platychlamys*	0.5	0.2
Indigofera monophylla	0.5	1.5

Maireana villosa	0.5	0.1
Paraneurachne muelleri	0.4	3
Psydrax latifolia		
Ptilotus astrolasius	0.5	3
Ptilotus calostachyus	0.9	1
Ptilotus ?carinatus	0.05	0.1
Ptilotus rotundifolius	0.9	0.5
Senna artemisioides subsp. *helmsii*	0.3	0.1
Senna artemisioides subsp. *oligophylla*	0.8	1
Senna glaucifolia	1.1	0.7
Senna glutinosa subsp. *x luerssenii*	1.1	0.2
Seringia exastia (T)	0.3	1
Sida echinocarpa	0.5	0.1
Sida sp. L (A.M. Ashby 4202)	0.3	0.1
Solanum lasiophyllum	0.9	0.5
Tribulus suberosus	1.6	0.2
Triodia pungens	0.8	4
Triodia wiseana	0.6	8

PHOTOS



Site Name:	C29
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	23/03/2022
GPS Location:	GDA94 Zone 50 689610.18E 7476537.7N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Other, washout (other)
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	N
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone, Quartz
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	(other) - track nearby
Fire:	<5 Years
Habitat:	sparse mallee woodland over tall open shrubland over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia atkinsiana	2.5	6
Acacia inaequilatera	1.4	0.1
Acacia monticola	2.5	0.5
Corymbia deserticola subsp. *deserticola*	4	1
Corymbia hamersleyana	3	0.5
Duperreya commixta		0.2
Enneapogon polyphyllus		
Eriachne mucronata	0.4	0.5
Eucalyptus gamophylla	3	10
Eucalyptus leucophloia subsp. *leucophloia*	4	0.1
Eulalia aurea	0.9	0.1
Hakea chordophylla	1.2	0.1
Hibiscus sturtii var. *campylochlamys*	0.3	0.2
Hibiscus sturtii var. *platychlamys*	1.5	1
Indigofera monophylla	0.3	1
Jasminum didymum subsp. *lineare*		0.1
Paraneurachne muelleri	0.5	4
Ptilotus astrolasius	0.4	0.1
Ptilotus calostachyus	0.7	1.5
Ptilotus rotundifolius	0.9	0.2
Rhynchosia minima		0.1
Scaevola parvifolia subsp. *pilbarae*	0.4	0.1
Senna artemisioides subsp. *helmsii*	0.3	0.1
Senna artemisioides subsp. *oligophylla*	1.5	1
Senna glutinosa subsp. *glutinosa*	1.3	0.2
Senna glutinosa subsp. *x luerssenii*	1.1	0.6
Sida arenicola	2.5	0.2
Sida cardiophylla	0.6	0.1
Sida echinocarpa	0.5	0.2
Solanum lasiophyllum		
Tephrosia densa	0.5	0.1
Triodia pungens	0.5	12
Triodia vanleeuwenii	0.2	8

PHOTOS



Site Name:	C30
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	04/04/2022
GPS Location:	GDA94 Zone 50 685302.91E 7474990.24N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	NW
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Low open woodland over tall open shrubland over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.8	0.3
Acacia atkinsiana	0.7	0.5
Acacia bivenosa		
Acacia dictyophleba	0.6	0.2
Acacia monticola	2	12
Afrohybanthus aurantiacus	0.7	0.5
Androcalva luteiflora	0.1	0.1
Aristida holathera var. *holathera*	0.5	0.2
Aristida inaequiglumis	1.6	0.1
Arivela viscosa	0.1	0.1
Bonamia erecta	0.5	5.5
Corchorus lasiocarpus subsp. *parvus*	0.8	4
Corymbia hamersleyana	6	5
Duperreya commixta		0.3
Eriachne mucronata	0.5	0.2
Eucalyptus gamophylla	3	3
Eulalia aurea	1.1	1
Euploca cunninghamii	0.2	0.1
Gompholobium oreophilum	0.6	0.1
Goodenia microptera	0.2	0.1
Goodenia stellata	0.1	0.1
Goodenia stobbsiana	0.3	0.1
Gossypium robinsonii	1.8	0.1
Grevillea wickhamii subsp. ?*hispidula*	2	0.1
Hibiscus coatesii	0.4	0.1
Hibiscus sturtii var. *campylochlamys*	0.6	2
Hibiscus sturtii var. *platychlamys*	0.6	0.2
Indigofera monophylla	0.5	0.4
Jasminum didymum subsp. *lineare*		0.2
Paraneurachne muelleri	0.5	4
Perotis rara	0.1	0.1
Ptilotus astrolasius	0.7	0.1
Ptilotus calostachyus	1	0.2

Ptilotus ?*carinatus*	0.05	0.1
Ptilotus rotundifolius	0.8	0.1
Rhynchosia minima		0.5
Santalum lanceolatum	2	0.4
Scaevola parvifolia subsp. *pilbarae*	0.4	0.1
Senna artemisioides subsp. *oligophylla*	1.1	1
Senna glutinosa subsp. *pruinosa*	0.9	0.5
Senna notabilis	0.1	0.1
Seringia exastia (T)	0.4	0.3
Sida arenicola	1.8	2
Sida cardiophylla	1.8	1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.9	0.1
Solanum lasiophyllum	0.3	0.1
Tephrosia densa	0.4	0.1
Tephrosia oxalidea	0.15	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	1.1	8
Triodia pungens	1.5	15
Triodia vanleeuwenii	0.3	2
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	C31
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	04/04/2022
GPS Location:	GDA94 Zone 50 685976.53E 7475494N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	NW
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Isolated trees over sparse low shrubland over open hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia atkinsiana	0.7	2
Acacia pyrifolia var. *pyrifolia*	0.5	0.1
Acacia tenuissima	0.4	0.1
Acacia tumida var. *pilbarensis*	0.5	0.1
Afrohybanthus aurantiacus	0.4	0.1
Amphipogon sericeus	0.4	1
Aristida contorta	0.3	1
Capparis lasiantha	0.8	0.1
Codonocarpus cotinifolius		
Corchorus lasiocarpus subsp. *parvus*	0.5	0.1
Corymbia deserticola subsp. *deserticola*		
Cymbopogon obtectus	0.6	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.4	0.5
Eragrostis eriopoda	0.4	0.1
Eremophila longifolia	0.5	0.1
Eriachne mucronata	0.5	0.5
Eucalyptus gamophylla	2.5	2
Eucalyptus leucophloia subsp. *leucophloia*	8	3
Eulalia aurea	0.8	1
Goodenia triodiophila	0.2	0.1
Hakea chordophylla		
Hibiscus sturtii var. *campylochlamys*	0.4	0.1
Indigofera monophylla	0.3	1
Jasminum didymum subsp. *lineare*		0.1
Paraneurachne muelleri	0.5	0.5
Ptilotus astrolasius	0.3	0.2
Ptilotus calostachyus	0.8	0.3
Ptilotus ?exaltatus	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.4	0.2
Ptilotus rotundifolius	0.8	0.2
Senna artemisioides subsp. *helmsii*	0.8	0.2
Senna artemisioides subsp. *oligophylla*	1	2

Senna glutinosa subsp. *pruinosa*	0.9	0.1
Senna glutinosa subsp. *x luerssenii*	1.2	0.5
Sida arenicola	1.6	0.5
Sida cardiophylla	0.8	0.1
Solanum lasiophyllum	0.5	0.1
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.1	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.9	0.1
Triodia pungens	0.5	6
Triodia vanleeuwenii	0.25	5
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	C32
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	05/04/2022
GPS Location:	GDA94 Zone 50 691535.34E 7476026.29N
Orientation:	90/180
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Exotic Weeds, (other) - track nearby
Fire:	> 10 Years
Habitat:	Low open woodland over tall open shrubland over open grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon lepidum	0.5	0.3
Abutilon otocarpum	0.3	0.1
Acacia ancistrocarpa	1.7	0.4
Acacia aneura	5	5
Acacia aptaneura	0.6	0.1
Acacia atkinsiana	1.3	0.5
Acacia ayersiana	7	4
Acacia pruinocarpa	3.5	3
Acacia sibirica		
Acacia tumida var. *pilbarensis*		
Afrohybanthus aurantiacus	0.8	3
Alternanthera nana	0.2	0.1
Anthobolus leptomerioides	1.1	0.2
Aristida inaequiglumis	1.3	1
Aristida obscura	0.35	8
Arivela viscosa	0.05	0.1
**Bidens bipinnata*	0.15	0.2
Boerhavia coccinea	0.05	0.2
Cheilanthes sieberi subsp. *sieberi*	0.3	0.1
Chrysopogon fallax	0.9	0.1
Clerodendrum floribundum var. *angustifolium*		
Corymbia deserticola subsp. *deserticola*	4.5	1
Cucumis variabilis	0.02	0.1
Dodonaea petiolaris	1.2	0.4
Duperreya commixta		0.1
Enneapogon polyphyllus	0.35	1
Eremophila forrestii subsp. *forrestii*	1.2	0.4
Eremophila fraseri subsp. *fraseri*		
Eriachne mucronata	0.4	4
Eucalyptus leucophloia subsp. *leucophloia*	4	0.5
Euphorbia australis var. *hispidula*	0.02	0.1
Euphorbia biconvexa	0.3	0.1
Evolvulus alsinoides	0.15	0.1
Goodenia microptera	0.25	0.1

Gossypium australe		0.1
Hakea chordophylla	0.8	0.1
Hibiscus burtonii	0.6	1
Hibiscus coatesii	0.4	0.1
Hibiscus sturtii var. *platychlamys*	0.6	0.1
Maireana villosa	0.3	0.5
Paspalidium clementii	0.1	0.1
Perotis rara	0.1	0.1
Psydrax suaveolens	1.2	0.2
Ptilotus astrolasius	0.5	0.5
Ptilotus obovatus var. *obovatus*	0.4	0.1
Senna artemisioides subsp. *helmsii*	1.4	2
Senna artemisioides subsp. *oligophylla*	1.2	0.2
Senna glaucifolia	1.4	0.1
Senna glutinosa subsp. *glutinosa*	1.3	0.1
Senna glutinosa subsp. *x luerssenii*	1.5	2
Senna notabilis	0.05	0.1
**Setaria verticillata*	0.3	0.1
Sida ectogama	0.6	0.1
Sida sp. dark green fruits (S. van Leeuwen 2260)	0.7	0.1
Sida sp. L (A.M. Ashby 4202)	0.2	0.5
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.8	0.2
Solanum lasiophyllum	0.6	0.1
Solanum phlomoides	0.3	0.1
Sporobolus australasicus	0.1	0.1
Streptoglossa decurrens	0.5	0.1
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.1	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.8	1
Tribulus suberosus	0.9	0.1
Trichodesma zeylanicum	0.1	0.1
Triodia pungens	1.1	2
Triodia vanleeuwenii	0.2	0.2

PHOTOS



Site Name:	C33
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	05/04/2022
GPS Location:	GDA94 Zone 50 690740.33E 7476199.24N
Orientation:	90/180
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Exotic Weeds
Fire:	> 10 Years
Habitat:	Tall open woodland over tall open shrubland over open grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.5	0.2
Abutilon otocarpum	0.6	0.3
Acacia ancistrocarpa	1.2	0.2
Acacia aneura	3.5	1
Acacia aptaneura	3.5	8
Acacia atkinsiana	4	2
Acacia ayersiana	4	0.5
Acacia pruinocarpa	4	7
Alternanthera nana	0.1	0.1
Anthobolus leptomerioides	1.2	0.1
Aristida inaequiglumis	1.2	1
Aristida obscura	0.4	6
Arivela viscosa	0.3	0.2
**Bidens bipinnata*	0.1	0.2
Boerhavia coccinea	0.1	0.2
**Cenchrus setiger*	0.4	0.1
Cheilanthes sieberi subsp. *sieberi*	0.3	0.1
Chrysopogon fallax	1.1	1
Corchorus lasiocarpus subsp. *parvus*	0.5	0.1
Corymbia deserticola subsp. *deserticola*	2	0.2
Dodonaea petiolaris	1.2	2
Duperreya commixta		0.5
Enneapogon polyphyllus	0.4	4
Enneapogon robustissimus	1	0.1
Eremophila fraseri subsp. *fraseri*	1.5	1
Eremophila latrobei subsp. *filiformis*	0.6	0.1
Eriachne mucronata	0.4	3
Eulalia aurea	0.8	0.1
Euphorbia biconvexa	0.25	0.1
Evolvulus alsinoides	0.1	0.1
Glycine canescens		0.1
Gomphrena canescens subsp. *canescens*	0.4	0.2
Gomphrena kanisii	0.4	0.1
Gossypium australe	0.5	0.2

Hibiscus burtonii	1.1	0.2
Hibiscus coatesii	0.4	0.1
Hibiscus sturtii var. *platychlamys*	0.4	0.2
Indigofera georgei	0.5	0.2
Isotropis iophyta	0.5	0.2
Jasminum didymum subsp. *lineare*		0.1
Maireana villosa	0.3	0.2
Melhania oblongifolia	0.4	0.1
Paraneurachne muelleri	0.4	3
Perotis rara	0.1	0.1
Psydrax suaveolens	0.9	0.1
Pterocaulon sphacelatum	0.9	0.2
Ptilotus astrolasius	0.5	3
Ptilotus obovatus var. *obovatus*	0.2	0.1
Santalum lanceolatum	2	0.1
Sclerolaena cornishiana	0.3	0.3
Senna artemisioides subsp. *helmsii*	1.3	3
Senna glaucifolia	1.1	0.2
Senna glutinosa subsp. *glutinosa*	1.1	0.1
Senna notabilis	0.1	0.1
Setaria surgens	0.3	0.1
Sida sp. Articulation below (A.A. Mitchell PRP 1605)	1.2	0.3
Sida sp. L (A.M. Ashby 4202)	0.5	0.2
Solanum cleistogamum	0.4	0.1
Solanum lasiophyllum	0.5	0.2
Solanum phlomoides	0.5	0.1
Spermacoce brachystema	0.15	0.1
Streptoglossa decurrens	0.9	0.5
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.9	1
Tribulus ?*macrocarpus*		
Tribulus macrocarpus	0.1	0.1
Triodia pungens	0.8	5

PHOTOS



Site Name:	C34
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	05/04/2022
GPS Location:	GDA94 Zone 50 690746.41E 7475621.46N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	N
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	Isolated trees over tall open shrubland over open hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.7	0.1
Acacia ancistrocarpa	2.2	2
Acacia aptaneura	2.5	0.2
Acacia atkinsiana	3	10
Acacia inaequilatera	2	1
Afrohybanthus aurantiacus	0.4	0.2
Amphipogon sericeus	0.4	0.1
Androcalva luteiflora	0.1	0.1
Aristida holathera var. *holathera*	0.5	0.3
Aristida obscura	0.35	0.5
Bonamia erecta		
Corymbia deserticola subsp. *deserticola*	4	1
Cymbopogon obtectus	0.7	0.2
Dodonaea petiolaris	1.5	0.1
Eragrostis eriopoda	0.3	0.1
Eremophila fraseri subsp. *fraseri*	0.7	0.1
Eriachne mucronata	0.5	1
Eucalyptus gamophylla	2.5	0.5
Eucalyptus leucophloia subsp. *leucophloia*		
Euphorbia australis var. *hispidula*	0.2	0.1
Fimbristylis dichotoma	0.12	0.1
Hakea loreus subsp. *loreus*	1.5	0.2
Hibiscus sturtii var. *platychlamys*	0.4	0.1
Indigofera monophylla	0.5	0.2
Paraneurachne muelleri	0.5	2
Ptilotus astrolasius	0.5	1
Ptilotus calostachyus	0.8	1
Ptilotus rotundifolius	1	0.2
Santalum lanceolatum	2.5	0.1
Senna artemisioides subsp. *helmsii*	1	0.1
Senna artemisioides subsp. *oligophylla*	0.5	0.1
Senna glutinosa subsp. *glutinosa*	1.2	0.1
Senna glutinosa subsp. *pruinosa*	1.1	0.1
Senna glutinosa subsp. *x luerssenii*	1.3	0.1
Seringia exastia (T)	0.6	0.5
Sida arenicola	2	0.1

Solanum lasiophyllum	0.5	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.9	0.2
Trichodesma zeylanicum	1.2	0.1
Triodia pungens	0.9	15
Triodia vanleeuwenii	0.4	3

PHOTOS



Site Name:	C35
Site Type:	QUADRAT
Dimensions:	100m x 25m
Survey Date:	06/04/2022
GPS Location:	GDA94 Zone 50 694596.85E 7474935.33N
Orientation:	110/200
Vegetation Type:	4
Landform Type:	Rocky Gully (other)
Slope Class:	Moderately Inclined (10 degrees)
Aspect:	S
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 20-50% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm, 600-2000mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years
Habitat:	Low open woodland over tall sparse shrubland over hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	1.6	0.1
Acacia hamersleyensis	2.2	0.2
Acacia pyrifolia var. *pyrifolia*	1.3	0.5
Acacia tumida var. *pilbarensis*	1.6	0.1
Afrohybanthus aurantiacus	0.3	0.1
Amaranthus cuspidifolius	0.05	0.1
Aristida burbidgeae	0.5	2
Arivela viscosa	0.1	0.1
Capparis spinosa subsp. *nummularia*	0.25	0.1
Cheilanthes brownii	0.05	0.1
Cheilanthes sieberi subsp. *sieberi*	0.1	0.1
Corchorus laniflorus	0.8	0.2
Corymbia hamersleyana	5	2
Cucumis variabilis	0.05	0.1
Cymbopogon ambiguus	0.6	0.3
Cynanchum pedunculatum		0.1
Cyperus cunninghamii subsp. *cunninghamii*	0.3	0.1
Diplatia grandibractea		0.2
Dodonaea viscosa subsp. *mucronata*	1.4	1.5
Duperreya commixta		0.1
Enneapogon robustissimus	0.6	0.1
Eriachne mucronata	0.6	1
Eucalyptus leucophloia subsp. *leucophloia*	7	5
Euphorbia trigonosperma	0.05	0.1
Evolvulus alsinoides	0.1	0.1
Gossypium robinsonii	2.2	1
Grevillea wickhamii subsp. ?*hispidula*	1.8	0.2
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)	0.6	0.1
Indigofera fractiflexa subsp. *fractiflexa*	0.25	0.1
Jasminum didymum subsp. *lineare*		0.1
Pterocaulon sphacelatum	0.3	0.1
Ptilotus astrolasius	0.3	0.1

Rhynchosia minima		0.1
Santalum lanceolatum	2.2	0.3
Senna glutinosa subsp. *glutinosa*	0.6	0.1
Senna venusta	0.7	0.1
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	0.15	0.1
Solanum cleistogamum	0.4	0.1
Stylobasium spathulatum	1.3	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.9	0.1
Trichodesma zeylanicum	0.05	0.1
Triodia biflora	0.5	5
Triodia pungens	0.5	10
Triumfetta maconochieana	1.2	0.1

PHOTOS



Site Name:	C36
Site Type:	QUADRAT
Dimensions:	100m x 25m
Survey Date:	06/04/2022
GPS Location:	GDA94 Zone 50 693242.75E 7475766.83N
Orientation:	90/180
Vegetation Type:	4
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	W
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Exotic Weeds, (other) - old track in vicinity.
Fire:	5-10 Years
Habitat:	Isolated trees over tall open shrubland over low herbs and grasses

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	2.2	1.5
Acacia adsurgens	1.5	0.1
Acacia atkinsiana	1.8	0.2
Acacia inaequilatera	1.4	0.1
Acacia monticola	1.8	1
Acacia pyrifolia var. *pyrifolia*	1.3	0.2
Acacia tumida var. *pilbarensis*	1.2	0.5
Afrohybanthus aurantiacus	0.4	0.1
Alternanthera nana	0.2	0.1
Androcalva luteiflora	1.2	0.2
Aristida burbidgeae	0.5	0.2
Arivela viscosa	0.1	0.2
**Bidens bipinnata*	0.1	0.5
Boerhavia coccinea	0.1	0.1
Boerhavia repleta	0.02	0.1
Capparis spinosa subsp. *nummularia*	0.3	0.1
Clerodendrum floribundum var. *angustifolium*		
Corchorus laniflorus	0.7	0.5
Corchorus lasiocarpus subsp. *parvus*	0.5	0.4
Corymbia hamersleyana	6	3
Crotalaria medicaginea var. *neglecta*	0.1	0.1
Cucumis variabilis		1
Cymbopogon ambiguus	0.8	0.5
Cynanchum pedunculatum		0.1
Cyperus cunninghamii subsp. *cunninghamii*	0.3	0.1
Digitaria ammophila	0.2	0.1
Dodonaea viscosa subsp. *mucronata*	1.2	0.3
Duperreya commixta		1
Enneapogon lindleyanus	0.4	0.1
Enneapogon polyphyllus	0.3	0.1
Eriachne mucronata	0.35	1
Eriachne tenuiculmis	0.3	0.2
Eucalyptus leucophloia subsp. *leucophloia*	6	1
Euphorbia tannensis subsp. *eremophila*	0.8	0.1

Euphorbia trigonosperma	0.2	0.1
Evolvulus alsinoides	0.2	0.1
Glycine canescens		0.1
Gomphrena cunninghamii	0.2	0.2
Gossypium robinsonii	3	6
Grevillea wickhamii subsp. ?*hispidula*	2	4
Hakea chordophylla	4.5	0.2
Indigofera monophylla	0.4	0.2
Jasminum didymum subsp. *lineare*		1
Leiocarpa semicalva subsp. *semicalva*	0.3	0.1
Melhania oblongifolia	0.8	0.1
Nellica maderaspatensis	0.3	0.4
Paspalidium clementii	0.12	0.1
Perotis rara	0.1	0.1
Polycarpaea longiflora	0.25	0.1
Pterocaulon sphacelatum	0.4	0.3
Ptilotus astrolasius	0.4	0.5
Ptilotus fusiformis	0.15	0.1
Rhynchosia minima	0.1	0.1
Santalum lanceolatum		1
Senna artemisioides subsp. *oligophylla*	0.6	0.2
Senna glutinosa subsp. *glutinosa*	0.6	0.2
Senna venusta	0.2	0.1
Setaria surgens	0.15	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.9	0.1
Solanum lasiophyllum	0.3	0.1
Solanum phlomoides	0.4	0.1
Stylobasium spathulatum	1.1	0.2
Tephrosia densa	0.8	1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.9	4
Tinospora smilacina		0.1
Trichodesma zeylanicum	0.05	0.1
Triodia biflora	0.9	2
Triodia pungens	0.7	3
Triodia wiseana	0.8	5

PHOTOS



Site Name:	C37
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	06/04/2022
GPS Location:	GDA94 Zone 50 694905.61E 7475344.16N
Orientation:	90/180
Vegetation Type:	6
Landform Type:	Upper Slope
Slope Class:	Very Steep (37 degrees)
Aspect:	S
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, >50% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years
Habitat:	Low open woodland over isolated shrubs over closed hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia hamersleyensis	5	0.1
Afrohybanthus aurantiacus	0.3	1
Cassytha capillaris		0.2
Cheilanthes brownii	0.05	0.1
Cheilanthes sieberi subsp. *sieberi*	0.03	0.1
Clerodendrum floribundum var. *angustifolium*	0.15	0.1
Codonocarpus cotinifolius	0.5	0.1
Corymbia hamersleyana	4	4
Cymbopogon ambiguus	0.5	0.1
Cynanchum pedunculatum		0.1
Dodonaea viscosa subsp. *mucronata*	1.5	1
Eriachne mucronata	0.3	5
Eucalyptus kingsmillii	2	3
Eucalyptus leucophloia subsp. *leucophloia*	4	5
Hakea chordophylla	1.6	0.2
Pimelea forrestiana	1.1	0.2
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	0.25	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.3	0.1
Triodia biflora	1.1	35
Triodia wiseana	1.1	15

PHOTOS



Site Name:	C38
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	07/04/2022
GPS Location:	GDA94 Zone 50 692644.85E 7477334.12N
Orientation:	90/180
Vegetation Type:	9
Landform Type:	Flat
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years
Habitat:	Isolated trees over sparse tall shrubland over grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon macrum	1.1	0.1
Abutilon otocarpum	0.8	0.1
Acacia adoxa var. *adoxa*	0.6	0.2
Acacia adsurgens	1.1	0.2
Acacia ancistrocarpa	1.6	0.3
Acacia aptaneura	2.2	0.5
Acacia atkinsiana	1.9	0.5
Acacia pruinocarpa		
Acacia tumida var. *pilbarensis*	3.5	2
Afrohybanthus aurantiacus	0.6	0.2
Androcalva luteiflora	0.1	0.1
Aristida holathera var. *holathera*	0.45	1
Aristida inaequiglumis	1.3	0.5
Arivela viscosa	0.1	0.1
Boerhavia coccinea	0.2	0.1
Bonamia erecta	0.4	2
Chrysopogon fallax	1.1	1
Corymbia deserticola subsp. *deserticola*	4.5	1
Digitaria brownii	0.9	0.1
Dodonaea coriacea	0.8	0.1
Duperreya commixta		0.3
Enneapogon polyphyllus	0.4	0.5
Enneapogon robustissimus	0.6	0.3
Eragrostis eriopoda	0.45	0.1
Eremophila longifolia	0.6	0.2
Eucalyptus gamophylla	2.5	2
Eulalia aurea	0.7	0.3
Euphorbia australis var. *hispidula*	0.2	0.1
Euphorbia biconvexa	0.3	0.1
Evolvulus alsinoides	0.1	0.1
Gomphrena canescens subsp. *canescens*	0.2	0.1
Goodenia microptera	0.3	0.1
Goodenia stobbsiana	0.4	0.1
Gossypium robinsonii	0.9	0.1

Hibiscus burtonii	0.8	0.1
Hibiscus sturtii var. *platychlamys*	0.5	0.2
Indigofera georgei	0.9	0.2
Indigofera monophylla	0.4	0.1
Isotropis iophyta	0.3	0.1
Jasminum didymum subsp. *lineare*		0.2
Melhania oblongifolia	0.7	0.1
Notoleptopus decaisnei	0.1	0.1
Paraneurachne muelleri	0.4	1
Perotis rara	0.1	0.1
Ptilotus astrolasius	0.5	0.5
Ptilotus calostachyus	0.9	0.2
Scaevola parvifolia subsp. *pilbarae*	0.3	0.5
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *oligophylla*	0.9	0.2
Senna artemisioides subsp. *x artemisioides*	1.1	0.2
Senna glutinosa subsp. *glutinosa*	0.9	0.1
Senna notabilis	0.05	0.1
Seringia exastia (T)	0.5	1.5
Sida cardiophylla		
Sida sp. L (A.M. Ashby 4202)	0.5	1
Solanum lasiophyllum	0.6	0.2
Tephrosia densa	0.4	0.3
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.8	6
Triodia pungens	0.7	15
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	C39
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	07/04/2022
GPS Location:	GDA94 Zone 50 691211.82E 7476736.22N
Orientation:	90/180
Vegetation Type:	9
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Isolated trees over low sparse shrubland over open hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia ancistrocarpa	0.7	0.1
Acacia inaequilatera	3	4
Alternanthera nana	0.2	0.1
Amaranthus cuspidifolius	0.3	0.1
Anthobolus leptomerioides		
Aristida holathera var. *holathera*	0.4	1
Arivela viscosa	0.1	0.1
Boerhavia coccinea	0.1	0.1
Crotalaria medicaginea var. *neglecta*	0.3	0.1
Duperreya commixta		0.2
Eragrostis eriopoda	0.4	0.5
Eremophila fraseri subsp. *fraseri*	0.7	0.1
Eremophila longifolia	0.8	0.1
Eriachne mucronata	0.5	0.3
Evolvulus alsinoides	0.1	0.1
Gomphrena canescens subsp. *canescens*	0.3	0.2
Goodenia microptera	0.3	0.1
Gossypium robinsonii		
Grevillea wickhamii subsp. ?*hispidula*	0.25	0.1
Hakea chordophylla	1.3	0.2
Hakea loreus subsp. *loreus*	0.8	0.1
Hibiscus burtonii	0.8	0.1
Hibiscus coatesii	0.05	0.1
Hibiscus sturtii var. *platychlamys*	0.7	0.1
Paraneurachne muelleri	0.4	1
Ptilotus astrolasius	0.5	0.3
Ptilotus ?*carinatus*	0.05	0.1
Senna artemisioides subsp. *helmsii*	0.7	0.5
Senna artemisioides subsp. *oligophylla*	0.8	0.1
Senna glaucifolia	0.9	0.2
Senna glutinosa subsp. *x luerssenii*	0.9	0.1
Sida cardiophylla	1.1	0.1
Sida echinocarpa	0.9	0.2
Sida sp. L (A.M. Ashby 4202)	0.2	0.1

Solanum lasiophyllum	0.5	0.1
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)		
Tribulus macrocarpus	0.02	0.1
Triodia pungens	0.4	12
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	C40
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	08/04/2022
GPS Location:	GDA94 Zone 50 693324.36E 7476023.41N
Orientation:	90/180
Vegetation Type:	6
Landform Type:	Mid Slope
Slope Class:	Steep (23 degrees)
Aspect:	SE
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 10-20% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years
Habitat:	Low open woodland over isolated low shrubs over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.4	0.1
Acacia hamersleyensis	3	0.4
Cassytha capillaris		0.1
Cheilanthes brownii	0.05	0.1
Corymbia hamersleyana	4	1
Dodonaea coriacea	0.3	0.1
Dodonaea viscosa subsp. *mucronata*	0.8	0.2
Eriachne mucronata	0.4	0.5
Eucalyptus leucophloia subsp. *leucophloia*	4	3
Fimbristylis dichotoma	0.05	0.1
Goodenia triodiophila	0.3	0.1
Grevillea wickhamii subsp. ?*hispidula*	1.6	0.1
Hakea chordophylla	2	0.2
Jasminum didymum subsp. *lineare*		0.1
Mirbelia viminalis	0.8	0.2
Psydrax latifolia	0.4	0.1
Scaevola browniana subsp. *browniana*	0.3	0.1
Senna glutinosa subsp. *glutinosa*	1.2	0.1
Solanum lasiophyllum	0.5	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.6	0.1
Triodia wiseana	0.4	30

PHOTOS



Site Name:	C41
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	08/04/2022
GPS Location:	GDA94 Zone 50 687487.82E 7477012.09N
Orientation:	90/180
Vegetation Type:	2
Landform Type:	Other, foothill (other)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Low open woodland over low open shrubland over open hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.4	0.3
Acacia hilliana	0.3	4
Acacia inaequilatera	2.5	0.1
Acacia maitlandii		
Acacia pruinocarpa	0.8	0.1
Corchorus lasiocarpus subsp. *parvus*	0.4	0.2
Corymbia hamersleyana	3	0.5
Eriachne mucronata	0.4	0.3
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eucalyptus leucophloia subsp. *leucophloia*	4	1
Fimbristylis dichotoma	0.15	0.1
Goodenia stobbsiana	0.2	0.1
Goodenia triodiophila	0.4	0.1
Hakea chordophylla	2.5	0.5
Indigofera monophylla	0.3	0.4
Petalostylis labicheoides	1.8	0.2
Polycarpaea holtzei	0.01	0.1
**Portulaca pilosa*		
Ptilotus calostachyus	0.3	0.1
Ptilotus ?*carinatus*	0.01	0.1
Ptilotus rotundifolius	0.8	0.3
Schizachyrium fragile	0.03	0.1
Senna artemisioides subsp. *oligophylla*	0.4	0.1
Senna glaucifolia	2.2	0.1
Senna glutinosa subsp. *glutinosa*	0.7	0.3
Senna glutinosa subsp. *pruinosa*	0.5	0.2
Seringia exastia (T)	0.4	0.2
Sida arenicola	0.9	0.1
Sida cardiophylla	0.6	0.1
Solanum phlomoides	0.3	0.1
Tephrosia oxalidea	0.1	0.1
Triodia vanleeuwenii	0.3	6
Triodia wiseana	0.4	0.2

PHOTOS



Site Name:	C42
Site Type:	QUADRAT
Dimensions:	100m x 25m
Survey Date:	09/04/2022
GPS Location:	GDA94 Zone 50 695072.6E 7476655.93N
Orientation:	80/170
Vegetation Type:	4
Landform Type:	Other, Gully (other)
Slope Class:	Moderately Inclined (10 degrees)
Aspect:	E
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, >50% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm, 600-2000mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Exotic Weeds
Fire:	<5 Years
Habitat:	Low open woodland over open tall shrubland over tussock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon lepidum	0.3	0.1
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	1.3	0.4
Acacia hamersleyensis	2.5	0.3
Acacia maitlandii	1.5	0.3
Acacia monticola	3	1
Acacia pruinocarpa	1.2	0.2
Acacia pyrifolia var. *pyrifolia*	0.6	0.1
Afrohybanthus aurantiacus	0.4	0.2
Amaranthus undulatus	0.06	0.1
Aristida burbidgeae	0.5	0.5
Aristida obscura	0.2	0.1
Arivela viscosa	0.02	0.1
**Bidens bipinnata*		
Bulbostylis barbata		
Capparis mitchellii	0.2	0.1
Capparis spinosa subsp. *nummularia*	1.2	0.2
**Cenchrus ciliaris*	0.4	0.1
Cheilanthes brownii	0.1	0.1
Clerodendrum floribundum var. *angustifolium*	1.5	0.2
Corchorus laniflorus	0.8	2
Corchorus lasiocarpus subsp. *parvus*	0.6	0.2
Corymbia ferriticola	4	1
Corymbia hamersleyana	4	0.4
Cucumis variabilis		0.2
Cullen leucochaites	2.5	0.2
Cymbopogon ambiguus	0.9	3
Cynanchum pedunculatum		0.5
Cyperus cunninghamii subsp. *cunninghamii*	0.25	0.1
Dodonaea pachyneura	1.2	0.5
Duperreya commixta		0.3
Enneapogon lindleyanus	0.4	0.3
Enneapogon polyphyllus	0.4	0.5
Eragrostis tenellula	0.2	0.1

Eremophila jucunda subsp. *pulcherrima*	0.5	0.1
Eriachne mucronata	0.4	1.5
Eucalyptus leucophloia subsp. *leucophloia*	8	5
Euphorbia biconvexa	0.15	0.1
Euphorbia trigonosperma	0.05	0.1
Ficus brachypoda	4	3
Gomphrena cunninghamii	0.2	1
Goodenia stobbsiana	0.3	0.1
Gossypium australe	0.7	0.1
Gossypium robinsonii	2.5	2
Grevillea wickhamii subsp. ?*hispidula*	2	0.2
Hakea chordophylla	2	0.2
Jasminum didymum subsp. *lineare*		1
Nellica maderaspatensis	0.4	0.4
Paraneurachne muelleri	0.4	0.2
Paspalidium clementii	0.15	0.1
Pluchea dentex	0.4	0.2
Polycarpaea longiflora	0.3	0.2
Ptilotus astrolasius	0.5	0.1
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *oligophylla*	0.5	0.1
Senna ferraria	1.5	0.2
Senna glutinosa subsp. *glutinosa*	1.2	0.3
Senna venusta	0.4	0.1
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	0.6	1
Solanum cleistogamum	0.4	0.1
Solanum gabrielae	0.3	0.1
Solanum lasiophyllum	0.3	0.1
Stemodia grossa	0.3	0.1
Stylobasium spathulatum	1.5	0.5
Teucrium teucriiflorum	0.8	0.5
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.6	10
Tinospora smilacina		1
Triodia pungens	0.5	1
Triodia wiseana	0.4	2
Tripogonella loliiformis	0.05	0.1
Triumfetta maconochieana	0.3	0.1
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)	0.1	0.1

PHOTOS



Site Name:	C43
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	09/04/2022
GPS Location:	GDA94 Zone 50 692119.75E 7478456.31N
Orientation:	90/180
Vegetation Type:	10
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	N
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - G - Good
Disturbance:	Exotic Weeds, (other) - Cows
Fire:	<5 Years
Habitat:	Low open woodland over tall open shrubland over tussock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon amplum	1.2	0.1
Acacia ancistrocarpa	1.1	0.2
Acacia dictyophleba	1.6	0.3
Acacia pyrifolia var. *pyrifolia*	1.5	1
Acacia sericophylla	1.7	0.1
Acacia tumida var. *pilbarensis*	1.7	0.5
Afrohybanthus aurantiacus	0.5	0.5
Alternanthera nana	0.2	1
Androcalva luteiflora	1.5	2
Aristida contorta	0.3	0.2
Aristida holathera var. *holathera*	0.4	0.5
Aristida inaequiglumis	1.3	0.5
Arivela viscosa	0.3	0.3
Atalaya hemiglauca	1.5	1
**Bidens bipinnata*	0.2	0.1
Boerhavia coccinea	0.25	0.1
Boerhavia repleta	0.2	0.5
Bonamia erecta	0.5	0.3
Capparis lasiantha	0.5	0.1
**Cenchrus ciliaris*	0.7	5
Chrysopogon fallax	0.8	0.5
Corymbia hamersleyana	11	10
Crotalaria medicaginea var. *neglecta*	0.4	0.3
Cucumis variabilis		0.5
Dodonaea lanceolata var. *lanceolata*	0.9	0.2
Duperreya commixta		0.5
Enneapogon lindleyanus	0.4	0.4
Eragrostis eriopoda	0.4	0.5
Eremophila longifolia	1.5	2
Eucalyptus xerothermica	9	1
Eulalia aurea	0.6	2
Euphorbia biconvexa	0.3	0.1
Euploca cunninghamii	0.3	0.1

Evolvulus alsinoides	0.2	0.1
Evolvulus alsinoides var. *decumbens*	0.15	0.1
Glycine canescens		0.1
Gomphrena canescens subsp. *canescens*	0.3	1
Goodenia microptera	0.4	0.1
Goodenia stellata	0.15	0.1
Gossypium australe	0.7	0.1
Gossypium robinsonii	2	2
Grevillea wickhamii subsp. ?*hispidula*	1.7	2
Hibiscus sturtii var. *platychlamys*	0.7	0.3
Indigofera georgei	0.6	0.2
Indigofera monophylla	0.4	2
Isotropis iophyta	0.9	0.1
Jasminum didymum subsp. *lineare*		1
**Malvastrum americanum*	0.6	0.1
Melhania oblongifolia	0.4	0.1
Paraneurachne muelleri	0.4	0.5
Perotis rara	0.1	0.2
Polymeria ambigua	0.2	0.3
Pterocaulon sphacelatum	0.5	0.5
Ptilotus calostachyus	0.8	0.2
Ptilotus ?*exaltatus*	0.05	0.1
Ptilotus obovatus var. *obovatus*	0.4	0.2
Rhynchosia minima		0.2
Salsola australis	0.5	0.1
Santalum lanceolatum	1.6	0.4
Scaevola amblyanthera var. *centralis*	0.25	0.1
Senna artemisioides subsp. *oligophylla*	0.5	0.2
Setaria surgens	0.3	0.2
**Setaria verticillata*	0.4	0.1
Sida echinocarpa	0.8	0.2
Sida sp. L (A.M. Ashby 4202)	0.2	0.3
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.9	0.2
Solanum phlomoides	0.3	0.1
Tephrosia densa	0.8	3
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.9	7
Tribulus macrocarpus	0.1	0.1
Trichodesma zeylanicum	0.6	0.1
Triodia pungens	0.6	0.8
Waltheria indica	0.6	0.2

PHOTOS



Site Name:	C44
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	09/04/2022
GPS Location:	GDA94 Zone 50 694512.09E 7477652.09N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Lower Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	S
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, <2% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone, ironstone gravel - almost like laterite (other)
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	(other) - track and monitoring bore nearby.
Fire:	<5 Years
Habitat:	Low open woodland over isolated shrubs over open hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.4	0.1
Acacia aptaneura		
Acacia atkinsiana	1.2	0.5
Acacia bivenosa	1.1	0.2
Acacia inaequilatera		
Acacia synchronicia	0.3	0.1
Acacia tetragonophylla	1.2	0.3
Acacia tumida var. *pilbarensis*	1.3	0.1
Aristida contorta	0.3	0.5
Aristida holathera var. *holathera*	0.4	0.1
Capparis lasiantha	0.9	0.1
Corchorus crozophorifolius		
Dodonaea lanceolata var. *lanceolata*	1.1	0.1
Duperreya commixta		0.1
Eriachne lanata	0.4	1
Eriachne mucronata	0.4	1
Eucalyptus leucophloia subsp. *leucophloia*	7	8
Eulalia aurea	0.4	0.1
Euphorbia australis var. *hispidula*	0.01	0.1
Goodenia microptera	0.4	0.1
Goodenia stobbsiana	0.3	0.2
Goodenia triodiophila	0.4	0.1
Gossypium australe	0.6	0.1
Gossypium robinsonii		
Grevillea wickhamii subsp. ?*hispidula*	1.9	0.1
Hakea loreus subsp. *loreus*	2.1	0.1
Hibiscus coatesii	0.2	0.1
Jasminum didymum subsp. *lineare*		
Paraneurachne muelleri	0.45	0.4
Ptilotus astrolasius	0.4	0.5
Ptilotus calostachyus	0.9	0.2
Ptilotus ?*carinatus*	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.4	0.1

Santalum lanceolatum	1.8	0.1
Senna artemisioides subsp. *helmsii*	0.2	0.1
Senna artemisioides subsp. *oligophylla*	0.4	0.1
Senna glutinosa subsp. *glutinosa*		
Senna glutinosa subsp. *pruinosa*	0.9	0.1
Senna glutinosa subsp. *x luerssenii*	1.5	0.3
Seringia exastia (T)	0.35	0.3
Sida arenicola	1.7	0.3
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.5	0.2
Solanum lasiophyllum	0.4	0.1
Solanum phlomoides		
Themeda sp. Mt Barricade (M.E. Trudgen 2471)		
Triodia pungens	0.3	10
Triodia vanleeuwenii	0.2	2
Triodia wiseana	0.3	0.1

PHOTOS



Site Name:	C45
Site Type:	QUADRAT
Dimensions:	25m x 100m
Survey Date:	09/04/2022
GPS Location:	GDA94 Zone 50 693079.42E 7477947.61N
Orientation:	90/180
Vegetation Type:	10
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	W
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm
CF Types:	Ironstone, Quartz
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Isolated trees over tall shrubland over open tussock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon cunninghamii	0.5	0.1
Acacia adoxa var. *adoxa*	0.4	0.2
Acacia adsurgens	1.1	0.1
Acacia ancistrocarpa	1.6	0.1
Acacia bivenosa	0.7	0.1
Acacia monticola	1.5	0.5
Acacia pyrifolia var. *pyrifolia*	1.5	0.8
Acacia tumida var. *pilbarensis*	2	15
Afrohybanthus aurantiacus	0.5	0.2
Androcalva luteiflora	1.3	2
Aristida holathera var. *holathera*	0.4	0.2
Aristida inaequiglumis	0.8	0.3
Aristida obscura	0.25	0.1
Bonamia pilbarensis	0.1	0.1
Cassytha capillaris		0.3
Corchorus lasiocarpus subsp. *parvus*	0.8	0.1
Corymbia hamersleyana	8	4
Cymbopogon ambiguus	0.9	0.2
Digitaria brownii	0.5	0.1
Dodonaea lanceolata var. *lanceolata*	1.2	0.5
Duperreya commixta		0.2
Enneapogon polyphyllus	0.3	0.1
Eriachne mucronata	0.4	0.5
Eucalyptus leucophloia subsp. *leucophloia*	7	0.5
Eulalia aurea	0.6	0.1
Evolvulus alsinoides	0.1	0.1
Evolvulus alsinoides var. *decumbens*	0.2	0.1
Goodenia stobbsiana	0.3	0.1
Goodenia triodiophila	0.3	0.1
Gossypium australe	0.6	0.1
Gossypium robinsonii	2.5	3
Grevillea wickhamii subsp. ?*hispidula*	1.5	0.1
Hakea chordophylla	1.2	0.1

Hibiscus sturtii var. *campylochlamys*	0.4	0.1
Hibiscus sturtii var. *platychlamys*	0.6	0.1
Indigofera monophylla	0.4	0.2
Isotropis iophyta	0.5	0.1
Jasminum didymum subsp. *lineare*		0.2
Melhania oblongifolia	0.8	0.1
Paraneurachne muelleri	0.4	1
Ptilotus astrolasius	0.4	0.2
Ptilotus calostachyus	0.8	0.2
Ptilotus ?carinatus	0.05	0.1
Santalum lanceolatum	2	1
Senna artemisioides subsp. *oligophylla*	0.4	0.1
Senna glutinosa subsp. *glutinosa*	0.6	0.1
Senna glutinosa subsp. *x luerssenii*	0.3	0.1
Senna notabilis	0.2	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.8	0.1
Solanum phlomoides	0.4	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.9	10
Triodia pungens	0.4	2
Triodia vanleeuwenii	0.2	0.1
Triodia wiseana	0.5	0.2

PHOTOS



Site Name:	C46
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	10/04/2022
GPS Location:	GDA94 Zone 50 692602.48E 7477523.5N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Low Rise (other)
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	NW
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years
Habitat:	Isolated trees over sparse tall shrubland over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia ancistrocarpa	2.5	4
Acacia atkinsiana	2.1	2
Acacia inaequilatera		
Amphipogon sericeus	0.3	0.1
Androcalva luteiflora	0.2	0.1
Aristida holathera var. *holathera*	0.4	0.1
Codonocarpus cotinifolius	6	0.3
Corymbia deserticola subsp. *deserticola*		
Goodenia microptera	0.3	0.1
Goodenia stobbsiana		
Hakea chordophylla	1.6	0.2
Hakea loreus subsp. *loreus*	4	0.5
Hibiscus coatesii	0.4	0.1
Indigofera monophylla	0.5	0.3
Paraneurachne muelleri	0.4	0.5
Ptilotus calostachyus	0.8	0.1
Senna glutinosa subsp. *pruinosa*		
Senna glutinosa subsp. *x luerssenii*	1.1	0.1
Senna notabilis	0.01	0.1
Seringia exastia (T)	0.3	0.5
Sida arenicola	1.2	0.1
Solanum lasiophyllum	0.6	0.1
Trianthema glossostigmum	0.02	0.1
Triodia vanleeuwenii	0.25	18

PHOTOS



Site Name:	C47
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	10/04/2022
GPS Location:	GDA94 Zone 50 692935.4E 7476756.37N
Orientation:	90/180
Vegetation Type:	2
Landform Type:	Lower Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	NW
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	(other) - mine rehab track
Fire:	5-10 Years
Habitat:	Isolated trees over low sparse shrubland over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.6	0.2
Acacia adsurgens	1.3	0.3
Acacia ancistrocarpa		
Acacia atkinsiana	1.8	0.5
Acacia bivenosa	1.2	0.1
Acacia elachantha		
Acacia hilliana	0.4	2
Aristida holathera var. *holathera*	0.3	0.2
Aristida inaequiglumis		
Clerodendrum floribundum var. *angustifolium*		
Corymbia deserticola subsp. *deserticola*	5	1.5
Cucumis variabilis		0.1
Cymbopogon ambiguus	0.8	0.1
Digitaria brownii	0.4	0.1
Duperreya commixta		0.1
Eucalyptus leucophloia subsp. *leucophloia*		
Fimbristylis dichotoma	0.2	0.1
Fimbristylis simulans	0.1	0.1
Goodenia stobbsiana	0.25	0.5
Goodenia triodiophila	0.5	0.1
Hakea chordophylla	4	1
Jasminum didymum subsp. *lineare*		0.1
Ptilotus calostachyus	0.7	0.1
Schizachyrium fragile	0.07	0.1
Senna artemisioides subsp. *oligophylla*	0.4	0.1
Senna glaucifolia	0.8	0.1
Senna glutinosa subsp. *glutinosa*	1.1	0.2
Senna glutinosa subsp. *pruinosa*	0.9	0.2
Sida arenicola		
Solanum lasiophyllum		
Solanum phlomoides	0.5	0.1
Trichodesma zeylanicum	0.4	0.1
Triodia vanleeuwenii	0.3	25

Triodia wiseana	0.5	0.5

PHOTOS



Site Name:	C48
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	10/04/2022
GPS Location:	GDA94 Zone 50 694413.27E 7476472.46N
Orientation:	90/180
Vegetation Type:	6
Landform Type:	Mid Slope
Slope Class:	Steep (23 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, >50% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm, 600-2000mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Low open woodland over shrubland over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia pyrifolia var. *pyrifolia*	1.1	0.2
Aristida holathera var. *holathera*	0.3	0.1
**Bidens bipinnata*	0.1	0.1
Boerhavia coccinea	0.2	0.1
Cheilanthes brownii	0.1	0.1
Codonocarpus cotinifolius	1.8	0.1
Corchorus laniflorus	0.2	0.1
Corymbia hamersleyana	4	1
Cymbopogon ambiguus	0.8	0.1
Dolichocarpa crouchiana	0.1	0.1
Enneapogon polyphyllus	0.2	0.1
Eremophila jucunda subsp. *pulcherrima*	0.5	0.2
Eriachne mucronata	0.3	2
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eucalyptus leucophloia subsp. *leucophloia*	6	5
Euphorbia trigonosperma	0.15	0.1
Fimbristylis dichotoma	0.1	0.1
Gomphrena cunninghamii	0.2	0.1
Goodenia stobbsiana	0.3	0.1
Gossypium robinsonii	1.5	0.5
Grevillea wickhamii subsp. ?*hispidula*	1.5	0.5
Hakea chordophylla	3	0.1
Jasminum didymum subsp. *lineare*		0.1
Paraneurachne muelleri	0.4	0.5
Polycarpaea longiflora	0.3	0.1
Ptilotus astrolasius	0.4	0.5
Ptilotus calostachyus	0.8	0.1
Ptilotus rotundifolius	0.05	0.1
Schizachyrium fragile	0.05	0.1
Senna glutinosa subsp. *glutinosa*	0.8	0.3
Sida echinocarpa	0.6	0.1
Sida sp. Excedentifolia (J.L. Egan 1925)	0.3	0.1
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	0.3	0.2
Solanum lasiophyllum	0.4	0.1

Solanum phlomoides	0.4	0.1
Tinospora smilacina		0.1
Triodia pungens	0.3	0.1
Triodia wiseana	0.4	15
Triumfetta maconochieana	0.4	0.1

PHOTOS



Site Name:	C49
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	11/04/2022
GPS Location:	GDA94 Zone 50 690256.71E 7476182.17N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Lower Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	NE
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone, Quartz
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Isolated mallee trees over sparse shrubland over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon lepidum	0.4	0.1
Acacia adoxa var. *adoxa*	0.4	1
Acacia atkinsiana	0.8	5
Acacia bivenosa	0.9	0.1
Acacia inaequilatera	3.5	0.5
Amphipogon sericeus	0.3	0.1
Androcalva luteiflora	0.15	0.1
Aristida holathera var. *holathera*	0.4	0.1
Arivela viscosa	0.1	0.1
Boerhavia coccinea	0.2	0.1
Corchorus lasiocarpus subsp. *parvus*	0.4	0.2
Dodonaea petiolaris	0.1	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.3	0.1
Eucalyptus gamophylla	2.5	3
Eucalyptus leucophloia subsp. *leucophloia*	8	0.1
Evolvulus alsinoides	0.1	0.1
Fimbristylis simulans	0.15	0.1
Hakea chordophylla	1.3	0.1
Hibiscus sturtii var. *campylochlamys*	0.3	0.1
Indigofera monophylla	0.5	1
Jasminum didymum subsp. *lineare*	0.2	0.1
Paraneurachne muelleri	0.4	0.3
Ptilotus astrolasius	0.5	1
Ptilotus calostachyus	0.9	5
Ptilotus ?*carinatus*	0.1	0.1
Ptilotus rotundifolius	0.9	0.5
Scaevola parvifolia subsp. *pilbarae*	0.3	0.1
Schizachyrium fragile	0.05	0.1
Sclerolaena cornishiana	0.3	0.1
Senna artemisioides subsp. *oligophylla*	0.4	0.1
Senna glaucifolia	0.9	0.5
Senna glutinosa subsp. *glutinosa*	1.2	1

Senna glutinosa subsp. *pruinosa*	0.7	0.2
Senna glutinosa subsp. *x luerssenii*	0.9	0.1
Seringia exastia (T)	0.5	1.5
Sida arenicola	1.2	0.5
Sida cardiophylla	0.6	0.1
Triodia pungens	0.4	2
Triodia vanleeuwenii	0.2	15

PHOTOS



Site Name:	C50
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	11/04/2022
GPS Location:	GDA94 Zone 50 682655.38E 7472471.01N
Orientation:	90/180
Vegetation Type:	9
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	W
Soil Type:	Sandy Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years
Habitat:	Low open woodland over tall shrubland over tussock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.5	0.1
Acacia atkinsiana	4	4
Acacia cowleana	4	2
Acacia dictyophleba	1.5	0.5
Acacia monticola	4	2
Acacia steedmanii subsp. *borealis*	1.2	1
Acacia tenuissima		
Acacia tumida var. *pilbarensis*	0.5	0.1
Afrohybanthus aurantiacus	0.8	3
Alternanthera nana	0.25	0.1
Androcalva luteiflora	0.15	0.1
Anthobolus leptomerioides	1.5	0.1
Aristida holathera var. *holathera*	0.3	0.2
Aristida inaequiglumis	0.9	0.5
Boerhavia coccinea	0.05	0.1
Bonamia erecta	0.4	0.1
Chrysopogon fallax	1.1	0.1
Corchorus sp. (Potentially undescribed)	0.4	0.1
Corymbia deserticola subsp. *deserticola*	5	2
Cymbopogon obtectus	0.8	0.1
Digitaria brownii	0.8	0.5
Duperreya commixta		0.1
Enneapogon polyphyllus	0.3	0.1
Enneapogon robustissimus	0.8	0.5
Eragrostis eriopoda	0.5	2
Eucalyptus gamophylla	5	7
Eulalia aurea	0.7	8
Euphorbia australis var. *hispidula*	0.1	0.1
Euphorbia tannensis subsp. *eremophila*	0.8	0.1
Evolvulus alsinoides	0.1	0.1
Glycine canescens		0.1
Goodenia microptera	0.25	0.1
Goodenia stobbsiana	0.2	0.1

Hibiscus burtonii	0.8	0.1
Hibiscus coatesii	0.5	0.1
Hibiscus sturtii var. *platychlamys*	0.5	0.2
Indigofera georgei	0.5	0.1
Isotropis iophyta	0.8	1
Jasminum didymum subsp. *lineare*		0.1
Maireana villosa	0.3	0.1
Paraneurachne muelleri	0.5	4
Perotis rara	0.1	0.1
Psydrax suaveolens	2.1	0.2
Pterocaulon sphacelatum	0.3	0.1
Ptilotus astrolasius	0.6	1
Ptilotus calostachyus	0.8	0.1
Ptilotus ?carinatus	0.05	0.1
Rhynchosia minima		0.1
Scaevola parvifolia subsp. *pilbarae*	0.3	0.3
Senna artemisioides subsp. *oligophylla*	1.1	0.3
Senna glutinosa subsp. *x luerssenii*	0.9	0.1
Senna notabilis	0.1	0.1
Seringia exastia (T)	0.5	1
Sida cardiophylla	0.4	0.5
Sida sp. L (A.M. Ashby 4202)	0.8	0.2
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.8	0.1
Solanum cleistogamum	0.3	0.1
Solanum lasiophyllum	0.7	0.1
Tephrosia densa	0.4	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.9	2
Triodia pungens	0.4	7
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	C51
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	11/04/2022
GPS Location:	GDA94 Zone 50 688022.85E 7476842.66N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	E
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone, Quartz
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Isolated trees over sparse low shrubland over open hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia atkinsiana	0.7	2
Acacia bivenosa	0.9	0.1
Acacia inaequilatera	2.2	0.5
Acacia pruinocarpa	0.9	0.1
Acacia tenuissima	0.3	0.1
Amphipogon sericeus	0.4	0.1
Aristida inaequiglumis	1.1	0.1
Aristida obscura	0.3	0.1
Bonamia erecta	0.4	0.6
Corchorus lasiocarpus subsp. *parvus*	0.5	0.2
Enneapogon polyphyllus	0.35	0.1
Eragrostis eriopoda	0.4	0.3
Eriachne mucronata	0.4	0.3
Eucalyptus gamophylla	2.5	0.5
Eucalyptus leucophloia subsp. *leucophloia*	7	1.5
Eulalia aurea	0.6	0.1
Euphorbia australis var. *hispidula*	0.02	0.1
Euphorbia tannensis subsp. *eremophila*	0.2	0.1
Goodenia microptera	0.3	0.1
Goodenia stobbsiana	0.2	0.1
Hakea loreus subsp. *loreus*	0.8	0.1
Hibiscus sturtii var. *campylochlamys*	0.4	0.1
Indigofera monophylla	0.4	0.2
Paraneurachne muelleri	0.4	0.1
Ptilotus astrolasius	0.4	0.2
Ptilotus calostachyus	1	0.1
Ptilotus ?*carinatus*		
Ptilotus rotundifolius	0.8	0.1
Scaevola parvifolia subsp. *pilbarae*	0.3	0.1
Schizachyrium fragile	0.05	0.1
Senna artemisioides subsp. *oligophylla*	0.4	0.1
Senna glutinosa subsp. *x luerssenii*	0.9	0.3
Seringia exastia (T)	0.5	1

Sida arenicola	1.5	0.5
Sida cardiophylla	0.4	0.1
Sida echinocarpa	1.2	0.3
Solanum lasiophyllum	0.7	0.1
Triodia pungens	0.4	6
Triodia vanleeuwenii		8

PHOTOS



Site Name:	C52
Site Type:	QUADRAT
Dimensions:	25m x 100m
Survey Date:	12/04/2022
GPS Location:	GDA94 Zone 50 694892.92E 7475906.42N
Orientation:	70/160
Vegetation Type:	4
Landform Type:	Other, Breakaway (other)
Slope Class:	Precipitous (60 degrees)
Aspect:	NE
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, >50% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm, 600-2000mm
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Exotic Weeds
Fire:	<5 Years
Habitat:	Low open woodland over open shrubland over open grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia aptaneura	4	0.5
Amaranthus undulatus	0.1	0.3
Aristida burbidgeae	0.5	2
Aristida contorta	0.4	0.1
Arivela viscosa	0.1	0.1
Astrotricha hamptonii	1.8	1
**Bidens bipinnata*	0.1	0.1
Brachychiton acuminatus	2.1	0.2
Bulbostylis barbata	0.03	0.1
Capparis mitchellii	1.6	0.1
Capparis spinosa subsp. *nummularia*	0.8	0.5
Cheilanthes sieberi subsp. *sieberi*	0.2	0.1
Clerodendrum floribundum var. *angustifolium*	0.2	0.1
Corchorus laniflorus	1.3	7
Corymbia ferriticola	4	6
Cucumis variabilis		0.1
Cymbopogon ambiguus	1	1
Cynanchum pedunculatum		0.5
Cynanchum viminale subsp. *australe*	1.1	1.5
Cyperus cunninghamii subsp. *cunninghamii*	0.3	1
Dodonaea viscosa subsp. *mucronata*	0.9	1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.3	0.1
Eremophila naaykensii (P3)	1.8	2
Eremophila petrophila subsp. *petrophila*	2.1	0.2
Eriachne mucronata	0.3	5
Eucalyptus leucophloia subsp. *leucophloia*	5	0.1
Evolvulus alsinoides	0.1	0.1
Ficus brachypoda	3.5	2
Gomphrena cunninghamii	0.2	1
Goodenia stobbsiana	0.3	0.1
Hibiscus coatesii	1.1	0.3
Jasminum didymum subsp. *lineare*		0.1
Newcastelia clavipetala	0.8	0.2

Paspalidium clementii	0.05	0.1
Perotis rara	0.15	0.1
Psydrax latifolia	2.1	0.5
Pterocaulon sphacelatum	0.4	2
Ptilotus astrolasius	0.6	0.5
Senna venusta	0.1	0.1
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	0.2	0.5
Solanum cleistogamum	0.4	0.3
Solanum gabrielae	0.5	0.3
Tinospora smilacina		0.2
Triodia pungens	0.7	2
Triodia wiseana	0.6	3
Triumfetta leptacantha	0.7	2
Triumfetta maconochieana	0.4	0.2

PHOTOS



Site Name:	C53
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	12/04/2022
GPS Location:	GDA94 Zone 50 683571.1E 7474477.38N
Orientation:	90/180
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Exotic Weeds
Fire:	>10 Years
Habitat:	Low open woodland over open shrubland over open tussock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.4	0.1
Abutilon otocarpum	0.45	0.1
Acacia aneura	6	2
Acacia aptaneura	9	4
Acacia ?ayersiana	2.5	1
Acacia bivenosa	1.2	0.1
Acacia pruinocarpa	3.5	1
Alternanthera nana	0.25	0.1
Anthobolus leptomerioides	2.7	0.2
Aristida inaequiglumis	1.3	3
Aristida obscura	0.3	2
Arivela viscosa	0.3	0.1
**Bidens bipinnata*	0.15	0.1
Boerhavia coccinea	0.1	0.1
Boerhavia repleta	0.25	0.1
Bothriochloa ewartiana	0.8	0.1
Cheilanthes sieberi subsp. *sieberi*	0.25	0.1
Chrysopogon fallax	1.1	0.3
Cucumis variabilis		0.1
Cymbopogon obtectus	1.1	0.1
Dactyloctenium radulans	0.15	0.1
Digitaria brownii	0.7	0.5
Digitaria ctenantha	0.8	0.1
Duperreya commixta		0.2
Enneapogon lindleyanus	0.3	0.1
Enneapogon polyphyllus	0.3	0.5
Enneapogon robustissimus	0.8	1
Eremophila forrestii subsp. *forrestii*	1.3	0.3
Eremophila latrobei subsp. *filiformis*	1.4	0.1
Eriachne mucronata	0.3	0.3
Euphorbia australis var. *hispidula*	0.05	0.1
Euphorbia biconvexa	0.05	0.1
Evolvulus alsinoides var. *villosicalyx*	0.15	0.1
Glycine canescens		0.1

Hibiscus burtonii	0.7	0.2
Hibiscus coatesii	0.3	0.1
Hibiscus sturtii var. *platychlamys*	0.45	0.2
Indigofera monophylla	0.3	0.1
Iseilema membranaceum	0.1	0.1
Maireana villosa	0.5	0.7
**Malvastrum americanum*	0.4	0.2
Paraneurachne muelleri	0.45	0.2
Perotis rara	0.15	0.1
Portulaca ?oleracea	0.05	0.1
Psydrax suaveolens	2.5	0.1
Pterocaulon sphacelatum	0.3	0.1
Ptilotus astrolasius	0.45	0.5
Ptilotus ?exaltatus	0.05	0.1
Ptilotus helipteroides	0.05	0.1
Ptilotus obovatus var. *obovatus*	0.2	0.1
Salsola australis	0.25	0.1
Sclerolaena cornishiana	0.4	0.2
Senna artemisioides subsp. *helmsii*	1.2	3
Senna artemisioides subsp. *oligophylla*	1.3	0.1
Senna glutinosa subsp. *x luerssenii*	0.4	0.1
Senna notabilis	0.2	0.1
Sida ectogama	1.2	0.2
Sida sp. L (A.M. Ashby 4202)	0.3	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.45	0.1
Solanum cleistogamum	0.45	0.1
Solanum phlomoides	0.5	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	1.1	1
Tribulus macrocarpus	0.1	0.1
Tribulus suberosus	1.3	0.2
Triodia pungens	0.5	1

PHOTOS



Site Name:	C54
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	12/04/2022
GPS Location:	GDA94 Zone 50 685509.61E 7467868.05N
Orientation:	90/180
Vegetation Type:	9
Landform Type:	Flat
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	>10 Years
Habitat:	Isolated trees over sparse tall shrubland over grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.6	0.1
Acacia ancistrocarpa	4	1
Acacia aneura		
Acacia aptaneura	4	3
Acacia cowleana	0.8	0.1
Acacia dictyophleba	2.2	0.2
Acacia minyura	1.8	1
Acacia pachyacra	2.5	0.3
Acacia tenuissima	2.5	0.3
Alternanthera nana	0.2	0.2
Anthobolus leptomerioides	1.2	0.1
Aristida contorta	0.3	0.1
Aristida holathera var. *holathera*	0.4	0.2
Aristida inaequiglumis	0.9	4
Codonocarpus cotinifolius	1.5	0.2
Cucumis variabilis		0.1
Cymbopogon obtectus	0.7	0.1
Digitaria brownii	0.6	0.2
Duperreya commixta		0.3
Enneapogon robustissimus	0.8	0.2
Eragrostis eriopoda	0.4	0.1
Eremophila longifolia	2.1	0.3
Eriachne mucronata	0.4	0.1
Eulalia aurea	0.9	1
Euphorbia australis var. *hispidula*	0.3	0.1
Euphorbia tannensis subsp. *eremophila*	0.6	0.1
Hakea loreus subsp. *loreus*	5	1
Hibiscus burtonii	0.8	0.2
Hibiscus sturtii var. *platychlamys*	0.8	0.1
Indigofera georgei	0.4	0.1
Isotropis iophyta	0.7	0.3
Jasminum didymum subsp. *lineare*		0.1
Maireana villosa	0.4	0.1
Panicum effusum	0.6	0.5

Paraneurachne muelleri	0.5	0.5
Peripleura obovata	0.5	0.1
Perotis rara	0.1	0.1
Psydrax latifolia		
Pterocaulon sphacelatum	0.5	0.2
Ptilotus astrolasius	0.4	0.3
Ptilotus ?carinatus	0.05	0.1
Ptilotus helipteroides	0.1	0.1
Senna notabilis	0.1	0.1
Sida cardiophylla	0.4	0.1
Sida sp. L (A.M. Ashby 4202)	0.4	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.9	0.1
Solanum lasiophyllum	0.3	0.1
Solanum phlomoides	0.4	0.1
Tephrosia ?sp. Newman	0.1	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.9	3
Triodia melvillei	0.8	15
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	C55
Site Type:	QUADRAT
Dimensions:	25m x 100m
Survey Date:	13/04/2022
GPS Location:	GDA94 Zone 50 693547.6E 7476322.6N
Orientation:	90/180
Vegetation Type:	4
Landform Type:	Upper Slope
Slope Class:	Very Steep (37 degrees)
Aspect:	NW
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, >50% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Low open woodland over sparse shrubland over hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia hamersleyensis	1.2	0.2
Acacia pruinocarpa	1.1	0.2
Amaranthus undulatus	0.25	0.5
Aristida burbidgeae	0.4	2
Arivela viscosa	0.4	1
**Bidens bipinnata*	0.2	0.4
Capparis lasiantha	0.25	0.1
Capparis mitchellii	0.3	0.1
Capparis spinosa subsp. *nummularia*	1.1	0.2
Cheilanthes brownii	0.1	0.1
Cheilanthes sieberi subsp. *sieberi*	0.2	0.1
Corymbia ferriticola	8	3
Cucumis variabilis		0.3
Cymbopogon ambiguus	0.7	4
Cynanchum pedunculatum		2
Cyperus cunninghamii subsp. *cunninghamii*	0.4	0.1
Dysphania ?*rhadinostachya*	0.03	0.1
Enneapogon polyphyllus	0.3	0.1
Eremophila jucunda subsp. *pulcherrima*	0.3	0.1
Eriachne mucronata	0.4	5
Eucalyptus leucophloia subsp. *leucophloia*	7	1
Euphorbia trigonosperma	0.25	0.1
Gomphrena cunninghamii	0.2	3
Goodenia stobbsiana	0.3	0.1
Gossypium robinsonii	1.8	0.3
Grevillea wickhamii subsp. ?*hispidula*	1.8	0.2
Hibiscus coatesii	0.4	0.1
Indigofera fractiflexa subsp. *fractiflexa*	0.4	1
Iseilema membranaceum	0.05	0.1
Jasminum didymum subsp. *lineare*		0.1
Nicotiana benthamiana	0.15	0.1
Paspalidium clementii	0.1	0.1
Polycarpaea longiflora	0.25	0.3

Ptilotus astrolasius	0.4	1
Santalum lanceolatum	0.7	0.1
Schizachyrium fragile	0.05	0.1
Senna glaucifolia	0.4	0.1
Senna glutinosa subsp. *glutinosa*	1.5	0.5
Senna venusta	0.1	0.1
Sida sp. Excedentifolia (J.L. Egan 1925)	0.3	0.2
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	0.2	0.2
Solanum cleistogamum	0.3	0.1
Tephrosia densa	0.8	0.1
Tinospora smilacina		0.1
Trichodesma zeylanicum	0.2	0.1
Triodia wiseana	0.3	12
Triumfetta leptacantha	0.5	0.5
Triumfetta maconochieana	0.4	0.1

PHOTOS



Site Name:	CR01
Site Type:	RELEVE
Survey Date:	16/03/2022
GPS Location:	GDA94 Zone 50 694870.61E 7476615.34N
Vegetation Type:	6
Slope Class:	Moderately Inclined (10 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, >50% bedrock exposed
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years
Habitat:	Low open woodland over tall open shrubland over open grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Clerodendrum floribundum var. *angustifolium*		
Corymbia hamersleyana		
Dodonaea pachyneura		
Eucalyptus leucophloia subsp. *leucophloia*		
Gossypium robinsonii		
Grevillea wickhamii		
Jasminum didymum subsp. *lineare*		
Santalum lanceolatum		

Site Name:	CR02
Site Type:	RELEVE
Survey Date:	17/03/2022
GPS Location:	GDA94 Zone 50 683120.97E 7473640.24N
Vegetation Type:	2
Landform Type:	Crest, summit of small hill (other)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 2-10% bedrock exposed
CF Abundance:	>90%
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	> 10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*		
Acacia monticola	4	
Corymbia hamersleyana	6	
Dampiera candicans		
Eriachne mucronata		
Eucalyptus leucophloia subsp. *leucophloia*	5	
Goodenia stobbsiana		
Grevillea wickhamii subsp. *hispidula*		
Hakea chordophylla	2	
Hibiscus sturtii var. *campylochlamys*		
Paraneurachne muelleri		
Senna glutinosa subsp. *pruinosa*		
Triodia wiseana		

Site Name:	CR03
Site Type:	RELEVE
Survey Date:	21/03/2022
GPS Location:	GDA94 Zone 50 693500.65E 7476771.21N
Vegetation Type:	2
Landform Type:	Drainage Line
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 10-20% bedrock exposed
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*		
Acacia hilliana		
Acacia monticola		
Acacia tumida var. *pilbarensis*		
Corchorus lasiocarpus subsp. *parvus*		
Corymbia hamersleyana		
Cymbopogon ambiguus		
Eucalyptus leucophloia subsp. *leucophloia*		
Gompholobium oreophilum		
Goodenia stobbsiana		
Gossypium robinsonii		
Grevillea wickhamii subsp. ?*hispidula*		
Triodia wiseana		

Site Name:	CR04
Site Type:	RELEVE
Survey Date:	08/04/2022
GPS Location:	GDA94 Zone 50 692852.22E 7476239.53N
Vegetation Type:	5
Landform Type:	Other, Gully (other)
Slope Class:	Very Steep (37 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, >50% bedrock exposed
CF Abundance:	>90%
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia monticola		
Corymbia hamersleyana		
Cymbopogon ambiguus		
Duperreya commixta		
Eremophila jucunda subsp. *pulcherrima*		
Gossypium robinsonii		
Grevillea wickhamii subsp. ?*hispidula*		
Paraneurachne muelleri		
Psydrax latifolia		
Sida sp. Excedentifolia (J.L. Egan 1925)		
Triodia wiseana		

PHOTOS



Site Name:	CR05
Site Type:	RELEVE
Survey Date:	08/04/2022
GPS Location:	GDA94 Zone 50 692906.47E 7476323.24N
Vegetation Type:	5
Landform Type:	Other, Gully (other)
Slope Class:	Very Steep (37 degrees)
Aspect:	S
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 20-50% bedrock exposed
CF Abundance:	>90%
CF Sizes:	20-60mm, 60-200mm, 200-600mm, 600-2000mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia aptaneura		
Acacia monticola		
Cheilanthes sieberi subsp. *sieberi*		
Corymbia ferriticola		
Cymbopogon ambiguus		
Eriachne mucronata		
Fimbristylis dichotoma		
Gossypium robinsonii		
Grevillea wickhamii subsp. ?*hispidula*		
Santalum lanceolatum		
Senna glutinosa subsp. *glutinosa*		
Triodia pungens		

PHOTOS



Site Name:	K01
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	14/03/2022
GPS Location:	GDA94 Zone 50 694572.51E 7478495.95N
Orientation:	180/90
Vegetation Type:	5
Landform Type:	Other, Crest; Upper Slope (other)
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 2-10% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	Isolated low trees over isolated mid-tall shrubs over isolated mid shrubs over hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia inaequilatera	3	0.5
Acacia tenuissima	0.4	0.1
Aristida holathera var. *holathera*	0.2	0.1
Arivela viscosa	0.1	0.1
Enneapogon caerulescens	0.1	0.1
Enneapogon polyphyllus	0.1	1
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eucalyptus leucophloia subsp. *leucophloia*	1	0.2
Fimbristylis dichotoma	0.1	2
Goodenia triodiophila	0.2	0.1
Hibiscus sturtii var. *campylochlamys*	0.3	0.1
Indigofera monophylla	0.3	0.2
Poaceae sp.	0.1	0.1
Ptilotus calostachyus	0.4	0.1
Senna artemisioides subsp. *oligophylla*	0.8	0.1
Senna glutinosa subsp. *glutinosa*	1.5	0.3
Senna glutinosa subsp. *pruinosa*	1	0.2
Triodia wiseana	0.3	50

PHOTOS



Site Name:	K02
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	15/03/2022
GPS Location:	GDA94 Zone 50 683288.99E 7470036.67N
Orientation:	180/90
Vegetation Type:	1
Landform Type:	Other, Drainage Line/Outwash (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone, Quartz
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	5-10 Years
Habitat:	Low open woodland over tall mixed shrubland over low mixed hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	0.3	0.1
Acacia atkinsiana	2	5
Acacia bivenosa	1	1
Acacia pyrifolia var. *pyrifolia*	1	0.1
Arivela viscosa	0.1	0.1
**Cenchrus ciliaris*	0.4	0.3
Cymbopogon ambiguus	0.4	0.3
Duperreya commixta		0.1
Enneapogon lindleyanus	0.2	0.1
Eriachne mucronata	0.3	0.3
Eucalyptus gamophylla	5	6
Eucalyptus leucophloia subsp. *leucophloia*	10	3
Gossypium robinsonii	2.5	5
Hibiscus coatesii	0.3	0.1
Hibiscus sturtii var. *platychlamys*	0.4	0.1
Indigofera monophylla	0.2	0.2
Jasminum didymum subsp. *lineare*		0.1
Melhania oblongifolia	0.1	0.1
Paraneurachne muelleri	0.2	0.1
Ptilotus ?*carinatus*	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.3	0.1
Ptilotus rotundifolius	0.5	0.3
Rhynchosia minima		0.1
Scaevola parvifolia subsp. *pilbarae*	0.2	0.1
Senna artemisioides subsp. *oligophylla*	0.5	0.1
Senna glutinosa subsp. *glutinosa*	1	0.1
Senna glutinosa subsp. *x luerssenii*	1	0.1
Seringia exastia (T)	0.2	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.2	0.1
Solanum lasiophyllum	0.4	0.1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.2	0.2
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.5	0.5

Triodia pungens	0.4	60
Triodia vanleeuwenii	0.3	1

PHOTOS



Site Name:	K03
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	15/03/2022
GPS Location:	GDA94 Zone 50 683511.12E 7469666.94N
Orientation:	180/90
Vegetation Type:	1
Landform Type:	Other, Outwash (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone, Quartz
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	5-10 Years
Habitat:	Low open woodland over tall open shrubland over sparse low shrubland over low hummock grassland

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia atkinsiana	3	5
Acacia bivenosa	1	0.3
Acacia tenuissima	1.5	0.1
Cymbopogon ambiguus	0.2	0.1
Duperreya commixta		0.1
Eucalyptus gamophylla	5	5
Indigofera monophylla	0.6	0.1
Ptilotus astrolasius	0.2	0.1
Ptilotus calostachyus	0.5	0.1
Ptilotus rotundifolius	0.8	1
Senna artemisioides subsp. *oligophylla*	0.5	0.3
Senna glutinosa subsp. *x luerssenii*	0.7	0.1
Senna pleurocarpa var. *pleurocarpa*	0.5	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.4	0.3
Triodia pungens	0.3	60

PHOTOS



Site Name:	K035
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	06/04/2022
GPS Location:	GDA94 Zone 50 692929.15E 7476249.41N
Orientation:	90/180
Vegetation Type:	6
Landform Type:	Mid Slope
Slope Class:	Steep (23 degrees)
Aspect:	N
Soil Type:	Sandy Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 2-10% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	(other) - Drill pads adjacent
Fire:	5-10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Aristida holathera var. *holathera*	0.2	0.1
Arivela viscosa	0.1	0.1
Cassytha capillaris		0.1
Cheilanthes brownii	0.1	0.1
Corymbia hamersleyana	4	3
Eremophila jucunda subsp. *pulcherrima*	0.4	0.1
Eriachne mucronata	0.2	0.1
Eucalyptus leucophloia subsp. *leucophloia*	2.5	0.5
Fimbristylis dichotoma	0.1	0.1
Gossypium robinsonii	2.5	0.1
Grevillea wickhamii subsp. *hispidula*	1.2	0.1
Grevillea wickhamii subsp. ?*hispidula*	2	3
Schizachyrium fragile	0.1	0.1
Senna ferraria	0.6	0.1
Senna glutinosa subsp. *glutinosa*	0.8	0.1
Triodia pungens	0.3	2
Triodia wiseana	0.4	30

PHOTOS

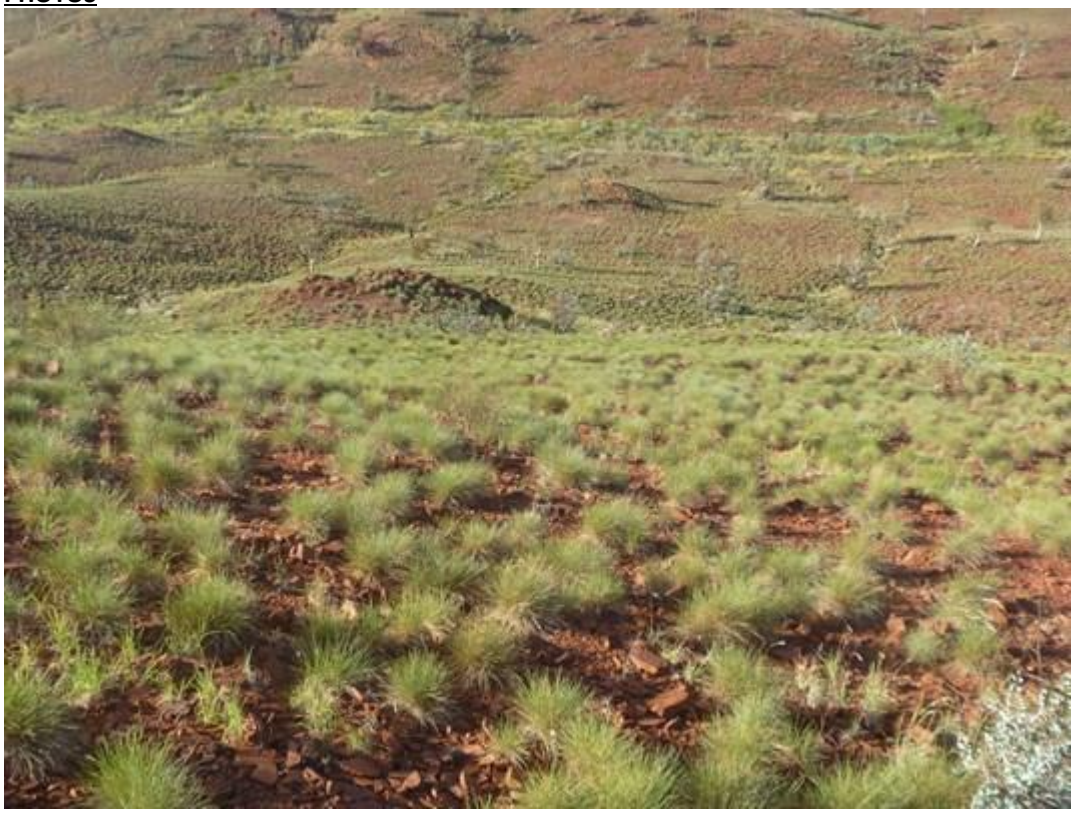


Site Name:	K04
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	16/03/2022
GPS Location:	GDA94 Zone 50 694876.12E 7478243.41N
Orientation:	180/90
Vegetation Type:	5
Landform Type:	Other, Upper Slope/Mid Slope (other)
Slope Class:	Steep (23 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 2-10% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	Isolated trees over isolated mid shrubs over isolated low shrubs over hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia inaequilatera	1.5	0.5
Acacia tetragonophylla	0.5	0.1
Aristida contorta	0.2	0.1
Boerhavia coccinea		
Cheilanthes contigua	0.1	0.1
Cullen leucochaites	0.4	0.1
Cymbopogon ambiguus	0.4	0.1
Enneapogon polyphyllus	0.1	0.2
Eremophila latrobei subsp. *filiformis*	0.3	0.1
Eriachne mucronata	0.3	0.2
Eucalyptus leucophloia subsp. *leucophloia*	1.5	0.3
Fimbristylis dichotoma	0.1	0.1
Goodenia muelleriana	0.1	0.1
Hakea loreus subsp. *loreus*	0.5	0.2
Jasminum didymum subsp. *lineare*		0.1
Maytenus sp. Mt Windell (S. van Leeuwen 846)	0.3	0.2
Rhynchosia minima		0.1
Santalum lanceolatum	0.4	0.1
Scaevola spinescens	0.3	0.2
Senna artemisioides subsp. *oligophylla*	0.4	0.3
Senna glutinosa subsp. *glutinosa*	0.8	0.1
Solanum lasiophyllum	0.2	0.1
?*Swainsona decurrens*	0.1	0.1
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.1	0.1
Themeda triandra	0.3	0.3
Trichodesma zeylanicum	0.2	0.1
Triodia vanleeuwenii	0.2	0.3
Triodia wiseana	0.3	65

PHOTOS



Site Name:	K05
Site Type:	QUADRAT
Dimensions:	25m x 100m
Survey Date:	16/03/2022
GPS Location:	GDA94 Zone 50 695088.35E 7478647.61N
Orientation:	270/90
Vegetation Type:	5
Landform Type:	Drainage Line
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clayey Sand
Soil Colour:	Brown
Rock Outcrop:	Dolerite, 2-10% bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm
CF Types:	Dolerite, Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	Isolated trees over mid open shrubland (mixed species) over low open tussock grassland over hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia inaequilatera	0.5	0.1
Aristida contorta	0.3	0.1
Aristida holathera var. *holathera*	0.2	0.1
Arivela viscosa	0.1	0.1
Atalaya hemiglauca	1.5	0.3
Boerhavia coccinea	0.1	0.1
Bothriochloa ewartiana	0.7	0.1
Corchorus incanus subsp. *lithophilus*	0.4	0.3
Corchorus sp. (sterile)	0.1	0.1
Corymbia hamersleyana	3	0.3
Cymbopogon ambiguus	0.6	0.1
Enneapogon lindleyanus	0.3	0.5
Enneapogon polyphyllus	0.2	0.1
Eremophila longifolia	0.6	0.1
Euphorbia biconvexa	0.2	0.1
Fimbristylis dichotoma	0.1	0.1
Gossypium australe	1	0.8
Gossypium robinsonii	0.5	0.1
Grevillea pyramidalis subsp. *leucadendron*	0.4	0.1
Grevillea wickhamii subsp. ?*hispidula*	0.7	0.1
Hakea loreus subsp. *loreus*	0.3	0.1
Hibiscus coatesii	1	0.1
Indigofera rugosa	0.8	2
Jasminum didymum subsp. *lineare*		0.2
Melhania oblongifolia	0.4	0.1
Mnesithea formosa	0.1	0.1
Polycarpaea longiflora	0.1	0.1
Ptilotus calostachyus	0.6	0.1
Rhynchosia minima		0.1
Santalum lanceolatum	1.2	0.1
Senna artemisioides subsp. *oligophylla*	0.5	5
Senna glaucifolia	1	0.1
Senna glutinosa subsp. *glutinosa*	0.8	1

Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.8	0.2
Solanum cleistogamum	0.1	0.1
Stemodia grossa	0.3	0.1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.3	0.1
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.1	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.5	2
Tinospora smilacina		0.1
Trichodesma zeylanicum	0.3	0.1
Triodia wiseana	0.3	45

PHOTOS



Site Name:	K06
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	16/03/2022
GPS Location:	GDA94 Zone 50 682983.53E 7472172.56N
Orientation:	180/90
Vegetation Type:	1
Landform Type:	Other, Drainage Line/Outwash (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Sandy Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone, Quartz
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	5-10 Years
Habitat:	Low open woodland over isolated tall shrubs over low open tussock grassland over mixed hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adsurgens	3	1
Acacia bivenosa	0.6	0.1
Acacia cowleana	3	5
Acacia steedmanii subsp. *borealis*	2	0.2
Aristida contorta	0.2	0.1
Aristida inaequiglumis	0.5	0.4
Bothriochloa ewartiana	0.5	3
Corchorus incanus subsp. *lithophilus*	0.4	0.1
Corymbia deserticola subsp. *deserticola*	8	0.5
Corymbia hamersleyana	3	0.3
Duperreya commixta		0.1
Enneapogon polyphyllus	0.1	0.1
Eragrostis eriopoda	0.2	0.1
Eremophila longifolia	0.3	0.1
Eriachne mucronata	0.3	0.1
Eucalyptus gamophylla	3	6
Eucalyptus leucophloia subsp. *leucophloia*	6	0.5
Euphorbia tannensis subsp. *eremophila*	0.2	0.1
Evolvulus alsinoides	0.1	0.1
Gompholobium oreophilum	0.5	0.2
Goodenia microptera	0.2	0.1
Grevillea wickhamii subsp. ?*hispidula*	2	0.2
Hibiscus burtonii	0.5	0.1
Hibiscus leptocladus	0.3	0.1
Hibiscus sturtii var. *campylochlamys*	0.2	0.1
Hibiscus sturtii var. *platychlamys*	0.3	0.1
Indigofera monophylla	0.3	0.1
Jasminum didymum subsp. *lineare*		0.1
Maireana villosa	0.3	0.1
Maytenus sp. Mt Windell (S. van Leeuwen 846)	0.6	0.2
Melhania oblongifolia	0.2	0.1
Paraneurachne muelleri	0.3	0.2
Ptilotus astrolasius	0.3	0.1
Ptilotus calostachyus	0.6	0.1

Ptilotus obovatus var. *obovatus*	0.5	0.1
Ptilotus rotundifolius	0.6	0.2
Scaevola parvifolia subsp. *pilbarae*	0.2	0.1
Senna artemisioides subsp. *oligophylla*	0.4	0.2
Senna glutinosa subsp. *glutinosa*	0.8	0.1
Senna glutinosa subsp. *x luerssenii*	0.5	0.1
Seringia exastia (T)	0.3	0.1
Sida arenicola	0.3	0.1
Sida sp. L (A.M. Ashby 4202)	0.4	0.1
Solanum lasiophyllum	0.3	0.1
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.2	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.4	0.5
Triodia pungens	0.4	12
Triodia vanleeuwenii	0.2	50
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	K07
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	17/03/2022
GPS Location:	GDA94 Zone 50 682549.5E 7471981.21N
Orientation:	180/90
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Exotic Weeds - Minor disturbance
Fire:	5-10 Years
Habitat:	Tall open shrubland over mid open (mixed) shrubland over open tussock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.1	0.1
Acacia aptaneura	7	2.5
Acacia inaequilatera	2.5	0.2
Acacia pruinocarpa	5	1.5
Alternanthera nana	0.1	0.1
Anthobolus leptomerioides	1.2	1
Aristida contorta	0.2	0.3
Aristida inaequiglumis	0.5	1
Arivela viscosa	0.2	0.1
**Bidens bipinnata*	0.1	0.1
Boerhavia coccinea	0.1	0.1
Boerhavia repleta	0.1	0.1
Bothriochloa ewartiana	0.5	2
Capparis lasiantha	0.7	0.1
**Cenchrus ciliaris*	0.6	2.5
Chrysopogon fallax		1
Corchorus tridens	0.1	0.1
Dactyloctenium radulans	0.1	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.4	3
Eremophila forrestii subsp. *forrestii*	2	0.5
Eremophila latrobei subsp. *filiformis*	1	0.1
Eremophila longifolia	2	0.5
Eriachne mucronata	0.3	0.1
Eucalyptus gamophylla	3	0.2
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia ?trigonosperma	0.1	0.1
Euploca cunninghamii	0.1	0.1
Euploca tanythrix	0.2	0.1
Evolvulus alsinoides	0.1	0.1
Gossypium australe	0.2	0.1
Gossypium robinsonii	3	2
Hibiscus sturtii var. *platychlamys*	0.2	0.1

Jasminum didymum subsp. *lineare*		0.1
Maireana villosa		
Perotis rara	0.1	0.1
Psydrax latifolia		
Pterocaulon sphacelatum	0.4	0.1
Ptilotus calostachyus	0.1	0.1
Ptilotus ?carinatus	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.6	3
Salsola australis	0.1	0.1
Senna artemisioides subsp. *helmsii*	0.8	0.5
Senna artemisioides subsp. *oligophylla*	0.4	0.1
Sida fibulifera	0.2	0.1
Sida sp. L (A.M. Ashby 4202)		0.1
Solanum lasiophyllum	0.4	0.1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.5	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.5	2
Tribulus macrocarpus	0.1	0.1
Tribulus suberosus	0.8	0.1
Triodia pungens	0.3	0.3
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)		0.1

PHOTOS



Site Name:	K08
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	17/03/2022
GPS Location:	GDA94 Zone 50 683143E 7472593.15N
Orientation:	180/90
Vegetation Type:	9
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	>10 Years
Habitat:	Low isolated trees over isolated tall shrubs over mid shrubs over low open tussock grassland over low open hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.2	0.1
Acacia adsurgens	2	0.5
Acacia aptaneura	5	0.8
Acacia atkinsiana	2	0.3
Acacia bivenosa	2	0.1
Acacia cowleana	3	0.2
Acacia dictyophleba	2	0.3
Acacia pruinocarpa	4	0.5
Afrohybanthus aurantiacus	0.2	0.1
Aristida contorta	0.2	0.1
Aristida inaequiglumis	0.4	1
Arivela viscosa	0.1	0.1
Boerhavia coccinea	0.1	0.1
Bothriochloa ewartiana	0.5	0.5
Corymbia deserticola subsp. *deserticola*	5	1
Cymbopogon obtectus	0.5	0.1
Digitaria brownii	0.4	1
Duperreya commixta		0.1
Enneapogon lindleyanus	0.3	0.1
Enneapogon polyphyllus	0.1	0.1
Eremophila forrestii subsp. *forrestii*	0.8	0.1
Eremophila longifolia	2	0.1
Eriachne mucronata	0.3	0.1
Eucalyptus gamophylla	7	0.75
Eucalyptus leucophloia subsp. *leucophloia*		
Euploca tanythrix	0.2	0.1
Evolvulus alsinoides	0.1	0.1
Fimbristylis dichotoma	0.1	0.1
Goodenia microptera	0.1	0.1
Goodenia stobbsiana	0.1	0.1
Gossypium australe	0.2	0.1
Hakea loreus subsp. *loreus*	2.5	0.2
Hibiscus burtonii	0.2	0.1
Hibiscus coatesii	0.2	0.1

Hibiscus sturtii var. *platychlamys*	0.2	0.1
Jasminum didymum subsp. *lineare*		0.1
Maireana villosa	0.1	0.1
Melhania oblongifolia	0.1	0.1
Paraneurachne muelleri	0.2	0.1
Peripleura obovata	0.2	0.1
Perotis rara	0.1	0.1
Ptilotus astrolasius	0.7	0.1
Ptilotus calostachyus	0.1	0.1
Ptilotus ?*carinatus*	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.3	0.3
Ptilotus rotundifolius	0.8	0.1
Scaevola parvifolia subsp. *pilbarae*	0.2	0.1
Senna artemisioides subsp. *helmsii*	0.4	0.1
Senna artemisioides subsp. *oligophylla*	0.2	0.1
Senna glutinosa subsp. *glutinosa*	2	0.2
Senna glutinosa subsp. *x luerssenii*	1.5	0.5
Sida echinocarpa	1	0.1
Sida fibulifera	0.1	0.1
Sida sp. L (A.M. Ashby 4202)		0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.6	0.1
Solanum lasiophyllum	0.5	0.1
Tribulus suberosus	0.8	0.1
Triodia pungens	0.4	11

PHOTOS



Site Name:	K09
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	18/03/2022
GPS Location:	GDA94 Zone 50 691203.2E 7478651.96N
Orientation:	180/90
Vegetation Type:	9
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Exotic Weeds - Minor disturbance
Fire:	>10 Years
Habitat:	Tall open shrubland over low open tussock grassland over low hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.2	0.1
Abutilon otocarpum	0.4	0.1
Acacia adsurgens	2.5	0.2
Acacia ?aneura	6	0.3
Acacia aptaneura	7	6
Acacia atkinsiana	7	0.5
Acacia bivenosa	2	0.3
Acacia inaequilatera	3	0.2
Acacia pruinocarpa	4	1.5
Acacia sibirica	2.5	1
Acacia tenuissima	4	0.2
Alternanthera nana	0.1	0.1
Aristida contorta	0.2	0.3
Aristida inaequiglumis	0.6	0.1
**Bidens bipinnata*	0.1	0.1
Boerhavia coccinea	0.1	0.1
Cheilanthes sieberi subsp. *sieberi*	0.2	0.1
Chrysopogon fallax	0.5	0.1
Corymbia deserticola subsp. *deserticola*	5	0.5
Corymbia hamersleyana		
Cymbopogon obtectus	0.5	0.1
Digitaria brownii	0.4	3
Duperreya commixta		0.1
Enneapogon lindleyanus	0.3	0.2
Enneapogon polyphyllus	0.2	0.1
Eremophila forrestii subsp. *forrestii*	1.8	0.4
Fimbristylis dichotoma	0.1	0.1
Hibiscus burtonii	0.6	0.1
Hibiscus sturtii var. *platychlamys*	0.4	0.1
Indigofera georgei	0.3	0.1
Maireana villosa	0.1	0.1
Paraneurachne muelleri	0.4	0.2
Pterocaulon sphacelatum	0.2	0.1

Ptilotus astrolasius	0.3	0.1
Ptilotus calostachyus	0.3	0.1
Ptilotus obovatus var. *obovatus*	0.3	0.2
Senna glaucifolia	0.6	0.1
Senna glutinosa subsp. *glutinosa*	0.8	0.1
Sida sp. L (A.M. Ashby 4202)	0.2	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.8	0.1
Triodia pungens	0.3	20
Triodia wiseana	0.5	30
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	K10
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	18/03/2022
GPS Location:	GDA94 Zone 50 691435.53E 7478687.25N
Orientation:	180/90
Vegetation Type:	1
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	>10 Years
Habitat:	Isolated trees over sparse tall shrubland over closed hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia atkinsiana	4	2
Acacia bivenosa	1.8	0.2
Acacia inaequilatera	2	0.5
Acacia pruinocarpa	3	0.5
Acacia tenuissima	1.5	0.1
Aristida contorta	0.2	0.2
Aristida inaequiglumis	0.4	0.2
Corymbia deserticola subsp. *deserticola*	3	0.4
Duperreya commixta		0.1
Enneapogon polyphyllus	0.3	0.1
Eucalyptus gamophylla	6	2
Eucalyptus leucophloia subsp. *leucophloia*	4	1
Hakea loreus subsp. *loreus*	2.5	0.2
Hibiscus burtonii	0.3	0.1
Indigofera monophylla	0.3	0.1
Ptilotus obovatus var. *obovatus*	0.4	0.2
Ptilotus rotundifolius	0.5	0.1
Rhagodia eremaea	1	0.2
Senna glutinosa subsp. *glutinosa*	1.5	0.1
Senna glutinosa subsp. *x luerssenii*	2	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.3	0.1
Triodia wiseana	0.5	85

PHOTOS



Site Name:	K11
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	18/03/2022
GPS Location:	GDA94 Zone 50 690728.93E 7478346.93N
Orientation:	180/90
Vegetation Type:	9
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	>5 Years
Habitat:	Isolated trees over sparse tall shrubland over tall hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adsurgens	1.8	0.2
Acacia aptaneura	0.4	0.1
Acacia atkinsiana	2.5	3
Acacia inaequilatera	4	1
Acacia pruinocarpa	3	0.2
Aristida contorta	0.3	0.2
Aristida inaequiglumis	0.4	0.2
Codonocarpus cotinifolius	1.3	0.1
Digitaria brownii	0.3	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.2	0.1
Eucalyptus leucophloia subsp. *leucophloia*		
Euphorbia ?trigonosperma	0.1	0.1
Evolvulus alsinoides	0.1	0.1
Goodenia microptera	0.1	0.1
Goodenia stobbsiana	0.2	0.1
Hakea loreus subsp. *loreus*		
Hibiscus burtonii	0.3	0.1
Hibiscus coatesii	0.6	0.1
Hibiscus sturtii var. *platychlamys*	0.3	0.1
Indigofera monophylla	0.1	0.1
Maireana villosa	0.1	0.1
Melhania oblongifolia	0.2	0.1
Paraneurachne muelleri	0.2	0.1
Psydrax suaveolens	1.2	0.1
Ptilotus obovatus var. *obovatus*	0.6	0.1
Senna artemisioides subsp. *helmsii*	0.5	0.1
Senna glutinosa subsp. *x luerssenii*	1.5	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.6	0.1
Solanum cleistogamum	0.2	0.1
Solanum lasiophyllum	0.2	0.1
Triodia wiseana	0.5	65

PHOTOS



Site Name:	K12
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	19/03/2022
GPS Location:	GDA94 Zone 50 691372.49E 7477873.43N
Orientation:	180/90
Vegetation Type:	10
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Exotic Weeds
Fire:	<5 Years
Habitat:	Low open woodland over tall sparse shrubland over mid open shrubland over low open shrub land over open tussock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	2	0.2
Acacia pyrifolia var. *pyrifolia*	2.5	2
Acacia tumida var. *pilbarensis*	2	0.75
Afrohybanthus aurantiacus	0.3	0.1
Alternanthera nana	0.1	0.1
Aristida contorta	0.2	0.3
Arivela viscosa	0.1	0.1
Atalaya hemiglauca	1.5	0.1
**Bidens bipinnata*	0.2	0.1
Boerhavia coccinea	0.1	0.1
Boerhavia repleta	0.1	0.1
**Cenchrus setiger*	0.6	0.5
Corchorus crozophorifolius	0.4	0.4
Corymbia hamersleyana	10	2.5
Cucumis variabilis		0.1
Cymbopogon obtectus	0.8	0.1
Duperreya commixta		0.1
Enneapogon lindleyanus	0.4	0.1
Enneapogon polyphyllus	0.2	0.3
Eremophila longifolia	0.6	0.1
Eriachne mucronata	0.3	2
Eriachne tenuiculmis	0.3	2
Euphorbia ?biconvexa	0.2	0.1
Euploca tanythrix	0.2	0.1
Evolvulus alsinoides	0.1	0.1
Gomphrena canescens subsp. *canescens*	0.2	0.2
Gossypium robinsonii	2.5	2
Grevillea wickhamii subsp. ?*hispidula*	2	0.3
Hakea loreus subsp. *loreus*	0.8	0.2
Indigofera monophylla	0.2	0.1
Jasminum didymum subsp. *lineare*	0.6	0.1
**Malvastrum americanum*	0.3	0.3
Melhania oblongifolia	0.1	0.1

Nellica maderaspatensis	0.3	0.1
Pterocaulon sphacelatum	0.4	0.1
Ptilotus astrolasius	0.2	0.1
Ptilotus obovatus var. *obovatus*	0.4	0.2
Rhagodia eremaea	0.4	0.1
Santalum lanceolatum	2.5	0.2
Senna artemisioides subsp. *oligophylla*	0.6	0.1
Senna glutinosa subsp. *glutinosa*	1	0.1
Seringia exastia (T)	0.4	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.9	0.2
Solanum phlomoides	0.2	0.1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.6	5
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.7	2
Triodia pungens	0.4	0.1
Waltheria indica	0.4	0.2

PHOTOS



Site Name:	K13
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	19/03/2022
GPS Location:	GDA94 Zone 50 691957.65E 7477632.57N
Orientation:	180/90
Vegetation Type:	10
Landform Type:	Other, Drainage Line/Outwash (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	Isolated trees over sparse mid-tall shrubland over sparse tussock grassland over hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adsurgens	0.5	0.1
Acacia atkinsiana	0.5	0.2
Acacia cowleana	1.8	0.2
Acacia dictyophleba	1.2	0.1
Acacia pruinocarpa	1.5	0.4
Acacia pyrifolia var. *pyrifolia*	0.5	1
Acacia tumida var. *pilbarensis*	1.5	0.2
Afrohybanthus aurantiacus	0.4	0.2
Alternanthera nana	0.1	0.1
Androcalva luteiflora	2	0.8
Aristida holathera var. *holathera*	0.3	0.3
Arivela viscosa	0.1	0.1
Boerhavia repleta		0.1
Bonamia erecta	0.4	1
**Cenchrus ciliaris*	0.5	0.3
**Cenchrus setiger*	0.5	0.5
Chrysopogon fallax	0.5	0.3
Corymbia hamersleyana	6	2
Crotalaria medicaginea var. *neglecta*	0.2	0.1
Cymbopogon obtectus	0.5	0.2
Digitaria brownii	0.3	0.3
Duperreya commixta		0.1
Enneapogon polyphyllus	0.3	0.3
Eragrostis eriopoda	0.2	0.1
Eremophila longifolia	1.5	0.75
Eucalyptus gamophylla	2	0.3
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euploca pachyphylla	0.1	0.1
Euploca tanythrix	0.2	0.1
Evolvulus alsinoides	0.1	0.1
Gomphrena canescens subsp. *canescens*	0.2	0.1
Goodenia microptera	0.1	0.1
Goodenia stellata	0.2	0.1
Gossypium australe	0.5	0.3

Grevillea wickhamii subsp. ?*hispidula*	2	0.3
Hakea chordophylla	0.3	0.1
Hibiscus sturtii var. *platychlamys*	0.3	0.1
Indigofera monophylla	0.4	0.8
Jasminum didymum subsp. *lineare*	0.5	0.2
Paraneurachne muelleri	0.3	0.75
Polymeria ambigua		0.1
Ptilotus astrolasius	0.2	0.1
Ptilotus calostachyus	0.1	0.1
Ptilotus ?*carinatus*	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.4	0.2
Rhynchosia minima		0.1
Senna artemisioides subsp. *helmsii*	0.5	0.1
Senna artemisioides subsp. *oligophylla*	0.4	0.1
Senna glaucifolia	0.4	0.1
Senna glutinosa subsp. *glutinosa*	1	0.5
Sida sp. L (A.M. Ashby 4202)		0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.8	0.3
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.1	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.4	4
Trichodesma zeylanicum	0.3	0.1
Triodia pungens	0.3	30

PHOTOS



Site Name:	K14
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	19/03/2022
GPS Location:	GDA94 Zone 50 692121.1E 7477290.03N
Orientation:	180/90
Vegetation Type:	1
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam/Clay Sand (other)
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	5-10 Years
Habitat:	Low open woodland over tall open shrubland over mixed hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.1	0.1
Acacia adsurgens	0.5	0.2
Acacia ?aneura	1.5	0.1
Acacia aptaneura	1.5	0.1
Acacia atkinsiana	2	4
Acacia bivenosa	0.5	0.1
Acacia inaequilatera	2	0.1
Acacia monticola	3	0.2
Afrohybanthus aurantiacus	0.3	0.1
Aristida holathera var. *holathera*	0.3	0.1
Aristida inaequiglumis	0.3	0.1
Bonamia erecta	0.3	0.1
Bothriochloa ewartiana	0.4	0.2
Corymbia deserticola subsp. *deserticola*	4	0.5
Cymbopogon obtectus	0.5	0.1
Digitaria brownii	0.3	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.2	0.1
Eriachne tenuiculmis	0.3	0.1
Eucalyptus gamophylla	5	3
Evolvulus alsinoides	0.2	0.1
Goodenia stobbsiana	0.1	0.1
Hakea chordophylla	3.5	0.1
Hibiscus sturtii var. *platychlamys*	0.2	0.1
Indigofera monophylla	0.3	0.2
Jasminum didymum subsp. *lineare*	0.6	0.1
Melhania oblongifolia	0.2	0.1
Paraneurachne muelleri	0.3	0.1
Ptilotus calostachyus	0.4	0.1
Ptilotus obovatus var. *obovatus*	0.8	0.1
Ptilotus rotundifolius	0.6	0.1
Rhynchosia minima	0.3	0.1
Santalum lanceolatum	1.5	0.3
Senna artemisioides subsp. *oligophylla*	1	0.4
Senna glaucifolia	0.4	0.1

Senna glutinosa subsp. *pruinosa*	0.8	0.1
Senna glutinosa subsp. *x luerssenii*	0.8	0.1
Senna notabilis	0.3	0.1
Seringia exastia (T)	0.2	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.5	0.1
Solanum phlomoides	0.3	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.5	0.7
Tribulus suberosus	0.4	0.1
Triodia pungens	0.3	30
Triodia vanleeuwenii	0.2	30

PHOTOS



Site Name:	K15
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	20/03/2022
GPS Location:	GDA94 Zone 50 692410.8E 7476530.45N
Orientation:	180/90
Vegetation Type:	2
Landform Type:	Lower Slope
Slope Class:	Moderately Inclined (10 degrees)
Soil Type:	Clay Loam
Soil Colour:	Brown
Rock Outcrop:	Ironstone, 2-10% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	Isolated low trees over isolated mid-tall shrubs over hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.2	0.3
Acacia atkinsiana	0.4	0.2
Acacia bivenosa	0.8	0.1
Acacia cowleana	0.8	0.1
Acacia hilliana	0.2	0.2
Acacia inaequilatera	0.5	0.2
Acacia pruinocarpa	0.7	0.2
Aristida contorta	0.2	0.1
Cassytha capillaris		0.1
Clerodendrum floribundum var. *angustifolium*	2	0.1
Codonocarpus cotinifolius	0.7	0.1
Corymbia hamersleyana	8	0.5
Cymbopogon ambiguus	0.4	0.1
Dodonaea coriacea	1	0.1
Duperreya commixta		0.1
Enneapogon caerulescens	0.1	0.1
Enneapogon polyphyllus	0.1	0.1
Eriachne mucronata	0.2	0.1
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eucalyptus leucophloia subsp. *leucophloia*	4	0.75
Euploca tanythrix	0.1	0.1
Fimbristylis dichotoma	0.2	0.1
Gomphrena canescens subsp. *canescens*	0.2	0.1
Goodenia microptera	0.2	0.1
Goodenia stobbsiana	0.1	0.1
Goodenia triodiophila	0.2	0.1
Gossypium robinsonii	2	0.2
Grevillea wickhamii subsp. ?*hispidula*	1	0.1
Hakea chordophylla	2	0.2
Hibiscus coatesii	0.3	0.1
Hibiscus sturtii var. *campylochlamys*	0.4	0.2
Indigofera monophylla	0.2	0.1
Jasminum didymum subsp. *lineare*	0.3	0.1
Mnesithea formosa	0.1	0.1
Paraneurachne muelleri	0.3	0.1

Poaceae sp.	0.1	0.1
Polycarpaea longiflora	0.1	0.1
Ptilotus calostachyus	0.3	0.2
Ptilotus obovatus var. *obovatus*	0.3	0.1
Ptilotus rotundifolius	0.4	0.1
Senna artemisioides subsp. *oligophylla*	0.1	0.1
Senna glaucifolia	0.2	0.1
Senna glutinosa subsp. *glutinosa*	1	0.2
Senna glutinosa subsp. *pruinosa*	0.8	0.2
Senna glutinosa subsp. *x luerssenii*	1	0.1
Sida sp. Articulation below (A.A. Mitchell PRP 1605)	0.3	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.8	0.1
Solanum lasiophyllum	0.3	0.2
Solanum phlomoides	0.2	0.1
Tephrosia oxalidea	0.1	0.1
Tephrosia virens	1	0.1
Trichodesma zeylanicum	0.4	0.1
Triodia vanleeuwenii	0.2	50
Triodia wiseana	0.3	10

PHOTOS



Site Name:	K16
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	20/03/2022
GPS Location:	GDA94 Zone 50 692303.32E 7475876.69N
Orientation:	180/90
Vegetation Type:	2
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone, Quartz
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Mining - Drill lines adj./in
Fire:	<5 Years
Habitat:	Low isolated trees over mid-tall open shrubland over low sparse shrubland over hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.2	0.1
Acacia adoxa var. *adoxa*	0.2	0.1
Acacia adsurgens	1.5	0.2
Acacia atkinsiana	3	3.5
Acacia inaequilatera	3.5	0.5
Acacia pruinocarpa	0.6	0.2
Aristida holathera var. *holathera*	0.4	0.1
Corchorus incanus subsp. *lithophilus*	0.5	0.1
Dolichocarpa crouchiana	0.1	0.1
Eucalyptus leucophloia subsp. *leucophloia*	8	1
Euphorbia australis var. *subtomentosa*	0.1	0.1
Goodenia microptera	0.1	0.1
Goodenia stobbsiana	0.2	0.1
Goodenia triodiophila	0.1	0.1
Hakea chordophylla	3	0.2
Hibiscus sturtii var. *campylochlamys*	0.3	0.3
Indigofera monophylla	0.3	0.4
Mnesithea formosa	0.1	0.1
Poaceae sp.	0.2	0.1
Ptilotus calostachyus	0.3	0.1
Ptilotus ?*carinatus*	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.3	0.1
Ptilotus rotundifolius	0.6	0.4
Scaevola parvifolia subsp. *pilbarae*	0.2	0.1
Senna glutinosa subsp. *glutinosa*	1.2	0.1
Senna glutinosa subsp. *pruinosa*	0.8	0.3
Senna glutinosa subsp. *x luerssenii*	1	0.2
Senna notabilis	0.1	0.1
Seringia exastia (T)	0.2	0.1
Sida arenicola	1.2	0.1
Sida echinocarpa	0.7	0.1
Solanum lasiophyllum	0.2	0.1
Solanum phlomoides	0.3	0.1

Tephrosia oxalidea	0.1	0.1
Trichodesma zeylanicum	0.3	0.1
Triodia vanleeuwenii	0.2	40
Triodia wiseana	0.3	5

PHOTOS



Site Name:	K17
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	20/03/2022
GPS Location:	GDA94 Zone 50 691764.72E 7475612.16N
Orientation:	180/90
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Exotic Weeds - Minor disturbance
Fire:	>10 Years
Habitat:	Tall shrubland over open tussock grassland over sparse hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.5	0.1
Abutilon otocarpum	0.4	0.2
Acacia ?aneura	8	30
Acacia aptaneura	8	2
Acacia atkinsiana	3	0.3
Acacia ?ayersiana	2	0.2
Acacia pruinocarpa	2.5	0.2
Acacia sibirica	2	0.5
Alternanthera nana	0.1	0.1
Amaranthus cuspidifolius	0.1	0.1
Anthobolus leptomerioides	0.9	0.1
Aristida contorta	0.2	25
Aristida inaequiglumis	0.8	0.3
Arivela viscosa	0.1	0.1
**Bidens bipinnata*	0.1	0.1
Boerhavia coccinea	0.1	0.1
Capparis lasiantha	0.6	0.1
Cheilanthes sieberi subsp. *sieberi*	0.1	0.1
Clerodendrum floribundum var. *angustifolium*	0.8	0.1
Cucumis variabilis		0.1
Cynanchum viminale subsp. *australe*		0.3
Digitaria brownii	0.2	0.1
Duperreya commixta		0.1
Enneapogon lindleyanus	0.4	0.2
Enneapogon polyphyllus	0.2	0.1
Eremophila forrestii subsp. *forrestii*	0.8	0.2
Eremophila fraseri subsp. *fraseri*	3.5	4
Eriachne pulchella subsp. *dominii*	0.1	0.1
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia biconvexa	0.1	0.1
Evolvulus alsinoides	0.1	0.1
Goodenia microptera	0.1	0.1
Hibiscus burtonii	0.3	0.1
Hibiscus coatesii	0.3	0.1

Hibiscus sturtii var. *platychlamys*	0.3	0.1
Maireana villosa	0.1	0.1
Mnesithea formosa	0.1	0.1
Paraneurachne muelleri	0.3	0.1
Perotis rara		0.1
Portulaca ?*oleracea*	0.1	0.1
Psydrax suaveolens	0.5	0.1
Pterocaulon sphacelatum	0.2	0.1
Ptilotus obovatus var. *obovatus*	0.3	0.1
Santalum lanceolatum	2.5	0.3
Senna artemisioides subsp. *helmsii*	1.5	0.3
Senna artemisioides subsp. *oligophylla*	1.8	0.2
Senna glutinosa subsp. *glutinosa*	1.8	0.1
Senna glutinosa subsp. *x luerssenii*	2	0.3
Sida sp. dark green fruits (S. van Leeuwen 2260)	0.2	0.1
Sida sp. L (A.M. Ashby 4202)		0.1
Solanum lasiophyllum	0.2	0.1
Solanum phlomoides	0.1	0.1
Sporobolus australasicus	0.1	0.1
Stemodia grossa	0.3	0.1
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.1	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.5	0.2
Tribulus suberosus	0.6	0.1
Triodia pungens	0.3	5

PHOTOS



Site Name:	K18
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	20/03/2022
GPS Location:	GDA94 Zone 50 691293.65E 7475132.89N
Orientation:	180/90
Vegetation Type:	10
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Exotic Weeds
Fire:	<5 Years
Habitat:	Very open low woodland over mid-tall open shrubland over tussock grassland over open hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon amplum	1.5	0.1
Acacia adsurgens	1	0.2
Acacia bivenosa	1.5	0.2
Acacia cowleana	1.2	0.2
Acacia pyrifolia var. *pyrifolia*	1.5	0.1
Acacia tenuissima	1	0.1
Afrohybanthus aurantiacus	0.6	0.1
Alternanthera nana	0.1	0.1
Anthobolus leptomerioides	0.8	0.1
Aristida contorta	0.2	4.5
Aristida inaequiglumis	0.3	0.1
Arivela viscosa	0.1	0.1
Boerhavia coccinea	0.1	0.1
Bonamia erecta	0.3	3
Bothriochloa ewartiana	0.4	0.3
Capparis lasiantha	0.3	0.1
**Cenchrus setiger*	0.4	8
Chrysopogon fallax	0.2	0.1
Corchorus crozophorifolius	0.3	0.1
Corymbia hamersleyana	10	3.5
Crotalaria medicaginea var. *neglecta*	0.1	0.1
Cucumis variabilis		0.1
Duperreya commixta		0.1
Enneapogon lindleyanus	0.3	0.3
Enneapogon polyphyllus	0.2	0.1
Eragrostis eriopoda	0.2	2
Eremophila longifolia	0.5	0.2
Eriachne tenuiculmis	0.3	1
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia biconvexa	0.1	0.1
Euphorbia tannensis subsp. *eremophila*	0.3	0.1
Euploca pachyphylla	0.2	0.1
Euploca tanythrix	0.1	0.1

Evolvulus alsinoides	0.1	0.1
Gomphrena canescens subsp. *canescens*	0.3	0.5
Gomphrena cunninghamii	0.1	0.1
Goodenia microptera	0.1	0.1
Goodenia stellata	0.2	0.1
Gossypium australe	0.5	0.2
Gossypium robinsonii	2	2.5
Grevillea wickhamii subsp. ?*hispidula*	1.5	0.6
Hibiscus sturtii var. *platychlamys*	0.3	0.3
Indigofera monophylla	0.3	0.5
Jasminum didymum subsp. *lineare*	0.4	0.1
Melhania oblongifolia	0.1	0.1
Mnesithea formosa	0.1	0.1
Paraneurachne muelleri	0.3	2
Perotis rara	0.1	0.1
Pterocaulon sphacelatum	0.2	0.1
Ptilotus astrolasius	0.3	0.2
Ptilotus ?*carinatus*	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.2	3.5
Rhynchosia minima		0.1
Santalum lanceolatum	2	0.1
Senna artemisioides subsp. *helmsii*	0.4	0.1
Senna artemisioides subsp. *oligophylla*	1	0.2
Setaria surgens	0.2	0.1
**Setaria verticillata*	0.3	0.1
Sida sp. L (A.M. Ashby 4202)		0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.6	3.2
Solanum lasiophyllum	0.4	0.1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.2	5.5
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.2	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.4	0.3
Tribulus macrocarpus	0.2	0.1
Trichodesma zeylanicum	0.1	0.1
Triodia pungens	0.4	4
Waltheria indica	0.1	0.1

PHOTOS



Site Name:	K19
Site Type:	QUADRAT
Dimensions:	25m x 100m
Survey Date:	21/03/2022
GPS Location:	GDA94 Zone 50 693297.98E 7478450.1N
Orientation:	250/70
Vegetation Type:	10
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone, Quartz
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	Isolated trees over mid-tall shrubland over sparse low shrubland over sparse tall tussock grassland over hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.3	0.1
Acacia adsurgens	0.7	0.1
Acacia bivenosa	1.2	0.1
Acacia cowleana	1.5	11
Acacia inaequilatera	1.2	0.1
Acacia monticola	0.5	0.3
Acacia tenuissima	0.4	0.1
Afrohybanthus aurantiacus	0.3	0.1
Aristida holathera var. *holathera*	0.3	0.1
Boerhavia coccinea	0.1	0.1
Boerhavia repleta	0.1	0.1
Bonamia erecta	0.5	0.3
Capparis lasiantha	0.3	0.1
Clerodendrum floribundum var. *angustifolium*	0.1	0.1
Corchorus incanus subsp. *lithophilus*	0.1	0.1
Corymbia hamersleyana	5	1
Crotalaria medicaginea var. *neglecta*	0.2	0.1
Cymbopogon ambiguus	0.6	0.3
Digitaria brownii	0.3	0.1
Duperreya commixta		0.1
Enneapogon caerulescens	0.2	0.1
Enneapogon lindleyanus	0.3	0.5
Enneapogon polyphyllus	0.2	0.1
Eragrostis eriopoda	0.2	0.1
Eriachne mucronata	0.3	0.1
Eucalyptus leucophloia subsp. *leucophloia*	8	2
Evolvulus alsinoides	0.1	0.1
Gomphrena canescens subsp. *canescens*	0.2	0.1
Goodenia microptera	0.1	0.1
Gossypium australe	0.1	0.1
Gossypium robinsonii	3	9
Hibiscus coatesii	0.2	0.1
Hibiscus sturtii var. *campylochlamys*	0.2	0.1
Hibiscus sturtii var. *platychlamys*	0.3	0.1

Indigofera monophylla	0.2	0.5
Jasminum didymum subsp. *lineare*	0.1	0.1
**Malvastrum americanum*	0.2	0.1
Nellica maderaspatensis	0.4	0.1
Paraneurachne muelleri	0.4	0.2
Perotis rara	0.1	0.1
Ptilotus astrolasius	0.4	0.3
Ptilotus calostachyus	0.8	0.1
Ptilotus ?carinatus	0.2	0.1
Ptilotus obovatus var. *obovatus*	0.3	0.1
Rhynchosia minima		0.1
Santalum lanceolatum	2	1
Senna artemisioides subsp. *oligophylla*	0.2	0.1
Senna glaucifolia	0.5	0.1
Senna glutinosa subsp. *glutinosa*	1.8	0.3
Senna glutinosa subsp. *pruinosa*	1.2	0.1
Senna glutinosa subsp. *x luerssenii*	1	0.2
Setaria surgens	0.2	0.1
Sida arenicola	0.4	0.1
Sida echinocarpa	0.2	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.2	0.1
Solanum cleistogamum	0.1	0.1
Solanum phlomoides	0.1	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.5	5
Trichodesma zeylanicum	0.5	0.1
Triodia wiseana	0.3	35

PHOTOS



Site Name:	K20
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	21/03/2022
GPS Location:	GDA94 Zone 50 692789.05E 7478710.21N
Orientation:	180/90
Vegetation Type:	1
Landform Type:	Other, Low rise (other)
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	Isolated low trees over sparse low shrubland over open hummock grassland (impacted by fire).

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adsurgens	0.4	0.1
Acacia bivenosa	0.2	0.1
Acacia synchronicia	0.2	0.1
Acacia tetragonophylla	0.3	0.1
Aristida contorta	0.1	0.1
Corchorus lasiocarpus subsp. *parvus*	0.3	0.1
Dolichocarpa crouchiana	0.1	0.1
Enneapogon caerulescens	0.1	0.1
Eriachne mucronata	0.2	0.1
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eucalyptus leucophloia subsp. *leucophloia*	7	0.5
Fimbristylis dichotoma	0.1	0.1
Goodenia microptera	0.1	0.1
Goodenia muelleriana	0.1	0.1
Grevillea wickhamii subsp. ?*hispidula*	0.5	0.1
Hibiscus sturtii var. *campylochlamys*	0.2	0.1
Indigofera monophylla	0.3	0.1
Melhania oblongifolia	0.2	0.1
Poaceae sp.	0.2	0.1
Portulaca ?*oleracea*	0.1	0.1
Ptilotus astrolasius	0.2	0.1
Ptilotus calostachyus	1	0.1
Ptilotus ?*carinatus*	0.2	0.1
Ptilotus rotundifolius	0.4	0.1
Senna artemisioides subsp. *oligophylla*	0.3	0.5
Senna glutinosa subsp. *glutinosa*	1.2	0.1
Senna glutinosa subsp. *pruinosa*	0.6	0.1
Senna glutinosa subsp. *x luerssenii*	1.2	0.1
Solanum lasiophyllum	0.2	0.1
Triodia vanleeuwenii	0.1	0.1
Triodia wiseana	0.2	20

PHOTOS



Site Name:	K21
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	21/03/2022
GPS Location:	GDA94 Zone 50 694158.34E 7478134.87N
Orientation:	180/90
Vegetation Type:	1
Landform Type:	Mid Slope
Slope Class:	Moderately Inclined (10 degrees)
Soil Type:	Sandy Clay Loam
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	Low open woodland over sparse mid shrubland over hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia bivenosa	0.8	0.1
Acacia tenuissima	0.6	0.1
Acacia tetragonophylla	0.4	0.1
Amphipogon sericeus	0.2	0.1
Aristida contorta	0.1	0.1
Corchorus incanus subsp. *lithophilus*	0.3	0.1
Cymbopogon ambiguus	0.4	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.2	0.1
Eragrostis eriopoda	0.1	0.1
Eremophila latrobei subsp. *filiformis*	0.3	0.1
Eremophila latrobei × forrestii	0.3	0.1
Eremophila longifolia	0.8	0.2
Eriachne mucronata	0.3	0.2
Eucalyptus leucophloia subsp. *leucophloia*	10	25
Fimbristylis dichotoma	0.1	0.1
Goodenia microptera	0.1	0.1
Goodenia muelleriana	0.1	0.1
Goodenia triodiophila	0.1	0.1
Gossypium australe	0.1	0.1
Hibiscus burtonii	0.3	0.1
Hibiscus coatesii	0.1	0.1
Hibiscus sturtii var. *campylochlamys*	0.2	0.3
Jasminum didymum subsp. *lineare*	0.3	0.1
Lepidium pedicellosum	0.3	0.2
Melhania oblongifolia	0.2	0.2
Mnesithea formosa	0.1	0.1
Paraneurachne muelleri	0.3	0.2
Poaceae sp.	0.2	0.1
Pterocaulon sphacelatum	0.1	0.1
Ptilotus astrolasius	0.2	0.1
Ptilotus calostachyus	0.1	0.1
Ptilotus ?*carinatus*	0.1	0.1
Ptilotus clementii	0.2	0.1
Ptilotus obovatus var. *obovatus*	0.3	0.1

Ptilotus rotundifolius	0.4	0.1
Senna glutinosa subsp. *glutinosa*	1.2	0.4
Senna glutinosa subsp. *pruinosa*	1	0.1
Senna glutinosa subsp. *x luerssenii*	1.2	0.5
Sida arenicola	0.5	0.1
Solanum lasiophyllum	0.2	0.1
Solanum phlomoides	0.2	0.1
Sporobolus australasicus	0.1	0.1
Tribulus suberosus	0.4	0.2
Triodia vanleeuwenii	0.2	25
Triodia wiseana	0.3	5

PHOTOS



Site Name:	K22
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	21/03/2022
GPS Location:	GDA94 Zone 50 694237.32E 7477926.97N
Orientation:	180/90
Vegetation Type:	1
Landform Type:	Other, Hillock/Upper Slope (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Sandy Clay Loam
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Granite
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	Low open woodland over isolated tall shrubs over mid sparse shrubland over hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia aptaneura	0.2	0.1
Acacia atkinsiana	0.3	0.1
Acacia bivenosa	0.5	0.1
Acacia elachantha	0.4	0.1
Acacia tenuissima	0.5	0.2
Aristida contorta	0.1	0.1
Corchorus incanus subsp. *lithophilus*	0.2	0.1
Corymbia deserticola subsp. *deserticola*	0.8	0.1
Dodonaea coriacea	0.2	0.1
Dolichocarpa crouchiana	0.1	0.1
Eriachne mucronata	0.3	0.4
Eucalyptus leucophloia subsp. *leucophloia*	5	2.5
Evolvulus alsinoides	0.1	0.1
Fimbristylis dichotoma	0.1	0.1
Gompholobium oreophilum		
Goodenia muelleriana	0.1	0.1
Goodenia stobbsiana	0.2	0.2
Goodenia triodiophila	0.2	0.1
Hakea chordophylla	3	0.2
Hibiscus burtonii	0.3	0.1
Hibiscus coatesii	0.3	0.1
Paraneurachne muelleri	0.3	0.1
Ptilotus astrolasius	0.3	0.1
Ptilotus calostachyus	0.1	0.1
Ptilotus ?*carinatus*	0.3	0.1
Ptilotus obovatus var. *obovatus*	0.2	0.1
Ptilotus rotundifolius	0.4	0.2
Senna glutinosa subsp. *glutinosa*	0.5	0.2
Senna glutinosa subsp. *pruinosa*	0.3	0.1
Senna glutinosa subsp. *x luerssenii*	1.2	0.4
Sida arenicola	1.5	0.2
Solanum phlomoides	0.2	0.1
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.1	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.4	0.5

Triodia pungens	0.3	7
Triodia vanleeuwenii	0.1	25
Triodia wiseana	0.3	10

PHOTOS



Site Name:	K23
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	22/03/2022
GPS Location:	GDA94 Zone 50 693137E 7475300.67N
Orientation:	180/90
Vegetation Type:	2
Landform Type:	Lower Slope
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Soil Condition:	SE corner catches a creek line - have excluded creek species (moved to unburnt).
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	5-10 Years
Habitat:	Isolated low trees over sparse tall shrubland over isolated mid shrubs over sparse low tussock grassland over mixed hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.1	0.1
Acacia hilliana	0.1	0.1
Acacia inaequilatera	3.5	2.5
Aristida holathera var. *holathera*	0.3	0.5
Dampiera candicans		
Dolichocarpa crouchiana	0.1	0.1
Enneapogon polyphyllus	0.1	0.1
Eriachne mucronata	0.3	0.2
Eucalyptus leucophloia subsp. *leucophloia*	4	0.4
Euploca tanythrix	0.1	0.1
Fimbristylis dichotoma	0.1	0.1
Gompholobium oreophilum	0.1	0.3
Goodenia microptera	0.1	0.1
Goodenia stobbsiana	0.1	0.5
Goodenia triodiophila	0.1	0.1
Grevillea wickhamii subsp. ?*hispidula*	0.3	0.2
Hakea chordophylla	3.5	1.5
Hibiscus coatesii	0.2	0.1
Hibiscus sturtii var. *campylochlamys*	0.1	0.1
Indigofera monophylla	0.1	0.1
Paraneurachne muelleri	0.3	0.3
Ptilotus calostachyus	0.4	0.3
Ptilotus ?*carinatus*	0.2	0.1
Senna artemisioides subsp. *oligophylla*	0.4	0.1
Senna ferraria	1.5	0.1
Senna glaucifolia	0.3	0.1
Senna glutinosa subsp. *glutinosa*	0.5	0.1
Senna notabilis	0.1	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.3	0.5
Solanum lasiophyllum	0.2	0.1
Triodia vanleeuwenii	0.2	15
Triodia wiseana	0.3	15

PHOTOS



Site Name:	K24
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	22/03/2022
GPS Location:	GDA94 Zone 50 691821.93E 7474981.01N
Orientation:	180/90
Vegetation Type:	1
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	Low open woodland over mid-tall open shrubland over mixed hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.1	0.1
Acacia adsurgens	0.5	1
Acacia atkinsiana	0.4	0.2
Acacia cowleana	0.8	0.3
Acacia inaequilatera	3	0.75
Acacia tenuissima	0.5	0.1
Amphipogon sericeus	0.3	0.2
Aristida holathera var. *holathera*	0.3	0.1
Aristida inaequiglumis	0.6	0.1
Bonamia erecta	0.2	0.1
Corymbia deserticola subsp. *deserticola*	8	1
Corymbia hamersleyana	7	0.5
Duperreya commixta		0.1
Eragrostis eriopoda	0.2	0.1
Eriachne mucronata	0.3	0.2
Eucalyptus gamophylla	3	0.4
Eucalyptus leucophloia subsp. *leucophloia*	4	0.3
Euploca pachyphylla	0.2	0.1
Goodenia microptera	0.1	0.1
Grevillea wickhamii subsp. ?*hispidula*	0.5	0.1
Hakea chordophylla	0.3	0.1
Indigofera monophylla	0.2	0.1
Jasminum didymum subsp. *lineare*	0.3	0.1
Paraneurachne muelleri	0.3	0.1
Ptilotus astrolasius	0.3	0.1
Ptilotus calostachyus	0.4	0.3
Ptilotus obovatus var. *obovatus*	0.2	0.1
Ptilotus rotundifolius	0.7	0.2
Senna artemisioides subsp. *helmsii*	0.5	0.1
Senna artemisioides subsp. *oligophylla*	0.4	0.2
Senna glaucifolia	0.8	0.2
Senna glutinosa subsp. *x luerssenii*	0.5	0.1
Sida arenicola	0.8	0.1

Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.6	0.2
Solanum lasiophyllum	0.1	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.4	0.2
Triodia pungens	0.3	2
Triodia vanleeuwenii	0.2	30

PHOTOS



Site Name:	K25
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	22/03/2022
GPS Location:	GDA94 Zone 50 684168.86E 7474787.1N
Orientation:	180/90
Vegetation Type:	9
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	>10 Years
Habitat:	Isolated low trees over tall open shrubland over mid open shrubland over low hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.2	0.1
Acacia atkinsiana	4	0.5
Acacia bivenosa	3	0.5
Acacia dictyophleba	1.2	0.1
Acacia inaequilatera	3	5
Acacia monticola	1.8	0.2
Acacia pruinocarpa	4	2.1
Acacia tenuissima	3	0.4
Alternanthera nana	0.2	0.1
Anthobolus leptomerioides	2.5	0.1
Aristida contorta	0.2	0.1
Aristida inaequiglumis	0.4	0.1
Boerhavia coccinea	0.1	0.1
Bonamia erecta	0.3	0.2
Bothriochloa ewartiana	0.3	0.1
Capparis lasiantha	0.5	0.2
Chrysopogon fallax	0.4	0.1
Corymbia hamersleyana		
Cymbopogon obtectus	0.4	0.1
Cynanchum pedunculatum		0.1
Digitaria brownii	0.4	0.3
Duperreya commixta		0.1
Enneapogon polyphyllus	0.1	0.1
Eremophila forrestii subsp. *forrestii*	0.5	0.1
Eremophila longifolia	1.5	0.2
Eucalyptus gamophylla	7	2
Eucalyptus leucophloia subsp. *leucophloia*	8	3
Euploca tanythrix	0.2	0.1
Evolvulus alsinoides	0.1	0.1
Fimbristylis dichotoma	0.1	0.1
Glycine canescens		0.1
Goodenia microptera	0.1	0.1
Gossypium robinsonii	2.5	0.3
Hakea chordophylla	2.5	0.2

Hibiscus burtonii	0.3	0.1
Hibiscus sturtii var. *campylochlamys*	0.1	0.1
Hibiscus sturtii var. *platychlamys*	0.3	0.1
Maireana villosa	0.3	0.3
Melhania oblongifolia	0.6	0.1
Paraneurachne muelleri	0.3	0.1
Perotis rara	0.1	0.1
Pterocaulon sphacelatum	0.4	0.2
Ptilotus astrolasius	0.3	0.1
Ptilotus obovatus var. *obovatus*	0.2	0.1
Rhagodia eremaea	0.3	0.1
Rhynchosia minima		0.1
Senna artemisioides subsp. *helmsii*	1.2	0.1
Senna artemisioides subsp. *oligophylla*	0.3	0.8
Senna artemisioides subsp. *x artemisioides*	1	0.2
Senna glutinosa subsp. *pruinosa*	1.5	0.5
Sida arenicola	0.8	0.1
Sida echinocarpa	0.3	0.1
Solanum cleistogamum	0.2	0.1
Solanum lasiophyllum	0.5	0.1
Tephrosia densa	0.6	0.2
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.2	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.4	0.2
Tribulus suberosus	1.2	0.1
Trichodesma zeylanicum	0.1	0.1
Triodia pungens	0.4	60
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	K26
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	22/03/2022
GPS Location:	GDA94 Zone 50 684092.47E 7474211.68N
Orientation:	180/90
Vegetation Type:	2
Landform Type:	Other, Hillock/Low Rise (other)
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Brown
Rock Outcrop:	Ironstone, 2-10% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	Low open woodland over sparse low shrubland over hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.2	0.2
Acacia aptaneura	0.8	0.1
Acacia atkinsiana	0.4	0.2
Acacia bivenosa	0.6	0.2
Acacia elachantha	0.2	0.1
Acacia inaequilatera	2.5	0.3
Acacia pruinocarpa	0.5	0.2
Acacia sibirica	0.4	0.3
Acacia ?sibirica	0.2	0.1
Aristida contorta	0.2	0.1
Aristida pruinosa	0.3	0.1
Capparis lasiantha	0.4	0.1
Cymbopogon ambiguus	0.2	0.1
Dodonaea coriacea	0.6	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.1	0.1
Eremophila latrobei subsp. *filiformis*	0.2	0.1
Eriachne mucronata	0.2	0.5
Eucalyptus leucophloia subsp. *leucophloia*	7	4.5
Evolvulus alsinoides	0.1	0.1
Fimbristylis dichotoma	0.1	0.1
Goodenia microptera	0.1	0.1
Goodenia stobbsiana	0.1	0.1
Goodenia triodiophila	0.1	0.1
Gossypium australe	0.4	0.1
Grevillea berryana		
Hibiscus sturtii var. *campylochlamys*	0.2	0.1
Indigofera monophylla	0.1	0.3
Paraneurachne muelleri	0.3	0.1
Psydrax suaveolens	0.4	0.1
Ptilotus calostachyus	0.4	0.1
Ptilotus ?carinatus	0.3	0.1
Ptilotus obovatus var. *obovatus*	0.3	0.1
Ptilotus rotundifolius	0.4	0.1
Santalum lanceolatum	1.5	0.1

Senna artemisioides subsp. *helmsii*	0.3	0.1
Senna artemisioides subsp. *oligophylla*	0.5	0.1
Senna glaucifolia	0.4	0.1
Senna glutinosa subsp. *glutinosa*	0.3	0.5
Senna glutinosa subsp. *pruinosa*	0.2	0.1
Sida arenicola	0.3	0.1
Sida echinocarpa	0.5	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.4	1
Solanum lasiophyllum	0.2	0.1
Tephrosia oxalidea	0.1	0.1
Triodia pungens	0.3	0.5
Triodia vanleeuwenii	0.2	30
Triodia wiseana	0.3	3

PHOTOS



Site Name:	K27
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	22/03/2022
GPS Location:	GDA94 Zone 50 684134.48E 7473968.84N
Orientation:	180/90
Vegetation Type:	1
Landform Type:	Other, Plain/Outwash (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	>10 Years
Habitat:	Low open woodland over mid-tall open shrubland over hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adsurgens	2	0.3
Acacia aptaneura	2	0.2
Acacia atkinsiana	3	4
Acacia inaequilatera	2.5	0.5
Acacia pruinocarpa	1.5	0.2
Amphipogon sericeus	0.2	0.1
Aristida contorta	0.2	0.1
Aristida pruinosa	0.3	0.1
Bothriochloa ewartiana	0.3	0.1
Cymbopogon obtectus	0.2	0.1
Duperreya commixta		0.1
Eragrostis eriopoda	0.2	0.1
Eriachne mucronata	0.2	0.2
Eucalyptus leucophloia subsp. *leucophloia*	8	2
Gompholobium oreophilum	0.5	0.4
Goodenia microptera	0.1	0.1
Goodenia stobbsiana	0.1	0.1
Hakea chordophylla	4	0.75
Hibiscus sturtii var. *campylochlamys*	0.2	0.1
Indigofera monophylla	0.3	0.1
Paraneurachne muelleri	0.3	0.2
Ptilotus astrolasius	0.3	0.2
Ptilotus calostachyus	0.2	0.1
Ptilotus rotundifolius	0.4	0.1
Scaevola parvifolia subsp. *pilbarae*	0.2	0.1
Senna artemisioides subsp. *oligophylla*	0.3	0.1
Senna glaucifolia	0.3	0.1
Senna glutinosa subsp. *pruinosa*	1.2	0.1
Senna glutinosa subsp. *x luerssenii*	0.8	0.1
Seringia exastia (T)	0.2	0.2
Sida arenicola	0.4	0.1
Sida cardiophylla	0.4	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.3	0.1
Solanum lasiophyllum	0.5	0.2

Tribulus suberosus	0.5	0.2
Triodia pungens	0.3	1
Triodia vanleeuwenii	0.2	50

PHOTOS



Site Name:	K28
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	23/03/2022
GPS Location:	GDA94 Zone 50 684542.11E 7474505.46N
Orientation:	180/90
Vegetation Type:	1
Landform Type:	Other, Plain/Outwash (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	Isolated low trees over low-mid open shrubland over hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia atkinsiana	0.7	4
Acacia bivenosa	0.3	0.1
Acacia inaequilatera	4	0.2
Amphipogon sericeus	0.1	0.1
Aristida holathera var. *holathera*	0.2	0.2
Bonamia erecta	0.5	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.1	0.1
Eucalyptus leucophloia subsp. *leucophloia*	9	2
Fimbristylis simulans	0.1	0.1
Hibiscus coatesii	0.1	0.1
Hibiscus sturtii var. *campylochlamys*	0.2	0.1
Indigofera monophylla	0.3	0.2
Jasminum didymum subsp. *lineare*	0.4	0.1
Paraneurachne muelleri	0.3	0.1
Poaceae sp.	0.2	0.1
Portulaca ?*oleracea*	0.1	0.1
Ptilotus astrolasius	0.2	0.1
Ptilotus calostachyus	0.2	0.1
Ptilotus ?*carinatus*	0.2	0.1
Ptilotus obovatus var. *obovatus*	0.2	0.1
Ptilotus rotundifolius	0.8	0.2
Senna artemisioides subsp. *oligophylla*	0.2	0.1
Senna glutinosa subsp. *pruinosa*	0.8	0.1
Senna glutinosa subsp. *x luerssenii*	0.4	0.5
Sida arenicola	0.3	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.3	0.2
Solanum lasiophyllum	0.5	0.1
Triodia pungens	0.2	0.5
Triodia vanleeuwenii	0.2	33

PHOTOS



Site Name:	K29
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	23/03/2022
GPS Location:	GDA94 Zone 50 688496.68E 7476476.27N
Orientation:	180/90
Vegetation Type:	2
Landform Type:	Lower Slope
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	Isolated low trees over open low shrubland over hummock grassland.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*		
Acacia hilliana	0.2	7
Acacia inaequilatera	0.5	0.3
Amphipogon sericeus	0.2	0.1
Codonocarpus cotinifolius	0.3	0.1
Corymbia deserticola subsp. *deserticola*	5	0.5
Eragrostis eriopoda	0.2	0.1
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eucalyptus leucophloia subsp. *leucophloia*	1.2	0.2
Euploca tanythrix	0.2	0.1
Fimbristylis dichotoma	0.1	0.1
Fimbristylis simulans	0.1	0.1
Goodenia stobbsiana	0.1	0.1
Goodenia triodiophila	0.1	0.1
Gossypium australe	0.5	0.2
Hakea chordophylla	1.2	0.3
Hibiscus sturtii var. *campylochlamys*	0.2	0.1
Indigofera monophylla	0.3	0.1
Poaceae sp.	0.2	0.1
Ptilotus calostachyus	0.3	0.2
Ptilotus ?*carinatus*	0.4	0.1
Ptilotus obovatus var. *obovatus*	0.3	0.1
Ptilotus rotundifolius	0.2	0.1
Senna artemisioides subsp. *oligophylla*	0.3	0.1
Senna glutinosa subsp. *pruinosa*	1.5	0.3
Seringia exastia (T)	0.3	0.1
Sida arenicola	1.5	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.3	0.2
Solanum lasiophyllum	0.4	0.1
Triodia pungens	0.4	0.4
Triodia vanleeuwenii	0.2	30
Triodia wiseana	0.2	0.3

PHOTOS



Site Name:	K30
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	04/04/2022
GPS Location:	GDA94 Zone 50 684939.89E 7474629.08N
Orientation:	180/90
Vegetation Type:	1
Landform Type:	Lower Slope
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Sandy Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon macrum	0.2	0.1
Abutilon otocarpum	0.1	0.1
Acacia atkinsiana	3	3.5
Acacia bivenosa	2	0.2
Afrohybanthus aurantiacus	0.2	0.1
Amphipogon sericeus	0.2	0.1
Aristida contorta	0.2	0.1
Aristida holathera var. *holathera*	0.3	0.1
Aristida inaequiglumis	0.3	0.1
Aristida pruinosa	0.3	0.1
**Bidens bipinnata*	0.1	0.1
Boerhavia coccinea	0.1	0.1
Bonamia erecta	0.5	0.1
Corchorus lasiocarpus subsp. *parvus*	0.2	0.1
Corymbia deserticola subsp. *deserticola*	4	0.5
Corymbia hamersleyana	4	
Crotalaria medicaginea var. *neglecta*	0.1	0.1
Cucumis variabilis		0.1
Cymbopogon ambiguus	0.4	0.1
Cymbopogon obtectus	0.3	0.1
Digitaria brownii	0.2	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.2	0.1
Eragrostis eriopoda	0.2	0.1
Eriachne mucronata	0.2	0.1
Eucalyptus gamophylla	4	0.3
Eulalia aurea	0.4	0.1
Euphorbia australis var. *hispidula*	0.1	0.1
Euploca tanythrix	0.2	0.1
Evolvulus alsinoides	0.1	0.1
Fimbristylis dichotoma	0.1	0.1
Goodenia muelleriana	0.1	0.1
Goodenia stobbsiana	0.1	0.1
Gossypium robinsonii	0.1	0.1
Hibiscus burtonii	0.1	0.1
Hibiscus coatesii	0.2	0.1
Hibiscus sturtii var. *platychlamys*	0.3	0.1
Indigofera monophylla	0.2	0.1

Jasminum didymum subsp. *lineare*		0.1
Maireana villosa	0.1	0.1
Paraneurachne muelleri	0.2	0.1
Ptilotus astrolasius	0.1	0.1
Ptilotus calostachyus	0.6	0.1
Ptilotus ?carinatus	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.2	0.1
Ptilotus rotundifolius	0.5	0.1
Rhynchosia minima		0.1
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *helmsii*	0.8	0.1
Senna artemisioides subsp. *oligophylla*	1.1	0.2
Senna glutinosa subsp. *glutinosa*	1.4	0.3
Senna glutinosa subsp. *pruinosa*	1.3	0.1
Senna glutinosa subsp. *x luerssenii*	0.6	0.1
Senna notabilis	0.1	0.1
Seringia exastia (T)	0.5	3
Sida sp. Supplejack Station (T.S. Henshall 2345)	0.1	0.1
Solanum cleistogamum	0.2	0.1
Solanum lasiophyllum	0.2	0.1
Tephrosia densa	0.2	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.3	0.2
Triodia pungens	0.3	5
Triodia vanleeuwenii	0.2	10
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	K31
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	05/04/2022
GPS Location:	GDA94 Zone 50 685229.77E 7475272.45N
Orientation:	180/90
Vegetation Type:	1
Landform Type:	Other, Plain/Low spur b/w drainage lines (other)
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	W
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia atkinsiana	0.5	1
Acacia bivenosa	0.5	0.1
Aristida holathera var. *holathera*	0.2	0.1
Capparis lasiantha	0.9	0.1
Corchorus lasiocarpus subsp. *parvus*	0.3	0.1
Corymbia deserticola subsp. *deserticola*	3.5	0.3
Cymbopogon ambiguus	0.2	0.1
Duperreya commixta		0.1
Eriachne pulchella subsp. *dominii*		
Eucalyptus gamophylla	2	0.5
Eucalyptus leucophloia subsp. *leucophloia*	5	1
Euphorbia tannensis subsp. *eremophila*	0.3	0.1
Goodenia microptera	0.2	0.1
Hakea chordophylla	0.3	0.1
Indigofera monophylla	0.2	0.1
Ptilotus astrolasius	0.2	0.1
Ptilotus calostachyus	0.8	0.1
Ptilotus obovatus var. *obovatus*	0.4	0.1
Ptilotus rotundifolius	0.7	1
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *oligophylla*	0.3	0.2
Senna glutinosa subsp. *pruinosa*	0.2	0.2
Senna glutinosa subsp. *x luerssenii*	0.4	0.5
Seringia exastia (T)	0.5	0.1
Sida arenicola	0.6	0.1
Sida cardiophylla	0.3	0.1
Sida echinocarpa	0.6	0.1
Solanum lasiophyllum	0.2	0.1
Triodia pungens	0.3	1
Triodia vanleeuwenii	0.2	35

PHOTOS



Site Name:	K32
Site Type:	QUADRAT
Dimensions:	100m x 25m
Survey Date:	05/04/2022
GPS Location:	GDA94 Zone 50 687588.95E 7476671.05N
Orientation:	180/90
Vegetation Type:	10
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	NE
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Exotic Weeds
Fire:	<5 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	3	0.1
Acacia cowleana	2.5	40
Acacia monticola	2	0.3
Acacia pyrifolia var. *pyrifolia*	0.4	0.1
Afrohybanthus aurantiacus	0.2	0.1
Alternanthera nana	0.2	0.1
Androcalva luteiflora	1	1
Aristida contorta	0.2	0.1
Aristida holathera var. *holathera*	0.2	0.5
Aristida inaequiglumis	1	0.1
Arivela viscosa	0.1	0.1
Boerhavia coccinea		0.1
Bonamia erecta	0.4	0.1
**Cenchrus setiger*	0.3	20
Corchorus incanus subsp. *lithophilus*	0.3	0.1
Corymbia hamersleyana	5	6
Crotalaria medicaginea var. *neglecta*	0.2	0.1
Cymbopogon ambiguus	0.4	0.1
Digitaria brownii	0.3	0.1
Duperreya commixta		0.1
Enneapogon lindleyanus	0.4	0.1
Enneapogon polyphyllus	0.2	0.1
Eriachne mucronata	0.2	0.1
Eulalia aurea	0.3	0.1
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euploca tanythrix	0.2	0.1
Evolvulus alsinoides	0.1	0.1
Gomphrena canescens subsp. *canescens*	0.2	0.1
Goodenia microptera	0.1	0.1
Gossypium australe	1	0.1
Gossypium robinsonii	2.5	1
Grevillea wickhamii subsp. ?*hispidula*	0.8	1
Hakea loreus subsp. *loreus*		
Hibiscus sturtii var. *campylochlamys*	0.2	0.1

Hibiscus sturtii var. *platychlamys*	0.8	0.1
Indigofera monophylla	0.2	0.1
Isotropis iophyta	0.8	0.1
Jasminum didymum subsp. *lineare*		0.1
Melhania oblongifolia	0.3	0.1
Paraneurachne muelleri	0.2	0.1
Pterocaulon sphacelatum	0.2	0.1
Ptilotus astrolasius	0.3	0.1
Ptilotus obovatus var. *obovatus*	0.6	0.3
Rhynchosia minima		0.1
Santalum lanceolatum	2	1
Scaevola parvifolia subsp. *pilbarae*		
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *helmsii*	0.8	0.1
Senna artemisioides subsp. *oligophylla*	0.5	0.1
Senna glutinosa subsp. *glutinosa*	1.3	0.1
Setaria surgens	0.1	0.1
Sida echinocarpa	1.2	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.5	0.1
Stemodia grossa	0.3	0.1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	1	20
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.6	5
Triodia pungens	0.3	2

PHOTOS



Site Name:	K33
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	05/04/2022
GPS Location:	GDA94 Zone 50 687270.01E 7476718.73N
Orientation:	180/90
Vegetation Type:	2
Landform Type:	Upper Slope
Slope Class:	Moderately Inclined (10 degrees)
Aspect:	E
Soil Type:	Sandy Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, <2% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.2	0.1
Acacia hilliana	0.5	2
Acacia pyrifolia var. *pyrifolia*	0.3	0.1
Aristida holathera var. *holathera*	0.2	0.1
Aristida pruinosa	0.2	0.1
Cheilanthes contigua	0.1	0.1
Corchorus lasiocarpus subsp. *parvus*	0.2	1
Corymbia hamersleyana	1.5	2
Cymbopogon ambiguus	0.3	0.1
Dysphania rhadinostachya	0.1	0.1
Enneapogon caerulescens	0.4	0.1
Eremophila jucunda subsp. *pulcherrima*	0.8	0.1
Eriachne mucronata	0.3	0.1
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eucalyptus leucophloia subsp. *leucophloia*	4	3
Euphorbia ?*trigonosperma*	0.1	0.1
Gompholobium oreophilum	0.5	0.2
Goodenia stobbsiana	0.3	0.1
Goodenia triodiophila	0.2	0.1
Gossypium robinsonii	1.6	0.2
Grevillea wickhamii subsp. ?*hispidula*	2	0.3
Hibiscus sturtii var. *campylochlamys*	0.1	0.1
Indigofera monophylla	0.2	0.1
Jasminum didymum subsp. *lineare*		0.1
Mirbelia viminalis	0.6	0.1
Paraneurachne muelleri	0.3	0.1
Petalostylis labicheoides	2	1
Polycarpaea longiflora	0.1	0.1
Ptilotus astrolasius	0.3	0.1
Ptilotus calostachyus	0.3	0.1
Rhynchosia minima		0.1
Santalum lanceolatum	1.6	0.4
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *oligophylla*	0.6	0.1
Senna glutinosa subsp. *glutinosa*	0.3	0.1

Senna glutinosa subsp. *pruinosa*	0.8	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.5	0.1
Solanum lasiophyllum	0.2	0.1
Solanum phlomoides	0.4	0.1
Tephrosia densa	0.1	0.1
Tephrosia oxalidea	0.1	0.1
Triodia vanleeuwenii	0.2	0.2
Triodia wiseana	0.4	40

PHOTOS



Site Name:	K34
Site Type:	QUADRAT
Dimensions:	165m x 15m
Survey Date:	06/04/2022
GPS Location:	GDA94 Zone 50 694096.7E 7477282.5N
Orientation:	180/90
Vegetation Type:	10
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	NW
Soil Type:	Sandy Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	<5 Years
Habitat:	General.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	3	0.1
Acacia adoxa var. *adoxa*	0.4	0.1
Acacia cowleana	2	75
Acacia maitlandii	0.3	0.1
Afrohybanthus aurantiacus	0.4	0.1
Alternanthera nana	0.2	0.1
Androcalva luteiflora	1	0.1
Aristida holathera var. *holathera*	0.2	0.5
Arivela viscosa	0.1	0.1
Boerhavia coccinea	0.1	0.1
Bulbostylis barbata	0.1	0.1
Clerodendrum floribundum var. *angustifolium*	0.1	0.1
Corchorus incanus subsp. *lithophilus*	0.8	1
Corymbia hamersleyana	4	3
Crotalaria medicaginea var. *neglecta*	0.1	0.1
Cucumis variabilis		0.1
Cymbopogon ambiguus	0.3	0.1
Dendrophyllanthus erwinii	0.1	0.1
Digitaria ammophila	0.2	0.1
Digitaria ctenantha	0.3	0.1
Dodonaea lanceolata var. *lanceolata*	1.2	0.1
Duperreya commixta		0.1
Enneapogon lindleyanus	0.3	0.1
Enneapogon polyphyllus	0.4	0.1
Eragrostis cumingii	0.1	0.1
Eriachne mucronata	0.3	0.5
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eriachne sp. Dugald River (B.K. Simon+ 3007)	0.1	0.1
Eucalyptus gamophylla	2	0.2
Euphorbia ?biconvexa	0.1	0.1
Euploca tanythrix	0.1	0.1
Evolvulus alsinoides	0.1	0.1
Fimbristylis dichotoma	0.2	0.1
Fimbristylis simulans	0.1	0.1

Gomphrena canescens subsp. *canescens*	0.1	0.1
Gomphrena cunninghamii	0.1	0.1
Goodenia microptera	0.2	0.1
Goodenia stobbsiana	0.2	0.1
Gossypium australe	0.8	0.1
Gossypium robinsonii	1.5	0.5
Grevillea wickhamii subsp. ?*hispidula*	1.5	0.1
Hakea loreus subsp. *loreus*	0.7	0.1
Hibiscus coatesii	0.8	0.1
Hibiscus sturtii var. *campylochlamys*	0.2	0.5
Indigofera monophylla	0.7	1
Jasminum didymum subsp. *lineare*		0.5
Melhania oblongifolia	0.2	0.1
Nellica maderaspatensis	0.3	0.1
Notoleptopus decaisnei	0.1	0.1
Paraneurachne muelleri	0.4	0.1
Perotis rara	0.1	0.1
Polycarpaea longiflora	0.1	0.1
Pterocaulon sphacelatum	0.2	0.1
Ptilotus astrolasius	0.3	0.1
Ptilotus calostachyus	0.3	0.1
Ptilotus ?*carinatus*	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.3	0.1
Rhynchosia minima		0.1
Santalum lanceolatum	1.5	1
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *oligophylla*	0.2	0.1
Senna glutinosa subsp. *glutinosa*	1.4	0.1
Senna notabilis	0.1	0.1
Seringia exastia (T)	0.4	0.1
Setaria surgens	0.1	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.9	0.1
Solanum cleistogamum	0.2	0.1
Solanum lasiophyllum	0.6	0.1
Stylobasium spathulatum	1.2	0.1
Tephrosia densa	0.3	0.5
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.4	1.5
Trachymene oleracea subsp. *oleracea*	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Triodia pungens	0.3	5

PHOTOS



Site Name:	K36
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	06/04/2022
GPS Location:	GDA94 Zone 50 691937.68E 7476598.36N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Aspect:	NW
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.3	0.1
Acacia atkinsiana	1	2
Acacia inaequilatera	1.2	0.2
Aristida contorta	0.2	0.1
Aristida holathera var. *holathera*	0.3	1
Bonamia erecta	0.2	0.2
Corchorus lasiocarpus subsp. *parvus*	0.3	0.1
Corymbia deserticola subsp. *deserticola*	4.5	1.5
Dendrophyllanthus erwinii	0.1	0.1
Duperreya commixta		0.1
Eragrostis eriopoda	0.1	0.1
Eriachne mucronata	0.5	0.1
Eucalyptus gamophylla	1.7	0.5
Euphorbia australis var. *hispidula*	0.1	0.1
Gompholobium oreophilum	0.7	0.1
Gomphrena canescens subsp. *canescens*	0.1	0.1
Goodenia microptera	0.1	0.1
Indigofera monophylla	0.2	0.3
Paraneurachne muelleri	0.3	0.1
Pterocaulon sp. (dead)	0.1	0.1
Ptilotus calostachyus	0.5	0.1
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *helmsii*		
Senna artemisioides subsp. *oligophylla*		
Senna artemisioides subsp. *oligophylla*	0.1	0.1
Senna glaucifolia	0.6	0.2
Senna glutinosa subsp. *glutinosa*	0.2	0.1
Senna glutinosa subsp. *x luerssenii*	1.1	0.1
Senna notabilis	0.1	0.1
Sida arenicola	0.3	0.1
Sida cardiophylla	0.3	0.1
Solanum lasiophyllum	0.2	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.1	0.1
Triodia pungens	0.3	25

Triodia vanleeuwenii	0.2	1
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	K37
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	07/04/2022
GPS Location:	GDA94 Zone 50 689960.01E 7476882.2N
Orientation:	90/180
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Aspect:	N
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Exotic Weeds
Fire:	> 10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.1	0.1
Abutilon otocarpum	0.2	0.1
Acacia aptaneura	3.5	2
Acacia ayersiana	1.2	0.2
Acacia pruinocarpa	2	1
Anthobolus leptomerioides	1.5	0.1
Aristida contorta	0.2	0.1
Aristida holathera var. *holathera*	0.3	0.1
Aristida inaequiglumis	0.7	1.5
Arivela viscosa	0.2	1
**Bidens bipinnata*	0.2	0.1
Boerhavia coccinea		0.1
**Cenchrus setiger*	0.3	0.1
Chrysopogon fallax	0.3	0.5
Cucumis variabilis		0.1
Dactyloctenium radulans	0.1	0.1
Digitaria ctenantha	0.4	0.1
Dodonaea petiolaris	0.8	0.1
Duperreya commixta		0.1
Dysphania ?*rhadinostachya*	0.1	0.1
Enneapogon lindleyanus	0.5	0.5
Enneapogon polyphyllus	0.3	0.5
Eragrostis setifolia	0.2	0.1
Eremophila fraseri subsp. *fraseri*	2.2	1
Eremophila latrobei subsp. *filiformis*	1.1	0.1
Eriachne mucronata	0.3	0.1
Euphorbia biconvexa	0.2	0.1
Euploca tanythrix	0.1	0.1
Evolvulus alsinoides	0.1	0.1
Gomphrena canescens subsp. *canescens*	0.1	0.1
Gomphrena cunninghamii	0.1	0.1
Grevillea wickhamii subsp. ?*hispidula*	2	0.1
Hakea chordophylla	0.3	0.1
Hibiscus burtonii	0.6	0.1

Hibiscus sturtii var. *platychlamys*	0.4	0.1
Indigofera georgei	0.2	0.1
Iseilema membranaceum	0.2	0.1
Maireana villosa	0.3	2
Paspalidium clementii	0.1	0.1
Perotis rara	0.1	0.1
Portulaca ?oleracea	0.1	0.1
Ptilotus ?carinatus	0.1	0.1
Ptilotus helipteroides	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.4	0.1
Sclerolaena cornishiana	0.4	0.1
Senna artemisioides subsp. *helmsii*	0.2	0.1
Senna glaucifolia	0.4	0.1
Senna notabilis	0.1	0.1
Sida sp. Supplejack Station (T.S. Henshall 2345)	0.3	0.1
Solanum lasiophyllum	1	0.1
Spermacoce brachystema	0.1	0.1
Sporobolus australasicus	0.1	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.4	0.1
Tragus australianus	0.1	0.1
Tribulus astrocarpus	0.1	0.1

PHOTOS



Site Name:	K38
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	07/04/2022
GPS Location:	GDA94 Zone 50 690451.47E 7477612.01N
Orientation:	90/180
Vegetation Type:	9
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Aspect:	W
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adsurgens	0.4	0.1
Acacia aptaneura	0.3	0.1
Acacia atkinsiana	1.1	2
Acacia bivenosa	0.9	0.1
Acacia pruinocarpa	1.8	0.1
Alternanthera nana	0.1	0.1
Aristida contorta	0.2	0.2
Aristida holathera var. *holathera*	0.2	0.2
Aristida inaequiglumis	0.2	0.1
Arivela viscosa	0.1	0.1
Codonocarpus cotinifolius	0.6	0.1
Corymbia deserticola subsp. *deserticola*	6	1
Duperreya commixta		0.1
Eragrostis eriopoda	0.2	0.1
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eucalyptus gamophylla	2.2	0.3
Goodenia microptera	0.2	0.1
Hibiscus burtonii	0.6	0.1
Hibiscus sturtii var. *platychlamys*	0.3	0.1
Indigofera monophylla	0.3	0.1
Paraneurachne muelleri	0.3	0.1
Psydrax suaveolens	0.6	0.1
Ptilotus astrolasius	0.2	0.1
Ptilotus calostachyus	0.3	0.1
Ptilotus ?carinatus	0.1	0.1
Ptilotus helipteroides	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.2	0.1
Ptilotus rotundifolius	0.8	0.1
Schizachyrium fragile	0.1	0.1
Senna glutinosa subsp. *glutinosa*	1.1	0.1
Senna glutinosa subsp. *x luerssenii*	1.1	0.1
Senna notabilis	0.1	0.1
Sida cardiophylla	0.8	0.1
Sida echinocarpa	1.2	0.1

Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1	0.1
Sida sp. Supplejack Station (T.S. Henshall 2345)	0.6	0.1
Solanum lasiophyllum	0.5	0.1
Triodia pungens	0.3	10
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	K39
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	08/04/2022
GPS Location:	GDA94 Zone 50 693891.59E 7475624.64N
Orientation:	90/180
Vegetation Type:	6
Landform Type:	Upper Slope
Slope Class:	Moderately Inclined (10 degrees)
Aspect:	NNW
Soil Type:	Sandy Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 10-20% bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia hamersleyensis	5	
Acacia pyrifolia var. *pyrifolia*	1.8	0.1
Aristida holathera var. *holathera*	0.1	0.1
Corymbia hamersleyana	2	1
Eriachne mucronata	0.3	0.1
Eucalyptus leucophloia subsp. *leucophloia*	6	10
Goodenia triodiophila	0.2	0.1
Grevillea wickhamii subsp. ?*hispidula*	1.3	0.1
Hakea chordophylla	1.1	0.1
Mirbelia viminalis	1.1	0.1
Schizachyrium fragile	0.1	0.1
Solanum lasiophyllum	0.2	0.1
Triodia wiseana	0.4	40

PHOTOS



Site Name:	K40
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	09/04/2022
GPS Location:	GDA94 Zone 50 694054.6E 7475172.66N
Orientation:	90/180
Vegetation Type:	6
Landform Type:	Upper Slope
Slope Class:	Steep (23 degrees)
Aspect:	S
Soil Type:	Sandy Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 20-50% bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia cowleana	1.3	0.1
Acacia hamersleyensis	3	0.1
Acacia pyrifolia var. *pyrifolia*	2	0.1
Afrohybanthus aurantiacus	0.1	0.1
Aristida holathera var. *holathera*	0.1	0.1
Cassytha capillaris		0.1
Cheilanthes brownii	0.1	0.1
Cheilanthes contigua	0.1	0.1
Clerodendrum floribundum var. *angustifolium*	2	0.1
Corchorus lasiocarpus subsp. *parvus*	0.2	0.1
Corymbia hamersleyana	4.5	10
Cymbopogon ambiguus	0.8	0.1
Dodonaea lanceolata var. *lanceolata*	1.2	0.1
Duperreya commixta		0.1
Eremophila jucunda subsp. *pulcherrima*	0.8	0.1
Eriachne mucronata	0.1	0.1
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eucalyptus leucophloia subsp. *leucophloia*	5	3
Eulalia aurea	0.2	0.1
Euphorbia ?*trigonosperma*	0.1	0.1
Fimbristylis dichotoma	0.1	0.1
Goodenia triodiophila	0.2	0.1
Gossypium robinsonii	2	0.1
Grevillea wickhamii subsp. ?*hispidula*	2	0.1
Indigofera fractiflexa subsp. *fractiflexa*	0.3	0.1
Jasminum didymum subsp. *lineare*	0.3	0.1
Newcastelia clavipetala	0.7	0.1
Petalostylis labicheoides	0.7	0.2
Ptilotus obovatus var. *obovatus*	0.1	0.1
Santalum lanceolatum	2.5	0.1
Scaevola browniana subsp. *browniana*	0.3	0.1
Schizachyrium fragile	0.1	0.1
Senna ferraria	0.5	0.1
Senna glutinosa subsp. *glutinosa*	1.2	0.1

Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	0.2	0.1
Solanum lasiophyllum	0.3	0.1
Triodia pungens	0.3	3
Triodia wiseana	0.4	40

PHOTOS



Site Name:	K41
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	09/04/2022
GPS Location:	GDA94 Zone 50 693931.55E 7474952.39N
Orientation:	90/180
Vegetation Type:	6
Landform Type:	Lower Slope
Slope Class:	Steep (23 degrees)
Aspect:	S
Soil Type:	Sandy Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 20-50% bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia aptaneura	1.3	0.1
Acacia hamersleyensis	2.5	0.1
Acacia pruinocarpa	1.5	0.1
Acacia pyrifolia var. *pyrifolia*	2	0.1
Acacia tenuissima	1.4	0.1
Aristida holathera var. *holathera*	0.2	0.1
Cheilanthes brownii	0.1	0.1
Clerodendrum floribundum var. *angustifolium*	0.2	0.1
Corchorus incanus subsp. *lithophilus*	0.3	0.1
Corymbia hamersleyana	4	4
Cymbopogon ambiguus	0.3	0.1
Dysphania ?*rhadinostachya*	0.1	0.1
Eremophila jucunda subsp. *pulcherrima*	0.5	0.1
Eriachne mucronata	0.3	0.1
Eucalyptus leucophloia subsp. *leucophloia*	5	6
Fimbristylis dichotoma	0.1	0.1
Goodenia stobbsiana	0.1	0.1
Goodenia triodiophila	0.2	0.1
Grevillea wickhamii subsp. ?*hispidula*	1.8	0.1
Hakea chordophylla	3	0.3
Indigofera monophylla	0.3	0.1
Jasminum didymum subsp. *lineare*		0.2
Ptilotus astrolasius	0.2	0.1
Ptilotus obovatus var. *obovatus*	0.1	0.1
Scaevola browniana subsp. *browniana*	0.5	0.1
Senna ferraria	1.7	0.1
Senna glaucifolia	0.7	0.1
Senna glutinosa subsp. *glutinosa*	0.4	0.1
Senna glutinosa subsp. *pruinosa*	1.7	0.1
Seringia exastia (T)	0.2	0.1
Solanum lasiophyllum	0.7	0.1
Triodia pungens	0.4	5
Triodia wiseana	0.4	35

PHOTOS



Site Name:	K42
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	09/04/2022
GPS Location:	GDA94 Zone 50 691600.81E 7477762.79N
Orientation:	90/180
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	NW
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Exotic Weeds
Fire:	<5 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.3	0.1
Abutilon macrum	0.5	0.1
Abutilon otocarpum	0.3	0.1
Acacia adsurgens	2.5	0.1
Acacia ?aneura	5	1
Acacia aptaneura	3	5
Acacia bivenosa	2.5	0.1
Acacia pruinocarpa	2.5	2
Afrohybanthus aurantiacus	0.3	0.1
Alternanthera nana	0.2	0.1
Anthobolus leptomerioides	2	0.1
Aristida contorta	0.3	0.5
Aristida inaequiglumis	1.5	0.3
Arivela viscosa	0.1	0.1
**Bidens bipinnata*	0.1	0.1
Boerhavia coccinea		0.1
Capparis lasiantha	0.6	0.1
Cheilanthes sieberi subsp. *sieberi*	0.3	0.1
Chrysopogon fallax	0.3	0.1
Corymbia hamersleyana	8	1
Cucumis variabilis		0.1
Cymbopogon ambiguus	0.4	0.1
Digitaria brownii	0.7	0.2
Digitaria ctenantha	0.2	0.1
Duperreya commixta		1
?Enchylaena tomentosa	0.4	0.1
Enneapogon polyphyllus	0.2	0.3
Eremophila forrestii subsp. *forrestii*	1	0.1
Eremophila fraseri subsp. *fraseri*	1	1.8
Eremophila latrobei subsp. *filiformis*	2.2	0.1
Eremophila longifolia	3	0.1
Eriachne mucronata	0.3	0.1
Eriachne pulchella subsp. *dominii*	0.1	0.1
Evolvulus alsinoides	0.1	0.1

Glycine canescens		0.1
Gomphrena canescens subsp. *canescens*	0.1	0.1
Goodenia muelleriana	0.2	0.1
Hakea loreus subsp. *loreus*	0.2	0.1
Hibiscus burtonii	0.4	0.1
Hibiscus sturtii var. *platychlamys*	0.4	0.1
Jasminum didymum subsp. *lineare*	0.2	0.1
Maireana planifolia	0.6	0.1
Maireana villosa	0.4	0.1
Melhania oblongifolia	0.4	0.1
Paraneurachne muelleri	0.3	0.1
Perotis rara	0.1	0.1
Portulaca ?*oleracea*	0.1	0.1
Pterocaulon sphacelatum	0.3	0.1
Ptilotus astrolasius	0.3	0.1
Ptilotus ?*carinatus*	0.1	0.1
Ptilotus helipteroides	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.3	1
Rhagodia eremaea	0.7	0.1
Schizachyrium fragile	0.2	0.1
Sclerolaena cornishiana	0.2	0.1
Senna artemisioides subsp. *helmsii*	1.2	1
Senna artemisioides subsp. *oligophylla*	1.2	0.2
Senna glutinosa subsp. *glutinosa*	1.5	0.1
Senna glutinosa subsp. *pruinosa*	2	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.4	0.1
Sida sp. Supplejack Station (T.S. Henshall 2345)	0.3	0.1
Solanum cleistogamum	0.2	0.1
Sporobolus australasicus	0.1	0.1
Stemodia grossa	0.5	0.1
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.2	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.5	0.1
Tragus australianus	0.1	0.1
Tribulus macrocarpus		0.1
Tribulus suberosus	0.8	0.1
Triodia pungens	0.3	10
Waltheria indica	0.7	0.1

PHOTOS



Site Name:	K43
Site Type:	QUADRAT
Dimensions:	15m x 165m
Survey Date:	09/04/2022
GPS Location:	GDA94 Zone 50 693665.87E 7477551.16N
Orientation:	90/180
Vegetation Type:	10
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	SW
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.3	0.1
Acacia adoxa var. *adoxa*	0.4	0.1
Acacia adsurgens	1.3	0.1
Acacia cowleana	3	80
Acacia monticola	1.6	0.1
Acacia sericophylla	1.5	0.1
Afrohybanthus aurantiacus	0.4	0.1
Alternanthera nana	0.1	0.1
Androcalva luteiflora	1.8	0.5
Aristida contorta	0.3	0.1
Aristida holathera var. *holathera*	0.4	0.1
Boerhavia coccinea		0.1
Cheilanthes contigua	0.1	0.1
Corchorus incanus subsp. *lithophilus*	0.5	0.1
Corymbia hamersleyana	4	5
Cucumis variabilis		0.1
Digitaria brownii	0.3	0.1
Dodonaea lanceolata var. *lanceolata*	1.3	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.5	0.1
Eragrostis cumingii	0.1	0.1
Eriachne mucronata	0.4	0.1
Eriachne tenuiculmis	0.7	1
Eulalia aurea	0.4	0.1
Evolvulus alsinoides	0.2	0.1
Gompholobium oreophilum	0.4	0.1
Goodenia microptera	0.1	0.1
Goodenia stobbsiana	0.2	0.1
Gossypium robinsonii	1	0.1
Grevillea wickhamii subsp. ?*hispidula*	2	0.1
Hibiscus coatesii	0.3	0.1
Hibiscus sturtii var. *campylochlamys*	0.4	0.3
Hibiscus sturtii var. *platychlamys*	0.5	0.1
Indigofera monophylla	0.4	1

Jasminum didymum subsp. *lineare*		0.1
Melhania oblongifolia	0.5	0.1
Nellica maderaspatensis	0.5	0.1
Paraneurachne muelleri	0.4	0.3
Ptilotus astrolasius	0.6	0.1
Ptilotus calostachyus	0.6	0.1
Rhynchosia minima		0.1
Santalum lanceolatum	1.3	0.1
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *oligophylla*	0.5	0.1
Seringia exastia (T)	0.6	2
Setaria surgens	0.2	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.8	0.1
Sida sp. Supplejack Station (T.S. Henshall 2345)	0.4	0.1
Solanum phlomoides	0.3	0.1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.5	0.1
Tephrosia virens	1.6	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	1.2	10
Triodia pungens	0.3	7
Waltheria indica	0.4	0.1

PHOTOS



Site Name:	K44
Site Type:	QUADRAT
Dimensions:	10m x 250m
Survey Date:	10/04/2022
GPS Location:	GDA94 Zone 50 689065.12E 7476748.63N
Orientation:	90/180
Vegetation Type:	1
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	NNW
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.6	0.1
Acacia atkinsiana	2	1
Acacia monticola	3	75
Afrohybanthus aurantiacus	0.2	1
Aristida contorta	0.2	0.1
Aristida holathera var. *holathera*	0.4	2
Aristida inaequiglumis	0.6	0.1
Arivela viscosa	0.1	0.1
Boerhavia coccinea	0.1	0.1
Bonamia erecta	0.2	0.1
Bothriochloa ewartiana	0.5	0.5
Capparis lasiantha	0.7	0.1
Corymbia deserticola subsp. *deserticola*	2.8	0.2
Corymbia hamersleyana	4.5	0.2
Duperreya commixta		0.1
Enneapogon polyphyllus	0.2	0.1
Eragrostis eriopoda	0.2	0.1
Eriachne mucronata	0.3	0.1
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eriachne tenuiculmis	0.4	0.1
Eucalyptus gamophylla	3	8
Euploca tanythrix	0.2	0.1
Evolvulus alsinoides	0.1	0.1
Goodenia microptera	0.2	0.1
Goodenia stobbsiana	0.1	0.1
Gossypium robinsonii	1.2	0.1
Hibiscus coatesii	0.2	0.1
Hibiscus sturtii var. *campylochlamys*	0.3	0.1
Hibiscus sturtii var. *platychlamys*	0.7	0.1
Indigofera monophylla	0.6	0.2
Jasminum didymum subsp. *lineare*		0.1
Maytenus sp. Mt Windell (S. van Leeuwen 846)	0.8	0.1
Paraneurachne muelleri	0.4	0.3
Psydrax latifolia	0.7	0.1

Ptilotus astrolasius	0.3	0.1
Ptilotus calostachyus	0.7	0.1
Ptilotus obovatus var. *obovatus*	0.6	0.1
Santalum lanceolatum	0.7	0.1
Scaevola parvifolia subsp. *pilbarae*	0.3	0.1
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *helmsii*	0.8	0.1
Senna artemisioides subsp. *oligophylla*	0.8	0.1
Senna glutinosa subsp. *glutinosa*	0.8	0.1
Senna glutinosa subsp. *pruinosa*	0.9	0.1
Senna glutinosa subsp. *x luerssenii*	1.2	0.1
Senna notabilis	0.1	0.1
Seringia exastia (T)	0.3	0.1
Sida arenicola	1.8	0.2
Sida cardiophylla	0.4	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1	0.1
Sida sp. Supplejack Station (T.S. Henshall 2345)	0.4	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	1	3
Trichodesma zeylanicum	0.1	0.1
Triodia pungens	0.4	8
Triodia wiseana	1.3	0.1
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	K45
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	10/04/2022
GPS Location:	GDA94 Zone 50 689020.97E 7477251.67N
Orientation:	90/180
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	NW
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Exotic Weeds
Fire:	> 10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.4	0.1
Abutilon macrum	0.4	0.1
Abutilon otocarpum	0.3	0.1
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	0.3	0.1
Acacia aptaneura	2	0.2
Acacia atkinsiana	1.5	0.2
Acacia pruinocarpa	2	0.3
Acacia pyrifolia var. *pyrifolia*	0.7	0.1
Afrohybanthus aurantiacus	0.8	0.1
Alternanthera nana	0.1	0.2
Aristida contorta	0.3	3
Aristida inaequiglumis	0.4	0.1
Arivela viscosa	0.3	0.1
**Bidens bipinnata*	0.2	0.1
Boerhavia repleta		0.1
Bonamia erecta	0.2	0.1
**Cenchrus ciliaris*	0.4	0.1
**Cenchrus setiger*	0.4	2
Chrysopogon fallax	0.6	2
Corchorus tridens	0.1	0.1
Corymbia deserticola subsp. *deserticola*	7	0.2
Cucumis variabilis		0.1
Cymbopogon ambiguus	0.5	0.1
Dactyloctenium radulans	0.1	0.1
Digitaria ammophila	0.3	0.1
Digitaria brownii	0.7	0.3
Duperreya commixta		0.1
Enneapogon lindleyanus	0.4	2
Enneapogon polyphyllus	0.3	5
Eremophila longifolia	1.2	0.1
Eucalyptus gamophylla	3	0.5
Eucalyptus xerothermica	10	8
Eulalia aurea	0.5	0.1
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia tannensis subsp. *eremophila*	0.1	0.1
Evolvulus alsinoides	0.1	0.1

Evolvulus alsinoides var. *decumbens*	0.2	0.1
Gomphrena canescens subsp. *canescens*	0.3	0.1
Goodenia stellata	0.1	0.1
Gossypium australe	0.9	0.1
Gossypium robinsonii	1.8	0.1
Hakea chordophylla	1.8	0.1
Hibiscus burtonii	0.8	0.1
Hibiscus sturtii var. *campylochlamys*	0.3	0.1
Hibiscus sturtii var. *platychlamys*	0.3	0.1
Indigofera georgei	1.3	0.1
Iseilema membranaceum	0.2	0.1
Isotropis iophyta	0.8	0.1
Maireana villosa	0.6	0.1
**Malvastrum americanum*	0.6	0.1
Melhania oblongifolia	0.4	0.1
Panicum effusum	0.3	0.1
Paraneurachne muelleri	0.7	0.1
Perotis rara	0.1	1
Psydrax latifolia	0.8	0.1
Pterocaulon sphacelatum	0.9	0.2
Ptilotus calostachyus	0.4	0.1
Ptilotus ?*carinatus*	0.1	0.1
Ptilotus helipteroides	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.3	1
Rhagodia eremaea	0.4	0.1
Rhynchosia minima		0.1
Santalum lanceolatum	1.7	0.1
Senna artemisioides subsp. *oligophylla*	0.7	0.1
Senna pleurocarpa var. *pleurocarpa*	0.5	0.3
**Setaria verticillata*	0.6	0.1
Sida echinocarpa	1.2	0.1
Sida fibulifera	0.3	0.1
Sida sp. L (A.M. Ashby 4202)		0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.3	0.1
Solanum lasiophyllum	0.8	0.1
Solanum phlomoides	0.4	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.7	60
Trichodesma zeylanicum	0.6	0.1
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	K46
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	11/04/2022
GPS Location:	GDA94 Zone 50 687045.85E 7476252.35N
Orientation:	90/180
Vegetation Type:	2
Landform Type:	Lower Slope
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	SE
Soil Type:	Sandy Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	<5 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.3	0.1
Acacia atkinsiana	0.4	1
Acacia bivenosa	0.8	0.1
Acacia cowleana	1.2	0.3
Acacia hilliana	0.2	0.1
Acacia tenuissima	0.3	0.1
Amphipogon sericeus	0.2	0.1
Aristida contorta	0.2	0.1
Aristida holathera var. *holathera*	0.2	0.1
Aristida inaequiglumis	0.3	0.1
Corchorus incanus subsp. *lithophilus*	0.3	0.3
Corymbia deserticola subsp. *deserticola*	4	2
Cymbopogon ambiguus	0.8	0.1
Dampiera candicans	0.4	0.1
Digitaria brownii	0.3	0.1
Dodonaea coriacea	0.8	0.1
Duperreya commixta		0.1
Eragrostis eriopoda	0.2	0.1
Eriachne mucronata	0.3	0.1
Eulalia aurea	0.6	0.1
Fimbristylis dichotoma	0.1	0.1
Fimbristylis simulans	0.1	0.1
Gompholobium oreophilum	0.6	0.1
Goodenia microptera	0.2	0.1
Goodenia stobbsiana	0.1	0.1
Goodenia triodiophila	0.1	0.1
Hakea chordophylla	3.5	1
Hibiscus burtonii	0.7	0.1
Hibiscus sturtii var. *campylochlamys*	0.4	0.1
Indigofera monophylla	0.3	0.1
Jasminum didymum subsp. *lineare*	0.2	0.1
Paraneurachne muelleri	0.5	0.1
Ptilotus astrolasius	0.4	0.1
Ptilotus calostachyus	0.3	0.1

Ptilotus obovatus var. *obovatus*	0.8	0.1
Scaevola parvifolia subsp. *pilbarae*	0.2	0.1
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *helmsii*	0.6	0.1
Senna artemisioides subsp. *oligophylla*	0.4	0.1
Senna ferraria	1.2	0.1
Seringia exastia (T)	0.3	0.1
Sida sp. Excedentifolia (J.L. Egan 1925)	0.6	0.1
Solanum lasiophyllum	0.2	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.9	1
Triodia vanleeuwenii	0.2	25

PHOTOS



Site Name:	K47
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	11/04/2022
GPS Location:	GDA94 Zone 50 693922.05E 7476906.82N
Orientation:	90/180
Vegetation Type:	2
Landform Type:	Lower Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	NW
Soil Type:	Sandy Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	(other) - Old rehabbed drill line
Fire:	5-10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.2	0.1
Acacia adsurgens	2	0.1
Acacia dictyophleba		
Acacia hilliana	0.4	0.1
Acacia monticola	3	0.2
Aristida holathera var. *holathera*	0.3	0.2
Arivela viscosa	0.1	0.1
Corchorus incanus subsp. *lithophilus*	0.8	0.5
Corymbia deserticola subsp. *deserticola*	6	0.5
Corymbia hamersleyana	5	
Cymbopogon ambiguus	0.5	0.1
Cymbopogon obtectus	0.9	0.1
Eriachne sp. Dugald River (B.K. Simon+ 3007)	0.1	0.1
Eucalyptus gamophylla	3.5	0.2
Eucalyptus leucophloia subsp. *leucophloia*	8	
Fimbristylis dichotoma	0.1	0.1
Fimbristylis simulans	0.1	0.1
Gomphrena cunninghamii	0.1	0.1
Goodenia microptera	0.4	0.1
Goodenia stobbsiana	0.2	0.1
Goodenia triodiophila	0.2	0.1
Gossypium robinsonii	2	0.1
Hakea chordophylla	5	1.5
Hibiscus sturtii var. *campylochlamys*	0.3	0.1
Indigofera monophylla	0.2	0.1
Paraneurachne muelleri	0.3	0.1
Polycarpaea longiflora	0.1	0.1
Ptilotus calostachyus	0.7	0.1
Ptilotus rotundifolius	0.8	0.1
Rhynchosia minima		0.1
Schizachyrium fragile	0.1	0.1
Senna glaucifolia	1.2	0.1
Senna glutinosa subsp. *glutinosa*	1.1	0.1
Senna glutinosa subsp. *pruinosa*	1.3	0.1

Solanum phlomoides	0.3	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.2	0.1
Trichodesma zeylanicum	0.4	0.1
Triodia vanleeuwenii	0.3	35
Triodia wiseana	0.6	25

PHOTOS



Site Name:	K48
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	12/04/2022
GPS Location:	GDA94 Zone 50 683724.82E 7473600.58N
Orientation:	90/180
Vegetation Type:	2
Landform Type:	Lower Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	SW
Soil Type:	Sandy Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 2-10% bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	> 10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adoxa var. *adoxa*	0.2	0.1
Acacia aptaneura	2.5	0.2
Acacia bivenosa	2	0.1
Acacia cowleana	1.5	0.1
Acacia dictyophleba	2.5	0.1
Acacia hamersleyensis	1.4	0.1
Acacia inaequilatera	1.5	0.1
Acacia maitlandii	2.5	0.2
Acacia pruinocarpa	1.7	0.1
Aristida contorta	0.3	0.1
Clerodendrum floribundum var. *angustifolium*	1.1	0.1
Corchorus lasiocarpus subsp. *parvus*	0.2	0.1
Corymbia hamersleyana	0.4	0.1
Cymbopogon ambiguus	0.3	0.1
Cymbopogon obtectus	0.3	0.1
Enneapogon polyphyllus	0.2	0.1
Eremophila forrestii subsp. *forrestii*	0.8	0.1
Eriachne mucronata	0.3	0.1
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eucalyptus leucophloia subsp. *leucophloia*	6	3
Eulalia aurea	0.3	0.1
Evolvulus alsinoides	0.1	0.1
Fimbristylis dichotoma	0.1	0.1
Goodenia muelleriana	0.1	0.1
Goodenia stobbsiana	0.3	0.1
Goodenia triodiophila	0.2	0.1
Hakea chordophylla	3	0.3
Hibiscus sturtii var. *campylochlamys*	0.2	0.1
Indigofera monophylla	0.3	0.1
Ptilotus astrolasius	0.2	0.1
Ptilotus calostachyus	0.5	0.1
Ptilotus clementii	0.1	0.1
Ptilotus rotundifolius	0.4	0.1
Schizachyrium fragile	0.1	0.1

Senna artemisioides subsp. *oligophylla*	0.3	0.1
Senna ferraria	1.5	0.1
Senna glutinosa subsp. *glutinosa*	1.2	0.2
Senna glutinosa subsp. *pruinosa*	1.2	0.2
Seringia exastia (T)	0.3	0.1
Sida echinocarpa	0.5	0.1
Solanum lasiophyllum	0.8	0.1
Tribulus suberosus	0.5	0.1
Triodia pungens	0.3	0.5
Triodia vanleeuwenii	0.2	40
Triodia wiseana	0.4	5

PHOTOS



Site Name:	K49
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	12/04/2022
GPS Location:	GDA94 Zone 50 684097.35E 7467772.59N
Orientation:	90/180
Vegetation Type:	8
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	WSW
Soil Type:	Sandy Clay
Soil Colour:	Brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	> 10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.1	0.1
Acacia aptaneura	4.5	
Afrohybanthus aurantiacus	0.1	0.1
Alternanthera nana	0.1	0.1
Areocleome oxalidea		
Aristida contorta	0.2	0.2
Aristida inaequiglumis	0.3	2
Boerhavia repleta		0.1
Cheilanthes sieberi subsp. *sieberi*	0.2	0.1
Chrysopogon fallax	1	0.5
Cucumis variabilis		0.1
Cymbopogon obtectus	0.3	0.1
Digitaria ammophila	0.3	0.1
Digitaria brownii	0.4	0.1
Eragrostis setifolia	0.2	0.1
Eremophila lanceolata	0.2	0.1
Eremophila latrobei subsp. *filiformis*	0.7	0.1
Eulalia aurea	0.6	1
Euphorbia ferdinandi s. lat. (Potentially undescribed)	0.1	0.1
Evolvulus alsinoides	0.1	0.1
Fimbristylis dichotoma	0.1	0.1
Goodenia nuda	0.2	0.1
Goodenia prostrata	0.1	0.1
Hakea loreus subsp. *loreus*	2.5	0.2
Hibiscus burtonii	0.6	0.1
Maireana planifolia	0.3	0.1
Paspalidium rarum	0.1	0.1
Perotis rara	0.1	0.2
Ptilotus ?*carinatus*	0.4	0.1
Ptilotus obovatus var. *obovatus*	0.3	0.1
Ptilotus schwartzii var. *schwartzii*	0.3	1
Schizachyrium fragile	0.1	0.2
Sclerolaena tetragona	0.1	0.1

Setaria surgens	0.2	0.1
Sida platycalyx	0.2	0.1
Sida sp. L (A.M. Ashby 4202)	0.2	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.8	0.1
Tribulus astrocarpus		0.1
Tribulus suberosus	0.7	0.1

PHOTOS



Site Name:	K50
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	12/04/2022
GPS Location:	GDA94 Zone 50 685084.05E 7466904.52N
Orientation:	90/180
Vegetation Type:	3
Landform Type:	Mid Slope
Slope Class:	Moderately Inclined (10 degrees)
Aspect:	N
Soil Type:	Sandy Clay
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 2-10% bedrock exposed
CF Abundance:	>90%
CF Sizes:	60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adsurgens	2	0.2
Acacia atkinsiana	1.2	0.2
Acacia bivenosa	1.5	0.1
Acacia cowleana	0.9	0.1
Acacia maitlandii	1.5	0.1
Acacia monticola		
Acacia pruinocarpa	0.4	0.1
Acacia tenuissima	0.6	0.1
Amphipogon sericeus	0.4	0.2
Aristida holathera var. *holathera*	0.5	0.1
Aristida inaequiglumis	0.7	0.1
Chrysopogon fallax	0.8	0.1
Corymbia hamersleyana		
Cymbopogon ambiguus		
Eriachne mucronata	0.4	0.1
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eucalyptus leucophloia subsp. *leucophloia*	4	2
Gompholobium oreophilum	0.6	0.1
Goodenia stobbsiana	0.3	0.1
Indigofera monophylla	0.4	0.1
Paraneurachne muelleri	0.4	0.1
Polycarpaea corymbosa var. *corymbosa*	0.1	0.1
Ptilotus calostachyus	0.6	0.2
Ptilotus rotundifolius	0.7	0.3
Schizachyrium fragile	0.1	0.3
Senna glutinosa subsp. *glutinosa*	1.1	0.1
Senna glutinosa subsp. *pruinosa*	1.2	0.1
Seringia exastia (T)	0.4	0.5
Solanum lasiophyllum	0.5	0.1
Triodia pungens	0.5	0.2
Triodia wiseana	0.4	30

PHOTOS



Site Name:	K51
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	13/04/2022
GPS Location:	GDA94 Zone 50 694281.55E 7475976.62N
Orientation:	90/180
Vegetation Type:	6
Landform Type:	Upper Slope
Slope Class:	Very Steep (37 degrees)
Aspect:	SW
Soil Type:	Sandy Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Ironstone, 10-20% bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	5-10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Cassytha capillaris		0.1
Cheilanthes brownii	0.1	0.1
Clerodendrum floribundum var. *angustifolium*	0.1	0.1
Corymbia hamersleyana	4	1.5
Cymbopogon obtectus	0.3	0.1
Cynanchum pedunculatum		0.1
Dodonaea coriacea	0.8	0.1
Eriachne mucronata	0.3	0.1
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eucalyptus kingsmillii	2	1
Eucalyptus leucophloia subsp. *leucophloia*	4.5	3
Fimbristylis dichotoma	0.1	0.1
Goodenia triodiophila	0.2	0.1
Grevillea wickhamii subsp. ?*hispidula*	3.5	0.1
Paraneurachne muelleri	0.4	0.1
Scaevola browniana subsp. *browniana*	0.3	0.1
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	0.3	0.1
Solanum cleistogamum	0.2	0.1
Triodia pungens	0.3	0.1
Triodia wiseana	0.3	50

PHOTOS



Site Name:	K52
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	14/04/2022
GPS Location:	GDA94 Zone 50 683343.28E 7473136.73N
Orientation:	90/180
Vegetation Type:	9
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	SW
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	(other) - Many tracks adjacent, new track through plot
Fire:	> 10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.1	0.3
Abutilon otocarpum	0.4	0.1
Acacia adsurgens	2.5	0.2
Acacia atkinsiana	0.6	0.1
Acacia bivenosa	1.3	0.3
Acacia cowleana	0.6	0.1
Acacia dictyophleba	2	0.1
Acacia maitlandii	2	0.3
Acacia monticola	1.5	0.1
Acacia tenuissima	1.3	0.1
Afrohybanthus aurantiacus	0.3	0.1
Alternanthera nana	0.1	0.1
Aristida contorta	0.3	0.3
Aristida holathera var. *holathera*	0.3	0.1
Aristida inaequiglumis	0.5	0.5
Arivela viscosa	0.1	0.1
Boerhavia coccinea		0.1
Chrysopogon fallax	0.9	0.1
Corchorus incanus subsp. *lithophilus*	0.7	0.1
Corymbia hamersleyana	1.2	0.1
Crotalaria medicaginea var. *neglecta*	0.1	0.1
Cymbopogon obtectus	0.3	0.1
Digitaria brownii	0.4	0.1
Duperreya commixta		0.1
Enneapogon lindleyanus	0.6	0.3
Enneapogon polyphyllus	0.2	0.3
Eragrostis eriopoda	0.6	0.1
Eremophila longifolia	1	0.1
Eriachne mucronata	0.6	0.1
Eriachne pulchella subsp. *dominii*	0.1	0.1
Eucalyptus gamophylla	4	15
Eulalia aurea	0.3	0.1
Euphorbia tannensis subsp. *eremophila*	0.4	0.1
Euploca tanythrix	0.2	0.1

Evolvulus alsinoides	0.2	0.1
Gomphrena canescens subsp. *canescens*	0.1	0.1
Goodenia microptera	0.3	0.1
Gossypium australe	0.9	0.1
Gossypium robinsonii	3	0.1
Hakea chordophylla	1.2	0.1
Hibiscus burtonii	0.1	0.1
Hibiscus sturtii var. *platychlamys*	0.4	0.1
Indigofera monophylla	0.4	0.1
Jasminum didymum subsp. *lineare*		0.1
Maireana villosa	0.2	0.1
Melhania oblongifolia	0.4	0.1
Paraneurachne muelleri	0.6	0.3
Peripleura obovata	0.3	0.1
Perotis rara	0.1	0.1
Ptilotus astrolasius	0.3	0.1
Ptilotus calostachyus	0.4	0.1
Ptilotus ?*carinatus*	0.1	0.1
Ptilotus helipteroides	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.5	0.1
Ptilotus rotundifolius	0.6	0.1
Rhynchosia minima		0.1
Scaevola parvifolia subsp. *pilbarae*	0.2	0.1
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *helmsii*	0.9	0.5
Senna artemisioides subsp. *oligophylla*	1	0.5
Senna glutinosa subsp. *glutinosa*	1.3	0.3
Senna notabilis	0.1	0.1
Sida echinocarpa	0.2	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.6	0.1
Sida sp. Supplejack Station (T.S. Henshall 2345)	0.2	0.1
Solanum lasiophyllum	0.7	0.1
Tephrosia densa	0.6	0.1
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.3	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.4	0.1
Tribulus suberosus	0.2	0.1
Triodia pungens	0.2	30
Triodia vanleeuwenii	0.4	4

PHOTOS



Site Name:	Q01
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	14/04/2022
GPS Location:	GDA94 Zone 50 684003.56E 7469197.01N
Orientation:	90/180
Vegetation Type:	9
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	SSW
Soil Type:	Sandy Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Exotic Weeds
Fire:	5-10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.1	0.1
Acacia ancistrocarpa	1.5	0.5
Acacia aptaneura	0.5	0.1
Acacia atkinsiana	1.4	0.1
Acacia bivenosa	2	0.1
Acacia cowleana	0.6	0.1
Acacia dictyophleba	1.3	0.1
Acacia pruinocarpa	5	1
Acacia tenuissima	0.3	0.1
Alternanthera nana	0.1	0.1
Anthobolus leptomerioides	1.3	0.1
Aristida contorta	0.2	0.1
Aristida holathera var. *holathera*	0.5	0.1
**Bidens bipinnata*	0.1	0.1
Corymbia deserticola subsp. *deserticola*	7	1
Cymbopogon obtectus	0.3	0.1
Digitaria ammophila	0.2	0.1
Digitaria brownii	0.4	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.2	0.1
Eragrostis eriopoda	0.4	0.1
Eremophila forrestii subsp. *forrestii*	1.2	0.1
Eremophila fraseri subsp. *fraseri*	0.5	0.1
Eremophila longifolia	2	0.1
Eriachne mucronata	0.3	0.1
Eucalyptus gamophylla	4.5	3
Eulalia aurea	0.4	0.1
Euphorbia australis var. *hispidula*	0.1	0.1
Evolvulus alsinoides var. *villosicalyx*	0.1	0.1
Goodenia microptera	0.4	0.1
Hibiscus burtonii	0.4	0.1
Hibiscus coatesii	0.4	0.1
Hibiscus sturtii var. *platychlamys*	0.3	0.1
Indigofera georgei	0.5	0.1

Maireana villosa	0.1	0.1
Paraneurachne muelleri	0.9	0.1
Perotis rara	0.1	0.1
Pterocaulon sphacelatum	0.3	0.1
Ptilotus exaltatus	0.1	0.1
Ptilotus helipteroides	0.1	0.1
Ptilotus obovatus var. *obovatus*	0.3	0.1
Scaevola parvifolia subsp. *pilbarae*	0.2	0.1
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *oligophylla*	0.7	0.1
Senna glutinosa subsp. *x luerssenii*	1.3	0.3
Senna notabilis	0.1	0.1
Sida sp. L (A.M. Ashby 4202)	0.2	0.1
Solanum lasiophyllum	0.4	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.3	0.1
Triodia melvillei	0.5	2
Triodia pungens	0.3	25
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	Q03
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	13/04/2022
GPS Location:	GDA94 Zone 50 684623E 7469253N
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Exotic Weeds
Fire:	5-10 Years
Habitat:	Mulga and acacia open woodland over open tussock grassland on gently sloping (drainage) plain with variable rock cover

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.3	0.1
Abutilon lepidum	0.5	0.1
Abutilon otocarpum	0.3	0.1
Acacia aneura	2	1
Acacia aptaneura	2	0.1
Acacia bivenosa	2	0.1
Acacia cowleana	2.6	0.2
Acacia dictyophleba	1.1	0.1
Acacia pruinocarpa	5	1
Acacia tumida var. *pilbarensis*		
Alternanthera nana	0.2	0.1
Aristida holathera var. *holathera*	0.3	0.1
Aristida inaequiglumis	0.6	5
Aristida lazaridis (P2)	0.8	2
Arivela viscosa	0.5	0.1
**Bidens bipinnata*	0.1	0.1
Boerhavia coccinea	0.1	0.1
Boerhavia repleta	0.1	0.1
Bothriochloa ewartiana	0.8	0.1
**Cenchrus ciliaris*	0.8	20.5
**Cenchrus setiger*		
Chrysopogon fallax	0.5	0.1
Cucumis variabilis		0.1
Dactyloctenium radulans	0.05	0.1
Duperreya commixta		0.3
Enneapogon lindleyanus	0.6	0.1
Enneapogon polyphyllus	0.3	0.2
Enneapogon robustissimus	0.5	0.1
Eragrostis eriopoda	0.4	0.1
Eremophila longifolia	4	2
Eulalia aurea	0.7	0.5
Euphorbia australis var. *subtomentosa*	0.2	0.1
Euphorbia biconvexa	0.2	0.1
Euphorbia tannensis subsp. *eremophila*	0.2	0.1

Evolvulus alsinoides var. *villosicalyx*	0.2	0.1
Glycine canescens		0.1
Gomphrena canescens subsp. *canescens*	0.4	0.1
Goodenia stellata	0.1	0.1
Gossypium robinsonii		
Hakea loreus subsp. *loreus*		
Hibiscus burtonii	0.6	0.1
Hibiscus sturtii var. *platychlamys*	0.3	0.1
Ipomoea polymorpha	0.2	0.1
Jasminum didymum subsp. *lineare*		0.1
Maireana villosa	0.3	0.1
**Malvastrum americanum*	0.4	0.2
Melhania oblongifolia	0.4	0.1
Paraneurachne muelleri	0.2	0.1
Pterocaulon sphacelatum	0.7	25
Ptilotus obovatus var. *obovatus*	0.6	0.1
Rhagodia eremaea	1.2	0.1
Salsola australis	0.3	0.1
Santalum lanceolatum	2	0.1
Senna artemisioides subsp. *oligophylla*	0.3	0.1
Sida sp. L (A.M. Ashby 4202)	0.3	0.2
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1	0.1
Solanum lasiophyllum	0.5	0.1
Tephrosia densa	0.9	0.5
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.4	4
**Tribulus terrestris*	0.1	0.1
Trichodesma zeylanicum	1.2	0.1
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)		0.1

PHOTOS



Site Name:	Q04
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	14/04/2022
GPS Location:	GDA94 Zone 50 684314E 7468803N
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Exotic Weeds
Fire:	5-10 Years
Habitat:	Mulga and acacia low open woodland over open tussock grassland on gently sloping (drainage) plain with variable rock cover

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon lepidum	0.5	0.1
Abutilon macrum	0.2	0.1
Abutilon otocarpum	0.4	0.1
Acacia aptaneura	8	0.1
Acacia pruinocarpa	3	2
Alternanthera nana	0.2	0.1
Aristida inaequiglumis	0.5	25
Arivela viscosa	1	0.1
**Bidens bipinnata*	0.4	0.1
Boerhavia coccinea	0.1	0.1
Boerhavia repleta	0.1	0.1
Bothriochloa ewartiana	0.8	0.2
**Cenchrus ciliaris*	0.8	0.7
Chrysopogon fallax	0.7	0.2
Corymbia hamersleyana	10	1
Cucumis variabilis		0.1
Dactyloctenium radulans	0.1	0.1
Digitaria brownii	0.7	0.1
Digitaria ctenantha	0.2	0.1
Duperreya commixta		0.2
Dysphania ?rhadinostachya	0.1	0.1
Enneapogon polyphyllus	0.2	0.1
Eremophila forrestii subsp. *forrestii*	1.1	0.1
Eremophila longifolia	1.1	0.1
Eulalia aurea	0.8	0.1
Euphorbia biconvexa	0.2	0.1
Euphorbia tannensis subsp. *eremophila*	0.2	0.1
Evolvulus alsinoides var. *villosicalyx*	0.1	0.1
Glycine canescens		0.1
Gomphrena canescens subsp. *canescens*	0.1	0.1
Goodenia muelleriana	0.1	0.1
Goodenia stellata	0.15	0.1
Gossypium robinsonii	4	0.3
Hakea loreus subsp. *loreus*	2.5	0.1
Hibiscus burtonii	0.8	0.1

Hibiscus sturtii var. *platychlamys*	0.4	0.1
Iseilema membranaceum	0.1	0.1
Maireana villosa	0.4	0.1
**Malvastrum americanum*	0.6	0.1
Panicum effusum	0.5	0.1
Paraneurachne muelleri	0.5	0.2
Paspalidium rarum	0.2	0.1
Perotis rara	0.1	0.2
Psydrax latifolia	1	0.4
Pterocaulon sphacelatum	0.9	15
Ptilotus astrolasius	0.5	1
Ptilotus ?carinatus	0.05	0.1
Rhynchosia minima		0.1
Salsola australis	0.6	0.1
Senna artemisioides subsp. *helmsii*	1	0.1
Senna artemisioides subsp. *oligophylla*	0.5	0.1
Sida platycalyx	0.3	0.2
Sida sp. L (A.M. Ashby 4202)	0.2	0.2
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.2	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.6	6
**Tribulus terrestris*	0.1	0.1
Trichodesma zeylanicum	1.5	0.1
Urochloa occidentalis var. *ciliata*	0.2	0.1
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)		

PHOTOS



Site Name:	Q09
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	13/04/2022
GPS Location:	GDA94 Zone 50 684202E 7468451N
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Exotic Weeds
Fire:	>10 Years
Habitat:	Mulga and acacia low open woodland over open spinifex and tussock grassland on flat plain with medium rock cover

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.3	0.1
Acacia aptaneura	6	1
Acacia ayersiana	1.5	0.2
Acacia cowleana	1.1	0.5
Acacia dictyophleba	2.5	1
Acacia pruinocarpa	6	1
Acacia sibirica	1.5	0.2
Acacia tenuissima	1.2	0.1
Alternanthera nana	0.2	0.1
Aristida inaequiglumis	0.4	0.5
Arivela viscosa	0.7	0.1
**Bidens bipinnata*	0.1	0.1
Bothriochloa ewartiana	0.7	0.5
Chrysopogon fallax	0.5	0.1
Corymbia deserticola subsp. *deserticola*	3.2	1
Cucumis variabilis		0.2
Cymbopogon obtectus	1	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.3	0.1
Enneapogon robustissimus	0.5	0.1
Eremophila forrestii subsp. *forrestii*	1.2	0.1
Eremophila latrobei subsp. *filiformis*	1	0.1
Eucalyptus leucophloia subsp. *leucophloia*		
Eulalia aurea	0.7	0.5
Euphorbia drummondii	0.02	0.1
Evolvulus alsinoides	0.2	0.1
Hakea loreus subsp. *loreus*	2.5	0.2
Hibiscus burtonii	0.9	0.1
Hibiscus sturtii var. *platychlamys*	0.5	0.1
Indigofera georgei	0.5	0.1
Maireana villosa	0.5	0.1
Panicum effusum	0.5	1
Paraneurachne muelleri	0.5	0.5
Peripleura obovata	0.4	0.1
Perotis rara	0.1	0.1

Psydrax latifolia	1.2	0.1
Pterocaulon sphacelatum	1	10
Ptilotus ?*carinatus*	0.01	0.1
Ptilotus ?*exaltatus*	0.05	0.1
Ptilotus helipteroides	0.2	0.1
Ptilotus obovatus var. *obovatus*	0.6	0.1
Ptilotus rotundifolius	0.9	0.1
Rhagodia sp. Hamersley (M. Trudgen 17794) (P3)	1.1	0.1
Scaevola parvifolia subsp. *pilbarae*	0.3	0.2
Senna artemisioides subsp. *helmsii*	0.5	0.1
Senna artemisioides subsp. *oligophylla*	0.4	0.1
Senna artemisioides subsp. *x artemisioides*	1.1	0.2
Sida platycalyx	0.2	0.1
Sida sp. L (A.M. Ashby 4202)	0.2	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.9	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.6	1
Trichodesma zeylanicum	1.2	0.1
Triodia melvillei	0.5	1
Triodia pungens	0.5	6
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	Q14
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	14/04/2022
GPS Location:	GDA94 Zone 50 685016E 7468258N
Orientation:	90/180
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Exotic Weeds, (other) - New track through one side of quadrat, Limited Clearing
Fire:	5-10 Years
Habitat:	Mulga and acacia low open woodland over tussock grassland on flat plain with medium rock cover
Comments:	Previous stone records - quartzite and shale

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.3	0.1
Acacia adsurgens	0.5	0.1
Acacia aptaneura	6	2.3
Acacia ayersiana	8	2
Acacia cowleana	0.2	0.1
Acacia dictyophleba	3	1
Acacia pruinocarpa	4	3
Acacia tenuissima	1.1	0.1
Anthobolus leptomerioides	1	0.2
Aristida holathera var. *holathera*	0.4	0.2
Aristida inaequiglumis	0.5	0.1
Aristida obscura	0.3	0.2
Arivela viscosa	0.1	0.1
**Bidens bipinnata*	0.1	0.1
Boerhavia coccinea	0.1	0.1
Chrysopogon fallax	0.6	0.1
Corchorus ?lasiocarpus subsp. *parvus*	0.1	0.1
Dactyloctenium radulans	0.1	0.1
Dendrophyllanthus erwinii		
Digitaria brownii	0.7	0.5
Duperreya commixta		0.1
Dysphania ?rhadinostachya	0.1	0.1
Enneapogon polyphyllus	0.3	0.2
Enneapogon robustissimus	0.3	0.1
Eremophila longifolia	3.5	0.3
Eriachne pulchella subsp. *dominii*	0.2	0.1
Eulalia aurea	0.9	0.1
Euphorbia australis var. *hispidula*	0.1	0.1
Evolvulus alsinoides var. *villosicalyx*	0.2	0.1
Hakea loreus subsp. *loreus*	2.1	0.1
Hibiscus burtonii	0.5	0.1
Hibiscus sturtii var. *platychlamys*	0.5	0.1

Maireana villosa	0.3	0.2
Panicum effusum	0.5	0.1
Paraneurachne muelleri	0.5	0.2
Paspalidium rarum	0.2	0.1
Perotis rara	0.1	0.1
Polygala glaucifolia	0.1	0.1
Psydrax latifolia	1	0.1
Psydrax rigidula	1	0.1
Ptilotus ?exaltatus	0.2	0.1
Ptilotus helipteroides	0.3	0.1
Ptilotus obovatus var. *obovatus*	0.4	0.2
Rhagodia eremaea	1.2	0.1
Rhagodia sp. Hamersley (M. Trudgen 17794) (P3)	1.2	0.2
Scaevola parvifolia subsp. *pilbarae*	0.3	0.1
Senna artemisioides subsp. *helmsii*	0.3	0.1
Senna notabilis	0.1	0.1
Senna pleurocarpa var. *angustifolia*	0.5	0.2
Sida sp. L (A.M. Ashby 4202)	0.2	0.2
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.1	0.1
Solanum ferocissimum	0.02	0.1
Solanum lasiophyllum	0.5	0.1
Teucrium teucriiflorum	0.5	0.1
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.7	1
Themeda triandra	0.5	0.1
Triodia melvillei	1	12
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	Q19
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	14/04/2022
GPS Location:	GDA94 Zone 50 685094.78E 7467730.05N
Orientation:	90/180
Vegetation Type:	8
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	N
Soil Type:	Sandy Clay
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	None
Fire:	>10 Years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.3	0.1
Acacia aptaneura	10	8
Acacia cowleana	0.6	0.1
Alternanthera nana	0.2	0.1
Anthobolus leptomerioides	0.9	0.1
Aristida contorta	0.2	0.5
Aristida inaequiglumis	0.4	35
Aristida jerichoensis var. *subspinulifera* (P3)	0.3	0.1
Boerhavia coccinea	0.1	0.1
Chrysopogon fallax	0.5	0.5
Cucumis variabilis		0.1
Digitaria ammophila	0.4	0.3
Enneapogon lindleyanus	0.3	0.1
Enneapogon polyphyllus	0.3	0.1
Eremophila longifolia	1.2	0.5
Eulalia aurea	0.6	2
Hakea loreus subsp. *loreus*	3	0.5
Indigofera georgei	0.3	0.1
Lysiana murrayi		0.1
Maireana villosa	0.6	0.1
Perotis rara	0.1	0.1
Pluchea tetranthera	0.2	0.1
Pterocaulon sphacelatum	0.5	0.2
Ptilotus obovatus var. *obovatus*	0.6	0.3
Sida platycalyx	0.2	0.1
Sida sp. L (A.M. Ashby 4202)	0.4	0.3
Solanum lasiophyllum	0.2	0.1
Stemodia grossa	0.3	0.1
Themeda triandra	0.5	30
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	Q24
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	13/04/2022
GPS Location:	GDA94 Zone 50 685612.7728E 7467169.265N
Orientation:	90/180
Vegetation Type:	8
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	N
Soil Type:	Sandy Clay
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	(other) - track adjacent
Fire:	5-10 years

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.2	0.1
Acacia adsurgens	0.7	0.1
Acacia aptaneura	3.5	0.1
Acacia cowleana	0.8	0.1
Acacia dictyophleba	0.6	0.1
Acacia pachyacra	3.5	1
Alternanthera nana	0.4	0.1
Aristida inaequiglumis	0.5	0.1
Aristida lazaridis (P2)	0.7	0.1
Arivela viscosa	0.1	0.1
Capparis lasiantha	0.6	0.1
Chrysopogon fallax	0.3	0.3
Cucumis variabilis		0.2
Digitaria ammophila	0.3	0.3
Digitaria brownii	1	0.1
Duperreya commixta		0.1
Enneapogon lindleyanus	0.6	0.1
Eremophila longifolia	1.1	0.1
Eucalyptus xerothermica	4	0.5
Eulalia aurea	0.7	2
Euphorbia biconvexa	0.1	0.1
Grevillea berryana	1.2	0.1
Hakea loreus subsp. *loreus*	0.4	0.1
Indigofera georgei	0.3	0.1
Iseilema membranaceum	0.2	0.1
Panicum effusum	0.3	0.1
Psydrax latifolia	0.5	0.1
Pterocaulon sphacelatum	1.1	0.2
Ptilotus obovatus var. *obovatus*	0.5	0.3
Sida sp. L (A.M. Ashby 4202)	0.3	0.1
Solanum lasiophyllum	0.1	0.1
Teucrium teucriiflorum	0.7	0.1
Themeda triandra	0.6	80
Triodia wiseana	0.5	0.1

PHOTOS



Site Name:	Q26
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	13/04/2022
GPS Location:	GDA94 Zone 50 684002E 7468043N
Vegetation Type:	7
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone, Previous quadrat had Quartz (other)
Disturbance:	(other) - Litter. Located next to GNH
Fire:	>10 Years
Habitat:	Quadrat rescore. Low mulga woodland over sparse understorey on stony plain

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri subsp. *fraseri*	0.05	0.1
Acacia aneura	1.2	2
Acacia aptaneura	4	20
Acacia dictyophleba	0.7	0.1
Acacia pruinocarpa	6	3
Acacia tenuissima	1.5	5
Anthobolus leptomerioides	1.2	0.1
Aristida obscura	0.1	0.1
**Bidens bipinnata*	0.1	0.1
Boerhavia coccinea	0.05	0.1
Cheilanthes sieberi subsp. *sieberi*	0.2	0.1
Chrysopogon fallax	0.4	0.1
Commelina ensifolia	0.3	0.1
Digitaria brownii	0.4	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.2	0.1
Enneapogon robustissimus	0.3	0.1
Eragrostis eriopoda	0.1	0.1
Eremophila latrobei subsp. *filiformis*	0.9	0.1
Euphorbia drummondii	0.05	0.1
Evolvulus alsinoides var. *villosicalyx*	0.2	0.1
Gomphrena canescens subsp. *canescens*	0.3	0.1
Hibiscus burtonii	0.3	0.2
Iseilema membranaceum	0.2	0.1
Maireana villosa	0.4	0.1
Panicum effusum	0.2	0.1
Paraneurachne muelleri	0.2	0.1
Paspalidium clementii	0.2	0.1
Paspalidium rarum	0.1	0.1
Perotis rara	0.1	0.1
Psydrax latifolia	2.5	0.1
Psydrax suaveolens	2.5	0.1
Ptilotus ?*carinatus*	0.01	0.1
Ptilotus obovatus var. *obovatus*	0.2	0.1
Sida sp. L (A.M. Ashby 4202)	0.2	0.1
Solanum ferocissimum	0.2	0.1

Solanum lasiophyllum	0.4	0.1
Triodia melvillei	0.4	20
Vincetoxicum lineare		0.1

PHOTOS



Site Name:	R01
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	13/04/2022
GPS Location:	GDA94 Zone 50 685435.15E 7466835.09N
Orientation:	90/180
Vegetation Type:	3
Landform Type:	Lower Slope
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	NE
Soil Type:	Sandy Clay Loam
Soil Colour:	Red-Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	>90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Ironstone
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	(other) - Vehicle track through plot
Fire:	>10 Years
Habitat:	Rapallo rescore

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia adsurgens	2.5	2
Acacia atkinsiana	2.5	0.5
Acacia dictyophleba	3	0.1
Acacia marramamba		
Acacia minyura	1.5	0.1
Acacia pyrifolia var. *pyrifolia*	1.7	0.1
Acacia rhodophloia x sibirica	1.3	0.2
Acacia tenuissima	1.5	0.1
Amphipogon sericeus	0.2	0.1
Aristida holathera var. *holathera*	0.4	0.1
Aristida inaequiglumis	0.3	0.1
Corymbia deserticola subsp. *deserticola*		
Corymbia hamersleyana		
Cymbopogon obtectus	0.2	0.1
Digitaria brownii	0.4	0.1
Eucalyptus gamophylla		
Eulalia aurea	0.7	0.1
Evolvulus alsinoides	0.2	0.1
Gompholobium oreophilum	0.9	0.1
Goodenia stobbsiana	0.1	0.1
Hakea chordophylla	3.5	0.5
Indigofera monophylla	0.3	0.1
Paraneurachne muelleri	0.3	0.1
Ptilotus calostachyus	0.9	0.1
Ptilotus obovatus var. *obovatus*	0.5	0.1
Scaevola parvifolia subsp. *pilbarae*	0.4	0.1
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *oligophylla*	0.8	0.1
Senna glutinosa subsp. *pruinosa*	1.2	0.1
Senna notabilis	0.1	0.1
Senna pleurocarpa var. *pleurocarpa*	0.6	0.1
Seringia exastia (T)	0.4	0.2
Sida arenicola	0.6	0.1

Triodia melvillei	0.4	0.1
Triodia pungens	0.5	1
Triodia wiseana	0.6	45

PHOTOS



Data Source: Rapallo (2021b)

Site Name: Q01RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 684008E 7469197N

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.3	0.1
Acacia ancistrocarpa	1.5	0.1
Acacia aptaneura	0.5	0.1
Acacia atkinsiana	1.5	0.1
Acacia dictyophleba	1.5	0.1
Acacia pruinocarpa	2	1
Acacia tenuissima	0.5	0.1
Anthobolus leptomerioides	0.8	0.1
Aristida contorta	0.3	0.1
Aristida holathera var. *holathera*	0.4	0.1
Aristida inaequiglumis	0.5	0.1
**Cenchrus ciliaris*	0.3	0.1
Corymbia deserticola subsp. *deserticola*	7	0.1
Cymbopogon ambiguus	0.4	0.1
Cymbopogon obtectus	0.4	0.1
Duperreya commixta		0.1
Enneapogon caerulescens	0.2	0.1
Enneapogon polyphyllus	0.2	0.1
Eragrostis eriopoda	0.4	0.1
Eremophila forrestii subsp. *forrestii*	1.2	0.1
Eremophila fraseri subsp. *fraseri*	0.5	0.1
Eriachne pulchella subsp. *pulchella*	0.2	0.1
Eucalyptus gamophylla	4.5	1
Euphorbia australis var. *hispidula*	0.1	0.1
Euploca inexplicita	0.2	0.1
Evolvulus alsinoides var. *villosicalyx*	0.2	0.1
Goodenia microptera	0.1	0.1
Hibiscus burtonii	0.3	0.1
Hibiscus coatesii	0.3	0.1
Indigofera georgei	0.4	0.1
Maireana villosa	0.2	0.1
Panicum decompositum	0.5	0.1
Paraneurachne muelleri	0.2	0.1
Polycarpaea corymbosa	0.1	0.1
Portulaca oleracea	0.1	0.1
Ptilotus calostachyus	0.8	0.1
Ptilotus exaltatus	0.5	0.1
Ptilotus helipteroides	0.2	0.1
Ptilotus obovatus	0.4	0.1
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *oligophylla*	0.3	0.1
Senna glutinosa subsp. *glutinosa*	0.5	0.1
Sida ?L (A.M. Ashby 4202)	0.2	0.1
Solanum lasiophyllum	0.5	0.1
Tribulus macrocarpus	0.1	0.1
Trichodesma zeylanicum var. *zeylanicum*	0.4	0.1
Triodia melvillei	0.5	2
Triodia pungens	0.4	1

Data Source: Rapallo (2021b)

Site Name: Q02RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 684249E 7469197N
Vegetation Type: 7

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri	0.3	0.1
Abutilon lepidum	0.2	0.1
Abutilon otocarpum	0.3	0.1
Acacia aptaneura	8	2
Acacia aptaneura	2.5	0.1
Acacia pruinocarpa	4	1
Aristida contorta	0.3	3
Aristida inaequiglumis	0.4	4
Arivela viscosa	0.8	0.1
Boerhavia coccinea	0.1	0.1
Chrysopogon fallax	0.6	0.1
Cucumis variabilis		0.1
Cymbopogon ambiguus	0.8	0.1
Dactyloctenium radulans	0.1	0.1
Digitaria ctenantha	0.2	0.1
Duperreya commixta		0.1
Dysphania rhadinostachya subsp. *inflata*	0.1	0.1
Enneapogon caerulescens	0.2	0.1
Enneapogon polyphyllus	0.2	0.1
Enneapogon robustissimus	0.2	0.1
Eremophila forrestii subsp. *forrestii*	2.2	1
Eremophila latrobei subsp. *filiformis*	1.5	1
Eremophila longifolia	2.5	3
Eriachne mucronata	0.3	0.1
Eulalia aurea	0.1	0.1
Euphorbia coghlanii	0.1	0.1
Evolvulus alsinoides var. *villosicalyx*	0.1	0.1
Gomphrena canescens subsp. *canescens*	0.2	0.1
Hibiscus burtonii	0.6	0.1
Maireana villosa	0.1	0.1
Perotis rara	0.1	0.1
Pterocaulon sphacelatum	1	1
Ptilotus exaltatus	0.2	0.1
Ptilotus helipteroides	0.1	0.1
Ptilotus obovatus	1	1
Rhynchosia minima	0.3	0.1
Salsola australis	0.3	0.1
Santalum lanceolatum	2	0.1
Sclerolaena cornishiana	0.2	0.1
Senna artemisioides subsp. *helmsii*	0.6	0.1
Senna artemisioides subsp. *helmsii*	0.6	0.1
Sida ?L (A.M. Ashby 4202)	0.1	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.9	0.1
Themeda triandra	0.2	3
Tragus australianus	0.1	0.1
Triodia pungens	0.4	0.1

Data Source: Rapallo (2021b)

Site Name: Q03RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 684598E 7469275N

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon macrum	0.3	0.1
Abutilon otocarpum	0.3	0.1
Acacia aneura	2	1
Acacia aptaneura	2	0.1
Acacia bivenosa	2	0.1
Acacia pruinocarpa	5	1
Alternanthera nana	0.2	0.1
Androcalva luteiflora	1.3	0.1
Aristida contorta	0.3	0.1
Aristida inaequiglumis	0.6	5
Aristida lazaridis (P2)	0.8	0.1
Arivela viscosa	0.5	0.1
Boerhavia coccinea	0.1	0.1
Cajanus marmoratus	0.1	0.1
**Cenchrus setiger*	0.5	0.1
Chrysopogon fallax	0.5	0.1
Convolvulus clementii		0.1
Cucumis variabilis		0.1
Dactyloctenium radulans	0.1	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.3	0.1
Enneapogon robustissimus	0.5	0.1
Eremophila longifolia	4	2
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia coghlanii	0.2	0.1
Euphorbia tannensis subsp. *eremophila*	0.2	0.1
Evolvulus alsinoides var. *villosicalyx*	0.2	0.1
Glycine sp.	0.4	0.1
Goodenia stellata	0.1	0.1
Hibiscus sturtii var. *platychlamys*	0.3	0.1
Indigofera georgei	0.5	0.1
Maireana villosa	0.3	0.1
**Malvastrum americanum*	0.4	0.1
Melhania oblongifolia	0.4	0.1
Panicum decompositum	0.5	0.1
Paraneurachne muelleri	0.2	0.1
Perotis rara	0.1	0.1
Pterocaulon sphacelatum	0.7	20
Ptilotus exaltatus	0.4	0.1
Ptilotus helipteroides	0.4	0.1
Ptilotus obovatus	0.6	0.1
Rhynchosia minima		0.1
Salsola australis	1.1	0.1
Santalum lanceolatum	2	0.1
Senna artemisioides subsp. *oligophylla*	0.3	0.1
Sida ?L (A.M. Ashby 4202)	0.3	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1	0.1
Solanum lasiophyllum	0.5	0.1

Themeda triandra	0.4	4
Tribulus macrocarpus	0.1	0.1
Trichodesma zeylanicum var. *zeylanicum*	1.2	0.1

Data Source: Rapallo (2021b)

Site Name: Q04RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 684314E 7468803N

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri	0.5	0.1
Abutilon otocarpum	0.4	0.1
Acacia aptaneura	8	0.1
Acacia pruinocarpa	3	2
Alternanthera nana	0.2	0.1
Amaranthus cuspidifolius	0.2	0.1
Aristida contorta	0.3	5
Aristida inaequiglumis	0.5	60
Arivela viscosa	1	0.1
**Bidens bipinnata*	0.4	0.1
Chrysopogon fallax	0.7	0.1
Cucumis variabilis		0.1
Dactyloctenium radulans	0.1	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.3	0.1
Eragrostis eriopoda	0.3	0.1
Glycine sp.		0.1
Gossypium robinsonii	4	0.1
Maireana villosa	0.4	0.1
**Malvastrum americanum*	0.6	0.1
Panicum decompositum	0.5	0.1
Paraneurachne muelleri	0.5	0.1
Perotis rara	0.1	0.1
Psydrax latifolia	1	0.1
Pterocaulon sphacelatum	0.9	15
Ptilotus exaltatus	0.8	0.1
Ptilotus helipteroides	0.1	0.1
Rhynchosia minima		0.1
Salsola australis	0.5	0.1
Santalum lanceolatum	2	0.1
Senna artemisioides subsp. *helmsii*	1	0.1
Sida ?L (A.M. Ashby 4202)	0.1	0.1
Sida platycalyx	0.3	0.1
Themeda triandra	0.6	0.1
Tribulus macrocarpus	0.1	0.1
Trichodesma zeylanicum var. *zeylanicum*	1.5	0.1

Data Source: Rapallo (2021b)

Site Name: Q05RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 684684E 7468922N
Vegetation Type: 7

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon macrum	0.2	0.1
Abutilon otocarpum	0.3	0.1
Acacia aptaneura	9	20
Alternanthera nana	0.2	0.1
Aristida contorta	0.3	8
Aristida inaequiglumis	0.6	5
Arivela viscosa	1	0.1
**Bidens bipinnata*	0.2	2
Boerhavia coccinea	0.1	0.1
**Cenchrus ciliaris*	1	40
Chrysopogon fallax	0.7	0.1
Cucumis variabilis		0.1
Digitaria ammophila	0.2	0.1
Digitaria ctenantha	0.1	0.1
Duperreya commixta		0.1
Dysphania rhadinostachya subsp. *inflata*	0.1	0.1
Enneapogon caerulescens	0.2	0.1
Enneapogon polyphyllus	0.3	0.1
Eragrostis eriopoda	0.2	0.1
Eremophila latrobei subsp. *filiformis*	1.5	0.1
Eriachne pulchella subsp. *pulchella*	0.1	0.1
Euphorbia australis var. *subtomentosa*	0.1	0.1
Evolvulus alsinoides var. *villosicalyx*	0.1	0.1
Glycine sp.		0.1
Goodenia prostrata	0.01	0.1
Gossypium robinsonii		0.1
Maireana villosa	0.2	0.1
**Malvastrum americanum*	0.3	2
Melhania oblongifolia	0.3	0.1
Paraneurachne muelleri	0.1	0.1
Perotis rara	0.1	0.1
Polycarpaea corymbosa	0.1	0.1
Portulaca oleracea	0.1	0.1
Pterocaulon sphacelatum	0.5	5
Ptilotus exaltatus	0.7	0.1
Ptilotus helipteroides	0.2	0.1
Ptilotus obovatus	0.5	0.1
Rhagodia eremaea	1	0.1
Rhagodia sp. Hamersley (M. Trudgen 17794) (P3)	2	0.1
Rhynchosia minima	0.3	0.1
Salsola australis	1	0.1
Schizachyrium fragile	0.1	0.1
Senna artemisioides subsp. *helmsii*	0.6	0.1
Senna artemisioides subsp. *oligophylla*	0.4	0.1
Sida ?L (A.M. Ashby 4202)	0.2	0.1
Solanum lasiophyllum	0.3	0.1
Sporobolus australasicus	0.15	0.1

Stemodia grossa	0.4	0.1
Themeda triandra	0.9	2
Tragus australianus	0.1	0.1
Tribulus macrocarpus	0.1	0.1
Trichodesma zeylanicum var. *zeylanicum*	1.5	0.1
Triodia pungens	0.3	0.1

Data Source: Rapallo (2021b)

Site Name: Q06RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 684562E 7468748N
Vegetation Type: 7

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.2	0.1
Acacia aptaneura	4	1
Acacia pruinocarpa	9	1
Aristida contorta	0.2	6
Aristida inaequiglumis	0.5	0.1
Boerhavia coccinea	0.1	0.1
Cucumis variabilis		0.1
Cymbopogon ambiguus	1	0.1
Duperreya commixta	1.2	0.1
Dysphania rhadinostachya subsp. *inflata*	0.1	0.1
Enneapogon caerulescens	0.2	0.1
Enneapogon polyphyllus	0.3	0.1
Enneapogon robustissimus	0.2	0.1
Eremophila forrestii subsp. *forrestii*	1.2	0.1
Goodenia prostrata	0.01	0.1
Hakea loreus subsp. *loreus*	1.5	0.1
Hibiscus burtonii	0.3	0.1
Maireana villosa	0.5	0.1
Paraneurachne muelleri	0.4	0.1
Perotis rara	0.1	0.1
Portulaca oleracea	0.1	0.1
Pterocaulon sphacelatum	1	0.1
Ptilotus exaltatus	1	0.1
Ptilotus helipteroides	0.2	0.1
Ptilotus obovatus	0.9	0.1
Rhagodia eremaea	0.6	0.1
Salsola australis	1	0.1
Senna artemisioides subsp. *helmsii*	0.5	0.1
Sida ?echinocarpa	0.5	0.1
Solanum lasiophyllum	1	0.1
Stemodia grossa	0.2	0.1
Themeda triandra	0.7	0.1
Tribulus macrocarpus	0.1	0.1
Triodia pungens	0.6	0.1

Data Source: Rapallo (2021b)

Site Name: Q07RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 684837E 7468759N
Vegetation Type: 7

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.4	0.1
Acacia aptaneura	4	2
Acacia dictyophleba	1.2	0.1
Acacia elachantha	4	0.1
Acacia pruinocarpa	5	4
Acacia sp.	2	0.1
Alternanthera nana	0.2	0.1
Aristida contorta	0.1	0.1
Aristida inaequiglumis	0.8	10
Arivela viscosa	0.4	0.1
Boerhavia schomburgkiana	0.2	0.1
Capparis lasiantha	1	0.1
Chrysopogon fallax	0.3	0.1
Cucumis variabilis		0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.2	0.1
Enneapogon robustissimus	0.5	0.1
Eremophila forrestii subsp. *forrestii*	2	0.1
Eriachne pulchella subsp. *pulchella*	0.1	0.1
Eucalyptus gamophylla	3	1
Evolvulus alsinoides var. *villosicalyx*	0.1	0.1
Goodenia microptera	0.1	0.1
Hakea chordophylla	2	0.1
Hibiscus burtonii	0.3	0.1
Hibiscus coatesii	0.3	0.1
Hibiscus sturtii var. *platychlamys*	0.2	0.1
Maireana villosa	0.2	0.1
Panicum decompositum	0.5	0.1
Paraneurachne muelleri	0.2	0.1
Perotis rara	0.1	0.1
Polycarpaea corymbosa	0.1	0.1
Portulaca oleracea	0.1	0.1
Psydrax latifolia	1.2	0.1
Pterocaulon sphacelatum	0.7	0.1
Ptilotus exaltatus	0.2	0.1
Ptilotus helipteroides	0.2	0.1
Ptilotus obovatus	1	1
Rhagodia sp. Hamersley (M. Trudgen 17794) (P3)	1.1	0.1
Salsola australis	0.1	0.1
Santalum lanceolatum	3	0.1
Senna artemisioides subsp. *helmsii*	0.5	0.1
Sida ?L (A.M. Ashby 4202)	0.1	0.1
Sida platycalyx	0.3	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.8	0.1
Themeda triandra	0.8	10
Trichodesma zeylanicum var. *zeylanicum*	1.1	0.1
Triodia pungens	0.5	5

Data Source: Rapallo (2021b)

Site Name: Q09RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 684181E 7468474N

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.3	0.1
Acacia acradenia	1.5	0.1
Acacia aptaneura	8	0.1
Acacia bivenosa	2	0.1
Acacia dictyophleba	2.5	0.1
Acacia elachantha	1.1	0.1
Acacia pruinocarpa	6	0.1
Acacia tenuissima	1.2	0.1
Alternanthera nana	0.2	0.1
Aristida contorta	0.3	0.1
Aristida holathera var. *holathera*	0.4	0.1
Aristida inaequiglumis	0.4	3
Arivela viscosa	0.7	0.1
Boerhavia coccinea	0.2	0.1
Chrysopogon fallax	0.5	0.1
Corymbia deserticola subsp. *deserticola*	3.2	0.1
Cucumis variabilis		0.1
Cymbopogon obtectus	1	0.1
Dendrophyllanthus erwinii	0.1	0.1
Duperreya commixta		0.1
Dysphania kalpari	0.1	0.1
Enneapogon polyphyllus	0.4	0.1
Enneapogon robustissimus	0.5	0.1
Eremophila forrestii subsp. *forrestii*	1.2	0.1
Eremophila latrobei subsp. *filiformis*	1	0.1
Eremophila longifolia	1.2	0.1
Eulalia aurea	0.7	0.1
Evolvulus alsinoides var. *villosicalyx*	0.2	0.1
Goodenia microptera	0.3	0.1
Hibiscus sturtii var. *platychlamys*	0.5	0.1
Maireana villosa	0.5	0.1
**Malvastrum americanum*	0.8	0.1
Panicum decompositum	0.5	0.1
Paraneurachne muelleri	0.5	0.1
Perotis rara	0.1	0.1
Portulaca oleracea	0.1	0.1
Pterocaulon sphacelatum	1	0.1
Ptilotus exaltatus	0.6	0.1
Ptilotus helipteroides	0.2	0.1
Ptilotus obovatus	0.6	0.1
Santalum lanceolatum	2	0.1
Senna notabilis	0.4	0.1
Sida ?L (A.M. Ashby 4202)	0.2	0.1
**Stylosanthes hamata*	0.3	0.1
Themeda triandra	0.6	2
Trichodesma zeylanicum var. *zeylanicum*	1.2	0.1
Triodia melvillei	0.5	0.1
Triodia pungens	0.5	4

Data Source: Rapallo (2021b)

Site Name: Q10RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 684659E 7468432N
Vegetation Type: 7

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.2	0.1
Acacia aptaneura	5	2
Acacia dictyophleba	2.5	0.1
Acacia pruinocarpa	6	4
Aristida contorta	0.3	0.1
Aristida holathera var. *holathera*	0.3	0.1
Aristida inaequiglumis	0.4	2
Arivela viscosa	0.8	0.1
**Cenchrus ciliaris*	0.6	0.1
Chrysopogon fallax	0.5	0.1
Corymbia deserticola subsp. *deserticola*	4	0.1
Cucumis variabilis		0.1
Duperreya commixta		0.1
Enneapogon caerulescens	0.2	0.1
Enneapogon polyphyllus	0.3	0.1
Eremophila forrestii subsp. *forrestii*	2	0.1
Eremophila latrobei subsp. *filiformis*	0.5	0.1
Eremophila longifolia	2.5	0.1
Eriachne pulchella subsp. *pulchella*	0.1	0.1
Eulalia aurea	1	0.1
Euphorbia australis var. *subtomentosa*	0.2	0.1
Evolvulus alsinoides var. *villosicalyx*	0.3	0.1
Hibiscus sturtii var. *platychlamys*	0.2	0.1
Maireana villosa	0.4	0.1
Panicum decompositum	0.5	0.1
Paraneurachne muelleri	0.4	0.1
Perotis rara	0.1	0.1
Polycarpaea corymbosa	0.2	0.1
Pterocaulon sphacelatum	0.8	0.1
Ptilotus exaltatus	0.3	0.1
Ptilotus obovatus	0.4	0.1
Salsola australis	0.3	0.1
Schizachyrium fragile	0.2	0.1
Sclerolaena cornishiana	0.1	0.1
Senna artemisioides subsp. *oligophylla*	0.1	0.1
Sida ?L (A.M. Ashby 4202)	0.4	0.1
Sida platycalyx	0.3	0.1
Themeda triandra	0.5	2
Tribulus macrocarpus	0.2	0.1
Triodia pungens	0.5	40

Data Source: Rapallo (2021b)

Site Name: Q11RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 684096E 7468226N
Vegetation Type: 7

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.6	0.1
Acacia aptaneura	7	5
Acacia dictyophleba	2	0.1
Acacia elachantha	2.5	0.1
Acacia pachyacra	1.2	0.1
Acacia pruinocarpa	2.5	0.1
Aristida contorta	0.4	5
Aristida holathera var. *holathera*	0.4	0.1
Arivela viscosa	0.2	0.1
Cheilanthes sieberi subsp. *sieberi*	0.2	0.1
Chrysopogon fallax	0.5	0.1
Cucumis variabilis		0.1
Duperreya commixta		0.1
Dysphania kalpari	0.1	0.1
Enneapogon polyphyllus	0.2	0.1
Enneapogon robustissimus	0.6	0.1
Eulalia aurea	0.6	0.1
Euphorbia biconvexa	0.2	0.1
Euphorbia aff. *ferdinandi*	0.1	0.1
Evolvulus alsinoides var. *villosicalyx*	0.3	0.1
Goodenia microptera	0.2	0.1
Goodenia stellata	0.1	0.1
Hibiscus burtonii	0.5	0.1
Hibiscus sturtii var. *platychlamys*	0.5	0.1
Indigofera georgei	0.8	0.1
Maireana villosa	0.3	0.1
Panicum decompositum	0.3	0.1
Paraneurachne muelleri	0.4	1
Paspalidium rarum	0.2	0.1
Perotis rara	0.1	0.1
Psydrax latifolia	1.8	0.1
Pterocaulon sphacelatum	1.2	0.1
Ptilotus calostachyus	0.8	0.1
Ptilotus exaltatus	0.4	0.1
Ptilotus helipteroides	0.2	0.1
Ptilotus obovatus	0.5	0.1
Scaevola parvifolia subsp. *parvifolia*	0.4	0.1
Sclerolaena cornishiana	0.1	0.1
Senna artemisioides subsp. *oligophylla*	0.3	0.1
Sida ?L (A.M. Ashby 4202)	0.2	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.2	0.1
Themeda triandra	0.8	2
Triodia melvillei	0.7	10

Data Source: Rapallo (2021b)

Site Name: Q12RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 684574E 7468353N
Vegetation Type: 7

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon macrum	0.5	0.1
Abutilon otocarpum	0.6	0.1
Acacia aptaneura	3	0.1
Acacia dictyophleba	1.5	0.1
Acacia pruinocarpa	7	5
Alternanthera nana	0.4	0.1
Anthobolus leptomerioides	1	0.1
Aristida contorta	0.3	1
Aristida holathera var. *holathera*	0.5	0.1
Aristida inaequiglumis	0.6	0.1
Aristida lazaridis (P2)	0.3	0.1
Arivela viscosa	1	0.1
Boerhavia coccinea	0.1	0.1
Cheilanthes sieberi subsp. *sieberi*	0.2	0.1
Chrysocephalum apiculatum subsp. *pilbarense*	0.25	0.1
Chrysopogon fallax	0.7	0.1
Cucumis variabilis		0.1
Duperreya commixta		0.1
Dysphania kalpari	0.1	0.1
Enneapogon lindleyanus	0.3	0.1
Enneapogon polyphyllus	0.4	0.1
Enneapogon robustissimus	0.5	0.1
Eremophila longifolia	6	0.1
Eulalia aurea	0.5	10
Euphorbia australis var. *subtomentosa*	0.1	0.1
Evolvulus alsinoides var. *villosicalyx*	0.2	0.1
Glycine sp.		0.1
Hakea loreus subsp. *loreus*	5	0.1
Hibiscus burtonii	0.5	0.1
Maireana villosa	0.4	0.1
Panicum decompositum	0.5	0.1
Paraneurachne muelleri	0.5	0.1
Peripleura virgata	0.3	0.1
Perotis rara	0.1	0.1
Pterocaulon sphacelatum	0.5	5
Ptilotus calostachyus	0.8	0.1
Ptilotus exaltatus	0.7	0.1
Ptilotus helipteroides	0.2	0.1
Ptilotus obovatus	1	0.1
Salsola australis	1	0.1
Senna notabilis	0.3	0.1
Sida ?L (A.M. Ashby 4202)	0.2	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.6	0.1
Themeda triandra	0.5	20
Triodia pungens	0.5	5

Data Source: Rapallo (2021b)

Site Name: Q13RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 684555E 7467944N
Vegetation Type: 7

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.2	0.1
Acacia aptaneura	4	2
Acacia dictyophleba	1.5	0.1
Acacia elachantha	3	0.1
Acacia pachyacra	2	0.1
Acacia pruinocarpa	2.2	1
Alternanthera nana	0.3	0.1
Aristida contorta	0.3	1
Aristida inaequiglumis	0.5	10
Aristida lazaridis (P2)	0.5	0.1
Arivela viscosa	0.6	0.1
**Bidens bipinnata*	0.2	0.1
Boerhavia coccinea	0.2	0.1
**Cenchrus setiger*	0.2	0.1
Chrysopogon fallax	0.3	0.1
Cucumis variabilis		0.1
Digitaria brownii	0.6	0.1
Duperreya commixta		0.1
Dysphania rhadinostachya subsp. *inflata*	0.2	0.1
Enneapogon polyphyllus	0.4	1
Enneapogon robustissimus	0.5	0.1
Eremophila latrobei subsp. *filiformis*	1.1	0.1
Eremophila longifolia	1.2	0.1
Eriachne pulchella subsp. *pulchella*	0.1	0.1
Eulalia aurea	0.7	15
Euphorbia biconvexa	0.1	0.1
Euphorbia aff. *ferdinandi*	0.1	0.1
Evolvulus alsinoides var. *villosicalyx*	0.1	0.1
Hakea loreus subsp. *loreus*	2	1
Hibiscus burtonii	0.8	0.1
Indigofera georgei	1.1	0.1
Maireana villosa	0.4	0.1
Panicum decompositum	0.5	0.1
Paraneurachne muelleri	0.1	0.1
Peripleura obovata	0.3	0.1
Peripleura virgata	0.3	0.1
Perotis rara	0.1	0.1
Portulaca oleracea	0.1	0.1
Psydrax latifolia	0.7	0.1
Pterocaulon sphacelatum	1	4
Ptilotus exaltatus	0.5	0.1
Ptilotus helipteroides	0.3	0.1
Ptilotus obovatus	0.5	0.1
Senna artemisioides subsp. *x artemisioides*	1	0.1
Sida ?L (A.M. Ashby 4202)	0.2	0.1
Solanum ?horridum	0.5	0.1
Solanum lasiophyllum	0.2	0.1
Sporobolus australasicus	0.1	0.1

Themeda triandra	0.6	5
Triodia melvillei	0.6	1
Triodia pungens	0.6	2

Data Source: Rapallo (2021b)

Site Name: Q14RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 685014E 7468361N

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri	0.3	0.1
Abutilon otocarpum	0.3	0.1
Acacia acradenia	8	2
Acacia aptaneura	6	2
Acacia dictyophleba	3	2
Acacia pruinocarpa	4	2
Alternanthera nana	0.1	0.1
Anthobolus leptomerioides	1	0.1
Aristida contorta	0.4	0.1
Aristida inaequiglumis	0.5	0.1
Arivela viscosa	0.1	0.1
**Bidens bipinnata*	0.1	0.1
Boerhavia coccinea	0.1	0.1
Chrysopogon fallax	0.6	0.1
Digitaria brownii	0.5	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.3	0.1
Eriachne mucronata	0.1	0.1
Eriachne pulchella subsp. *pulchella*	0.1	0.1
Eulalia aurea	0.9	0.1
Euphorbia aff. *ferdinandi*	0.1	0.1
Evolvulus alsinoides var. *villosicalyx*	0.2	0.1
Goodenia microptera	0.3	0.1
Goodenia prostrata	0.01	0.1
Hakea loreus subsp. *loreus*	2.1	0.1
Hibiscus burtonii	0.5	0.1
Hibiscus sturtii var. *platychlamys*	0.5	0.1
Panicum decompositum	0.5	0.1
Paraneurachne muelleri	0.5	0.1
Polycarpaea corymbosa	0.1	0.1
Polygala glaucifolia	0.1	0.1
Portulaca oleracea	0.1	0.1
Psydrax latifolia	1	0.1
Psydrax rigidula	1	0.1
Pterocaulon sphacelatum	0.3	0.1
Ptilotus exaltatus	0.3	0.1
Ptilotus helipteroides	0.3	0.1
Ptilotus obovatus	0.4	0.1
Scaevola parvifolia subsp. *parvifolia*	0.3	0.1
Schizachyrium fragile	0.2	0.1
Senna notabilis	0.1	0.1
Sida ?L (A.M. Ashby 4202)	0.3	0.1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1	0.1
Solanum lasiophyllum	0.5	0.1
Tephrosia sp.	0.4	0.1
Themeda triandra	0.5	0.1
Triodia melvillei	1	10

Data Source: Rapallo (2021b)

Site Name: Q17RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 685015E 7467909N
Vegetation Type: 7

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.2	0.1
Acacia aptaneura	6	5
Acacia pachyacra	2.5	0.1
Acacia tenuissima	2.5	0.1
Anthobolus leptomerioides	1	0.1
Aristida contorta	0.2	2
Aristida holathera var. *holathera*	0.3	0.1
Aristida inaequiglumis	0.5	2
Boerhavia coccinea	0.1	0.1
Chrysopogon fallax	0.6	0.1
Cymbopogon obtectus	0.3	0.1
Digitaria brownii	0.5	0.1
Duperreya commixta		0.1
Dysphania kalpari	0.1	0.1
Enneapogon polyphyllus	0.3	0.1
Enneapogon robustissimus	0.5	0.1
Eremophila latrobei subsp. *filiformis*	1.5	0.1
Eremophila longifolia	1.2	0.1
Eriachne pulchella subsp. *pulchella*	0.1	0.1
Eulalia aurea	0.6	0.1
Euphorbia biconvexa	0.1	0.1
Evolvulus alsinoides var. *villosicalyx*	0.2	0.1
Gomphrena canescens subsp. *canescens*	0.2	0.1
Goodenia prostrata	0.01	0.1
Hakea loreus subsp. *loreus*	2	2
Hibiscus burtonii	1	0.1
Lysiana murrayi		0.1
Maireana villosa	0.1	0.1
Perotis rara	0.1	0.1
Polycarpaea corymbosa	0.1	0.1
Portulaca oleracea	0.1	0.1
Pterocaulon sphacelatum	0.8	0.1
Ptilotus exaltatus	0.1	0.1
Ptilotus gaudichaudii	0.2	0.1
Ptilotus helipteroides	0.2	1
Ptilotus obovatus	0.4	0.1
Rhagodia sp. Hamersley (M. Trudgen 17794) (P3)	1	0.1
Schizachyrium fragile	0.1	0.1
Senna notabilis	0.1	0.1
Sida ?L (A.M. Ashby 4202)	0.5	0.1
Solanum ferocissimum	0.2	0.1
Themeda triandra	0.5	0.1
Triodia melvillei	0.5	10

Data Source: Rapallo (2021b)

Site Name: Q19RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 685089E 7467734N

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia aptaneura	10	3
Acacia pachyacra	1.2	0.1
Alternanthera nana	0.1	0.1
Aristida contorta	0.2	2
Aristida holathera var. *holathera*	0.2	0.1
Aristida inaequiglumis	0.4	32
**Bidens bipinnata*	0.3	0.1
Boerhavia coccinea	0.2	0.1
Cheilanthes sieberi subsp. *sieberi*	0.2	0.1
Chrysopogon fallax	0.5	0.1
Cucumis variabilis		0.1
Digitaria ammophila	0.2	0.1
Dysphania rhadinostachya subsp. *inflata*	0.1	0.1
Enneapogon polyphyllus	0.4	0.1
Eremophila longifolia	1.2	0.1
Eulalia aurea	0.4	0.1
Euphorbia biconvexa	0.2	0.1
Goodenia prostrata	0.01	0.1
Hakea loreus subsp. *loreus*	3	2
Indigofera georgei	0.3	0.1
Lysiana murrayi		0.1
Maireana villosa	0.3	0.1
Panicum decompositum	0.5	0.1
Perotis rara	0.1	0.1
Pterocaulon sphacelatum	0.5	2
Ptilotus clementii	0.3	0.1
Ptilotus obovatus	0.5	0.1
Sida ?L (A.M. Ashby 4202)	0.4	0.1
Sida platycalyx	0.4	0.1
Teucrium teucriiflorum	0.4	0.1
Themeda triandra	0.5	32

Data Source: Rapallo (2021b)

Site Name: Q23RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 685632E 7466984N
Vegetation Type: 8

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.5	0.1
Acacia aptaneura	7	6
Acacia tenuissima	1.2	0.1
Alternanthera nana	0.2	0.1
Aristida contorta	0.4	2
Aristida inaequiglumis	0.6	5
Aristida lazaridis (P2)	0.5	0.1
Arivela viscosa	1	0.1
Chrysocephalum gilesii	0.3	0.1
Chrysopogon fallax	0.7	0.1
Cucumis variabilis		0.1
Digitaria ammophila	0.5	0.1
Duperreya commixta		0.1
Dysphania kalpari	0.2	0.1
Eremophila lanceolata	0.5	0.1
Eucalyptus xerothermica	8	1
Eulalia aurea	0.9	0.1
Evolvulus alsinoides var. *villosicalyx*	0.1	0.1
Hakea loreus subsp. *loreus*	4	2
Panicum decompositum	0.6	0.1
Pterocaulon sphacelatum	0.4	0.1
Ptilotus obovatus	0.5	0.1
Sida ?L (A.M. Ashby 4202)	0.3	0.1
Sida platycalyx	0.5	0.1
Stemodia grossa	0.2	0.1
Themeda triandra	0.6	85
Trichodesma zeylanicum var. *zeylanicum*	1.5	0.1
Triodia melvillei	0.5	0.1

Data Source: Rapallo (2021b)

Site Name: Q24RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 685593E 7467197N

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon fraseri	0.4	0.1
Abutilon otocarpum	0.1	0.1
Acacia dictyophleba	2.5	0.1
Acacia elachantha	1.5	0.1
Acacia pachyacra	2.5	0.1
Acacia pruinocarpa	0.4	0.1
Alternanthera nana		0.1
Aristida contorta	0.2	0.1
Aristida inaequiglumis	0.5	15
Aristida lazaridis (P2)	0.3	0.1
Arivela viscosa	0.8	0.1
Chrysopogon fallax	0.8	0.1
Clerodendrum floribundum var. *angustifolium*	2.3	0.1
Cucumis variabilis	2	0.1
Digitaria ammophila	0.2	0.1
Duperreya commixta		0.1
Enneapogon polyphyllus	0.5	0.1
Eremophila longifolia	2	0.1
Eucalyptus xerothermica	9	0.1
Eulalia aurea	0.7	0.1
Evolvulus alsinoides var. *villosicalyx*	0.2	0.1
Hibiscus burtonii	0.6	0.1
Jasminum didymum subsp. *lineare*		0.1
Pterocaulon sphacelatum	1.1	0.1
Ptilotus obovatus	0.5	0.1
Sida ?L (A.M. Ashby 4202)	1	0.1
Themeda triandra	0.6	80
Trichodesma zeylanicum var. *zeylanicum*	1.2	0.1

Data Source: Rapallo (2021b)

Site Name: Q26RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 683979E 7468067N

SPECIES LIST

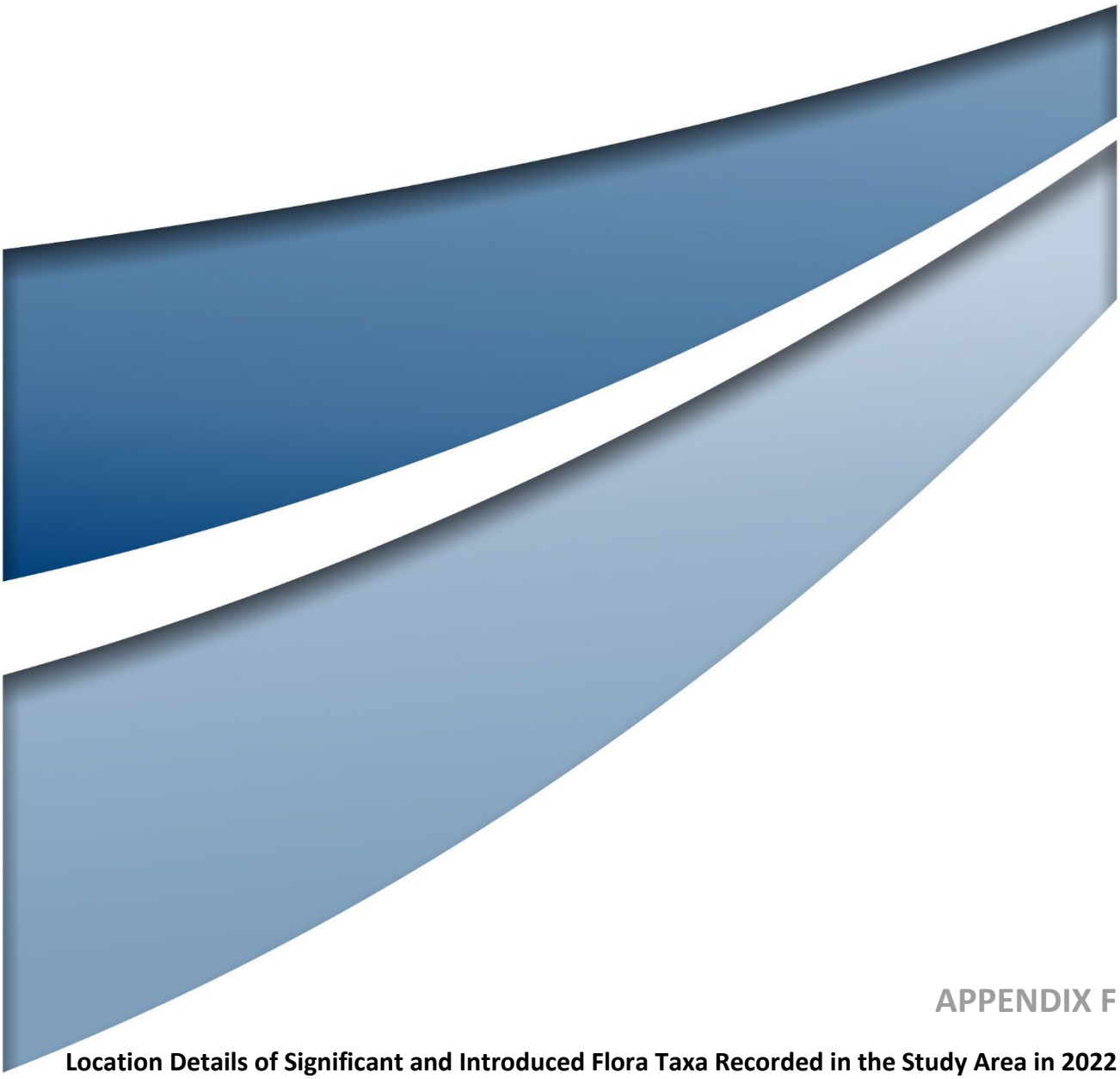
Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.3	0.1
Acacia aneura	1.2	2
Acacia aptaneura	4	20
Acacia tenuissima	1.2	5
Alternanthera nana	0.2	0.1
Aristida contorta	0.1	0.1
Aristida inaequiglumis	0.3	0.1
Aristida obscura	0.1	0.1
Cheilanthes sieberi subsp. *sieberi*	0.2	0.1
Chrysopogon fallax	0.4	0.1
Digitaria ammophila	0.5	0.1
Digitaria brownii	0.3	0.1
Duperreya commixta		0.1
Enneapogon caerulescens	0.3	0.1
Enneapogon polyphyllus	0.3	0.1
Enneapogon robustissimus	0.2	0.1
Eragrostis cumingii	0.1	0.1
Eriachne pulchella subsp. *pulchella*	0.1	0.1
Evolvulus alsinoides var. *villosicalyx*	0.2	0.1
Hibiscus burtonii	0.3	0.1
Indigofera georgei	0.3	0.1
Iseilema macratherum	0.2	0.1
Maireana villosa	0.2	0.1
Panicum decompositum	0.2	0.1
Paraneurachne muelleri	0.2	0.1
Perotis rara	0.1	0.1
Polygala glaucifolia	0.1	0.1
Ptilotus helipteroides	0.3	0.1
Ptilotus obovatus	0.2	0.1
Schizachyrium fragile	0.1	0.1
Sida ?L (A.M. Ashby 4202)	0.3	0.1
Sporobolus australasicus	1.3	0.1
Tribulus astrocarpus	0.1	0.1
Triodia melvillei	0.3	0.1

Data Source: Rapallo (2021b)

Site Name: Q27RAP
Site Type: QUADRAT
GPS Location: GDA94 Zone 50 684446E 7467636N
Vegetation Type: 8

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.4	0.1
Acacia aptaneura	2	0.1
Alternanthera nana	0.3	0.1
Aristida contorta	0.2	20
Aristida inaequiglumis	0.4	10
Arivela viscosa	0.5	0.1
**Bidens bipinnata*	0.1	0.1
Bulbostylis barbata	0.05	0.1
Cheilanthes sieberi subsp. *sieberi*	0.3	0.1
Chrysopogon fallax	0.3	0.1
Cucumis variabilis		0.1
Dichanthium sericeum subsp. *humilius*	0.2	0.1
Duperreya commixta		0.1
Dysphania glomulifera subsp. *eremaea*	0.1	0.1
Enneapogon polyphyllus	0.4	10
Eragrostis pergracilis	0.1	0.1
Euphorbia biconvexa	0.1	0.1
Euphorbia aff. *ferdinandi*	0.1	0.1
Evolvulus alsinoides var. *villosicalyx*	0.2	0.1
Goodenia nuda	0.3	0.1
Goodenia prostrata	0.01	0.1
Hakea loreus subsp. *loreus*	5	2
Hibiscus coatesii	0.2	0.1
Iseilema macratherum	0.3	0.1
Panicum decompositum	0.1	0.1
Paspalidium rarum	0.2	0.1
Perotis rara	0.1	0.1
Portulaca oleracea	0.1	0.1
Pterocaulon sphacelatum	0.5	0.1
Ptilotus exaltatus	0.5	0.1
Ptilotus gaudichaudii	0.4	0.1
Ptilotus helipteroides	0.4	0.1
Ptilotus obovatus	0.4	0.1
Senna notabilis	0.1	0.1
Sida ?L (A.M. Ashby 4202)	0.3	0.1
Spermacoce brachystema	0.2	0.1
Stenopetalum nutans	0.3	0.1
**Stylosanthes hamata*	0.2	0.1
Themeda triandra	0.3	40



APPENDIX F

Location Details of Significant and Introduced Flora Taxa Recorded in the Study Area in 2022

Significant Flora Taxa

Note: all locations in GDA94 Zone 50.

Taxon	Status (WA)	Easting	Northing	Location	Count
Aristida jerichoensis var. *subspinulifera*	P3	685094	7467730	Q19	10
Aristida jerichoensis var. *subspinulifera*	P3	685028	7467724		8
Aristida jerichoensis var. *subspinulifera*	P3	685022	7467708		11
Aristida jerichoensis var. *subspinulifera*	P3	685008	7467693		50
Aristida jerichoensis var. *subspinulifera*	P3	685071	7467622		3
Aristida jerichoensis var. *subspinulifera*	P3	684587	7467576		1
Aristida jerichoensis var. *subspinulifera*	P3	685033	7467713		6
Aristida jerichoensis var. *subspinulifera*	P3	685023	7467714		8
Aristida lazaridis	P2	685350	7467249		2
Aristida lazaridis	P2	685267	7467689		1
Aristida lazaridis	P2	685112	7467908		1
Aristida lazaridis	P2	685612	7467169	Q24	60
Aristida lazaridis	P2	684623	7469253	Q03	200
Corchorus sp.	Potentially undescribed	682893	7472371		2
Corchorus sp.	Potentially undescribed	682714	7472360		3
Corchorus sp.	Potentially undescribed	682607	7472499		1
Corchorus sp.	Potentially undescribed	682423	7472612		1
Corchorus sp.	Potentially undescribed	682384	7472626		1
Corchorus sp.	Potentially undescribed	682371	7472670		6
Corchorus sp.	Potentially undescribed	682375	7472666		1
Corchorus sp.	Potentially undescribed	682383	7472661		1
Corchorus sp.	Potentially undescribed	682655	7472471	C50	
Corchorus sp.	Potentially undescribed	682681	7472451		1
Corchorus sp.	Potentially undescribed	682658	7472452		1
Corchorus sp.	Potentially undescribed	682646	7472439		1
Corchorus sp.	Potentially undescribed	682685	7472434		1
Corchorus sp.	Potentially undescribed	682732	7472341		2
Corchorus sp.	Potentially undescribed	682705	7472357		3
Corchorus sp.	Potentially undescribed	682681	7472381		1
Corchorus sp.	Potentially undescribed	682611	7472471		1
Corchorus sp.	Potentially undescribed	682463	7472576		1
Corchorus sp.	Potentially undescribed	682353	7472691		1
Corchorus sp.	Potentially undescribed	682363	7472689		1
Corchorus sp.	Potentially undescribed	682382	7472671		1
Corchorus sp.	Potentially undescribed	682382	7472672		1
Corchorus sp.	Potentially undescribed	682395	7472669		2
Eremophila naaykensii	P3	694892	7475906	C52	30

Taxon	Status (WA)	Easting	Northing	Location	Count
Eremophila naaykensii	P3	694263	7475775	C24	8
Euphorbia ferdinandi s. lat.	Potentially undescribed	684097	7467773	K49	
Euphorbia ferdinandi s. lat.	Potentially undescribed	684125	7467774		2
Euphorbia ferdinandi s. lat.	Potentially undescribed	684092	7467754		2
Euphorbia ferdinandi s. lat.	Potentially undescribed	684092	7467739		3
Euphorbia ferdinandi s. lat.	Potentially undescribed	684095	7467721		8
Euphorbia ferdinandi s. lat.	Potentially undescribed	684098	7467708		12
Euphorbia ferdinandi s. lat.	Potentially undescribed	684111	7467710		14
Euphorbia ferdinandi s. lat.	Potentially undescribed	684143	7467706		1
Euphorbia ferdinandi s. lat.	Potentially undescribed	684155	7467696		5
Euphorbia ferdinandi s. lat.	Potentially undescribed	684134	7467747		2
Euphorbia ferdinandi s. lat.	Potentially undescribed	684121	7467782		2
Euphorbia ferdinandi s. lat.	Potentially undescribed	684099	7467687		1
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	P2	694596	7474935	C35	2
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	P2	694263	7475775	C24	15
Rhagodia sp. Hamersley (M. Trudgen 17794)	P3	685016	7468258	Q14	3
Rhagodia sp. Hamersley (M. Trudgen 17794)	P3	684202	7468451	Q09	2
Rhagodia sp. Hamersley (M. Trudgen 17794)	P3	685034	7467719		2
Seringia exastia	T	685435	7466835	R01	
Seringia exastia	T	694512	7477652	C44	
Seringia exastia	T	692602	7477524	C46	
Seringia exastia	T	688022	7476843	C51	
Seringia exastia	T	690256	7476182	C49	
Seringia exastia	T	682655	7472471	C50	
Seringia exastia	T	693665	7477551	K43	500
Seringia exastia	T	689065	7476749	K44	
Seringia exastia	T	693931	7474952	K41	
Seringia exastia	T	694096	7477283	K34	10
Seringia exastia	T	685229	7475272	K31	1
Seringia exastia	T	686503	7476642	C25	
Seringia exastia	T	686365	7476227	C26	
Seringia exastia	T	686559	7475717	C27	
Seringia exastia	T	687732	7477441	C28	
Seringia exastia	T	684939	7474629	K30	100
Seringia exastia	T	692644	7477334	C38	
Seringia exastia	T	687487	7477012	C41	
Seringia exastia	T	690746	7475621	C34	

Taxon	Status (WA)	Easting	Northing	Location	Count
Seringia exastia	T	685084	7466905	K50	
Seringia exastia	T	685302	7474990	C30	
Seringia exastia	T	687045	7476252	K46	20
Seringia exastia	T	683724	7473601	K48	
Seringia exastia	T	683353	7473736	C09	
Seringia exastia	T	683289	7470037	K02	15
Seringia exastia	T	694872	7477203	C03	1
Seringia exastia	T	682983	7472173	K06	9
Seringia exastia	T	682677	7473210	C07	
Seringia exastia	T	691372	7477873	K12	25
Seringia exastia	T	684134	7473969	K27	50
Seringia exastia	T	688496	7476476	K29	7
Seringia exastia	T	692214	7475218	C19	
Seringia exastia	T	693450	7478092	C20	
Seringia exastia	T	692121	7477290	K14	20
Seringia exastia	T	690903	7474806	C15	
Seringia exastia	T	692303	7475877	K16	1
Seringia exastia	T	690825	7475207	C16	

Introduced Flora Taxa

Note: all locations in GDA94 Zone 50.

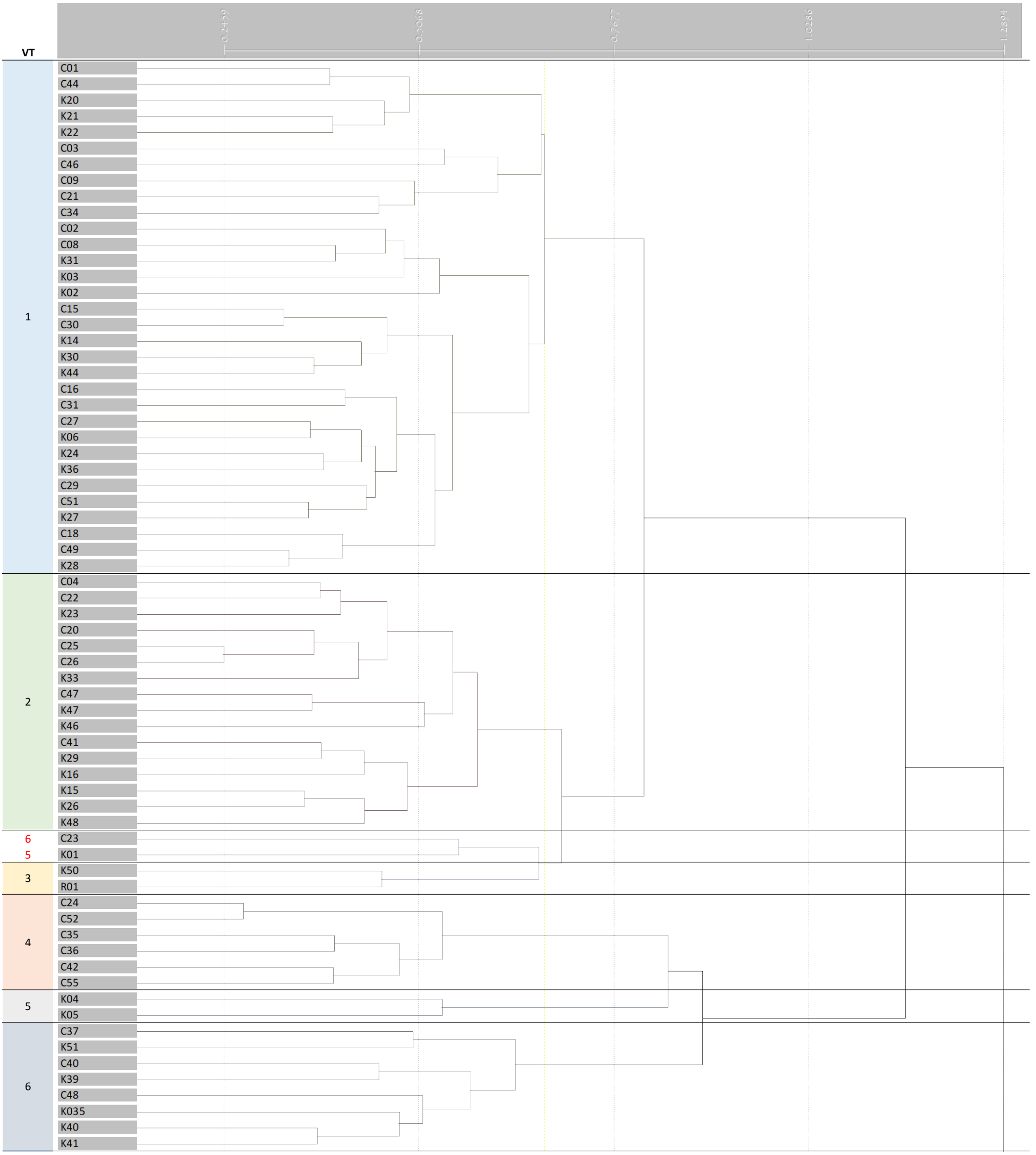
Taxon	Easting	Northing	Location	Count
Bidens bipinnata	692815	7476217		
Bidens bipinnata	692790	7476562		
Bidens bipinnata	691646	7477225		
Bidens bipinnata	684623	7469253	Q03	
Bidens bipinnata	684202	7468451	Q09	
Bidens bipinnata	685016	7468258	Q14	
Bidens bipinnata	684314	7468803	Q04	
Bidens bipinnata	693548	7476323	C55	
Bidens bipinnata	684002	7468043	Q26	
Bidens bipinnata	694893	7475906	C52	
Bidens bipinnata	683571	7474477	C53	
Bidens bipinnata	695073	7476656	C42	
Bidens bipinnata	692120	7478456	C43	
Bidens bipinnata	694413	7476472	C48	
Bidens bipinnata	684004	7469197	Q01	20
Bidens bipinnata	682550	7471981	K07	150
Bidens bipinnata	691203	7478652	K09	50
Bidens bipinnata	691372	7477873	K12	10
Bidens bipinnata	688930	7477533	C11	
Bidens bipinnata	690248	7478356	C12	
Bidens bipinnata	690820	7476485	C13	
Bidens bipinnata	691765	7475612	K17	500
Bidens bipinnata	691241	7475864	C17	
Bidens bipinnata	694263	7475775	C24	
Bidens bipinnata	684940	7474629	K30	20
Bidens bipinnata	689960	7476882	K37	
Bidens bipinnata	691601	7477763	K42	50
Bidens bipinnata	689021	7477252	K45	
Bidens bipinnata	691535	7476026	C32	
Bidens bipinnata	690740	7476199	C33	
Bidens bipinnata	693243	7475767	C36	
Cenchrus ciliaris	695073	7476656	C42	
Cenchrus ciliaris	689021	7477252	K45	10
Cenchrus ciliaris	691958	7477633	K13	20
Cenchrus ciliaris	682550	7471981	K07	100
Cenchrus ciliaris	683289	7470037	K02	10
Cenchrus ciliaris	691485	7476688		

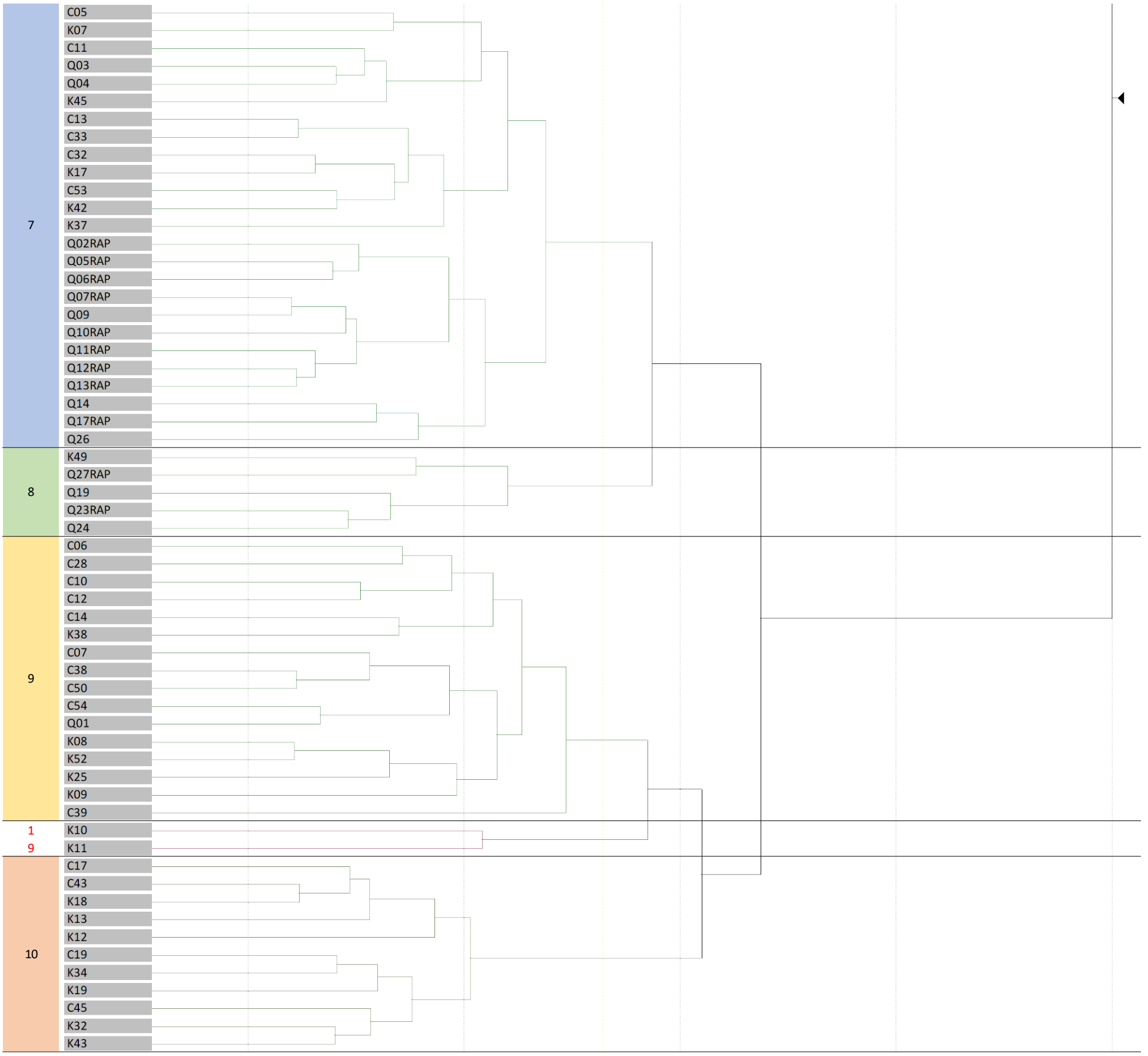
Taxon	Easting	Northing	Location	Count
Cenchrus ciliaris	691433	7476092		
Cenchrus ciliaris	691448	7475626		
Cenchrus ciliaris	691452	7476514		
Cenchrus ciliaris	692120	7478456	C43	
Cenchrus ciliaris	684623	7469253	Q03	
Cenchrus ciliaris	691120	7477292		
Cenchrus ciliaris	684314	7468803	Q04	
Cenchrus setiger	691454	7477317		
Cenchrus setiger	691452	7476514		
Cenchrus setiger	691448	7475626		
Cenchrus setiger	691433	7476092		
Cenchrus setiger	691445	7476241		
Cenchrus setiger	691485	7476688		
Cenchrus setiger	684623	7469253	Q03	
Cenchrus setiger	691372	7477873	K12	2
Cenchrus setiger	688930	7477533	C11	
Cenchrus setiger	691958	7477633	K13	40
Cenchrus setiger	691241	7475864	C17	
Cenchrus setiger	691294	7475133	K18	2000
Cenchrus setiger	692214	7475218	C19	
Cenchrus setiger	689960	7476882	K37	1
Cenchrus setiger	687589	7476671	K32	500
Cenchrus setiger	690740	7476199	C33	
Cenchrus setiger	689021	7477252	K45	100
Malvastrum americanum	692214	7475218	C19	
Malvastrum americanum	693298	7478450	K19	1
Malvastrum americanum	688930	7477533	C11	
Malvastrum americanum	691372	7477873	K12	10
Malvastrum americanum	689021	7477252	K45	50
Malvastrum americanum	691698	7477836		2
Malvastrum americanum	684314	7468803	Q04	
Malvastrum americanum	692120	7478456	C43	
Malvastrum americanum	683571	7474477	C53	
Malvastrum americanum	684623	7469253	Q03	
Malvastrum americanum	691445	7476241		
Portulaca pilosa	687488	7477012	C41	
Setaria verticillata	691294	7475133	K18	10
Setaria verticillata	692214	7475218	C19	
Setaria verticillata	689021	7477252	K45	6
Setaria verticillata	691535	7476026	C32	

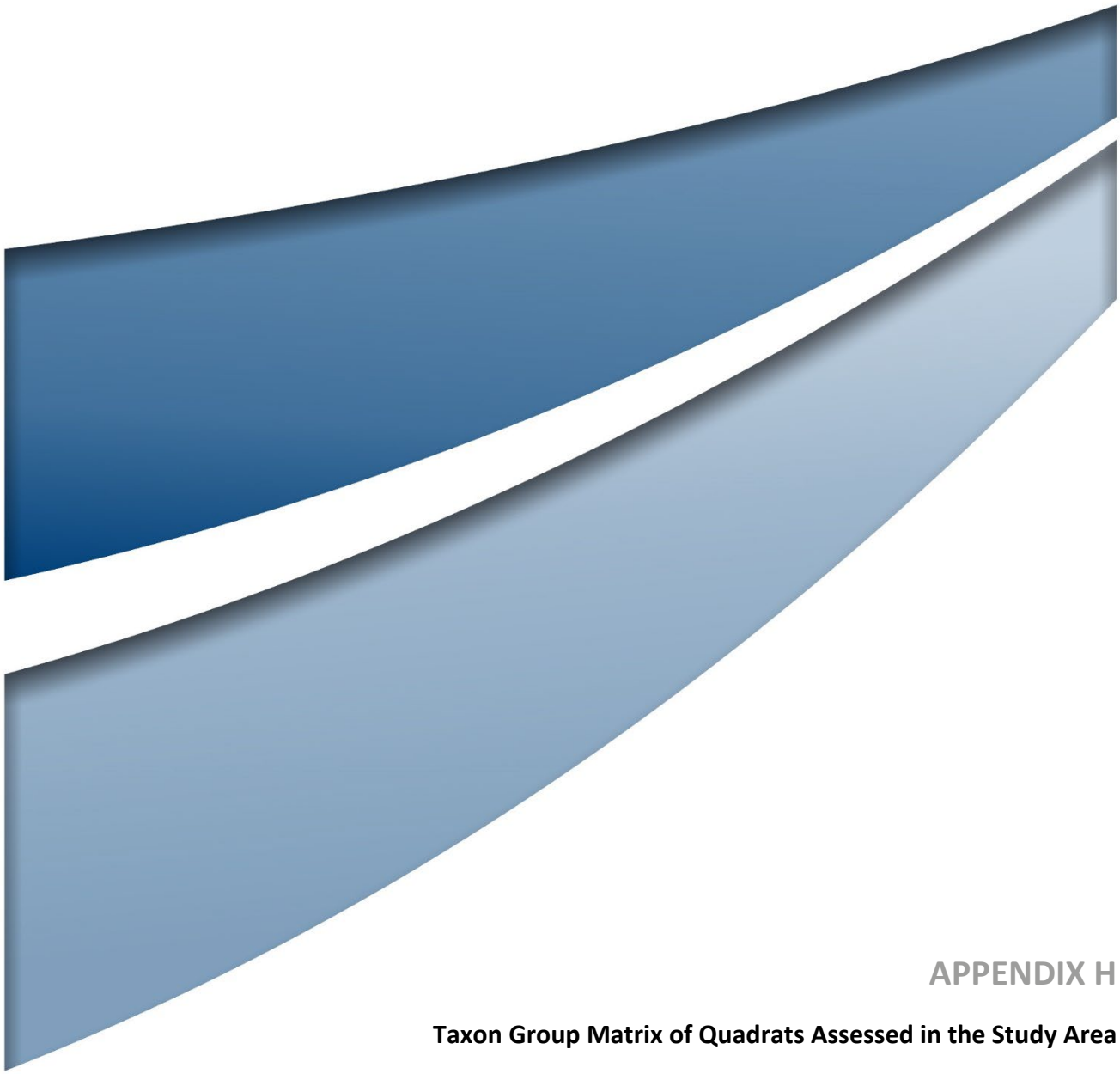
Taxon	Easting	Northing	Location	Count
Setaria verticillata	692120	7478456	C43	
Setaria verticillata	691445	7476241		
Tribulus terrestris	684623	7469253	Q03	
Tribulus terrestris	691400	7476113		3
Tribulus terrestris	684314	7468803	Q04	

APPENDIX G

Classification Analysis Dendrogram of Quadrats Assessed in the Study Area

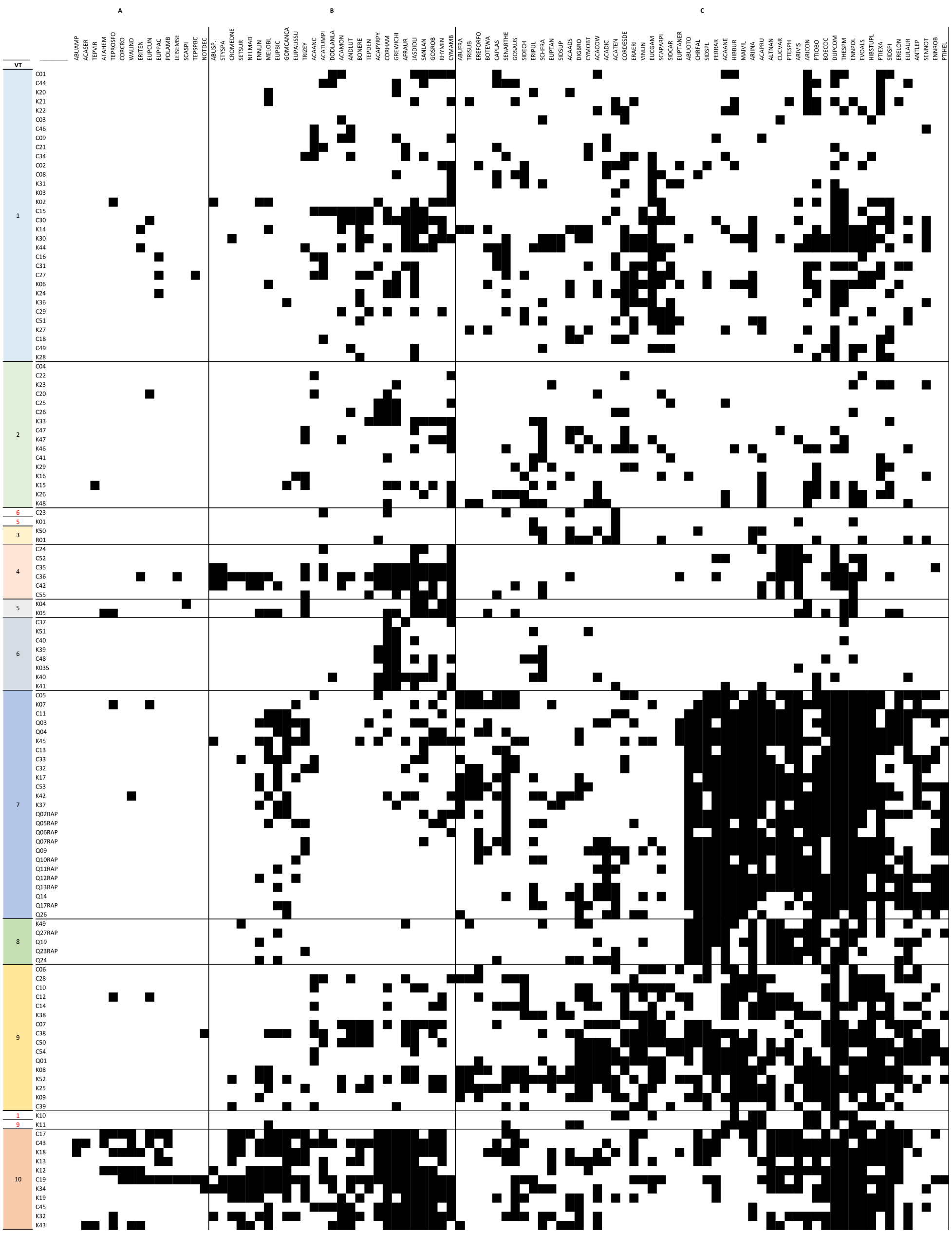

0.2459
0.5068
0.7677
1.0286
1.2894
VT
C01
C44
K20
K21
K22
C03
C46
C09
C21
C34
C02
C08
K31
K03
K02
C15
C30
K14
K30
K44
C16
C31
C27
K06
K24
K36
C29
C51
K27
C18
C49
K28
1
C04
C22
K23
C20
C25
C26
K33
C47
K47
K46
C41
K29
K16
K15
K26
K48
2
C23
K01
6
5
K50
R01
3
C24
C52
C35
C36
C42
C55
4
K04
K05
5
C37
K51
C40
K39
C48
K035
K40
K41
6

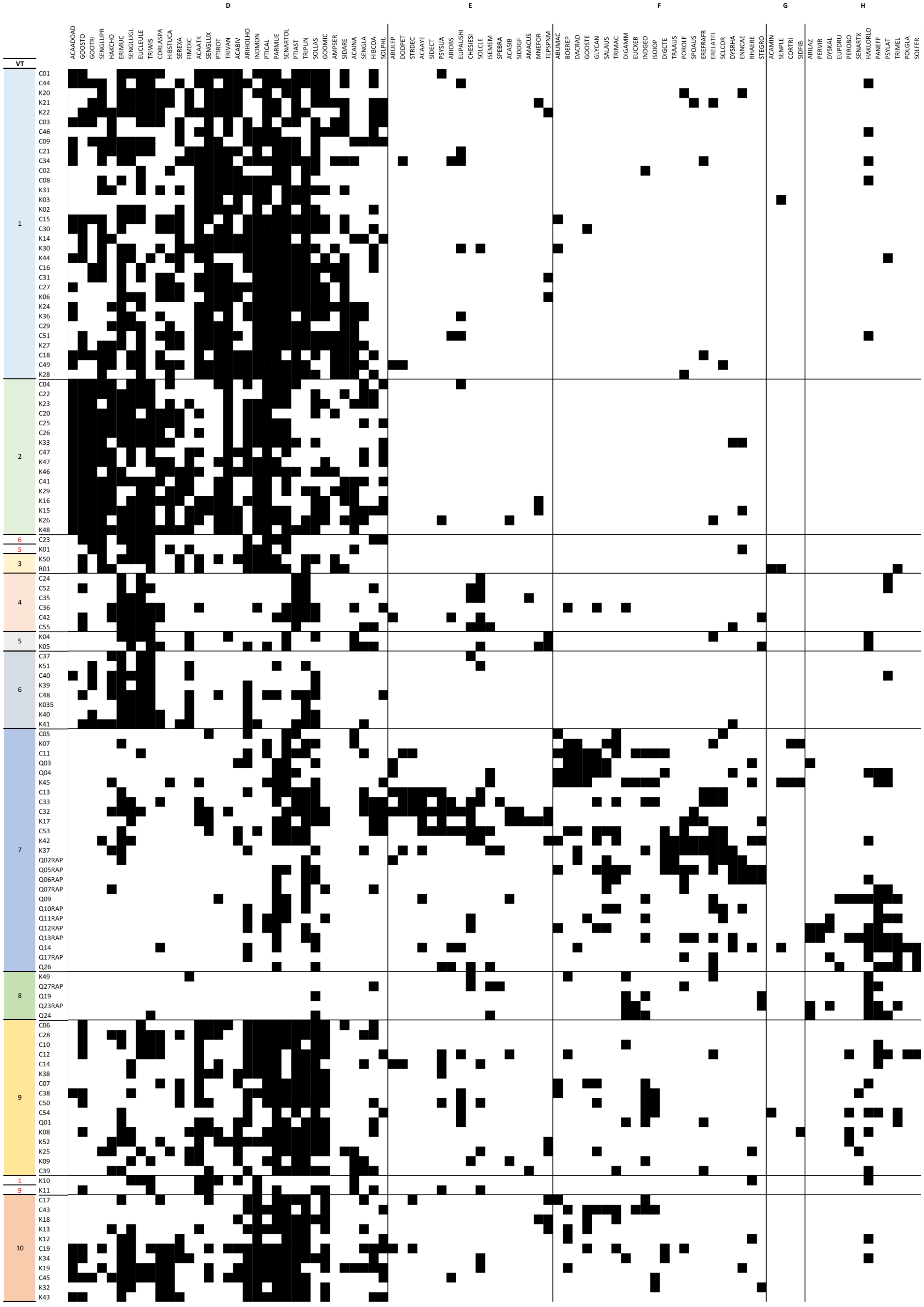

C05
K07
C11
Q03
Q04
K45
C13
C33
C32
K17
C53
K42
K37
Q02RAP
Q05RAP
Q06RAP
Q07RAP
Q09
Q10RAP
Q11RAP
Q12RAP
Q13RAP
Q14
Q17RAP
Q26
7
K49
Q27RAP
Q19
Q23RAP
Q24
8
C06
C28
C10
C12
C14
K38
C07
C38
C50
C54
Q01
K08
K52
K25
K09
C39
9
K10
K11
1
9
C17
C43
K18
K13
K12
C19
K34
K19
C45
K32
K43
10

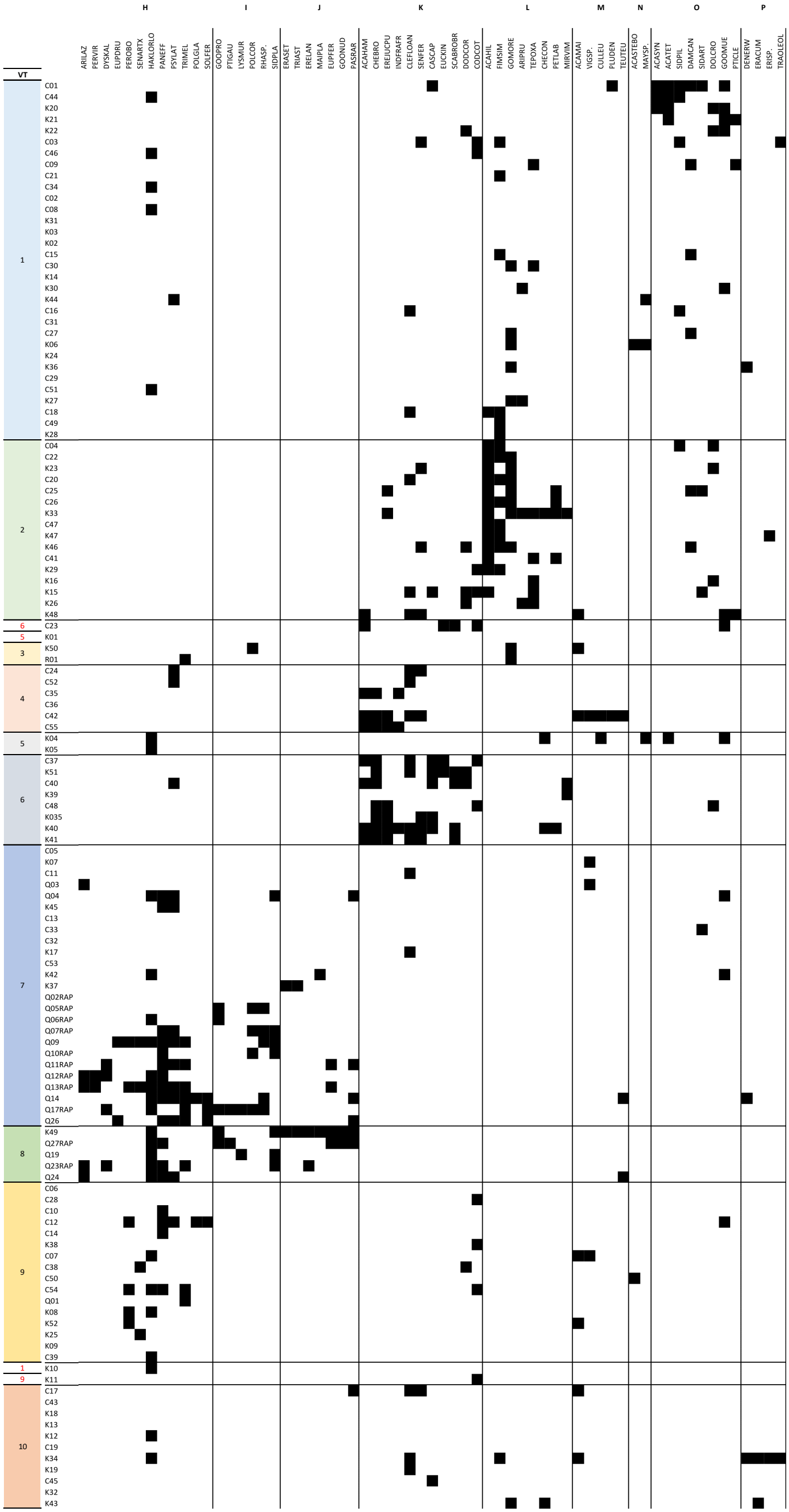


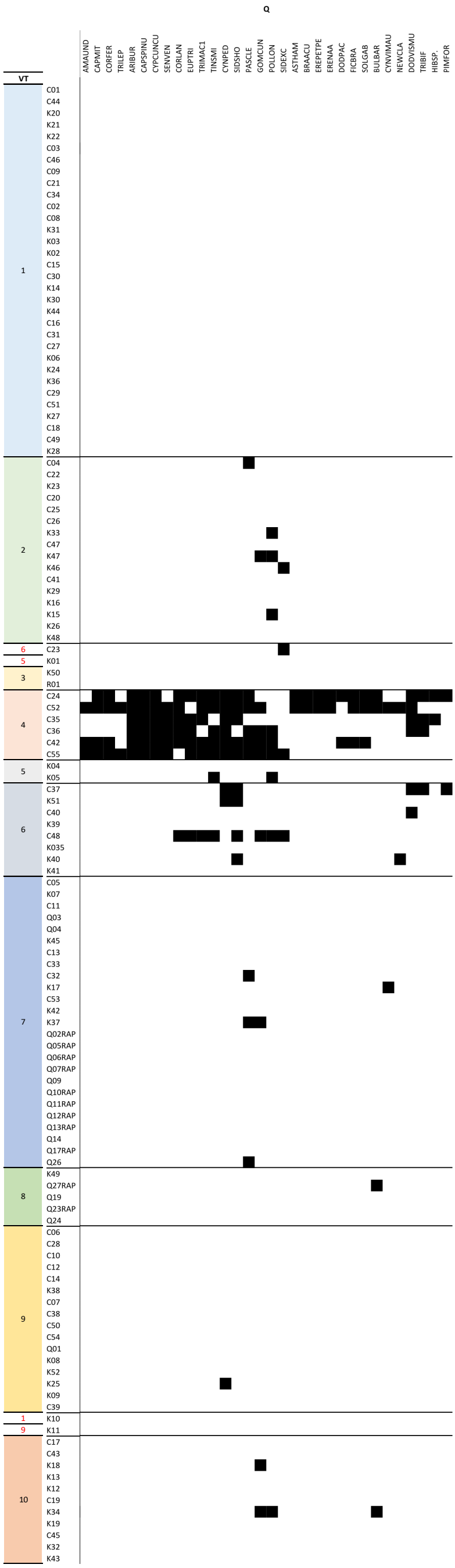
APPENDIX H

Taxon Group Matrix of Quadrats Assessed in the Study Area


A
B
C
ABUAMP ACASER TEPVIR ATAHEM TEPROSFO CORCRO WALIND ERITEN EUPCUN EUPPAC POLAMB LEISEMSE SCASPI TEPSPBC NOTDEC
ABUSP. STYSPA CROMEDNE SETSUR NELMAD ENNLIN MELOBL EUPBIC GOMCANCA EUPAUSSU TRIZEY ACAANC ACATUMPI DODLANLA ACAMON ANDLUT BONERE TEPDEN ACAPYRPY CORHAM GREWICHI AFRAUR JASDIDLI SANLAN GOSROB RHYMIN CYMAMB
ABUFRA TRISUB EREFORFO BOTEWA CAPLAS SENARTHE GOSAUS SIDECH ERIPUL SCHFRA EUPTAN SIDSUP ACAADS DIGBRO CYMOBT ACACOW ACADIC ACATEN CORDESDE ERAERI VINLIN EUCGAM SCAPARPI SIDCAR EUPTANER ABUOTO CHRFAL SIDSPL PERRAR ACAANE HIBBUR MAIVIL ARIINA ACAPRU ALTNAN CUCVAR PTESPH ARIVIS ARICON PTIOBO BOECOC DUPCOM THESPM ENNPOL EVOALS HIBSTUPL PTIEXA SIDSPI ERELON EULAUR ANTLEP SENNOT ENNROB PTIHEL
VT
1
C01 C44 K20 K21 K22 C03 C46 C09 C21 C34 C02 C08 K31 K03 K02 C15 C30 K14 K30 K44 C16 C31 C27 K06 K24 K36 C29 C51 K27 C18 C49 K28
2
C04 C22 K23 C20 C25 C26 K33 C47 K47 K46 C41 K29 K16 K15 K26 K48
6
C23
5
K01
3
K50 R01
4
C24 C52 C35 C36 C42 C55
5
K04 K05
6
C37 K51 C40 K39 C48 K035 K40 K41
7
C05 K07 C11 Q03 Q04 K45 C13 C33 C32 K17 C53 K42 K37 Q02RAP Q05RAP Q06RAP Q07RAP Q09 Q10RAP Q11RAP Q12RAP Q13RAP Q14 Q17RAP Q26
8
K49 Q27RAP Q19 Q23RAP Q24
9
C06 C28 C10 C12 C14 K38 C07 C38 C50 C54 Q01 K08 K52 K25 K09 C39
1
K10
9
K11
10
C17 C43 K18 K13 K12 C19 K34 K19 C45 K32 K43


D
E
F
G
H
ACAADOAD GOOSTO GOOTRI SENGLUPR HAKCHO ERIMUC SENGLUGL EUCLEULE TRIWIS CORLASPA HIBSTUCA SEREXA FIMDIC ACAATK SENGLUX PTIROT TRIVAN ACABIV ARIHOLHO INDMON PTICAL PARMUE SENARTOL PTIAST TRIPUN SOLLAS GOOMIC AMPSER SIDARE ACAINA SENGLA HIBCOA SOLPHL
ABULEP DODPET STRDEC ACAAYE SIDECT PSYSUA ARIOBS EUPAUSHI CHESIESI SOLCLE ISEMEM SPEBRA ACASIB SIDDGF AMACUS MNEFOR TEPSPNM
ABUMAC BOEREP DACRAD GOOSTE GLYCAN SALAUS TRIMAC DIGAMM EUCXER INDGEO ISOIOP DIGCTE TRAAUS POROLE SPOAUS EREFRAFR ERELATFI SCLCOR DYSRHA ENNCAE RHAERE STEGRO
ACAMIN SENPLE CORTRI SIDFIB
ARILAZ PERVIR DYSKAL EUPDRU PEROBO SENARTX HAKLORLO PANEFF PSYLAT TRIMEL POLGLA SOLFER
VT
1 C01 C44 K20 K21 K22 C03 C46 C09 C21 C34 C02 C08 K31 K03 K02 C15 C30 K14 K30 K44 C16 C31 C27 K06 K24 K36 C29 C51 K27 C18 C49 K28
2 C04 C22 K23 C20 C25 C26 K33 C47 K47 K46 C41 K29 K16 K15 K26 K48
6 C23
5 K01
3 K50 R01
4 C24 C52 C35 C36 C42 C55
5 K04 K05
6 C37 K51 C40 K39 C48 K035 K40 K41
7 C05 K07 C11 Q03 Q04 K45 C13 C33 C32 K17 C53 K42 K37 Q02RAP Q05RAP Q06RAP Q07RAP Q09 Q10RAP Q11RAP Q12RAP Q13RAP Q14 Q17RAP Q26
8 K49 Q27RAP Q19 Q23RAP Q24
9 C06 C28 C10 C12 C14 K38 C07 C38 C50 C54 Q01 K08 K52 K25 K09 C39
1 K10
9 K11
10 C17 C43 K18 K13 K12 C19 K34 K19 C45 K32 K43


H
I
J
K
L
M
N
O
P
ARILAZ
PERVIR
DYSKAL
EUPDRU
PEROBO
SENARTX
HAKLORLO
PANEFF
PSYLAT
TRIMEL
POLGLA
SOLFER
GOOPRO
PTIGAU
LYSMUR
POLCOR
RHASP.
SIDPLA
ERASET
TRIAST
ERELAN
MAIPLA
EUPFER
GOONUD
PASRAR
ACAHAM
CHEBRO
EREJUCPU
INDFRAFR
CLEFLOAN
SENFER
CASCAP
EUCKIN
SCABROBR
DODCOR
CODCOT
ACAHIL
FIMSIM
GOMORE
ARIPRU
TEPOXA
CHECON
PETLAB
MIRVIM
ACAMAI
VIGSP.
CULLEU
PLUDEN
TEUTEU
ACASTEBO
MAYSP.
ACASYN
ACATET
SIDPIL
DAMCAN
SIDART
DOLCRO
GOOMUE
PTICLE
DENERW
ERACUM
ERISP.
TRAOLEOL
VT
1
2
6
5
3
4
5
6
7
8
9
1
9
10


Q
AMAUND
CAPMIT
CORFER
TRILEP
ARIBUR
CAPSPINU
CYPCUNCU
SENVEN
CORLAN
EUPTRI
TRIMAC1
TINSMI
CYNPED
SIDSHO
PASCLE
GOMCUN
POLLON
SIDEXC
ASTHAM
BRAACU
EREPETPE
ERENAA
DODPAC
FICBRA
SOLGAB
BULBAR
CYNVIMAU
NEWCLA
DODVISMU
TRIBIF
HIBSP.
PIMFOR
VT
1
C01
C44
K20
K21
K22
C03
C46
C09
C21
C34
C02
C08
K31
K03
K02
C15
C30
K14
K30
K44
C16
C31
C27
K06
K24
K36
C29
C51
K27
C18
C49
K28
2
C04
C22
K23
C20
C25
C26
K33
C47
K47
K46
C41
K29
K16
K15
K26
K48
6
C23
5
K01
3
K50
R01
4
C24
C52
C35
C36
C42
C55
5
K04
K05
6
C37
K51
C40
K39
C48
K035
K40
K41
7
C05
K07
C11
Q03
Q04
K45
C13
C33
C32
K17
C53
K42
K37
Q02RAP
Q05RAP
Q06RAP
Q07RAP
Q09
Q10RAP
Q11RAP
Q12RAP
Q13RAP
Q14
Q17RAP
Q26
8
K49
Q27RAP
Q19
Q23RAP
Q24
9
C06
C28
C10
C12
C14
K38
C07
C38
C50
C54
Q01
K08
K52
K25
K09
C39
1
K10
9
K11
10
C17
C43
K18
K13
K12
C19
K34
K19
C45
K32
K43

APPENDIX I

Summary of Misclassified and Manually Reassigned Quadrats Assessed in the Study Area

Quadrat	Original Group	Reassigned VT	Reasoning
C23	VT 3	VT 6	This quadrat grouped with K01 split at a higher level to remainder of quadrats originally grouped into VT 3, indicating a lower level of similarity. Quadrat C23 is within transitional vegetation and has been relatively recently burnt (~4-5 years ago). Allocated to VT 6 based on dominant taxa present and its occurrence on an ironstone crest.
K01	VT 3	VT 5	This quadrat grouped with quadrat C23 split at a higher level to remainder of quadrats originally grouped into VT 3, indicating a lower level of similarity. Quadrat K23 is within transitional vegetation and has been relatively recently burnt (~4-5 years ago). Allocated to VT 5 based on dominant taxa present, it's location and occurrence on an upperslope with ironstone within the McKay soil landscape system.
K10	Separate grouping (located between VT 9 / 10 in dendrogram)	VT 1	This quadrat grouped with K11 within the dendrogram, however the two quadrats were not sufficiently floristically similar to form a unique VT. Allocated to VT 1 based on floristics, soil, landform and location.
K11	Separate grouping (located between VT 9 / 10 in dendrogram)	VT 9	This quadrat grouped with K10 in the dendrogram, however the two quadrats were not sufficiently floristically similar to form a unique VT. Allocated to VT 9 based on floristics, soil, landform and location.

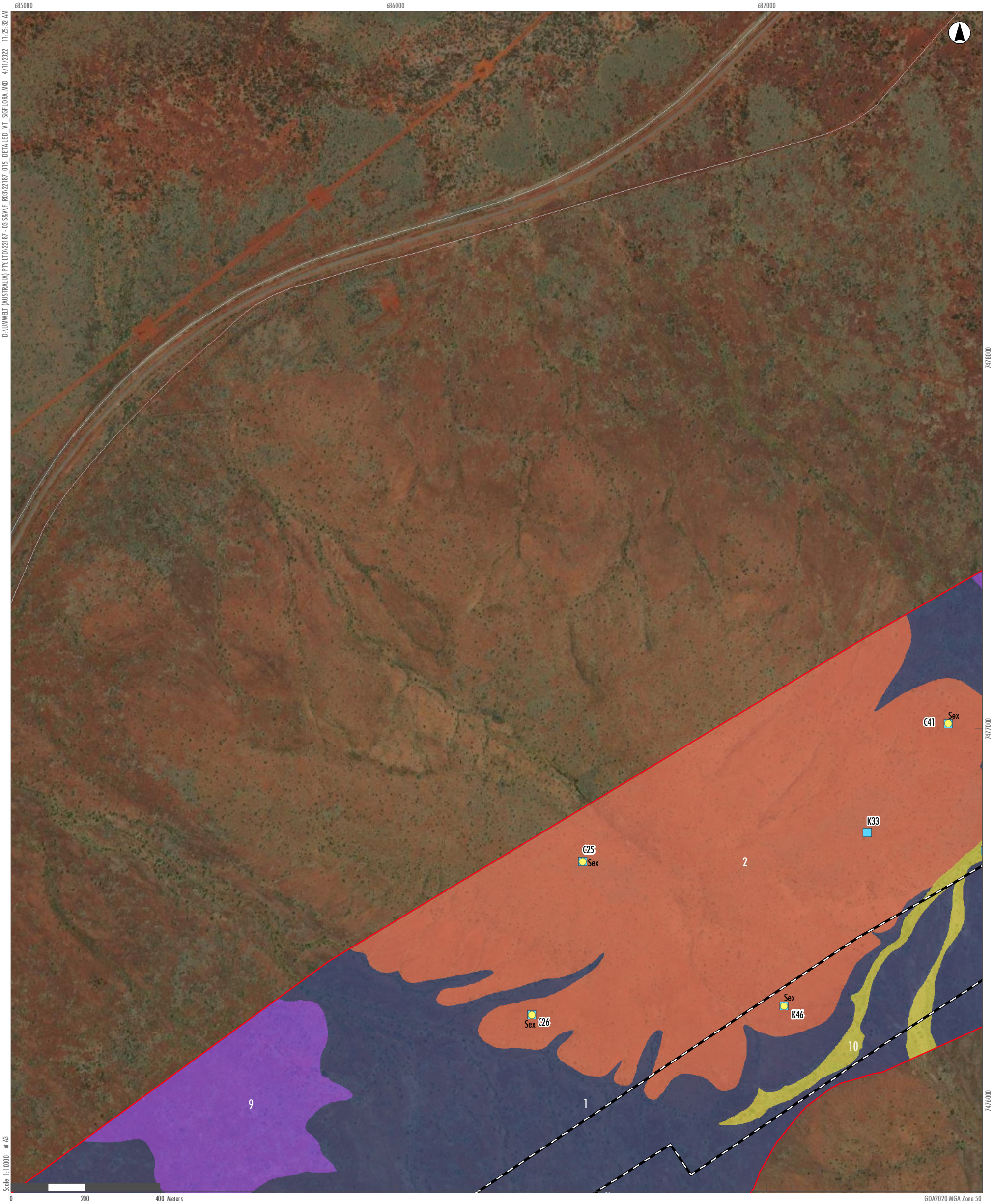
APPENDIX J

Detailed Mapping of Vegetation Types and Significant Flora Locations of the Study Area

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&V\F_R03\22187_015_DETAILED_VT_SIGFLORA.MXD 4/11/2022 11:25:32 AM

685000 686000 687000

7478000 7477000 7476000



Scale 1:10000 at A3

0 200 400 Meters

GDA2020 MGA Zone 50

Legend

- Study Area
- Proposed Development Envelope
- Quadrat

Vegetation Types

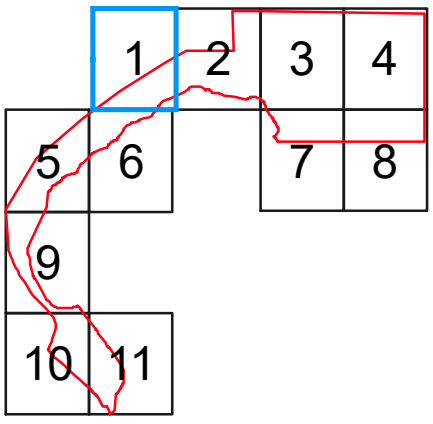
- 1
- 2
- 9
- 10

Significant Flora (Umwelt, 2022)

- Ajes *Aristida jerichoensis* var. *subspinulifera* (P3)
- Alaz *Aristida lazaridis* (P2)
- Csp *Corchorus* sp. (Potentially Undescribed)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- HspGR *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)
- Sex *Seringia exastia* (T)

Significant Flora (Rapallo, 2021b)

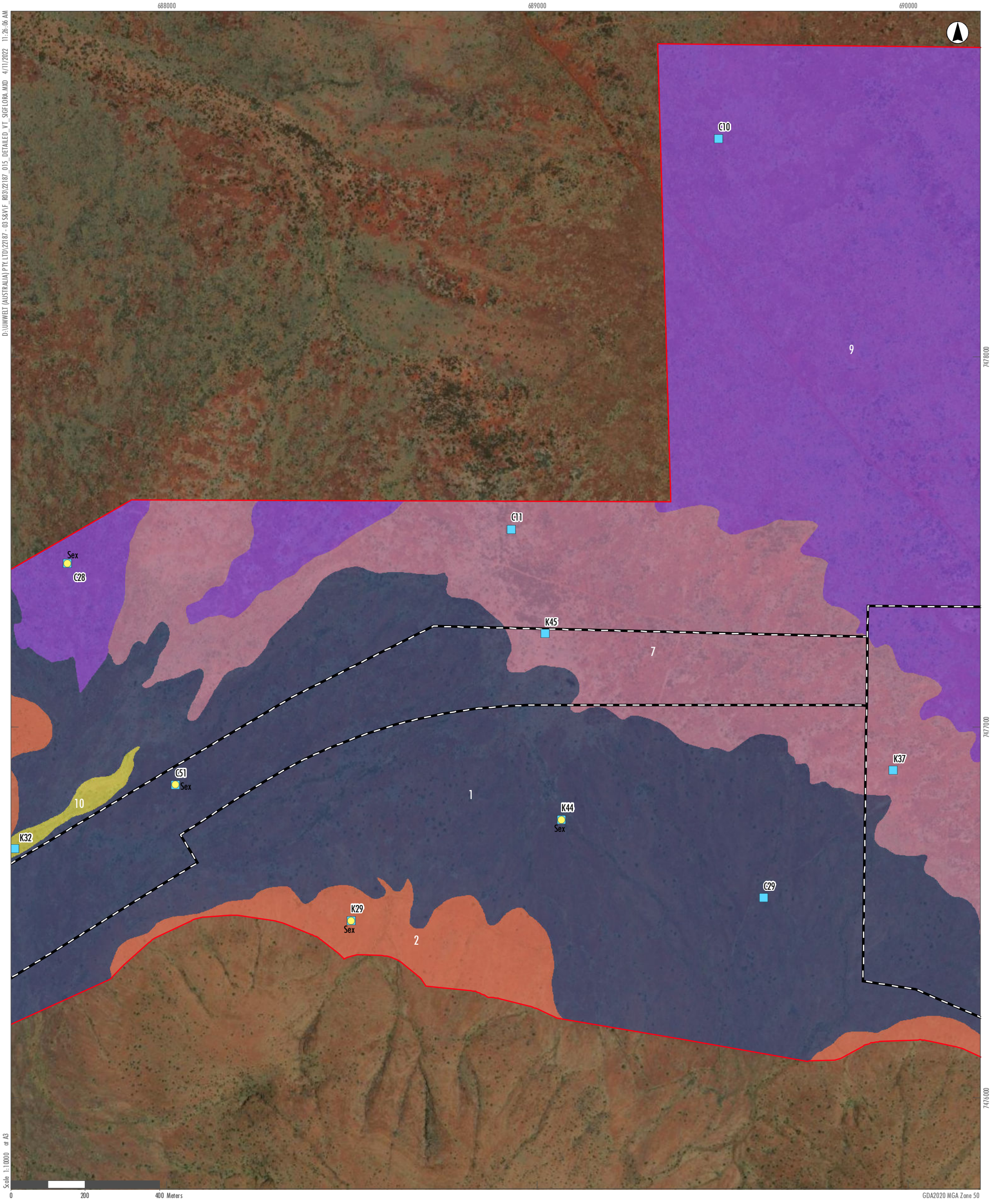
- Alaz *Aristida lazaridis* (P2)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)



APPENDIX J

Detailed Mapping of Vegetation Types and Significant Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Rapallo (2021), Umwelt (2022)



Legend

- Study Area
- Proposed Development Envelope
- Quadrat

Vegetation Types

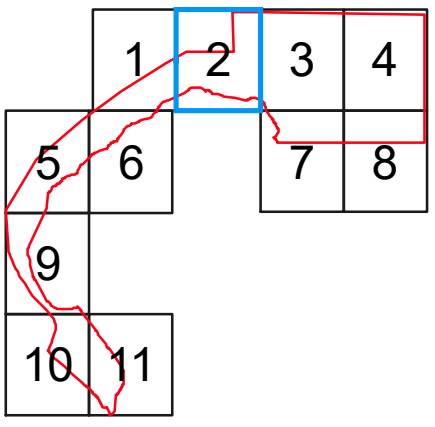
- 1
- 2
- 7
- 9
- 10

Significant Flora (Umwelt, 2022)

- Ajes *Aristida jerichoensis* var. *subspinulifera* (P3)
- Alaz *Aristida lazaridis* (P2)
- Csp *Corchorus* sp. (Potentially Undescribed)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- HspGR *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)
- Sex *Seringia exastia* (T)

Significant Flora (Rapallo, 2021b)

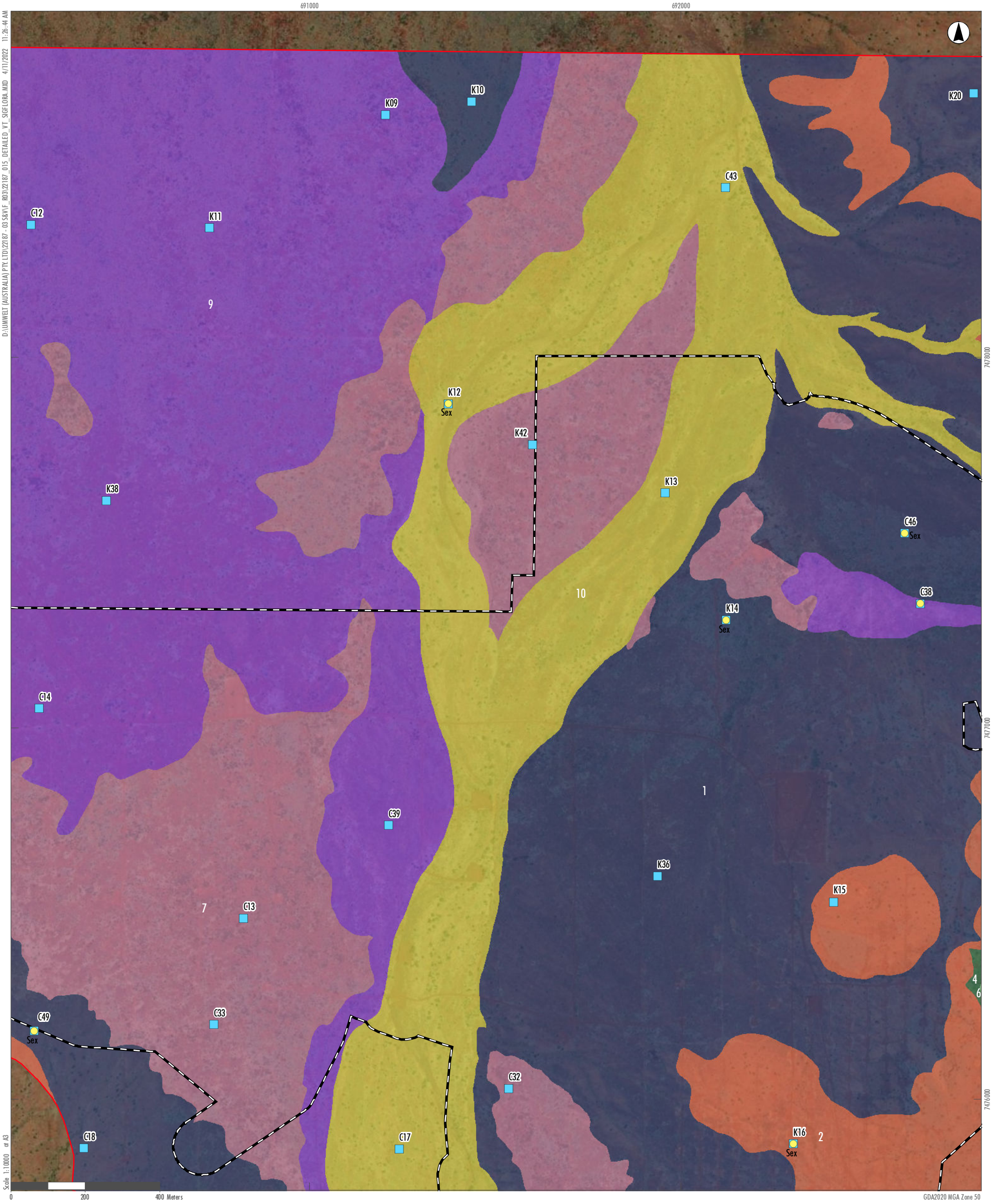
- Alaz *Aristida lazaridis* (P2)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)



APPENDIX J

Detailed Mapping of Vegetation Types and Significant Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Rapallo (2021), Umwelt (2022)



Legend

- Study Area
- Proposed Development Envelope
- Quadrat

Vegetation Types

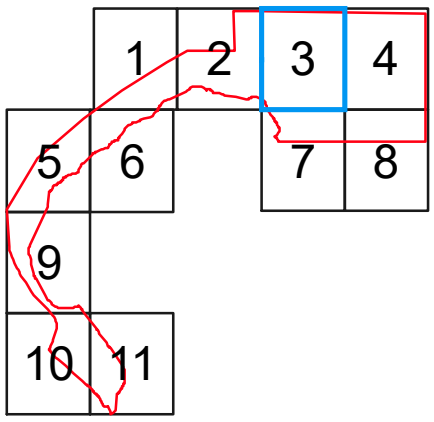
- 1
- 2
- 4
- 6
- 7
- 9
- 10

Significant Flora (Umwelt, 2022)

- Ajes *Aristida jerichoensis* var. *subspinulifera* (P3)
- Alaz *Aristida lazaridis* (P2)
- Csp *Corchorus* sp. (Potentially Undescribed)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- HspGR *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)
- Sex *Seringia exastia* (T)

Significant Flora (Rapallo, 2021b)

- Alaz *Aristida lazaridis* (P2)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)



APPENDIX J

Detailed Mapping of Vegetation Types and Significant Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Rapallo (2021), Umwelt (2022)

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&V\F_R03\22187_015_DETAILED_VT_SIGFLORA.MXD 4/11/2022 11:26:44 AM

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&V\F_R03\22187_015_DETAILED_VT_SIGFLORA.MXD 4/11/2022 11:27:20 AM

693000 694000 695000

7478000 7477000 7476000

K05 K01 K19 K04 K21 C20 Sex C45 K22 K43 Sex C44 Sex C01 K34 Sex C21 C03 Sex C47 C22 CR03 C04 C42 CR01 C48 CR05 C55 CR04 K035 C40 K51 C23 Ena C52 C36 C24 Ena HspGR Ena

5 1 10 9 2 6 4

Scale 1:10000 at A3

0 200 400 Meters

GDA2020 MGA Zone 50

Legend

- Study Area
- Proposed Development Envelope
- Quadrat
- Relevé

Vegetation Types

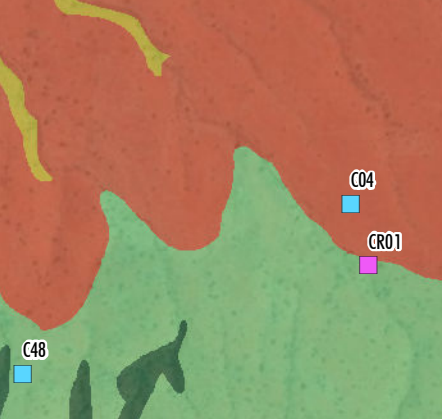
- 1
- 2
- 4
- 5
- 6
- 9
- 10

Significant Flora (Umwelt, 2022)

Ajes	*Aristida jerichoensis* var. *subspinulifera* (P3)
Alaz	*Aristida lazaridis* (P2)
Csp	*Corchorus* sp. (Potentially Undescribed)
Ena	*Eremophila naaykensii* (P3)
Efe	*Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
HspGR	*Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
RspH	*Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
Radl	*Rostellularia adscendens* var. *latifolia* (P3)
Sex	*Seringia exastia* (T)

Significant Flora (Rapallo, 2021b)

Alaz	*Aristida lazaridis* (P2)
Ena	*Eremophila naaykensii* (P3)
Efe	*Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
RspH	*Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
Radl	*Rostellularia adscendens* var. *latifolia* (P3)



APPENDIX J

Detailed Mapping of Vegetation Types and Significant Flora Locations of the Study Area

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&V\F. R03\22187_015_DETAILED_VT_SIGFLORA.MXD 4/11/2022 11:27:56 AM

683000 684000 7475000 7474000 7473000

K25 K28 K26 Radl K27 Sex C53 7 1 C09 Sex CR02 2 K48 Sex C07 Sex C08 K52 9 Csp K08

Scale 1:10000 at A3

0 200 400 Meters

GDA2020 MGA Zone 50

Legend

- Study Area
- Proposed Development Envelope
- Quadrat
- Relevé

Vegetation Types

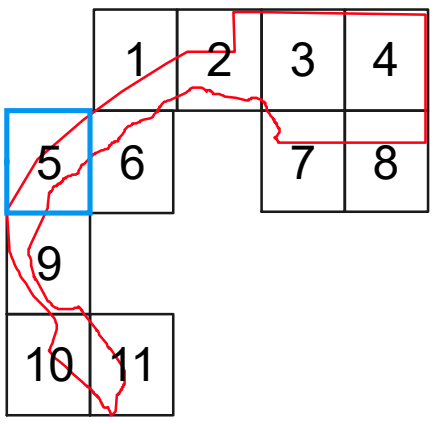
- 1
- 2
- 7
- 9

Significant Flora (Umwelt, 2022)

- Ajes *Aristida jerichoensis* var. *subspinulifera* (P3)
- Alaz *Aristida lazaridis* (P2)
- Csp *Corchorus* sp. (Potentially Undescribed)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- HspGR *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)
- Sex *Seringia exastia* (T)

Significant Flora (Rapallo, 2021b)

- Alaz *Aristida lazaridis* (P2)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)



APPENDIX J

Detailed Mapping of Vegetation Types and Significant Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Rapallo (2021), Umwelt (2022)

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&W\F_R03\22187_015_DETAILED_VT_SIGFLORA.MXD 4/11/2022 11:28:31 AM

685000 686000 687000

7475000 7474000 7473000

9 1

C27 Sex
C31
K31 Sex
C30
K30 Sex

Scale 1:10000 at A3

0 200 400 Meters

GDA2020 MGA Zone 50

Legend

- Study Area
- Proposed Development Envelope
- Quadrat

Vegetation Types

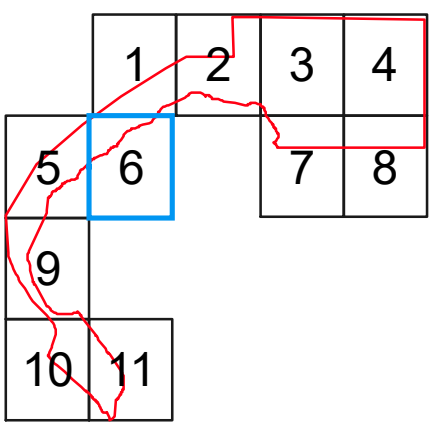
- 1
- 9

Significant Flora (Umwelt, 2022)

Ajes	*Aristida jerichoensis* var. *subspinulifera* (P3)
Alaz	*Aristida lazaridis* (P2)
Csp	*Corchorus* sp. (Potentially Undescribed)
Ena	*Eremophila naaykensii* (P3)
Efe	*Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
HspGR	*Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
RspH	*Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
Radl	*Rostellularia adscendens* var. *latifolia* (P3)
Sex	*Seringia exastia* (T)

Significant Flora (Rapallo, 2021b)

Alaz	*Aristida lazaridis* (P2)
Ena	*Eremophila naaykensii* (P3)
Efe	*Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
RspH	*Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
Radl	*Rostellularia adscendens* var. *latifolia* (P3)



APPENDIX J

Detailed Mapping of Vegetation Types and Significant Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Rapallo (2021), Umwelt (2022)

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&V\F_R03\22187_015_DETAILED_VT_SIGFLORA.MXD 4/11/2022 11:29:08 AM

691000 692000 7475000 7474000 7473000

9 2 7 1 10 K17 C34 Sex C16 Sex K18 C19 Sex K24 C15 Sex

Scale 1:10000 at A3

0 200 400 Meters

GDA2020 MGA Zone 50

Legend

- Study Area
- Proposed Development Envelope
- Quadrat

Vegetation Types

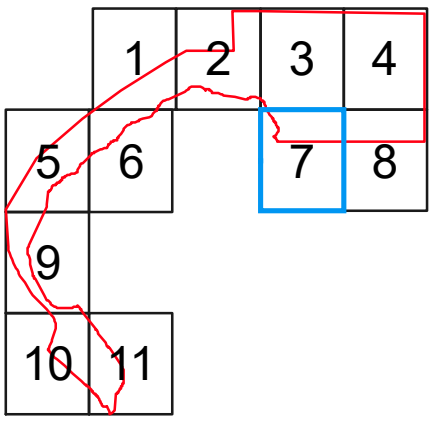
- 1
- 2
- 7
- 9
- 10

Significant Flora (Umwelt, 2022)

- Ajes *Aristida jerichoensis* var. *subspinulifera* (P3)
- Alaz *Aristida lazaridis* (P2)
- Csp *Corchorus* sp. (Potentially Undescribed)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- HspGR *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)
- Sex *Seringia exastia* (T)

Significant Flora (Rapallo, 2021b)

- Alaz *Aristida lazaridis* (P2)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)



APPENDIX J

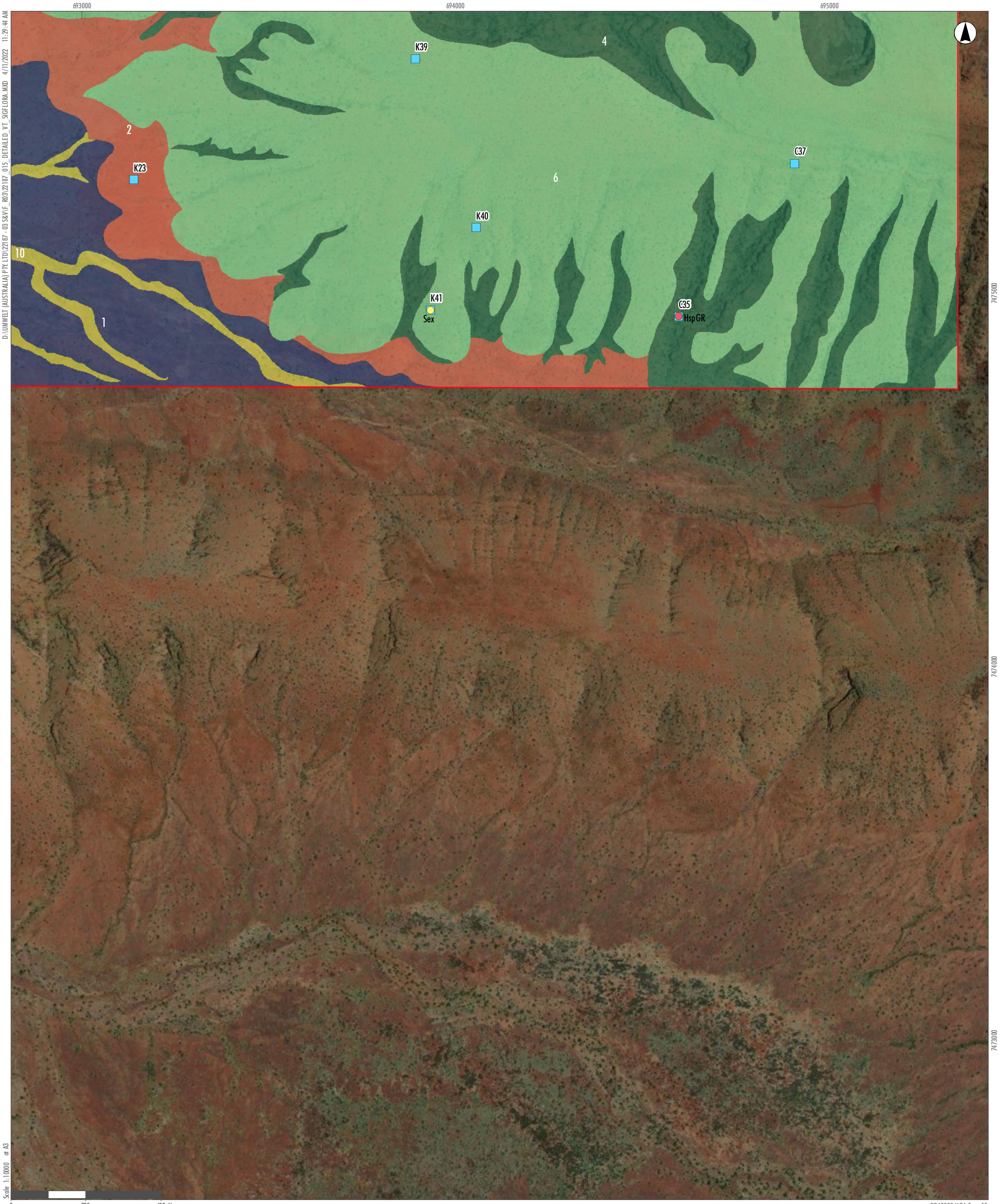
Detailed Mapping of Vegetation Types and Significant Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Rapallo (2021), Umwelt (2022)

693000 694000 695000

747500 747400 747300

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&V\F_R03\22187_015_DETAILED_VT_SIGFLORA.MXD 4/11/2022 11:29:44 AM



Scale 1:10000 at A3

0 200 400 Meters

GDA2020 MGA Zone 50

Legend

Study Area

Quadrat

Vegetation Types

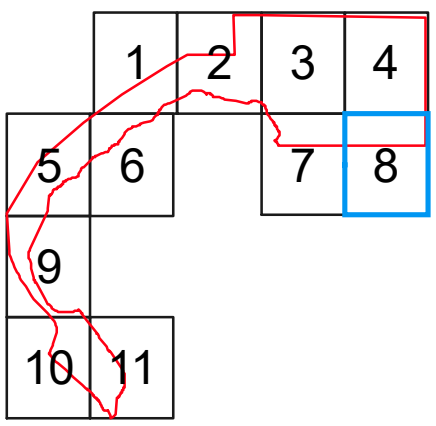
1
2
4
6
10

Significant Flora (Umwelt, 2022)

Ajes	*Aristida jerichoensis* var. *subspinulifera* (P3)
Alaz	*Aristida lazaridis* (P2)
Csp	*Corchorus* sp. (Potentially Undescribed)
Ena	*Eremophila naaykensii* (P3)
Efe	*Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
HspGR	*Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
RspH	*Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
Radl	*Rostellularia adscendens* var. *latifolia* (P3)
Sex	*Seringia exastia* (T)

Significant Flora (Rapallo, 2021b)

Alaz	*Aristida lazaridis* (P2)
Ena	*Eremophila naaykensii* (P3)
Efe	*Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
RspH	*Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
Radl	*Rostellularia adscendens* var. *latifolia* (P3)



APPENDIX J

Detailed Mapping of Vegetation Types and Significant Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Rapallo (2021), Umwelt (2022)

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&V\F_R03\22187_015_DETAILED_VT_SIGFLORA.MXD 4/11/2022 11:30:22 AM

683000

684000

7472000

7471000

7470000

C50
Sex
Csp
9
K06
Sex
K07
7
C06
C05
C02
1
K02
Sex
K03
Alaz

Scale 1:10000 at A3

0 200 400 Meters

GDA2020 MGA Zone 50

Legend

- Study Area
- Proposed Development Envelope
- Quadrat

Vegetation Types

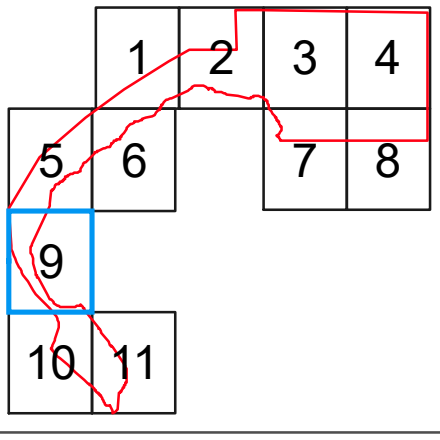
- 1
- 7
- 9

Significant Flora (Umwelt, 2022)

- Ajes *Aristida jerichoensis* var. *subspinulifera* (P3)
- Alaz *Aristida lazaridis* (P2)
- Csp *Corchorus* sp. (Potentially Undescribed)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- HspGR *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)
- Sex *Seringia exastia* (T)

Significant Flora (Rapallo, 2021b)

- Alaz *Aristida lazaridis* (P2)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)



APPENDIX J

Detailed Mapping of Vegetation Types and Significant Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Rapallo (2021), Umwelt (2022)

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&V\F_R03\22187_015_DETAILED_VT_SIGFLORA.MXD 4/11/2022 11:30:58 AM

683000 684000 7469000 7468000 7467000

RspH Alaz Q01 Q02RAP Q03 Q04 Q05RAP Q06RAP Q09 Q10RAP Q11RAP Q12RAP Q13RAP Q26 K49 Efe Q27RAP Ajes

1 9 7 C 8 3

Scale 1:10000 at A3

0 200 400 Meters

GDA2020 MGA Zone 50

Legend

- Study Area
- Proposed Development Envelope
- Quadrat
- Rapallo Quadrat (2020b)

Vegetation Types

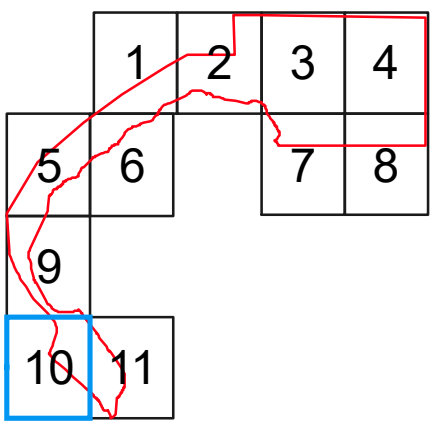
- 1
- 3
- 7
- 8
- 9
- C

Significant Flora (Umwelt, 2022)

- Ajes *Aristida jerichoensis* var. *subspinulifera* (P3)
- Alaz *Aristida lazaridis* (P2)
- Csp *Corchorus* sp. (Potentially Undescribed)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- HspGR *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)
- Sex *Seringia exastia* (T)

Significant Flora (Rapallo, 2021b)

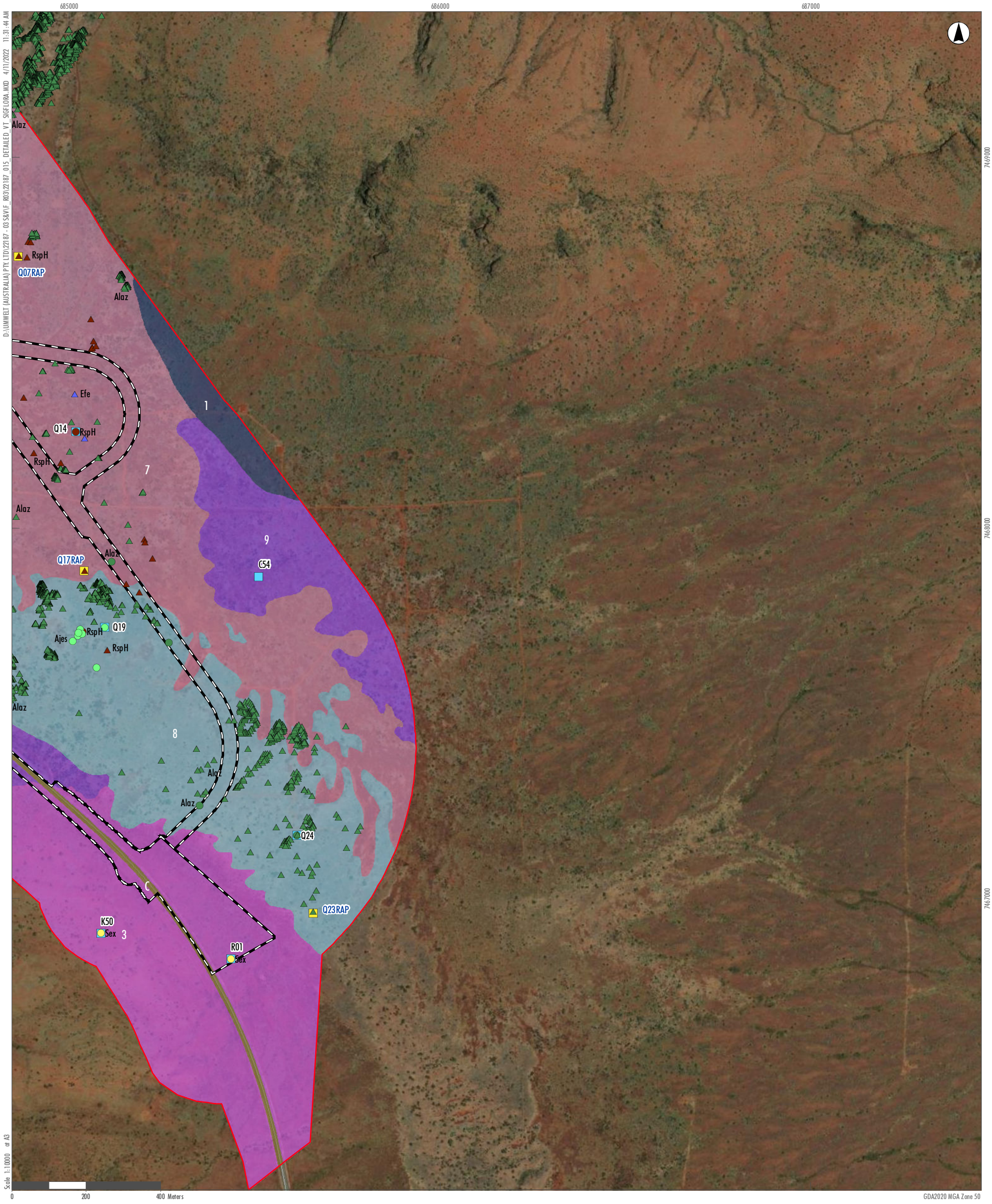
- Alaz *Aristida lazaridis* (P2)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)



APPENDIX J

Detailed Mapping of Vegetation Types and Significant Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Rapallo (2021), Umwelt (2022)



Legend

- Study Area
- Proposed Development Envelope
- Quadrat
- Rapallo Quadrat (2020b)

Vegetation Types

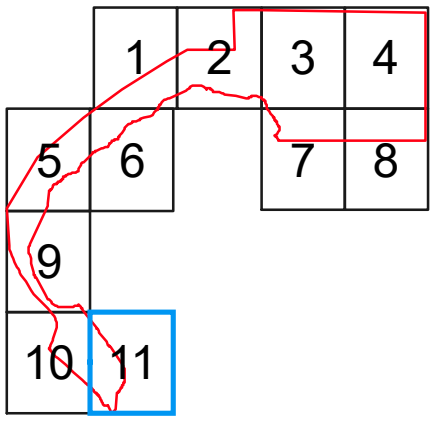
- 1
- 3
- 7
- 8
- 9
- C

Significant Flora (Umwelt, 2022)

- Ajes *Aristida jerichoensis* var. *subspinulifera* (P3)
- Alaz *Aristida lazaridis* (P2)
- Csp *Corchorus* sp. (Potentially Undescribed)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- HspGR *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)
- Sex *Seringia exastia* (T)

Significant Flora (Rapallo, 2021b)

- Alaz *Aristida lazaridis* (P2)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* s. lat. (Potentially Undescribed)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)



APPENDIX J

Detailed Mapping of Vegetation Types and Significant Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Rapallo (2021), Umwelt (2022)

APPENDIX K

Matrix of Vascular Plant Taxa Recorded within Each VT Described in the Study Area

Taxon	VT									
	1	2	3	4	5	6	7	8	9	10
Abutilon amplum										x
Abutilon cunninghamii										x
Abutilon fraseri							x			
Abutilon fraseri subsp. *fraseri*	x						x		x	x
Abutilon lepidum	x			x			x		x	x
Abutilon macrum	x						x		x	x
Abutilon otocarpum	x	x					x	x	x	
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	x			x			x			x
Acacia adoxa var. *adoxa*	x	x				x			x	x
Acacia adsurgens	x	x	x	x		x	x	x	x	x
Acacia ancistrocarpa	x	x					x		x	x
Acacia aneura	x						x		x	
Acacia aptaneura	x	x		x		x	x	x	x	x
Acacia atkinsiana	x	x	x	x			x		x	x
Acacia ayersiana							x			
Acacia bivenosa	x	x	x				x		x	x
Acacia cowleana	x	x	x			x	x	x	x	x
Acacia dictyophleba	x	x	x				x	x	x	x
Acacia elachantha	x	x					x		x	
Acacia hamersleyensis		x		x		x				
Acacia hilliana	x	x								
Acacia inaequilatera	x	x		x	x		x		x	x
Acacia maitlandii		x	x	x					x	x
Acacia marramamba			x							
Acacia minyura			x						x	

Taxon	VT									
	1	2	3	4	5	6	7	8	9	10
Acacia monticola	x	x	x	x					x	x
Acacia pachyacra							x	x	x	
Acacia pruinocarpa	x	x	x	x		x	x		x	x
Acacia pyrifolia var. *pyrifolia*	x	x	x	x		x	x			x
Acacia rhodophloia x sibirica			x							
Acacia sericophylla										x
Acacia sibirica		x					x		x	
Acacia steedmanii subsp. *borealis*	x								x	
Acacia synchronicia	x									
Acacia tenuissima	x	x	x		x	x	x	x	x	x
Acacia tetragonophylla	x				x					
Acacia tumida var. *pilbarensis*	x			x		x	x		x	x
Afrohybanthus aurantiacus	x			x		x	x	x	x	x
Alternanthera nana				x			x	x	x	x
Amaranthus cuspidifolius				x			x		x	
Amaranthus undulatus				x						
Amphipogon sericeus	x	x	x							
?Androcalva loxophylla	x								x	
Androcalva luteiflora	x	x		x					x	x
Anthobolus leptomerioides							x	x	x	x
Areocleome oxalidea								x		
Aristida burbidgeae				x						
Aristida contorta	x	x		x	x		x	x	x	x
Aristida holathera var. *holathera*	x	x	x		x	x	x		x	x
Aristida inaequiglumis	x	x	x				x	x	x	x

Taxon	VT									
	1	2	3	4	5	6	7	8	9	10
Aristida jerichoensis var. *subspinulifera* (P3)								x		
Aristida lazaridis (P2)							x	x		
Aristida obscura	x			x			x			x
Aristida pruinosa	x	x								
Arivela viscosa	x	x		x	x	x	x	x	x	x
Astrotricha hamptonii				x						
Atalaya hemiglauca					x					x
**Bidens bipinnata*	x			x		x	x	x	x	x
Boerhavia coccinea	x			x	x	x	x	x	x	x
Boerhavia repleta				x			x	x	x	x
Boerhavia schomburgkiana							x			
Bonamia erecta	x						x		x	x
Bonamia pilbarensis										x
Bothriochloa ewartiana	x				x		x		x	x
Brachychiton acuminatus				x						
Bulbostylis barbata				x				x		x
Capparis lasiantha	x	x		x			x	x	x	x
Capparis mitchellii				x						
Capparis spinosa subsp. *nummularia*				x						
Cassytha capillaris	x	x				x				x
**Cenchrus ciliaris*	x			x			x			x
**Cenchrus setiger*							x			x
Cheilanthes brownii				x		x				
Cheilanthes contigua		x			x	x				x
Cheilanthes sieberi subsp. *sieberi*				x		x	x	x	x	

Taxon	VT									
	1	2	3	4	5	6	7	8	9	10
Chrysocephalum apiculatum subsp. *pilbarense*							x			
Chrysocephalum gilesii								x		
Chrysopogon fallax	x		x				x	x	x	x
Clerodendrum floribundum var. *angustifolium*	x	x		x		x	x			x
Codonocarpus cotinifolius	x	x				x			x	
Commelina ensifolia							x			
Corchorus crozophorifolius	x									x
Corchorus incanus subsp. *lithophilus*	x	x			x	x			x	x
Corchorus laniflorus				x		x				
Corchorus lasiocarpus subsp. *parvus*	x	x		x		x	x		x	x
Corchorus tridens							x			
Corchorus sp. (potentially undescribed)									x	
Corymbia deserticola subsp. *deserticola*	x	x	x				x		x	
Corymbia ferriticola				x						
Corymbia hamersleyana	x	x	x	x	x	x	x		x	x
Crotalaria medicaginea var. *neglecta*	x			x					x	x
Cucumis variabilis	x	x		x			x	x	x	x
Cullen leucochaites				x	x					
Cymbopogon ambiguus	x	x	x	x	x	x	x		x	x
Cymbopogon obtectus	x	x	x			x	x	x	x	x
Cynanchum pedunculatum				x		x			x	
Cynanchum viminale subsp. *australe*				x			x			
Cyperus cunninghamii subsp. *cunninghamii*				x						
Dactyloctenium radulans							x			
Dampiera candicans	x	x								

Taxon	VT									
	1	2	3	4	5	6	7	8	9	10
Dendrophyllanthus erwinii	x						x			x
Dichanthium sericeum subsp. *humilius*								x		
Digitaria ammophila				x			x	x	x	x
Digitaria brownii	x	x	x				x	x	x	x
Digitaria ctenantha							x			x
Diplatia grandibractea				x						
Dodonaea coriacea	x	x				x			x	
Dodonaea lanceolata var. *lanceolata*	x					x				x
Dodonaea pachyneura				x						
Dodonaea petiolaris	x						x		x	
Dodonaea viscosa subsp. *mucronata*				x		x				
Dolichocarpa crouchiana	x	x				x				
Duperreya commixta	x	x		x		x	x	x	x	x
Dysphania glomulifera subsp. *eremaea*								x		
Dysphania kalpari							x	x		
Dysphania rhadinostachya		x		x		x	x			
Dysphania rhadinostachya subsp. *inflata*							x			
?Enchylaena tomentosa							x			
Enneapogon caerulescens	x	x			x		x			x
Enneapogon lindleyanus	x			x	x		x	x	x	x
Enneapogon polyphyllus	x	x		x	x	x	x	x	x	x
Enneapogon robustissimus				x			x		x	x
Eragrostis cumingii										x
Eragrostis eriopoda	x	x					x		x	x
Eragrostis pergracilis								x		

Taxon	VT									
	1	2	3	4	5	6	7	8	9	10
Eragrostis setifolia							x	x		
Eragrostis tenellula				x						
Eremophila forrestii subsp. *forrestii*	x	x					x		x	
Eremophila fraseri subsp. *fraseri*	x						x		x	
Eremophila jucunda subsp. *pulcherrima*		x		x		x				
Eremophila lanceolata								x		
Eremophila latrobei subsp. *filiformis*	x	x			x		x	x	x	
Eremophila latrobei × *forrestii*	x									
Eremophila longifolia	x				x		x	x	x	x
Eremophila naaykensii (P3)				x						
Eremophila petrophila subsp. *petrophila*				x						
Eriachne aristidea										x
Eriachne lanata	x									
Eriachne mucronata	x	x	x	x	x	x	x		x	x
Eriachne pulchella subsp. *dominii*	x	x	x		x	x	x		x	x
Eriachne pulchella subsp. *pulchella*							x			
Eriachne tenuiculmis	x			x						x
Eriachne sp. Dugald River (B.K. Simon+ 3007)		x								x
Eucalyptus gamophylla	x	x	x				x		x	x
Eucalyptus kingsmillii						x				
Eucalyptus leucophloia subsp. *leucophloia*	x	x	x	x	x	x	x		x	x
Eucalyptus xerothermica							x	x		x
Eulalia aurea	x	x	x			x	x	x	x	x
Euphorbia australis var. *subtomentosa*		x					x			x
Euphorbia australis var. *hispidula*	x	x					x		x	

Taxon	VT									
	1	2	3	4	5	6	7	8	9	10
Euphorbia biconvexa				x	x		x	x	x	x
Euphorbia coghlanii							x			
Euphorbia drummondii							x			
Euphorbia ferdinandi s. lat.								x		
Euphorbia aff. *ferdinandi*							x	x		
Euphorbia tannensis subsp. *eremophila*	x			x			x		x	x
Euphorbia trigonosperma		x		x		x	x		x	
Euploca cunninghamii	x	x					x		x	x
Euploca pachyphylla	x									x
Euploca tanythrix	x	x					x		x	x
Evolvulus alsinoides	x	x	x	x			x	x	x	x
Evolvulus alsinoides var. *villosicalyx*							x	x	x	
Evolvulus alsinoides var. *decumbens*							x		x	x
Ficus brachypoda				x						
Fimbristylis dichotoma	x	x			x	x		x	x	x
Fimbristylis simulans	x	x								x
Glycine canescens				x			x		x	x
Gompholobium oreophilum	x	x	x							x
Gomphrena canescens subsp. *canescens*	x	x					x		x	x
Gomphrena cunninghamii		x		x		x	x			x
Gomphrena kanisii							x			
Goodenia microptera	x	x					x		x	x
Goodenia muelleriana	x	x			x	x	x		x	
Goodenia nuda								x		
Goodenia prostrata							x	x		

Taxon	VT									
	1	2	3	4	5	6	7	8	9	10
Goodenia stellata	x						x		x	x
Goodenia stobbsiana	x	x	x	x		x			x	x
Goodenia triodiophila	x	x			x	x				x
Gossypium australe	x	x		x	x		x		x	x
Gossypium robinsonii	x	x		x	x	x	x		x	x
Grevillea berryana		x						x		
Grevillea pyramidalis subsp. *leucadendron*					x					
Grevillea wickhamii subsp. *hispidula*	x	x		x	x	x	x		x	x
Hakea chordophylla	x	x	x	x		x	x		x	x
Hakea loreus subsp. *loreus*	x				x		x	x	x	x
Hibiscus burtonii	x	x					x	x	x	
Hibiscus coatesii	x	x		x	x	x	x	x	x	x
Hibiscus leptocladus	x									
Hibiscus sturtii var. *platychlamys*	x						x		x	x
Hibiscus sturtii var. *campylochlamys*	x	x			x		x		x	x
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)				x						
Indigofera fractiflexa subsp. *fractiflexa*				x		x				
Indigofera georgei	x						x	x	x	x
Indigofera monophylla	x	x	x	x	x	x	x		x	x
Indigofera rugosa					x					
Ipomoea polymorpha							x			
Iseilema macratherum								x		
Iseilema membranaceum				x			x	x		
Isotropis iophyta							x		x	x
Jasminum didymum subsp. *lineare*	x	x		x	x	x	x		x	x

Taxon	VT									
	1	2	3	4	5	6	7	8	9	10
Leiocarpa semicalva subsp. *semicalva*				x						x
Lepidium pedicellosum	x									
Lysiana murrayi							x	x		
Maireana planifolia							x	x		
Maireana villosa	x						x	x	x	x
**Malvastrum americanum*							x			x
Maytenus sp. Mt Windell (S. van Leeuwen 846)	x				x					
Melhania oblongifolia	x			x	x		x		x	x
Mirbelia viminalis		x				x				
Mnesithea formosa	x	x			x		x			x
Nellica maderaspatensis				x						x
Newcastelia clavipetala				x		x				
Nicotiana benthamiana				x						
Notoleptopus decaisnei									x	x
Olearia xerophila				x						
Panicum decompositum							x	x		
Panicum effusum							x	x	x	
Paraneurachne muelleri	x	x	x	x		x	x		x	x
Paspalidium clementii		x		x			x			
Paspalidium rarum							x	x		x
Paspalidium tabulatum				x						
Peripleura obovata							x		x	
Peripleura virgata							x			
Perotis rara	x			x			x	x	x	x
Petalostylis labicheoides	x	x				x				

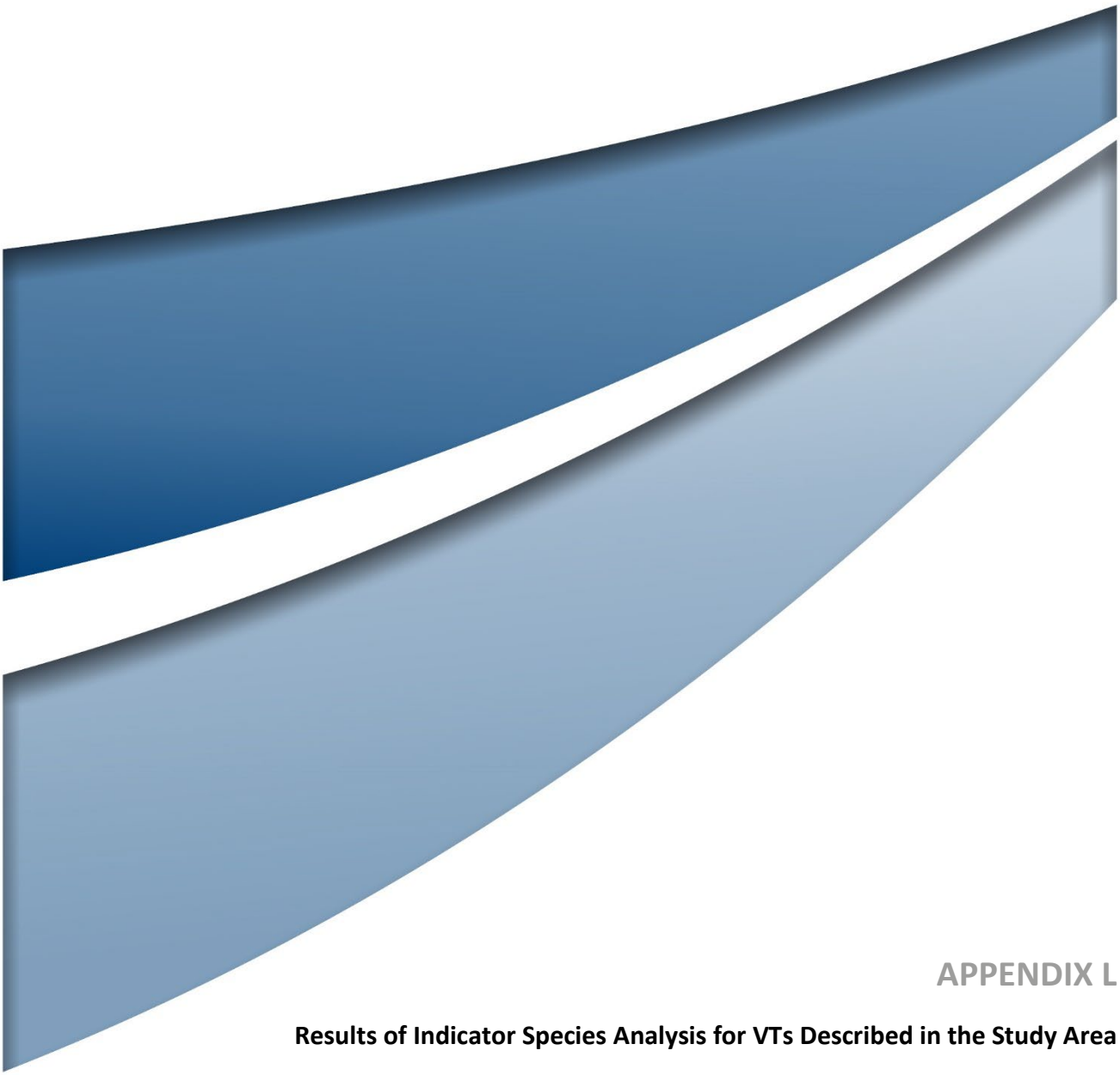
Taxon	VT									
	1	2	3	4	5	6	7	8	9	10
Pimelea forrestiana				x		x				
Pluchea dentex	x			x						
Pluchea tetranthera								x		
Polycarpaea corymbosa var. *corymbosa*			x				x			
Polycarpaea holtzei		x								
Polycarpaea longiflora		x		x	x	x				x
Polygala glaucifolia							x		x	
Polymeria ambigua										x
Portulaca oleracea	x						x	x		x
**Portulaca pilosa*		x								
Prostanthera albiflora				x						
Psydrax latifolia	x			x		x	x	x	x	
Psydrax rigidula	x						x			
Psydrax suaveolens	x	x					x		x	
Pterocaulon serrulatum var. *velutinum*				x						
Pterocaulon sphacelatum	x			x			x	x	x	x
Ptilotus astrolasius	x	x		x		x	x		x	x
Ptilotus calostachyus	x	x	x		x	x	x		x	x
Ptilotus ?carinatus	x	x					x	x	x	x
Ptilotus clementii	x	x								
Ptilotus exaltatus	x						x	x	x	x
Ptilotus fusiformis				x						
Ptilotus gaudichaudii							x	x		
Ptilotus helipteroides							x	x	x	x
Ptilotus obovatus							x	x		

Taxon	VT									
	1	2	3	4	5	6	7	8	9	10
Ptilotus obovatus var. *obovatus*	x	x	x			x	x	x	x	x
Ptilotus rotundifolius	x	x	x			x	x		x	
Ptilotus schwartzii var. *schwartzii*								x		
Rhagodia eremaea	x						x		x	x
Rhagodia sp. Hamersley (M. Trudgen 17794) (P3)							x			
Rhynchosia minima	x	x		x	x		x		x	x
Salsola australis							x			x
Santalum lanceolatum	x	x		x	x	x	x		x	x
Scaevola amblyanthera var. *centralis*										x
Scaevola browniana subsp. *browniana*						x				
Scaevola parvifolia subsp. *pilbarae*	x	x	x				x		x	x
Scaevola parvifolia subsp. *parvifolia*							x			
Scaevola spinescens	x				x					x
Schizachyrium fragile	x	x	x	x		x	x	x	x	x
Sclerolaena cornishiana	x						x			
Sclerolaena tetragona								x		
Senna artemisioides subsp. *helmsii*	x	x				x	x		x	x
Senna artemisioides subsp. *oligophylla*	x	x	x	x	x	x	x		x	x
Senna artemisioides subsp. *x artemisioides*							x		x	
Senna ferraria	x	x		x		x				x
Senna glaucifolia	x	x		x	x	x	x		x	x
Senna glutinosa subsp. *glutinosa*	x	x	x	x	x	x	x		x	x
Senna glutinosa subsp. *x luerssenii*	x	x					x		x	x
Senna glutinosa subsp. *pruinosa*	x	x	x		x	x	x		x	x
Senna notabilis	x	x	x				x	x	x	x

Taxon	VT									
	1	2	3	4	5	6	7	8	9	10
Senna pleurocarpa var. *pleurocarpa*	x		x				x			
Senna pleurocarpa var. *angustifolia*							x			
Senna stricta	x									
Senna symonii	x									
Senna venusta				x						
Seringia exastia (T)	x	x	x			x			x	x
Setaria surgens				x			x	x		x
**Setaria verticillata*							x			x
Sida arenicola	x	x	x						x	x
Sida cardiophylla	x	x							x	
Sida echinocarpa	x	x				x	x		x	x
Sida ectogama							x			
Sida fibulifera							x		x	
Sida platycalyx							x	x		
Sida sp. Articulation below (A.A. Mitchell PRP 1605)	x	x					x			
Sida sp. dark green fruits (S. van Leeuwen 2260)							x			
Sida sp. Excedentifolia (J.L. Egan 1925)		x		x		x				
Sida sp. L (A.M. Ashby 4202)	x						x	x	x	x
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	x	x								
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)				x		x				
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	x	x		x	x		x		x	x
Sida sp. Supplejack Station (T.S. Henshall 2345)	x						x		x	x
Solanum cleistogamum	x			x	x	x	x		x	x
Solanum ferocissimum							x		x	
Solanum gabrielae				x						

Taxon	VT									
	1	2	3	4	5	6	7	8	9	10
Solanum ?horridum							x			
Solanum lasiophyllum	x	x	x	x	x	x	x	x	x	x
Solanum phlomoides	x	x		x		x	x		x	x
Spermacoce brachystema							x	x		
Sporobolus australasicus	x						x			
Stemodia grossa				x	x		x	x		x
Stenopetalum nutans								x		
Streptoglossa bubakii	x									
Streptoglossa decurrens							x			x
Stylobasium spathulatum				x						x
**Stylosanthes hamata*								x		
?Swainsona decurrens					x					
Tephrosia densa	x	x		x			x		x	x
Tephrosia oxalidea	x	x								
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	x				x		x		x	x
Tephrosia virens		x								x
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	x								x	x
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	x				x		x		x	x
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	x									
Teucrium teucriiflorum				x			x	x		
Themeda triandra					x		x	x		
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	x	x		x	x	x	x	x	x	x
Tinospora smilacina				x	x	x				
Trachymene oleracea subsp. *oleracea*	x									x
Tragus australianus							x			

Taxon	VT									
	1	2	3	4	5	6	7	8	9	10
Trianthema glossostigmum	x									
Tribulus astrocarpus							x	x		
Tribulus macrocarpus							x		x	x
Tribulus suberosus	x	x					x	x	x	
**Tribulus terrestris*							x			
Trichodesma zeylanicum var. *zeylanicum*	x	x		x	x		x	x	x	x
Triodia biflora				x		x				
Triodia melvillei			x				x	x	x	
Triodia pungens	x	x	x	x		x	x		x	x
Triodia vanleeuwenii	x	x			x		x		x	x
Triodia wiseana	x	x	x	x	x	x		x	x	x
Tripogonella loliiformis				x						
Triumfetta leptacantha				x						
Triumfetta maconochieana				x		x				
Urochloa occidentalis var. *ciliata*							x			
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)				x			x		x	
Vincetoxicum lineare	x						x	x	x	x
Waltheria indica							x			x



APPENDIX L

Results of Indicator Species Analysis for VTs Described in the Study Area

Note: Shading denotes highest INDVAL values per taxon and VT. INDVAL values are only shown for taxa that were significant at $p < 0.05$. p values are indicated by:

* = $p < 0.05$

** = $p < 0.01$

*** = $p < 0.001$.

Taxon	INDVAL Value (%)									
	1	2	3	4	5	6	7	8	9	10
*Ptilotus rotundifolius***	29	11	11	0	0	1	0	0	5	0
Senna glutinosa subsp. x *luerssenii****	43	1	0	0	0	0	1	0	11	6
Acacia adoxa var. *adoxa****	9	49	0	0	0	1	0	0	0	10
*Acacia hilliana****	0	78	0	0	0	0	0	0	0	0
*Fimbristylis simulans**	4	32	0	0	0	0	0	0	0	1
*Goodenia stobbsiana**	3	25	25	6	0	3	0	0	5	3
*Goodenia triodiophila****	3	42	0	0	5	19	0	0	0	0
*Ptilotus calostachyus***	15	19	19	0	8	1	1	0	9	8
*Triodia vanleeuwenii****	30	39	0	0	4	0	0	0	1	1
*Acacia adsurgens**	1	1	37	1	0	0	0	1	5	8
*Acacia atkinsiana****	19	5	28	1	0	0	1	0	22	0
*Acacia minyura**	0	0	45	0	0	0	0	0	1	0
*Acacia tenuissima, Acacia pachyacra**	3	0	30	0	3	1	2	5	7	1
*Amphipogon sericeus****	10	2	63	0	0	0	0	0	0	0
*Gompholobium oreophilum***	1	11	60	0	0	0	0	0	0	0
*Schizachyrium fragile**	1	4	31	3	0	6	1	1	2	2
Senna glutinosa subsp. *pruinosa***	11	23	30	0	3	1	0	0	0	1

Taxon	INDVAL Value (%)									
	1	2	3	4	5	6	7	8	9	10
Senna pleurocarpa var. *angustifolia*, *Senna pleurocarpa* var. *pleurocarpa**	0	0	44	0	0	0	0	0	0	0
Seringia exastia (T)***	11	9	36	0	0	0	0	0	2	5
*Triodia pungens**	10	1	18	12	0	5	7	0	12	14
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)*	0	0	0	30	0	0	0	0	0	9
*Amaranthus undulatus****	0	0	0	50	0	0	0	0	0	0
*Aristida burbidgeae****	0	0	0	100	0	0	0	0	0	0
*Astrotricha hamptonii**	0	0	0	33	0	0	0	0	0	0
*Brachychiton acuminatus**	0	0	0	33	0	0	0	0	0	0
*Capparis mitchellii****	0	0	0	67	0	0	0	0	0	0
Capparis spinosa subsp. *nummularia****	0	0	0	100	0	0	0	0	0	0
*Corymbia ferriticola****	0	0	0	67	0	0	0	0	0	0
*Corchorus laniflorus***	0	0	0	74	0	1	0	0	0	0
*Cucumis variabilis**	0	0	0	27	0	0	16	27	1	11
*Cymbopogon ambiguus**	2	9	0	28	12	5	1	0	0	6
*Cynanchum pedunculatum****	0	0	0	78	0	4	0	0	0	0
Cyperus cunninghamii subsp. *cunninghamii****	0	0	0	100	0	0	0	0	0	0
*Dodonaea pachyneura**	0	0	0	33	0	0	0	0	0	0
Dodonaea viscosa subsp. *mucronata***	0	0	0	50	0	6	0	0	0	0
Eremophila naaykensii (P3)*	0	0	0	33	0	0	0	0	0	0
Eremophila petrophila subsp. *petrophila**	0	0	0	33	0	0	0	0	0	0
*Euphorbia trigonosperma***	0	0	0	74	0	1	0	0	0	0
*Ficus brachypoda***	0	0	0	50	0	0	0	0	0	0

Taxon	INDVAL Value (%)									
	1	2	3	4	5	6	7	8	9	10
*Gomphrena cunninghamii***	0	0	0	42	0	1	0	0	0	3
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)*	0	0	0	33	0	0	0	0	0	0
*Paspalidium clementii***	0	0	0	68	0	0	1	0	0	0
*Ptilotus astrolasius****	14	1	0	23	0	1	2	0	18	19
*Senna venusta****	0	0	0	83	0	0	0	0	0	0
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)**	0	0	0	54	0	15	0	0	0	0
*Solanum cleistogamum**	0	0	0	37	6	1	1	0	3	2
*Solanum gabrielae***	0	0	0	50	0	0	0	0	0	0
*Stylobasium spathulatum**	0	0	0	37	0	0	0	0	0	5
*Tinospora smilacina***	0	0	0	54	9	1	0	0	0	0
*Triodia biflora**	0	0	0	41	0	2	0	0	0	0
*Triumfetta leptacantha**	0	0	0	33	0	0	0	0	0	0
*Triumfetta maconochieana***	0	0	0	74	0	1	0	0	0	0
*Acacia inaequilatera****	6	8	0	1	42	0	0	0	2	0
*Fimbristylis dichotoma**	1	11	0	0	35	15	0	1	1	0
Tephrosia sp. Newman (A.A. Mitchell PRP 29)*	1	0	0	0	35	0	1	0	1	6
*Cassytha capillaris***	0	1	0	0	0	42	0	0	0	1
*Cheilanthes brownii***	0	0	0	20	0	47	0	0	0	0
*Eucalyptus kingsmillii**	0	0	0	0	0	33	0	0	0	0
Scaevola browniana subsp. *browniana***	0	0	0	0	0	56	0	0	0	0
*Acacia aptaneura, Acacia aneura****	1	1	0	1	0	0	30	30	12	0
*Acacia ayersiana, Acacia acradenia, Acacia ?ayersiana**	0	0	0	0	0	0	32	0	0	0

Taxon	INDVAL Value (%)									
	1	2	3	4	5	6	7	8	9	10
*Acacia pruinocarpa***	0	3	8	8	0	0	26	0	11	1
*Dactyloctenium radulans**	0	0	0	0	0	0	36	0	0	0
*Duperreya commixta****	9	1	0	13	0	0	19	7	19	15
*Enneapogon polyphyllus**	2	2	0	8	18	0	18	3	11	15
*Enneapogon robustissimus**	0	0	0	2	0	0	33	0	5	3
*Maireana villosa****	0	0	0	0	0	0	47	2	21	0
*Perotis rara***	0	0	0	4	0	0	29	13	6	10
*Ptilotus helipteroides**	0	0	0	0	0	0	32	4	5	1
*Salsola australis**	0	0	0	0	0	0	33	0	0	2
*Sclerolaena cornishiana**	0	0	0	0	0	0	33	0	0	0
*Abutilon otocarpum****	0	0	0	0	0	0	31	40	11	0
*Alternanthera nana***	0	0	0	1	0	0	11	31	13	21
*Aristida inaequiglumis**	2	0	22	0	0	0	19	22	13	5
*Chrysopogon fallax***	0	0	8	0	0	0	24	31	5	4
*Digitaria ammophila***	0	0	0	2	0	0	1	51	1	1
*Eremophila lanceolata**	0	0	0	0	0	0	0	40	0	0
*Goodenia nuda**	0	0	0	0	0	0	0	40	0	0
*Panicum effusum, Panicum decompositum**	0	0	0	0	0	0	13	29	4	0
*Ptilotus obovatus***	4	2	6	0	0	1	18	23	4	9
*Sida platycalyx***	0	0	0	0	0	0	3	47	0	0
Sida sp. L (A.M. Ashby 4202)***	0	0	0	0	0	0	26	34	12	5
*Goodenia microptera**	9	5	0	0	0	0	1	0	25	25
*Hibiscus burtonii****	2	0	0	0	0	0	34	2	39	0

Taxon	INDVAL Value (%)									
	1	2	3	4	5	6	7	8	9	10
Hibiscus sturtii var. *platychlamys****	3	0	0	0	0	0	19	0	33	20
*Paraneurachne muelleri****	13	7	18	0	0	2	9	0	18	15
*Vincetoxicum lineare**	3	0	0	0	0	0	2	3	34	2
*Afrohybanthus aurantiacus****	2	0	0	9	0	2	1	2	5	38
Androcalva luteiflora, *?Androcalva loxophylla**	3	0	0	2	0	0	0	0	4	32
*Bonamia erecta**	8	0	0	0	0	0	0	0	5	26
*Corchorus crozophorifolius**	0	0	0	0	0	0	0	0	0	36
*Corymbia hamersleyana**	1	5	0	7	3	26	0	0	1	26
Crotalaria medicaginea var. *neglecta***	0	0	0	3	0	0	0	0	1	51
Dodonaea lanceolata var. *lanceolata**	1	0	0	0	0	2	0	0	0	31
Euphorbia australis var. *subtomentosa**	0	0	0	0	0	0	10	0	0	26
Evolvulus alsinoides var. *decumbens*, *Evolvulus alsinoides* var. *villosicalyx***	2	1	5	5	0	0	19	8	10	21
Gomphrena canescens subsp. *canescens***	0	0	0	0	0	0	13	0	2	44
*Gossypium australe**	0	1	0	1	6	0	2	0	3	34
*Indigofera monophylla***	15	14	21	1	2	0	0	0	6	21
*Melhania oblongifolia**	1	0	0	1	5	0	4	0	4	33
*Nellica maderaspatensis**	0	0	0	13	0	0	0	0	0	34
*Polymeria ambigua**	0	0	0	0	0	0	0	0	0	36
Senna artemisioides subsp. *oligophylla***	11	11	4	2	17	0	6	0	7	17
*Setaria surgens***	0	0	0	2	0	0	0	4	0	47
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)****	3	3	0	1	3	0	10	0	11	31
Themeda sp. Mt Barricade (M.E. Trudgen 2471), *Themeda triandra**	4	0	0	5	8	1	17	19	4	19

Taxon	INDVAL Value (%)									
	1	2	3	4	5	6	7	8	9	10
*Waltheria indica***	0	0	0	0	0	0	0	0	0	51

APPENDIX M

Detailed Vegetation Condition Mapping and Introduced Flora Locations of the Study Area

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&WF_R03\22187_016_DETAILED_CONDITION_INTRODUCEDFLORA.MXD 10/11/2022 5:58:37 PM

685000 686000 687000

7478000 7477000 7476000

Ppi

Scale 1:10000 at A3

0 200 400 Meters

GDA2020 MGA Zone 50

Legend

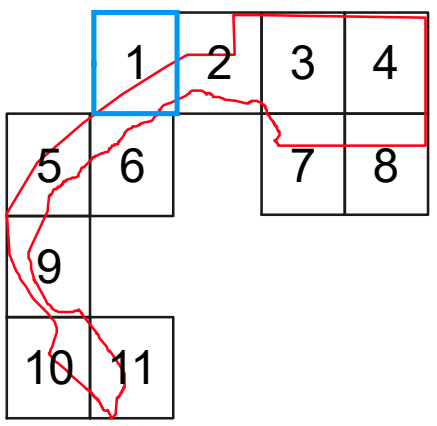
- Study Area
- Proposed Development Envelope

Vegetation Condition

- Excellent
- Very Good

Introduced Flora Taxa (Umwelt 2022)

- Bib **Bidens bipinnata*
- Cec **Cenchrus ciliaris*
- Cse **Cenchrus setiger*
- Maa **Malvastrum americanum*
- Ppi **Portulaca pilosa*
- Sev **Setaria verticillata*
- Trt **Tribulus terrestris*



APPENDIX M

Detailed Vegetation Condition Mapping and Introduced Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Umwelt (2022)

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&WF_R03\22187_016_DETAILED_CONDITION_INTRODUCEDFLORA.MXD 10/11/2022 5:59:09 PM

Legend

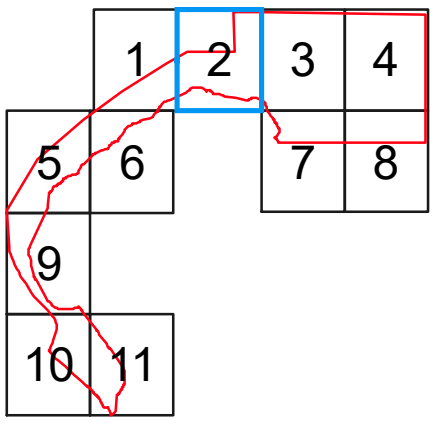
- Study Area
- Proposed Development Envelope

Vegetation Condition

- Excellent
- Very Good

Introduced Flora Taxa (Umwelt 2022)

- Bib **Bidens bipinnata*
- Cec **Cenchrus ciliaris*
- Cse **Cenchrus setiger*
- Maa **Malvastrum americanum*
- Ppi **Portulaca pilosa*
- Sev **Setaria verticillata*
- Trt **Tribulus terrestris*



APPENDIX M

Detailed Vegetation Condition Mapping and Introduced Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Umwelt (2022)

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&WF_R03\22187_016_DETAILED_CONDITION_INTRODUCEDFLORA.MXD 10/11/2022 5:59:42 PM

691000 692000 7478000 7477000 7476000

Bib Sev Cec Maa Cse Trt

Scale 1:10000 at A3

0 200 400 Meters

GDA2020 MGA Zone 50

Legend

Study Area
Proposed Development Envelope

Vegetation Condition
Excellent
Very Good
Good

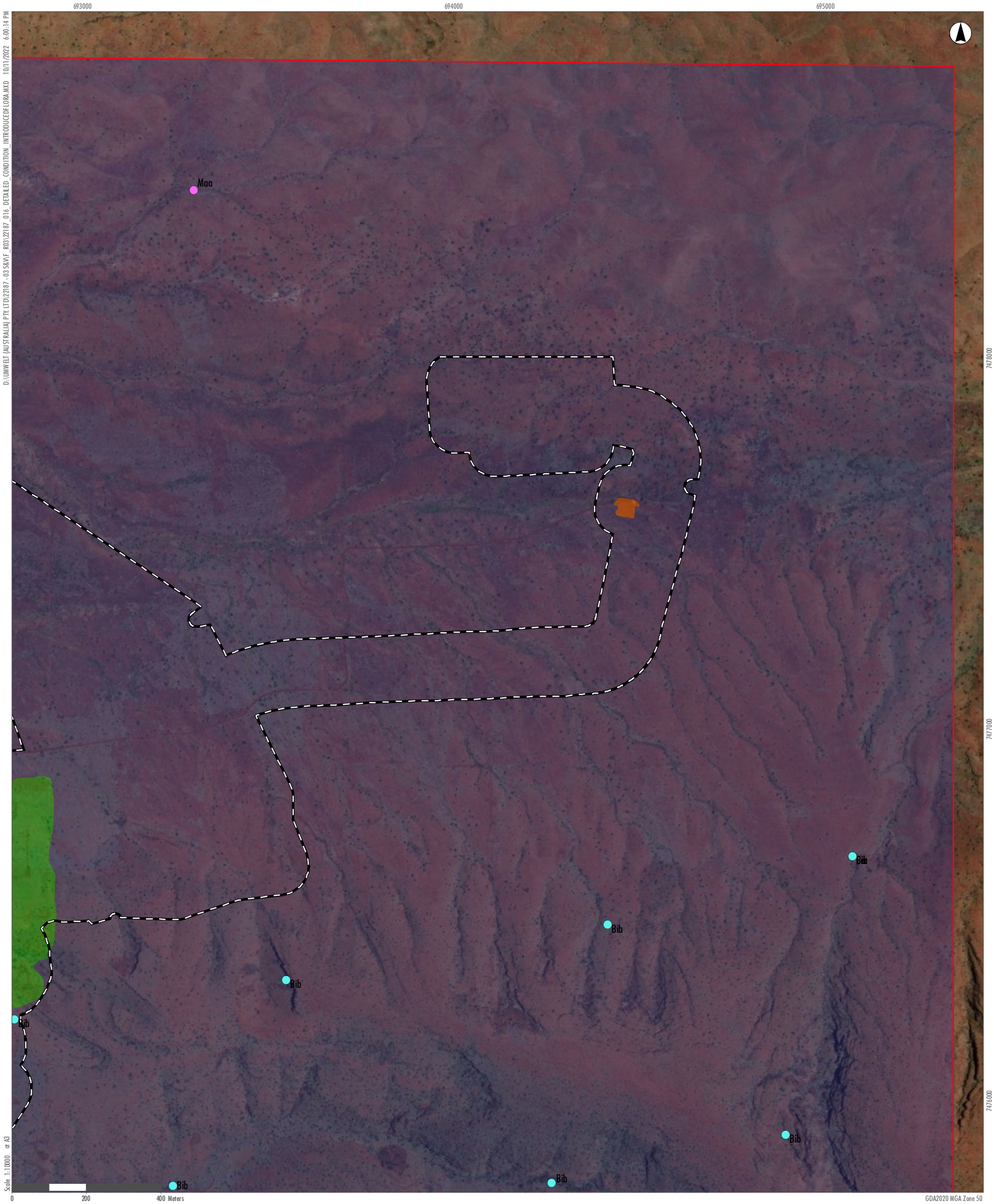
Introduced Flora Taxa (Umwelt 2022)
Bib *Bidens bipinnata
Cec *Cenchrus ciliaris
Cse *Cenchrus setiger
Maa *Malvastrum americanum
Ppi *Portulaca pilosa
Sev *Setaria verticillata
Trt *Tribulus terrestris

1 2 3 4 5 6 7 8 9 10 11

APPENDIX M

Detailed Vegetation Condition Mapping and Introduced Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Umwelt (2022)



D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&WF_R03\22187_016_DETAILED_CONDITION_INTRODUCEDFLORA.MXD 10/11/2022 6:00:14 PM

Legend

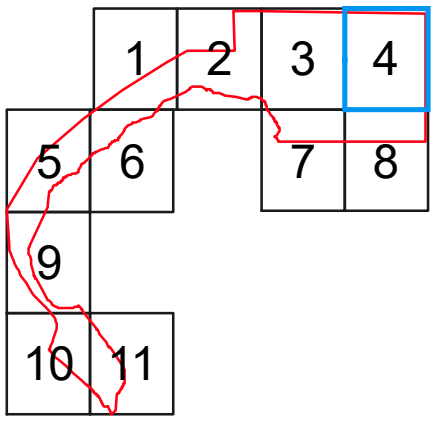
- Study Area
- Proposed Development Envelope

Vegetation Condition

- Excellent
- Very Good
- Good

Introduced Flora Taxa (Umwelt 2022)

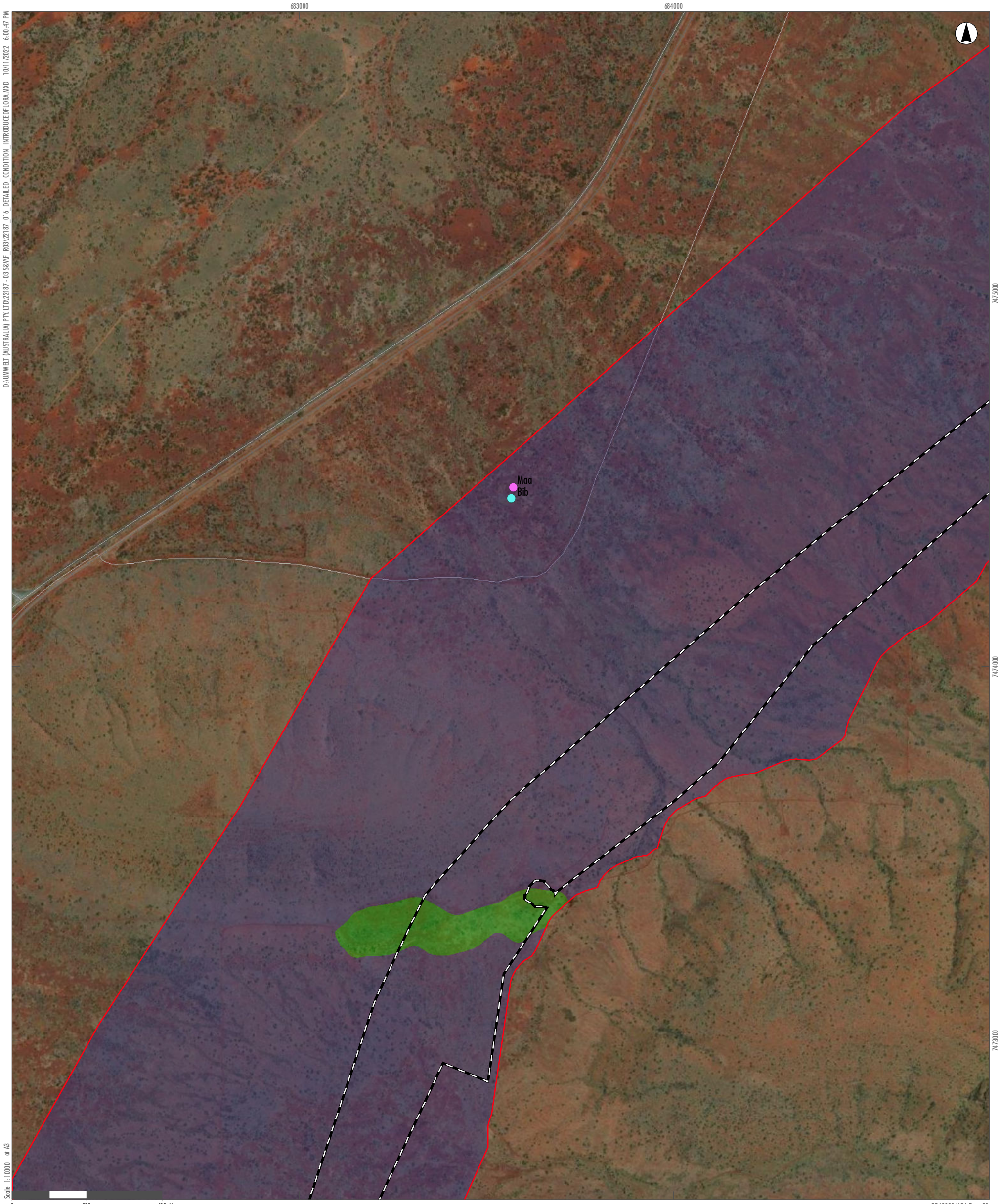
- Bib **Bidens bipinnata*
- Cec **Cenchrus ciliaris*
- Cse **Cenchrus setiger*
- Maa **Malvastrum americanum*
- Ppi **Portulaca pilosa*
- Sev **Setaria verticillata*
- Trt **Tribulus terrestris*



APPENDIX M

Detailed Vegetation Condition Mapping and Introduced Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Umwelt (2022)



D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&WF_R03\22187_016_DETAILED_CONDITION_INTRODUCEDFLORA.MXD 10/11/2022 6:00:47 PM

Legend

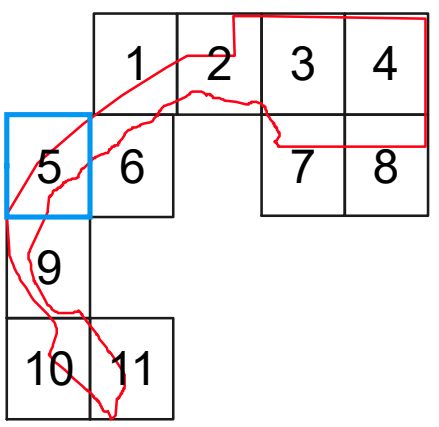
- Study Area
- Proposed Development Envelope

Vegetation Condition

- Excellent
- Very Good

Introduced Flora Taxa (Umwelt 2022)

- Bib **Bidens bipinnata*
- Cec **Cenchrus ciliaris*
- Cse **Cenchrus setiger*
- Maa **Malvastrum americanum*
- Ppi **Portulaca pilosa*
- Sev **Setaria verticillata*
- Trt **Tribulus terrestris*



APPENDIX M

Detailed Vegetation Condition Mapping and Introduced Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Umwelt (2022)

685000 686000 687000

7475000 7474000 7473000

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&WF_R03\22187_016_DETAILED_CONDITION_INTRODUCEDFLORA.MXD 10/11/2022 6:01:22 PM

Bib

Scale 1:10000 at A3

0 200 400 Meters

GDA2020 MGA Zone 50

Legend

Study Area

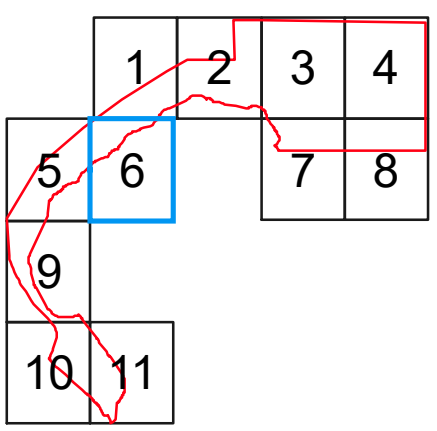
Proposed Development Envelope

Vegetation Condition

Excellent

Introduced Flora Taxa (Umwelt 2022)

- Bib **Bidens bipinnata*
- Cec **Cenchrus ciliaris*
- Cse **Cenchrus setiger*
- Maa **Malvastrum americanum*
- Ppi **Portulaca pilosa*
- Sev **Setaria verticillata*
- Trt **Tribulus terrestris*



APPENDIX M

Detailed Vegetation Condition Mapping and Introduced Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Umwelt (2022)

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&WF_R03\22187_016_DETAILED_CONDITION_INTRODUCEDFLORA.MXD 10/11/2022 6:01:54 PM

691000

692000

7475000

7474000

7473000

Cse
Cec
Bib
Maa
Sev
Cse
Cse
Sev

Scale 1:10000 at A3

0 200 400 Meters

GDA2020 MGA Zone 50

Legend

Study Area

Proposed Development Envelope

Vegetation Condition

Excellent

Very Good

Good

Introduced Flora Taxa (Umwelt 2022)

Bib **Bidens bipinnata*

Cec **Cenchrus ciliaris*

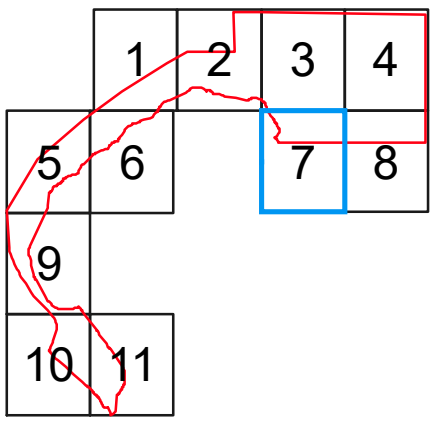
Cse **Cenchrus setiger*

Maa **Malvastrum americanum*

Ppi **Portulaca pilosa*

Sev **Setaria verticillata*

Trt **Tribulus terrestris*



APPENDIX M

Detailed Vegetation Condition Mapping and Introduced Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Umwelt (2022)

693000 694000 695000

7475000 7474000 7473000

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&WF_R03\22187_016_DETAILED_CONDITION_INTRODUCEDFLORA.MXD 10/11/2022 6:02:27 PM

Scale 1:10000 at A3

0 200 400 Meters

GDA2020 MGA Zone 50

Legend

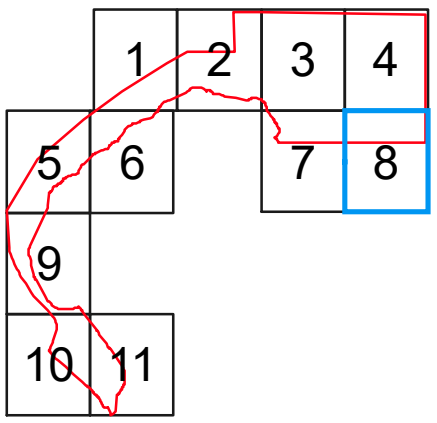
Study Area

Vegetation Condition

Excellent

Introduced Flora Taxa (Umwelt 2022)

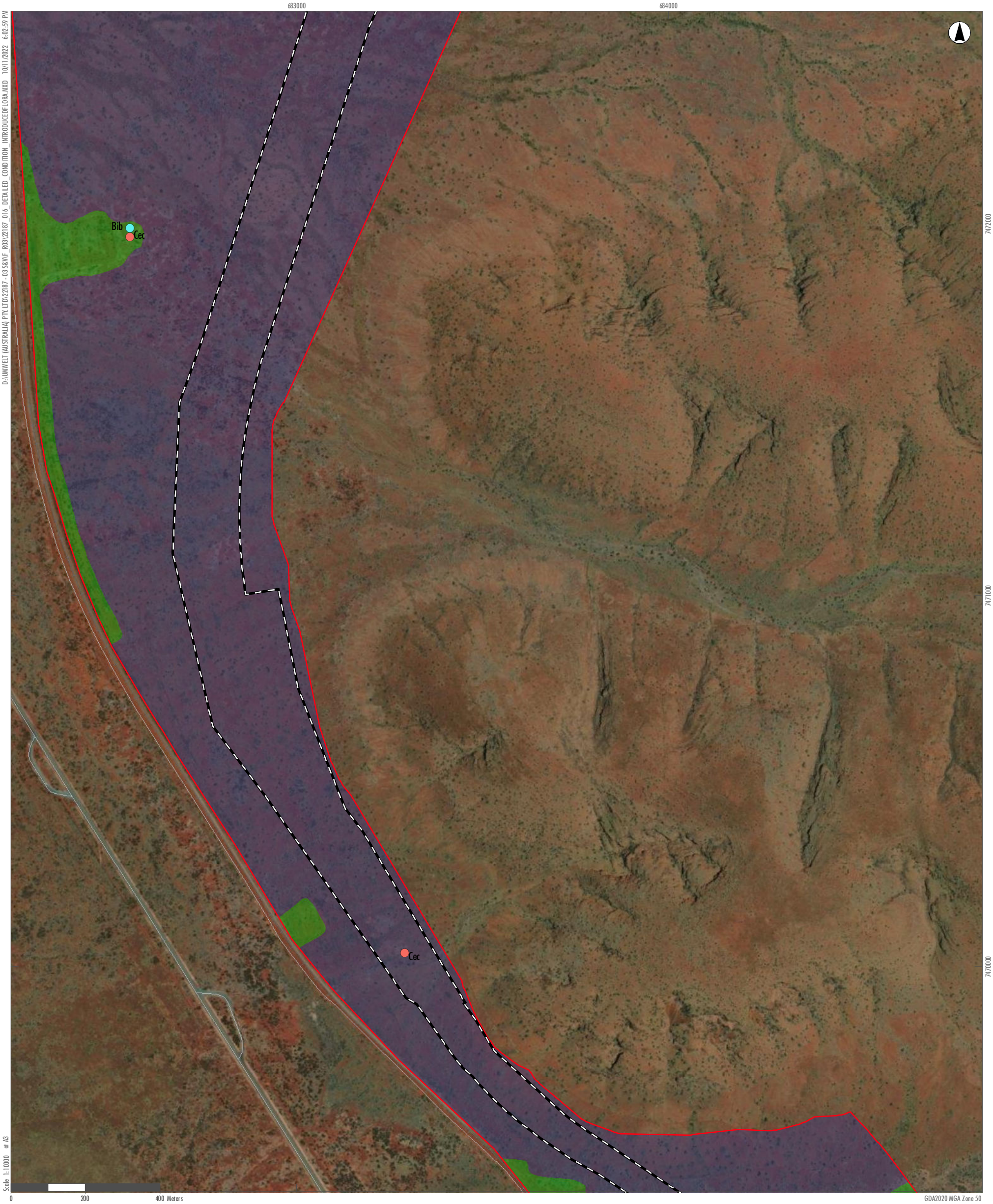
- Bib *Bidens bipinnata*
- Cec *Cenchrus ciliaris*
- Cse *Cenchrus setiger*
- Maa *Malvastrum americanum*
- Ppi *Portulaca pilosa*
- Sev *Setaria verticillata*
- Trt *Tribulus terrestris*



APPENDIX M

Detailed Vegetation Condition Mapping and Introduced Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Umwelt (2022)



D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&WF_R03\22187_016_DETAILED_CONDITION_INTRODUCEDFLORA.MXD 10/11/2022 6:02:59 PM

Legend

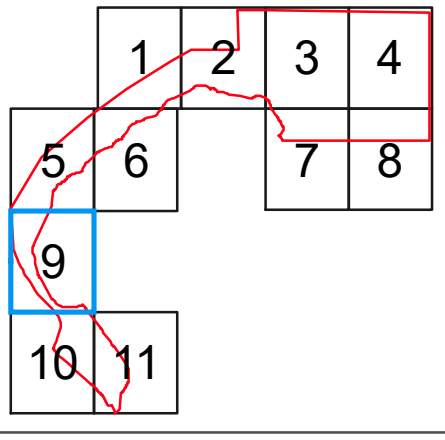
- Study Area
- Proposed Development Envelope

Vegetation Condition

- Excellent
- Very Good

Introduced Flora Taxa (Umwelt 2022)

- Bib **Bidens bipinnata*
- Cec **Cenchrus ciliaris*
- Cse **Cenchrus setiger*
- Maa **Malvastrum americanum*
- Ppi **Portulaca pilosa*
- Sev **Setaria verticillata*
- Trt **Tribulus terrestris*



APPENDIX M

Detailed Vegetation Condition Mapping and Introduced Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Umwelt (2022)

D:\UMWELT (AUSTRALIA) PTY. LTD\22187 - 03 S&WF_R03\22187_016_DETAILED_CONDITION_INTRODUCEDFLORA.MXD 10/11/2022 6:03:31 PM

683000

684000

7469000

7468000

7467000

Bib
Cse Maa
Bib Cec
Trt
Maa
Cec
Trt
Bib
Bib
Bib

Scale 1:10000 at A3

0 200 400 Meters

GDA2020 MGA Zone 50

Legend

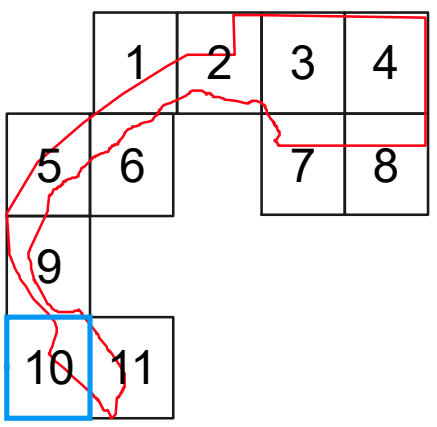
- Study Area
- Proposed Development Envelope

Vegetation Condition

- Excellent
- Very Good
- Good
- Cleared

Introduced Flora Taxa (Umwelt 2022)

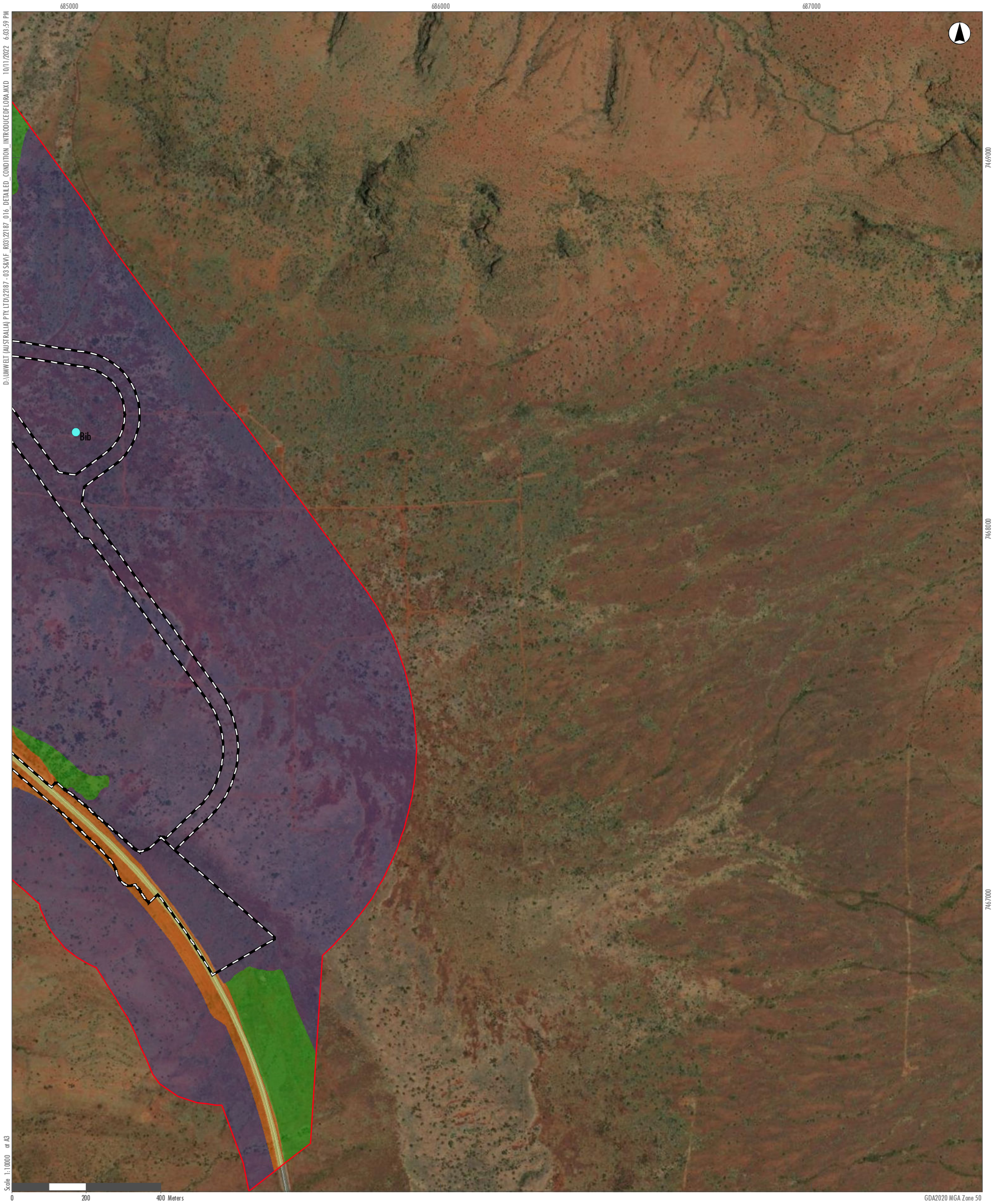
- Bib **Bidens bipinnata*
- Cec **Cenchrus ciliaris*
- Cse **Cenchrus setiger*
- Maa **Malvastrum americanum*
- Ppi **Portulaca pilosa*
- Sev **Setaria verticillata*
- Trt **Tribulus terrestris*



APPENDIX M

Detailed Vegetation Condition Mapping and Introduced Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Umwelt (2022)



Legend

Study Area

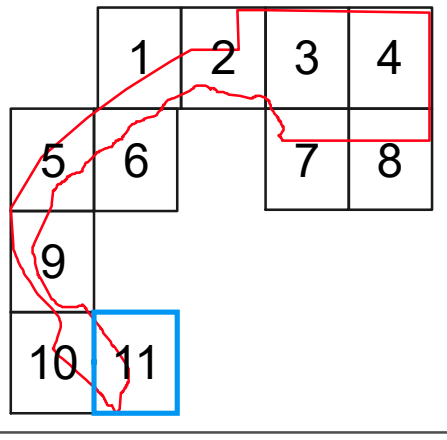
Proposed Development Envelope

Vegetation Condition

- Excellent
- Very Good
- Good
- Cleared

Introduced Flora Taxa (Umwelt 2022)

- Bib **Bidens bipinnata*
- Cec **Cenchrus ciliaris*
- Cse **Cenchrus setiger*
- Maa **Malvastrum americanum*
- Ppi **Portulaca pilosa*
- Sev **Setaria verticillata*
- Trt **Tribulus terrestris*



APPENDIX M

Detailed Vegetation Condition Mapping and Introduced Flora Locations of the Study Area

Image Source: ESRI Basemap (2022) Data source: Umwelt (2022)



umwelt
Environmental & Social
Consultants

Umwelt (Australia) Pty Limited

T| 1300 793 267 E| info@umwelt.com.au www.umwelt.com.au

umwelt

Inspired people | Dedicated team
Quality outcomes



MINERAL RESOURCES

LAMB CREEK PROJECT

Flora and Vegetation Impact Assessment

FINAL

November 2022

LAMB CREEK PROJECT

Flora and Vegetation Impact Assessment

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Mineral Resources Limited

Project Director:	Greg Woodman
Project Manager:	Cielito Marbus
Report No.	22187/R02
Date:	November 2022

Perth
PO Box 255
South Perth WA 6951
T | 1300 793 267
E | info@umwelt.com.au
www.umwelt.com.au

This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

Disclaimer

This document has been prepared for the sole use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by Umwelt (Australia) Pty Ltd (Umwelt). No other party should rely on this document without the prior written consent of Umwelt.

Umwelt undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. Umwelt assumes no liability to a third party for any inaccuracies in or omissions to that information. Where this document indicates that information has been provided by third parties, Umwelt has made no independent verification of this information except as expressly stated.

©Umwelt (Australia) Pty Ltd

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
V1	Cathy Godden	11/11/2022	Greg Woodman	11/11/2022
Final	Cielito Marbus	24/11/2022	Greg Woodman	24/11/2022

Executive Summary

Mineral Resources Limited (MinRes) are exploring mining opportunities associated with the Lamb Creek Deposit (the Project), located approximately 120 kilometres (km) northwest of Newman. Baseline flora and vegetation surveys were completed over 2020 to 2022 by Rapallo (2021b) and Umwelt (in prep) including detailed and targeted level assessments, to inform the Environmental Impact Assessment (EIA) process for the Project (the Baseline Surveys). This Impact Assessment considers the potential significance of significant flora populations and vegetation in a regional context and the significance of potential direct and indirect impacts to them.

The extent of proposed direct impacts are presented in quantifiable terms (numbers of individuals and locations, and area of preferred habitat, of significant flora taxa within the Disturbance Footprint). Indirect impacts are presented quantitatively (regarding edge effects) where possible, with comments provided otherwise. All local data for flora and vegetation was based on data collected by the Baseline Surveys, (Rapallo, 2021a, b; Umwelt, 2022) with regional data sourced from relevant government databases.

Nine significant flora taxa were considered in the impact assessment. Of these, three have records within the proposed indicative footprint (the Disturbance Footprint) being *Aristida lazaridis* (P2), *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) and *Seringia exastia* (T), and an additional one (*Aristida jerichoensis* var. *subspinulifera* (P3)) occurring in the Indirect Impact Assessment Zone (IIAZ). The occurrence of further significant flora taxa within the Disturbance Footprint is considered unlikely (Appendix A). It should be noted that recent changes to the understanding of the Threatened taxon *S. exastia* mean that it is now considered common and widespread (Binks, *et al*., 2020) and whilst it is no longer recognised as Threatened under WA's BC ACT, it remains listed as Threatened under the EPBC Act (Department of Premier and Cabinet (DPC) 2018). Until such time as it can be delisted the new understanding of the taxon's distribution would be considered in the EIA process.

At a regional scale, the potential direct impacts are unlikely to be significant for any of the significant flora taxa occurring within the Disturbance Footprint due to the relatively low percentage of impact to plant numbers and the extent of known records and preferred habitat outside the Disturbance Footprint in the local area.

There is potential for indirect impacts via interruption of surface water flows (including sheet flow) or changes in water quality to areas downstream or downslope of the Disturbance Footprint, where those areas contain vegetation that are reliant on surface water inputs. These include Mulga grove and riparian vegetation, and the significant flora that those habitats potentially support. It is recommended that the volume, spread, and quality of surface water flows be maintained over the course of construction and mine life.

Any potential fragmentation impacts to significant flora through separation (or increasing existing separation) are likely to be negligible and not significant.

A total of 10 vegetation types (VTs) were defined and mapped across the Study Area by Umwelt's (in prep) Baseline Survey, and all but one VT occurs in the Disturbance Footprint. None of the VTs were considered to represent any formally listed Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs). In addition, none of the VTs described in the Study Area are considered to be significant for reasons other than formal listing. While a small number of VTs are not well-represented

within the Study Area, there are very low potential direct impacts to these VTs. In addition all VTs mapped in the Study Area and Disturbance Footprint are either known to, or considered likely to, extend outside the Study Area to some extent, based on field observations and aerial photography interpretation.

The local impact of the Disturbance Footprint on all VTs is relatively low in terms of the percentage of impact, and not likely to be significant at the local scale. Consequently, and considering that none of the VTs in the Disturbance Footprint are significant, the potential regional impact to VTs is unlikely to be significant. Similarly, the regional impact of the Disturbance Footprint to pre-European vegetation system associations (VSAs) and soil-landscape units is unlikely to be significant.

Predicted potential combined impacts to VTs of the Study Area was calculated, which considered direct impacts as a result of clearing of the Disturbance Footprint and complete removal/deterioration of vegetation in the Indirect Impact Assessment Zone (IIAZ). However, total permanent loss of vegetation in the IIAZ is considered unlikely. Although the combined impact assessment is considered to represent a worst-case scenario, the impacts to VTs at a combined scale are unlikely to be significant for any assessed VT.

Abbreviations

Term	Definition
Baseline Surveys	Rapallo (2021a, 2021b) and Umwelt (in prep)
Combined impacts	Potential impacts on significant flora and vegetation values as a combination of direct and indirect impacts by Project activities
DBCA	Department of Biodiversity, Conservation and Attractions
Development Envelope	The area within which clearing of vegetation will be contained. Approximately 894 ha in size. Contains the Footprint.
Direct impacts	Impacts on environment values occurring as a result of direct removal of significant flora and/or vegetation components by Project activities
Disturbance Footprint	Proposed indicative footprint, approximately 661 ha in size
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
EPBC Act	Environment Protection Biodiversity Conservation Act 1999
EP Act	Environmental Protection Act 1986
GIS	Geographic Information System
GDE	Groundwater Dependent Ecosystem
GDV	Groundwater Dependent Vegetation
ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
IIAZ	Indirect Impact Assessment Zone, a 20 m buffer around the Disturbance Footprint utilised for the assessment of indirect impacts to flora and vegetation. Approximately 119 ha in size.
Indicative regional populations	Populations of significant flora taxa within WA, determined by review of distribution of known flora taxa locations according to DBCA databases (using the DBCA (2017) definition of a population, as a discrete group of individuals of a taxon separated by more than 500 m from the nearest discrete group of individuals), or from the results of intensive surveys of significant flora taxa over their known range
Indirect impacts	Impacts on environmental values occurring via indirect pathways as a result of Project activities
km	Kilometres
Listed	Pertaining to listed taxa or vegetation - those that are formally listed as conservation significant under the *Environment Protection and Biodiversity Conservation Act 1999*, or the *Biodiversity Conservation Act 2016*. Refer to
Local	Known distribution of significant flora and vegetation within the Study Area and relevant contiguous habitat
Local population	Local significant flora populations, defined using the DBCA (2017) definition of a population as a discrete group of individuals of a taxon separated by more than 500 m from the nearest discrete group of individuals
m	Metres
MinRes	Mineral Resources Limited
P	Priority
PEC	Priority Ecological Community

Term	Definition
the Project	Lamb Creek Project
Regional	Known distribution of significant flora and vegetation within WA
Significant flora	As defined in **Section 1.3**
Significant vegetation	As defined in **Section 1.3**
Study Area	Area within which the Baseline Survey was conducted, approximately 24,868 ha in size. Contains the Development Envelope and the Footprint
T	Threatened
TEC	Threatened Ecological Community
Umwelt	Umwelt (Australia) Pty Ltd
VSA	Vegetation System Association
VT	Vegetation Type
WA	Western Australia

Table of Contents

1.0 Introduction 8

1.1 Project Overview 8

1.2 Purpose and Scope 8

1.3 Terminology and Definitions 8

2.0 Background 13

2.1 Significant Flora 13

2.2 Vegetation 17

2.2.1 Regional Vegetation 17

2.2.2 Local Vegetation 19

3.0 Methods 22

3.1 Conservation Significance Ratings and Direct Impacts 22

3.1.1 Significant Flora 22

3.1.2 Vegetation 23

3.2 Indirect Impacts 24

4.0 Results 25

4.1 Conservation Significance Ratings 25

4.1.1 Significant Flora 25

4.1.2 Vegetation 30

4.2 Direct Impacts 33

4.2.1 Significant Flora 33

4.2.2 Vegetation 37

4.3 Indirect Impacts 38

4.3.1 Background 38

4.3.2 Indirect Impact Assessment 41

4.4 Combined Impacts 44

4.4.1 Significant Flora 44

4.4.2 Vegetation 47

5.0 Conclusion 49

6.0 References 50

Figures

Figure 1.1	Project Location	12
Figure 2.1	Significant Flora Recorded by the Baseline Surveys	16
Figure 2.2	Vegetation Types described by the Baseline Survey (Umwelt, 2022)	21

Tables

Table 2.1	Summary of Significant Flora Taxa Recorded by the Baseline Surveys Within the Study Area (Rapallo 2021b, Umwelt, 2022)	15
Table 2.2	Vegetation System Associations of the Study Area	17
Table 2.3	Soil Landscape Units of the Study Area	18
Table 2.4	Vegetation Types of the Study Area and Disturbance Footprint Mapped by the Baseline Survey (Umwelt, 2022)	20
Table 3.1	Regional Conservation Significance Ratings of Local Populations of Significant Flora Taxa	2
Table 3.2	Local Conservation Significance Rating of Vegetation Types	23
Table 4.1	Significant Flora Taxa Considered in the Impact Assessment and the Significance of their Local Populations in a Regional Context	26
Table 4.2	Local Conservation Significant Rating Assessment of Vegetation Types of the Disturbance Footprint	31
Table 4.3	Potential Direct Impact to Locations and Individuals of Significant Flora Taxa	33
Table 4.4	Potential Direct Impact to Preferred Habitat of Significant Flora Taxa	33
Table 4.5	Significance of Potential Local Direct Impact to Significant Flora Taxa	34
Table 4.6	Potential Regional Impact of Populations of Significant Flora Taxa	36
Table 4.7	Potential Local Impact to Vegetation Types	37
Table 4.8	Impact to Vegetation System Associations of the Disturbance Footprint	38
Table 4.9	Impact to Soil Landscape Units of the Disturbance Footprint	38
Table 4.10	Number of Locations and Individuals of Significant Flora Taxa Recorded by the Baseline Surveys Within the IIAZ	41
Table 4.11	Mapped Extent of Vegetation Types in the IIAZ	41
Table 4.12	Potential Combined Impacts to Locations of Significant Flora Taxa	45
Table 4.13	Potential Combined Impacts to Individuals of Significant Flora Taxa	46
Table 4.14	Potential Combined Impacts to Preferred Habitat of Significant Flora Taxa	47
Table 4.15	Potential Combined Impacts to Vegetation Types	48

Appendices

Appendix A	Likelihood of Occurrence of Further Significant Flora Taxa

1.0 Introduction

1.1 Project Overview

Mineral Resources Limited (MinRes) are actively exploring mining opportunities associated with the Lamb Creek Deposit (the Project), located approximately 120 kilometres (km) northwest of Newman in Western Australia (WA). The exploration area consists of a proposed mining area and associated infrastructure corridor linking the proposed mining area to Great Northern Highway.

Previous flora and vegetation surveys conforming to different levels of survey under various Environmental Protection Authority (EPA) Guidance Statements (EPA, 2004, 2016b) have been conducted for the Project. A gap analysis and peer review of previous survey work, as undertaken by Umwelt (Australia) Pty Ltd (Umwelt) (2022), recommended additional targeted survey and a detailed flora and vegetation survey (as per Sections 4.2 and 4.3 of EPA (2016b)).

MinRes commissioned Umwelt to undertake a flora and vegetation survey of the Project to support the Environmental Impact Assessment (EIA) process for the Project, and to use the data collected with that of Rapallo (2021a, b) to develop a flora and vegetation impact assessment report utilising a supplied Development Envelope and Indicative Footprint.

1.2 Purpose and Scope

This report presents a summary of the significant features of the Project area with respect to flora and vegetation, and an assessment of potential aspects of the Project that will impact flora and vegetation, including discussion of the potential significance of any such impacts, using the information collected by the Baseline Surveys (Rapallo, 2021a, b; Umwelt, 2022).

Direct and indirect impacts are presented as quantitative data where possible. Where indirect impacts cannot be assessed quantitatively, a qualitative discussion is presented.

1.3 Terminology and Definitions

The following definitions apply with reference to the Project area and are presented on **Figure 1.1** (with the exception of the Indirect Impact Assessment Zone, which is too narrow to present meaningfully on this figure):

- **Study Area:** an area of 3,785 ha, defined in consultation with MinRes and representing a buffered area on the Proposed Development Envelope and MinRes tenements, sufficient to provide contextual information relevant to interpreting impacts. Detailed vegetation survey was undertaken within the Study Area by Umwelt (in prep).
- **Development Envelope:** the area (approximately 894 ha) within which clearing of vegetation will be contained. The development envelope is composed of three parts: the Great Northern Highway Intersection Development Envelope (GNHI DE); the Access Road Development Envelope (Access Rd DE); and the Mine Development Envelope (Mine DE), containing the waste rock dumps, pit area and other infrastructure relevant to the mining operations. These three areas are displayed on **Figure 1.1**.

- **Disturbance Footprint:** the proposed indicative area (approximately 661 ha) within the Development Envelope that is planned to be cleared for the Project. The Disturbance Footprint encompasses the infrastructure design, from which avoidance areas have been excised (heritage) or impact minimised (flora), and has been utilised in this assessment to calculate potential impacts to flora and vegetation as a result of the project.

- **Indirect Impact Assessment Zone (IIAZ):** a potential indirect impact zone surrounding the Disturbance Footprint to an extent of 20 m. The IIAZ is approximately 119 ha in size. The IIAZ is designed to capture potential quantitative impact of some indirect impact pathways as listed below, including edge effects through dust, clearing, water and sediment run-off and the introduction of weeds. The buffer distance of 20 m is considered sufficient to assess edge effects, based on field observations of flora and vegetation adjacent to impact areas at Lamb Creek. It is considered unlikely that there would be any edge effects beyond this distance.

Direct, indirect and combined impacts in the context of this assessment are defined as below:

- **Direct impacts:** impacts on environment values occurring as a result of direct removal of flora taxa and vegetation by clearing and other ground disturbance activities for the Project. This results in both removal of known locations, death of individuals at these locations, and removal of habitat.

- **Indirect impacts:** impacts on environmental values occurring via indirect pathways as a result of Project activities. Such impacts may occur as a result of processes including, but not limited to:

    - Smothering of plants from dust emissions, causing potential decline in health or death of individual plants, and reduction in the overall condition of vegetation.

    - Degradation of vegetation through edge effects associated with clearing activities.

    - Water and/or sediment run off (e.g. erosion after significant rainfall from waste rock landforms, and spillage of saline water/tailings/hydrocarbons), causing potential smothering of individual plants and vegetation, resulting in decline in health or death.

    - Altered hydrology and drainage shadow, causing potential reduction or removal of seasonal surface water flow, resulting in either death or loss of condition to individual plants or vegetation.

    - Introduction of weeds, leading to increased competition for available resources with individual plants, and reduction in the overall condition of vegetation.

    - Changes to groundwater levels in groundwater dependent ecosystems (GDEs), causing potential death of phreatophytic taxa and change in composition of groundwater dependent vegetation (GDV).

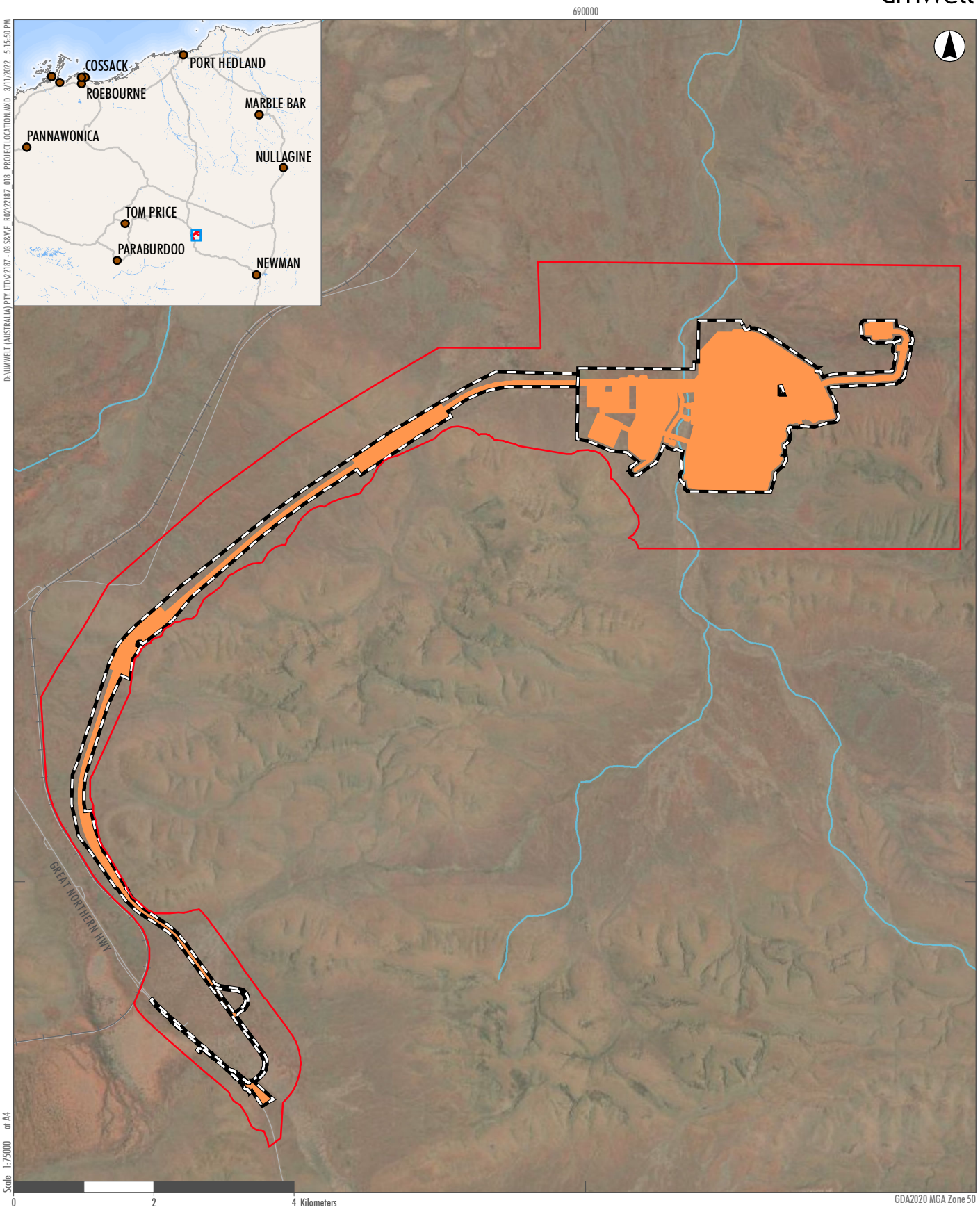
    - Fragmentation of local populations of significant flora taxa and vegetation, leading to a decline in health and quality of populations/patches of vegetation, or loss of genetic diversity through isolation of segments of a population, resulting in reduced genetic fitness of remaining populations.

- **Combined impacts:** the total impact on environmental values from direct and indirect impacts as a result of the Project, as far as they can be assessed.

The following definitions apply with reference to significant flora and vegetation:

- **Significant flora:** flora taxa that belong to one of the following categories as defined by EPA (2016a, 2016b):
    - taxa identified as a Threatened (T) or Priority (P) species (formally listed significant taxa – includes taxa listed under both State and Commonwealth legislation, and classified as Priority by DBCA)
    - locally endemic taxa or taxa associated with a restricted habitat type (e.g. surface water or GDEs)
    - new species or taxa having anomalous features that indicate a potential new species
    - representative of the range of a species (particularly at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
    - unusual species, including restricted subspecies, varieties or naturally occurring hybrids
    - having a relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.
- **Significant vegetation:** vegetation communities that belong to one of the following categories as defined by EPA (2016a, 2016b):
    - being identified as a Threatened Ecological Community (TEC) or Priority Ecological Community (PEC) (formally listed significant vegetation – includes vegetation listed under State or Commonwealth legislation, or classified as a PEC by DBCA)
    - having a restricted distribution
    - having a degree of historical impact from threatening processes
    - playing a role as a refuge
    - providing an important function required to maintain ecological integrity of a significant ecosystem.
- **Local:** the known distribution of significant flora taxa and vegetation within the Study Area (**Figure 1.1**) and verified, contiguous habitat outside the Study Area. Therefore, local impacts are defined as impacts to significant flora taxa or Vegetation Types (VTs) located within the Study Area and surrounding contiguous habitat, as per the results of the Baseline Survey (Umwelt, 2022). Note that narrow, natural breaks such as creeks and rivers are not considered barriers to contiguous habitat in a local context. Given that the extent of contiguous habitat will be different for each significant flora taxon, and limited survey for significant flora has been undertaken outside the Study Area, an 'overall' local area cannot be specifically mapped.
- **Regional:** the known distribution of significant flora taxa and vegetation within WA. Therefore, regional impacts are defined as impacts to significant flora taxa or VTs across their total known distributions in WA.
- **Local populations:** flora populations within the Study Area, defined using the DBCA (2017) definition of a population (a discrete group of individuals of a taxon separated by more than 500 metres (m) from the nearest discrete group of individuals). Note that this definition can only be tentatively applied if the intervening 500 m has not been surveyed and should consider whether appropriate habitat extends within this area.

- **Indicative regional populations:** populations of significant flora taxa within WA, determined by review of distribution of known locations according to DBCA databases (via NatureMap (DBCA, 2007) and Florabase (WA Herbarium, 1998)), and using the DBCA (2017) definition of populations as provided above. However, if the characteristics of regional populations of a significant flora taxon has been surveyed intensively over its known range, the values presented in these reports or literature publications will be used instead, provided this data is considered current and reliable.



Legend

- Study Area
- Proposed Development Envelope
- Disturbance Footprint
- Roads
- Rail
- Drainage Line

FIGURE 1.1

Project Location

Image Source: ESRI Basemap (2021) Data source: Landgate (2022), MRL (2022)

2.0 Background

Baseline Survey data relevant to this assessment were recorded over 2020 to 2022, encompassing:

- Detailed flora and vegetation assessment across the Study Area, conducted by:
    - Rapallo (2021a) in May 2021
    - Umwelt (in prep) over March and April 2022; and
- Targeted Survey over the Development Envelope conducted by
    - Rapallo (2021b) in April 2020 and May 2021; and
    - Umwelt (in prep) in April, June and July 2022.

These baseline surveys encompassed the establishment of vegetation survey quadrats and relevés in the Study Area, targeted searching for significant flora taxa in the Development Envelope, and description of VTs following statistical analysis of quadrat data. The assessment was conducted to the requirements of EPA's *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016b). The results of the Baseline Survey relating to significant flora and vegetation are summarised in the following sections.

2.1 Significant Flora

Over 2020 to 2022, targeted surveys by Rapallo (2021b) and Umwelt (in prep.) were undertaken across the Development Envelope, with the exception of some small areas identified as Australia Heritage Sites that could not be accessed. Targeted searching for significant flora taxa was also undertaken outside the Development Envelope to provide context for the assessment.

The Threatened taxon *Seringia exastia* has been recorded within the Development Envelope and wider Study Area, which despite being no longer recognised as Threatened under WA's BC ACT, remains listed as Threatened under the EPBC Act (Department of Premier and Cabinet (DPC) 2018). Correspondence with the Department of Biodiversity, Conservation and Attractions (DBCA) Species and Communities Assessment Team (dated 4th August 2022) has provided clarity with regards to the treatment of this taxon. It is not expected that the taxon would be removed from the official published Threatened flora listing before September – October 2022, however no exact date can be provided. It is understood that the synonymisation of *S. elliptica* under *S. exastia* means that *S. exastia* is now considered common and widespread (Binks, *et al*., 2020). However, until changes are officially made to the threatened species list, *S. exastia* is still legally listed as threatened flora and should be treated as such. Authorisation to take under section 40 of the *Biodiversity Conservation Act 2016* is still required, however the new understanding of the taxon's distribution would be considered in the EIA process by the DBCA.

A further eight significant flora taxa were recorded within the Study Area including six DBCA listed Priority (P) taxa, and two taxa considered significant as a 'new species or species with anomalous features that indicate a potential new species' as defined in EPA (2016a, 2016b) (**Figure 2.1)**. Rapallo's (2021a, b) study recorded three locations of *Goodenia nuda* within the Study Area, however this taxon has since been delisted (formerly P4).

The potentially undescribed *Corchorus* sp. is considered taxonomically significant as it is not able to be matched to any other specimen within the WA Herbarium collection. The WA Herbarium has advised that a precautionary approach would also see it regarded as a plant of conservation significance, whilst noting that its poorly collected nature and potential geographical restriction make this difficult to formally assess (M. Hislop, *pers. comm*. June 2022). Six specimens of *Corchorus* sp. from the 2022 survey have been submitted for lodgement with the WA Herbarium to facilitate this assessment going forward.

The potentially undescribed entity *Euphorbia ferdinandi* s. lat is currently under review by the WA Herbarium. In response to consultation the WA Herbarium have advised in the interim to treat the entity as a plant of taxonomic significance (M. Hislop, *pers. comm.* August 2022).

A summary of data relating to significant flora taxa recorded in the Study Area by the Baseline Survey is presented in **Table 2.1**. Of the nine significant flora taxa known to occur in the Study Area, three have been recorded in the Disturbance Footprint (**Figure 2.1, Table 2.1**)**.** All other significant flora taxa recorded within the Study Area or identified by the Desktop Study (Umwelt, 2022) have been assessed as unlikely to occur within the Disturbance Footprint (**Appendix A**).

A likelihood of occurrence assessment (**Appendix A**) of the remaining significant flora taxa identified by the Desktop Study, resolved that 41 significant taxa could possibly occur within the Study Area (excluding the Development Envelope), in addition to those already recorded, based on the presence of suitable habitat and the known range of the taxon.

The likelihood that any further significant flora taxa may occur within the Development Envelope has been assessed as unlikely (**Appendix A**).

Table 2.1 Summary of Significant Flora Taxa Recorded by the Baseline Surveys Within the Study Area (Rapallo 2021b, Umwelt, 2022)

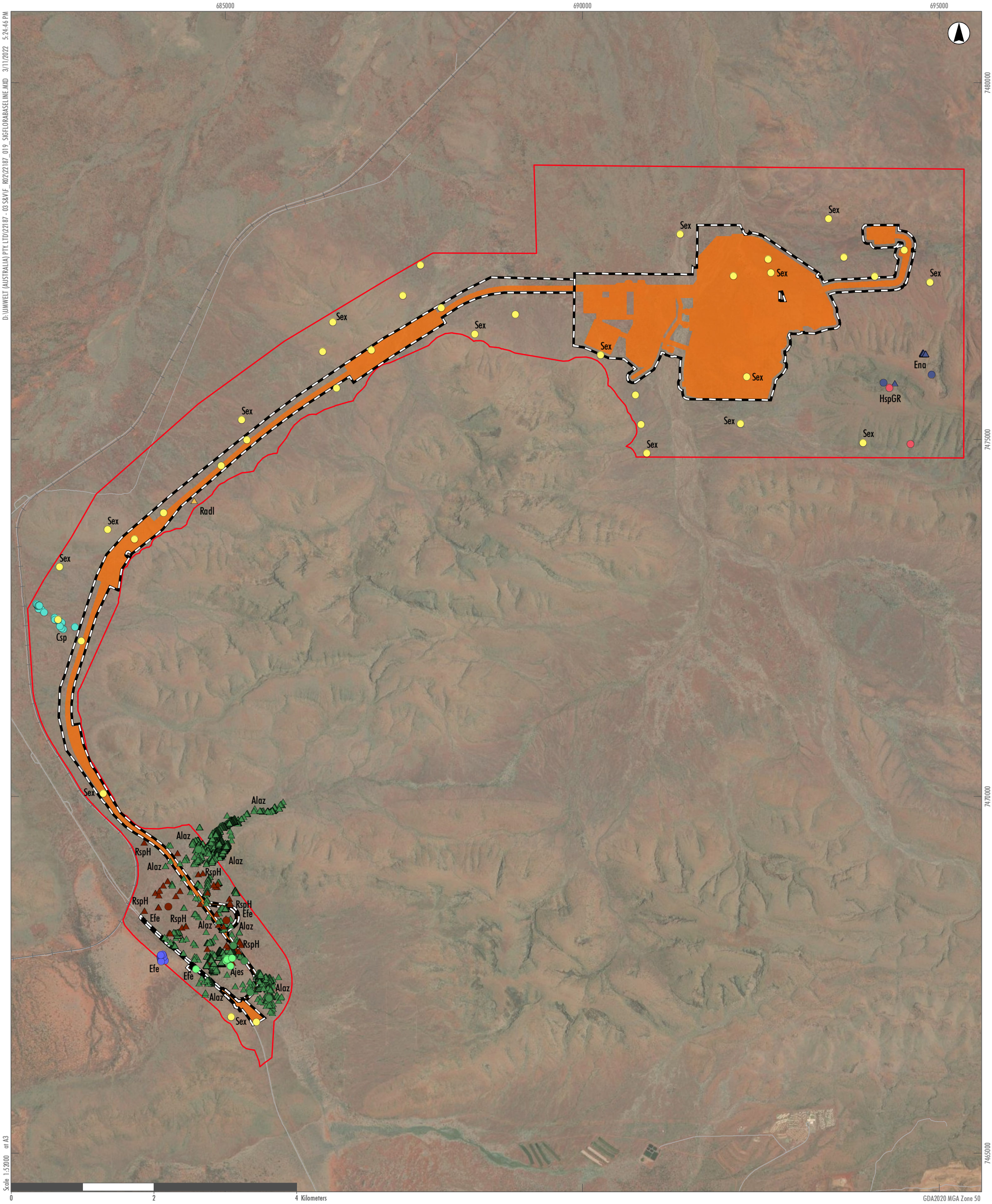
Taxon	Status (WA)	Disturbance Footprint		Development Envelope (excluding Disturbance Footprint)		Study Area (excluding Footprint and Development Envelope)		Total		Vegetation Types*
		No. Locations	No. Locations	No. Locations	No. Locations	No. Locations	No. Locations	No. Locations	No. Locations	
Aristida jerichoensis var. subspinulifera	P3	NR	NR	1	1	7	96	8	97	8~
Aristida lazaridis	P2	63	77	11	12	3020	7128	3094	7217	7~; 8~; 3, 9
Corchorus sp.	Potentially undescribed	NR	NR	NR	NR	23	35	23	35	9~
Eremophila naaykensii	P3	NR	NR	NR	NR	37	73	37	73	4~, 6~
Euphorbia ferdinandi s. lat.	Potentially undescribed	NR	NR	NR	NR	19	60	19	60	8~, 7
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	P2	NR	NR	NR	NR	2	17	2	17	4~
Rhagodia sp. Hamersley (M. Trudgen 17794)	P3	3	3	0	0	46	50	49	53	7~; 8; 9
Rostellularia adscendens var. latifolia	P3	NR	NR	NR	NR	1	1	1	1	1
Seringia exastia	T	11	211	3	11	23	561	37	783	1~, 2, 3, 6, 9, 10

* Refer to **2.2.2** for VT descriptions.

~ Designates preferred habitat, based on proportional location representation and landforms/soils.

^ Counts not undertaken for taxon by the Baseline Survey.

NR – not recorded.



Legend

- Study Area
- Proposed Development Envelope
- Disturbance Footprint

Significant Flora (Umwelt, 2022 in prep)

- Ajes *Aristida jerichoensis* var. *subspinulifera* (P3)
- Alaz *Aristida lazaridis* (P2)
- Csp *Corchorus* sp. (Potentially Undescribed)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* S. lat (Potentially Undescribed)
- HspGR *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)
- Sex *Seringia exastia* (T)

Significant Flora (Rapallo, 2021b)

- Alaz *Aristida lazaridis* (P2)
- Ena *Eremophila naaykensii* (P3)
- Efe *Euphorbia ferdinandi* S. lat (Potentially Undescribed)
- RspH *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- Radl *Rostellularia adscendens* var. *latifolia* (P3)

FIGURE 2.1

Significant Flora Recorded by the Baseline Surveys (Rapallo, 2021b; Umwelt, in prep)

Image Source: ESRI Basemap (2022) Data source: Rapallo (2021b), Umwelt (2022 - in prep)

2.2 Vegetation

2.2.1 Regional Vegetation

The Study Area is located within the Pilbara Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion, and specifically within the Hamersley IBRA Subregion (PIL3) (DAWE 2020). The Hamersley Subregion comprises mainly of mulga low woodland over bunch grasses on fine textured soils in valley floors, and *Eucalyptus leucophloia* over *Triodia brizoides* on skeletal soils of the ranges (Kendrick, 2001).

The vegetation of WA as it was presumed to have existed prior to European settlement has been mapped at a scale of 1:250,000 as vegetation system associations (VSAs) (DBCA, 2019), with the pre-European Vegetation spatial database subsequently created (DPIRD, 2019). The Study Area occurs across two VSAs, as summarised in **Table 2.3**. **Table 2.3** also presents the current extent of each VSA in relation to its pre-European extent within the Hamersley IBRA Subregion, and the percentage of the current extent of each VSA currently protected for conservation in all DBCA-managed land (as a proportion of the current extent) within the Hamersley IBRA Subregion (Government of Western Australia 2019), as well as area (ha) and extent (as percentage) in the Study Area.

There is over 99 % of the pre-European extent of both VSAs remaining, and both have some areas protected for conservation.

Table 2.2 Vegetation System Associations of the Study Area

Vegetation System Association	Description *	Mapped Extent (ha)				Pre-European Extent Remaining (%)*	Current Extent Protected for Conservation (%)*
		Disturbance Footprint	Development Envelope	Study Area	Current Extent*		
Hamersley_18	Low woodland, open low woodland or sparse woodland	412.74	594.40	2,432.9	575,808	99.2	29.6
Hamersley_82	Low tree-steppe	247.89	299.73	1,352.8	2,146,708	99.4	13.7

* Data from DBCA (2019).

Soil landscape mapping of WA (previously referred to as land system mapping) has been compiled from the results of various surveys across the state by the Department of Agriculture (now the Department of Primary Industries and Regional Development (DPIRD)) (DPIRD 2019). Data from van Vreeswyk *et al.* (2004) has been used to map soil landscape units in the region within which the Desktop Study Area is located. This data includes general ecological information, vegetation physiognomy and composition, patterns of variation, conservation status, gradational association and land system representation (van Vreeswyk *et al*., 2004).

The Study Area occurs across five soil landscape systems, as summarised in **Table 2.3.** None of these soil landscape systems are listed as TECs under the EPBC Act (DAWE 2021a) or as TECs or PECs under the BC Act (DBCA 2018; 2022a), and all are detailed as being common in the Pilbara landscape mapping Study Area (van Vreeswyk *et al.* 2004).

Table 2.3 Soil Landscape Units of the Study Area

	Description*	Mapped Extent (ha)			
		Indicative Footprint	Development Envelope	Study Area	Total*
Boolgeeda (285Bg)	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands and mulga shrublands. Predominantly colluvium on gently sloping plains; widespread and common Stony lower slopes, level stony plains and narrow sub-parallel drainage floors, relief up to 20 m. A common system in shallow valleys below hill systems such as Newman and Rocklea. Noted to be subject to fairly frequent burning.	588.41	790.68	2,510.3	774,800
McKay (285Mk)	Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands. Predominantly sedimentary rocks on hills; widespread and common. Erosional surfaces; hill tracts, ridges, plateaux remnants and breakaways with steep upper slopes and more gently inclined lower footslopes, restricted stony plains and interfluves; moderately spaced tributary drainage patterns incised in narrow valleys in upper parts becoming broader and more widely spaced downstream. Relief up to 100 m.	12.70	20.07	213.1	420,200
Newman (285Ne)	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands Predominantly jaspilite on ridges and plateaux; very common in the southern half of the Landscape mapping Study Area Rugged high mountains, ridges and plateaux with near vertical escarpments of jaspilite, chert and shale, the second largest system in the survey area and prominent in southern parts (e.g. Ophthalmia Range, Hamersley Range), relief up to 450 m.	44.53	54.01	654.3	1,458,000
Platform (285Pl)	Dissected slopes and raised plains supporting hard spinifex grasslands Predominantly colluvium on incised slopes; common in the central and south-west of the Landscape mapping Study Area Narrow, raised plains and highly dissected slopes on partly consolidated colluvium below the footslopes of hill systems such as Newman, relief mostly up to about 30 m but occasionally considerably greater.	10.25	22.90	301.2	1,570,000

	Description*	Mapped Extent (ha)			
		Indicative Footprint	Development Envelope	Study Area	Total*
Wannamunna (285Wn)	Hardpan plains and internal drainage tracts supporting mulga shrublands and woodlands (and occasionally Eucalypt woodlands) Predominately alluvium on hardpan plains, internal drainage flats; common in the central and south of the Landscape mapping Study Area Level alluvial plains with prominent grove patterns of vegetation and shallow loamy soils over hardpan and broad internal drainage plains with deeper more clayey soils, relief up to 5 m. The system is found in south central parts of the survey area as broad flats within the Hamersley Ranges (Newman land system).	4.75	6.47	106.8	57,700

* Data from DPIRD (2018)

2.2.2 Local Vegetation

Three flora and vegetation surveys have been previously undertaken at Lamb Creek (see Umwelt (in prep) for a summary of previous surveys conducted within and in the vicinity of the Study Area); however two of these have been considered out of date and/or unlikely to be sufficient to support assessment under current EPA Guidance and Policy (Umwelt, 2022). Furthermore, previous flora and vegetation assessments have been conducted utilising a variety of survey methods and naming conventions, and/or were not undertaken using the methods detailed in EPA's *Technical Guidance—Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016b). Therefore, assessment of impacts from the Project to vegetation is undertaken using the VT dataset presented by Umwelt (in prep), which was conducted in line with EPA (2016b) requirements, and is considered to supersede all previous flora and vegetation surveys undertaken in the Study Area.

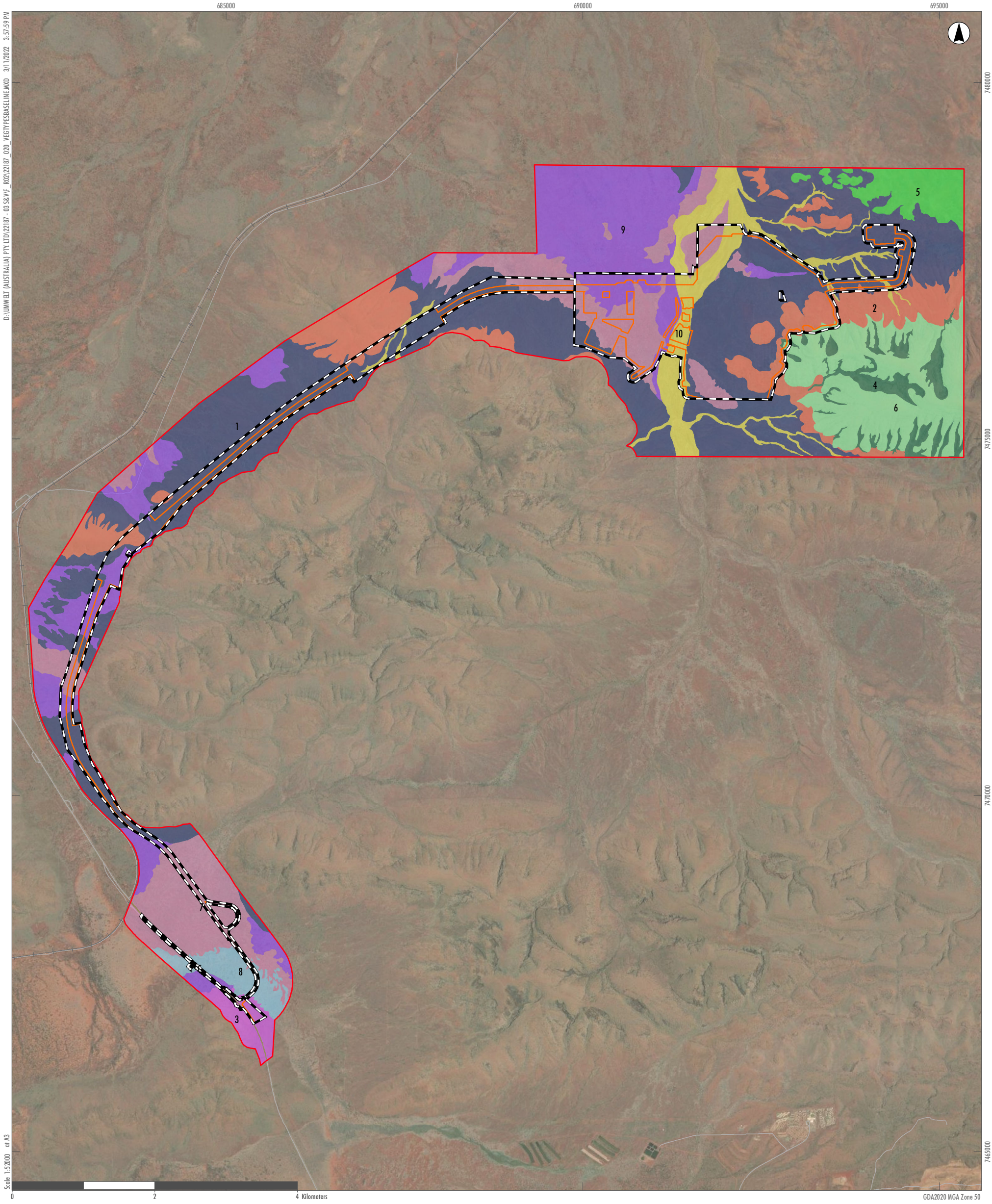
The 10 Vegetation Types determined by Umwelt (in prep) were derived through analysis of a total of 127 quadrats recorded by Rapallo (2021a) and Umwelt (in prep) which were established over 2021 and 2022. The quadrat locations were established across the Study Area, targeting all landform types identified via aerial photography interpretation and field observations. Floristic composition classification and subsequent examination of quadrat data resulted in the definition of 10 VTs across the Study Area, as presented on **Figure 2.2** (Umwelt, 2022).

Table 2.4 presents a summary of the extent of VTs mapped within the Study Area and Disturbance Footprint. All but one VT mapped in the Study Area occurs in the Disturbance Footprint.

None of the VTs defined by the Baseline Survey were considered to represent any formally listed TECs (DAWE, 2021a; DBCA, 2018) or PECs (DBCA, 2021). In addition, none of the VTs described in the Study Area are considered to be significant for reasons other than formal listing (**Section 1.3**). While a small number of VTs are not well-represented within the Study Area (i.e. mapped over < 3 % of the Study Area), based on field observations and aerial photography interpretation, all VTs mapped in the Study Area and Disturbance Footprint are either known to, or considered likely to, extend outside the Study Area to some extent (Umwelt, 2022).

Table 2.4 Vegetation Types of the Study Area and Disturbance Footprint Mapped by the Baseline Survey (Umwelt, 2022)

Vegetation Type	Mapped Extent in Study Area (ha)	Percent of Study Area (%)	Mapped Extent in Disturbance Footprint (ha)	Percent of Disturbance Footprint (%)
1	1,429.16	37.75	343.39	51.98
2	382.30	10.10	76.30	11.55
3	48.16	1.27	6.32	0.96
4	95.32	2.52	0.62	0.09
5	100.95	2.67	0.00	0.00
6	316.61	8.36	0.84	0.13
7	523.39	13.83	118.88	17.99
8	68.93	1.82	2.93	0.44
9	600.81	15.87	68.28	10.34
10	215.50	5.69	41.11	6.22
Cleared	4.62	0.12	1.95	0.30



Legend

- Study Area
- Proposed Development Envelope
- Disturbance Footprint

Vegetation Types

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- C

FIGURE 2.2

Vegetation Types described by the Baseline Survey (Umwelt, in prep)

Image Source: ESRI Basemap (2022) Data source: Umwelt (2022 - in prep)

D:\UMWELT (AUSTRALIA) PTY LTD\22187 - 03 S&VF_R02\22187_020_VEGTYPESBASELINELEGEND.MXD 3/11/2022 5:28:25 PM

Legend

Vegetation Types

1 Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and/or *E. gamophylla* with isolated *Corymbia deserticola* subsp. *deserticola* over low to mid sparse to open shrubland dominated by species including *Acacia atkinsiana* and *A. ancistrocarpa* over low open hummock grassland of *Triodia pungens, T. vanleeuwenii* and *T. wiseana* and low open tussock grassland of *Themeda* sp. Mt Barricade (M.E. Trudgen 2471) and *Paraneurachne muelleri* on red-brown sandy clay loam to clay loam on gently inclined mid to lower slopes and associated drainage lines

2 Low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia* with occasional *Corymbia deserticola* subsp. *deserticola* and *C. hamersleyana* over low sparse shrubland of *Acacia hilliana* and *Hakea chordophylla* over open hummock grassland of *Triodia vanleeuwenii* and *T. wi*seana on red-brown clay loam with ironstone pebbles on gently inclined lower to upper slopes

3 Isolated trees of *Corymbia hamersleyana, Eucalyptus leucophloia* subsp. *leucophloia* and *E. gamophylla* over low sparse shrubland of mixed Acacia species over low hummock grassland of *Triodia pungens* and *T. wiseana* on red-brown sandy clay loam on mid to lowerslopes with ironstone pebbles

4 Low open woodland of *Corymbia ferriticola* or *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* with *Ficus brachypoda* occurring on gorge and gully areas, over low sparse shrubland of mixed species dominated by *Corchorus laniflorus, Dodonaea viscosa* subsp. *mucronata* and *Gossypium robinsonii* over sparse hummock grassland dominated by *Triodia pungens* with *T. wiseana* and tussock grasses including *Cymbopogon ambiguus* and *Aristida burbidgeae* on red brown clay loam on steep upperslopes, gullies, breakaways and gorges with significant ironstone outcropping

5 Occasional *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* over mixed isolated shrubs including *Acacia inaequilatera* and *Senna artemisioides* subsp. *glutinosa* over low hummock grassland of *Triodia wiseana* on steep upperslopes and associated drainage lines on red-brown clay loam with exposed ironstone and dolerite

6 Low woodland to open woodland of *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* and occasional *E. kingsmillii* over mid isolated shrubs of *Acacia hamersleyensis* and *Grevillea wickhamii* ?subsp. *hispidula* over low hummock grassland of *Triodia wiseana* on red brown sandy clay loam on steep mid to upperslopes with exposed ironstone

7 Isolated trees of *Corymbia hamersleyana, Eucalyptus leucophloia* subsp. *leucophloia* and *Eucalyptus xerothermica* over low open to sparse shrubland dominated by *Acacia aptaneura, A. aneura* and *A. pruinocarpa* over low tussock grassland to sparse tussock grassland dominated by *Themeda* sp. Mt Barricade (M.E. Trudgen 2471), *Enneapogon polyphyllus, Chrysopogon fallax* and *Aristida* spp. with occasional *Triodia pungens* on red brown clay loam with some ironstone pebbles on plains

8 Isolated trees of *Eucalyptus xerothermica* over tall open to sparse shrubland of *Hakea lorea* subsp. *lorea* and *Acacia aptaneura* over low open tussock grassland of *Aristida contorta, A. inaequiglumis* and *Themeda triandra* on red-brown sandy clay to clay on plains

9 Low open woodland of *Corymbia hamersleyana, C. deserticola* subsp. *deserticola, Eucalyptus gamophylla* and *Eucalyptus leucophloia* subsp. *leucophloia* over tall sparse shrubland of *Acacia atkinsoniana* and occasional *A. ancistrocarpa* and *A. aptaneura* over low hummock grassland dominated by *Triodia pungens* and occasional *T. wiseana* with *Paraneurachne muelleri* also dominant on red-brown clay loam with ironstone pebbles on plains

10 Low open woodland of *Corymbia hamersleyana* with occasional *Eucalyptus gamophylla, E. leucophloia* subsp. *leucophloia* and *E. xerothermica* over tall open shrubland dominated by taxa including *Acacia cowleana, A. tumida* var. *pilbarensis, Gossypium robinsonii* and *A. pyrifolia* over low open hummock grassland of *Triodia pungens* and tussock grassland dominated by *Themeda* sp. Mt Barricade (M.E. Trudgen 2471) and *Aristida* spp. on red-brown clay loams on major and minor drainage lines

C Cleared Land (road and verge)

FIGURE 2.2

LEGEND - Vegetation Types described by the Baseline Survey (Umwelt, in prep)

3.0 Methods

3.1 Conservation Significance Ratings and Direct Impacts

The assessment of direct impacts to significant flora and vegetation is provided by quantification of the Project layout (i.e. Disturbance Footprint) in a Geographic Information System (GIS) environment on the known extent and range of significant environmental factors in the Study Area and local area. Therefore, the Project is expected to directly impact no more than 661 ha within an 894 ha Development Envelope.

3.1.1 Significant Flora

As previously mentioned, the significant flora dataset collected by the Baseline Surveys (Rapallo, 2021b, Umwelt, 2022) has been utilised for the flora component of this impact assessment.

A qualitative assessment of the significance of local populations of significant flora taxa to the regional conservation status of each taxon was undertaken. This assessment considered the number and distribution of indicative regional populations, the size of these populations, the reservation status of the tenure of the lands upon which they occur, and the position of the Study Area within the known range of each taxon. Information relating to significant flora taxa indicative regional populations was sourced from DBCA databases (NatureMap; Threatened and Priority Flora (TPFL) and Western Australian Herbarium Specimen databases (DBCA, 2007)), in combination with data collected for the Baseline Survey (Umwelt, 2022).

Table 3.1 Regional Conservation Significance Ratings of Local Populations of Significant Flora Taxa

Regional Conservation Significance Rating	Description
Low	Local populations are not of particular significance in terms of maintaining the survival of the taxon, as: • taxon is known from a wide distribution • taxon is known from ≥ 10 indicative regional populations, some of which are protected in conservation estate • local populations are likely to have low significance in maintaining the extent of the taxon; e.g. the local populations are located within the known range and do not represent disjunct populations, the local populations are located in relatively close proximity to other populations.
Moderate	Local populations are moderately significant in terms of maintaining the taxon through its range, as: • taxon is known from < 10 indicative regional populations, which may include those on conservation estate • taxon may have a wide distribution; however, the local populations are located on the edge of the known range or forms a significant disjunct population in comparison to other known populations • there are few, if any, nearby known populations.

Regional Conservation Significance Rating	Description
High	Local populations are relatively significant in terms of maintaining the taxon through its range, as: • taxon has a restricted distribution (< 40 km) • taxon is known from < 5 indicative regional populations, with no populations being located on conservation estate • local populations potentially contribute significantly to the maintenance of the taxon through being representative of the edge of the known range, forming a significant disjunct population or representing a significantly large population in comparison to other populations.

The number of individuals of each significant flora taxon potentially impacted, along with the impact to potential habitat for such taxa, was used to assess potential local impacts to significant flora taxa. The Disturbance Footprint was overlain on locations of significant flora taxa in a GIS environment to determine the potential extent of impact to these locations. The extent of proposed impact to preferred habitat VTs for each taxon was also calculated, to determine the proportional extent to which habitat for each taxon will be impacted. Qualitative assessment of the potential significance of impact to flora taxa and preferred habitat is provided with regard to the extent of impact and significance of local populations.

3.1.2 Vegetation

The VT mapping prepared by Umwelt (in prep) has been utilised for the vegetation component of this impact assessment.

Table 3.2 Local Conservation Significance Rating of Vegetation Types

Local Conservation Significance Rating	Description
1	• VT mapped over > 10 % of the Study Area, and • Landform/soil type on which the VT occurs is locally common and widespread.
2	• VT mapped over 1-10 % (inclusive) of the Study Area, and • Landform/soil type on which the VT occurs is locally common and widespread.
3	• VT mapped over 1-10 % (inclusive) of the Study Area, and • Landform/soil type on which the VT occurs is not locally common and/or is restricted.
4	• VT mapped over < 1 % of the Study Area, and • Landform/soil type on which the VT occurs is potentially locally uncommon and/or restricted.
5	• VT mapped over < 1 % of the Study Area, and • Landform/soil type on which the VT occurs is locally uncommon and/or restricted.

VTs ranked '1' and '2' are of low significance, with VTs ranked '3' or above considered to be of higher significance and examined on that basis accordingly.

The Development Footprint was overlain on VT polygons mapped in the Study Area in a GIS environment to determine the proposed impact area of each VT. Qualitative assessment of the potential significance of impact to vegetation is provided with regard to the extent of impact and local significance of vegetation.

Limited information regarding the regional distribution of vegetation is available for the Pilbara Bioregion. Although a regional flora and vegetation survey of the Pilbara Region has been undertaken by DBCA (McKenzie et al., 2009), no reports describing VTs on a regional scale are currently available. Studies by Beard (1975) and van Vreeswyk et al. (2004) have characterised the vegetation of the Pilbara Bioregion, but not at a scale appropriate for EIA. The significance of potential impacts to vegetation on a regional scale has been assessed through the determination of impact to pre-European vegetation (i.e. VSAs) mapped within the IBRA Subregion (DBCA, 2019), and to soil landscape units (DPIRD, 2018) (**Section 4.2.2.2**). The Disturbance Footprint was overlain on VSA polygons in a GIS environment to determine the proposed impact area for each VSA, and subsequent analysis of the pre-European and current extent of each VSA proposed to be impacted, with a similar process utilised for soil landscape units, to provide regional context.

In addition to the above, a brief qualitative assessment of potential significance of local and regional impact to Study Area VTs is provided.

3.2 Indirect Impacts

A potential indirect impact zone surrounding the Disturbance Footprint to an extent of 20 m (the IIAZ) was used to quantify potential indirect impacts (i.e. edge effects) of the Project on nearby significant flora and vegetation, in a GIS environment.

A qualitative discussion of other potential indirect impacts to flora and vegetation surrounding the Disturbance Footprint is also provided where a quantitative assessment cannot be undertaken.

4.0 Results

4.1 Conservation Significance Ratings

4.1.1 Significant Flora

As discussed in **Section 2.1**, nine significant flora taxa have been recorded within the Study Area; of these, three have records within the Disturbance Footprint (Rapallo 2021b; Umwelt, 2022). It is considered unlikely that any further significant flora taxa occur within the Disturbance Footprint (Appendix A).

An assessment of the regional conservation significance of the local populations of these significant flora taxa is provided in **Table 4.1**. This assessment uses the scale defined in **Table 3.1** and considers factors including the number of known indicative regional populations in WA, the presence of known records on lands managed for conservation, the known range of the taxon in WA, and the position of the Study Area within this range.

The ranges, number of indicative regional populations and number of populations in conservation estate of the two potentially undescribed taxa (*Corchorus* sp. and *Euphorbia ferdinandi* s. lat.) are unknown, and therefore the significance of their local populations in a regional context have been rated as High **(Table 4.1).**

Table 4.1 Significant Flora Taxa Considered in the Impact Assessment and the Significance of their Local Populations in a Regional Context

Taxon	Status (WA)	Occurrence in the Disturbance Footprint (Umwelt, 2022; Rapallo 2021b))	Significance of Local Populations in a Regional Context (Table 3.1)
Aristida jerichoensis* var. *subspinulifera	P3	• Not known to occur in the Disturbance Footprint, but one plant has been recorded 5 m away, within the Development Envelope. • Preferred habitat present in the Disturbance Footprint (VT8). • 69 ha of preferred habitat (VT8) has been mapped in the Study Area, of which 3 ha has been mapped in the Disturbance Footprint. • All suitable habitat in the Disturbance Footprint has been surveyed. • Total of 8 locations (97 individuals) recorded in the Study Area.	Local population assessed to be of Low regional significance • Taxon has a relatively wide distribution of approximately 1,000 km from near Gill Pinnacle (close to the WA / Northern Territory (NT) border) in the east, to north-west of Tom Price in the west; the Study Area is in the known range of this taxon. • Known from 42 WA Herbarium records across approximately 38 broad regional locations, three of which occur within DBCA-managed tenure within Karijini National Park (WA Herbarium 1998-). • There are 14 populations recorded (WA Herbarium, 1998-; DBCA, 2022c) within 40km of the Study Area, the nearest within one kilometre on the western side of the GNH and considered continuous with the population recorded by the baseline study (Umwelt, 2022).
Aristida lazaridis	P2	• Known to occur in the Disturbance Footprint. • Preferred habitat is present in the Disturbance Footprint (VTs 7 and 8), though it only occurs in the GNHI areas of VTs 7 and 8. • Within the GNHI area, there is 286 ha of preferred habitat. Of this, 16.8 ha (5.9%) is in the Disturbance Footprint. • All suitable habitat in the Disturbance Footprint has been surveyed. • Over 12,000 individuals recorded in the local area, of which 77 were recorded in the Disturbance Footprint.	Local populations assessed to be of Low regional significance: • Taxon has a distribution of approximately 130 km within WA, from north west of Newman in the south-east, to south-east of Wittenoom in the north-west (DBCA, 2007); the Study Area is in the centre of the known range of this taxon. • Known from 22 WA Herbarium records across approximately 17 broad regional locations, one of which occurs within DBCA-managed tenure within Karijini National Park (WA Herbarium 1998-). This taxon is also known from two records in the NT and 78 records in Qld (ALA 2022). • There are an additional 10 recorded populations within 40 km of the Study Area, the nearest to the Project's population is 10 km to the south.

Taxon	Status (WA)	Occurrence in the Disturbance Footprint (Umwelt, 2022; Rapallo 2021b))	Significance of Local Populations in a Regional Context (Table 3.1)
***Corchorus* sp.**	Potentially undescribed	• Not known to occur in the Disturbance Footprint, but one record located approximately 150 m from the Disturbance Footprint. • Preferred habitat (VT9) present in the Disturbance Footprint, however it is likely that this taxon will only occur in specific, localised sites within this VT (the known population occurs on sandy drainage lines). • 601 ha of preferred habitat (VT9) has been mapped in the Study Area, of which 68 ha has been mapped in the Disturbance Footprint. • All suitable habitat in the Disturbance Footprint been surveyed. • Total of 23 locations (35 individuals) recorded in the Study Area.	Local populations assessed to be of High regional significance: • Potentially represents an unrecognised taxon. • Range and extent of the potential new taxon is unknown; there are currently no other confirmed locations of this entity outside those collected in the local area for the Project.
Eremophila naaykensii	P3	• Not known to occur in the Disturbance Footprint. • Preferred habitat (VTs 4 and 6) present in the Disturbance Footprint. • 412 ha of preferred habitat (VTs 4 and 6) has been mapped in the Study Area, of which 1.5 ha has been mapped in the Disturbance Footprint. • All suitable habitat in the Disturbance Footprint has been surveyed. • A total of 37 locations (73 individuals) recorded in the Study Area.	Local populations assessed to be of Low regional significance: • Taxon has a distribution of approximately 200 km from near Newman in the east to east of Paraburdoo in the west, with the Study Area in the known range of this taxon. • Known from 21 WA Herbarium records across approximately 19 broad regional locations, one of which occurs within DBCA-managed tenure within Karijini National Park (WA Herbarium 1998-). • The nearest WA Herbarium record of this taxon is located 8 km south, on a range of hills between the Lamb Creek Study Area and Area C.

Taxon	Status (WA)	Occurrence in the Disturbance Footprint (Umwelt, 2022; Rapallo 2021b))	Significance of Local Populations in a Regional Context (Table 3.1)
***Euphorbia ferdinandi* s. lat.**	Potentially undescribed	• Not known to occur in the Disturbance Footprint. • Preferred habitat (VT8) present in the Disturbance Footprint. • 69 ha of preferred habitat has been mapped in the Study Area, of which 3 ha has been mapped in the Disturbance Footprint. • Total of 19 locations (60 individuals) recorded in the Study Area. • All suitable habitat in the Disturbance Footprint has been surveyed.	Local populations assessed to be of potentially High regional significance: • Potentially represents an unrecognised taxon. • Range and extent of the potential new taxon is unknown; although there are several segregated specimens at the WA Herbarium which may represent this taxon, a determination on this would be required. The submitted specimens of this entity are awaiting final determination by the WA Herbarium.
***Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708)**	P2	• Not known to occur in the Disturbance Footprint • Preferred habitat (VT4) present in the Disturbance Footprint. • 95 ha of preferred habitat (VT4) has been mapped in the Study Area, of which less than 1 ha has been mapped in the Disturbance Footprint. • All suitable habitat in the Disturbance Footprint has been surveyed. • 2 locations (17 individuals) were recorded in the Study Area.	Local populations assessed to be of Moderate regional significance: • Taxon has a distribution of approximately 180 km from north of Newman in the east to north-east of Paraburdoo in the west. The Study area is located on the northern extent of its known range. • known from 24 WA Herbarium records across 10 broad regional locations, two of which occur within DBCA-managed tenure within Karijini National Park (WA Herbarium 1998-). • No records are within 10km of the Study Area.
***Rhagodia* sp Hamersley (M. Trudgen 17794)**	P3	• Known to occur in the Disturbance Footprint • Preferred habitat present in the Disturbance Footprint (VT7); however this species only occurs in the GNHI area of VT7. • Within the GNHI area, there is 217 ha of preferred habitat. Of this, 13.8 ha (6.4%) is in the Disturbance Footprint. • All suitable habitat in the Disturbance Footprint has been surveyed. • Total of 43 locations (53 individuals) have been recorded in the Study Area, 3 locations (3 individuals) of which occur in the Disturbance Footprint.	Local populations assessed to be of Low regional significance: • Taxon has a distribution of approximately 330 km from west of Jigalong in the east to north-east of Tom Price in the west. The Study Area is in the northern extent of the known range of this taxon. • Known from 72 WA Herbarium records across more than 50 broad regional locations, two of which occur within DBCA-managed tenure including Jigalong Aboriginal Reserve and Karijini National Park (WA Herbarium 1998-). • A total of five records are known from within 10km of the Study Area, with nearby records confirming preferred habitat for this taxon.

Taxon	Status (WA)	Occurrence in the Disturbance Footprint (Umwelt, 2022; Rapallo 2021b))	Significance of Local Populations in a Regional Context (Table 3.1)
Rostellularia adscendens* var. *latifolia	P3	• Not known to occur in the Disturbance footprint, but one record (one individual) located approximately 80 m from the Disturbance Footprint. • Preferred habitat (VT1) present in the Disturbance Footprint; however taxon is likely to occur only in rocky drainage lines of VT1. • 1,429 ha of preferred habitat (VT1) has been mapped in the Study Area, of which 342 ha has been mapped in the Disturbance Footprint. • All suitable habitat in the Disturbance Footprint has been searched. • One location (one individual) has been recorded in the Study Area.	Local population assessed to be of Low regional significance: Taxon has • A distribution of approximately 450 km from west of Tom Price to north east of Meenthena Station. The study area is in the centre of the known range of this taxon. • Known from 42 WA Herbarium records across more than 280km from near Mt Farquhar (89km north-west of Tom Price) to the Oakover River. At least six locations occur in the Karijini National Park. • This taxon has been recorded approximately 20km south-east of the Lamb Creek retention license on the MAC development Envelope (Onshore 2017 quoted in Rapallo 2021a).
Seringia exastia	T	• Known to occur in the Disturbance Footprint. • Preferred habitat (VT1) present in the Disturbance Footprint. • 1,429 ha of preferred habitat (VT1) has been mapped in the Study Area, of which 342 ha has been mapped in the Disturbance Footprint. • Taxon was not specifically searched for in Disturbance Footprint given its common and widespread nature since synonimisation with *S. elliptica* (Binks, *et al.*, 2020), and its consistent and abundant occurrence throughout VT1. • 37 locations (783 individuals) recorded in the Study Area, of which 11 locations (211 individuals) were recorded in the Disturbance Footprint.	Local populations assessed to be of Low regional significance: • At the time of publication, *S. exastia* is no longer recognised under WA's BC Act, but remains listed as Threatened under the EPBC Act. • This taxon now has a very wide range across Western Australia (>1200km), extending from Giralia Station in the west through to the border with the NT, and from Broome in the north to Mt Manning Range NR in the south. The Study Area is within the known range of this taxon. • There are 293 records of this taxon across its range (WA Herbarium 1998-).

4.1.2 Vegetation

As discussed in **Section 2.2.2**, a total of nine VTs have been mapped in the Disturbance Footprint (Umwelt, 2022), and therefore are at risk of impact by the Project. The single VT that is not mapped in the Disturbance Footprint, VT5, predominately occurs north-east of the Disturbance Footprint in the north-eastern portion of the Study Area, with the closest occurrence being approximately 150 m from the Disturbance Footprint. VT 5 is likewise not mapped within the Development Envelope. Consequently, it is not expected that this VT will be directly impacted by Project activities.

None of the VTs mapped in the Study Area are considered to represent any formally listed TECs or PECs, nor considered significant for reasons other than formal listing (Umwelt, 2022) (**Section 2.2.2**). Although the VTs have not been mapped at a regional scale, none of the VTs are likely to be regionally significant, as no listed TECs or PECs occur in the Study Area, all landform and soil types associated with the VTs are likely to be relatively common in the region and all VTs are likely to extend outside of the Study Area due to continuing similarity of landforms and soils.

An assessment of the local conservation significance rating of each VT mapped in the Disturbance Footprint is presented in **Table 4.2.** This assessment uses the scale defined in **Table 3.2,** and considers the extent of the VT mapped over the Study Area and whether it occurs on restricted landforms and/or soils. Significant flora taxa that have preferred habitat in each VT is also provided in **Table 4.2** for context.

The local conservation significance of the majority (six) of VTs mapped was rated as '2', due to the VTs being mapped over 1-10 % of the Study Area and having a common local or widespread occurrence. Four VTs were mapped widely (>10%) over the Study Area, also on common or widespread landforms and soil types, and were therefore rated '1', the lowest significance rating. No VTs were mapped over less than 1% of the Study Area, nor were considered to occur on restricted landforms or soils **(Table 4.2)**. Therefore, all VTs are considered to have low significance at the local scale.

Table 4.2 Local Conservation Significant Rating Assessment of Vegetation Types of the Disturbance Footprint

Vegetation Type	Percent of Study Area (%)	Local Area Characteristics (Umwelt, 2022)	Local Conservation Significance Rating (Table 3.2)
1	37.8	• Occurs on stony red-brown sandy clay loam to clay loam on gently inclined mid to lower slopes and associated drainage lines. • Mapped widely over the entirety of the Study Area. • Considered likely to extend outside the Study Area to the north, west and south. • Occurs on landforms and soils that are likely to be locally common and widespread.	1
2	10.1	• Occurs on red-brown clay loam with ironstone pebbles on gently inclined lower to upper slopes. • Mapped across four general occurrences in the Study Area, typically at the upper slopes and summits of low hills, or the midslopes of high elevation ranges. • Considered likely to extend outside the Study Area to the northwest, north, east and south. • Occurs on landforms and soils that are likely to be locally common and widespread.	1
3	1.3	• Occurs on red-brown clay loam with ironstone pebbles on gently inclined lower to upper slopes. • Mapped over low ranges in the south west of the Study Area. • Considered likely to extend outside the Study Area to the south west. • Occurs on landforms and soils that are likely to be locally common and widespread.	2
4	2.5	• Occurs on red brown clay loam on steep upperslopes, gullies, breakaways and gorges with significant ironstone outcropping. • Mapped on ranges in the east of the Study Area, south east of the Mine DE. • Considered likely to extend outside the Study Area to the east and south. • Occurs on landforms and soils that are likely to be locally common and widespread.	2
5	2.7	• Occurs on steep upperslopes and associated drainage lines on red-brown clay loam with exposed ironstone and dolerite. • Mapped on ranges in the north east of the Study Area. • Considered likely to extend outside the Study Area to the north and east. • Occurs on landforms and soils that are likely to be locally common and widespread.	2

Vegetation Type	Percent of Study Area (%)	Local Area Characteristics (Umwelt, 2022)	Local Conservation Significance Rating (Table 3.2)
6	8.4	• Occurs on red brown sandy clay loam on steep mid to upper slopes with exposed ironstone. • Mapped on ranges in the east of the Study Area, south east of the Mine DE. • Considered likely to extend outside the Study Area to the east and south. • Occurs on landforms and soils that are likely to be relatively locally common and widespread.	2
7	13.8	• Occurs on red brown clay loam with some ironstone pebbles on plains. • Mapped widely over plains west of Mine Creek. • Considered likely to extend outside the Study Area to the north and west. • Occurs on landforms and soils that are likely to be locally common and widespread.	1
8	1.8	• Occurs on red-brown sandy clay to clay on plains. • Mapped over plains in the south west of the Study Area. • Considered likely to extend outside the Study Area to the west and south. • Occurs on landforms and soils that are likely to be locally common and widespread.	2
9	15.9	• Occurs on red-brown clay loam with ironstone pebbles on plains. • Mapped widely over plains west of Mine Creek. • Considered likely to extend outside the Study Area to the north and west and south. • Occurs on landforms and soils that are likely to be locally common and widespread.	1
10	5.7	• Occurs on red-brown clay loams on major and minor drainage lines. • Mapped over Mine Creek and its tributaries, significant drainage lines flowing down from hills in the south west, east and north east of the Mine DE. • Considered likely to extend outside the Study Area to the north and south. • Occurs on landforms and soils that are likely to be locally common and widespread.	2

4.2 Direct Impacts

4.2.1 Significant Flora

4.2.1.1 Local Impact

Table 4.3 presents a summary of potential direct impacts to the three significant flora taxa that are known to occur in the Disturbance Footprint (as per **Table 2.1**), based on calculation of percentages of individuals known from the Disturbance Footprint that are at risk of direct impact by the Project.

Less than 7% of the local population of *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) and less than 1% of the local population of *Aristida lazaridis* (P2) is potentially at risk of direct impact by the project. Approximately 27% of the known numbers of individuals of *Seringia exastia* are potentially directly impacted by the project (**Table 4.3**).

Table 4.3 Potential Direct Impact to Locations and Individuals of Significant Flora Taxa

Taxon	Status*	Local Area		Disturbance Footprint			
		Number of Locations	Number of Individuals	Number of Locations	Percent of Locations (%)	Number of Individuals	Percent of Individuals (%)
Aristida lazaridis	P2	6,766[a]	12,942[a]	63	0.9	77	0.6
***Rhagodia* sp. Hamersley (M. Trudgen 17794)**	P3	49[b]	53[b]	3	6.1	3	5.7
Seringia exastia	T	37[b]	783[b]	11	29.7	211	26.9

[a] Counts include locations and individuals outside the Study Area, representing a continuance of the population within the study area (Rapallo, 2021b)

[b] Count is of locations and individuals inside the Study Area only

*Conservation status in WA under the BC Act, with the exception of *Seringia exastia* (T) which remains recognised only under the EPBC Act.

Table 4.4 presents a summary of the potential local direct impact to significant flora taxa whose preferred habitat occurs within the Disturbance Footprint, based on calculation of the percentage of its preferred habitat in the Disturbance Footprint that is at risk of impact by the Project. For the purpose of calculating impacts, the preferred habitat of two taxa (*Aristida lazaridis* and *Rhagodia* sp. Hamersley (M. Trudgen 17794)) is considered restricted to the GNH area of their respective VTs. **Table 4.4** considers all significant flora taxa in **Table 4.1**, irrespective of whether known locations are present in the Disturbance Footprint.

Table 4.4 Potential Direct Impact to Preferred Habitat of Significant Flora Taxa

Taxon	Status*	Preferred Habitat (VTs)	Mapped Extent of Preferred Habitat (ha)		Percent Impact (%)
			Study Area	Disturbance Footprint	
Aristida jerichoensis* var. *subspinulifera	P3	8	68.93	2.93	4.3
Aristida lazaridis	P2	7 and 8 (GNHI Area only)	286.17	16.81	5.9

Taxon	Status*	Preferred Habitat (VTs)	Mapped Extent of Preferred Habitat (ha)		Percent Impact (%)
Corchorus sp.	Potentially undescribed	9	600.81	68.28	11.4
Eremophila naaykensii	P3	4 and 6	411.93	1.46	0.4
Euphorbia ferdinandi s. lat.	Potentially undescribed	8	68.93	2.93	4.3
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	P2	4	95.32	0.62	0.7
Rhagodia sp Hamersley (M. Trudgen 17794)	P3	7 (GNHI Area only)	217.24	13.88	6.4
Rostellularia adscendens var. *latifolia*	P3	1	1,429.16	343.39	24.0
Seringia exastia	T	1	1,429.16	343.39	24.0
*Conservation status in WA under the BC Act, with the exception of *Seringia exastia* (T) which remains recognised only under the EPBC Act.					

Table 4.5 presents a qualitative assessment of the significance of the potential direct impact by the Project to significant flora taxa at a local scale. The potential direct impact to all assessed taxa is considered unlikely to be significant at the local scale.

Table 4.5 Significance of Potential Local Direct Impact to Significant Flora Taxa

Taxon	Status*	Regional Significance of Local Populations (Table 4.1)	Potential Local Direct Impact (%)		Comment Regarding Potential Significance of Local Direct Impact
			Number of Individuals (Table 4.3)	Preferred Habitat VT (Table 4.4)	
Aristida jerichoensis var. *subspinulifera*	P3	Low	0	4.3	Unlikely to be significant direct impact. No individuals and less than 5% of preferred habitat of the Study Area is at risk of direct impact.
Aristida lazaridis	P2	Low	0.6	5.9	Unlikely to be significant direct impact. Less than 2% of individuals at risk of direct impact and preferred habitat is well represented outside of the Disturbance Footprint and in the local area.
Corchorus sp.	Potentially undescribed	High	0	11.4	Unlikely to be significant direct impact. No individuals at risk of direct impact and preferred habitat is primarily represented outside the Disturbance Footprint in the local area.
Eremophila naaykensii	P3	Low	0	0.4	Unlikely to be significant direct impact. No individuals and less than 1% of preferred habitat of the Study Area is at risk of direct impact.

Taxon	Status*	Regional Significance	Potential Local Direct Impact (%)		Comment Regarding Potential Significance of Local Direct Impact
***Euphorbia ferdinandi* s. lat.**	Potentially undescribed	High	0	4.3	Unlikely to be significant direct impact. No individuals and less than 5% of preferred habitat of the Study Area is at risk of direct impact.
***Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708)**	P2	Moderate	0	0.7	Unlikely to be significant direct impact. No individuals and less than 1% of preferred habitat of the Study Area is at risk of direct impact.
***Rhagodia* sp Hamersley (M. Trudgen 17794)**	P3	Low	5.7	6.4	Unlikely to be significant direct impact. Less than 6% of individuals at risk of direct impact and preferred habitat is well represented outside of the Disturbance Footprint and in the local area.
Rostellularia adscendens* var. *latifolia	P3	Low	0	24.0	Unlikely to be significant direct impact. No individuals and less than 25% of preferred habitat of the Study Area is at risk of direct impact.
Seringia exastia	T	Low	26.9	24.0	Unlikely to be significant direct impact. Taxon is common in the local area, and preferred habitat is well represented outside the Disturbance Footprint in the local area.
*Conservation status in WA under the BC Act, with the exception of *Seringia exastia* (T) which remains recognised only under the EPBC Act.					

4.2.1.2 Regional Impact

Table 4.6 presents a summary of significance of potential impacts at the regional scale to populations of significant flora taxa that are known to occur in the Disturbance Footprint (as per **Table 4.3**). Note that while the number of indicative regional populations of significant flora taxa presented in **Table 4.6** has been determined using the DBCA (2017) definition of a population (described in **Section 1.3**), the number of new populations recorded by the Baseline Survey and the number of regional populations that will be impacted has been limited to a maximum of one, as it is considered that there is insufficient spatial separation between significant flora records in the local area and Disturbance Footprint to indicate the presence of multiple indicative local populations.

There is unlikely to be significant regional impact to any of the assessed taxa, including those with local populations that have high regional conservation significance. This is primarily due to the relatively low levels of direct impact on local populations of these taxa, with all taxa that have known records in the Disturbance Footprint also having known records and preferred habitat outside the Disturbance Footprint in the wider local area (**Table 4.1**).

Table 4.6 Potential Regional Impact of Populations of Significant Flora Taxa

Taxon	Status*	Regional Significance of Local Populations (Table 4.1)	Known Indicative Regional Populations (Table 4.1)	New Regional Populations Recorded by Baseline Survey	Total Known Indicative Regional Populations	Indicative Regional Populations to be Impacted	Comment Regarding Potential Significance of Regional Impact
Aristida lazaridis	P2	Low	17	0	17	1	Unlikely to be significant impact Whilst the taxon is known from only 17 regional populations (low regional significance of these local populations), the Project has a very low (less than 1%) potential direct impact at the local scale.
***Rhagodia* sp. Hamersley (M. Trudgen 17794)**	P3	Low	72	0	72	1	Unlikely to be significant impact Taxon is known from a relatively large number of regional populations (low regional significance of these local populations) and has a low impact at the local scale.
Seringia exastia	T	Low	293	0	293	1	Unlikely to be significant impact Taxon is known from an extensive and large number of regional populations (low regional significance of these local populations) and has a low impact at the local scale.

*Conservation status in WA under the BC Act, with the exception of *Seringia exastia* (T) which remains recognised only under the EPBC Act.

4.2.2 Vegetation

4.2.2.1 Local Impact

Table 4.7 presents a summary of potential local impact to VTs mapped in the Disturbance Footprint, based on the mapped extent of VTs in the Disturbance Footprint in relation to their total mapped extent in the Study Area.

The extent of impact on VTs mapped in the Disturbance Footprint is relatively low with the mapped extents in the Disturbance Footprint ranging between 23.9 % (VT1) and 0.3 % (VT6) of the mapped extent in the Study Area (**Table 4.7**).

The highest local conservation significance rating for VTs of the Disturbance Footprint was '2' (VT mapped over 1-10 % (inclusive) of the Study Area, and landform/soil type is locally common and widespread) (VTs 3,4,5,6,8 and 10) (**Table 4.2**). Therefore, these VTs are considered to be of low local significance. In addition, there is unlikely to be significant impact at the local scale for any of the assessed VTs due to the relatively low percentage of impact, with less than 25% of the mapped extent of any VT at risk of direct impact (**Table 4.7**).

Table 4.7 Potential Local Impact to Vegetation Types

Vegetation Type	Local Conservation Significance Rating (Table 4.2)	Mapped Extent (ha)		Percent Impact (%)
		Study Area	Disturbance Footprint	
1	1	1,429.16	343.39	24.0
2	1	382.30	76.30	20.0
3	2	48.16	6.32	13.1
4	2	95.32	0.62	0.7
5	2	100.95	-	0.0
6	2	316.61	0.84	0.3
7	1	523.39	118.88	22.7
8	2	68.93	2.93	4.3
9	1	600.81	68.28	11.4
10	2	215.50	41.11	19.1

4.2.2.2 Regional Impact

As discussed in **Section 2.2.1,** two VSAs occur in the Study Area and Disturbance Footprint. A summary of the impact of the Project to these VSAs is presented in **Table 4.8**. This assessment considers the spatial extent of each VSA that will remain in the Hamersley IBRA subregion following clearing of vegetation for the Project, and the extent remaining as a percent of each VSA's Pre-European extent in the Hamersely IBRA subregion.

The implementation of the Project will not result in any of the VSAs in the Disturbance Footprint falling below the 30 % pre-European extent threshold (EPA, 2008) (**Table 4.8**). Therefore, the scale of regional impact to these VSAs because of the Project is unlikely to be significant.

Table 4.8 Impact to Vegetation System Associations of the Disturbance Footprint

Vegetation System Association	Mapped Extent (ha)			Extent Remaining^ (ha)	Extent Remaining$ (%)
	Pre-European*	Current*	Disturbance Footprint		
Hamersley_18	580,512	575,808	413	575,395	99.1
Hamersley_82	2,158,862	2,146,708	248	2,146,460	99.4

* Data from DBCA (2019).

^ Current extent of VSA remaining following clearing of the Disturbance Footprint.

$ Current extent of VSA remaining as a percent of the Pre-European extent following clearing of the Disturbance Footprint.

Five soil landscape units occur in the Study Area and Disturbance Footprint (**Table 2.3**). A summary of the impact of the Project to these soil landscape units is presented in **Table 4.9**. This assessment considers the spatial extent of each soil landscape unit that maybe impacted by the Project, which in all cases is negligible (less than 0.01%).

Table 4.9 Impact to Soil Landscape Units of the Disturbance Footprint

Unit	Mapped Extent (ha)		Extent Remaining (ha)	Percent Impact (%)
	Total*	Disturbance Footprint		
Boolgeeda (285Bg)	774,800	588.41	774,212	0.076
McKay (285Mk)	420,200	12.70	420,187	0.003
Newman (285Ne)	1,458,000	44.53	1,457,955	0.003
Platform (285Pl)	1,570,000	10.25	1,569,990	0.001
Wannamunna (285Wn)	57,700	4.75	57,695	0.008

* Data from DPIRD (2018) and van Vreeswyk et al. (2004).

Given that none of the VTs are considered regionally significant, nor correspond to any formally-listed TECs or PECs, nor are considered significant for reasons other than formal listing (Umwelt, 2022), and all VTs are considered to be represented outside of the Study Area, the potential regional significance of impact to VTs is unlikely to be significant.

4.3 Indirect Impacts

4.3.1 Background

4.3.1.1 Dust

There is potential for dust generated during Project construction and operation to be deposited on flora and vegetation in close proximity to Project areas. Dust can impede photosynthesis and other physiological processes of plants, including by blocking stomata, which can impact the overall health of vegetation.

Some research has been undertaken to investigate the impact of dust on native vegetation in the Pilbara and southwest of WA (Butler, 2009; Matsuki *et al.*, 2016), as well as at mine sites in nearby regions. There is some evidence to suggest that dust from mining operations can impact flora taxa and/or vegetation, but the long-term impact is not clear. Turner (2013) reported that heavy dust loading resulted in reduced stomatal conductance in two *Acacia* taxa; likewise, it was evident in field observations that heavy dust loads resulted in some plant stress, including leaf shed, or plant senescence. It was found that the leaf surface and dust interaction was more important to plant stress levels than the actual amount of dust; however, metal-rich dust with low pH may have been the causal factor.

In other studies, while some temporary impacts have been recorded in terms of reduced photosynthesis, no long-term effects such as increased plant mortality have been established. Monitoring by Woodman Environmental (2017) at the Atlas Iron Pty Ltd Pardoo iron ore mine focussed on potential impacts of dust generated by mining operations including road use, on two ephemeral significant flora taxa, *Eragrostis crateriformis* (P3) and *Rothia indica* subsp. *australis* (P1). However, unlike Turner, Woodman Environmental reported that the dust levels on these taxa did not result in significant stress or death.

If appropriate dust suppression procedures are implemented during clearing and machinery movement, it is unlikely that dust deposition will significantly impact surrounding vegetation and flora taxa. Likewise, if dust suppression at Lamb Creek utilises groundwater that is fresh, run-off of saline water into adjacent vegetation, or overspray of saline water directly onto vegetation, is not anticipated.

4.3.1.2 Changes to Surface Water Hydrology

Altered surface water hydrology may result in the potential reduction or removal of seasonal surface water flows, leading to either death or loss of condition to individual plants or vegetation. Barriers to surface water flows, such as intersection of watercourses, may result in ponding upstream, interruption of sheet flows, and drainage shadow effects downstream of the barrier. Water ponding may have secondary effects, including the creation of new or modified environments due to the presence of waterlogging or permanent water, and increased presence of weed species. Vegetation at risk from drainage shadow includes both terrestrial vegetation that is reliant on sub-surface soil-water flow, and riparian vegetation that is at least partially reliant on water sources provided by creeklines and drainage areas.

4.3.1.3 Changes to Groundwater Levels (Groundwater Drawdown)

Open pit mines often extend below the natural position of the water table, and therefore groundwater surrounding such mines may be extracted to lower the water table and provide dry mining conditions. This may result in the death of phreatophytic taxa and change in composition of GDV. Loss of groundwater-dependant tree species may in turn affect overall vegetation condition as a result of increased light levels, altered vegetation structure, and vegetation-related soil moisture levels. Phreatophytic taxa in the Pilbara include *Melaleuca argentea* (strongly obligate phreatophyte), *Sesbania formosa* (obligate phreatophyte), *Eucalyptus camaldulensis* subsp. *refulgens* (can be obligate or a facultative phreatophyte depending on the situation), and facultative phreatophytes including *Atalaya hemiglauca, Acacia ampliceps, Melaleuca glomerata* and *Melaleuca linophylla.*

Natural seasonal fluctuations in groundwater levels may also serve to affect the health of phreatophytic taxa, with the greatest risk of stress likely to be prior to the start of the 'wet' season in the Pilbara (October-November). The effects of these fluctuations may be exacerbated by groundwater drawdown, potentially resulting in severe stress of phreatophytic taxa prior to significant rainfall (Groom *et al*., 2000).

Groundwater drawdown is proposed at Lamb Creek from mining inception for pit dewatering and to meet water supply demands (PSM, 2021). The depth of the water table in the resource area ranges from 25 to 60 m, which discounts the local presence of GDEs (PSM, 2021). In addition, within Umwelt's (in prep) Study Area, no GDV has been identified; the only GDV indicator taxon recorded from the Study Area was the facultative phreatophyte *Atalaya hemiglauca,* occurring occasionally in the riparian vegetation of Mine Creek (VT10). The presence of this taxon alone does not indicate the presence of GDV, with the depth of the water table indicating that the vegetation is unlikely to be dependent on groundwater.

4.3.1.4 Groundwater Discharge

Surplus water from groundwater dewatering may be discharged to the land surface as a controlled release into designated watercourses or wetlands. Impacts from groundwater discharge can be two-fold; during discharge activities, followed by impacts when discharge stops. Primary impacts from groundwater discharge include temporary creation of new or modified environments downstream of discharge points due to the presence of permanent water/waterlogging or extension of the time that water is present, followed by subsequent decline of these environments after cessation of discharge (CSIRO, 2015; MWH, 2009; Woodman Environmental, 2019). Senescence of plant species that cannot tolerate constant waterlogging may occur, as well as the introduction and/or spread of tolerant weed species. While it is likely that any species lost due to the surface saturation will re-colonise the area after environmental discharge has ceased, the re-colonisation may take many years (van Etten & Vellekoop, 2009; Woodman Environmental, 2019).

4.3.1.5 Fragmentation

Fragmentation is the process by which habitat loss results in the division of large, continuous habitats into smaller, more isolated habitat fragments. The main drivers of fragmentation impacts include reduced patch (habitat) area, increased edge effects (introduction of weeds and other degradation), altered patch shape, increased patch isolation and altered matrix structure. Smaller patches, including smaller populations of significant flora taxa, can result in reduction of reproductive success of individual species, and reduction of overall species composition. The length of time for which a patch has been isolated is also important, with species richness decreasing with increased time since fragmentation (Didham, 2010).

With respect to individual species, several traits may assist in predicting their sensitivity to fragmentation (Henle *et al.* (2004), referenced in Didham (2010)):

- Population size: smaller populations are more prone to extinction.
- Population variability: greater temporal variability in population size reduces the probability of population persistence.
- Competitive ability and sensitivity to disturbance: competitively-dominant species in undisturbed habitats may reduce at the expense of disturbance-opportunists.
- Degree of habitat specialisation: specialist species are more susceptible than generalist species.
- Rarity: rare, patchily distributed species are more susceptible than common species.
- Biogeographical location: tropical and Mediterranean biomes are more sensitive to fragmentation than temperate biomes.

Gene flow that is too low to sufficiently buffer the negative effects of inbreeding and genetic drift in fragmented populations may result in decreased population fitness and increased risk of extinction following further habitat fragmentation (Lienert, 2004; Luquet et al., 2012). Furthermore, taxa with genetic diversity that is already low may be at greater risk from habitat fragmentation than those with greater genetic diversity.

4.3.2 Indirect Impact Assessment

4.3.2.1 Edge Effects

The flora and vegetation in the IIAZ is at risk of edge effects as a result of the Project, including dust deposition, water ponding, runoff, drainage shadow and weeds (**Section 4.3.1**). The IIAZ encompasses a total area of 278 ha. Note that a figure for the IIAZ has not been prepared given the small buffer distance from the Disturbance Footprint.

Table 4.10 presents the number of locations and individuals of significant flora taxa recorded by the Baseline Survey within the IIAZ that are at risk of edge effects as a result of the Project.

A total of four significant flora taxa have records within the IIAZ **(Table 4.10).** Note that the Baseline Survey searched for significant taxa throughout the Development Envelope, which is a 20 – 40 m buffer on the majority of the Footprint. As such, it is considered likely that the majority of significant flora taxa present in the IIAZ were recorded by the Baseline Survey.

Table 4.10 Number of Locations and Individuals of Significant Flora Taxa Recorded by the Baseline Surveys Within the IIAZ

Taxon	Status*	Number of Locations	Number of Individuals
Aristida jerichoensis var. *subspinulifera*	P3	1	1
Aristida lazaridis	P2	168	217
Corchorus sp.	Potentially undescribed	-	-
Eremophila naaykensii	P3	-	-
Euphorbia ferdinandi s. lat.	Potentially undescribed	-	-
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	P2	-	-
Rhagodia sp. Hamersley (M. Trudgen 17794)	P3	3	3
Rostellularia adscendens var. *latifolia*	P3	-	-
Seringia exastia	T	2	10

*Conservation status in WA under the BC Act, with the exception of *Seringia exastia* (T) which remains recognised only under the EPBC Act.

Table 4.11 presents the extent of VTs mapped by the Baseline Surveys in the IIAZ that is at risk of edge effects as a result of the Project. A total of nine VTs have been mapped within the IIAZ, as well as Cleared Land (not presented in **Table 4.11**). The total mapped extent of vegetation in the IIAZ is 119.64 ha.

Table 4.11 Mapped Extent of Vegetation Types in the IIAZ

Vegetation Type	Mapped Extent in IIAZ (ha)
1	52.02
2	6.39
3	3.27
4	0.17
5	-

Vegetation Type	Mapped Extent in IIAZ (ha)
6	0.87
7	28.82
8	4.35
9	14.29
10	8.21

4.3.2.2 Weeds

The condition of the vegetation of the Study Area was predominately rated as 'Excellent', as there was no or little evidence of impact to vegetation composition as a result of human activities, or there were only low levels of weed taxa. The vegetation condition of some areas was rated lower (Very Good to Good) due to the presence of moderate to large infestations of invasive weeds (in riparian areas) and or historical clearing (Umwelt, 2022).

If not adequately managed, Project activities could result in the introduction and/or spread of weeds, particularly in areas within close proximity to, or downstream of, the Disturbance Footprint, resulting in degradation of otherwise intact vegetation.

4.3.2.3 Changes to Surface Water Hydrology

A number of minor ephemeral watercourses intersect the Disturbance Footprint and will therefore be impacted by the Project. Sheet flow interruption may also occur. Most watercourses that will be impacted by the Disturbance Footprint are located on service corridors, and consequently it is expected that surface water flow in these areas can be adequately managed by appropriate design. However, for the larger watercourse of Mine Creek there is the potential for surface water drainage shadow impacts to downstream flora and vegetation if the flow is interrupted. Mine Creek and all drainage catchments within the resource area flow northward into Marillana Creek (RPS, 2017) which supports GDV (riparian vegetation and seasonal pools in the Flat Rocks area, about 24 km downstream of the Project) (PSM, 2021). Normal surface water flows and quality needs to be maintained to avoid impacts downstream.

One VT mapped in the Disturbance Footprint by the Baseline Survey represents riparian vegetation, being VT10, of which a combined 49 ha is potentially impacted (**Section 4.4.2**). The health of Mulga groves such as those that dominate VTs 7 and 8 are known to be dependent in part on surface water flows, including sheet flow (Davies, 2010). Other VTs (VT1 and VT9) include minor drainage features which support vegetation that depend on surface water flows to some degree (Umwelt, 2022).

There is potential for indirect impacts via interruption of surface water flows (including sheet flow) or changes in water quality to the following areas, where they occur downstream or downslope:

- The population of *Corchorus* sp. (potentially undescribed, and an assessed conservation significance rating of high (see **Section 4.1.1**));
- Riparian vegetation;
- Mulga grove vegetation (VT7, VT8);
- Populations of significant flora in the GNHI area;

- Any further significant taxa which have been assessed as 'possibly' occurring in the Study Area (**Appendix A**), which are dependent or partially dependent on surface water flows.

As these areas are reliant on surface water inputs, the flora and vegetation of these areas both within and downstream of the Disturbance Footprint are potentially at risk of impact through reduced availability of water. As the Lamb Creek development lies within the Marillana Creek catchment, disturbance of footprint areas, and any catchments blocked or trapped, are likely to decrease runoff into Marillana Creek and any GDEs downstream of the Project (RPS, 2017). The extent of potential impact to vegetation in terms of inducing drought stress as a result of a reduction in catchment area is unknown.

Where proposed mining and associated infrastructure will interrupt natural flows, the extent and significance of impacts will be dependent on the allowances made for surface water flows to pass under or around any barriers and the success of efforts to re-establish flows (Muller, 2005). Recommendations have been made by RPS (2017) to establish culverts and other drainage structures at creek crossings sufficient to minimise closure times during flooding events to acceptable operational levels. The design of drainage structures must also consider impacts to downstream vegetation and aim to re-establish both the volume and spread of water flows, particularly for the Mulga groves of VTs 7 and 8.

Other potential changes to surface water hydrology as a result of the Project include increased water runoff and sediment deposition from mining infrastructure and landforms, water ponding, and erosion in vegetation adjacent to the Disturbance Footprint. This can lead to secondary impacts including changes to vegetation structure and increased presence and severity of weeds. The potential impacts to significant flora and vegetation from these effects have been quantified and discussed in **Section 4.3.2.1** with reference to the IIAZ.

Surface water flow will need to be maintained over the course of construction and mine life. Similarly, the design and maintenance of the Haulage route will need to take into account surface water drainage features. The use of water for dust suppression must also consider water quality, in particular salinity, for potential impacts of runoff to adjacent vegetation, and avoid the use of hypersaline water (Davies, 2010).

4.3.2.4 Impacts through Groundwater Drawdown

No GDV has been identified as occurring within the Study Area (Umwelt, 2022) and depths to groundwater within the Project area are typically greater than 10 m (PSM, 2021). Although total depth of groundwater drawdown is predicted to be approximately 33m below the topographical surface (during the last four months of mine planning – months 23-26), groundwater drawdown to a depth of 1m is expected to occur across a range of 5.4km from the pit area under the Lower-bound scenario (most likely scenario); to an extent of 4.4km in the base case and 6.3km for the Upper-bound scenario (less likely). The groundwater drawdown is not expected to impact vegetation of the Study Area as no GDV has been identified in this area. As per PMK (2021), the proposed groundwater drawdown is not expected to influence nearby GDEs (calcretes at the confluence of the Marillana and Mine Creek), however that GDE area is outside the current Study Area and therefore outside the scope of this assessment and not assessed in this report.

4.3.2.5 Groundwater Discharge

It is unclear from PSM (2021) if groundwater discharge will be required (where groundwater abstraction is greater than the water requirements of the project). Figure 16 of PSM (2021) presents potential groundwater injection sites with regards to the upper-bound scenario (where pit dewatering produces more water than the project demands), which was described as being less-likely than the lower-bound

scenario (pit dewatering supplying less water than demand). These point injection sites are located on the Mine Creek, within the Study Area. It is recommended that this assessment be revisited if such discharge is required. Monitoring of the health of vegetation in the vicinity of the injection site is recommended to be undertaken if discharge is realised, given the terrestrial (non-phreatophytic) nature of the vegetation in this area.

4.3.2.6 Fragmentation

The impact of fragmentation to local populations of significant flora taxa is difficult to quantify at a site level. A brief qualitative assessment of the possible impacts of fragmentation by the Project has been undertaken.

Four taxa (*Aristida lazaridis* (P2), *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3), *Aristida jerichoensis* var. *subspinulifera* (P3) and *Euphorbia ferdinandi* s. lat (potentially undescribed)) only occur in the GNHI area, in which the Great Northern Highway and a railway line already intersect populations. The Disturbance Footprint in this area consists of a 30 – 75 m wide linear corridor, and a 15 m widening of Great Northern Highway into historically disturbed vegetation. Any potential impacts of fragmentation through separation (or increasing existing separation) are likely to be negligible and not significant for these four taxa.

The population of *Corchorus* sp. occurs only to the west (downslope) of the Disturbance Footprint and is unlikely to be impacted by fragmentation.

Targeted survey extent was limited to potential impact areas (the Development Envelope), and it is likely that targeted survey outside the DE would provide further data regarding the presence of additional existing linkages between populations, with suitable habitat for each taxon often occurring between currently known populations.

The impacts of fragmentation to vegetation types, if any, are unlikely to be significant.

4.4 Combined Impacts

The following sections present potential impacts to significant flora and vegetation as a combination of direct impacts in the Disturbance Footprint (**Section 4.2**) and indirect impacts in the IIAZ (**Section 4.3.2**). Note that the combined impact assessment assumes a worst-case scenario of total clearing of the Disturbance Footprint as well as complete loss of environmental values in the IIAZ.

4.4.1 Significant Flora

Predicted potential combined impacts to significant flora locations and individuals as a result of the Project are presented in **Table 4.13** and **Table 4.14**, respectively, while **Table 4.15** presents potential combined impacts to significant flora preferred habitat.

The combined impact to the preferred habitat of *Seringia exastia* is relatively low at <28% of the mapped habitat extent within the Study Area. This taxon is now recognised as widespread and common (**Table 4.1**), as is its preferred habitat (**Table 4.2**), which has been acknowledged at the state level by removal of its conservation listing under the BC Act. The loss of preferred habitat is considered an insignificant impact to the taxon in light of this and its impending change of conservation status under the EPBC Act (**Section 2.1**).

The combined impacts to preferred habitat of all other significant flora taxa are relatively low at < 30% of each habitat's mapped extent within the study area and therefore the combined impact is not likely to be significant.

Table 4.12 Potential Combined Impacts to Locations of Significant Flora Taxa

Taxon	Status*	Number of Locations in Local Area	Locations at Risk of Impact			Potential Combined Impact to Locations (%)
			Disturbance Footprint (Table 4.3)	IIAZ[c] (Table 4.10)	Total	
Aristida jerichoensis* var. *subspinulifera	P3	8[b]	-	1	1	12.5
Aristida lazaridis	P2	6,766[a]	63	168	231	3.4
***Corchorus* sp.**	Potentially undescribed	23[b]	-	-	-	-
Eremophila naaykensii	P3	37[b]	-	-	-	-
***Euphorbia ferdinandi* s. lat.**	Potentially undescribed	19[b]	-	-	-	-
***Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708)**	P2	2[b]	-	-	-	-
***Rhagodia* sp. Hamersley (M. Trudgen 17794)**	P3	49[b]	3	3	6	12.2
Rostellularia adscendens* var. *latifolia	P3	1[b]	-	-	-	-
Seringia exastia	T	37[b]	11	2	13	35.1

[a] Counts include locations outside the Study Area, representing a continuance of the population within the study area (Rapallo, 2021b)

[b] Count is of locations inside the Study Area only

[c] Number of locations of significant flora taxa that are at risk of edge effects as a result of the Project, including dust deposition, water ponding, runoff, drainage shadow and weeds.

*Conservation status in WA under the BC Act, with the exception of *Seringia exastia* (T) which remains recognised only under the EPBC Act.

Table 4.13 Potential Combined Impacts to Individuals of Significant Flora Taxa

Taxon	Status*	Number of Individuals in Local Area	Individuals at Risk of Impact (ha)			Potential Combined Impact to Individuals (%)
			Disturbance Footprint (Table 4.3)	IIAZ[c] (Table 4.10)	Total	
Aristida jerichoensis* var. *subspinulifera	P3	97[b]	-	1	1	1.0
Aristida lazaridis	P2	12,942[a]	77	217	294	2.3
***Corchorus* sp.**	Potentially undescribed	35[b]	-	-	-	-
Eremophila naaykensii	P3	73[b]	-	-	-	-
***Euphorbia ferdinandi* s. lat.**	Potentially undescribed	60[b]	-	-	-	-
***Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708)**	P2	17[b]	-	-	-	-
***Rhagodia* sp. Hamersley (M. Trudgen 17794)**	P3	53[b]	3	3	6	11.3
Rostellularia adscendens* var. *latifolia	P3	1[b]	-	-	-	-
Seringia exastia	T	783[b]	211	10	221	28.2

[a] Counts include individuals outside the Study Area, representing a continuance of the population within the study area (Rapallo, 2021b)

[b] Count is of individuals inside the Study Area only

[c] Number of individuals of significant flora taxa that are at risk of edge effects as a result of the Project, including dust deposition, water ponding, runoff, drainage shadow and weeds.

*Conservation status in WA under the BC Act, with the exception of *Seringia exastia* (T) which remains recognised only under the EPBC Act.

Table 4.14 Potential Combined Impacts to Preferred Habitat of Significant Flora Taxa

Taxon	Status*	Preferred Habitat (VTs)	Mapped Extent of Preferred Habitat in Study Area (ha)	Extent of Preferred Habitat at Risk of Impact (ha)			Potential Combined Impact to Habitat (%)
				Disturbance Footprint (Table 4.4)	IIAZ[c] (Table 4.11)	Total	
Aristida jerichoensis var. *subspinulifera*	P3	8	68.93	2.93	4.35	7.28	10.6
Aristida lazaridis	P2	7 and 8	592.32	16.81[a]	17.46[a]	34.27	12.0
Corchorus sp.	Potentially undescribed	9	600.81	68.28	14.29	82.57	13.7
Eremophila naaykensii	P3	4 and 6	411.93	1.46	1.03	2.50	0.6
Euphorbia ferdinandi s. lat.	Potentially undescribed	8	68.93	2.93	4.35	7.28	10.6
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	P2	4	95.32	0.62	0.17	0.79	0.8
Rhagodia sp Hamersley (M. Trudgen 17794)	P3	7	523.39	13.88[a]	13.11[a]	26.99	12.4
Rostellularia adscendens var. *latifolia*	P3	1	1,429.16	343.39	52.02	395.41	27.7
Seringia exastia	T	1	1,429.16	343.39	52.02	395.41	27.7

[a] Preferred habitat is areas of preferred VTs in the GNH area only (Section 4.2.1.1)

c Area of significant flora preferred habitat that is at risk of edge effects as a result of the Project, including dust deposition, water ponding, runoff, drainage shadow and weeds.

* Conservation status in WA under the BC Act, with the exception of *Seringia exastia* (T) which remains recognised only under the EPBC Act.

4.4.2 Vegetation

Predicted potential combined impacts to VTs as a result of the Project are presented in **Table 4.16**. These impacts are unlikely to be significant, as the combined impact to any VT is relatively low (all VTs will be impacted by less than 28.2 % of the mapped extent in the Study Area, however the actual combined impacts are likely to be less than shown in **Table 4.16**), and the local significance of each VT are also relatively low (a local conservation significance rating of 1, or 2 as presented in **Table 4.2**).

The highest potential combined impact to vegetation of the Study Area as a result of the Project will be to VTs 7 (28.2%), 1 (27.7%), 10 (22.9%), 2 (21.6%), and 3 (19.9%). All other VTs had potential combined impacts that were less than 14 % (**Table 4.16**).

Table 4.15 Potential Combined Impacts to Vegetation Types

Vegetation Type	Mapped Extent of VT in Study Area (ha)	Extent of VT at Risk of Impact (ha)			Potential Combined Impact to VT (%)
		Disturbance Footprint (Table 4.7)	IIAZ (Table 4.11)*	Total	
1	1,429.16	341.73	52.02	395.41	27.7
2	382.30	75.53	6.39	82.69	21.6
3	48.16	6.39	3.27	9.59	19.9
4	95.32	0.62	0.17	0.79	0.8
5	100.95	-	-	-	-
6	316.61	0.84	0.87	1.71	0.5
7	523.39	119.01	28.82	147.70	28.2
8	68.93	2.69	4.35	7.28	10.6
9	600.81	66.78	14.29	82.57	13.7
10	215.50	41.11	8.21	49.32	22.9

* Area of VT that is at risk of edge effects as a result of the Project, including dust deposition, water ponding, runoff, drainage shadow and weeds.

5.0 Conclusion

A total of nine significant flora taxa have been recorded, and 10 VTs mapped, within the Study Area by the Baseline Surveys (Rapallo, 2021a, b; Umwelt, 2022). Direct impacts and edge effects to all nine taxa and their preferred habitats were assessed as unlikely to be significant at both the local and regional scale, due to the low percentage of plants and habitat impacted, the range of populations and the common and widespread nature of their preferred habitats. Likewise, direct impacts to vegetation are assessed as unlikely to be significant at both the local and regional scale, due to the relatively low percentage of each VT potentially impacted and the common and widespread nature of the vegetation system associations.

There is a potential for indirect impacts via interruption of surface water flows (including sheet flow) or changes in water quality to the following areas, where they occur downstream:

- The population of *Corchorus* sp. (potentially undescribed, and an assessed conservation significance rating of high (see **Section 4.1.1**);
- Riparian vegetation;
- Mulga grove vegetation (VT7);
- Populations of significant flora in the GNHI area, downstream of interrupted sheet flows.
- Any further significant taxa which have been assessed as 'possibly' occurring in the Study Area (Appendix A), which are dependent or partially dependent on surface water flows.

Whilst recommendations have been made by RPS (2017) to establish culverts and other drainage structures at creek crossings sufficient to minimise operational impacts, the design of drainage structures must also consider potential impacts to downstream flora and vegetation through interruption of surface water flow, and aim to re-establish both the volume and spread of water flows to avoid these potential impacts.

6.0 References

Atlas of Living Australia (ALA) (2022)
The Australasian Virtual Herbarium. Council of Heads of Australasian Herbaria. Available: http://avh.chah.org.au. Accessed August, 2022.

Beard, J. S. (1975)
Vegetation Survey of Western Australia, Pilbara 1:1 000 000. Map and Explanatory Notes to Sheet 7. University of Western Australia Press, Perth, Western Australia.

Binks, R. M., Wilkins, C. F., Markey, A. S., Lyons, M. N., Byrne, M. (2020)
Genomic data and morphological re-assessment reveals synonymy and hybridisation among Seringia taxa (Lasiopetaleae, Malvaceae) in remote north-western Australia *Taxon* 69(2), 307-320
https://doi.org/10.1002/tax.12233

Davies, M. (2010)
Mulga (Acacia aneura F. Muell. Ex Benth.) death adjacent to haul roads in the north-eastern Goldfields, Western Australia. https://ro.ecu.edu.au/theses/1876

DAWE. (2020)
Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions). Spatial data. Last updated 27 October 2020. Department of Agriculture, Water and the Environment (DAWE).
http://www.environment.gov.au/fed/catalog/main/home.page

Department of Agriculture, Water and the Environment (DAWE) (2021a)
Threatened species and ecological communities. Available: https://www.dcceew.gov.au/environment/biodiversity/threatened. Updated October 2021.

DAWE. (2021b) *Species Profile and Threats Database*. Department of Agriculture, Water and Environment (DAWE). http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

DBCA. (2007)
NatureMap: Mapping Western Australia's Biodiversity. Threatened and Priority Flora and WA Herbarium Specimen Databases. Department of Biodiversity, Conservation and Attractions (DBCA).
https://naturemap.dbca.wa.gov.au/

Department of Biodiversity, Conservation and Attractions (DBCA) (as Department of Environment and Conservation) (2013)
Definitions, Categories and Criteria for Threatened and Priority Ecological Communities. Current January 2013. Available: https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/definitions_categories_and_criteria_for_threatened_and_priority_ecological_communities.pdf.

DBCA. (2017).
Threatened and Priority Flora Report Form – Field Manual (Version 1.3, August 2017). Department of Biodiversity, Conservation and Attractions (DBCA).
https://www.dpaw.wa.gov.au/images/documents/plants-animals/monitoring/forms/threatened-priority-flora-field-manual.pdf

DBCA. (2018). *List of Threatened Ecological Communities (TECs) endorsed by the Western Australian Minister for Environment*. Species and Communities Branch, 28 June 2018. Department of Biodiversity, Conservation and Attractions (DBCA). https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatened-ecological-communities

DBCA. (2019).
2018 Statewide Vegetation Statistics (formerly the CAR Reserve Analysis): Full Report. Last updated 30 April 2019. Remote Sensing and Spatial Analysis Program, Department of Biodiversity, Conservation and Attractions (DBCA). https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics

Department of Biodiversity, Conservation and Attractions (DBCA) (2020)
Conservation Codes for Western Australian Flora and Fauna. Current 10 December 2020. Available: https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities

DBCA. (2021). *Priority Ecological Communities for Western Australia Version 32*. Species and Communities Program, 15 July 2021. Department of Biodiversity, Conservation and Attractions (DBCA). https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatened-ecological-communities

Department of Biodiversity, Conservation and Attractions (DBCA) (2022a)
Priority Ecological Communities for Western Australia Version 33. Species and Communities Branch, 1 June 2022

Department of Biodiversity, Conservation and Attractions (DBCA) (2022b)
Department of Biodiversity, Conservation and Attractions Threatened and Priority Flora List 27 June 2022. Available: https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants.

Department of Biodiversity, Conservation and Attractions (DBCA) (2022c)
Interrogation of the DBCA Western Australian Herbarium specimen database, Threatened and Priority Flora database and Threatened and Priority Flora List, performed 30/6/2022. Reference: 58-0622FL.

Department of Biodiversity, Conservation and Attractions (DBCA) (2022d)
Interrogation of the DBCA Threatened Ecological Communities and Priority Ecological Communities database, performed 4/7/2022. Reference: 41_0622EC.

Didham, R. K. (2010).
Ecological Consequences of Habitat Fragmentation. In *Encyclopedia of Life Sciences* (p. 384). John Wiley & Sons, Ltd. Chichester, UK.

DPIRD. (2018).
Soil Landscape Mapping—Best Available (DPIRD-027). Spatial data. Last updated 2 August 2018. Department of Primary Industries and Regional Development (DPIRD).
https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-best-available

DPIRD. (2019).
Pre-European Vegetation (DPIRD-006). Spatial data. Last updated 23 September 2019. Department of Primary Industries and Regional Development (DPIRD). https://catalogue.data.wa.gov.au/dataset/pre-european-dpird-006

Environmental Protection Authority (EPA) (2016a)
Environmental Factor Guideline – Flora and Vegetation. Published 13th December 2016 (www.epa.wa.gov.au/).

Environmental Protection Authority (EPA) (2016b)
Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment. EPA, Western Australia, December 2016.

Government of Western Australia (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. Available: https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics

Henle, K., Davies, K. F., Kleyer, M., Margules, C., & Settele, J. (2004).
Predictors of species sensitivity to fragmentation. *Biodiversity and Conservation*, *13*, 207–251. https://doi.org/10.1023/B:BIOC.0000004319.91643.9e

Lienert, J. (2004).
Habitat fragmentation effects on fitness of plant populations – a review. *Journal for Nature Conservation*, *12*(1), 53–72. https://doi.org/10.1016/j.jnc.2003.07.002

Luquet, E., Garner, T. W. J., Léna, J.-P., Bruel, C., Joly, P., Lengagne, T., Grolet, O., & Plénet, S. (2012).
Genetic erosion in wild populations makes resistance to a pathogen more costly. *Evolution*, *66*(6), 1942–1952. https://doi.org/10.1111/j.1558-5646.2011.01570.x

McKenzie, N. L., van Leeuwen, S., & Pinder, A. M. (2009).
Introduction to the Pilbara Biodiversity Survey, 2002–2007. *Records of the Western Australian Museum, Supplement*, *78*, 3–89. https://doi.org/10.18195/issn.0313-122x.78(1).2009.003-089

Muller, C. (2005)
Water flow in mulga areas adjoining Fortescue Marsh, Report of observations from field trials undertaken for Fortescue Metals Group Limited.
https://www.epa.wa.gov.au/sites/default/files/PER_documentation/1520-PER%20Appendix%20F_Water%20Distribution%20Trial%20Report.pdf

PSM (2021)
Lamb Creek Iron Ore Project: Hydrogeological Assessment. Unpublished report (PSM4241-004R) prepared for Mineral Resources Ltd; p. 101

Rapallo Pty Ltd (Rapallo) (2021a)
Detailed Flora and Vegetation Survey of the Great Northern Highway Intersection – Lamb Creek Project. Unpublished report (Report reference: J021158, Final) prepared for Mineral Resources Ltd; p. 108

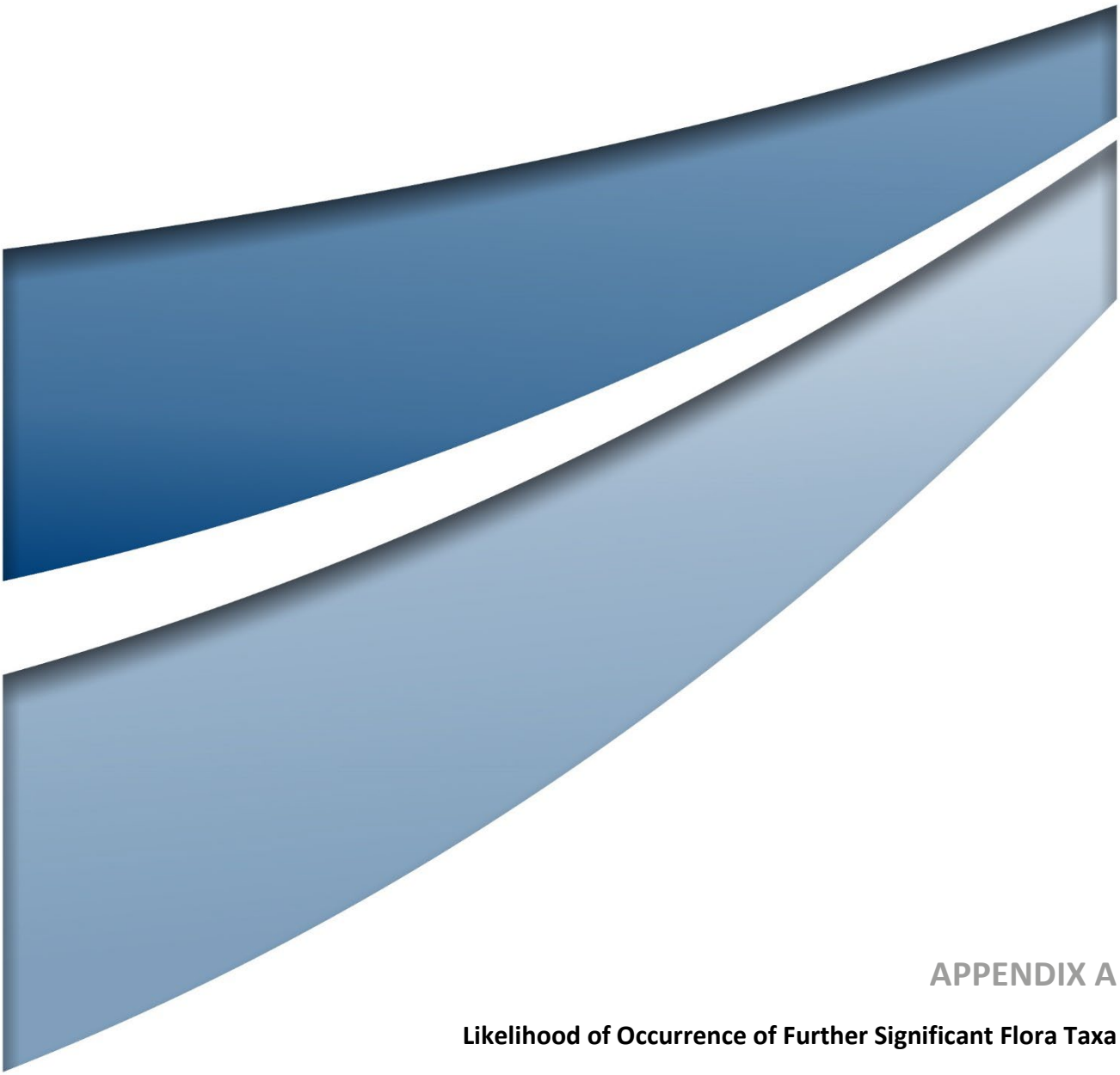
Rapallo Pty Ltd (Rapallo) (2021b)
Targeted Conservation Significant Flora Survey of the Lamb Creek Project Area. Unpublished report (Report reference: J020347, V3) prepared for Mineral Resources Ltd; p. 65.

RPS (2017)
Lamb Creek Surface Water Assessment. Unpublished report (EWP72691.001/003, Vc) prepared for Mineral Resources Ltd; p. 48

Umwelt (Australia) Pty Ltd (Umwelt) (2022)
Flora and Vegetation Peer Review and Gap Analysis Lamb Creek Project. Unpublished report (Report reference: 21838/R01, Final) prepared for Mineral Resources Ltd, January 2022.

Umwelt (Australia) Pty Ltd (Umwelt) (in prep)
Lamb Creek Project: Detailed and Targeted Flora and Vegetation Survey. Unpublished report (Report reference: 22187/R03, V1) prepared for Mineral Resources Ltd, August 2022.

van Vreeswyk, A. M. E., Payne, A. L., Leighton, K. A., & Hennig, P. (2004).
An inventory and condition survey of the Pilbara region, Western Australia (No. 92; Technical Bulletin, p. 429). Department of Agriculture.



APPENDIX A

Likelihood of Occurrence of Further Significant Flora Taxa

A. Likelihood of Occurrence of Further Significant Flora Taxa

Table A.1 presents an assessment of the likelihood of occurrence of significant taxa within the Study Area and Disturbance Footprint. This list includes significant taxa identified as occurring (or potentially occurring) within the Desktop Study Area prior to the Baseline Surveys (Rapallo 2021b, Umwelt, 2022). The assessment considered whether a taxon was identifiable at the time of the surveys, the known range of the taxon, if habitat is present in the Study Area and/or Disturbance Footprint, proximity of known records to the Study Area and the extent of targeted survey undertaken within the Study Area and Disturbance Footprint, when determining the further potential for a taxon to occur in the Study Area and Disturbance Footprint.

A total of 62 taxa have been assessed within **Table A.1 including** two **Threatened taxa, 58 Priority listed taxa and two potentially undescribed taxa.** Of these, nine taxa were recorded within the Study Area by the Baseline Surveys, and two taxa were considered potentially not identifiable during the survey. *Arthropodium vanleeuwenii* (P2) is considered visible only when flowering in September as it grows up through *Triodia*. *Rhodanthe ascendens* (P1) is an annual taxon known from a limited number of records all of which were collected in August or September. It is possible that this taxon is present (and therefore identifiable) after significant rainfall; however, this cannot be confirmed based on existing information. It is considered that the 61 remaining taxa were identifiable during the 2022 survey, either because the survey period coincides with the taxon's flowering period, or the taxon can be identified reliably when in fruit or sterile.

The likelihood of occurrence assessment identified a total of 42 taxa which could Possibly occur within the Study Area due to suitable habitat occurring within the Study Area and the Study Area being within the known range of the taxon or within close proximity to its known range. All of these taxa were identifiable at the time of survey with the exception of *Arthropodium vanleeuwenii* (P2). Suitable habitat for this taxon is described as elevations above 900 m on south-facing hillslopes of Brockman Iron Formation (Dillon and Macfarlane 2020). This habitat occurs within the Study Area, at the highest elevation areas of VTs 4 and 6. The areas of VT 4 and 6 within the Disturbance Footprint and IIAZ are not considered to represent suitable habitat; these areas occur at or below 750 m elevation and are north and north-west facing.

It is worthy of note that 'suitable habitat' as used to inform the assessment has been determined using details recorded at known locations. However, for many of the taxa known from the general vicinity of the Study Area, suitable habitat is difficult to define, as available habitat information is often vague or very broad and difficult to interpret; for example an area described as a stony plains and flats with red or brown clay or clay loam could feasibly occur almost anywhere in the Pilbara. Therefore, a precautionary approach has been adopted when assessing whether suitable habitat for a species is present in the Study Area.

All 62 taxa assessed are considered unlikely to occur within the Disturbance Footprint due to their known range, the extent of targeted survey undertaken and/or the absence of suitable habitat within the Targeted Survey Area.

Table A.1 Likelihood of Occurrence of Further Significant Flora Taxa in the Study Area and Disturbance Footprint

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Disturbance Footprint
Acacia bromilowiana	P4	July to August	Rocky hills, breakaways, scree slopes, gorges, creek beds. Rocky red-brown loam with ironstone or laterite.	Yes	3.9 km W of Study Area	Possible – known record in close proximity to Study Area, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Acacia daweana	P3	July to September	Low rocky rises, along drainage lines. Red stony clay loam.	Yes	37 km W of Study Area	Possible – Study Area occurs outside of known range of taxon; however, suitable habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Acacia effusa	P3	May to August	Scree slopes of low ranges. Red-brown silty clay or clay loam with ironstone and quartz stones and pebbles.	Yes	1.6 km NW of Study Area	Possible – known record in close proximity to Study Area, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Acacia subtiliformis	P3	May to June	Rocky ridges, hills and slopes, often with calcrete. Light brown or brown loam or silty clay.	Yes	7.1 km NE of Study Area	Unlikely –potential habitat unlikely to be present in Study Area.	Unlikely – potential habitat unlikely to be present in Disturbance Footprint, all potential habitat searched.
Amaranthus centralis	P3	May to July	Plains, flats and granite outcrops. Gritty red clay loam.	Yes	23.5 km E of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Aristida jerichoensis var. *subspinulifera*	P3	likely after significant rainfall	Plains and flats. Red-brown loamy clay or cracking clay.	Yes	0.6 km W of Study Area	Recorded in the Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Disturbance Footprint
Aristida lazaridis	P2	likely after significant rainfall	Floodplains, drainage areas and plains. Red or red-brown clay loam, sometimes with ironstone.	Yes	Within Study Area	Recorded in the Study Area.	Recorded in the Disturbance Footprint.
Arthropodium vanleeuwenii	P2	September	Steep hill slopes and gorges. Red-brown or orange-brown loam, often with banded ironstone.	No	20.4 km W of Study Area	Possible – Study Area occurs outside of the known range of taxon; however, suitable habitat present in Study Area and taxon not identifiable during the survey.	Unlikely –taxon not identifiable during the survey however suitable habitat not present in Disturbance Footprint.
Cladium procerum	P2	likely year-round	Major creeks and gorges. Red gravelly sand.	Yes	33.2 km NNE of Study Area	Unlikely –Study Area occurs within known range of taxon; however, potential habitat unlikely to be present in Study Area.	Unlikely - potential habitat unlikely to be present in Disturbance Footprint.
Corchorus sp.	-	No data on *FloraBase* but flowering during the survey	No data on *FloraBase* (not formally described)*;* in the Study Area this entity was recorded within a drainage line in VT10 on sandy loam soils.	Yes	NA	Recorded in the Study Area.	Unlikely - all potential habitat has been searched within the Disturbance Footprint.
Dampiera metallorum	P3	June to October	High in the landscape on steep slopes, summits of hills. Red-brown stony clay loam over banded ironstone.	Yes	10.3 km E of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Disturbance Footprint
Dolichocarpa sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3	May to September	Floodplains and crabhole plains. Red-brown or brown cracking clay.	Yes	11 km N of Study Area	Unlikely –Study Area occurs within known range of taxon, west of Study Area is area of cracking clay which extends into the western edge of VT 9; however the area of cracking clay has been searched.	Unlikely - potential habitat unlikely to be present in Disturbance Footprint.
Eragrostis crateriformis	P3	likely after significant rainfall	Creek banks, depressions. Gritty or gravelly brown sandy loam, red-brown clay loam.	Yes	20.7 km N of Study Area	Possible – Study Area occurs outside of the known range of taxon; however, suitable habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	P1	likely after significant rainfall	Steep slopes, summits. Brown or red-brown silty loam, often with banded ironstone.	Yes	16.7 km S of Study Area	Possible – Study Area occurs outside of the known range of taxon; however, suitable habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Eremophila magnifica subsp. *magnifica*	P4	August to November	Hillslopes and gullies. Rocky red-brown or brown sandy loam, often with ironstone.	Yes	11 km S of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Eremophila magnifica subsp. *velutina*	P3	August to September	Hillslopes and ridges. Red stony loam, often with ironstone or banded ironstone.	Yes	15.1 km SW of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Eremophila naaykensii	P3	June to August	Rocky hill slopes, crests and gorges. Rocky red-brown clay loam, sometimes over banded ironstone.	Yes	5.6 km E of Study Area	Recorded in the Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Disturbance Footprint
Eremophila pusilliflora	P2	March to July	Flats and plains. Red-brown sandy loam, often with ironstone.	Yes	13.9 km W of Study Area	Possible –Study Area occurs on eastern edge of range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Eremophila spongiocarpa	P3	May to September	Weakly saline alluvial plains and dune slopes on margins of marshes and saline flats. Red-brown clay loam.	Yes	38.2 km NE of Study Area	Unlikely –Study Area occurs outside of known range of taxon (known from plains adjacent to Fortescue Marsh), potential habitat unlikely to be present in Study Area.	Unlikely - potential habitat unlikely to be present in Disturbance Footprint.
Eremophila sp. West Angelas (S. van Leeuwen 4068)	P1	August to September	Hill slopes and crests. Brown or red silty loam over banded ironstone.	Yes	17.9 km S of Study Area	Possible – Study Area occurs outside of the known range of taxon; however, suitable habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Euphorbia australis var. *glabra*	P3	likely after significant rainfall	Drainage lines and flats. Red-brown clay loam, sometimes with calcrete or silcrete.	Yes	10.7 km N of Study Area	Possible – Study Area occurs outside of the known range of taxon; however, suitable habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Euphorbia clementii	P3	likely after significant rainfall	Fire responder. Recently burnt hills, slopes and undulating plains. Red-brown clay loam.	Yes	29.1 km S of Study Area	Unlikely –Study Area is outside of known range of taxon according to FloraBase (WA Herbarium (1998-)); the record of this taxon near the Study Area is potentially erroneous given it is not verified by a vouchered specimen and is a significantly disjunct record.	Unlikely – record near Study Area potentially erroneous, all potential habitat searched, however area not recently burnt.

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Disturbance Footprint
Euphorbia ferdinandi s. lat	-	No data on *FloraBase* but flowering during the survey	No data on *FloraBase* (not formally described); recorded on VTs 7 and 8 on red-brown clay to clay loam with ironstone pebbles on plains in the Study Area.	Yes	Unknown	Recorded in the Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Euphorbia inappendiculata var. *queenslandica*	P2	likely after significant rainfall	Flats and plains. Brown cracking clay, gilgai.	Yes	26 km W of Study Area	Unlikely –Study Area occurs within known range of taxon, west of Study Area is area of cracking clay which extends into the western edge of VT 9; however the area of cracking clay has been searched.	Unlikely - potential habitat unlikely to be present in Disturbance Footprint.
Euphorbia stevenii	P3	likely after significant rainfall	Gentle slopes and plains. Brown or red-brown clay and cracking clay.	Yes	31 km SSW of Study Area	Possible –Study Area occurs on eastern edge of range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Fimbristylis sieberiana	P3	May to June	Pool edges, sandstone cliffs and major creek lines. Brown or red-brown gritty sand.	Yes	33.7 km E of Study Area	Unlikely –Study Area occurs within known range of taxon; however, potential habitat unlikely to be present in Study Area.	Unlikely - potential habitat unlikely to be present in Disturbance Footprint.
Glycine falcata	P3	May to September	Along drainage depressions in crabhole plains and clay plains. Brown or red cracking clay.	Yes	11 km N of Study Area	Unlikely –Study Area occurs outside of known range of taxon, west of Study Area is area of cracking clay which extends into the western edge of VT 9; however the area of cracking clay has been searched.	Unlikely - potential habitat unlikely to be present in Disturbance Footprint.

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Disturbance Footprint
Goodenia lyrata	P3	likely after significant rainfall	Claypans and plains. Red or brown sandy loam or clay loam.	Yes	1.5 km S of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	P3	likely after significant rainfall	Low undulating plains, swampy plains. Red-brown clay soil, calcrete pebbles.	Yes	6.6 km NE of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Grevillea saxicola	P3	February to June	Rocky hills, slopes and gullies. Red-brown sandy loam.	Yes	20 km S of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Gymnanthera cunninghamii	P3	February to May, October to December	Drainage lines. Brown or red-brown sand or sandy loam.	Yes	24.1 km NE of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	P2	April to August, October	Rocky gullies, drainage lines and gorges. Loamy skeletal soil.	Yes	26.6 km SW of Study Area	Recorded in the Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Indigofera gilesii	P3	May, August	Rocky slopes, hills, creeklines and outcrops. Red or orange loam, often with ironstone.	Yes	13.3 km W of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Disturbance Footprint
Iotasperma sessilifolium	P3	May to September	Edges of waterholes, plains, Cracking clay, black loam.	Yes	23.3 km N of Study Area	Unlikely –Study Area occurs outside of known range of taxon, west of Study Area is area of cracking clay which extends into the western edge of VT 9; however the area of cracking clay has been searched.	Unlikely - potential habitat unlikely to be present in Disturbance Footprint.
Ipomoea racemigera	P2	April to June	Drainage lines and flats. Brown silty loam.	Yes	11.9 km NE of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Isotropis parviflora	P2	June to August	Rocky hills, slopes and undulating plains. Red or brown sandy loam, often with ironstone.	Yes	8.2 km SE of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Kohautia australiensis	P2	likely after significant rainfall	Plains and hills. Brown or orange clay with calcrete.	Yes	11.8 km N of Study Area	Unlikely – Study Area occurs outside the known range of taxon, potential habitat unlikely to be present in the Study Area.	Unlikely – potential habitat unlikely to be present in Disturbance Footprint.
Lepidium catapycnon	P4	September	Rocky hills and slopes. Red or brown loam or sandy loam, often with ironstone.	Yes	15.6 km S of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Olearia mucronata	P3	July to August	Rocky hills, gullies and creeklines. Red-brown or orange-brown silty clay or sandy clay loam with ironstone.	Yes	26.1 km SW of Study Area	Possible –Study Area occurs on eastern edge of range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Disturbance Footprint
Oxalis sp. Pilbara (M.E. Trudgen 12725)	P2	May to July	Gorges, gullies, drainage lines and slopes. Red loam or sandy loam, often with ironstone.	Yes	15.6 km S of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Pilbara trudgenii	P3	September to October	Hill summits, steep slopes, screes, cliff faces. Skeletal red stony soil over ironstone.	Yes	15.8 km S of Study Area	Possible –Study Area occurs north of known range of taxon; however, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Ptilotus mollis	P4	July to September	Rocky hills and screes with red or brown clay loam, often with ironstone.	Yes	16.9 km S of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Rhagodia sp. Hamersley (M. Trudgen 17794)	P3	March to May, September	Plains and alluvial plains. Red or brown clay loam, often with ironstone gravel.	Yes	Within Study Area	Recorded in the Study Area.	Recorded in the Disturbance Footprint.
Rhodanthe ascendens	P1	August to September	Flats. Cracking clay and sand over clay.	Unknown – limited information	32.1 km SW of Study Area	Unlikely –Study Area occurs within known range of taxon, west of Study Area is area of cracking clay which extends into the western edge of VT 8; however the area of cracking clay has been searched.	Unlikely - potential habitat unlikely to be present in Disturbance Footprint. Study Area is outside known range.
Rhynchosia bungarensis	P4	May to November	Rocky hill slopes, drainage lines, gorges. Orange brown loam, often with ironstone.	Yes	21 km NE of Study Area	Possible –Study Area occurs on southern edge of known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Disturbance Footprint
Rostellularia adscendens var. *latifolia*	P3	April to May	Rocky hills, gullies, floodplains and drainage lines. Red/brown sandy loam.	Yes	8.6 km NNE of Study Area	Recorded in the Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Seringia exastia	T		Sandy soils on plains, creeks, rocky areas.	Yes	5 km south of the Study Area	Recorded in the Study Area.	Recorded in the Disturbance Footprint.
Sida sp. Barlee Range (S. van Leeuwen 1642)	P3	likely after significant rainfall	Rocky hills, gullies and gorges. Red or brown sandy loam, often with ironstone.	Yes	13.9 km S of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Sida sp. Hamersley Range (K. Newbey 10692)	P3	likely after significant rainfall	Ironstone gullies, slopes and breakaways. Skeletal red loam.	Yes	37.4 km SSW of Study Area	Possible –Study Area occurs outside of known range of taxon; however, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Solanum kentrocaule	P3	May to September	Steep rocky gullies, slopes, gorges. Skeletal red loam.	Yes	16.1 km S of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Stackhousia clementii	P3	April to September	Floodplains and flats. Clay loam, sometimes saline or with calcrete.	Yes	20.6 km W of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Stylidium weeliwolli	P3	March to September	Drainage lines, pool edges, seepage areas. Sandy loam or clay.	Yes	32.2 km E of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Disturbance Footprint
Swainsona thompsoniana	P3	April to August	Floodplains and flats. Red or brown cracking clay, clay loam.	Yes	18.1 km W of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Synostemon hamersleyensis	P1	April to November	Steep hills, slopes, screes. Rocky red or brown sandy loam with ironstone or banded ironstone.	Yes	23.7 km NE of Study Area	Possible –Study Area occurs outside (south) of known range of taxon; however, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Tetratheca fordiana	P2	April to July	Cliffs, ridges and breakaways. Skeletal soil with ironstone.	Yes	26.8 km W of Study Area	Possible –Study Area occurs outside (east) of known range of taxon; however, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Teucrium pilbaranum	P2	April to September	Flats, clay pans and crabhole plains. Red or brown sandy loam, clay or cracking clay, sometimes with calcrete.	Yes	15.4 km SSW of Study Area	Unlikely –Study Area occurs within known range of taxon, west of Study Area is area of cracking clay which extends into the western edge of VT 9; however the area of cracking clay has been searched.	Unlikely - potential habitat unlikely to be present in Disturbance Footprint.
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	P3	May to July	Floodplains, drainage lines and flats. Red or brown clay loam, clay or cracking clay.	Yes	4.6 km S of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Thryptomene wittweri	T	April to August	Breakaways and cliffs. Skeletal red-brown soil with sandstone or ironstone.	Yes	22.9 km SW of Study Area	Possible –Study Area occurs outside (east) of known range of taxon; however, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.

Taxon	Status	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Study Area (DBCA 2022c)	Likelihood of Occurrence in Study Area	Likelihood of Occurrence in Disturbance Footprint
Triodia sp. Karijini (S. van Leeuwen 4111)	P1	likely after significant rainfall	Hill crests, moderate to steep hill slopes. Grey, brown or red sandy loam or silty loam, often with ironstone.	Yes	3.7 km W of Study Area	Possible –Study Area occurs on eastern edge of known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Triodia sp. Mt Ella (M.E. Trudgen 12739)	P3	likely after significant rainfall	Rocky slopes, gullies, ridges gorges and associated drainage lines/floodplains. Red or brown sandy clay loam, often with ironstone.	Yes	12.3 km SW of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)	P1	March to September	Floodplains and drainage areas. Red or brown clay loam or silty loam.	Yes	1.7 km S of Study Area	Possible –Study Area occurs within known range of taxon, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint; however, all potential habitat searched.
Xerochrysum boreale	P3	July, September	Stony plains and flats. Red or brown clay or clay loam.	Yes	21.6 km SW of Study Area	Possible –Study Area occurs outside (north) of known range of taxon; however, potential habitat present in Study Area.	Unlikely – potential habitat present in Disturbance Footprint, however, all potential habitat searched.

*Source: WA Herbarium (1998-)



umwelt
Environmental & Social Consultants

Umwelt (Australia) Pty Limited

T| 1300 793 267 E| info@umwelt.com.au www.umwelt.com.au