East Jimblebar & Caramulla

Detailed Flora and Vegetation Assessment

BHP Western Australian Iron Ore

23 October 2019

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EXECUTIVE SUMMARY

BHP Western Australian Iron Ore (WAIO) commissioned Biologic Environmental Survey Pty Ltd to undertake a single season Detailed Flora and Vegetation Survey of the East Jimblebar and Caramulla Project. The Study Area is approximately 48 km east of the Newman township and is approximately 10,318 hectares in size. The Study Area includes mineral lease M366SA and exploration tenements E52/18 and E52/172 and is located directly east of the Jimblebar-Wheelarra BHP mining operations.

The Detailed Flora and Vegetation Assessment was undertaken over 12 days between 7 and 18 April 2019, with the major vegetation communities visited and sampled. The Study Area has been surveyed numerous times with recent surveys overlapping the Study Area. The information presented and collected from these surveys has been included in this current assessment to supplement the survey intensity, effort and results.

The vegetation was sampled with 63 quadrats and 14 relevés during the current assessment, while an additional 119 sites have previously been sampled in the Study Area. The sites were sampled to record the vegetation communities and their condition, as well as collecting an inventory of flora species present. A total of 221 vascular flora taxa from 37 families and 95 genera, comprising 219 native and two introduced taxa, were recorded from the Study Area during the current field survey. This number increases to 462 vascular flora taxa from 45 families and 95 genera, comprising 456 native taxa and six introduced taxa, when the additional data is included.

Three priority listed taxa were recorded from the Study Area during the current assessment, *Eremophila capricornica* (P1), *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) and *Goodenia nuda* (P4). The previous surveys have also identified these three priority taxa. A total of 87 discrete point locations of *Eremophila capricornica* were recorded from the Study Area, totalling approximately 3,838 individuals. A total of 175 discrete point locations of *Rhagodia* sp. Hamersley (M. Trudgen 17794) were recorded from the Study Area, totalling approximately 405 individuals. A total of 14 discrete point locations for *Goodenia nuda* were recorded from the Study Area, totalling approximately 142.

The six introduced taxa, **Bidens bipinnata, *Cenchrus ciliaris*, *Cenchrus setiger*, *Flaveria trinervia,* *Malvastrum americanum* and **Tribulus terrestris*, recorded from the Study Area are not listed as weeds of national significance or declared plant pests listed under the *Biosecurity and Agriculture Management Act 2007*. The six introduced taxa have been previously recorded from the region based on the desktop and literature review and are common species in the Pilbara.

A total of 46 vegetation associations were described and delineated from the Study Area. The 46 vegetation associations were grouped into 13 broad floristic formations. The vegetation associations described from the Study Area are not considered to be analogous with the known Threatened and Priority Ecological Communities occurring in the Pilbara region.

Review of the vegetation units and floristic assemblage indicates that four vegetation associations mapped in association with Jimblebar Creek and Caramulla Creek are potentially Groundwater Dependent Ecosystems due to the presence of the facultative phreatophyte *Eucalyptus camaldulensis* subsp. *obtusa*.

The Study Area supports sheet flow dependent Mulga communities. The sheet flow dependent community (vegetation association HP AaChApr DopeErfoSeah TtChfAri) occurred in association with the Zebra land system which is known to support sheet flow. The sheet flow dependent community occurs in the central portion of the Study Area and supports an upper dominant stratum of mulga (represented by *Acacia aptaneura, Acacia paraneura* and *Acacia pteraneura*). Although the reliance of vegetation association HP AaChApr DopeErfoSeah TtChfAri on sheet flow has not been quantified, the prominent banding suggests that the sheet flow has an important role.

In addition to the banding in the central portion of the Study Area, there are several other portions of the Study Area that show minor groving and intergroving suggesting some minor reliance on sheet flow. The vegetation associations that have been described and delineated in association with the mulga banding are SP AptAcaoApr TbTs DopeSieErfo; and HP AaAptCdd SeaoErmaErfr Tb. The dependence on sheet flow for these two communities that displayed minor banding has not been quantified and the actual extent of vegetation reliant on sheet flow may alter.

The condition of the vegetation in the Study Area ranged from Degraded to Excellent, with the majority in Excellent condition. The most common impacts to the vegetation were from cattle grazing and trampling, which is evident across and the majority of the Study Area, excluding the large stony hills. The cattle grazing and trampling has resulted in many of the native understorey species not being present along the banks of Jimblebar and Caramulla Creeks. Weed density was highest in association with the two creeks. Fires have temporarily altered the vegetation structure in the eastern portions of the Study Area. The remainder of the Study Area was mostly mapped as Excellent.

1 INTRODUCTION

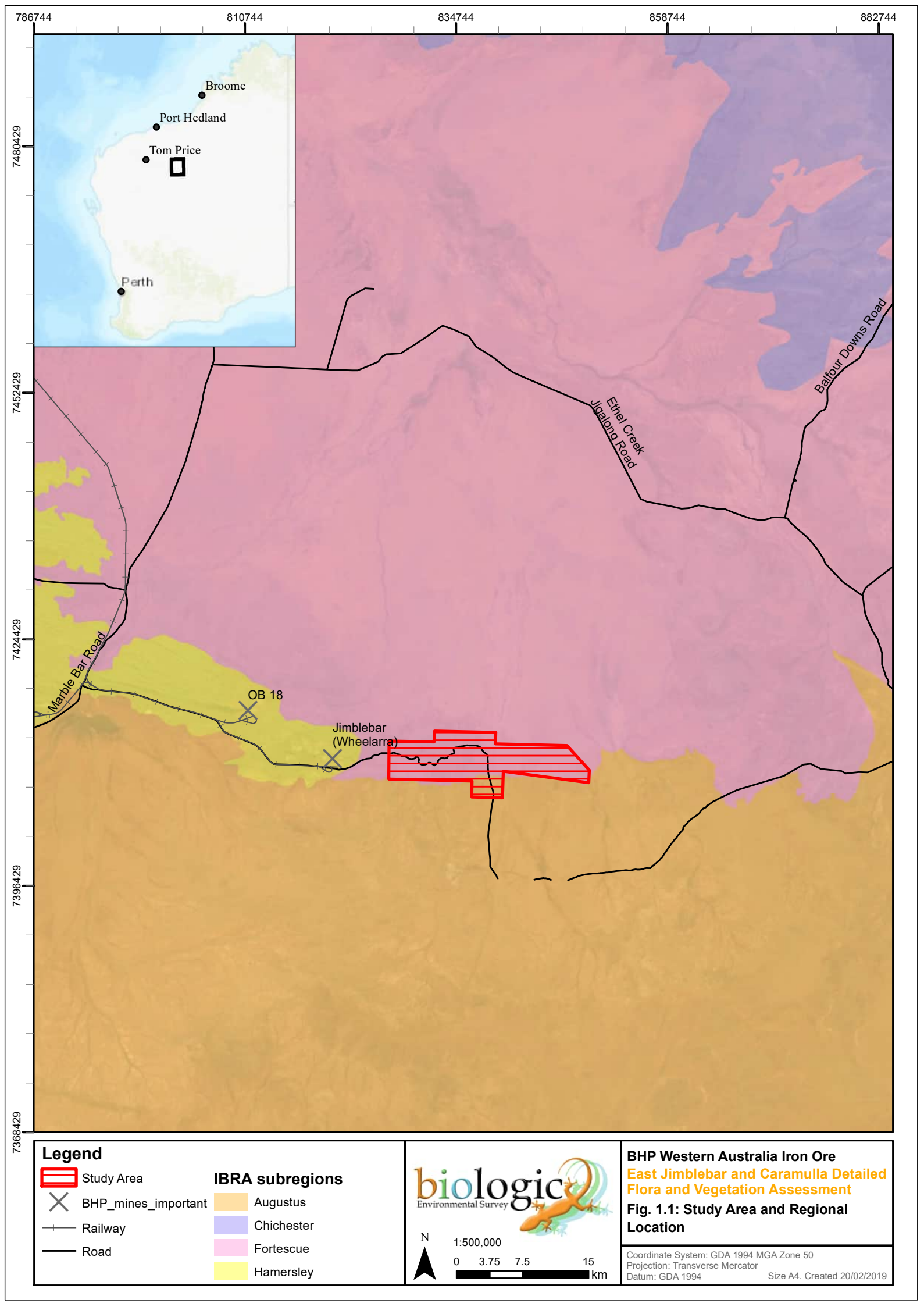
1.1 Background

BHP Western Australian Iron Ore (WAIO) commissioned Biologic Environmental Survey Pty Ltd (Biologic) to undertake a single season Detailed Flora and Vegetation Survey of the East Jimblebar and Caramulla Project (hereafter referred to as the Study Area). The Study Area is located within the Pilbara bioregion of Western Australia, along the northern boundary of the Gascoyne bioregion (Figure 1.1). The Study Area is approximately 48 km east of the Newman township and is approximately 10,318 hectares (ha) in size. The Study Area includes mineral lease M366SA and exploration tenements E52/18 and E52/172 (Figure 1.2) and is located directly east of the Jimblebar-Wheelarra BHP mining operations (Figure 1.1).

1.2 Objectives

The overarching objective of the single season Detailed Flora and Vegetation Assessment (hereafter referred to as the Survey) was to identify the flora and vegetation values of the Study Area and to determine if there are any conservation significant values that need to be considered during any future environmental approvals across the Study Area. The overarching objective was achieved via the following scope of works:

- The completion of a desktop assessment, including the review of previous biological surveys and government and non-government databases;
- The completion of a single season Detailed Flora and Vegetation Survey across the Study Area and relevant regional context;
- A review of the results of the flora and vegetation assessment to determine if there are any significant environmental values within the Study Area;
- A discussion of the significant environmental values (and remaining environmental values) from a regional and local context; and
- The provision of advice and guidance related to the environmental approvals process, with respect to any significant flora and vegetation values identified from the Study Area.


786744
810744
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882744
7480429
7452429
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7396429
7368429
Broome
Port Hedland
Tom Price
Perth
Ethel Creek
Jigalong Road
Balfour Downs Road
Marble Bar Road
OB 18
Jimblebar
(Wheelarra)
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Chichester
Fortescue
Hamersley
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Environmental Survey
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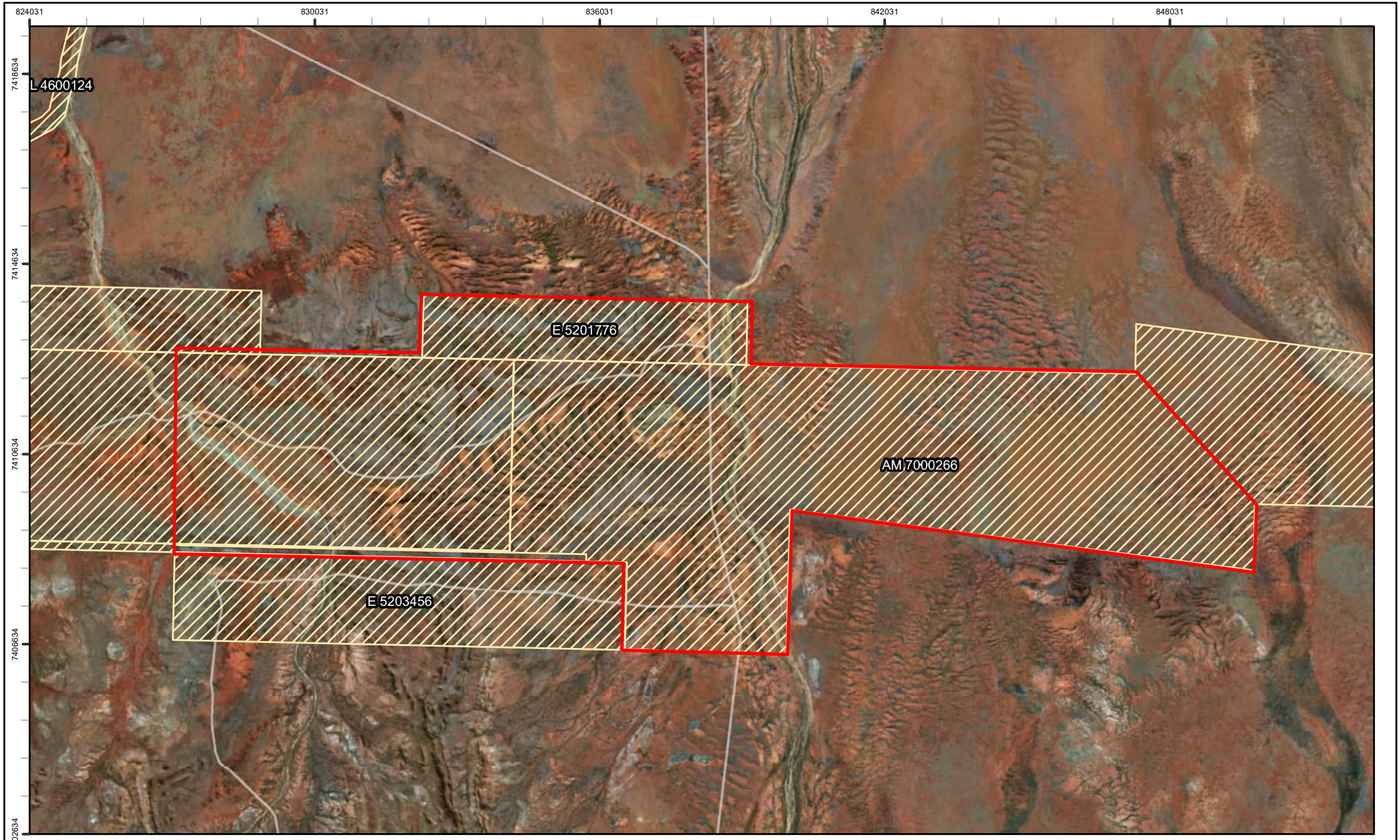
0 3.75 7.5 15
km
BHP Western Australia Iron Ore
East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment
Fig. 1.1: Study Area and Regional Location
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994
Size A4. Created 20/02/2019



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Study Area

BHP Tenements

Roads (unsealed)

biologic Environmental Survey

N

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0 1 2 4 km

BHP Western Australian Iron Ore

East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment

Figure 1.2: Study Area and BHP WAIO Tenure

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 13/03/2019

1.3 Background to Protection of Flora and Vegetation

Within Western Australia, all native flora is protected under the *Biodiversity Conservation Act 2016* (BC Act) and any action that has the potential to impact on native flora needs to be approved by relevant State and/ or Federal departments as dictated by the Western Australian *Environmental Protection Act 1986* (EP Act) and the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Some species of flora that are determined to be at risk of extinction or in decline are afforded extra protection under these Acts. For the purposes of this report, these species are called conservation significant species. A summary of applicable legislation and status codes is provided in Table 1.1. Additional information on conservation status codes is provided in Appendix A.

The EPBC Act identifies Threatened Ecological Communities (TECs) as ecological communities at risk of extinction. The BC Act provides for the statutory listing of TECs by the Western Australian (WA) Minister for Environment. The WA Minister for Environment has endorsed 69 ecological communities as threatened under critically endangered (20 communities), endangered (17 communities), vulnerable (28 communities) and presumed totally destroyed (four communities).

For some species and ecological communities there is insufficient information to determine their status. These species are generally considered by the Environmental Protection Authority (EPA)/ Department of Biodiversity, Conservation and Attractions (DBCA) as 'conservation significant' for all development related approvals and are listed on a 'Priority List'. The Priority List is regularly reviewed and maintained by DBCA. Possible TECs that do not meet the criteria for statutory listing by the WA Minister for Environment are added to DBCA's 'Priority Ecological Communities' (PECs) lists under Priorities 1, 2, 3, 4 (near threatened) or 5 (conservation dependent).

Table 1.1: Conservation significance assessment guidelines

Agreement, Act or List	Status Codes
FEDERAL	
Environment Protection and Biodiversity Conservation Act 1999 DoEE lists threatened flora, which are determined by the Threatened Species Scientific Committee (TSSC) according to criteria set out in the Act. The Act lists flora that are considered to be of conservation significance under one of eight categories (listed under 'Status Codes'). Threatened Ecological Communities (TECs) are those that are at risk of extinction.	• Extinct (EX) • Extinct in the Wild (EW) • Critically Endangered (CE) • Endangered (EN) • Vulnerable (VU) • Conservation Dependent (CD) • Critically Endangered (CE) • Endangered (EN) • Vulnerable (VU)
Agreement, Act or List	**Status Codes**
STATE	
Biodiversity Conservation Act 2016 The *Biodiversity Conservation Act 2016* provides for the listing of threatened native flora and Threatened Ecological Communities that need protection as critically endangered, endangered or vulnerable species or ecological communities because they are under identifiable threat of extinction (species) or collapse (ecological communities).	• Schedule 1 (Critically Endangered) (S1 or CR) • Schedule 2 (Endangered) (S2 or EN) • Schedule 3 (Vulnerable) (S3 or VU) • Schedule 4 (Extinct) (S4 or EX)

Agreement, Act or List	Status Codes
DBCA Priority list (DBCA) DBCA produces a list of Priority species and ecological communities (*e.g.* Priority Ecological Communities) that have not been assigned statutory protection under the *Biodiversity Conservation Act 2016*. This system gives a ranking from Priority 1 to Priority 5.	• Priority 1 (P1) • Priority 2 (P2) • Priority 3 (P3) • Priority 4 (P4) • Priority 5 (P5)

2 ENVIRONMENT

2.1 Biogeographical Regionalisation of Australia

The Interim Biogeographic Regionalisation for Australia (IBRA, version 7) divides Australia into 89 bioregions and 419 sub-regions based on climate, geology, landform, native vegetation and species information (Thackway & Cresswell, 1995). The Study Area is located in the southern section of the Pilbara Craton (Kendrick, 2001) and the northern margin of Yilgarn Craton (Desmond *et al.*, 2001) at the juncture of the Pilbara and Gascoyne bioregions. The majority of the Study Area occurs in the Pilbara bioregion with a small portion of the Study Area located in the Gascoyne bioregion (Figure 1.1), as defined by IBRA (IBRA; Thackway & Cresswell, 1995). The Pilbara bioregion is characterised by vast coastal plains and inland mountain ranges with cliffs and deep gorges (Thackway & Cresswell, 1995). Vegetation is predominantly mulga low woodlands or snappy gum over bunch and hummock grasses (Bastin, 2008). The Gascoyne bioregion is characterised by rugged low Proterozoic sedimentary and granite ranges divided by broad flat valleys (Thackway & Cresswell, 1995). The vegetation is dominated by open mulga low woodlands (Bastin, 2008).

The Pilbara bioregion is characterised by four separate subregions, Chichester (PIL01), Fortescue (PIL02), Hamersley (PIL03) and Roebourne (PIL04), of which the majority of the Study Area is located within the Fortescue subregion (Figure 1.1). The Fortescue is described as alluvial plains and river frontage with extensive salt marsh, mulga-bunch grass, and short grass communities on alluvial plains in the east (Kendrick, 2001). River gum woodlands fringe the drainage lines and it contains the northern limit of Mulga. It also contains broad calcrete aquifers that feeds many permanent springs in the central Fortescue, supporting large permanent wetlands with extensive stands of *Eucalyptus camaldulensis* and *Melaleuca argentea* woodlands (Kendrick, 2001). Caramulla Creek runs south to north through the centre of the Study Area and forms part of the Fortescue River catchment area.

The nearby adjacent Hamersley subregion is characterised by mountainous area of sedimentary ranges and plateaux which receives significantly higher rainfall than the surrounding subregion giving rise to deeply incised gorges, up to 100 metres (m) deep, containing extensive permanent spring-fed streams and pools (Kendrick, 2001). The Hamersley contains extensive open snappy gum woodland and hummock grassland communities on ranges and plateaus, with low mulga woodlands over bunch grasses on fine textured soils in lower areas and valley floors (Kendrick, 2001).

The Gascoyne bioregion is characterised by three separate subregions, Ashburton (GAS01), Carnegie (GAS02) and Augustus (GAS03), of which the Study Area is partially located within the Augustus (GAS03) subregion (Figure 1.1). The Gascoyne River System provides the main drainage of the subregion, however the headwaters of the Ashburton and Fortescue Rivers also occur in the subregion (Desmond *et al.*, 2001). There are extensive areas of alluvial valley-fill deposits. Mulga (*Acacia aneura* and close relatives) woodland with *Triodia* species occur on shallow stony loams on rises, while the shallow earthy loams over hardpan on the plains are covered by Mulga parkland (Desmond *et al.*, 2001).

2.2 Climate

The Pilbara and Gascoyne bioregions have a semi-desert to tropical climate, with rainfall occurring sporadically throughout the year, although mostly during summer (Thackway & Cresswell, 1995). Summer rainfall is usually the result of tropical storms in the north or tropical cyclones that impact upon the coast and move inland (Leighton, 2004). The winter rainfall is generally lighter and is the result of cold fronts moving north easterly across the state (Leighton, 2004). The average annual rainfall ranges from 200-350 mm, although there are significant fluctuations between years (BoM, 2019), with up to 1200 mm falling in some locations in some years (McKenzie *et al.*, 2009).

Long-term climatic data is not available for the Study Area itself; however, long term climatic data is available from the Bureau of Meteorology (BoM) weather station at Newman Airport (Station 7176), 40 km west of the Study Area ((BoM, 2019)). The Newman Airport is expected to provide the most accurate long-term average (LTA) dataset for climatic conditions experienced within the Study Area (Figure 2.1).

Newman airport receives on average 329 mm of rainfall each year, with the majority falling during the months of December through to March (65% of the total rainfall, BoM, 2019). Day time temperatures are the hottest during the summer months of December to February, with temperatures regularly exceeding 40°C. The average maximum temperature during the hottest three months is 38.5°C, while the average minimum temperature is 24.3°C (Figure 2.1) (BoM, 2019). The coolest three months of the year coincide with the winter months of June to August, with night-time temperatures regularly falling below 10°C. The average maximum temperature during the coldest three months is 24°C, while the average minimum temperature is 7.2°C (Figure 2.1) (BoM, 2019).

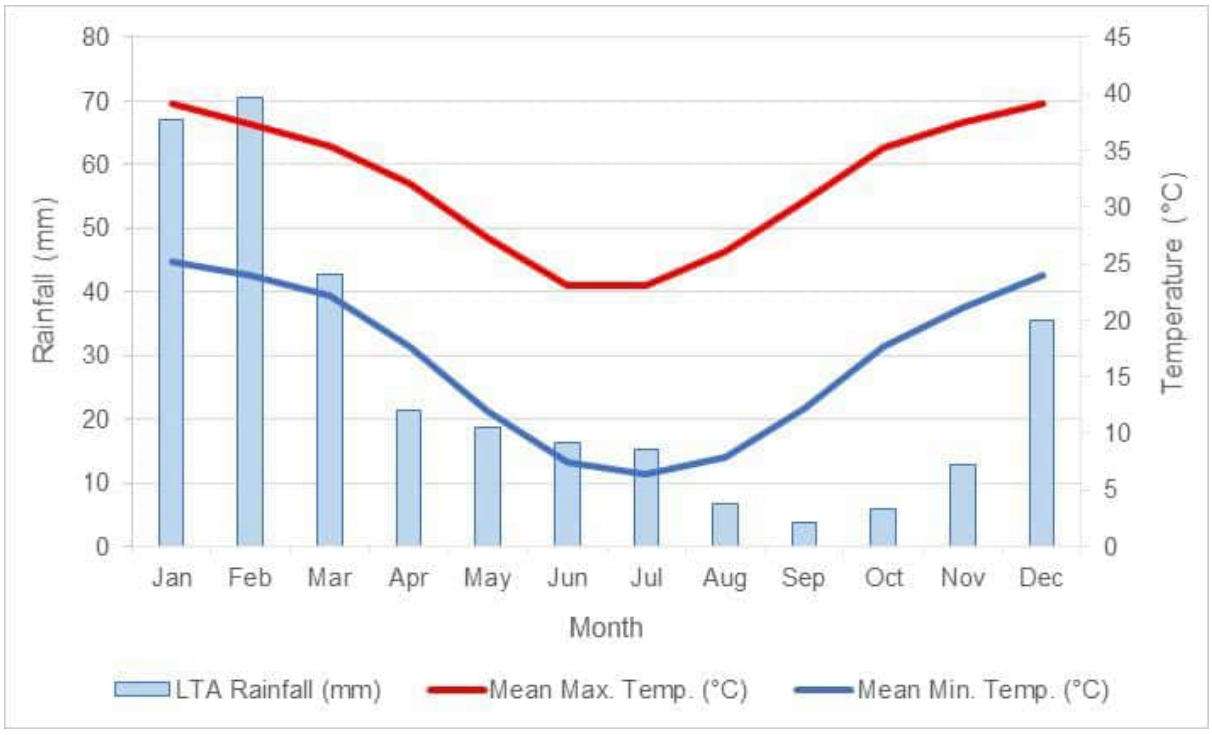


Figure 2.1: Long-term climatic averages (LTA) of monthly rainfall and temperature from Newman Airport (station 7176; BoM, 2018)

2.3 Existing Land Use

The Study Area includes a portion of mineral lease M266SA and the entirety of exploration tenements E52/18 and E52/172, held by BHP Iron Ore (Jimblebar) Pty Ltd (a subsidiary of the BHP Group). Pastoral infrastructure, including tracks and fences, traverse throughout the Study Area. Mining and exploration works occur to the west of the Study Area (Jimblebar).

The Study Area is wholly located within the Shire of East Pilbara Local Government Authority (LGA) (Figure 1.1). The boundary between the Shire of East Pilbara and the Shire of Meekatharra is located less than 3 km to the south of the Study Area (Figure 1.1).

2.4 Soils and Landforms

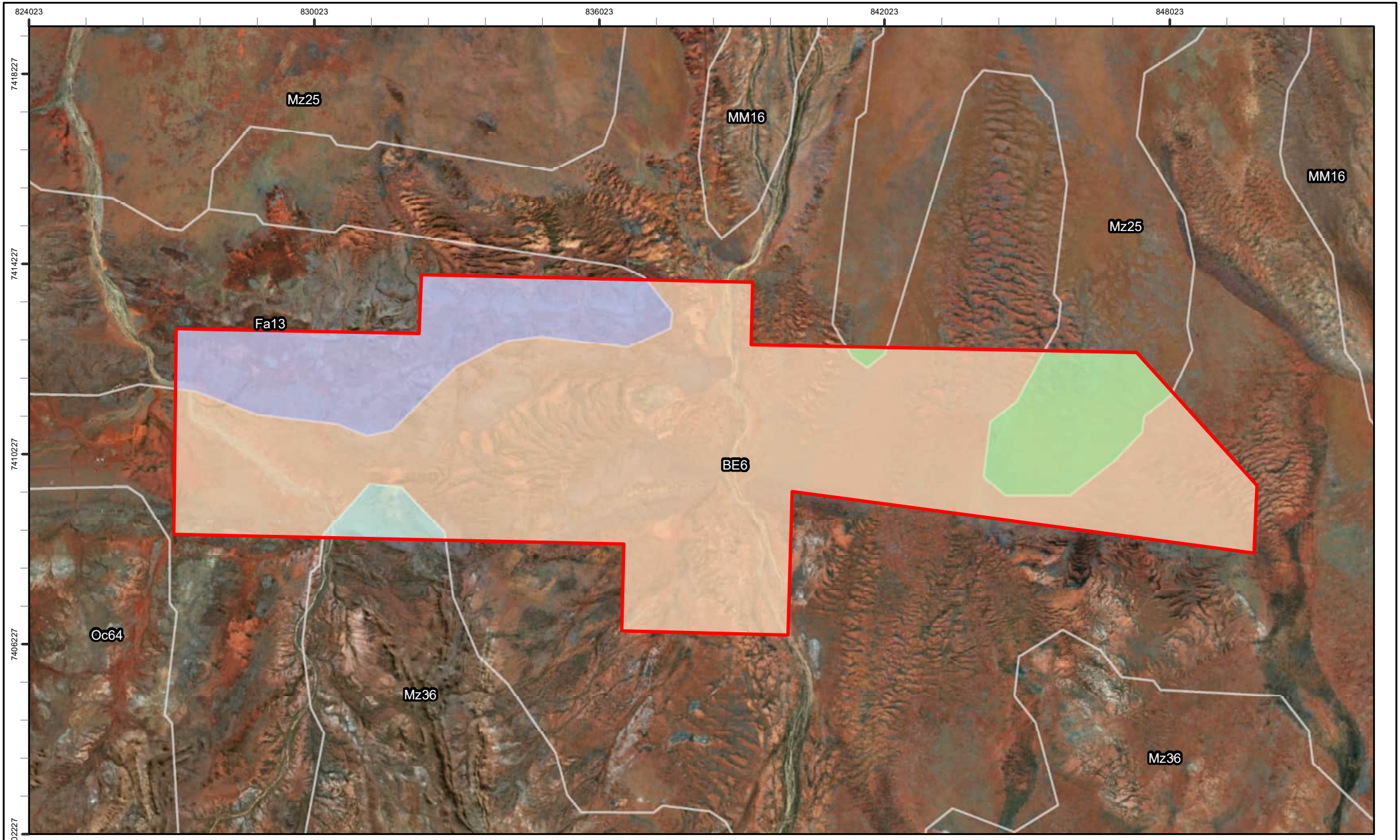
The Atlas of Australian Soils (Northcote *et al.*, 1960-1968) was compiled by the Commonwealth Scientific and Industrial Research Organisation (CSIRO, 2009) in the 1960's to provide a consistent national description of Australia's soils. It comprises of a series of ten maps and associated explanatory notes and is published at a scale of 1:2,000,000, but the original compilation was at scales from 1:250,000 to 1:500,000.

The broad soil landscape units that have been mapped across the Study Area comprise BE6, Fa13, Mz25 and Mz36 (Northcote *et al.*, 1960-1968) (Table 2.1 and Figure 2.2). The majority of the Study Area is mapped as BE6, with a portion in the northwest mapped as Fa13, a portion in the northeast mapped as Mz25 and a portion in the southwest mapped as Mz36 (Table 2.1).

Table 2.1: Soil landscape units mapped within the Study Area

Code & Description	Study Area	
	ha	%
BE6: Extensive flat and gently sloping plains. Soils with predominantly physical limitations; shallow soils.	7,595	74
Fa13: Ranges of banded jaspilite and chert along with shales, dolomites, and iron ore formations. This unit is largely associated with the Hamersley and Ophthalmia Ranges. Soils with predominantly physical limitations; shallow soils.	1,690	16
Mz25: Plains associated with the Fortescue valley with surface cover of stony gravels close to the ranges and hills. Soils with predominantly chemical limitations; soils naturally low in nutrients.	843	8
Mz36: Pediments with some steep hills on granites; granitic residuals; bosses and tors: chief soils are acid red earths overlying a red-brown hardpan. Soils with predominantly chemical limitations; soils naturally low in nutrients.	191	2
Total	**10,318**	**100**

NB: values have been rounded to the nearest whole number



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Study Area

CSIRO Soil Unit

- Be6 - Extensive flat and gently sloping plains
- Fa13 - Ranges of banded jaspilite and chert along with shales
- Mz25 - Plains associated with the Fortescue valley
- Mz36 - Pediments with some steep hills on granites

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Figure 2.2: Soil Landscape Units of the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 13/03/2019

At a finer scale, the Study Area mainly consists of shallow earthy loams. Soils on the ranges are predominantly stony and shallow soils with extensive areas without soil cover (van Vreeswyk *et al.*, 2004). Less dominant areas include soils on plains associated with the Fortescue valley containing acid red earths with some neutral red earths (red-brown hardpan is absent) (van Vreeswyk *et al.*, 2004). Minor portions contain granitic pediments with acid red earths overlying a red-brown hardpan occurring on sheets (van Vreeswyk *et al.*, 2004). Associated areas of calcareous earths and loams on calcrete (kunkar) and some hard red soils around creek lines (van Vreeswyk *et al.*, 2004).

The Study area occurs within the Hamersley Plateaux Zone. The dominant broad landforms in the Study Area are ranges, extensive flat and gently sloping plains, plains and steep hills and slopes (Northcote *et al.*, 1960-1968). The northwestern portion of the Study Area broadly coincide with stony hills, ridges, and dissected ranges of the Hamersley while the southern and central areas coincide with sloping plains and hardpan plains, that then migrate into sandplains in the east (van Vreeswyk *et al.*, 2004).

2.5 Geology

According to the Australian Geological Provinces database, the Study Area is located within the Warakurna Large Igneous Province (Wingate *et al.*, 2004). The spatial data has been captured largely at approximately 1:1 Million scale. The Warakurna Large Igneous Province consists of layered mafic-ultramafic intrusions, mafic to felsic volcanic rocks and dykes, extensive mafic sills and swarms of mafic dykes (Wingate *et al.*, 2004). The Warakurna Large Igneous Province consists of coeval mafic igneous rocks. The bulk of the magmatic products emplaced between 1,078 and 1,070 million years ago, along an east-west swath approximately 800 km wide and 2,400 km long (Wingate *et al.*, 2004).

At a finer scale (1:500,00) the Study Area (GSWA, 2016) is mapped (Figure 2.3) as:

- Sylvania Inlier granitic unit (A-u-PYV): Granite to granodiorite; metamorphosed and variably foliated. Occurs in the south across 3% (or 333 ha) of the Study Area.
- Sylvania Inlier greenstones (A-u-PYV): Ultramafic rock; includes metamorphosed peridotite, dunite, pyroxene peridotite, serpentinite, and talc schist. Occurs in the south across 4% (or 419 ha) of the Study Area.
- Marra Mamba Iron Formation (A-HAm-cib): Chert, banded iron-formation, mudstone, and siltstone; minor carbonate; metamorphosed. Occurs across the centre of the Study Area (6% or 606 ha).
- Jeerinah Formation (A-FOj-xs-b): Siliciclastic sedimentary rocks, mafic volcanic rocks and minor felsic volcanic rocks; local carbonate rocks, chert, and dolerite sills. Occurs across the south and southwest of the Study Area (6% or 633 ha).
- Wittenoom Formation (A-HAd-kd): Thinly bedded dolomite and dolomitic shale, with minor black chert, shale, banded iron formation and sandstone. Occurs across the centre of the Study Area (30% or 3,116 ha).
- Mount McRae Shale and Mount Sylvia Formation (A-HAu-xsl-ci): Mudstone, siltstone, chert, banded iron-formation, and dolomite; metamorphosed. Occurs across the centre of the Study Area (8% or 831 ha).

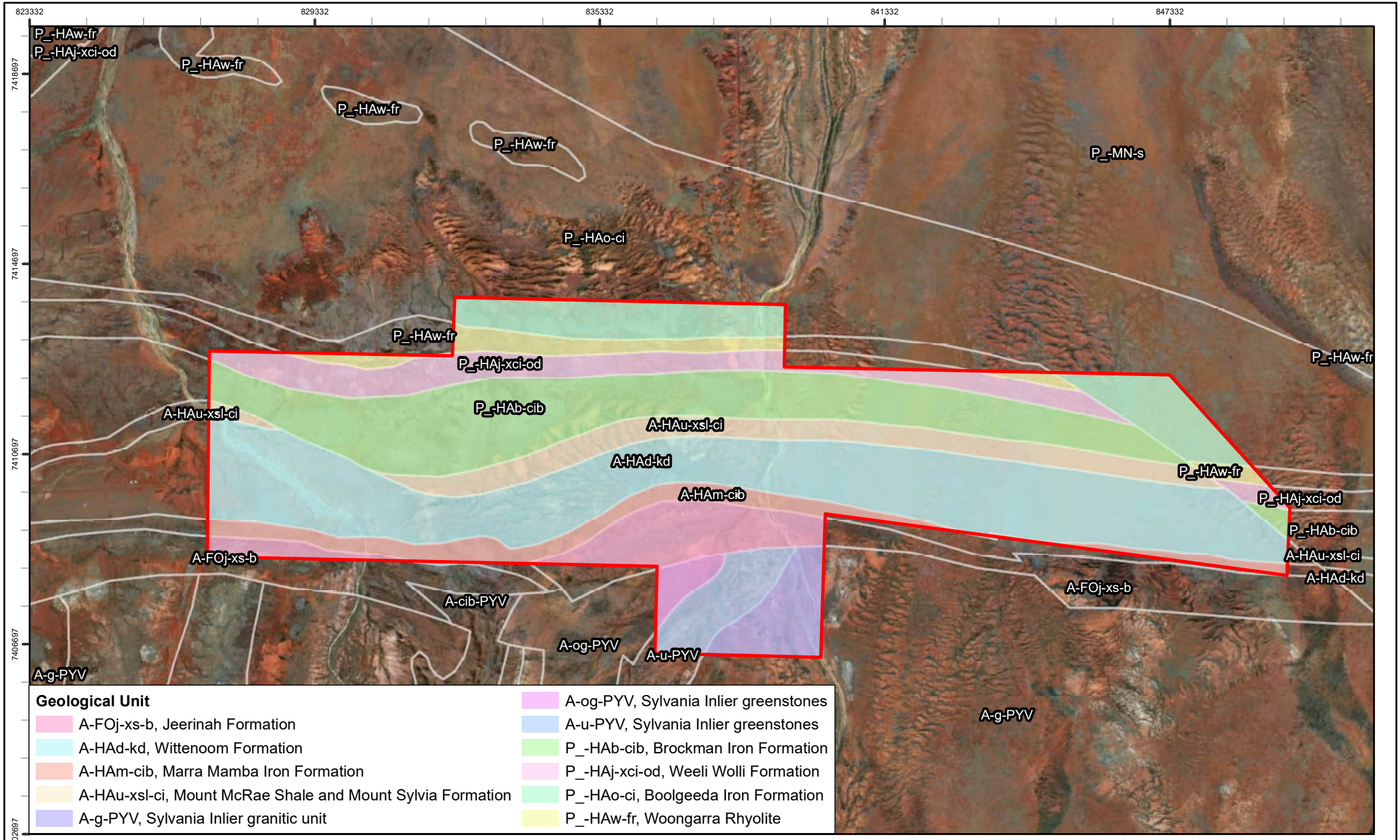
- Brockman Iron Formation (P_-HAb-cib): Banded iron-formation, chert, mudstone, and siltstone; metamorphosed. Occurs across the centre of the Study Area (22% or 2,230 ha).
- Weeli Wolli Formation (P_-HAj-xci-od): Banded iron-formation (commonly jaspilitic), mudstone, siltstone, and numerous dolerite sills; metamorphosed. Occurs across the centre of the Study Area (9% or 903 ha).
- Woongarra Rhyolite (P_-HAw-fr): Rhyolite, rhyodacite, rhyolitic breccia, and banded iron-formation; metamorphosed. Occurs in the north and east of the Study Area (4% or 396 ha).
- Boolgeeda Iron Formation (P_-HAo-ci): Fine-grained, finely laminated iron-formation, mudstone, siltstone, and chert; metamorphosed. Occurs in the north and the east of the Study Area (8% or 853 ha).

2.6 Land Systems

Work undertaken by a joint team from the (former) Department of Agriculture (now Department of Primary Industries and Regional Development) and the (former) Department of Lands Administration (now Department of Planning, Lands and Heritage) attempted to classify the pastoral areas of Western Australia (van Vreeswyk *et al.*, 2004). The purpose of the surveys were to provide a comprehensive description and mapping of the biophysical resources of the pastoral areas, together with an evaluation of the pastoral potential and the condition of the soils and vegetation (van Vreeswyk *et al.*, 2004).

Ten land systems have been mapped as occurring across the Study Area, Cadgie, Divide, Jamindie, McKay, Newman, River, Sylvania, Talga, Washplain and Zebra (van Vreeswyk *et al.*, 2004) (Table 2.2 and Figure 2.4). The dominant land system is the Divide land system, which covered approximately one quarter of the Study Area (Table 2.2). The Divide land system is described as Sandplains and occasional dunes supporting shrubby hard spinifex grasslands (Table 2.2).

The land types across the Study Area range are: sandplains and occasional dunes with spinifex grasslands; Wash plains and sandy banks on hardpan, with mulga shrublands and wanderrie grasses or spinifex; River plains with grassy woodlands and tussock grasslands; Wash plains on hardpan with mulga shrublands; Stony plains with acacia shrublands; and Hills and ranges with spinifex grasslands. The dominant land type is sandplain and occasional dunes with spinifex grasslands (2,614 ha or 25% of the Study Area), closely followed by hills and ranges with spinifex grasslands (2,558 ha or 25% of the Study Area).



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Study Area

biologic Environmental Survey

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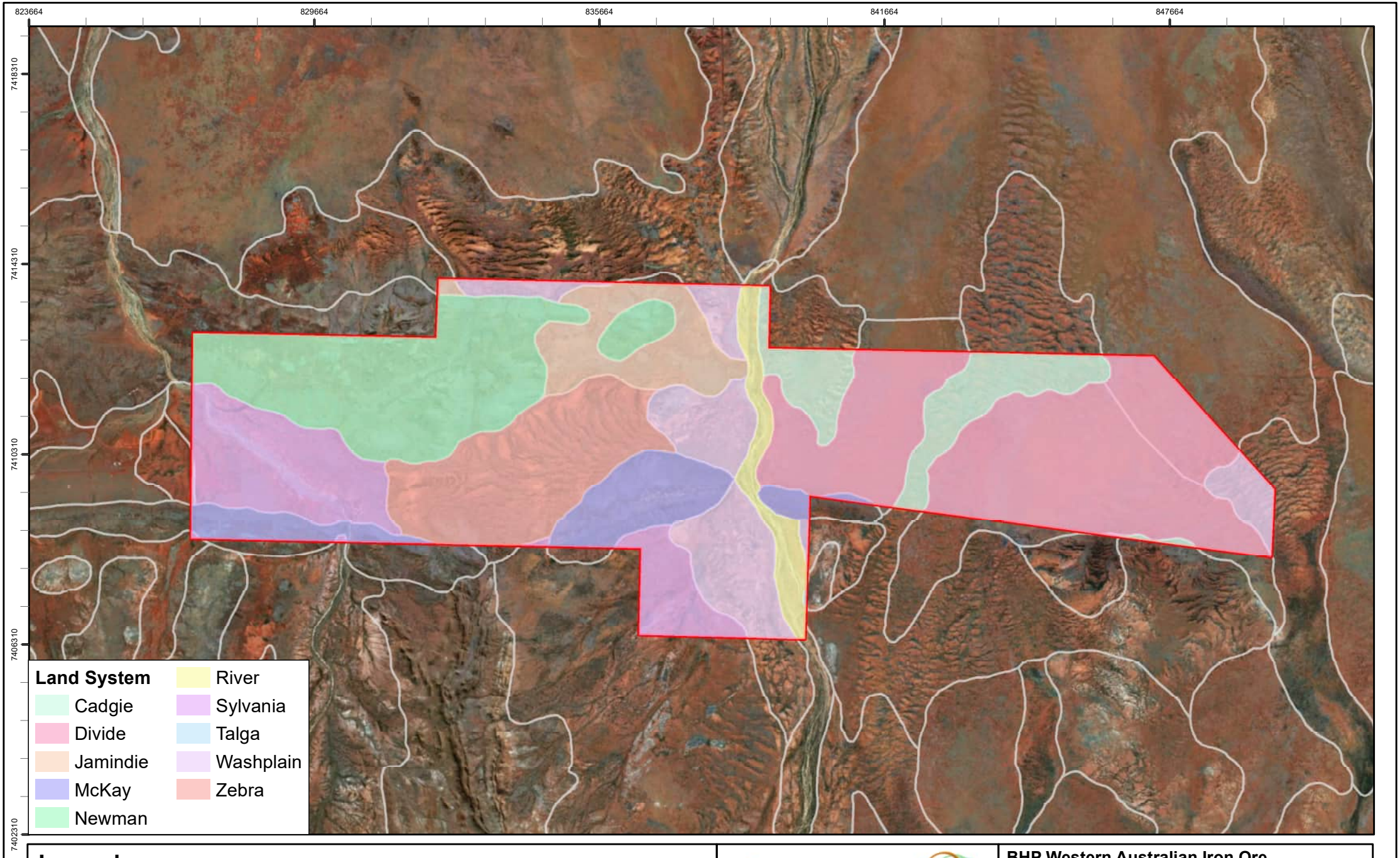
Figure 2.3: Broad Geology of the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4, Created 13/03/2019



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Study Area

biologic Environmental Survey

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0 1 2 4 km

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Figure 2.4: Land Systems of the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4, Created 13/03/2019

Table 2.2 Land Systems of the Study Area

Land System	Land Type	Description	Extent in Study Area	
			Ha	%
Cadgie	Wash plains and sandy banks on hardpan, with mulga shrublands and wanderrie grasses or spinifex	Hardpan plains with thin sand cover and sandy banks supporting mulga shrublands with soft and hard	726	7
Divide	Sandplains and occasional dunes with spinifex grasslands	Sandplains and occasional dunes supporting shrubby hard spinifex grasslands.	2,614	25
Jamindie	Wash plains on hardpan with mulga shrublands	Stony hardpan plains and rises supporting groved mulga shrublands, occasionally with spinifex understorey.	622	6
McKay	Hills and ranges with spinifex grasslands	Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands.	752	7
Newman	Hills and ranges with spinifex grasslands	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands	1,804	17
River	River plains with grassy woodlands and tussock grasslands.	Active flood plains, major rivers and banks supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands.	321	3
Sylvania	Stony plains with acacia shrublands	Gritty surfaced plains and low rises on granite supporting acacia-eremophila-cassia shrublands.	1,142	11
Talga	Hills and ranges with spinifex grasslands	Hills and ridges of greenstone and chert and stony plains supporting hard and soft spinifex grasslands.	2	<1
Washplain	Wash plains on hardpan with mulga shrublands	Hardpan plains supporting groved mulga shrublands.	1,135	11
Zebra	Wash plains and sandy banks on hardpan, with mulga shrublands and wanderrie grasses or spinifex	Hardpan plains with large linear gravelly sand banks supporting acacia shrublands with soft and hard spinifex.	1,199	12
		Total	10,318	100

NB: hectare values have been rounded to the nearest whole number.

2.7 Hydrology

The hydrology, both surface and groundwater, of the Pilbara and Gascoyne is highly variable as a result of a dynamic climate with severe droughts followed by major flooding (DoW, 2010). Streamflows are mostly a direct response to rainfall and are highly seasonal and variable. Most runoff occurs from January to March as a result of episodic cyclonic activities (DoW, 2010).

The Study Area is located within the Fortescue River basin, which extends from the Upper Fortescue River, along the Fortescue Marsh and through the Lower Fortescue River. At a finer scale, the Study

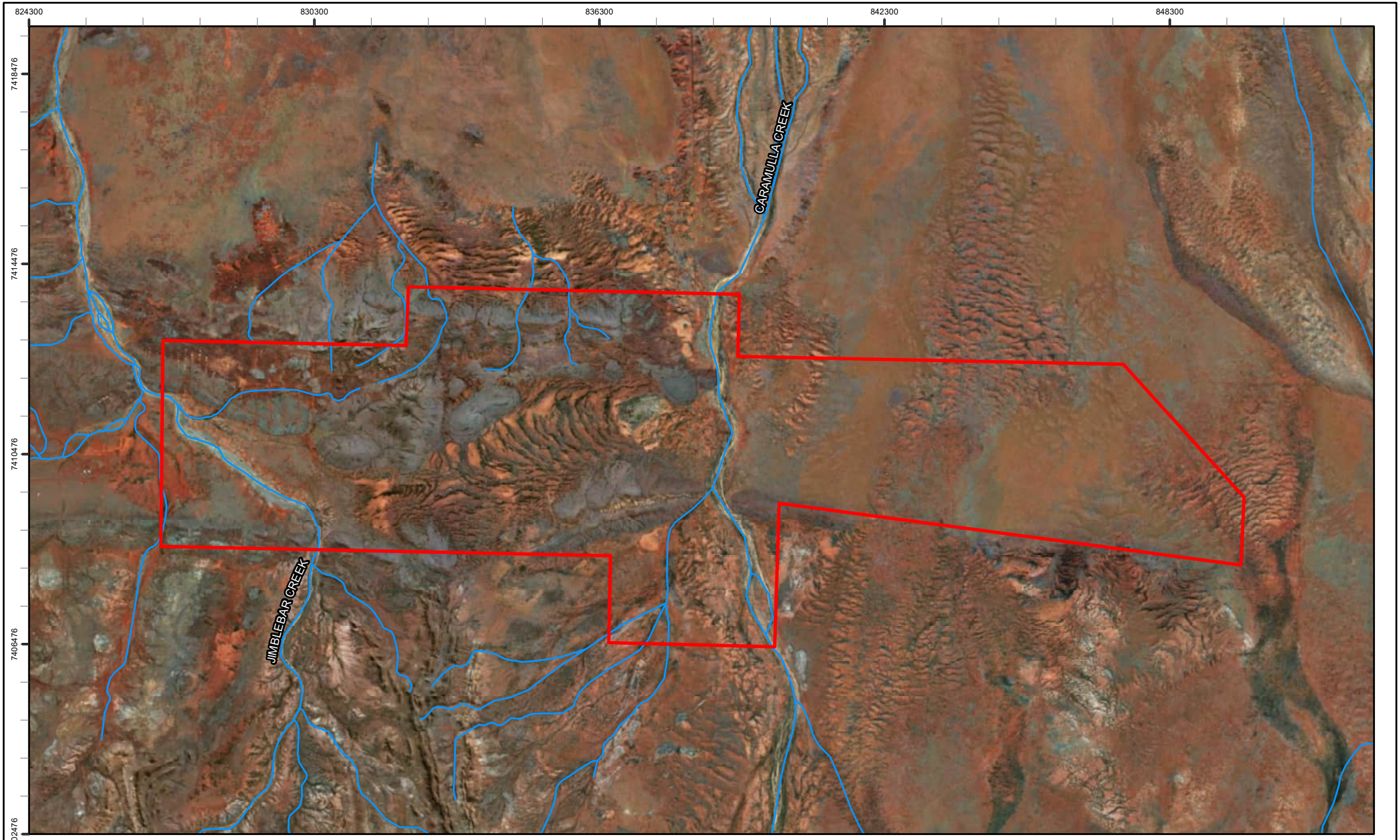
Area is located within the Upper Fortescue River Catchment and the Fortescue Marsh sub-catchment. Two major creek systems occur in the Study Area, Caramulla Creek and Jimblebar Creek (Figure 2.5). Jimblebar Creek traverses southeast to northwest through the southwestern portion of the Study Area before tracking north to join with Caramulla Creek approximately 41 km to the north of the Study Area. Caramulla Creek traverses south to north through the central portion of the Study Area. Eventually Caramulla Creek flows into the Fortescue River and the Fortescue Marsh, 89 km to the north of the Study Area.

Groundwater originates from direct infiltration by rainfall and from surface water flows and occurs throughout the Pilbara; however, it is most easily located and accessed in close proximity to surface water drainage lines (alluvial channels). The most significant aquifers can be grouped into three types: alluvial aquifers that are either unconsolidated sedimentary aquifers or chemically deposited aquifers; consolidated sedimentary (or sedimentary rock) aquifers; and fractured rock aquifers. Broadly, the groundwater associated with the Study Area is located within fractured and weathered rock aquifers.

2.8 Vegetation Associations

The Study Area is located in the Fortescue Botanical District, which is a part of the Eremaean Province (Beard, 1990). It is essentially a tree- and shrub-steppe with *Eucalyptus* trees, *Acacia* shrubs, *Triodia pungens* and *Triodia wiseana* hummock grasslands (Beard, 1990). Some mulga (*Acacia aneura* and close relatives) occurs in valleys and there are short-grass plains on alluvia (Beard, 1990). The vegetation associations of the Study area was mapped by Beard (1975), in which he classified the following six vegetation associations (Figure 2.6):

- 18: Low woodland; mulga (*Acacia aneura* and close relatives). Occurs across 4% (or 363 ha) of the Study Area;
- 28: Open low woodland; mulga (*Acacia aneura* and close relatives). Occurs across <1% (or 27 ha) of the Study Area;
- 29: Sparse low woodland; mulga (*Acacia aneura* and close relatives), discontinuous in scattered groups. Occurs across 46% (or 4,754 ha) of the Study Area;
- 82: Hummock grasslands, low tree steppe; snappy gum (*Eucalyptus leucophloia*) over *Triodia wiseana*. Occurs across 29% (or 2,955 ha) of the Study Area;
- 111: Hummock grasslands, shrub steppe; *Eucalyptus gamophylla* over hard *Triodia* species. Occurs across 12% (or 1,215 ha) of the Study Area; and
- 216: Low woodland; mulga (*Acacia aneura* and close relatives) (with spinifex) on rises. Occurs across 10% (or 1,004 ha) of the Study Area.



Legend

- Study Area
- Watercourse

biologic Environmental Survey

N

1:100,000

0 1 2 4 km

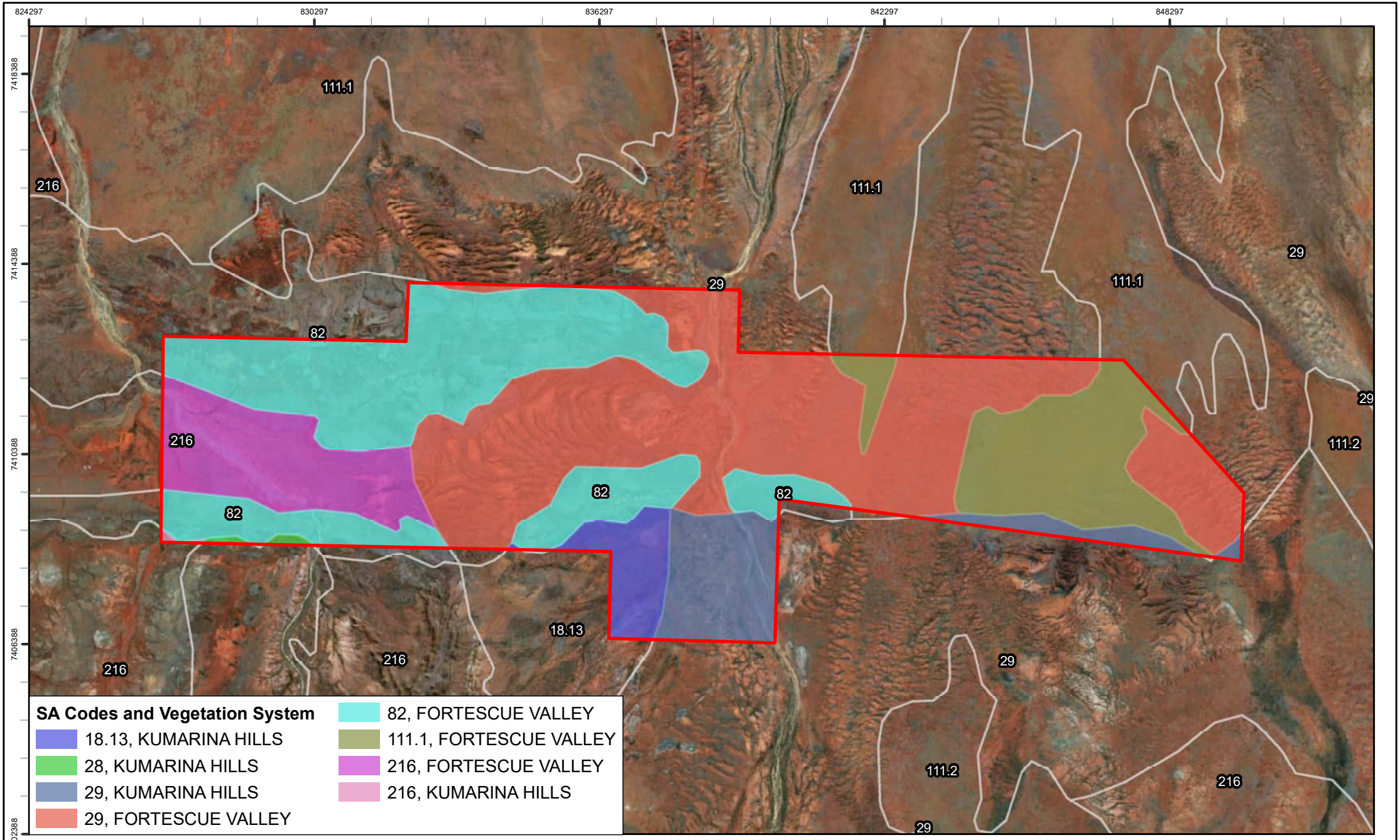
BHP Western Australian Iron Ore

East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment

Figure 2.5: Hydrology of the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 13/03/2019



Legend

Study Area

biologic Environmental Survey

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0 1 2 4 km

BHP Western Australian Iron Ore

East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment

Figure 2.6: Pre-European Vegetation Associations of the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 13/03/2019

Shepherd *et al.* (2002) attempted to reinterpret and update the vegetation association mapping to reflect the National Vegetation Information System (NVIS Technical Working Group) standards (ESCAVI, 2003). The update also accounts for extensive clearing since Beard (1975) mapping. Shepherd *et al.* (2002) created a series of 'systems' to assist in removing mosaic vegetation associations originally mapped by Beard (1975); however, some mosaics still occur. The Study Area is located within the Kumarina Hills and the Fortescue Valley Systems, as reinterpreted by Shepherd *et al.* (2002).

The current extent remaining of the vegetation system associations exceeds 94% across the four regional scales: State, bioregion (Pilbara and Gascoyne), subregion (Fortescue and Augustus) and Local Government Authority (Shire of East Pilbara) (Government of Western Australia, 2019) (Table 2.3 and Table 2.4). Currently only one vegetation system association (18.13) is well represented within the National Reserve System having greater than 11% of current bioregional and subregional extent within reserves (Government of Western Australia, 2019) (Table 2.4). The majority of the remaining vegetation system associations have none of their current bioregional and subregional extent within reserves (Table 2.3 and Table 2.4).

Table 2.3: Regional and local extent of Fortescue Valley System Associations within the Study Area

Code	Scale	Pre-European extent (ha)	Current extent remaining (ha / %)	Current extent remaining within reserves (ha / %)
29	State	878,058	877,889 / 99.98	2,329 / 0.27
	Pilbara	877,822	877,653 / 99.98	2,329 / 0.27
	Gascoyne	82.6	82.6 / 100	0 / 0
	Fortescue	872,486	872,316 / 99.98	2,303 / 0.26
	Augustus	82.57	82.57 / 100	0 / 0
	LGA	697,400	697,230 / 99.98	0 / 0
82	State	30,467	30,271 / 99.4	0 / 0
	Pilbara	30,240	30,044 / 99.4	0 / 0
	Gascoyne	227	227 / 100	0 / 0
	Fortescue	15,128	15,128 / 100	0 / 0
	Augustus	227	227 / 100	0 / 0
	LGA	29,989	29,793 / 99.3	0 / 0
111.1	State	430,980	430,925 / 99.99	7,007 / 1.63
	Pilbara	430,961	430.906 / 99.99	7,007 / 1.63
	Gascoyne	13.9	13.9 / 100	0 / 0
	Fortescue	430,135	430,080 / 99.99	6,858 / 1.59
	Augustus	13.9	13.9 / 100	0 / 0
	LGA	364,294	364,294 / 100	0 / 0

Code	Scale	Pre-European extent (ha)	Current extent remaining (ha / %)	Current extent remaining within reserves (ha / %)
216	State	26,399	26,102 / 98.9	0 / 0
	Pilbara	26,388	26,091 / 98.9	0 / 0
	Gascoyne	11	11 / 100	0 / 0
	Fortescue	18,931	18,931 / 100	0 / 0
	Augustus	11	11 / 100	0 / 0
	LGA	26,399	26,102 / 98.9	0 / 0

NB: LGA (Local Government Authority): Shire of East Pilbara

Reserves – International Union of Nature Conservation (IUCN) Class I-IV reserves (i.e. National Parks, Strict Nature Reserves)

Source: Government of Western Australia (2019); NB: area values have been rounded to the nearest whole number.

Table 2.4: Regional and local extent of Kumarina Hills System Associations within the Study Area

Code	Scale	Pre-European extent (ha)	Current extent remaining (ha / %)	Current extent remaining within reserves (ha / %)
18.13	State	569,021	569,021 / 100	65,122 / 11.44
	Pilbara	686	686 / 100	0 / 0
	Gascoyne	568,139	568,139 / 100	65,122 / 11.46
	Fortescue	419	419 / 100	0 / 0
	Augustus	567,548	568,548 / 100	65,122 / 11.47
	LGA	28,358	28,358 / 100	0 / 0
28	State	74,299	74,299 / 100	0 / 0
	Pilbara	37	37 / 100	0 / 0
	Gascoyne	74,262	74,262 / 100	0 / 0
	Fortescue	37	37 / 100	0 / 0
	Augustus	73,829	73,829 / 100	0 / 0
	LGA	1,395	1,395 / 100	0 / 0
29	State	784,575	784,364 / 99.97	0 / 0
	Pilbara	2,706	2,689 / 99.37	0 / 0
	Gascoyne	780,622	780,429 / 99.98	0 / 0
	Fortescue	317	317 / 100	0 / 0
	Augustus	780,337	780,144 / 99.98	0 / 0
	LGA	42,853	42,645 / 99.51	0 / 0

Code	Scale	Pre-European extent (ha)	Current extent remaining (ha / %)	Current extent remaining within reserves (ha / %)
216	State	254,360	253,135 / 99.5	0 / 0
	Pilbara	282	282 / 100	0 / 0
	Gascoyne	254,078	252,853 / 99.5	0 / 0
	Fortescue	136	136 / 100	0 / 0
	Augustus	254,078	252,853 / 99.5	0 / 0
	LGA	18,669	17,710 / 94.9	0 / 0

NB: LGA (Local Government Authority): Shire of East Pilbara

Reserves – International Union of Nature Conservation (IUCN) Class I-IV reserves (i.e. National Parks, Strict Nature Reserves)

Source: Government of Western Australia (2019); NB: area values have been rounded to the nearest whole number.

3 METHODOLOGY

3.1 Compliance

The survey was carried out in a manner consistent with the Western Australian EPA, DBCA and BHP WAIO guidelines for the environmental surveying and reporting of flora and vegetation. The following guidelines, procedures and documents were utilised prior to, during and after completion of the field survey:

- EPA (2018) Statement of Environmental Principles, Factors and Objectives;
- EPA (2016a) Environmental Factor Guideline: Flora and Vegetation;
- EPA (2016b) Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment;
- Latest version of BHP WAIO's Vegetation and Flora Survey Procedure (0124627) (BHP, 2018); and
- Latest version of BHP WAIO's Biological Survey Spatial Data Requirements (SPR-IEN-EMS-015) (BHP, 2019).

3.2 Desktop Assessment

3.2.1 Literature Review

Background information on the Study Area and surrounds was compiled prior to, during and after the field survey. Historic vegetation mapping conducted by Beard (1975) and Shepherd *et al.* (2002), land systems mapping (van Vreeswyk *et al.*, 2004), and the IBRA classification system (Desmond *et al.*, 2001) were consulted to provide broad contextual knowledge of the vegetation types likely to be encountered within the Study Area. The literature review also considered 41 previous field surveys of relevance to the Study Area (Table 3.1). The 41 previous field surveys that were considered were provided by BHP WAIO and are located within a radius of 20 km from the Study Area. The Index of Biological Surveys for Assessments (IBSA) online portal was reviewed to identify additional projects that have been conducted in close proximity to the Study Area. No additional surveys were identified from IBSA.

Table 3.1: Literature sources used for the review

Survey Title	Reference	Survey Type	Distance from Study Area (km)
Caramulla Creek Flora and Vegetation Survey	Astron (2019)	Reconnaissance	Adjacent and partially overlaps
Jimblebar East Exploration Project Biological Survey	Ecologia (2005b)	Detailed Flora Survey	Adjacent and partially overlaps
Caramulla Exploration Area Flora and Vegetation Survey and Fauna Assessment	GHD (2009)	Detailed Flora Survey and Fauna Habitat Assessment	Adjacent and partially overlaps
Reconnaissance Flora and Vegetation Survey Caramulla	Onshore (2018a)	Reconnaissance	Adjacent and partially overlaps

Survey Title	Reference	Survey Type	Distance from Study Area (km)
Vegetation Survey and Desktop Assessment Caramulla Creek	Onshore (2018c)	Reconnaissance	Adjacent and partially overlaps
Jimblebar North Reconnaissance Flora and Vegetation Survey	Onshore (2019)	Reconnaissance	Adjacent and partially overlaps
Jimblebar Iron Ore Project Ophthalmia Dam (and downstream) Phreatophytic Vegetation Assessment	Astron (2010a)	Riparian Survey	Adjacent – NW
Jimblebar Iron Ore Project Flora and Vegetation Assessment	Outback Ecology (2010)	Two-phase Detailed Flora Survey	Adjacent - NW
Jimblebar Mine Site Biological Survey	BHP (1994)	Detailed (formerly level 2) Flora Survey	Adjacent
Jimblebar – Wheelarra Hill 3 Flora and Fauna Assessment	Biota (2004)	Detailed Flora Survey	Adjacent
Ecological Observations Jimblebar Railway Line	Dames and Moore (1993)	Ecological Survey	Adjacent
Level 1 Flora and Fauna Surveys Along the Great Northern Highway for Jimblebar Mine Module Transport	Eco Logical Australia (2012)	Reconnaissance Flora Survey	Adjacent
Jimblebar Rail Spur Biological Assessment Survey	ecologia (1996)	Detailed Flora Survey	Adjacent
Jimblebar Flora & Soil Survey	ecologia (1999)	Detailed Flora and Soil Survey	Adjacent
OB 18 Flora and Fauna Review	ecologia (2004)	Targeted Survey	Adjacent
Jimblebar Wye Rail Junction Priority Flora and Riparian Vegetation Assessment	ecologia (2005a)	Targeted Survey and Riparian Vegetation Assessment	Adjacent
Jimblebar Stage 2, Levee Banks and Communications Tower Redevelopment Flora and Vegetation Assessments	ENV (2007a)	Two-phase Detailed Flora Survey	Adjacent
OB 18 Flora and Vegetation Assessment Phase II	ENV (2007b)	Detailed Flora Survey	Adjacent
RGP4 Jimblebar Rail Loop Flora and Vegetation Assessment	ENV (2007c)	Detailed Flora Survey	Adjacent
Jimblebar Access Road Flora and Vegetation Assessment	ENV (2008a)	Detailed Flora Survey	Adjacent
Rapid Growth Project 5: Repeater 9 Access Road Flora and Vegetation Assessment	ENV (2008b)	Detailed Flora Survey	Adjacent
Jimblebar Spur 2 Flora and Vegetation Assessment	ENV (2009a)	Reconnaissance (formerly level 1) Flora Survey	Adjacent
Newman to Jimblebar Transmission Line and Newman Town Substation Flora and Vegetation Assessment	ENV (2009b)	Detailed Flora Survey	Adjacent
Jimblebar Wye Targeted Declared Rare Flora and Priority Listed Flora Assessment	ENV (2010a)	Targeted Survey	Adjacent
RGP6 Jimblebar Hub (Water Pipeline) Flora and Vegetation Assessment	ENV (2010b)	Detailed Flora Survey	Adjacent
Mesa Gap Biological Survey	GHD (2008a)	Detailed Flora Survey	Adjacent

Survey Title	Reference	Survey Type	Distance from Study Area (km)
Draft Report for Wheelarra Hill (Jimblebar Mine Site) Priority Species Verification – Goodenia hartiana Species Verification	GHD (2008b)	Targeted Survey	Adjacent
Consolidation of Regional Vegetation Mapping BHP Billiton Iron Ore Pilbara Tenure	Onshore (2014a)	Review	Adjacent
Dynasty Tenement E52/2591 Flora and Vegetation Desktop Assessment	Onshore (2014b)	Desktop	Adjacent
Level 2 Flora and Vegetation Assessment Orebody 31	Onshore (2014c)	Two-phase Detailed Flora Survey	Adjacent
Dynasty and West Jimblebar Level 2 Flora and Vegetation Survey	Onshore (2015b)	Detailed Flora Survey	Adjacent
Level 2 Riparian & Aquatic Flora & Vegetation Survey Jimblebar Creek and Innawally Pool	Onshore (2016)	Detailed Riparian Survey	Adjacent
Shearers West Detailed Flora and Vegetation Survey	Onshore (2018b)	Detailed Flora Survey	Adjacent
Wheelarra Hill Iron Ore Mine Modification Flora and Fauna Assessment	Outback Ecology Services (2009)	Two-phase Detailed Flora Survey	Adjacent
Wheelarra Hill North Level 2 Flora and Vegetation Assessment	Syrinx (2012)	Two-phase Detailed Flora Survey	Adjacent
South West Jimblebar Level 2 Flora and Vegetation Survey	Syrinx (2014)	Detailed Flora Survey	Adjacent
OB 31 Flora and Vegetation Assessment	Syrinx Environmental (2011)	Two-phase Detailed Flora Survey	Adjacent
Hashimoto Exploration Project Biological Survey: Flora and Vegetation	ecologia (2007)	Two-phase Detailed Flora Survey	2 km N
Targeted Flora Survey *Acacia* sp. East Fortescue	Onshore (2015a)	Targeted Survey	2 km N
West Jimblebar Exploration Lease Flora and Vegetation Assessment	ENV (2007d)	Detailed Flora Survey	1.9 km N
Jimblebar Marra Mamba Exploration Biological Survey	ecologia (2006b)	Detailed	<1 km N

3.2.2 Database Searches

Database searches were undertaken to generate a list of vascular flora taxa previously recorded within, and near, the Study Area, including introduced species and taxa of conservation significance. The database searches also identified ecological communities/ vegetation types of conservation significance that occur, or may occur, within, and near, the Study Area. Conservation codes for flora and vegetation of conservation significance are provided in Appendix A. Six database searches were conducted around a central coordinate (23°22'31"S; 120°17'20"E), with varying buffers as deemed appropriate (Table 3.2).

Table 3.2: Details of database searches conducted

Provider	Reference	Database	Parameters
Department of Biodiversity, Conservation and Attractions	DBCA (2018b)	Threatened and Priority Ecological Communities	Circle of radius 50 km centred on the coordinates: 23°22'31"S; 120°17'20"E
Department of Biodiversity, Conservation and Attractions	DBCA (2018c)	Threatened and Priority Flora	Circle of radius 50 km centred on the coordinates: 23°22'31"S; 120°17'20"E
Department of Biodiversity, Conservation and Attractions	DBCA (2018a)	NatureMap	Circle of radius 30 km centred on the coordinates: 23°22'31"S; 120°17'20"E
Department of the Environment and Energy	DoEE (2018)	Protected Matters Search (MNES)	Circle of radius 50 km centred on the coordinates: 23°22'31"S; 120°17'20"E
Atlas of Living Australia	ALA (2018a)	Occurrence search	Circle of radius 30 km centred on the coordinates: 23°22'31"S; 120°17'20"E
Department of Primary Industry and Regional Development (DPIRD)	DPIRD (2018)	Declared Plants Database (WAOL)[1]	Search of the Shire of East Pilbara local government area.

NB: MNES – Matters of National Environmental Significance; WAOL – Western Australian Organism List

The conservation significant flora species identified from the database searches were assessed and ranked on the likelihood of occurring within the Study Area (see Section 4.2.1). The rankings were assigned using the following definitions:

1. **Confirmed**: the presence of the species in the Study Area has been recorded unambiguously during the last 15 years.
2. **Highly Likely**: the Study Area lies within the known distribution of the species, the species has been recorded from within 10 km and within the last 15 years.
3. **Likely**: the Study Area lies within the known distribution of the species and the species has been recorded within 20 km in the last 20 years; however, either:
    a. the Study Area is likely to contain only a small area of suitable habitat, or habitat that is only marginally suitable; or
    b. the species is generally rare and patchily distributed in suitable habitat.
4. **Possible**: there is an outside chance of occurrence, because:
    a. the Study Area is just outside the known distribution of the species, but is likely to contain suitable and sufficient habitat (the species may be common, rare, or patchily distributed); or
    b. the Study Area lies within the known distribution of the species, but the species is very rare and/or patchily distributed; or
    c. the Study Area lies on the edge of, or within, the known distribution and is likely to contain suitable habitat, but the species has not been recorded in the area for over 20 years.
5. **Unlikely**: the Study Area lies outside the known distribution of the species, the Study Area is unlikely to contain suitable habitat, and the species has not been recorded in the area for over 20 years.

[1] Filtered to only include declared plant pests listed under Section 22 of the *Biosecurity and Agricultural Management Act 2007*.

6. **Highly Unlikely**: the Study Area lies a significant distance outside of the known distribution, for example, greater than 150 km to the nearest record, and has never been recorded from the area.

3.3 Field Survey

3.3.1 Survey Type, Timing and Weather

The field survey was undertaken with due consideration given to:

- Environmental Factor Guideline. Flora and Vegetation (EPA, 2016a);
- Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016b); and
- BHP WAIO's Vegetation and Flora Survey Procedure (0124627) (BHP, 2018).

A single season Detailed Flora and Vegetation Survey was requested by BHP as substantial portions of the Study Area have previously been surveyed in the last five years. The field survey was undertaken over 12 days, equivalent to 270-person hours, between the 7th and the 18th of April 2019. The day time climatic conditions during the field survey (hot temperatures with clear skies, BoM, 2018) were not restrictive to completing the majority of the Survey on foot.

The field survey was undertaken following a 2018 and early 2019 seasons of large fluctuations. The beginning of 2018 received slightly below above average rainfall at the BHP operated Jimblebar weather station and the Newman Airport weather station (133 mm at each site compared to 180 mm for the LTA at Newman Airport; Figure 3.1) (BoM, 2019). The following three months (April to June) in 2018 recorded average rainfall, prior to below average rainfall for the second half of 2018 (July to December) (Figure 3.1) (BoM, 2019).

The beginning of 2019 (January, February, March) received well below average rainfall (97 mm at Jimblebar and 82 mm at Newman Airport compared to 180 mm for the LTA; Figure 3.1) (BoM, 2019). Although there was a substantial rainfall event in March 2019 (56 mm) recorded at the Jimblebar weather station, the soil was dry from months of below average rainfall, so it is likely this rainfall soaked through to the aquifers and was not readily available for the local flora to utilise. This was confirmed during the survey with extremely dry conditions observed across the Study Area. No rain was received in the week prior to the commencement of the survey and a total of 3.8 mm was received during the 12 day survey which did not impact on soil moisture.

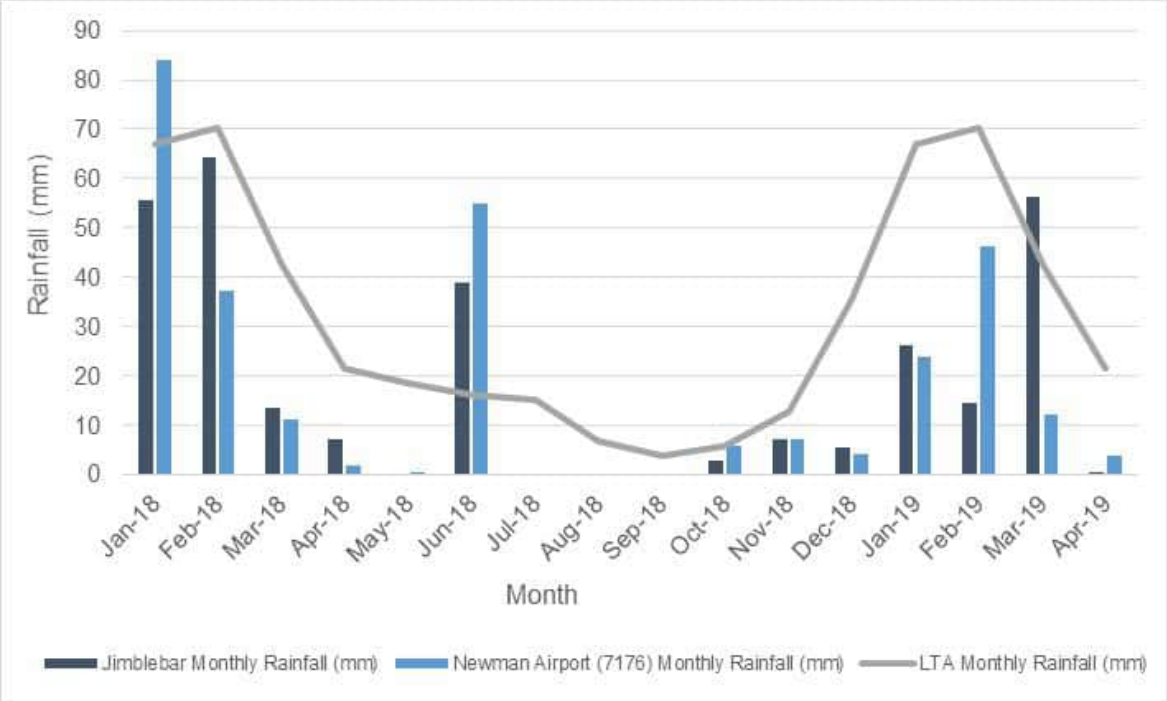


Figure 3.1: 2018/19 monthly Jimblebar and Newman Airport rainfall totals and long-term average (LTA) monthly rainfall for Newman Airport (7176). Survey completed in April 2019 (BoM, 2019).

3.3.2 Survey Team and Licensing

The field survey was led by Mr Clinton van den Bergh, a Senior Botanist with over 12 years' experience. Clinton was assisted by Mr Sam Coultas during the field survey, a Botanist with over 5 years' experience. Clinton meets the minimum requirements (5+ years' experience in the bioregion) to lead and manage a flora survey in the Pilbara, as prescribed by the EPA (EPA, 2016b). The collection of flora specimens was taken under flora collecting permits (SL012369; FB62000017) pursuant to the *Wildlife Conservation Act 1950* Sections 23C and 23F and the BC Act Section 171. Clinton and Sam also hold *Authorisation to Take Threatened Flora* for identification purposes (59-1819; 60-1819).

3.3.3 Flora and Vegetation Survey Design

Prior to the field survey trip, aerial photography (Scale 1:30,000) of the Study Area and Google Earth Pro©, were reviewed, along with previous vegetation mapping (Astron, 2019; Beard, 1975; ecologia, 2007, 2005b; GHD, 2009; Onshore, 2014a, 2016, 2018a, 2019; Shepherd *et al.*, 2002), land systems mapping (van Vreeswyk *et al.*, 2004) and soil landscape mapping (Northcote *et al.*, 1960-1968), to determine broad preliminary vegetation unit boundaries. Following the review of the aerial imagery and broad contextual information, survey plans were designed to ensure the Study Area was appropriately traversed, sampled and targeted to capture the data required for a Detailed Flora and Vegetation Survey.

3.3.4 Detailed Survey

Quadrats were established and sampled, in addition to the sampling of relevés and mapping points within the Study Area where deemed necessary. Where practical, at least three quadrats were

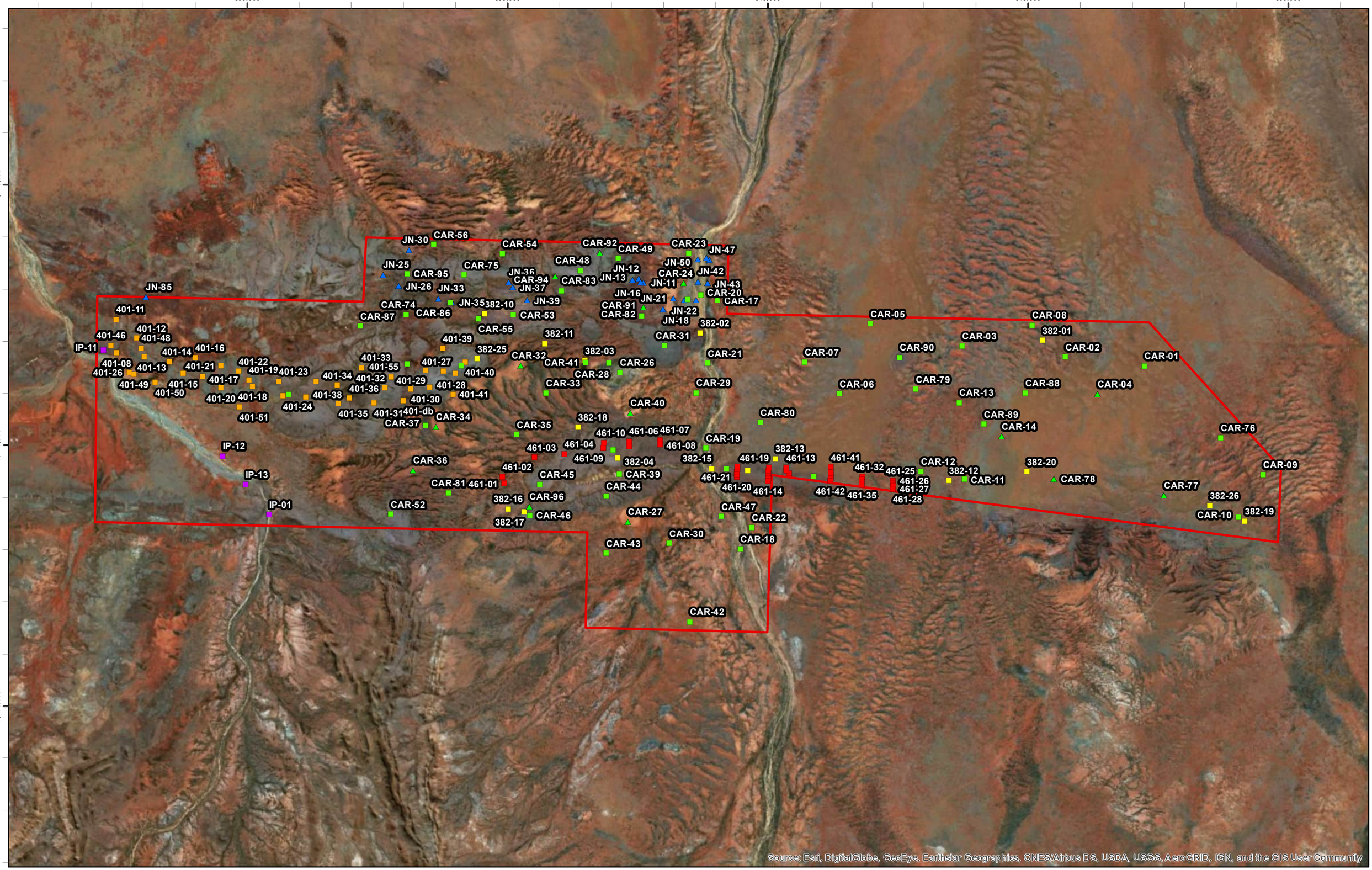
established in each of the preliminary vegetation type areas, to ensure that each vegetation type occurring within the Study Area was captured by the survey and described appropriately and in accordance with EPA (2016b).

The Detailed survey established and sampled 63 quadrats (50 m x 50 m) and 14 relevés across the Study Area (Figure 3.2; Appendix B). The 63 quadrats were orientated north west, north east, south west and south east (any deviation from this was recorded in the site data) to assist with any future re-sampling. Relevés were sampled in vegetation that was already sampled sufficiently or showed signs of disturbance (i.e. heavy cattle grazing, fire) that hindered an accurate determination of the typical vegetation structure and diversity. The relevés also ensured adequate spatial coverage across the Study Area and to assist with delineation of vegetation boundaries when the vegetation type had already been sufficiently sampled. Information recorded for the relevés was from a central coordinate to an approximate radius of 50 m, depending on the condition and structure of the vegetation.

In addition to the 77 sampling sites sampled across the Study Area, an additional 119 sampling sites (labelled by BHP Survey ID) occur across the Study Area from previous and historical surveys (ecologia, 2007, 2005b; GHD, 2009; Onshore, 2016, 2019). The additional 119 sampling sites supplement the work completed to date and represent surveys completed across the Study Area from 2005 to date. The 119 sampling sites does not include a further number of releves locations unknown, mapping points and flora/ vegetation observations completed across the Study Area from numerous botanical surveys (ecologia, 2007, 2005b; GHD, 2009; Onshore, 2016, 2019).

All vascular flora taxa within each of the 63 quadrats and 14 relevés (including overhang from plants rooted outside the boundary of quadrats) were recorded, with their corresponding height and cover class (excluding relevés). A brief summary of the vegetation assemblage at each site was also recorded to aid in producing vegetation association descriptions (NVIS Technical Working Group, 2017) (Appendix C). In addition, the following information was recorded at each quadrat (and relevé):

- quadrat (or relevé) number;
- date of survey;
- personnel;
- GPS coordinates of each corner (GDA 94) (only a central coordinate was taken for relevés);
- site photograph – taken from the north-west corner, facing south-east;
- soil characteristics (texture and colour);
- geology (type, size and nature of any rocks, stones, gravel, or outcropping);
- topography (landform type and aspect);
- vegetation condition (based on Trudgen, 1988) (Appendix D);
- disturbance (if present); and
- approximate time since last fire.



Legend

- Study Area

Survey ID & Sample Type

- 10068 Quadrat
- 10175 Relevé
- 10228 Quadrat
- 10228 Relevé
- 382 Quadrat
- 401 Quadrat
- 461 Quadrat

biologic Environmental Survey

N

1:65,000

0 0.5 1 2 km

BHP WAIO

East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment

Figure 3.2: Flora sampling sites

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

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Any flora taxa observed opportunistically in the vicinity of quadrats, or while completing meandering traverses in the Study Area were also recorded. For any populations of taxa known to be conservation significant or introduced flora observed, a GPS location and a count of the individuals present, or percentage foliage cover for a given area, were recorded.

Prior to the survey, a list of conservation significant flora known to, with the likelihood to, or potential to occur within the Study Area was compiled. Field personnel familiarised themselves with photographs, reference samples and descriptions of these taxa before conducting the survey and once on the ground actively searched, while traversing the Study Area and in known locations or preferred habitat encountered in the field.

3.3.5 Targeted Searches

Targeted searching was undertaken for flora of conservation significance, as identified during the desktop assessment. Taxa that were confirmed, very likely, likely or possible to occur within the Study Area were targeted. Targeted searches were conducted over large portions of the Study Area during targeted meandering traverses (Figure 3.3), with particular focus on habitat considered likely to support conservation significant flora (i.e. mulga groves, claypans/ gilgai plains and stony mulga/ hummock grassland plains).

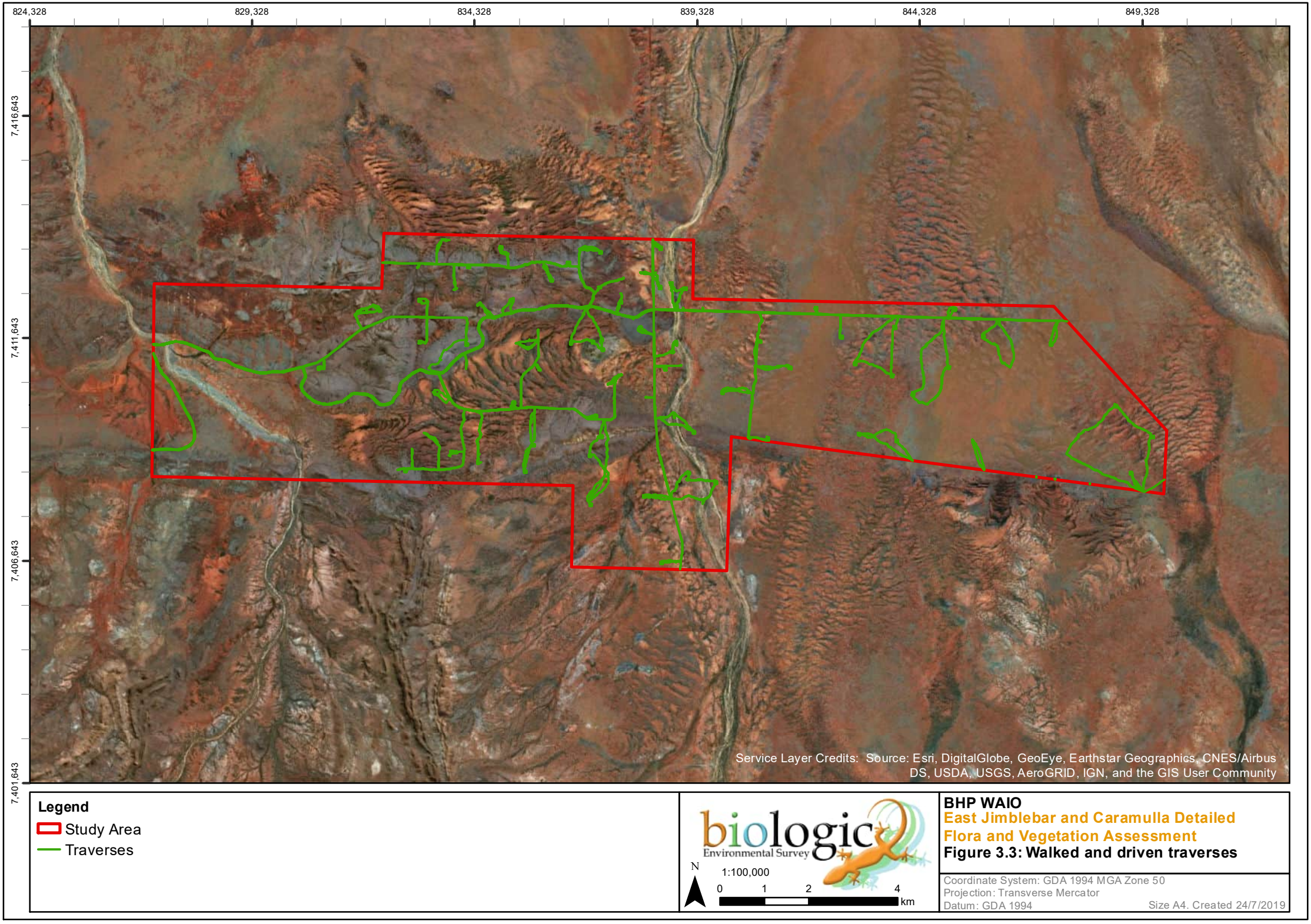
In addition to targeted searching for specific Priority Listed flora taxa in particular habitats, personnel actively searched for all Priority Listed flora taxa and opportunistic flora taxa while completing quadrats and traversing the Study Area. Personnel also identified suitable habitat for targeted searches while travelling within the Study Area.

When a conservation significant taxon was identified, a GPS coordinate of the individual was taken when occurring in isolation, or a central GPS coordinate was taken for a small population (central coordinate with an approximate 20 m radius). Information collected at each location included:

- Number of individuals, for a small population;
- Condition and reproductive status of the plants in each population;
- Photographs of vegetation habitat; and
- Broad information on vegetation type and condition.

Threatened and Priority Flora Report Forms will be provided to the Parks and Wildlife Division (Parks and Wildlife) of DBCA, as required under the flora collecting permits. Conservation significant flora specimens will be vouchered with the Western Australian Herbarium (WAH), where required and appropriate.

Where significant environmental weeds (weeds of national significance and Declared Plant Pests listed under Section 22 of the *Biosecurity and Agriculture Management Act 2007*) were identified in the field, searches were conducted within a minimum radius of 20 m from the given specimen, to document the number of individual plants and map the spatial extent of the infestation. The methodology and information collected for significant environmental weeds was consistent with the methodology and information collected for the conservation significant flora.



Legend

- Study Area
- Traverses

biologic Environmental Survey

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BHP WAIO

East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment

Figure 3.3: Walked and driven traverses

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 24/7/2019

3.3.6 Introduced Taxa

Weeds of National Significance

The Commonwealth of Australia, in collaboration with the states and territories, has identified 32 WoNS based on an assessment process that prioritises these weeds according to their invasiveness, potential for spread and environmental, social and economic impacts. A list of 20 WoNS was endorsed in 1999 and a further 12 were added in 2012.

Landowners and land managers at all levels are responsible for managing WoNS. State and territory governments are responsible for legislation, regulation and administration of weeds. The WoNS were selected as they require coordination among all levels of government, organisations and individuals with weed management responsibilities.

Declared Plant Pests

To protect Western Australian agriculture the Department of Primary Industries and Regional Development (DPIRD) (formerly the Department of Agriculture and Food Western Australia, DAFWA) regulates harmful plants under the *Biosecurity and Agriculture Management Act 2007* (BAM Act). Plants that are prevented entry into the state or have control or keeping requirements within the state are known as declared pests. The main purposes of the BAM Act and its regulations related to DPP are to prevent new plant pests from entering Western Australia, manage the impact and spread of those pests already present in the state and safely manage the use of agricultural chemicals.

The BAM Act has categorised the weeds of Western Australia into four main classifications:

- Declared Pests (under Section 22 of the Act);
- Permitted (under Section 11 of the Act);
- Prohibited (under Section 12 of the Act); and
- Permitted requiring a permit (Section 73, BAM Regulations 2013).

Under the BAM Act all declared plant pests are placed in one of three categories:

- C1 (Exclusion) — Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State;
- C2 (Eradication) — Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still feasible; and
- C3 (Management) — Pests will be assigned to this category if they are established in Western Australia, but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Weed Prioritisation

In 2008 Parks and Wildlife developed and implemented an integrated approach to weed management on Parks and Wildlife-managed lands in WA, the Weed Prioritisation Process. It was updated in 2013 and further revised in 2016. Parks and Wildlife prioritised weeds in each region, based on their:

- Invasiveness;
- Ecological impact;
- Potential and current distribution; and
- Feasibility of control.

The resulting priorities focus on weeds considered to be high impact, rapidly invasive and still at a population size that can feasibly be eradicated or contained to a manageable size. This means that weed species that are already widespread may not be ranked as a high priority. The weed prioritisation for the Pilbara bioregion has recently been revised by Parks and Wildlife. The key priorities are now centred on 'Priority Alert' weeds and weeds that receive a rating for 'Ecological Impact" and "Invasiveness'.

3.3.7 Groundwater Dependent and Sheet Flow Dependent Vegetation

The Survey included an assessment of vegetation that may be reliant on groundwater for part or all of their lifecycle. Preliminary review of aerial imagery available for the Study Area suggests that major drainage lines occur in the Study Area, specifically Caramulla and Jimblebar Creeks. These drainage lines are known to support phreatophytic flora, namely the facultative phreatophyte *Eucalyptus camaldulensis.* The determination of groundwater dependency will be undertaken with a review of the flora assemblage present within the Study Area and a review of the literature. A review of the Bureau of Meteorology Groundwater Dependent Ecosystem Atlas suggests that it is likely that any of the drainage lines or floodplain areas in the Study Area have the potential to support a GDE.

The structure and patterning of Mulga (*Acacia aneura* and its close relatives) communities varies from strongly banded (groved) through to open shrublands and woodlands across the landscape (Page & Grierson, 2012). Banded communities and overland sheet flow supports a diverse biota within the Mulga bands and plays and important ecological function which is well documented (Dawson & Ahern, 1973; Saco *et al.*, 2007; Winkworth, 1973). The single season Detailed flora and vegetation survey delineated and described any communities that were or could be sheet flow dependent. Based on aerial imagery, sheet flow dependent Mulga communities are likely to occur in the Study Area.

3.3.8 Identification of Flora Specimens

Plant taxa that could not be identified during the field survey were collected for subsequent identification. Identifications were carried out by Biologic's taxonomist, Mrs Sharnya Yates, utilising her personal reference collections, Western Australian Herbarium's (WAH) reference collection, taxonomic keys and reference material. All taxa were checked against Florabase© (version 2.9.31; WAH, 1998-) to ensure their currency and validity. Any conservation significant flora taxa, including potential threatened and priority species, range extensions and potential new taxa have been verified and vouchered (if appropriate) at the WAH.

3.4 Species Accumulation Curve

Species accumulation curves were plotted using Sobs, Chao 1, Jacknife 1, Bootstrap and Michealis-Menton in Primer v7 to determine the adequacy of the survey. The species accumulation curves were plotted for the Study Area with all native flora taxa, both annual and perennial, within each flora site used in generating the species accumulation curve.

Species accumulation curves including Sobs (S), to reflect the number of species observed (based on a given total of species recorded), and richness estimators Chao 1, Jacknife 1, Bootstrap and Michealis-Menton to predict the total number of flora taxa that could potentially be recorded were applied.

When a curve approaches an asymptote it suggests that sampling effort has been sufficient to adequately collect the species comprising the floral assemblage at the locations sampled (Thompson & Withers, 2003). The value at which the curve asymptotes can also be used as an approximate measure of the total size of the species complement at that location (Thompson *et al.*, 2003).

3.5 Vegetation Association Mapping

Broad vegetation mapping was conducted in the field, with vegetation boundaries delineated over aerial photography. Following the completion of the quadrat sampling and taxonomic identifications, the broad vegetation units were refined based on the review of the floristic data collected from the quadrats and relevés and review of the existing vegetation mapping occurring across the Study Area. The vegetation type mapping was then digitised using geographic information systems (GIS) software.

Vegetation associations were delineated and described from aerial imagery utilising the flora sampling site data. The vegetation structure information collected from the quadrats, relevés and mapping points was reviewed to describe the vegetation associations based on the dominant taxa, foliar cover and height of the three traditional strata (upper, mid and lower/ground). This method of vegetation type determination is consistent with EPA (2016b) and BHP (2018).

The vegetation types have been described to Level 5 (Vegetation Association) in the NVIS hierarchical structure (NVIS Technical Working Group, 2017) and have been coded in accordance with BHP (2018) standards. The mapping reliability is considered to be high across the Study Area, with the majority of the Study Area traversed.

3.6 Vegetation Condition Mapping

Vegetation condition was defined within the Study Area using the BHP (2018) vegetation condition scale which has been adapted from Keighery (1994) and Trudgen (2002) (Appendix D), based on the level of disturbance observed in an area. Condition was recorded at each sampling site, while additional notes were taken while traversing the Study Area and used to broadly map vegetation condition boundaries. The vegetation condition mapping was then digitised using GIS software.

4 RESULTS AND DISCUSSION

4.1 Literature Review

The results and outcomes of the review of 41 flora and vegetation reports identified from the literature review are presented in Appendix E. The literature review identified 13 conservation significant flora species (Threatened, Priority 1, Priority 2, Priority 3 and Priority 4 taxa) previously recorded in close proximity to the Study Area; however, only three have been recorded within the Study Area, *Eremophila capricornica* (P1), *Rhagodia* sp. Hamersley (M. Trudgen 12739) (P3) and *Goodenia nuda* (P4). The 48 reports, excluding Onshore (2014a) which includes all of BHP WAIO Pilbara tenure, did not identify any conservation significant vegetation associations (Appendix E).

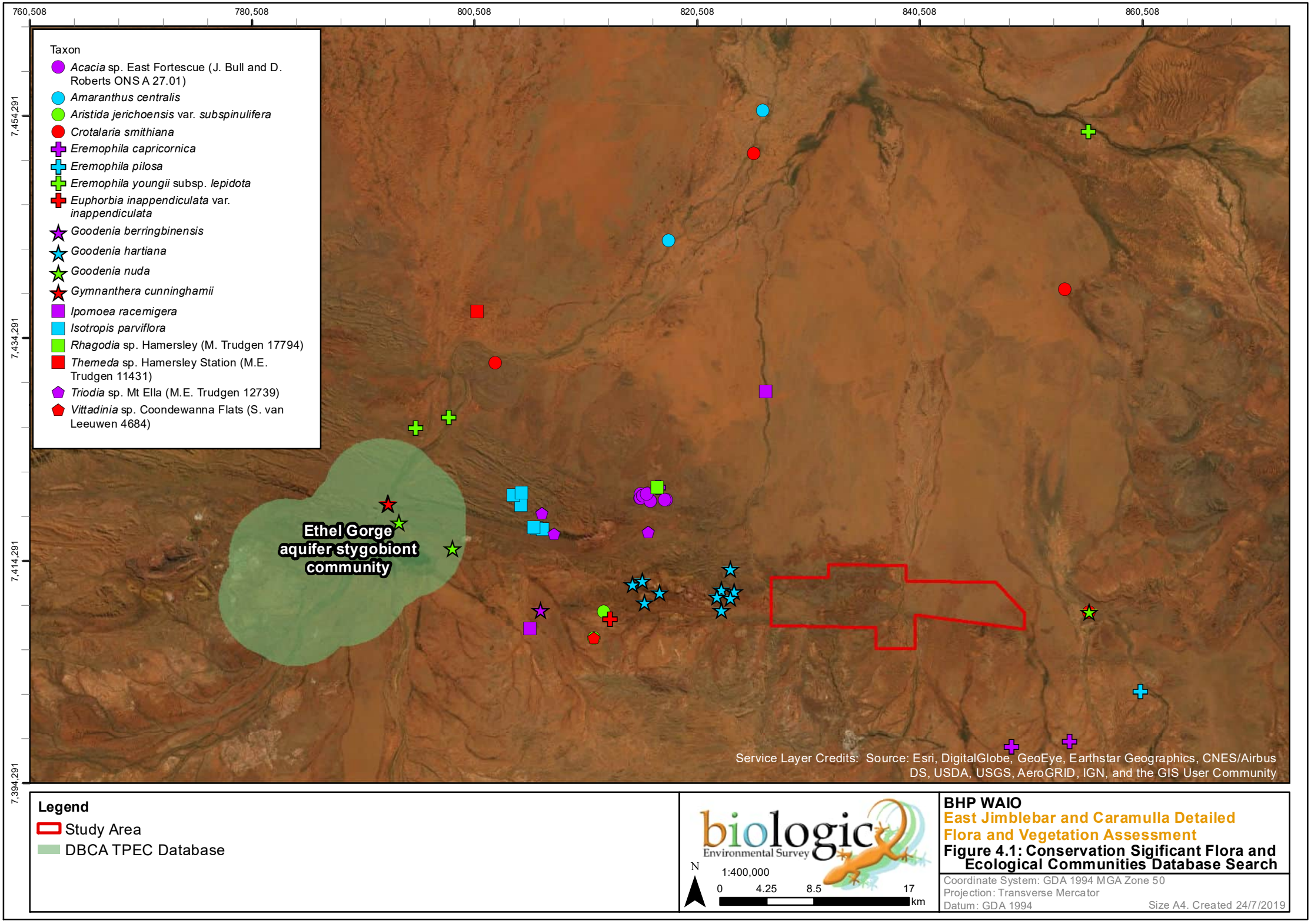
4.2 Database Search Results

4.2.1 Flora of Conservation Significance

A total of 20 conservation significant flora taxa (those listed under the EPBC Act, BC Act, or DBCA's Priority List) were identified from the database searches (Appendix F). None of the 20 taxa are listed as Threatened under the EPBC Act or the BC Act. There are three threatened flora taxa, *Aluta quadrata*, *Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4) and *Thryptomene wittweri*, known to occur within the Pilbara bioregion (WAH, 1998-). Each of the three are considered highly unlikely to occur in the Study Area, as they are known from summits of ranges (*Aluta quadrata* and *Thryptomene wittweri*) or isolated in the central Pilbara on steep slopes (*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)).

Of the 20 priority listed taxa, six are listed as Priority 1, four are listed as Priority 2, seven are listed as Priority 3, and the remaining three taxa are listed as Priority 4. Flora taxa of conservation significance identified by the desktop assessment were assessed and ranked on the likelihood of occurring within the Study Area.

Based on the results of the database searches, no priority listed taxa have previously been recorded from the Study Area. However, the literature identified that three priority listed taxa, *Eremophila capricornica* (P1), *Rhagodia* sp. Hamersley (M. Trudgen 12739) (P3) and *Goodenia nuda* (P4), have been recorded within the Study Area during previous surveys. Flora taxa of conservation significance identified by the desktop assessment were assessed and ranked on the likelihood of occurring within the Study Area (Appendix G). Excluding the three confirmed to occur in the Study Area, one priority taxon was considered likely to occur and six were considered to possibly occur within the Study Area (Table 4.1). The remaining 10 taxa were considered unlikely or highly unlikely to occur within the Study Area (Appendix G). A disjunct unconfirmed population of *Hibiscus campanulatus* (P1) has been previously recorded in close proximity to the study area (15 km north). This taxon has affinities with *Hibiscus campanulatus* but is potentially of interest as a separate entity. It has tentatively been named *Hibiscus* aff. *campanulatus*.



Legend

- Study Area
- DBCA TPEC Database

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BHP WAIO

East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment

Figure 4.1: Conservation Sigificant Flora and Ecological Communities Database Search

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 24/7/2019

Table 4.1: Conservation significant flora taxa known to occur near the Study Area based on the desktop assessment

Taxon	Description (WAH, 1998-)	Location
Confirmed		
Eremophila capricornica (P1)	Compact, sometimes prostrate, shrub, with greyish foliage, to 1 m high. Fl. purple. Rocky plains	Within
Rhagodia sp. Hamersley (M. Trudgen 12739) (P3)	Shrub, sometimes scrambling to 4 m high. Recorded from mulga on cracking clays	Within
Goodenia nuda (P4)	Erect to ascending herb, to 0.5 m high. Fl. yellow, Apr to Aug	Within
Likely		
Crotalaria smithiana (P3)	Annual, herb, to 0.4 m high. Fl. yellow, Jun. Regeneration site on floodplain	6 km E
Possible		
Aristida jerichoensis var. *subspinulifera* (P3)	Compactly tufted perennial, grass-like or herb, 0.3-0.8 m high, lemma groove muricate. Hardpan plains	>15 km W
Goodenia berringbinensis (P4)	Ascending annual, herb, 0.1-0.3 m high. Fl. yellow, Oct. Red sandy loam, often clay. Along watercourses, soaks	>20 km W
Gymnanthera cunninghamii (P3)	Erect emergent shrub, milky sap, 1-2 m high. Fl. cream-yellow-green, Jan to Dec. Sandy soils. Major drainage lines, rocky creeks	>35 km W
Ipomoea racemigera (P2)	Creeping annual, herb or climber. Fl. white	>16 km N
Triodia sp. Mt Ella (M.E. Trudgen 12739) (P3)	Perennial, grass-like or herb, 0.4 m high. Light orange-brown, pebbly loam. Amongst rocks & outcrops, gully slopes	>15 km N
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684) (P1)	Erect annual herb with scabrous hairs and adnate cauline leaves. Red-brown sandy clay loam. Drainage lines, floodplains	>16 km E

4.2.2 Vegetation of Conservation Significance

One Threatened Ecological Community (TEC) listed under the BC Act and relevant to vegetation, Themeda Grasslands on Cracking Clays, is recognised in the Pilbara region of Western Australia. The TEC is restricted to cracking clay alluvial soils near Tom Price, of which do not occur in the Study Area. A further TEC, Ethel Gorge Aquifer Stygobiont Community was identified as occurring within 40 km of the Study Area during the database search request (Figure 4.1). This TEC does not represent terrestrial vegetation and is not considered any further. The TEC and Priority Ecological Community (PEC) database search (DBCA, 2018b) did not identify any of the 42 PECs within the DBCA's Pilbara Region to occur within the 40 km database search buffer.

4.2.3 Introduced Taxa

The NatureMap (DBCA, 2019a), Protected Matters (DoEE, 2019), ALA (ALA, 2019) and WAOL (DPIRD, 2019) database searches identified a list of 52 introduced taxa that may potentially occur within the

Study Area. The list of introduced taxa known to occur or potentially occur within the Study Area (Appendix H) was reviewed to identify Weeds of National Significance (WoNS) and Declared Plant Pests (DPP).

Weeds of National Significance

Of the list of introduced taxa identified during the desktop assessment as occurring in or near the Study Area, 27 are listed as WoNS (Appendix H). The 27 WoNS were identified from the WAOL database search for the entire Shire of East Pilbara and occur or may potentially occur within the shire boundaries. No other database search or literature review identified any WoNS. The 27 taxa include numerous *Opuntia, Austrocylindropuntia* and *Cylindropuntia* species that are grouped together in the WoNS listing.

Declared Plant Pests

The desktop assessment identified 45 DPPs (including numerous cacti species that are all listed as DPPs, Appendix H), previously recorded or potentially located within the Shire of East Pilbara. The desktop assessment did not identify any DPPs as occurring within, or immediately adjacent to, the Study Area.

Weed Prioritisation

Fifteen introduced taxa have been identified by Parks and Wildlife as 'Priority Alerts' for the Pilbara region, including **Azadirachta indica, *Calotropis procera, *Chloris gayana, *Clitoria ternatea, *Cryptostegia grandiflora, *Cylindropuntia* spp*., *Euphorbia tirucalli, *Jatropha gossypifolia, *Lantana camara, *Moringa oleifera, *Ricinus communis, *Schinus molle* var*. areira, *Vachellia nilotica, *Washingtonia robusta* and **Xanthium strumarium*. None of these introduced 'Priority Alerts' taxa are expected to occur in the Study Area.

4.3 Flora Composition

A total of 221 vascular flora taxa from 37 families and 95 genera were recorded from the Study Area during the current field survey (Appendix I). The total number of vascular flora taxa recorded comprised of 219 native taxa and two introduced taxa (Appendix I). The total number of vascular flora recorded from the Study Area increases to 462 vascular flora taxa when the previous survey work in the Study Area is included. The 462 vascular flora taxa include 456 native taxa and six introduced taxa and represents 45 families and 139 genera (Appendix I).

The dominant families equate to 57% of the total taxa recorded and comprised Fabaceae (92 representatives), Poaceae (74 representatives), Malvaceae (46 representatives), Chenopodiaceae (26 representatives) and Asteraceae (25 representatives). Of the 45 families recorded, 14 were represented by one taxon, which equates to 3% of the total taxa recorded.

The dominant genera equate to 25% of the total taxa recorded and comprised *Acacia* (46 taxa), *Eremophila* (20 taxa), *Ptilotus* (17 taxa), *Senna* (17 taxa) and *Sida* (15 taxa). Of the 139 genera recorded, 59 were represented by only one taxon, which equates 12% of the total taxa recorded.

4.4 Flora of Conservation Significance

4.4.1 Federal and State Listing

The desktop assessment did not identify any federal or state listed threatened flora species as occurring in, or near, the Study Area. The field survey confirmed that there were no threatened flora occurring, or likely to occur within the Study Area. The vegetation and habitats present within the Study Area and the known locations of threatened flora confirm that it is unlikely that any threatened flora would occur within the Study Area.

The desktop assessment identified 20 priority listed taxa as potentially occurring within the Study Area (Section 4.2.1). Prior to the field trip, three priority taxa were confirmed as occurring within the study area, one was considered likely to occur and six were considered to possibly occur within the Study Area (Table 4.1). Following the completion of the field survey, three priority listed taxa were recorded from the Study Area; *Eremophila capricornica* (P1), *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) and *Goodenia nuda* (P4) (Figure 4.2).

Eremophila capricornica (P1)

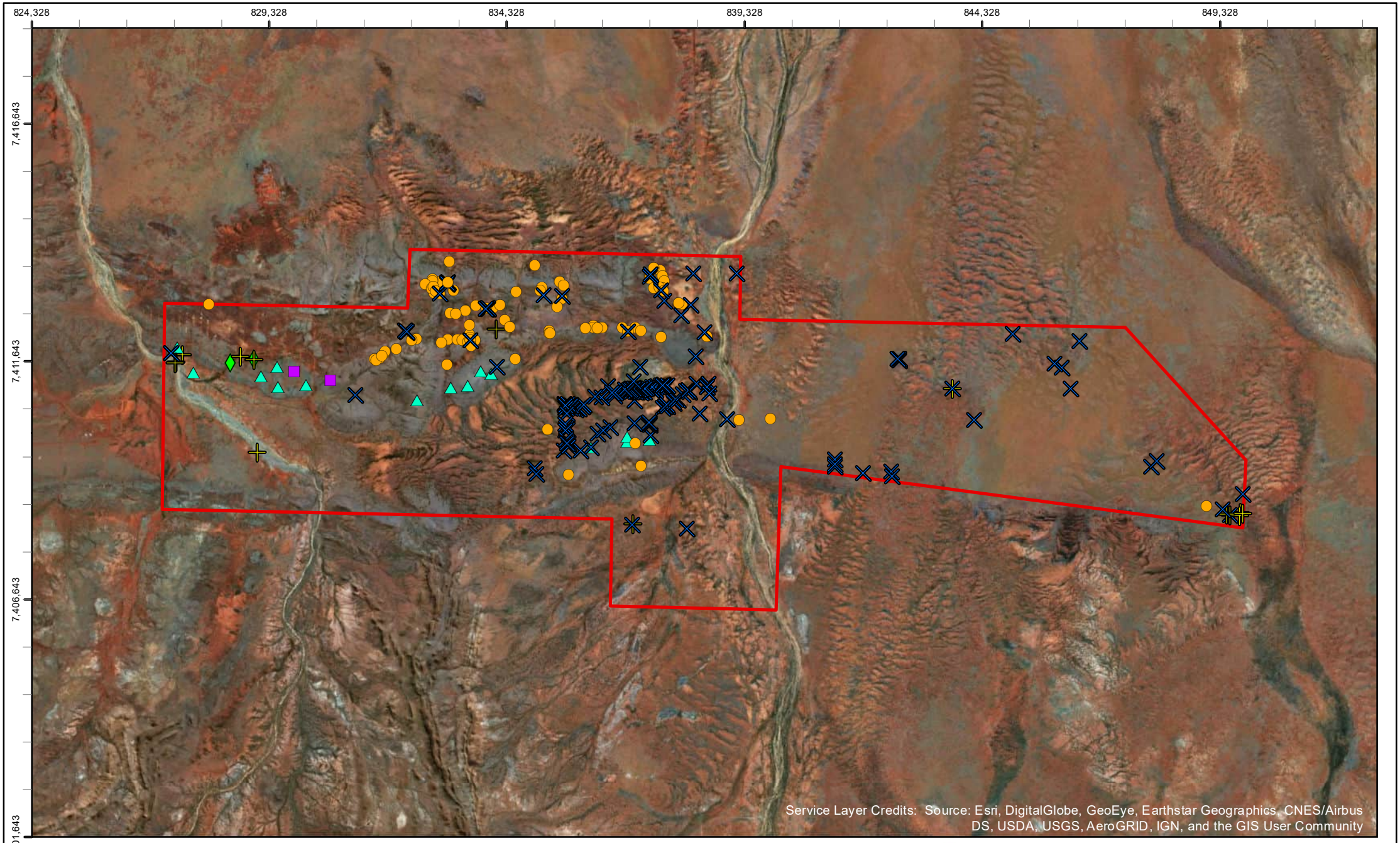
Eremophila capricornica is listed as a Priority 1 taxon which was formally described in 2016 (Buirchell & Brown, 2016). Prior to the formal naming it was phrase named *Eremophila* sp. Jigalong (B. Buirchell BB 204). *Eremophila capricornica* is a small shrub to 75 centimetres (cm) in height with terete branches with dendritic hairs and old leaf scars. It produces one flower per axil, with a mauve to lilac corolla. Flowers predominantly appear between June to August, but may also flower at other times of the year in response to rainfall (Buirchell & Brown, 2016).

Eremophila capricornica is found from east of Newman across to Jigalong, growing in sandy clay loams in open mulga shrubland with an understorey of *Triodia* species and other grasses (Buirchell & Brown, 2016). *Eremophila capricornica* appears closely related to *Eremophila margarethae* and *Eremophila demissa*. *Eremophila demissa* is not known to occur in the Pilbara, while *Eremophila margarethae* (which has been recorded from the Study Area) has linear leaves compared to the oblanceolate leaves of *Eremophila capricornica (Buirchell & Brown, 2016)*.

The current assessment recorded 11 point locations of *Eremophila capricornica*, while previous surveys identified a further 77 point locations (Onshore, 2018a, 2019), totalling 88 discrete point locations (Figure 4.2). The majority of the records were from the central portion of the Study Area (Figure 4.2). Approximately 3,838 individuals have been recorded from the Study Area.

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

Rhagodia sp. Hamersley (M. Trudgen 17794) is listed as a Priority 3 taxon and has similarities to the common *Rhagodia eremaea*. *Rhagodia* sp. Hamersley (M. Trudgen 17794) is described as shrub scrambling to heights of 4 m, utilising vegetation to reach these heights. Key differences between *Rhagodia* sp. Hamersley (M. Trudgen 17794) and *Rhagodia eremaea* are in leaf shape and size and aromatics in the leaf (Rio Tinto & WAH, 2015).



Legend

- Study Area

Priority Flora

- *Eremophila capricornica* (P1)
- *Gompholobium karijini* (P2)
- *Goodenia hartiana* (P2)
- *Goodenia nuda* (P4)
- *Isotropis forrestii* (P1)
- *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)

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BHP WAIO

East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment

Figure 4.2: Priority Flora records in the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 24/7/2019

Rhagodia sp. Hamersley (M. Trudgen 17794) has been recorded from mulga on hardpan plains, clays and stony plains (Rio Tinto & WAH, 2015). The authors have also recorded *Rhagodia* sp. Hamersley (M. Trudgen 17794) from hill slopes, drainage lines and gullies. *Rhagodia* sp. Hamersley (M. Trudgen 17794) is known from certainty from north of Newman in the Pilbara.

The current assessment recorded 31 point locations of *Rhagodia* sp. Hamersley (M. Trudgen 17794), while previous surveys identified a further 144 point locations (Onshore, 2018a, 2019), totalling 175 discrete point locations (Figure 4.2). The point locations of *Rhagodia* sp. Hamersley (M. Trudgen 17794) were scattered across the Study Area with a higher concentration in central potion associated with the mulga banding (Figure 4.2). Approximately 405 individuals have been recorded from the Study Area.

Goodenia nuda (P4)

Goodenia nuda is listed as a Priority 4 taxon, and is known to occur throughout the Pilbara, with isolated records in the Gascoyne, Murchison and Little Sandy Desert (WAH, 1998-). *Goodenia nuda* is a small erect to ascending herb, growing to heights of 0.5 m. It produces yellow flowers from April to August but may flower periodically following rainfall. *Goodenia nuda* has mostly been recorded from seasonally inundated clay soils and drainage lines, often in mulga. It has also been recorded from sand in scoured riverbeds and from hillsides.

The current assessment recorded one individual of *Goodenia nuda*, while previous surveys have identified a further 16 point locations (Onshore, 2018a, 2019), totalling 14 discrete point locations (Figure 4.2). The point locations for *Goodenia nuda* are scattered across the Study Area, mostly concentrating on the east, west and central portions (Figure 4.2). Approximately 142 individuals have been recorded from the Study Area.

4.4.2 Review of Significant Flora Likely to Occur in the Study Area

One priority listed taxon, *Crotalaria smithiana* (P3), was considered likely to occur in the Study Area. Following the completion of the field survey, this taxon is now considered to potentially occur in the Study Area. *Crotalaria smithiana* is known to occur on floodplains, sands and sandy loams which are often coarse textured on hills, creek beds and banks. It is possible that *Crotalaria smithiana* occurs along the beds and banks of Jimblebar and Caramulla Creeks within the Study Area, however numerous previous surveys have failed to record its presence (Astron, 2019; Onshore, 2018a, 2018c). *Crotalaria smithiana* was recorded by Astron (2019) along Caramulla Creek further to the north of the Study Area, suggesting that it is possible to occur within the Study Area.

4.4.3 Review of Significant Flora with Potential to Occur in the Study Area

Six priority listed taxa, *Aristida jerichoensis* var. *subspinulifera* (P3), *Goodenia berringbinensis* (P4), *Gymnanthera cunninghamii* (P3), *Ipomoea racemigera* (P2), *Triodia* sp. Mt Ella (M.E. Trudgen 12739) (P3) and *Vittadinia* sp. Coondewanna Flats (S. van Leeuwen 4684) (P1), were considered to potentially occur in the Study Area. Following the completion of the field survey, *Triodia sp*. Mt Ella (M.E. Trudgen 12739) (P3) is now considered unlikely to occur in the Study Area, while the remaining five taxa are still considered as possibly occurring within the Study Area. The Study Area provides no suitable habitat for

Triodia sp. Mt Ella (M.E. Trudgen 12739) (P3), which occurs within gullies and on hill slopes and crests of large hills and plateaus, none of which occur within the Study Area.

Suitable habitat (drainage areas, floodplains, hardpan plains and drainage lines) for the remaining taxa is present within the Study Area. However, the conditions present during the survey were considered to be poor for the location and identification of all of the remaining taxa except for *Gymnanthera cunninghamii* (P3). *Gymnanthera cunninghamii* is relatively sporadic in occurrence and may still be present within the two major drainage lines which occur in the Study Area. Location of this taxon would require more intensive searching of suitable habitat. Flowering and/ or fruiting material is required for a positive identification of *Aristida jerichoensis* var. *subspinulifera*, while *Goodenia berringbinensis* (P4), *Ipomoea racemigera* (P2) and *Vittadinia* sp. Coondewanna Flats (S. van Leeuwen 4684) (P1) are annual taxa which were unlikely to be identifiable during the field survey, owing to the poor seasonal conditions.

4.4.4 Flora of "Other" Significance

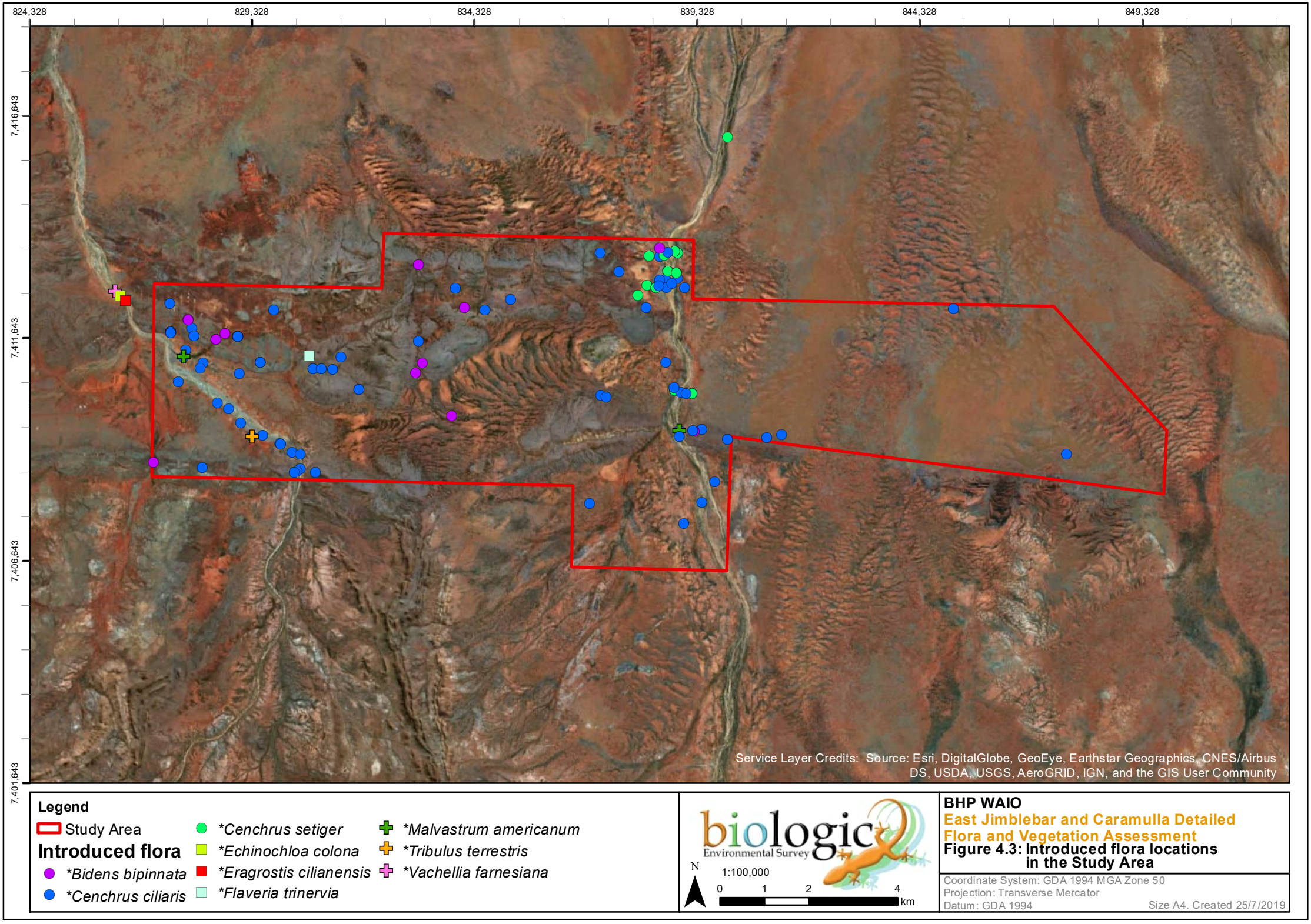
The EPA (2004) advises that flora species, subspecies, varieties, hybrids and ecotypes may be considered significant for reasons other than listing as a Threatened or Priority Flora taxa. This may include, but is not limited to, range extensions, keystone species, relic status, local endemism and anomalous features. Based on these features, no taxa recorded from the Study Area during the current assessment were considered to be flora of "other" significance.

4.5 Introduced Flora Taxa

Two introduced taxa, Buffel Grass (**Cenchrus ciliaris*) and Bipinnate Beggartick (**Bidens bipinnata*), were recorded from the Study Area during the current survey. The two introduced taxa are not listed as WoNS or Declared Plant Pests under the BAM Act. In addition to the two introduced taxa recorded during the current survey, a further four introduced taxa (**Cenchrus setiger, *Flaveria trinervia, *Malvastrum americanum* and **Tribulus terrestris*) have previously been recorded from the Study Area, while an additional three (**Echinochloa colona, *Eragrostis cilianensis* and **Vachellia farnesiana*) are known to occur just outside of the Study Area.

Most of the introduced taxa locations were recorded in association with drainage lines, floodplains and mulga woodlands, especially along Caramulla Creek and Jimblebar Creek (Figure 4.3). There are also numerous scattered locations throughout the Mulga hardpan plains and floodplains in the central portion of the Study Area (Figure 4.3).

**Cenchrus ciliaris* was a dominant understorey species along the channel and banks of Caramulla Creek (Plate 4.1) and Jimblebar Creek. The individuals of **Cenchrus ciliaris* have been grazed heavily and were showing signs of drought stress due to the timing of the survey. In total, **Cenchrus ciliaris* was recorded from 96 locations, with the majority located on the drainage lines, floodplains and the mulga woodlands (Figure 4.3).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Study Area
Introduced flora
*Bidens bipinnata
*Cenchrus ciliaris
*Cenchrus setiger
*Echinochloa colona
*Eragrostis cilianensis
*Flaveria trinervia
*Malvastrum americanum
*Tribulus terrestris
*Vachellia farnesiana
N
1:100,000
0 1 2 4
km
biologic Environmental Survey
BHP WAIO
East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment
Figure 4.3: Introduced flora locations in the Study Area
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994
Size A4. Created 25/7/2019

Plate 4.1: ****Cenchrus ciliaris* **individuals covering the banks of Caramulla Creek (left) and a flowering individual of ****Cenchrus ciliaris* **(right)

**Bidens bipinnata* was recorded from 23 locations mostly from the western half of the Study Area within drainage lines and Mulga hardpan plains where cattle visit more frequently (Figure 4.3). The individuals of **Bidens bipinnata* recorded during the current assessment were in poor condition from drought stress and cattle grazing and trampling. Some individuals were also observed in early flower or bud suggesting that some minor soil moisture was present in small isolated, shaded pockets.

Although not recorded during the current assessment **Cenchrus setiger* has previously been recorded from 11 locations, **Flaveria trinervia* from one location, **Malvastrum americanum* from two locations and **Tribulus terrestris* from one location (Figure 4.3). Following sufficient rainfall and an appropriate survey timing, it is expected that additional records of these four introduced taxa would increase.

4.6 Vegetation Units

4.6.1 Broad Floristic Formations

Thirteen broad floristic formations were described from the Study Area (Table 4.2), based on the dominant growth form and the dominant land cover genus for the dominant stratum. The 13 broad floristic formations were:

- *Acacia High Open Shrubland*
- *Acacia High Shrubland*
- *Acacia Low Open Forest*
- *Acacia Low Open Woodland*
- *Acacia Low Woodland*
- *Acacia Open Shrubland*
- *Acacia Scattered Tall Shrubs*
- *Cenchrus Tussock Grassland*
- *Eriachne Open Tussock Grassland*
- *Eucalyptus Open Woodland*
- *Senna Low Open Shrubland*
- *Triodia Hummock grassland*
- *Triodia Open Hummock Grassland*

The dominant broad floristic formation based on extent across the Study Area is *Triodia* hummock grassland, covering approximately 45% of the Study Area. This broad floristic formation also supported the highest number of vegetation associations (13). The *Triodia* Open Hummock Grassland (14% of the Study Area), *Acacia* Low Woodland (11% of the Study Area) and *Acacia* High Shrubland (10% of the Study Area) were the next three most extensive broad floristic formations. The nine remaining broad floristic formations covered less than 20% of the Study Area, while the approximately 2% of the Study Area has been cleared.

4.6.2 Vegetation Associations

A total of 46 vegetation associations were described and delineated from the Study Area (Table 4.2 and Figure 4.4) based on the three dominant genera within the three traditional strata (upper, middle and lower). The vegetation associations were described from the following 12 landforms:

- Floodplains and Drainage Areas;
- Footslopes;
- Gilgai Plains;
- Hardpan Plains;
- Hill crests and upper hill slopes;
- Hill slopes and undulating low hills;
- Major drainage lines;
- Medium drainage lines;
- Sand plains;
- Sandy/ Stony Plains;
- Stony plains; and
- Undulating hills.

The eastern third of the Study Area has been subjected to a fire within the last three years (discussed further in Sections 4.8 and 5.2). The fires have impacted on the structure and cover of the vegetation units, in particular the hummock grassland cover. The vegetation association descriptions may alter over time, while the identification of some of the *Triodia* species may change once more suitable material (inflorescences, including glumes and lemmas) is available.

Where relevant and appropriate, the vegetation association mapping in the Study Area was completed to ensure consistency between this Survey, the recent survey work completed within the Study Area (Astron, 2019; Onshore, 2018a, 2018c, 2019) and the consolidated regional vegetation mapping completed by Onshore (2014a).

Table 4.2: Vegetation association descriptions

Code	Description	Sample Sites	Extent (ha / %)	Condition	Photo
***Acacia* High Open Shrubland**					
MA ApyPlMg EcoAciAcp CyaTtEua	High Open Shrubland of *Acacia pyrifolia* var. *pyrifolia, Petalostylis labicheoides* and *Melaleuca glomerata* with Scattered Low Trees of *Eucalyptus camaldulensis* subsp. *obtusa, Acacia citrinoviridis* and *Acacia coriacea* subsp. *pendens* and Scattered Tussock Grasses of *Cymbopogon ambiguus, Themeda triandra* and *Eulalia aurea* on brown sand on major drainage lines	JN-23, JN-50	21 / <1	Very Good	
SA AssAwAa SegfSeaoSeah EuaAriChf	High open shrubland of *Acacia sclerosperma* subsp. *sclerosperma, Acacia wanyu* and *Acacia aptaneura* over low open shrubland of *Senna glaucifolia*, *Senna artemisioides* subsp. *oligophylla* and *Senna artemisioides* subsp. *helmsii* over very open tussock grassland of *Eulalia aurea, Aristida inaequiglumis* and *Chrysopogon fallax* on brown loamy sands on sand plains, hardpan plains and drainage areas/ floodplains	CAR-23, CAR30	404 / 4	Good	
SP Aw ErcuSesmMag Apt	High open shrubland of *Acacia wanyu* over low open shrubland of *Eremophila cuneifolia, Senna* sp. Meekatharra (E. Bailey 1-26) and *Maireana triptera* with scattered low trees of *Acacia pteraneura* on red clayey loams on stony plains and drainage areas	CAR-53, CAR-82, CAR-91, JN-11, JN-16	112 / 1	Very Good	
FS Aw SeglSes ErcuMatiFrs	High open shrubland of *Acacia wanyu* over open shrubland of *Senna glutinosa* subsp. *luerssenii* and *Senna Stricta* over low open shrubland of *Eremophila cuneifolia, Maireana triptera* and *Frankenia setosa* on brown silty loams on foot slopes and stony plains	Sampled by Onshore (2019)	44 / <1	Very Good	
FS AwHallAa ErcuSesm AriEuaErx	High open shrubland of *Acacia wanyu, Hakea lorea* subsp. *lorea* and *Acacia aptaneura* over low shrubland of *Eremophila cuneifolia* and *Senna* sp. Meekatharra (E. Bailey 1-26) over open tussock grassland of *Aristida inaequiglumis, Eulalia aurea* and *Eragrostis xerophila* on red sandy loam on foot slopes and stony plains	382-02, JN-18	25 / <1	Good	

Code	Description	Sample Sites	Extent (ha / %)	Condition	Photo
***Acacia* High Shrubland**					
FP AaAssAanc Tp	High shrubland of *Acacia aptaneura, Acacia sclerosperma* subsp. *sclerosperma* and *Acacia ancistrocarpa* over very open hummock grassland of *Triodia pungens* on red brown sandy loam on drainage areas/ floodplains and foot slopes	401-30	71 / 1	Very Good	
FP AaAssAte SesmPtoSol Tb	High shrubland of *Acacia aptaneura, Acacia sclerosperma* subsp. *sclerosperma* and *Acacia tetragonophylla* over low open shrubland of *Senna* sp. Meekatharra (E. Bailey 1-26), *Ptilotus obovatus* and *Solanum lasiophyllum* over scattered hummock grassland of *Triodia basedowii* on red loamy sands on drainage areas and floodplains.	CAR-17, CAR-22, CAR-29, CAR-47	432 / 4	Very Good	
HS AbaAwErfr Ts AaAcao	High shrubland of *Acacia balsamea, Acacia wanyu* and *Eremophila fraseri* over open hummock grassland of *Triodia vanleeuwenii* with low scattered trees of *Acacia aptaneura* and *Acacia catenulata* subsp. *occidentalis* on red sandy loams on hill slopes and undulating low hills	CAR-87, IP-11, JN-85, 401-08, 401-11	418 / 4	Excellent	
SA AptAwAss Tb Apt	High shrubland of *Acacia pteraneura, Acacia wanyu* and *Acacia sclerosperma* subsp. *sclerosperma* over open hummock grassland of *Triodia basedowii* with scattered low trees of *Acacia pteraneura* on brown sandy clay loam on sand plains and floodplains	Sampled by Astron (2019)	58 / 1	Excellent	
FP Aw ErcuSesmFrs EnraErmuErx	High shrubland of *Acacia wanyu* over low shrubland of *Eremophila cuneifolia, Senna* sp. Meekatharra (E. Bailey 1-26) and *Frankenia setosa* over open tussock grassland of *Enteropogon ramosus, Eriachne mucronata* and *Eragrostis xerophila* on brown loamy sands on drainage areas, foot slopes and stony plains	JN-39	23 / <1	Excellent	
***Acacia* Low Open Forest**					
MA AciAcp CcCs MgAmac	Low open forest of *Acacia citrinoviridis* and *Acacia coriacea* subsp. *pendens* with tussock grassland of **Cenchrus ciliaris* and **Cenchrus setiger* and high open shrubland of *Melaleuca glomerata* and *Acacia macraneura* on brown sand on major drainage lines	Sampled by Astron (2019)	24 / <1	Degraded	

Code	Description	Sample Sites	Extent (ha / %)	Condition	Photo
***Acacia* Low Open Woodland**					
HP AaAptCdd SeaoErmaErfr Tb	Low open woodland of *Acacia aptaneura, Acacia pteraneura* and *Corymbia deserticola* subsp. *deserticola* over open shrubland of *Senna artemisioides* subsp. *oligophylla, Eremophila margarethae* and *Eremophila fraseri* over very open hummock grassland of *Triodia basedowii* on red loamy sand on hardpan plains and sand plains	CAR-03, CAR-07, CAR-08, CAR-09, CAR-79, 382-01	426 / 4	Excellent	
SP AptAcaoApr TbTs DopeSieErfo	Low open woodland of *Acacia pteraneura, Acacia catenulata* subsp. *occidentalis* and *Acacia pruinocarpa* over open hummock grassland of *Triodia basedowii* and *Triodia vanleeuwenii* with open shrubland of *Dodonaea petiolaris*, Sida ectogama and *Eremophila forrestii* on red silty loams on stony plains	CAR-54, CAR-56	150 / 1	Very Good	
MI AptAprEx AwAseAte TsTp	Low open woodland of *Acacia pteraneura, Acacia pruinocarpa* and *Eucalyptus xerothermica* over high shrubland of *Acacia wanyu, Acacia sericophylla* and *Acacia tetragonophylla* over open hummock grassland of *Triodia vanleeuwenii* and *Triodia pungens* on red silty clay loams on minor drainage lines, drainage areas and floodplains	CAR-55, CAR-86, CAR-94, JN-35, JN-37, 461-04, 382-10	101 / 1	Very Good	
***Acacia* Low Woodland**					
HP AaChApr DopeErfoSeah TtChfAri	Low woodland of *Acacia aptaneura, Corymbia hamersleyana* and *Acacia pruinocarpa* over mid open shrubland of *Dodonaea petiolaris*, *Eremophila forrestii* and *Senna artemisioides* subsp. *helmsii* over very open tussock grassland of *Themeda triandra, Chrysopogon fallax* and *Aristida inaequiglumis* on red clayey loams on hardpan plains, drainage areas and floodplains	CAR-85, CAR-24, CAR-33, CAR-35, CAR-37, CAR-41, CAR-81, JN-21, 382-03, 382-11, 382-18, 401-39, 401-41, 461-01, 461-02, 461-03	1,096 / 11	Very Good	

Code	Description	Sample Sites	Extent (ha / %)	Condition	Photo
***Acacia* Open Shrubland**					
HC AwSeaa MagErfo	Open shrubland of *Acacia wanyu* and *Senna artemisioides* subsp. x *artemisioides* over low open shrubland of *Maireana georgei* and *Eremophila forrestii* on red silty loams on hillcrests and upper hillslopes	CAR-39	29 / 0	Very Good	
***Acacia* Scattered Tall Shrubs**					
HP AptAa SesmErlnSeah Tb	Scattered tall shrubs of *Acacia pteraneura* and *Acacia aptaneura* over scattered shrubs of *Senna* sp. Meekatharra (E. Bailey 1-26), *Eremophila lanceolata* and *Senna artemisioides* subsp. *helmsii* over scattered hummock grassland of *Triodia basedowii* on red loamy sand on hardpan plains	CAR-27, CAR-32, CAR-34, CAR-36, CAR-40	218 / 2	Very Good	
***Cenchrus* Tussock Grassland**					
FP CcCsTt AciAaCh AssAw	Tussock grassland of **Cenchrus ciliaris, *Cenchrus setiger* and *Themeda triandra* with low woodland of *Acacia citrinoviridis, Acacia aptaneura* and *Corymbia hamersleyana* over high open shrubland of *Acacia sclerosperma* subsp. *sclerosperma* and *Acacia wanyu* on brown sand on floodplains and drainage areas	JN-43, JN-47, JN-48	140 / 1	Degraded	
***Eriachne* Open Tussock Grassland**					
GP ErbEua Seca	Open tussock grassland of *Eriachne benthamii* and *Eulalia aurea* with scattered low shrubs of *Sesbania cannabina* on red cracking clays on gilgai plains	CAR-26	7 / <1	Very Good	

Code	Description	Sample Sites	Extent (ha / %)	Condition	Photo
HP ErbChfEua Aa Cocd	Open tussock grassland of *Eriachne benthamii*, *Chrysopogon fallax* and *Eulalia aurea* with high open shrubland of *Acacia aptaneura* with scattered low trees of *Corymbia candida* subsp. *dipsodes* on red clayey loam on hardpan plains	CAR-28	42 / <1	Very Good	
***Eucalyptus* Open Woodland**					
MA EcoEv CcTtCya AciApypMg	Open woodland of *Eucalyptus camaldulensis* subsp. *obtusa* and *Eucalyptus victrix* over tussock grassland of **Cenchrus ciliaris, Themeda triandra* and *Cymbopogon ambiguus* with high open shrubland of *Acacia citrinoviridis, Acacia pyrifolia* var. *pyrifolia* and *Melaleuca glomerata* on brown sand on major drainage lines	IP-01	28 / <1	Degraded	
MA Eco AcpAciEv MgApyp	Open woodland of *Eucalyptus camaldulensis* subsp. *obtusa* over low open woodland of *Acacia coriacea* subsp. *pendens*, *Acacia citrinoviridis* and *Eucalyptus victrix* over high open shrubland of *Melaleuca glomerata* and *Acacia pyrifolia* var. *pyrifolia* on brown sand on major drainage lines	CAR-18, CAR-19, CAR-20, CAR-21, JN-42, 381-15	125 / 1	Good	
***Senna* Low Open Shrubland**					
HP SeahSeaoErln AptAp AriArcEua	Low open shrubland of *Senna artemisioides* subsp. *helmsii, Senna artemisioides* subsp. *oligophylla* and *Eremophila lanceolata* with scattered low trees of *Acacia pteraneura* and *Acacia paraneura* over scattered low tussock grassland of *Aristida inaequiglumis, Aristida contorta* and *Eulalia aurea* on red clayey loams on hardpan plains	Sampled by Astron (2019)	25 / <1	Very Good	
***Triodia* Hummock Grassland**					
SP TbTp HallAancAa Ch	Hummock grassland of *Triodia basedowii* and *Triodia pungens* with high open shrubland of *Hakea lorea* subsp. *lorea, Acacia ancistrocarpa* and *Acacia aptaneura* with scattered low trees of *Corymbia hamersleyana* on red brown loamy sand on stony plains	401-DB, 401-14, 401-24	205 / 2	Very Good to Excellent	

Code	Description	Sample Sites	Extent (ha / %)	Condition	Photo
SP TbTs AptApr AwErfoSeah	Hummock grassland of *Triodia basedowii* and *Triodia vanleeuwenii* with low open woodland of *Acacia pteraneura* and *Acacia pruinocarpa* over open shrubland of *Acacia wanyu, Eremophila forrestii* and *Senna artemisioides* subsp. *helmsii* on brown loamy sands on sandy/ stony plains and minor drainage lines	CAR-49, CAR-74, CAR-92, CAR-95, JN-26, JN-30	148 / 1	Very Good to Excellent	
SA Tb AancHallAss ChApr	Hummock grassland of *Triodia basedowii* over high open shrubland of *Acacia ancistrocarpa, Hakea lorea* subsp. *lorea* and *Acacia sclerosperma* subsp. *sclerosperma* with scattered low trees of *Corymbia hamersleyana* and *Acacia pruinocarpa* on red sand on sand plains	CAR-05, CAR-06, CAR-25, CAR-80, JN-22, 461-32, 461-33, 461-34, 461-35, 461-41, 461-45	777 / 8	Excellent	
FP Tb AaAprApt Erfo	Hummock grassland of *Triodia basedowii* with low open woodland of *Acacia aptaneura, Acacia pruinocarpa* and *Acacia pteraneura* over low open shrubland of *Eremophila forrestii* on red loamy sands on floodplains and drainage areas	401-26, 401-49, 401-50	127 / 1	Very Good	
SA Tb AaCocdCdd HallApaAanc	Hummock grassland of *Triodia basedowii* with low open woodland of *Acacia aptaneura, Corymbia candida* subsp. *dipsodes* and *Corymbia deserticola* subsp. *deserticola* over high open shrubland of *Hakea lorea* subsp. *lorea, Acacia pachyacra* and *Acacia ancistrocarpa* on red loamy sands on sand plains and hardpan plains	CAR-02, CAR-12, CAR-13, CAR-76, 382-12, 461-25, 461-26, 461-27, 461-28	484 / 5	Very Good to Excellent	
SA Tb Apt AriArhhTrl	Hummock grassland of *Triodia basedowii* with low open woodland of *Acacia pteraneura* over very open tussock grassland of *Aristida inaequiglumis*, *Aristida holathera* var. *holathera* and *Tripogonella loliiformis* on brown loamy sand on sand plains	Sampled by Astron (2019)	94 / 1		

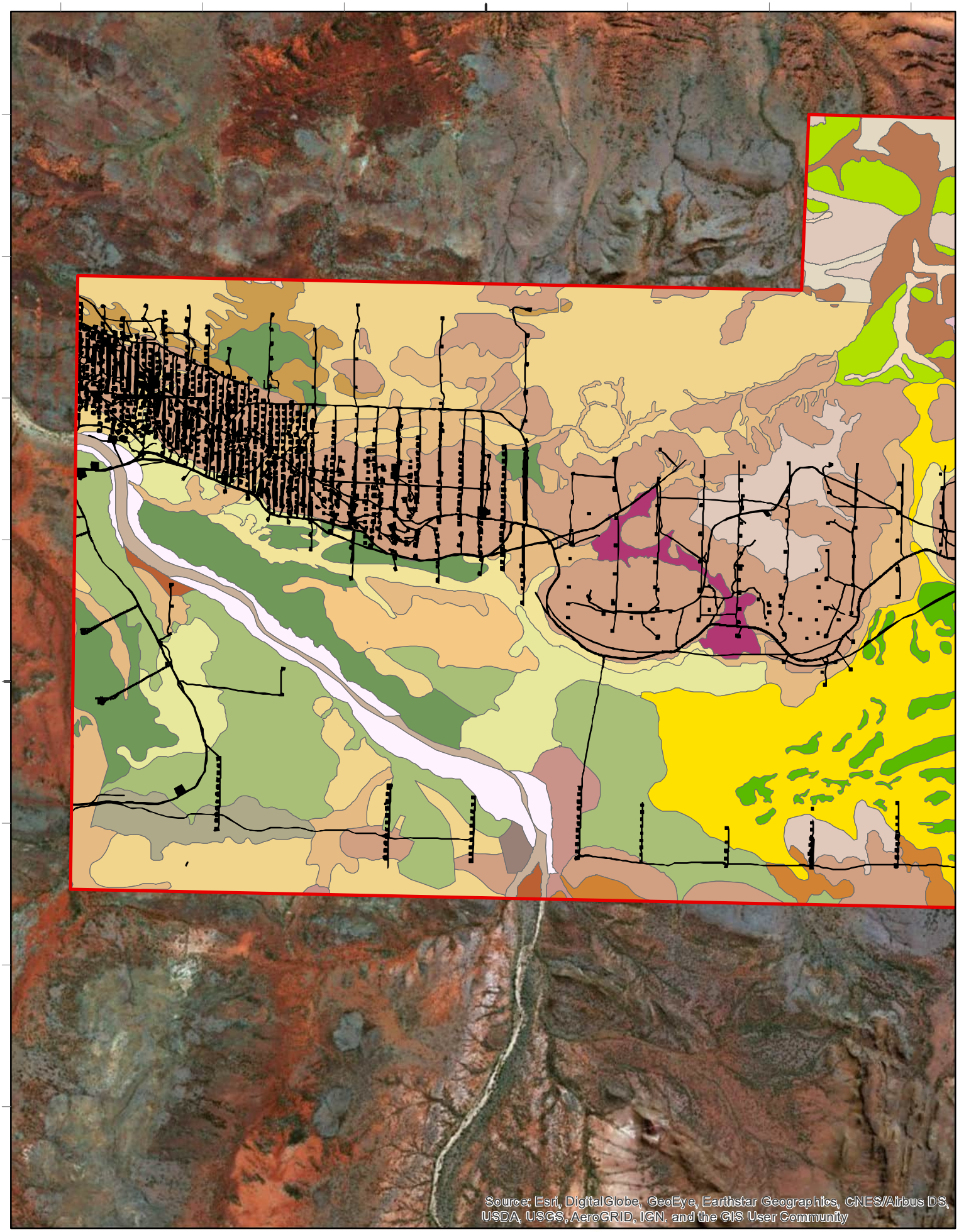
Code	Description	Sample Sites	Extent (ha / %)	Condition	Photo
SA Tb ApaAancSeao ChAprEg	Hummock grassland of *Triodia basedowii* with open shrubland of *Acacia pachyacra, Acacia ancistrocarpa* and *Senna artemisioides* subsp. *oligophylla* with low open woodland of *Corymbia hamersleyana, Acacia pruinocarpa* and *Eucalyptus gamophylla* on red loamy sand on sand plains	CAR-01, CAR-78, 382-20	1,093 / 11	Very Good to Excellent	
HS Ts AprGrwhHall AhiCacaEre	Hummock grassland of *Triodia vanleeuwenii* with high open shrubland of *Acacia pruinocarpa, Grevillea wickhamii* subsp. *hispidula* and *Hakea lorea* subsp. *lorea* over low open shrubland of *Acacia hilliana, Calytrix carinata* and *Eremophila exilifolia* on red sandy loam on hill slopes and undulating low hills	CAR-15, CAR-16, CAR-38, CAR-45, CAR-51, CAR-52, CAR-90, 382-04, 382-13, 382-14, 382-25, 401-12, 401-13, 401-15, 401-16, 401-17, 401-18, 401-19, 401-20, 401-21, 401-22, 401-23, 401-27, 401-28, 401-29, 401-31, 401-32, 401-35, 401-37, 401-40, 401-46, 401-48, 401-53, 401-55, 461-05, 461-06, 461-08, 461-09, 461-10, 461-11, 461-12, 461-13, 461-14, 461-15, 461-16, 461-17, 461-18, 461-19, 461-20, 461-21, 461-22, 461-23, 461-24, 461-42, 461-43, 461-44	934 / 9	Very Good to Excellent	
HS Ts GrwhAancAmar SeahSeglPtro	Hummock grassland of *Triodia vanleeuwenii* with high open shrubland of *Grevillea wickhamii* subsp. *hispidula, Acacia ancistrocarpa* and *Acacia marramamba* over open shrubland of *Senna artemisioides* subsp. *helmsii, Senna glutinosa* subsp. *luerssenii* and *Ptilotus rotundifolius* on red sandy loams on hill slopes and undulating low hills	CAR-44, CAR-48, CAR-75	267 / 3	Excellent	

Code	Description	Sample Sites	Extent (ha / %)	Condition	Photo
HS Ts AprAadsHall PtroAhiSeah	Hummock grassland of *Triodia vanleeuwenii* with high open woodland of *Acacia pruinocarpa, Acacia adsurgens* and *Hakea lorea* subsp. *lorea* over *Ptilotus rotundifolius, Acacia hilliana* and *Senna artemisioides* subsp. *helmsii* on red silty loams on hill slope and undulating low hills	CAR-31	68 / 1	Excellent	
HS Ts AptAcaoApr AwSeglSegp	Hummock grassland of *Triodia vanleeuwenii* with low open woodland of *Acacia pteraneura, Acacia catenulata* subsp. *occidentalis* and *Acacia pruinocarpa* over open shrubland of *Acacia wanyu*, *Senna glutinosa* subsp. *luerssenii* and *Senna glutinosa* subsp. *pruinosa* on red loamy sands on hill slopes and undulating low hills	CAR-46, CAR-83, JN-12, JN-13, JN-25, JN-33, JN-36, 382-17, 401-33, 401-34, 401-36	355 / 3	Very Good to Excellent	
HS Ts AhiAaaSe AbGrwh	Hummock Grassland of *Triodia vanleeuwenii* with low shrubland of *Acacia hilliana, Acacia adoxa* var. *adoxa* and *Seringia elliptica* with Scattered Shrubs of *Acacia bivenosa* and *Grevillea wickhamii* on brown sandy loam on hill slopes and undulating low hills	Sampled by Onshore (2016)	6 / <1	Excellent	
HS TsTwTp EllCh AhiAaa	Hummock Grassland of *Triodia vanleeuwenii*, *Triodia wiseana* and *Triodia pungens* with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* over Low Open Shrubland of *Acacia hilliana* and *Acacia adoxa* var. *adoxa* on red sandy loams on hill slopes and undulating low hills	Sampled by Outback Ecology (2010)	39 / <1	Excellent	

Code	Description	Sample Sites	Extent (ha / %)	Condition	Photo
***Triodia* Open Hummock Grassland**					
SP TbTs AptChApr ApaAdAanc	Open hummock grassland of *Triodia basedowii* and *Triodia vanleeuwenii* over low open woodland of *Acacia pteraneura, Corymbia hamersleyana* and *Acacia pruinocarpa* over high open shrubland of *Acacia pachyacra, Acacia dictyophleba* and *Acacia ancistrocarpa* on red sandy loams on sandy/ stony plains	Sampled by Outback Ecology (2010)	55 / 1	Very Good	
HS TbTs Ap ApaErjjErfo	Open hummock grassland of *Triodia basedowii* and *Triodia vanleeuwenii* with low open woodland of *Acacia paraneura* over scattered shrubs of *Acacia pachyacra, Eremophila jucunda* subsp. *jucunda* and *Eremophila forrestii* on red clayey loam on hill slopes and undulating low hills	461-07	77 / 1	Very Good	
SA Tb AaApa ErfoSeaoErma	Open hummock grassland of *Triodia basedowii* with high open shrubland of *Acacia aptaneura* and *Acacia pachyacra* over open shrubland of *Eremophila forrestii, Senna artemisioides* subsp. *oligophylla* and *Eremophila margarethae* on red loamy sands on sand plains	CAR-10, CAR-77, 382-19, 382-26	451 / 4	Excellent	
SA Tb HallAancAse EuaChfErer	Open hummock grassland of *Triodia basedowii* with high open shrubland of *Hakea lorea* subsp. *lorea, Acacia ancistrocarpa* and *Acacia sericophylla* over open tussock grassland of *Eulalia aurea, Chrysopogon fallax* and *Eragrostis eriopoda* on red loamy sands on sand plains	CAR-11, CAR-14, CAR-88, CAR-89	251 / 2	Excellent	
FP TbTscTp ChHallAa AdAssAanc	Open hummock grassland of *Triodia basedowii, Triodia schinzii* and *Triodia pungens* with low open woodland of *Corymbia hamersleyana, Hakea lorea* subsp. *lorea* and *Acacia aptaneura* over open shrubland of *Acacia dictyophleba, Acacia sclerosperma* subsp. *sclerosperma* and *Acacia ancistrocarpa* on red sandy loam on floodplains and drainage areas	CAR-32, IP-13	92 / 1	Very Good	

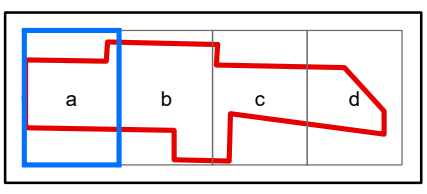
Code	Description	Sample Sites	Extent (ha / %)	Condition	Photo
FP Tp Cc AancAbPl	Open hummock grassland of *Triodia pungens* with open tussock grassland of **Cenchrus ciliaris* with high open shrubland of *Acacia ancistrocarpa, Acacia bivenosa* and *Petalostylis labicheoides* with scattered low trees of *Corymbia hamersleyana* on red clayey sands on drainage areas and floodplains	CAR-72, 401-38	25 / <1	Very Good	
HS TsTb AptCh AsiAw	Open hummock grassland of *Triodia vanleeuwenii* and *Triodia basedowii* with low open woodland of *Acacia pteraneura* and *Corymbia hamersleyana* over open shrubland of *Acacia sibirica* and *Acacia wanyu* on red loamy sands	IP-12, 401-51	161 / 2	Degraded to Good	
SP TsTbTp AcaoGrbApt ErfoSeglErll	Open hummock grassland of *Triodia vanleeuwenii*, *Triodia basedowii* and *Triodia pungens* with low open woodland of *Acacia catenulata* subsp. *occidentalis, Grevillea berryana* and *Acacia pteraneura* over open shrubland of *Eremophila forrestii, Senna glutinosa* subsp. *luerssenii* and *Eremophila latrobei* subsp. *latrobei* on red silty loams on stony plains, hill slopes and undulating low hills	CAR-96, 382-16	85 / 1	Excellent	
SA Tb AaHall ErfrSesmErcap	Open hummock grassland of *Triodia basedowii* with high open shrubland of *Acacia aptaneura* and *Hakea lorea* subsp. *lorea* over open shrubland of *Eremophila fraseri, Senna* sp. Meekatharra (E. Bailey 1-26) and *Eremophila capricornica* on red loamy sand on sandy/ stony plains	CAR-43	166 / 2	Excellent	

Code	Description	Sample Sites	Extent (ha / %)	Condition	Photo
SA Tb DicSeaoBe HallAa	Open hummock grassland of *Triodia basedowii* with low open shrubland of *Dicrastylis cordifolia*, *Senna artemisioides* subsp. *oligophylla* and *Bonamia erecta* with scattered shrubs of *Hakea lorea* subsp. *lorea* and *Acacia aptaneura* on red loamy sands on sand plains	CAR-04	130 / 1	Excellent	



Legend

- Study Area
- Disturbance Footprint



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0 0.3 0.6 1.2 km

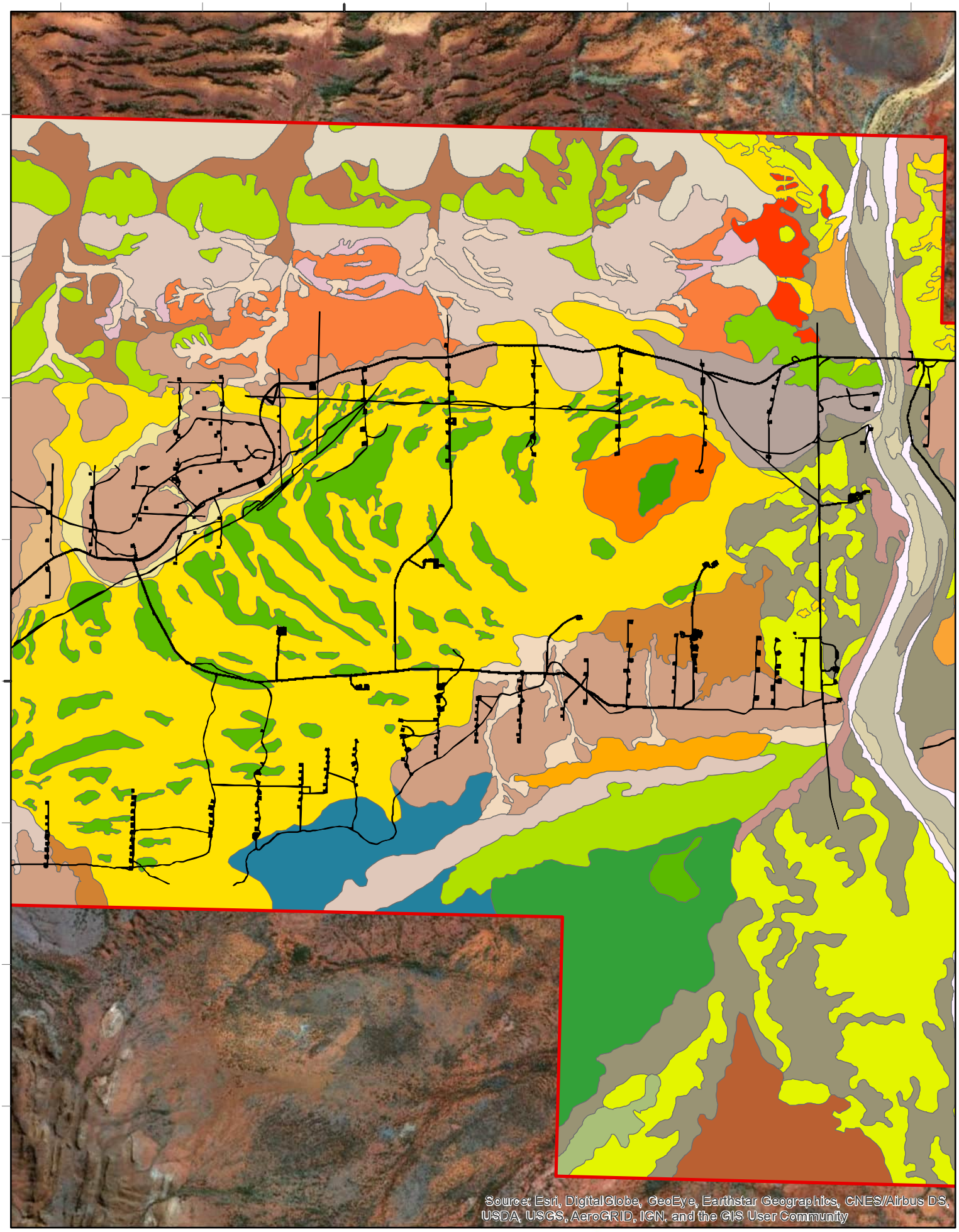
BHP WAIO

East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment

Figure 4.4a:Vegetation association mapping accross the Study Area

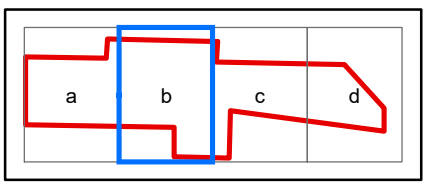
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 25/7/2019



Legend

- Study Area
- Disturbance Footprint



biologic Environmental Survey

N

1:33,570

0 0.3 0.6 1.2 km

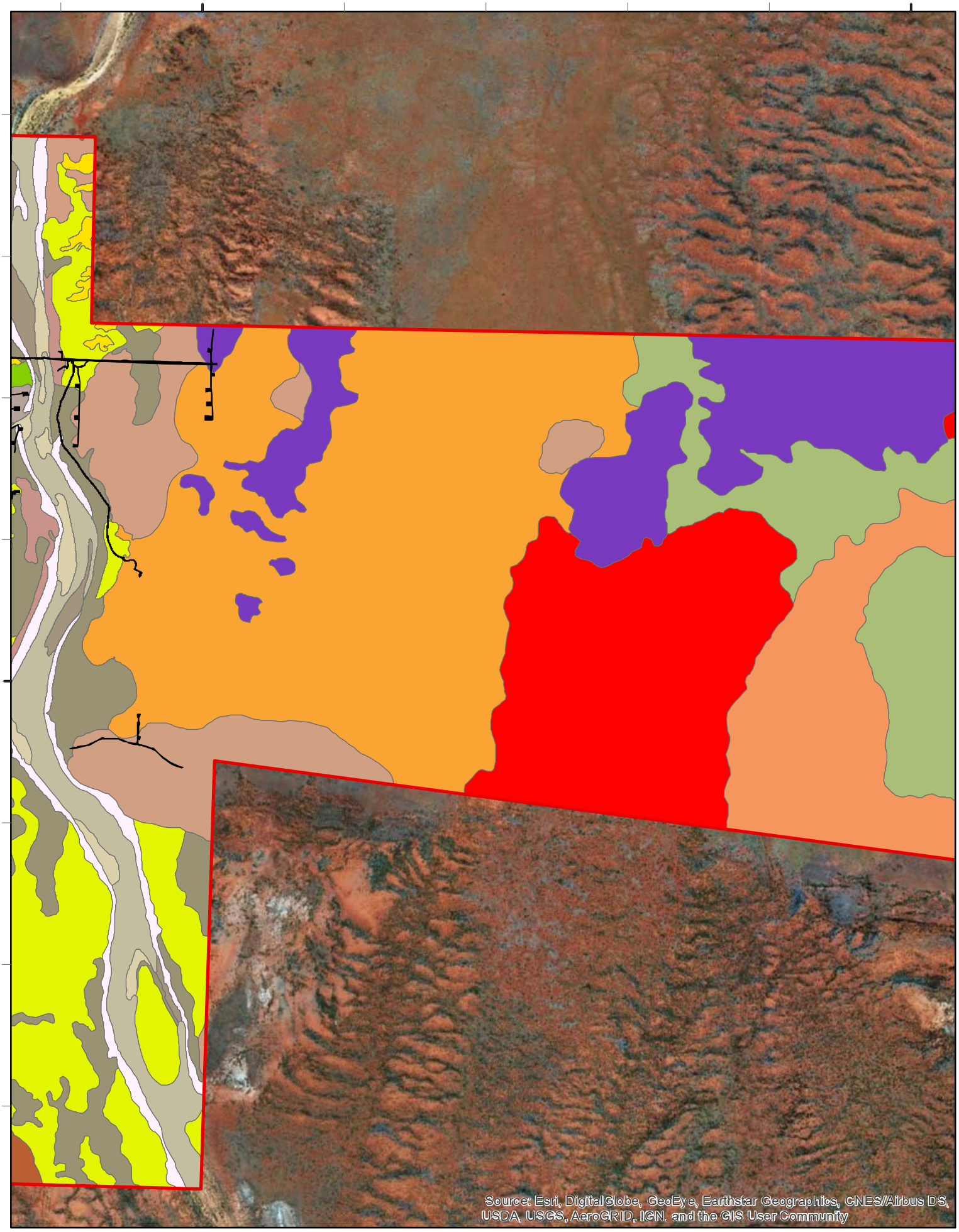
BHP WAIO

East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment

Figure 4.4b:Vegetation association mapping accross the Study Area

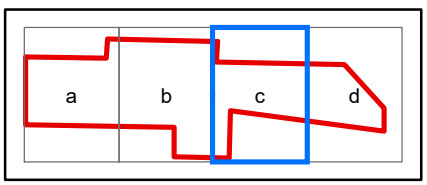
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 25/7/2019



Legend

- Study Area
- Disturbance Footprint



biologic Environmental Survey

N

1:33,570

0 0.3 0.6 1.2 km

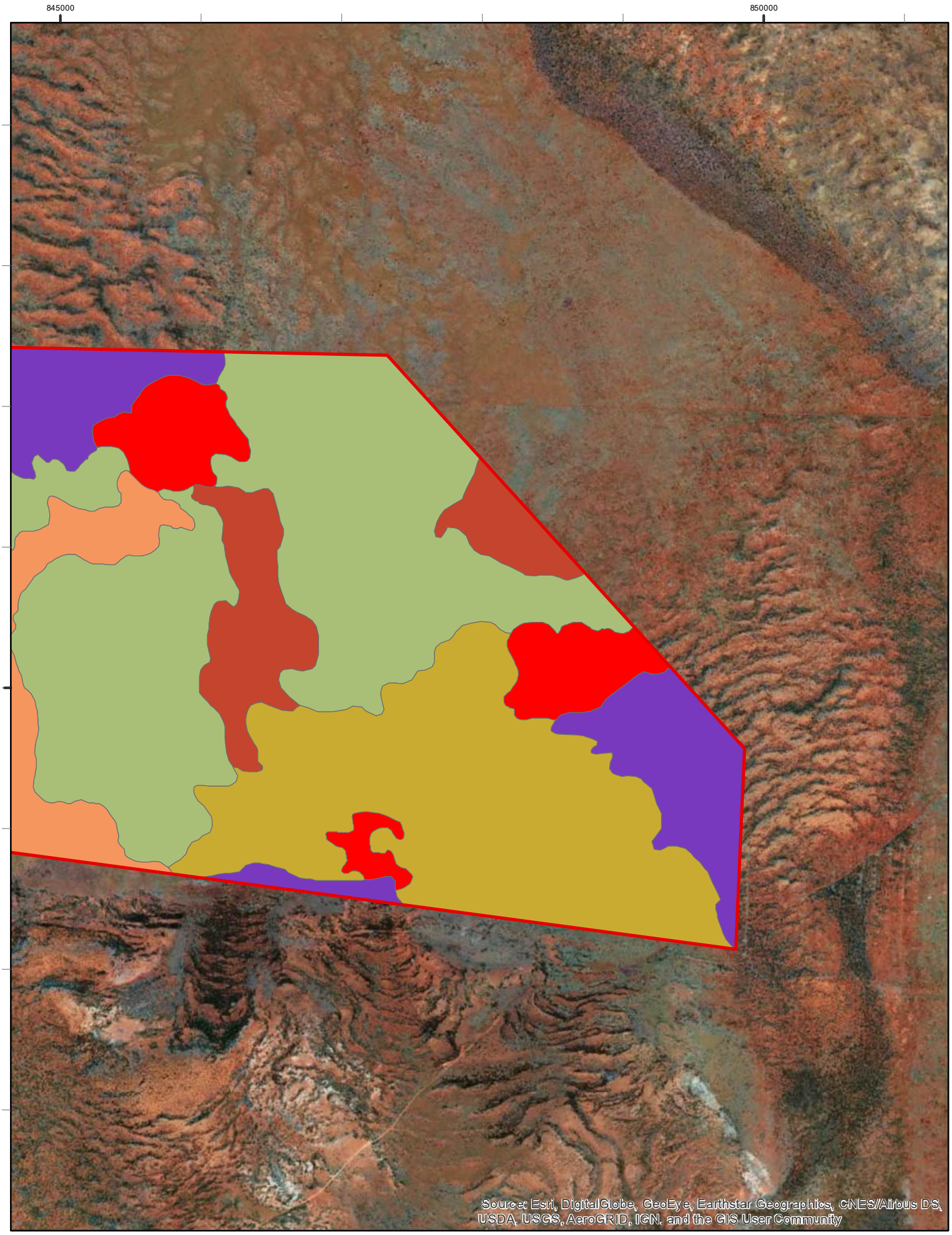
BHP WAIO

East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment

Figure 4.4c:Vegetation association mapping accross the Study Area

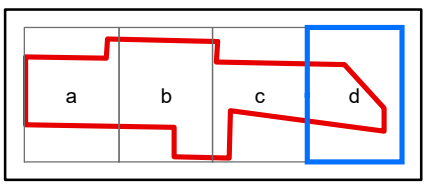
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 25/7/2019



Legend

Study Area



biologic Environmental Survey

N

1:33,570

0 0.3 0.6 1.2 km

BHP WAIO

East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment

Figure 4.4d:Vegetation association mapping accross the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 25/7/2019

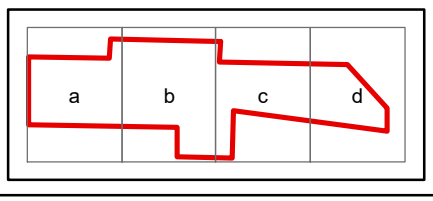
Legend

Vegetation Code

- FP AaAssAanc Tp
- FP AaAssAte SesmPtoSol Tb
- FP Aw ErcuSesmFrs EnraErmuErx
- FP CcCsTt AciAaCh AssAw
- FP Tb AaAprApt Erfo
- FP TbTscTp ChHallAa AdAssAanc
- FP Tp Cc AancAbPl
- FS Aw SeglSes ErcuMatiFrs
- FS AwHallAa ErcuSesm AriEuaErx
- GP ErbEua Seca
- HC AwSeaa MagErfo
- HP AaAptCdd SeaoErmaErfr Tb
- HP AaChApr DopeErfoSeah TtChfAri
- HP AptAa SesmErlnSeah Tb
- HP ErbChfEua Aa Cocd
- HP SeahSeaoErln AptAp AriArcEua
- HS AbaAwErfr Ts AaAcao
- HS TbTs Ap ApaErjjErfo
- HS Ts AhiAaaSe AbGrwh
- HS Ts AprAadsHall PtroAhiSeah
- HS Ts AprGrwhHall AhiCacaEre
- HS Ts AptAcaoApr AwSeglSegp
- HS Ts GrwhAancAmar SeahSeglPtro
- HS TsTb AptCh AsiAw
- HS TsTwTp EllCh AhiAaa
- MA AciAcp CcCs MgAmac
- MA ApyPlMg EcoAciAcp CyaTtEua
- MA Eco AcpAciEv MgApyp
- MA EcoEv CcTtCya AciApypMg
- Ml AptAprEx AwAseAte TsTp
- SA AptAwAss Tb Apt
- SA AssAwAa SegfSeaoSeah EuaAriChf
- SA Tb AaApa ErfoSeaoErma
- SA Tb AaCocdCdd HallApaAanc
- SA Tb AaHall ErfrSesmErcap
- SA Tb AancHallAss ChApr
- SA Tb ApaAancSeao ChAprEg
- SA Tb Apt AriArhhTrl
- SA Tb DicSeaoBe HallAa
- SA Tb HallAancAse EuaChfErer
- SP AptAcaoApr TbTs DopeSieErfo
- SP Aw ErcuSesmMag Apt
- SP TbTp HallAancAa Ch
- SP TbTs AptApr AwErfoSeah
- SP TbTs AptChApr ApaAdAanc
- SP TsTbTp AcaoGrbApt ErfoSeglErll

Legend

Study Area



biologic Environmental Survey

N

1:33,560

0 0.3 0.6 1.2 km

BHP WAIO

East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment

Figure 4.4: Vegetation association mapping accross the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 25/7/2019

4.7 Vegetation of Conservation Significance

4.7.1 Federal and State Listing

The desktop assessment (Section 4.2.2) did not identify any known TECs or PECs as potentially occurring within the Study Area. The vegetation associations described and delineated from the Study Area are not considered to be analogous with any TECs and PECs known to occur in the DBCA's Pilbara Region (which includes the Study Area).

4.7.2 Vegetation of "Other" Significance

The EPA (2004) advises that vegetation may be of significance for reasons other than a listing as a TEC or a PEC. This may include, although is not limited to, scarcity, novel combination of species, role as a refuge, restricted distribution and vegetation extent being below a threshold level.

The vegetation associations described from the Study Area are not considered to be of regional significance, as they are not analogous with any known TECs or PECs, do not support unique floristic assemblages, do not support any known threatened flora species and do not occur in association with any regionally significant drainage lines.

No semi-permanent or permanent waterbodies were recorded within the Study Area during the survey. It is likely that temporary waterbodies, such as in the creeks and drainage lines, will be present in the Study Area after substantial rainfall events. The longevity of the temporary waterbodies would be determined by the amount, intensity and frequency of the rainfall in the immediate region and within the catchment of the creeks. There was one Gilgai claypan (Plate 4.2) that would potentially flood following substantial rainfall events. The Gilgai claypan was dry during the field survey and was mostly devoid of annual and ephemeral vegetation, while perennial grasses and small shrubs were present.

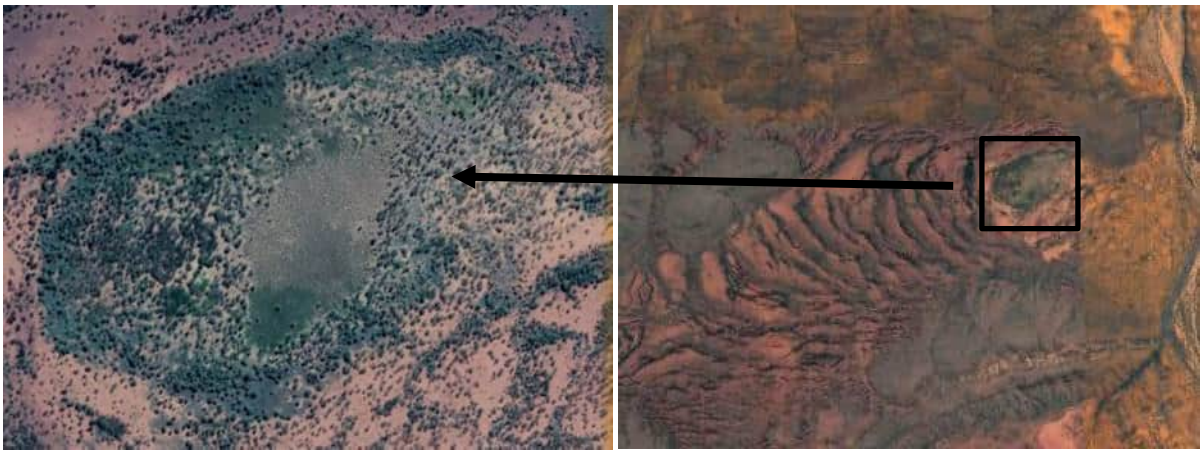


Plate 4.2: Ephemeral gilgai claypan located in the central portion of the Study Area.

An extensive area of mulga groving and intergroving in the central portion of the Study Area (see Plate 4.2) would suggest a reliance on sheet flow. The vegetation association HP AaChApr DopeErfoSeah TtChfAri had distinct bands of vegetation and more open stony or hardpan plain, with the vegetation bands capturing water, nutrients and resources to promote a diverse biota. The banding occurred in the Zebra land system which has previously been documented to rely on sheet flow across the surface (van

Vreeswyk *et al.*, 2004). Based on the distinct mulga banding and occurring in the Zebra land system, vegetation association HP AaChApr DopeErfoSeah TtChfAri is determined to be reliant on sheet flow. Although, the actual reliance on the sheet flow has not been quantified, so the overall extent considered to be reliant on sheet flow may alter.

In addition to the banding in the central portion of the Study Area, there are several other portions of the Study Area that show minor groving and intergroving suggesting some minor reliance on sheet flow. The vegetation associations that have been described and delineated in association with the minor mulga banding are SP AptAcaoApr TbTs DopeSieErfo; and HP AaAptCdd SeaoErmaErfr Tb. The reliance on sheet flow for these two communities has been determined based on the presence of the minor banding, so their actual dependence on sheet flow has not been quantified. The extent of vegetation reliant on sheet flow in these areas may alter.

In addition to sheet flow dependent communities, the two creeks, Caramulla and Jimblebar, support the facultative phreatophyte *Eucalyptus camaldulensis* subsp. *obtusa*. The presence of the phreatophyte indicates a reliance on groundwater for part of the year. In addition to the *Eucalyptus camaldulensis* subsp. *obtusa*, several other flora species are potentially reliant on groundwater for part of, or all of, the year. These species include: *Eucalyptus victrix* (very mildly facultative phreatophyte, but mostly a vadophyte); *Melaleuca glomerata*; *Cyperus vaginatus; Acacia citrinoviridis;* and *Acacia coriacea* subsp. *pendens* (Rio Tinto, 2018). The vegetation associations described and delineated from the Study Area that may be reliant on groundwater are: MA ApyPlMg EcoAciAcp CyaTtEua; MA AciAcp CcCs MgAmac; MA EcoEv CcTtCya AciApypMg; and MA Eco AcpAciEv MgApyp.

4.7.3 Bioregional Significance

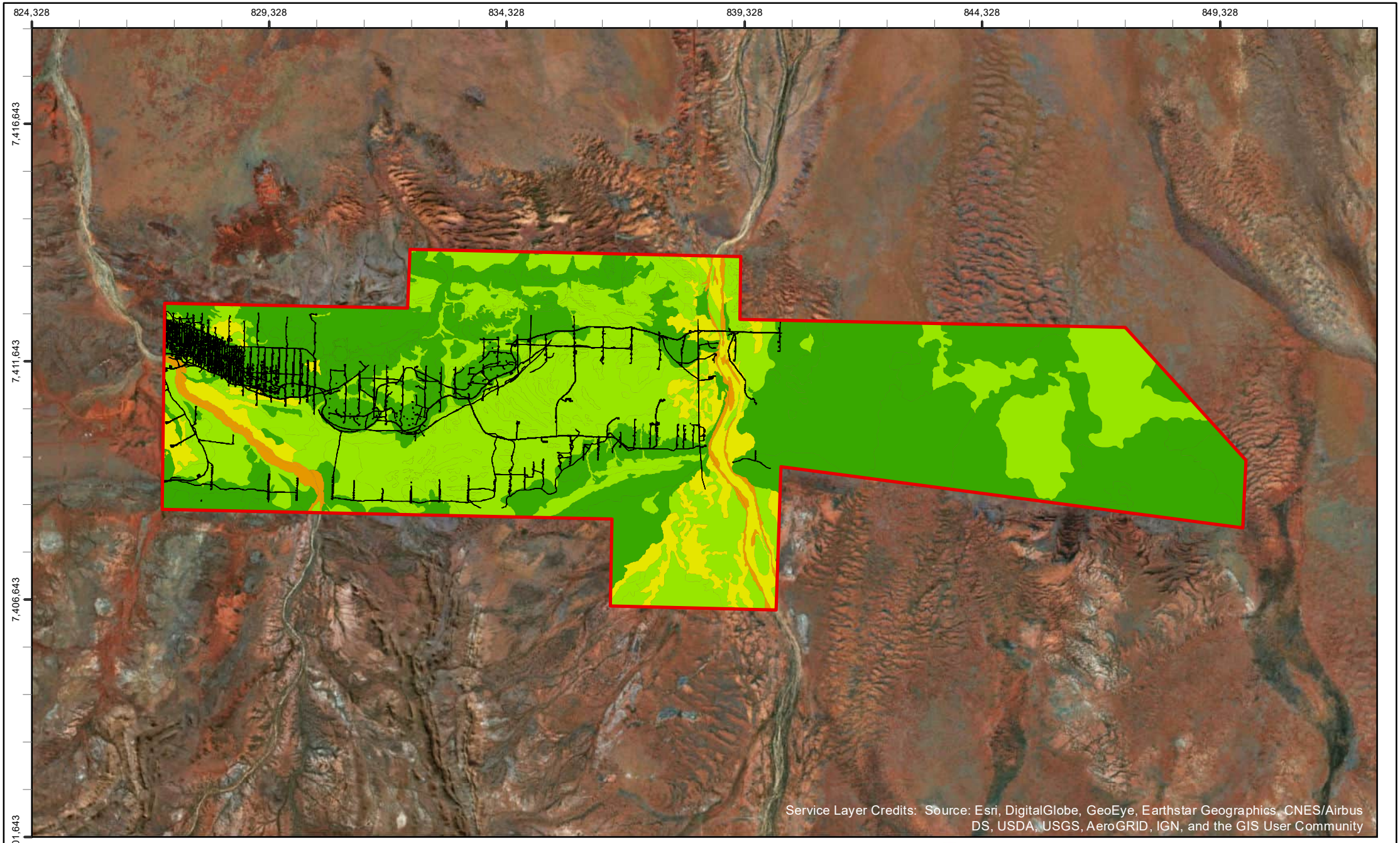
Under the Convention of Biological Diversity, Australia has worked towards a target of 17% of the continent to be protected as part of the National Reserve System (NRS) (NRSTG, 2009). In building the NRS, priority is given to under-represented bioregions that have less than 10% of their remaining area protected in reserves (NRSTG, 2009). The Pilbara and Gascoyne bioregions are underrepresented, with less than 10% of the total area protected in reserves. The Fortescue and Augustus subregions are both poorly represented, with less than 1% and 3% of subregional area protected in reserves respectively.

Despite the Pilbara and Gascoyne bioregions being underrepresented within the NRS, greater than 99% of the bioregional and the Fortescue and Augustus subregional areas remains intact (Government of Western Australia, 2019). As such, it has been determined that any potential vegetation clearing within the Study Area would not substantially impact the biological values of the bioregions (and subregions) as the regions will remain intact, and therefore the State retains the ability to adequately reserve vegetation within the Pilbara and Gascoyne bioregions (and the Fortescue and Augustus subregions).

4.8 Vegetation Condition

The condition of the vegetation within the Study Area ranged from Completely Degraded to Excellent (Table 4.3 and Figure 4.5). The main disturbances observed in the Study Area were associated with pastoralism, mining related clearing and fires. A portion of the Study Area occurs on an active pastoral lease with cattle grazing and trampling evident across the entire Study Area. The creeks and drainage

lines were impacted heavily by pastoralism with higher densities of weeds and obvious signs of trampling and grazing from cattle.



Legend

- Study Area
- Disturbance Footprint

Vegetation Condition

- Pristine
- Excellent
- Very Good
- Good
- Poor
- Degraded
- Completely Degraded

N

1:100,000

0 1 2 4 km

biologic Environmental Survey

BHP WAIO

East Jimblebar and Caramulla Detailed Flora and Vegetation Assessment

Figure 4.5: Vegetation condition mapping accross the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 25/7/2019

Caramulla Creek and Jimblebar Creek were classified as Degraded to Good in condition as influences from cattle grazing and trampling, weeds and drought stress were most evident. Numerous *Eucalyptus* trees were noted as being heavily drought stressed, with some recorded as recently dead. This observation was made due to the recent loss of the crown and bark (Plate 4.3). The causes of the tree loss were not determined, but the recent and prolonged drought, or lack of restorative rain (see Section 3.3.1) in the region may be a contributing factor.

Plate 4.3: Examples of recent *Eucalyptus* tree deaths on Caramulla Creek.

Substantial portions (approximately 40%) of the Study Area were rated as being in Very Good condition. These portions of the Study Area coincided with areas lower in the landscape, where cattle would visit on a regular basis. Weed presence was also more noticeable, as was the grazing and trampling pressures from cattle.

Historic and ongoing mining and exploration works has cleared approximately 2% of the Study Area. These areas have been mapped as Completely Degraded due to the complete loss of native vegetation. The clearing has mostly been for access tracks and drill pads, with a higher concentration of drilling in the north-west of the Study Area,

The eastern third (east of Caramulla Creek) of the Study Area has been subjected to a fire within the last 24 to 48 months, with the majority of the vegetation scorched and showing signs of recovery. An additional smaller portion at the far east of the Study Area had more recently (1 – 2 years ago) been burnt and was recovering slowly due to the below average rainfall in the region. Depending on rainfall over the coming 'wet' seasons, it is anticipated that these areas will recovery to pre-burn communities and flora assemblages.

Table 4.3: Vegetation condition extent in the Study Area

Condition	Extent (ha / %)	Comment
Excellent	5,047 / 49	Occurred across the majority of the Study Area and showed negligible signs of disturbances. Minor cattle trampling and grazing was the most evident disturbance
Very Good	4,150 / 40	Occurred across large portions of the Study Area and coincided with areas subjected to more frequent cattle grazing and trampling. Minor weed occurrences were also evident.
Good	715 / 7	Generally occurred in association with drainage lines and floodplains, areas subjected to recent, intense wildfires and vegetation associations with a high weed presence. Cattle grazing and trampling was more evident in some locations (i.e. drainage lines).
Degraded	192 / 2	Associated with the floodplain and drainage areas in the southern central portion of the Study Area The dominant understorey consisted of **Cenchrus ciliaris* tussock grasses, while cattle grazing and trampling was evident via a lack of native understorey species and trampling lines creating small erosional issues.
Completely Degraded	214 / 2	Occurred along cleared tracks, drill pads and other mining/ exploration associated works. The portion of completely degraded vegetation did not extend into the native vegetation, with all areas mapped as completely degraded coinciding with cleared areas.

5 SURVEY ADEQUACY

5.1 Sampling Efficacy

A total of 196 sites have been sampled across the Study Area (77 during the current assessment and 119 from previous assessments), which equates to approximately 0.019 sites sampled per hectare of native vegetation. BHP (2018) suggest that the intensive sampling of quadrats (i.e. during detailed surveys) shall allow for a minimum of one quadrat per square kilometre (km^2). The Study Area is approximately 103.18 km^2 in size, therefore, the sampling of 196 sites across the Study Area adequately addresses BHP minimum survey intensity.

The sampling intensity (including the 119 sites from previous assessments) is consistent with a snapshot (the ten most recent flora and vegetation surveys) of the flora and vegetation surveys reviewed in the desktop assessment, which ranges from 0.104 to 0.004 sites completed per hectare (Table 5.1). Not all the reports reviewed in the desktop assessment are included in Table 5.1 due to survey type and missing information in the reports (i.e. size of the respective study areas).

Table 5.1: Comparison of survey intensity and effort in the Study Area

Survey	Study Area (ha)	Taxa recorded	Sampling sites	Sites/ ha
Onshore (2019)	1,680	N/A	174	0.104
Onshore (2014c)	3,336	280	191	0.057
Onshore (2016)	4,410	90	242	0.055
Onshore (2015b)	3,385	263	171	0.051
Onshore (2018b)	1,500	262	49	0.033
Syrinx (2012)	4,972	411	102	0.021
Syrinx (2014)	2,052	330	38	0.019
This Survey	**10,318**	**462**	**196**	**0.019**
Onshore (2018c)	6,337	N/A	60	0.009
Onshore (2018a)	12,500	N/A	115	0.009
Astron (2019)	16,814	197	63	0.004

The species accumulation curve for the Study Area, inclusive of data previously collected, produced a curve that is steadily increasing. While not yet reaching asymptote, the curve has started to plateau slightly, especially Michaelis Menton estimators (Figure 5.1). Richness estimators indicated that the survey was approximately 76% (Chao 1) to 97% (Michaelis-Menton) adequate, with an observed value of 386 vascular flora taxa (Table 5.2). These results indicate that additional survey effort may contribute a greater vascular flora taxa count than what was actually observed when referring to the observed value of 168. The survey effort may be considered adequate when the additional native vascular flora taxa recorded opportunistically (76 native confirmed taxa) within the Study Area are taken into account (Table 5.2).

Table 5.2: Expected native species richness for the Study Area

Treatment	Results	Richness Estimates based on Sobs (386)	Richness Estimates based on Actual (462)
Chao 1	509	76%	91%
Jacknife 1	489	79%	94%
Bootstrap	432	89%	107%
Michaelis-Menton	397	97%	116%
Sobs	386	N/A	N/A

NB: percentage values have been rounded to the nearest whole number.

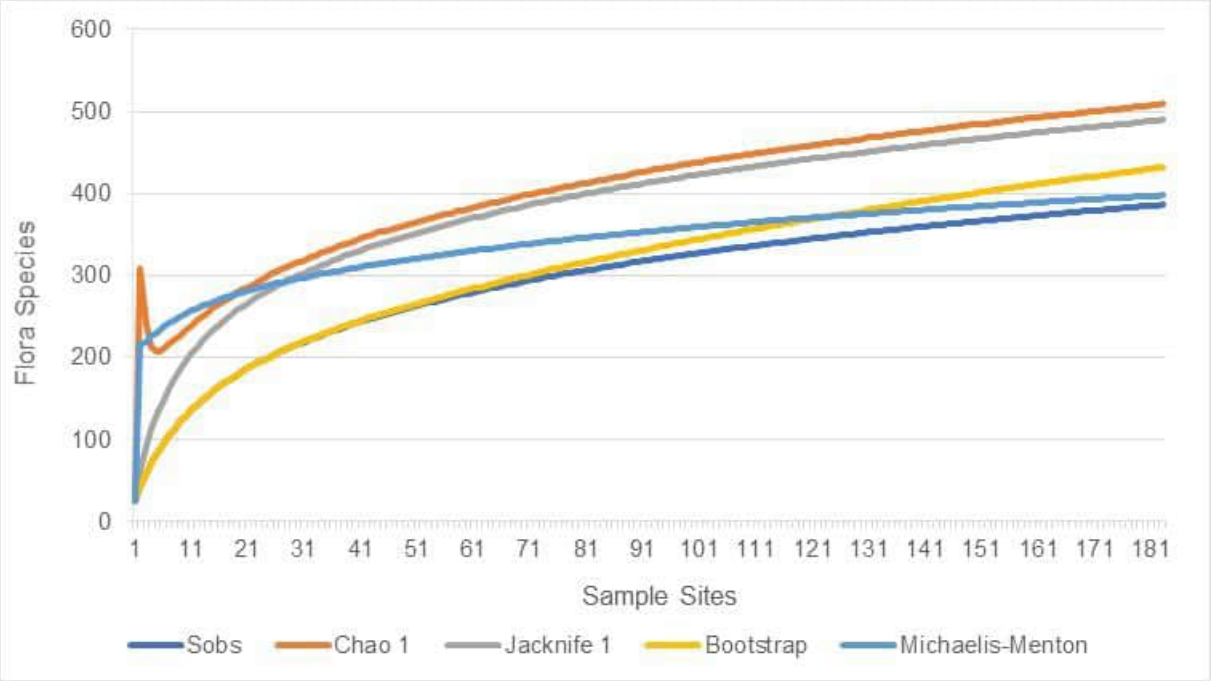


Figure 5.1: Species accumulation curve for the Study Area

5.2 Other Potential Limitation and Constraints

There are a number of possible limitations and constraints that can affect the adequacy of vegetation and flora surveys (EPA, 2016b). The limitations of the current assessment are presented in accordance with the Technical Guidance (EPA, 2016b) (Table 5.3).

The survey was undertaken during a time considered to be optimal for the Pilbara bioregion (optimal timing is considered to be between March and June, EPA, 2016b). However, the three months preceding the field survey (January, February and March) received well below average rainfall (82.2 mm compared to 180.5 mm; Figure 3.1) ((BoM, 2019). In addition to this, the six months preceding this below average rain (July to December) experienced extremely poor rainfall (15.2 mm at the Jimblebar weather station compared to the LTA of 79.7 mm in Newman; Figure 3.1) (BoM, 2019). This was further emphasised by

the dry conditions observed in the field. There were limited annual and ephemeral taxa present, while the perennial species were generally lacking flowering and fruiting material.

A substantial number of taxa observed and collected from the field were difficult to confidently identify to species or infraspecies level. This was mainly due to the timing of the survey and the lack of suitable material (i.e. flowers, fruits) to aid confident taxonomic identifications. Fourteen taxa have been tentatively identified to species or infraspecies level, while 20 have only been identified to genus level. An additional taxon has only been identified to family level (Malvaceae sp.). None of the 35 taxa that have been tentatively identified are considered to be analogous with the seven priority listed flora highly likely, likely, or with potential to occur in the Study Area (Table 4.1).

Table 5.3: Survey limitations and constraints

Limitation	Constraint	Comment
Availability of contextual information at a regional and local scale	No	Sufficient contextual information was available for the Study Area, including broad information on land systems and vegetation associations. The Study Area is located immediately east of the Jimblebar mine operated by BHP. An extensive amount of biological survey work has occurred across Jimblebar and surrounds, the data and reports of which were all available for this assessment.
Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed	No	The field survey was led by an experienced botanist with over 12 years of experience. The lead botanist met the minimum requirements to manager flora and vegetation surveys in the Pilbara bioregion (EPA, 2016b). The lead botanist was assisted by a botanist with 5 years' experience for the entire field survey.
Proportion of flora recorded and/or collected, any identification issues	Yes Minor	The field survey (April 2019) was undertaken following below average rainfall, with the soil and surrounds noted as being dry. As a result, a proportion of the flora expected to occur (i.e. annuals and ephemerals) were under-represented and sampled. Following sufficient rainfall, it is expected that the majority of the Study Area associated with drainage lines and floodplains, in particular the Jimblebar and Caramulla creeks and the clay pan area, would be covered in annual and ephemeral grasses (i.e. *Eragrostis* spp.) and herbs (i.e. *Calandrinia* spp.). As portions of the Study Area have been subjected to numerous flora and vegetation surveys previously (see Appendix E), the flora assemblage and diversity recorded supplemented the current assessment. As a result, 462 vascular flora taxa are known to occur within the Study Area. This total includes a substantial number of annual and ephemeral taxa.

Limitation	Constraint	Comment
Was the appropriate area fully surveyed (effort and extent)	Yes Moderate	The Study Area was traversed and surveyed either on foot or via vehicle. Due to issues out of the survey teams' control, the western third of the Study Area was not sampled. The remainder of the Study Area was appropriately surveyed. All though considered a constraint to have not sampled the western end of the Study Area, previous survey work was utilised to supplement the survey extent and effort. An additional 26 sample sites occur in the western third of the Study Area. The south-eastern corner of the Study Area is still lacking sufficient sampling, although this area has been previously traversed with the major vegetation units described and delineated. As a result, the constraint is only considered to be moderate.
Access restrictions within the survey area	No	The entire Study Area was easily accessible via active pastoral tracks and mining/exploration tracks. The Study Area was accessed via the Caramulla access track, which feeds various other small access, exploration pastoral tracks within Study Area.
Survey timing, rainfall, season of survey	Yes Minor	The survey was undertaken during a period which would be considered optimal (March to June for the Eremaean region; EPA, 2016b). Rainfall in the three preceding months was below average. This followed six months (July to December 2018) of below average rainfall. The Survey Area was noted as being dry with very minimal evidence of annual and ephemeral germination and growth, suggesting that the seasonality was suboptimal. Due to the poor season and below average rainfall, the surveys did not identify, record or collect a suite of flora species (annuals and ephemerals) which is known to represent high diversity in the Pilbara region. As detailed above, the suite of flora recorded during the current assessment was supplemented by previous work. As a result, 462 vascular flora taxa are known to occur within the Study Area. This total includes a substantial number of annual and ephemeral taxa.
Disturbance that may have affected the results of survey such as fire, flood or clearing	No	The Study Area is located within active pastoral leases and current mining exploration tenements. The vegetation was noted as being altered, especially around active exploration areas. A large portion of the Study Area from Caramulla Creek east to the edge of the study area had recently (2 – 4 years ago) been burnt. An additional smaller portion at the far east of the Study Area had more recently (1 – 2 years ago) been burnt and was recovering slowly. However, the majority of perennial taxa had produced significant growth for identification and many areas had sections of unburnt vegetation to aid in identification and delineation of vegetation associations.

6 DISCUSSION

The following section discusses the results of the Survey and places the significant results in a regional and local context, consistent with the requirements of EPA (2016b).

6.1 Flora of Conservation Significance

The Survey did not identify any Federal or State threatened (declared rare) flora species listed under the EPBC Act or the WC Act. No Priority taxa as listed by the DBCA were recorded during the Survey. No other flora species recorded during the Survey are considered to significant due to range extensions, unusual/ unique taxa or recorded at the extremities of their known geographical range.

6.1.1 Regional Significance

No regionally significant flora were recorded from the Study Area. The native flora recorded from the Study Area have previously been recorded (Astron, 2019; Onshore, 2018a, 2018c, 2019) or are known to occur in the general region of the Study Area (ALA, 2019; DBCA, 2019; WAH, 1998-).

6.2 Vegetation of Conservation Significance

The survey did not identify any vegetation units that are consistent with ecological communities listed as threatened under the EPBC Act or the BC Act. No Priority Ecological Communities were identified from the Study Area.

6.2.1 Regional Significance

The vegetation associations recorded from the Study Area were not considered to be regionally significant. The vegetation associations are well represented from a regional context across the Pilbara bioregion and into the Gascoyne bioregion to the south.

6.2.2 Groundwater Dependent Ecosystems

Groundwater Dependent Ecosystems (GDEs) and their associated vegetation is dependent on the presence of groundwater to meet some, or all, of their water requirements, either through surface expression or subsurface presence of groundwater (Hatton & Evans, 1998). Groundwater dependent species that utilise groundwater are referred to as phreatophytes, and they may be classified as either obligate or facultative phreatophytes depending on their level of dependence on groundwater (Eamus *et al.*, 2006).

Obligate phreatophytes are plants that are highly dependent on groundwater. This dependence can be continual, seasonal or episodic. Obligate phreatophytes tend to be associated with surface expressions of groundwater rather than the subsurface presence of groundwater (i.e. *Melaleuca argentea*) (adapted from Astron, 2015).

Facultative phreatophytes are plants that can access groundwater but are not totally reliant on groundwater to sustain their water requirement. Rather, they utilise groundwater opportunistically, particularly during times of drought when moisture reserves in the vadose (unsaturated) zone of the soil profile become depleted. Facultative phreatophytes are generally associated with the subsurface presence of groundwater rather than surface water. Most facultative phreatophytes are large woody trees

and shrubs with deep root systems capable of accessing the capillary fringe of the water table, which may occur at considerable depth within the profile (i.e. *Eucalyptus camaldulensis*) (adapted from Astron, 2015; Kath *et al.*, 2014; Thomas, 2014).

The two creeks, Caramulla and Jimblebar, were considered to be potentially groundwater dependent ecosystems as they support the facultative phreatophyte *Eucalyptus camaldulensis* subsp. *obtusa*. In addition to *Eucalyptus camaldulensis* subsp. *obtusa*, additional phreatophytic (or potentially phreatophytic) flora species were recorded, including:

- *Eucalyptus victrix* (vadophyte or facultative phreatophyte in anomalous cases with a low to moderate reliance on groundwater);
- *Melaleuca glomerata* (vadophyte or facultative phreatophyte in anomalous cases with a low to moderate reliance on groundwater);
- *Cyperus vaginatus* (good indicator of high moisture availability/ consistency);
- *Acacia citrinoviridis* (good indicator of high moisture availability/ consistency)*;* and
- *Acacia coriacea* subsp. *pendens* (good indicator of high moisture availability/ consistency) (Rio Tinto, 2018).

The vegetation associations described and delineated from the Study Area that may be reliant on groundwater are: MA ApyPlMg EcoAciAcp CyaTtEua; MA AciAcp CcCs MgAmac; MA EcoEv CcTtCya AciApypMg; and MA Eco AcpAciEv MgApyp. The four vegetation associations occurred along the banks and beds of Jimblebar Creek and Caramulla Creek.

6.2.3 Sheet Flow Dependent Ecosystems

Mulga is a large, variable and taxonomically complex group of plants allied to *Acacia aneura* that dominate significant areas of the vast Australian arid zone (Maslin *et al.*, 2012). The term Mulga is also used to describe vegetation communities in which these species predominate (Maslin *et al.*, 2012). A recent revision of the Mulga group (*Acacia aneura* and its close relatives) classified 12 separate entities, excluding informal variants, putative hybrids and intergrades (Maslin & Reid, 2012). The structure and patterning of mulga communities varies from strongly banded (groved) through to open shrublands and woodlands across the landscape (Page & Grierson, 2012). The bandings act as a sink for nutrients and water to infiltrate the soil and are readily available for uptake by the flora located within the banding. This banding and overland sheet flow supports a diverse biota within the Mulga bands and plays and important ecological function which is well documented (Dawson & Ahern, 1973; Saco *et al.*, 2007; Winkworth, 1973).

Of the ten land systems that occur in the Study Area (Section 2.6) five, Cadgie, Jamindie, Sylvania, Washplain and Zebra, may be subjected to sheet flow (van Vreeswyk *et al.*, 2004). Mulga dominated communities (represented by *Acacia aneura, A*. *aptaneura, A*. *paraneura* and *A*. *pteraneura*) or communities with Mulga species present, were mapped within these land systems. The Mulga communities mapped within the Study Area displayed prominent banding (Plate 6.1), especially in association with the Zebra land system. This strongly suggests a dependence on sheet flow across the

landscape. Any disruptions (decrease or an increase in amount and velocity) to the natural sheet flow may degrade the banding causing mulga deaths and a reduction in the biota.

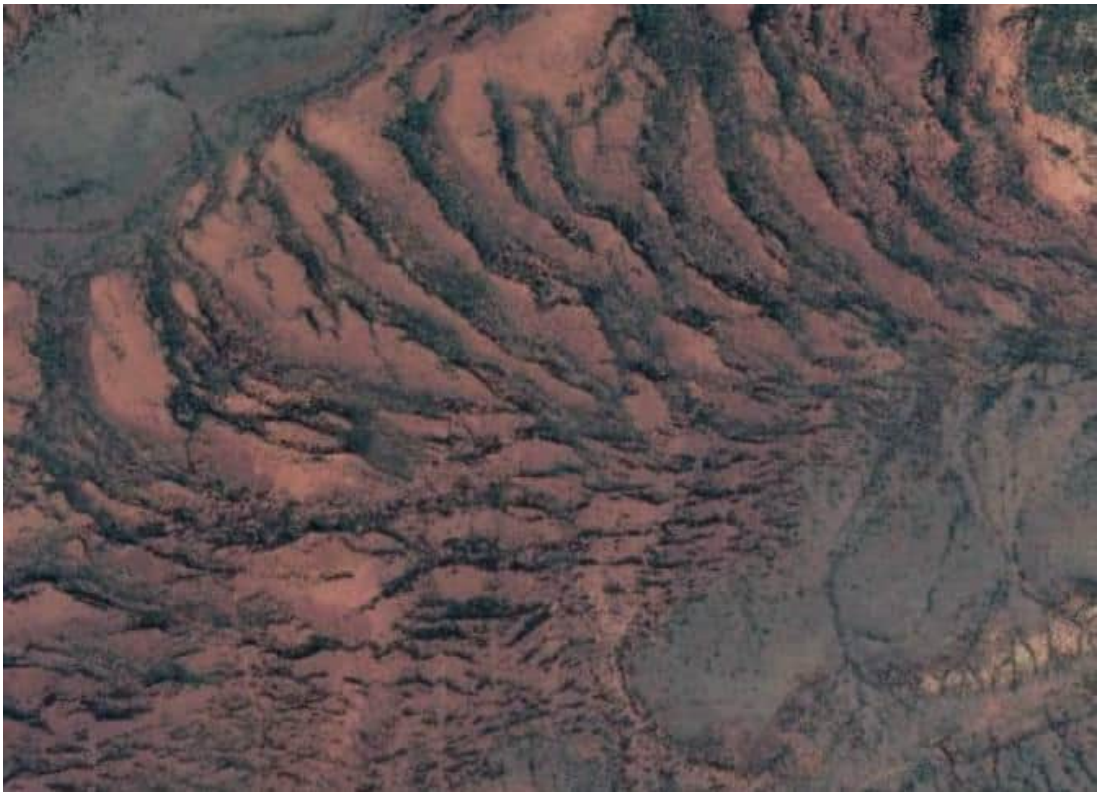


Plate 6.1: Mulga community in the Study Area displaying prominent mulga banding.

7 CONCLUSION

A single season Detailed flora and vegetation survey was completed over 12 days across the Study Area, with the majority of the major vegetation units visited and sampled. A total of 63 quadrats and 14 relevés were sampled across the Study Area to record the vegetation communities and their condition, as well as collecting an inventory of flora species present. In addition to the current assessment, the Study Area has been surveyed numerous times since 2005. These previous surveys were reviewed to supplement the current assessment. An additional 119 sites have been sampled within the Study Area, with 196 sample sites in total.

The field survey from the current assessment and the supplemented data from previous surveys recorded:

- 462 vascular flora taxa from 45 families and 95 genera, including 456 native species and six introduced taxa;
- No threatened flora taxa were recorded from the Study Area;
- Three priority listed taxa; *Eremophila capricornica* (P1), *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) and *Goodenia nuda* (P4) were recorded from the Study Area;
- No WoNS or declared plant pests were recorded from the Study Area;
- The six introduced taxa were; **Bidens bipinnata, *Cenchrus ciliaris, *Cenchrus setiger, *Flaveria trinervia, *Malvastrum americanum* and **Tribulus terrestris*;
- 46 vegetation units from 13 broad floristic formations were described and delineated from the Study Area;
- No TECs or PECs were recorded from the Study Area;
- Four vegetation associations, MA ApyPlMg EcoAciAcp CyaTtEua; MA AciAcp CcCs MgAmac; MA EcoEv CcTtCya AciApypMg; and MA Eco AcpAciEv MgApyp, are groundwater dependent as they support the facultative phreatophyte *Eucalyptus camaldulensis* subsp. *obtusa*;
- Sheet flow dependent ecosystems are present within the Study Area. Vegetation association HP AaChApr DopeErfoSeah TtChfAri is sheet flow dependent with prominent groving and intergroving present. Vegetation associations SP AptAcaoApr TbTs DopeSieErfo; and HP AaAptCdd SeaoErmaErfr Tb may be sheet flow dependent with minor groving and intergroving present. The actual reliance on sheet flow for the three vegetation associations has not been quantified; and
- The vegetation condition ranged from Degraded to Excellent, with the majority considered to be Excellent.

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9 APPENDICES

Appendix A: State and Federal Conservation Codes

International Union for Conservation of Nature

Category	Definition
Extinct (EX)	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Extinct in the Wild (EW)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Critically Endangered (CR)	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern (LTC	A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.
Not Evaluated (NE)	A taxon is Not Evaluated when it has not yet been evaluated against the criteria.

Environment Protection and Biodiversity Conservation Act 1999

Category	Definition
Threatened Flora Species	
Extinct (EX)	A native species is eligible to be included in the Extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (EW)	A native species is eligible to be included in the Extinct in the Wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CR)	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (EN)	A native species is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	A native species is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Conservation Dependent (CD)	A native species is eligible to be included in the Conservation Dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming Vulnerable, Endangered or Critically Endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; or (iii) the plan of management is in force under a law of the Commonwealth of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Category	Definition
Threatened Ecological Communities	
Critically Endangered	An ecological community is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	An ecological community is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	An ecological community is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered nor endangered; and (b) it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

Biodiversity Conservation Act 2016

Category	Definition
Threatened Flora Species	
Critically Endangered (CR)	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Published under schedule 1 of the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.
Endangered (EN)	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Published under schedule 2 of the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.
Vulnerable (VU)	Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Published under schedule 3 of the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.
Extinct (EX)	Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under schedule 4 of the Wildlife Conservation (Rare Flora) Notice 2018 for extinct flora.
Extinct in the Wild (EW)	Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened flora species listed as extinct in the wild.

Category	Definition
Threatened Ecological Communities	
Critically Endangered (CR)	An ecological community is eligible for listing in the category of critically endangered ecological community at a particular time if, at that time — (a) it is facing an extremely high risk of becoming eligible for listing as a collapsed ecological community in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines; and (b) listing in that category is otherwise in accordance with the ministerial guidelines.
Endangered (EN)	An ecological community is eligible for listing in the category of endangered ecological community at a particular time if, at that time — (a) it is not a critically endangered ecological community; and (b) it is facing a very high risk of becoming eligible for listing as a collapsed ecological community in the near future, as determined in accordance with criteria set out in the ministerial guidelines; and (c) listing in that category is otherwise in accordance with the ministerial guidelines.
Vulnerable (VU)	An ecological community is eligible for listing in the category of vulnerable ecological community at a particular time if, at that time — (a) it is not a critically endangered ecological community or an endangered ecological community; and (b) it is facing a high risk of becoming eligible for listing as a collapsed ecological community in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines; and (c) listing in that category is otherwise in accordance with the ministerial guidelines.
Collapsed	An ecological community is eligible for listing as a collapsed ecological community at a particular time if, at that time — (a) there is no reasonable doubt that the last occurrence of the ecological community has collapsed; or (b) the ecological community has been so extensively modified throughout its range that no occurrence of it is likely to recover — (i) its species composition or structure; or (ii) its species composition and structure.

Department of Biodiversity, Conservation and Attractions Priority Definitions

Category	Definition
Threatened Flora Species	
Priority 1 (P1)	**Poorly-known Species** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2 (P2)	**Poorly-known Species** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3 (P3)	**Poorly-known Species** Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4 (P4)	**Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Category	Definition
Threatened Ecological Communities	
Priority 1 (P1)	**Poorly-known ecological communities** Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
Priority 2 (P2)	**Poorly-known Ecological Communities** Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
Priority 3 (P3)	**Poorly-known Ecological Communities** (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; (iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Category	Definition
Priority 4 (P4)	**Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.** (i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
Priority 5 (P5)	**Conservation Dependent Ecological Communities** Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Appendix B: Sample Site Data

East Jimblebar & Caramulla

Site: CAR-01

Described by CvdB & SC
Date 9/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
233836mE; 7413215mN
Soil Loamy Sand
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia basedowii* low hummock grassland with *Acacia pachyacra*, *Acacia pruinocarpa* and *Acacia ancistrocarpa* mid to tall sparse shrubland with *Corymbia hamersleyana* low scattered trees

SPECIES LIST:

Name	Cover	Specimen
Acacia ancistrocarpa	0.1	
Acacia ayersiana	0.1	Car01.01
Acacia pachyacra	2	
Acacia pruinocarpa	1	
Acacia tetragonophylla	0.1	
Anthobolus leptomerioides	0.1	
Bonamia erecta	0.1	
Corymbia hamersleyana	0.1	
Cymbopogon ambiguus	0.1	
Dicrastylis cordifolia	0.1	
Eragrostis eriopoda	0.1	
Eremophila forrestii	0.1	
Eulalia aurea	0.1	
Euphorbia tannensis subsp. *eremophila*	0.1	Cvopp.04
Hakea lorea subsp. *lorea*	0.1	
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	Cvopp.06
Hybanthus aurantiacus	0.1	
Kennedia prorepens	0.1	Car01.02
Paraneurachne muelleri	0.1	
Ptilotus obovatus	0.1	
Senna artemisioides subsp. *helmsii*	0.1	
Senna artemisioides subsp. *oligophylla*	0.1	
Solanum lasiophyllum	0.1	
Triodia basedowii	50	

East Jimblebar & Caramulla

Site: CAR-02

Described by CvdB & SC
Date 9/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
232306mE; 7413323mN
Soil Silty Clay Loam
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia basedowii* mid hummock grassland with *Acacia aptaneura*, *Hakea lorea* subsp. *lorea* and *Corymbia candida* low sparse woodland over *Eremophila fraseri*, *Acacia aptaneura* mid sparse shrubland

SPECIES LIST:

Name	Cover	Specimen
Acacia pruinocarpa	0.1	
Amyema ? fitzgeraldii	0.1	
Enchylaena tomentosa var. *tomentosa*	0.1	
Eremophila fraseri subsp. *fraseri*	1	
Eulalia aurea	0.1	
Euphorbia tannensis subsp. *eremophila*	0.1	Cvopp.04
Hakea lorea subsp. *lorea*	1	
Psydrax latifolia	0.1	
Rhagodia sp. *Hamersley* (M. Trudgen 17794)	0.1	CAR02.01
Senna ? glaucifolia x ?	0.1	Car42.02
Senna artemisioides subsp. *helmsii*	0.1	
Senna artemisioides subsp. *oligophylla*	1.4	
Solanum lasiophyllum	0.1	
Triodia basedowii	50	

East Jimblebar & Caramulla

Site: CAR-03

Described by CvdB & SC
Date 10/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
230320mE; 7413452mN
Soil Silty Clay Loam
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Acacia pteraneura, Acacia aptaneura*, *Acacia sericophylla*, and *Acacia* sp. over mid sparse shrubs of *Senna artemisioides* subsp. *oligophylla*, *Eremophila margarethae* and *Eremophila latrobei* over isolated clumps of hummock and tussock grasses

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	2	
Acacia pteraneura	4	
Acacia sp.	0.3	Car03-01
Acacia tetragonophylla	0.1	
Anthobolus leptomerioides	0.1	
Aristida holathera	0.1	
Eragrostis setifolia	0.1	
Eremophila fraseri subsp. *fraseri*	0.2	
Eremophila latrobei subsp. *filiformis*	0.3	Car41.01
Eremophila margarethae	0.3	CAR10-03
Euphorbia tannensis subsp. eremophila	0.1	Cvopp.04
Grevillea berryana	0.1	Car03-02
Kennedia prorepens	0.1	CAR01.02
Psydrax latifolia		
Ptilotus schwartzii	0.1	Car07-01
Senna ? glaucifolia x ?	0.1	Car42.02
Senna artemisioides subsp. *helmsii*	0.1	
Senna artemisioides subsp. *oligophylla*	0.3	
Sida ectogama	0.2	
Solanum lasiophyllum	0.1	
Triodia basedowii	3	
Triodia basedowii	2	CAR03-03
Triodia melvillei	0.2	

East Jimblebar & Caramulla **Site:** CAR-05

Described by CvdB & SC
Date 10/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
228536mE; 7413807 mN
Soil Loamy Sand
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia basedowii* low hummock grassland with tall sparse shrubs of *Acacia ancistrocarpa* and *Hakea lorea* with mid sparse shrubs of *Senna* with occasional low *Corymbia hamersleyana*

SPECIES LIST:

Name	Cover	Specimen
Acacia ? kempeana	0.3	Car05-01
Acacia ancistrocarpa	2	
Acacia sericophylla	0.1	CAR14.01
Anthobolus leptomerioides	0.1	
Aristida latifolia	0.1	
Corymbia hamersleyana	1	
Eulalia aurea	0.1	
Hakea lorea subsp. *lorea*	2	
Kennedia prorepens	0.1	CAR01.02
Ptilotus obovatus	0.1	
Senna artemisioides subsp. *helmsii*	0.1	
Senna artemisioides subsp. *helmsii* x *oligophylla*	0.3	
Triodia basedowii	50	

East Jimblebar & Caramulla

Site: CAR-06

Described by CvdB & SC
Date 10/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
228004mE; 7412439mN
Soil Loamy Sand
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia basedowii* low hummock grassland with *Hakea lorea* subsp. *lorea*, *Acacia ancistrocarpa* and *Acacia pachyacra* mid to tall sparse shrubland with *Corymbia hamersleyana* and *Acacia pruinocarpa* low scattered trees

SPECIES LIST:

Name	Cover	Specimen
Acacia ancistrocarpa	1	
Acacia pachyacra		
Acacia pruinocarpa	0.1	
Acacia sericophylla	1	CAR14.01
Anthobolus leptomerioides	0.1	
Aristida inaequiglumis	0.1	
Cymbopogon ambiguus	0.1	
Eragrostis eriopoda	0.1	
Eremophila forrestii	0.1	
Eulalia aurea	0.1	
Hakea lorea subsp. *lorea*	1	
Kennedia prorepens	0.1	CAR01.02
Ptilotus obovatus	0.1	
Rhagodia eremaea	0.1	
Scaevola parvifolia subsp. *pilbarae*	0.1	
Senna artemisioides subsp. *helmsii*	0.1	
Solanum lasiophyllum	0.1	
Triodia basedowii	55	

East Jimblebar & Caramulla

Site: CAR-07

Described by CvdB & SC
Date 10/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
227305mE; 7413017mN
Soil Clay Loam
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Acacia aptaneura* and *Acacia wanyu* tall sparse shrubland with mid sparse shrubs of *Senna artemisioides* subsp. *oligophylla* and *Senna artemisioides* subsp. *helmsii* over low sparse shrubs

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	2	
Acacia wanyu	2	Car07-02
Cymbopogon ambiguus	0.1	
Ptilotus obovatus	0.2	
Ptilotus schwartzii	1	Car07-01
Rhagodia eremaea	0.1	
Senna ? glaucifolia x ?	0.2	Car42.02
Senna artemisioides subsp. *helmsii*	0.3	
Senna artemisioides subsp. *oligophylla*	0.2	
Solanum lasiophyllum	0.1	

East Jimblebar & Caramulla

Site: CAR-08

Described by CvdB & SC
Date 9/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
231647mE; 7413906mN
Soil Loamy Sand
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia basedowii* low hummock grassland with *E. fraseri*, *A. aptaneura* and mid to tall open shrub land with *Corymbia zygophylla*, *A. aptaneura* and *A. pruinocarpa* low scattered trees

SPECIES LIST:

Name	Cover	Specimen
Acacia ancistrocarpa	0.1	
Acacia aptaneura	4	
Acacia sp.	0.1	Car08.02
Acacia tetragonophylla	0.1	
Anthobolus leptomerioides	0.1	
Chrysopogon fallax	0.1	
Corymbia deserticola subsp. *deserticola*	0.1	
Eragrostis setifolia	0.1	
Eremophila fraseri subsp. *fraseri*	2	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Eremophila margarethae	0.1	CAR10-03
Euphorbia tannensis subsp. *eremophila*	0.1	Cvopp.04
Fimbristylis sp.	0.1	
Ipomoea muelleri	0.1	CAR09-01
Marsdenia australis	0.1	
Psydrax latifolia	0.1	
Ptilotus obovatus	0.1	
Rhagodia sp. *Hamersley* (M. Trudgen 17794)	0.1	CAR08.01
Santalum spicatum		
Senna artemisioides subsp. *helmsii*	0.1	
Senna artemisioides subsp. *oligophylla*	0.1	
Sida platycalyx	0.1	
Sida sp. dark green fruits (S. van Leeuwen 2260)	0.1	Car08.03
Solanum lasiophyllum	0.1	
Triodia basedowii	35	

East Jimblebar & Caramulla

Site: CAR-09

Described by CvdB & SC
Date 8/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
236200mE; 7411224 mN
Soil Sandy Clay Loam
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation Low open Mulga woodland over mid sparse shrubland of *Eremophila fraseri*, *Eremophila forrestii*

SPECIES LIST:

Name	Cover	Specimen
Acacia ? *aptaneura* (short/broad phyllode variant)	1	Cvopp.01
Acacia aptaneura	15	
Acacia sp. (Mulga Group)		
Cenchrus ciliaris	0.1	
Enchylaena tomentosa var. *tomentosa*	0.1	
Eragrostis eriopoda	0.1	
Eremophila forrestii	0.5	
Eremophila fraseri subsp. *fraseri*	0.5	
Eulalia aurea	0.3	
Ipomoea muelleri	0.1	CAR09-01
Paraneurachne muelleri	0.1	
Psydrax latifolia	0.3	
Ptilotus obovatus	0.2	
Rhagodia sp. *Hamersley* (M. Trudgen 17794)	0.1	CAR10-02
Senna artemisioides subsp. *helmsii*	0.1	
Senna artemisioides subsp. *oligophylla*	0.3	
Sida platycalyx	0.1	
Solanum lasiophyllum	0.1	

East Jimblebar & Caramulla

Site: CAR-10

Described by CvdB & SC
Date 8/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
235752mE; 7410392mN
Soil Sandy Clay Loam
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia* open hummock grassland with *A. aptaneura* sparse low woodland over mid sparse shrubs of *Eremophila fraseri*, *Senna artemisioides* subsp*. oligophylla and Eremophila margarethae*

SPECIES LIST:

Name	Cover	Specimen	
Acacia aptaneura	3		
Acacia pachyacra	0		
Acacia pruinocarpa	0.5		
Amyema ? fitzgeraldii	0.1		
Anthobolus leptomerioides	0.1		
Aristida inaequiglumis	0.1		
Eragrostis setifolia	0.1		
Eremophila forrestii	0.5		
Eremophila fraseri subsp. *fraseri*			
Eremophila margarethae	0.5	CAR10-03	
Eulalia aurea	0.1		
Grevillea wickhamii subsp*. hispidula*	0.1	CAR10-01	
Hakea lorea subsp. *lorea*	0.1		
Halgania ? solanacea var. Mt Doreen (G. M. Chippendale 4206)	0.1	CAR10-05	
Psydrax latifolia	0.1		
Ptilotus obovatus	0.1		
Rhagodia sp. *Hamersley* (M. Trudgen 17794)	0.1	CAR10-02	
Senna artemisioides subsp. *helmsii*	0.1		
Senna artemisioides subsp*. oligophylla*	0.5		
Solanum lasiophyllum	0.1		
Triodia basedowii	11	CAR10-04	

East Jimblebar & Caramulla

Site: CAR-11

Described by CvdB & SC
Date 11/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
230467mE; 7410897mN
Soil Loamy Sand
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia basedowii* low open hummock grassland with *Eulalia aurea* and *Eragrostis* mid open tussock grassland with *Corymbia candida*, *Corymbia hamersleyana* and *Acacia aptaneura* low scattered trees

SPECIES LIST:

Name	Cover	Specimen
Acacia ancistrocarpa	1	
Acacia aptaneura	0.1	
Acacia sericophylla	0.1	CAR14.01
Anthobolus leptomerioides	0.1	
Aristida inaequiglumis	0.1	
Corymbia candida subsp. *dipsodes*	2	CAR76.01
Corymbia hamersleyana	0.1	
Cymbopogon ambiguus	0.1	
Eragrostis eriopoda	0.1	
Eremophila ? capricornica	0.1	Car89.02
Eremophila fraseri subsp. *fraseri*	0.1	
Eulalia aurea	4	
Hakea lorea subsp. *lorea*	0.1	
Hibiscus sturtii var. *truncatus*	0.1	CAR11.01
Kennedia prorepens	0.1	CAR01.02
Psydrax latifolia	0.1	
Ptilotus obovatus	0.1	
Rhagodia eremaea	0.1	
Santalum lanceolatum	0.1	
Solanum lasiophyllum	0.1	
Triodia basedowii	15	

East Jimblebar & Caramulla

Site: CAR-12

Described by CvdB & SC
Date 11/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
229621mE; 7411011mN
Soil Clay Loam
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia basedowii* mid hummock grassland with *Acacia aptaneura*, *Acacia pachyacra* and *Hakea lorea* subsp. *lorea* mid to tall shrubland over *Eremophila forrestii* low scattered shrubs.

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	12	
Amyema ? fitzgeraldii	0.1	
Cleome viscosa	0.1	
Eremophila forrestii	1	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Eremophila margarethae	0.1	CAR10-03
Eulalia aurea	0.1	
Euphorbia tannensis subsp. *eremophila*	0.1	Cvopp.04
Hakea lorea subsp. *lorea*	0.1	
Ptilotus obovatus	0.1	
Rhagodia eremaea	0.1	
Senna ? glaucifolia x ?	0.1	Car42.02
Tribulus suberosus	0.1	
Triodia basedowii	40	

East Jimblebar & Caramulla

Site: CAR-13

Described by CvdB & SC
Date 10/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
230310mE; 7412361mN
Soil Sandy Clay Loam
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Acacia aptaneura* low open woodland with occasional *Corymbia zygophylla* low trees over open low *Triodia* hummock grassland

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	14	
Acacia inaequilatera	0.2	
Aristida contorta	0.1	
Corymbia deserticola subsp. *deserticola*	1	
Eremophila forrestii	0.3	
Eulalia aurea	1	
Euphorbia tannensis subsp. *eremophila*	0.1	Cvopp.04
Hakea lorea subsp. lorea	0.3	
Ptilotus obovatus	0.1	
Rhagodia eremaea	0.1	
Senna artemisioides subsp. helmsii	0.1	
Triodia basedowii	10	

East Jimblebar & Caramulla

Site: CAR-14

Described by CvdB & SC
Date 9/04/2019
Type Relevé
Season Poor
Location MGA Zone 51
231145mE; 7411739mN
Soil Loamy Sand
Rock Type None Discernible
Veg Condition Very Good
Fire Age Recent (0 to 2 yr)

Vegetation *Triodia basedowii* low scattered hummock grasses with *Hakea lorea* mid scattered shrubs with *C. hamersleyana*, *E. gamophylla* low scattered trees

SPECIES LIST:

Name	Specimen
Acacia sericophylla	Car14.01

East Jimblebar & Caramulla

Site: CAR-15

Described by CvdB & SC
Date 10/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
227576mE; 7410837mN
Soil Silty Loam
Rock Type CID
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia vanleeuwenii* low hummock grassland with *Grevillea wickhamii*, *Grevillea berryana* and *Acacia trudgeniana* mid to tall sparse shrubland

SPECIES LIST:

Name	Cover	Specimen
Acacia dictyophleba	0.1	
Acacia pachyacra	0.1	
Anthobolus leptomerioides	0.1	
Cymbopogon ambiguus	0.1	
Dodonaea coriacea	0.1	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Eulalia aurea	0.1	
Grevillea berryana	1	CAR90.01
Grevillea wickhamii subsp. *hispidula*	1	CAR52.02
Hakea lorea subsp. lorea	0.1	
Seringia elliptica	0.1	
Triodia vanleeuwenii	55	

East Jimblebar & Caramulla

Site: CAR-16

Described by CvdB & SC
Date 12/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
225898mE; 7410910mN
Soil Silty Clay Loam
Rock Type BIF
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation Low *Triodia vanleeuwenii* hummock grassland with low sparse shrubland of *Acacia hilliana* and *Calytrix* with occasional *Acacia pruinocarpa*

SPECIES LIST:

Name	Cover	Specimen
Acacia ? catenulata subsp. *occidentalis*	0.1	Car16-01
Acacia hilliana	4	
Acacia pachyacra	0.2	
Acacia pruinocarpa	0.2	
Acacia tetragonophylla	0.1	
Calytrix desolata	2	
Cymbopogon ambiguus	0.1	
Eriachne mucronata	0.1	
Eulalia aurea	0.1	
Grevillea berryana	0.1	CAR90.01
Hakea lorea subsp. *lorea*	0.1	
Paraneurachne muelleri	0.1	
Ptilotus calostachyus	0.1	
Ptilotus obovatus	0.1	
Ptilotus rotundifolius	0.1	
Senna glutinosa subsp. *luerssenii*	0.1	
Seringia elliptica	1	
Triodia vanleeuwenii	45	

East Jimblebar & Caramulla

Site: CAR-17

Described by CvdB & SC
Date 11/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
225588mE; 7414131mN
Soil Silty Clay Loam
Rock Type None Discernible
Veg Condition Good
Fire Age Old (6+ yr)

Vegetation *Acacia aptaneura* tall shrubland over *Triodia basedowii* low scattered hummock grassland

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	20	
Acacia pruinocarpa	0.1	
Acacia wanyu	0.1	CAR17.01
Cymbopogon ambiguus	0.1	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Ptilotus obovatus	0.1	
Rhagodia eremaea	0.1	
Triodia basedowii	1	

East Jimblebar & Caramulla

Site: CAR-18

Described by CvdB & SC
Date 12/04/2019
Type Quadrat 100m x 25m
Season Poor
Location MGA Zone 51
226227mE; 7409384mN
Soil Sand
Rock Type None Discernible
Veg Condition Good
Fire Age Old (6+ yr)

Vegetation *Acacia citrinoviridis*, *Acacia coriacea* subsp. *pendens* and *Eucalyptus camaldulensis* subsp. *obtusa* low sparse woodland over *Melaleuca glomerata* tall scattered shrubs over *Cenchrus ciliaris*, *Cymbopogon ambiguus* and *Eulalia aurea* mid scattered tussock grasses

SPECIES LIST:

Name	Cover	Specimen
Acacia citrinoviridis	3	Car20.03
Acacia coriacea subsp. *pendens*	2	Car20.02
Acacia pyrifolia	0.1	
Aristida holathera	0.1	
Cenchrus ciliaris	1	
Cleome viscosa	0.1	
Cymbopogon ambiguus	0.1	
Cyperus ? ixiocarpus	0.1	
Eucalyptus camaldulensis subsp. *obtusa*	0.1	Car20.04
Eucalyptus victrix	0.1	
Eulalia aurea	0.1	
Melaleuca glomerata	1	Car20.01
Senna artemisioides	0.1	
Solanum lasiophyllum	0.1	
Tephrosia rosea var. *Fortescue creeks*	0.1	
Themeda triandra	0.1	
Tribulus suberosus	0.1	
Triodia pungens	0.1	
Triumfetta chaetocarpa	0.1	Car18.01

East Jimblebar & Caramulla

Site: CAR-19

Described by CvdB & SC
Date 12/04/2019
Type Quadrat 100m x 25m
Season Poor
Location MGA Zone 51
225478mE; 7411286mN
Soil Sand
Rock Type None Discernible
Veg Condition Good
Fire Age Old (6+ yr)

Vegetation *Melaleuca glomerata* tall open shrubland with *Acacia citrinoviridis*, *Acacia coriacea* subsp. *pendens* and *Eucalyptus camaldulensis* subsp. *obtusa* low sparse woodland over *Cenchrus ciliaris*, *Eulalia aurea* and *Themeda triandra* low sparse tussock grassland

SPECIES LIST:

Name	Cover	Specimen
Acacia citrinoviridis	5	Car20.03
Acacia coriacea subsp. *pendens*	3	Car20.02
Acacia pyrifolia	0.1	
Acacia tetragonophylla	0.1	
Aristida sp.	0.1	
Bidens bipinnata	0.1	
Cenchrus ciliaris	4	
Chrysopogon fallax	0.1	
Cleome viscosa	0.1	
Cymbopogon ambiguus	0.1	
Cyperus ? ixiocarpus	0.1	
Eragrostis ? elongata	0.1	CAR19.01
Eucalyptus camaldulensis subsp. *obtusa*	1	Car20.04
Eucalyptus victrix	0.1	
Eulalia aurea	2	
Melaleuca glomerata	12	Car20.01
Themeda triandra	0.1	

East Jimblebar & Caramulla

Site: CAR-20

Described by CvdB & SC
Date 11/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
225264mE; 7414220mN
Soil Sand
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Melaleuca glomerata* tall open shrubland over *Cenchrus ciliaris* low sparse tussock grassland with *Acacia citrinoviridis*, *Acacia coriacea* subsp. *pendens* and *Eucalyptus camaldulensis* low scattered trees

SPECIES LIST:

Name	Cover	Specimen
Acacia citrinoviridis	1	Car20.03
Acacia coriacea subsp. pendens	1	Car20.02
Acacia pyrifolia	0.1	
Cenchrus ciliaris	3	
Cymbopogon ambiguus	0.1	
Eucalyptus camaldulensis subsp. *obtusa*	0.1	Car20.04
Eulalia aurea	0.1	
Melaleuca glomerata	20	Car20.01
Themeda triandra	0.1	
Triodia pungens	0.1	

East Jimblebar & Caramulla

Site: CAR-21

Described by CvdB & SC
Date 13/04/2019
Type Quadrat 100m x 25m
Season Poor
Location MGA Zone 51
225447mE;7412917mN
Soil Sand
Rock Type None Discernible
Veg Condition Good
Fire Age Old (6+ yr)

Vegetation Tall *Melaleuca glomerata* shrubland with low *Acacia citrinoviridis* and *A. coriacea* low open woodland with occasional *Eucalyptus camaldulensis* over open *Cenchrus ciliaris* tussock grassland on islands

SPECIES LIST:

Name	Cover	Specimen
Acacia citrinoviridis	4	Car20.03
Acacia coriacea subsp. *pendens*	3	Car20.02
Acacia pyrifolia var. *pyrifolia*	0.1	
Amyema ? fitzgeraldii	0	
Aristida sp.	0.1	
Cenchrus ciliaris	4	
Cleome viscosa	0.1	
Cymbopogon ambiguus	0.2	
Eragrostis ? elongata	0.1	CAR19.01
Eucalyptus camaldulensis subsp. *obtusa*	3	Car20.04
Eulalia aurea	0.3	
Melaleuca glomerata	12	Car20.01
Themeda triandra	0.1	
Triodia pungens	0.1	

East Jimblebar & Caramulla **Site:** CAR-22

Described by CvdB & SC
Date 12/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
226431mE; 7409805mN
Soil Loamy Sand
Rock Type Mudstone
Veg Condition Very Good
Fire Age Old (6+ yr)

Vegetation Mid open *Acacia sericophylla*, *A. sclerolaena* shrubland over low sparse shrubs of *Eremophila margarethae* and *Scaevola spinescens* with occasional tussock and hummock grasses and *Corymbia hamersleyana* trees

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	0.1	
Acacia citrinoviridis	0.5	Car20.03
Acacia coriacea subsp. *pendens*	0.1	Car20.02
Acacia sclerosperma subsp. *sclerosperma*	1	
Acacia sericophylla	18	
Acacia tetragonophylla	0.2	
Anthobolus leptomerioides	0.2	
Aristida inaequiglumis	0.1	
Corymbia hamersleyana	0.5	
Cymbopogon ambiguus	0.1	
Duperreya commixta	0.1	
Eremophila margarethae	0.3	CAR10-03
Eulalia aurea	0.1	
Hibiscus sp.	0.1	Car22-01
Ptilotus obovatus	0.1	
Rhagodia eremaea	0.1	
Scaevola spinescens	0.1	
Senna glutinosa subsp. *luerssenii*	0.2	
Senna sp. Meekatharra (E. Bailey 1-26)	0.1	Car22-03
Senna stricta	0.1	Car22-02
Solanum lasiophyllum	0.1	
Themeda triandra	0.7	
Triodia basedowii	0.5	

East Jimblebar & Caramulla

Site: CAR-23

Described by CvdB & SC
Date 13/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
224995mE;7415008mN
Soil Clay Loam
Rock Type None Discernible
Veg Condition Good
Fire Age Old (6+ yr)

Vegetation *Acacia sclerosperma* subsp. *sclerosperma*, *Acacia aptaneura* and *Acacia pteraneura* tall open shrubland over *Eulalia aurea*, *Aristida inaequiglumis* and *Eragrostis* sp. low sparse tussock grassland with *Corymbia hamersleyana*, *Acacia aptaneura* and *Acacia pteraneura*

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	5	
Acacia citrinoviridis	0.1	Car20.03
Acacia pachyacra	0.1	
Acacia pteraneura	0.1	
Acacia sclerosperma subsp. *sclerosperma*	8	
Acacia tetragonophylla	0.1	
Amyema ? fitzgeraldii	0.1	
Capparis lasiantha	0.1	
Cenchrus ciliaris	0.1	
Chrysopogon fallax	0.1	
Corymbia hamersleyana	2	
Duperreya commixta	0.1	
Eremophila forrestii	0.1	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Eulalia aurea	2	
Hakea lorea subsp. *lorea*	0.1	
Ptilotus obovatus	0.1	
Rhagodia eremaea	0.1	
Sclerolaena cornishiana	0.1	
Senna artemisioides subsp. *helmsii*	0.1	
Senna artemisioides subsp. *oligophylla*	0.1	
Senna artemisioides subsp. *oligophylla*	0.1	
Senna sp. Meekatharra (E. Bailey 1-26)	0.1	CAR30.01
Sida platycalyx	0.1	
Solanum lasiophyllum	0.1	
Themeda triandra	0.1	

East Jimblebar & Caramulla

Site: CAR-24

Described by CvdB & SC
Date 13/04/2019
Type Relevé
Season Poor
Location MGA Zone 51
224925mE; 7414423mN
Soil Loamy Sand
Rock Type None Discernible
Veg Condition Degraded
Fire Age Old (6+ yr)
Vegetation *Acacia aptaneura* tall open shrubland

East Jimblebar & Caramulla

Site: CAR-25

Described by CvdB & SC
Date 13/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone51
225012mE; 7414122mN
Soil Clayey Sand
Rock Type None Discernible
Veg Condition Very Good
Fire Age Old (6+ yr)

Vegetation *Triodia basedowii* mid hummock grassland over *Cenchrus ciliaris* and *Eragrostis eriopoda* low sparse tussock grassland with *Acacia sclerosperma* subsp. *sclerosperma*, *Hakea lorea* subsp. *lorea* tall scattered shrubs with *Corymbia hamersleyana* low scattered trees

SPECIES LIST:

Name	Cover	Specimen
Acacia coriacea subsp. *pendens*	0.1	Car20.02
Acacia pachyacra	0.1	
Acacia sclerosperma subsp. *sclerosperma*	1	
Aristida inaequiglumis	0.1	
Aristida sp.	0.1	
Bonamia erecta	0.1	
Cenchrus ciliaris	8	
Chrysocephalum apiculatum subsp. *pilbarense*	0.1	
Corymbia hamersleyana	1	
Cymbopogon ambiguus	0.1	
Eragrostis eriopoda	0.1	
Gossypium australe	0.1	
Hakea lorea subsp. *lorea*	1	
Jasminum didymum subsp. *lineare*	0.1	
Kennedia prorepens	0.1	CAR01.02
Pterocaulon sphacelatum	0.1	CAR30.02
Scaevola parvifolia subsp. *pilbarae*	0.1	
Senna artemisioides subsp. *helmsii*	0.1	
Tephrosia sp.	0.1	
Tephrosia supina	0.1	CAR25.02
Triodia basedowii	45	

East Jimblebar & Caramulla

Site: CAR-26

Described by CvdB & SC
Date 15/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
223775mE; 7412666mN
Soil Light Clay
Rock Type CID
Veg Condition Good
Fire Age Old (6+ yr)
Vegetation *Eriachne benthamii*, *Eulalia aurea* low open tussock grassland

SPECIES LIST:

Name	Cover	Specimen
Alternanthera angustifolia	0.1	Car26.02
Boerhavia coccinea	0.1	
Cleome viscosa	0.1	
Cyperus iria	0.1	Car26.03
Dactyloctenium radulans	0.1	
Eriachne benthamii	15	CAR26.01
Eulalia aurea	0.1	
Maireana villosa	0.1	Car26.04
Marsilea sp.	0.1	
Sesbania cannabina	0.1	
Solanum cleistogamum	0.1	
Solanum lasiophyllum	0.1	

East Jimblebar & Caramulla

Site: CAR-27

Described by CvdB & SC
Date 16/04/2019
Type Relevé
Season Poor
Location MGA Zone 51
224048mE; 7409805 mN
Soil Light Clay
Rock Type None Discernible
Veg Condition Very Good
Fire Age Old (6+ yr)

Vegetation *Acacia aptaneura*, *Grevillea berryana* and *Acacia victoriae* scattered tall shrubs over *Senna* sp. Meekatharra and *Eremophila lanceolata* low scattered shrubs.

SPECIES LIST:

Name	Specimen
Eremophila lanceolata	CAR27.01

East Jimblebar & Caramulla

Site: CAR-28

Described by CvdB & SC
Date 15/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
223554mE; 7412832mN
Soil Light Clay
Rock Type None Discernible
Veg Condition Good
Fire Age Old (6+ yr)

Vegetation *Eriachne benthamii, Chrysopogon fallax* and *Eulalia aurea* low open tussock grassland with *Acacia aptaneura* tall sparse shrubland with *Corymbia candida* low scattered trees

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	6	
Acacia tetragonophylla	0.1	
Amyema ? fitzgeraldii	0.1	
Aristida sp.	0.1	
Bidens bipinnata	0.1	
Cheilanthes sp.	0.1	
Chrysopogon fallax	1	
Corymbia candida subsp. dipsodes	*0.1*	*CAR76.01*
Enchylaena tomentosa var. tomentosa	0.1	
Eriachne benthamii	10	Car28.01
Eulalia aurea	1	
Hakea lorea subsp. lorea	0.1	
Senna artemisioides subsp. oligophylla	0.1	
Solanum cleistogamum	0.1	
Solanum lasiophyllum	0.1	

East Jimblebar & Caramulla

Site: CAR-29

Described by CvdB & SC
Date 12/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
225253mE; 7412340mN
Soil Silty Clay Loam
Rock Type None Discernible
Veg Condition Very Good
Fire Age Old (6+ yr)

Vegetation *Acacia aptaneura*, *Acacia sclerosperma* and *Acacia tetragonophylla* over low sparse shrubland of *Senna* and *Ptilotus obovatus*

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	5	
Acacia sclerosperma subsp. *sclerosperma*	1	
Acacia tetragonophylla	2	
Enchylaena tomentosa var. *tomentosa*	0.1	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Eulalia aurea	0.3	
Gossypium australe	0.1	
Maireana sp.	0.1	
Ptilotus obovatus	1	
Rhagodia eremaea	0.1	
Sclerolaena cornishiana		
Senna sp. Meekatharra (E. Bailey 1-26)	0.1	CAR30.01
Solanum lasiophyllum	0.1	

East Jimblebar & Caramulla

Site: CAR-30

Described by CvdB & SC
Date 12/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
224854mE; 7409428mN
Soil Silty Clay Loam
Rock Type None Discernible
Veg Condition Very Good
Fire Age Old (6+ yr)

Vegetation Low *Acacia aptaneura* woodland over sparse low *Senna* shrubs over isolated clumps of hummock and tussock grasses

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	20	
Acacia coriacea subsp. *pendens*	0.1	Car20.02
Aristida inaequiglumis	0.5	
Cenchrus ciliaris	0.2	
Cymbopogon ambiguus	0.1	
Duperreya commixta	0.1	
Enchylaena tomentosa var. *tomentosa*	0.1	
Eremophila forrestii	0.1	
Eulalia aurea	0.5	
Hakea lorea subsp. *lorea*	0.2	
Ipomoea muelleri	0.1	CAR09-01
Psydrax latifolia	0.2	
Ptilotus obovatus	0.1	
Rhagodia eremaea	0.1	
Sclerolaena cornishiana	0.1	
Senna artemisioides subsp. *oligophylla*	0.3	
Senna sp. Meekatharra (E. Bailey 1-26)	0.2	Car30-01
Sida platycalyx	0.1	
Solanum lasiophyllum	0.1	
Triodia basedowii	0.5	

East Jimblebar & Caramulla

Site: CAR-31

Described by CvdB & SC
Date 13/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
224604mE; 7413225mN
Soil Silty Loam
Rock Type BIF
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia vanleeuwenii* low hummock grassland with *Ptilotus rotundifolius, Senna artemisioides* subsp. *helmsii* and *Tribulus suberosus* low scattered shrubs with *Acacia trudgeniana* and *Acacia pruinocarpa* tall scattered shrubs

SPECIES LIST:

Name	Cover	Specimen
Acacia adsurgens	0.1	Car31.01
Acacia trudgeniana	0.1	
Aristida contorta	0.1	
Cucumis variabilis	0.1	
Cymbopogon ambiguus	0.1	
Eriachne mucronata	0.1	
Ptilotus calostachyus	0.1	
Ptilotus obovatus	0.1	
Ptilotus rotundifolius	1	
Rhagodia eremaea	0.1	
Senna artemisioides subsp. *helmsii*	0.1	
Senna glutinosa subsp. *luerssenii*	0.1	
Tribulus suberosus	0.1	
Triodia vanleeuwenii	45	

East Jimblebar & Caramulla

Site: CAR-32

Described by CvdB & SC
Date 17/04/2019
Type Relevé
Season Poor
Location MGA Zone 51
221861mE; 7412718mN
Soil Clay Loam
Rock Type CID
Veg Condition Very Good
Fire Age Old (6+ yr)
Vegetation *Acacia aptaneura* tall scattered shrubs over *Triodia basedowii* low isolated patches of hummock grasses

East Jimblebar & Caramulla

Site: CAR-33

Described by CvdB & SC
Date 17/04/2019
Type Quadrat 100m x 25m
Season Poor
Location MGA Zone 51
222368mE; 7412214mN
Soil Clay Loam
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Acacia aptaneura*, *Acacia* sp. and *Corymbia hamersleyana* low open woodland over *Eulalia aurea*, *Themeda triandra* and *Chrysopogon fallax* sparse tussock grassland over *Triodia basedowii* low scattered hummock grasses

SPECIES LIST:

Name	Cover	Specimen
Abutilon cryptopetalum	0.1	
Acacia aptaneura	20	
Acacia sp.	1	CAR49.02
Acacia tetragonophylla	0.1	
Aristida inaequiglumis	0.1	
Aristida sp.	0.1	
Chrysopogon fallax	1	
Corymbia candida subsp. *dipsodes*	1	CAR76.01
Corymbia hamersleyana	1	
Dodonaea petiolaris	0.1	
Eremophila forrestii	0.1	
Eremophila fraseri subsp. *fraseri*	0.1	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Eulalia aurea	6	
Ipomoea muelleri	0.1	CAR09.01
Malvaceae sp.	0.1	CAR54.04
Psydrax latifolia	0.1	
Psydrax suaveolens	0.1	
Rhagodia eremaea	0.1	
Rhagodia sp. *Hamersley* (M. Trudgen 17794)	0.1	
Sida fibulifera	0.1	
Themeda triandra	2	
Triodia basedowii	1	

East Jimblebar & Caramulla

Site: CAR-34

Described by CvdB & SC
Date 16/04/2019
Type Relevé
Season Poor
Location MGA Zone 51
220290mE; 7411474 mN
Soil Light Clay
Rock Type CID
Veg Condition Very Good
Fire Age Old (6+ yr)
Vegetation *Acacia aptaneura* tall scattered shrubs over *Triodia basedowii* isolated patches of hummock grasses

East Jimblebar & Caramulla

Site: CAR-35

Described by CvdB & SC
Date 16/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
221846mE; 7411399mN
Soil Clay Loam
Rock Type None Discernible
Veg Condition Very Good
Fire Age Old (6+ yr)

Vegetation Low *Acacia aptaneura* woodland over *Triodia basedowii* mid hummock grassland with sparse *Eremophila forrestii* shrubs

SPECIES LIST:

Name	Cover	Specimen
Acacia ? pyrifolia var. *morrisonii*	0.1	
Acacia aptaneura	27	
Acacia pruinocarpa	0.1	
Dodonaea petiolaris	0.1	
Eremophila forrestii	1	
Euphorbia tannensis subsp. *eremophila*	0.1	Cvopp.04
Psydrax latifolia	0.1	
Rhagodia sp. *Hamersley* (M. Trudgen 17794)	0.1	
Senna ? glaucifolia x ?	Car42.02	
Triodia vanleeuwenii	25	

East Jimblebar & Caramulla

Site: CAR-36

Described by CvdB & SC
Date 17/04/2019
Type Relevé
Season Poor
Location MGA Zone 51
220085mE; 7411500mN
Soil Clay Loam
Rock Type CID
Veg Condition Very Good
Fire Age Old (6+ yr)
Vegetation *Acacia aptaneura* and *Acacia pruinocarpa* tall scattered shrubs over *Triodia basedowii* low scattered hummock grasses.

East Jimblebar & Caramulla

Site: CAR-37

Described by CvdB & SC
Date 16/04/2019
Type Quadrat 100m x 25m
Season Poor
Location MGA Zone 51
220085mE; 7411500mN
Soil Light Clay
Rock Type None Discernible
Veg Condition Very Good
Fire Age Moderate (3 to 5 yr)

Vegetation *Acacia aptaneura, Corymbia hamersleyana* and *Acacia pruinocarpa* low open woodland over *Dodonaea petiolaris* and *Eremophila forrestii* mid scattered shrubs over *Triodia basedowii* low scattered hummock grasses and *Chrysopogon fallax* and *Eulalia aurea* low scattered tussock grassland

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	20	
Acacia pruinocarpa	0.1	
Bonamia erecta	0.1	
Chrysocephalum apiculatum subsp. *pilbarense*	0.1	CAR25.01
Chrysopogon fallax	0.1	
Corymbia hamersleyana	3	
Cymbopogon ambiguus	0.1	
Dodonaea petiolaris	0.1	
Duperreya commixta	0.1	
Enchylaena tomentosa var. *tomentosa*	0.1	
Eragrostis ? eriopoda	1	
Eremophila forrestii	0.1	
Eulalia aurea	1	
Hakea lorea subsp. *lorea*	0.1	
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	Cvopp.06
Indigofera linnaei	0.1	
Petalostylis labicheoides	0.1	
Psydrax latifolia	0.1	
Ptilotus obovatus	0.1	
Rhagodia sp. Hamersley (M. Trudgen 17794)	0.1	Car37.03
Senna artemisioides subsp. *helmsii*	0.1	
Sida fibulifera	0.1	
Triodia basedowii	2	

East Jimblebar & Caramulla

Site: CAR-38

Described by CvdB & SC
Date 16/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
223700mE; 7411180mN
Soil Silty Loam
Rock Type Dolerite
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia vanleeuwenii* low hummock grassland with *Acacia adsurgens*, *Acacia ancistrocarpa* and *Grevillea wickhamii* tall sparse shrubs with *Eucalyptus gamophylla and Corymbia zygophylla* low scattered trees

SPECIES LIST:

Name	Cover	Specimen
Acacia adsurgens	1	Cvopp.12
Acacia ancistrocarpa	0.1	
Acacia bivenosa	0.1	
Acacia hilliana	0.1	
Acacia inaequilatera	0.1	
Acacia pruinocarpa	0.1	
Acacia tetragonophylla	0.1	
Anthobolus leptomerioides	0.1	
Aristida sp.	0.1	
Corymbia deserticola subsp. *deserticola*	0.1	
Cymbopogon ambiguus	0.1	
Dodonaea coriacea	0.1	
Dodonaea petiolaris	0.1	
Duperreya commixta	0.1	
Eragrostis setifolia	0.1	
Eragrostis sp.	0.1	Car38.01
Eremophila fraseri subsp. *fraseri*	0.1	
Eremophila latrobei subsp. *latrobei*	0.1	CAR48.01
Eriachne mucronata	0.1	
Eucalyptus gamophylla	1	
Eulalia aurea	0.1	
Eulalia aurea	0.1	
Grevillea wickhamii subsp. *hispidula*	0.1	CAR52.02
Hibiscus sturtii var. *campylochlamys*	0.1	CAR48.04
Psydrax latifolia	0.1	
Scaevola spinescens	0.1	
Senna ? glaucifolia x ?	0.1	Car42.02
Senna glutinosa subsp. *pruinosa*	0.1	
Solanum centrale	0.1	Cvopp.10
Solanum lasiophyllum	0.1	
Triodia vanleeuwenii	50	

East Jimblebar & Caramulla

Site: CAR-39

Described by CvdB & SC
Date 16/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
223838mE; 7410722mN
Soil Silty Clay Loam
Rock Type Conglomerate
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation Mid open *Acacia sericophylla* and *Senna artemisioides* subsp. *artemisioides* shrubland over low sparse *Maireana thesioides* and *Eremophila cuneifolia* shrubs

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	0.5	
Acacia sericophylla	22	
Acacia tetragonophylla	0.2	
Aristida contorta	0.1	
Enneapogon polyphyllus	0.1	Car39-02
Eremophila ? capricornica	0.3	Car89.02
Eremophila forrestii	2	
Eremophila latrobei subsp. *latrobei*	0.1	CAR48.01
Hibiscus sp.	0.1	
Maireana melanocoma	0.1	
Maireana triptera	1	
Ptilotus obovatus	0.1	
Santalum spicatum	0.5	
Scaevola spinescens	0.1	
Senna glutinosa subsp. *luerssenii*	0.3	
Senna sp. Meekatharra (E. Bailey 1-26)	0.2	CAR30.01
Senna stricta	5	Car39-01
Solanum lasiophyllum	0.1	
Tribulus suberosus	0.2	
Triodia vanleeuwenii	0.1	

East Jimblebar & Caramulla

Site: CAR-40

Described by CvdB & SC
Date 16/04/2019
Type Relevé
Season Poor
Location MGA Zone 51
224003mE; 7411898
Soil Light Clay
Rock Type None Discernible
Veg Condition Very Good
Fire Age Old (6+ yr)
Vegetation *Acacia aptaneura* tall scattered shrubs over *Senna artemisioides* subsp. *helmsii* and *Sida platycalyx* low scattered shrubs

East Jimblebar & Caramulla

Site: CAR-41

Described by CvdB & SC
Date 15/04/2019
Type Quadrat 100m x 25m
Season Poor
Location MGA Zone 51
223100mE; 7412833mN
Soil Clay Loam
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Acacia aptaneura*, *Acacia* sp. and *Corymbia hamersleyana* low woodland over *Themeda triandra*, *Eulalia aurea* and *Chrysopogon fallax* mid sparse tussock grassland with *Dodonaea petiolaris* and *Acacia* sp. tall to mid sparse shrubland

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	40	
Acacia sp.	2	CAR08.02
Acacia sp.	1	CAR49.02
Aristida latifolia	0.1	
Chrysopogon fallax	1	
Corymbia hamersleyana	1	
Dodonaea petiolaris	0.1	
Duperreya commixta	0.1	
Eragrostis sp.	0.1	
Eremophila forrestii	0.1	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Eulalia aurea	1	
Ipomoea muelleri	0.1	CAR09.01
Malvaceae sp.	0.1	CAR54.04
Psydrax latifolia	0.1	
Psydrax suaveolens	0.1	
Ptilotus obovatus	0.1	
Sida fibulifera	0.1	
Themeda triandra	1	
Triodia basedowii	0.1	

East Jimblebar & Caramulla

Site: CAR-42

Described by CvdB & SC
Date 8/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
225309mE; 7407946mN
Soil Loamy Sand
Rock Type Quartz
Veg Condition Very Good
Fire Age Old (6+ yr)

Vegetation *Triodia schinzii* low open hummock grassland with *Acacia aptaneura*, *Eremophila fraseri* mid to tall sparse shrubland with *Acacia aptaneura* low scattered trees

SPECIES LIST:

Name	Cover	Specimen
Acacia ancistrocarpa	0.1	
Acacia aptaneura	6	
Acacia tetragonophylla	0.1	
Anthobolus leptomerioides	0.1	
Corymbia hamersleyana	0.1	
Eremophila forrestii	0.1	
Eremophila fraseri subsp. *fraseri*	1	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Hakea lorea subsp. *lorea*	0.1	
Psydrax latifolia	0.1	
Senna ? *glaucifolia* x ?	0.1	Car42.02
Senna artemisioides subsp. *helmsii*	1	
Solanum lasiophyllum	0.1	
Trichodesma zeylanicum	0.1	
Triodia schinzii	20	Car42.01

East Jimblebar & Caramulla

Site: CAR-43

Described by CvdB & SC
Date 16/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
223656mE; 7409191mN
Soil Sandy Clay Loam
Rock Type Quartz
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia basedowii* mid open hummock grassland with tall sparse *Acacia aptaneura* shrubland over mid to tall sparse *Senna* and *Eremophila* shrubs

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	7	
Acacia sp.	0.3	Car43-02
Aristida sp.	0.1	
Cheilanthes sieberi subsp. *sieberi*	0.1	Car86.01
Cymbopogon ambiguus	0.1	
Enchylaena tomentosa var. *tomentosa*	0.1	
Eremophila ? *capricornica*	0.3	Car89.02
Eremophila fraseri subsp. *fraseri*	1	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Euphorbia tannensis subsp. *eremophila*	0.1	Cvopp.04
Hakea lorea subsp. *lorea*	0.2	
Ptilotus obovatus	0.1	
Ptilotus schwartzii	0.1	Car07-01
Rhagodia sp. Hamersley (M. Trudgen 17794)	0.1	Car43-01
Senna ? sp. Meekatharra (E. Bailey 1-26) x ?	0.1	
Senna sp.	0.1	CAR54.01
Sida platycalyx	0.1	
Tribulus suberosus	0.1	
Triodia basedowii	20	

East Jimblebar & Caramulla

Site: CAR-44

Described by CvdB & SC
Date 16/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
223602mE; 7410286mN
Soil Sandy Clay Loam
Rock Type Dolerite
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation Low *Triodia vanleeuwenii* hummock grassland with tall sparse shrubland of *Senna glutinosa* subsp. *luerssenii*, *Acacia ancistrocarpa* and *Hakea lorea* over sparse mid shrubs of *Seringia* and *Eremophila* spp.

SPECIES LIST:

Name	Cover	Specimen
Acacia ancistrocarpa	1.5	
Acacia aptaneura	0.5	
Acacia tetragonophylla	0.1	
Cymbopogon ambiguus	0.1	
Dodonaea petiolaris	0.3	
Duperreya commixta	0.1	
Enchylaena tomentosa var. *tomentosa*	0.1	
Eremophila ? *capricornica*	0.1	Car89.02
Eremophila cuneifolia	0.1	
Eremophila forrestii	0.1	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Eremophila latrobei subsp. *latrobei*	0.2	Car44-01
Eulalia aurea	0.1	
Hakea lorea subsp. *lorea*	1	
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	Cvopp.06
Psydrax latifolia	0.1	
Ptilotus calostachyus	0.1	
Ptilotus rotundifolius	0.2	
Rhagodia sp. Hamersley (M. Trudgen 17794)	0.1	Car44-02
Senna artemisioides subsp. *helmsii*	0.1	
Senna glutinosa subsp. *luerssenii*	1	
Senna glutinosa subsp. *pruinosa*	0.1	
Senna stricta	0.1	CAR39.01
Solanum lasiophyllum	0.1	
Tribulus suberosus	0.1	
Triodia vanleeuwenii	45	

East Jimblebar & Caramulla

Site: CAR-45

Described by CvdB & SC
Date 17/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
222325mE; 7410462mN
Soil Silty Loam
Rock Type Dolerite
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia vanleeuwenii* low hummock grassland with *Acacia bivenosa*, *Grevillea berryana* and *Acacia aptaneura* tall sparse shrubland over *Senna glutinosa* subsp. *luerssenii* mid scattered shrubs

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	0.1	
Acacia ayersiana	0.1	Car45.01
Acacia bivenosa	1	
Acacia sp.	1	CAR49.02
Anthobolus leptomerioides	0.1	
Cymbopogon ambiguus	0.1	
Eremophila forrestii	0.1	
Eremophila latrobei subsp. *latrobei*	0.1	CAR48.01
Eriachne sp.	0.1	
Grevillea berryana	1	CAR90.01
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	Cvopp.06
Ptilotus obovatus	0.1	
Ptilotus rotundifolius	0.1	
Scaevola spinescens	0.1	
Senna artemisioides subsp. *oligophylla*	0.1	
Senna glutinosa subsp. *glutinosa*	0.1	
Senna glutinosa subsp. *luerssenii*	1	
Seringia elliptica	0.1	
Tribulus suberosus	0.1	
Triodia vanleeuwenii	50	

East Jimblebar & Caramulla

Site: CAR-46

Described by CvdB & SC
Date 17/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
222161mE; 7409860mN
Soil Silty Loam
Rock Type Dolerite
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia vanleeuwenii* low hummock grassland with *Acacia sericophylla*, *Acacia aptaneura* and *Senna glutinosa* subsp. *luersenii* mid to tall open shrubland

SPECIES LIST:

Name	Cover	Specimen
Acacia adsurgens	0.1	
Acacia aptaneura	1	
Acacia sericophylla	12	
Acacia tetragonophylla	0.1	
Anthobolus leptomerioides	0.1	
Enchylaena tomentosa var. *tomentosa*	0.1	
Eremophila jucunda subsp. *jucunda*	0.1	
Eremophila latrobei subsp. *latrobei*	0.1	CAR48.01
Hakea lorea subsp. *lorea*	0.1	
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	Cvopp.06
Ptilotus obovatus	0.1	
Senna artemisioides subsp. *oligophylla*	0.1	
Senna glutinosa subsp. *luerssenii*	0.1	
Seringia elliptica	0.1	CAR46.01
Tribulus suberosus	0.1	
Triodia vanleeuwenii	40	

East Jimblebar & Caramulla

Site: CAR-47

Described by CvdB & SC
Date 12/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
225834mE; 7409990mN
Soil Clay Loam Sandy
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation Low *Triodia basedowii* hummock grassland with tall open shrubland of *Acacia aptaneura* and *Acacia citrinoviridis*

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	4	
Acacia dictyophleba	0.1	
Acacia pachyacra	0.1	
Acacia pruinocarpa	3	
Acacia sclerosperma subsp. *sclerosperma*	0.1	
Acacia sericophylla	0	
Anthobolus leptomerioides	0.1	
Aristida inaequiglumis	0.1	
Cenchrus ciliaris	0.1	
Cleome viscosa	0.1	
Corymbia hamersleyana	0.3	
Cymbopogon ambiguus	0.1	
Eragrostis eriopoda	0.1	
Eremophila forrestii	0.2	
Eulalia aurea	0.1	
Euphorbia tannensis subsp. *eremophila*	0.1	Cvopp.04
Hakea lorea subsp. *lorea*	0.1	
Psydrax latifolia	0.1	
Ptilotus obovatus	0.1	
Rhagodia eremaea	0.1	
Scaevola parvifolia subsp. *pilbarae*	0.1	
Solanum lasiophyllum	0.1	
Triodia basedowii	45	

East Jimblebar & Caramulla **Site:** CAR-48

Described by CvdB & SC
Date 13/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
222934mE; 7414589mN
Soil Silty Clay Loam
Rock Type BIF
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation Low *Triodia vanleeuwenii* hummock grassland with tall sparse *Acacia marramamba, Acacia ancistrocarpa* and *Hakea lorea* over mid sparse shrubs of *Ptilotus rotundifolius* and *Senna artemisioides* subsp. *helmsii*

SPECIES LIST:

Name	Cover	Specimen
Acacia ancistrocarpa	1	
Acacia aptaneura	0.5	
Acacia bivenosa	0.1	
Acacia marramamba	4	
Anthobolus leptomerioides	0.1	
Cymbopogon ambiguus	0.1	
Dodonaea petiolaris	0.1	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Eremophila latrobei subsp. *latrobei*	0.1	Car48-01
Eriachne mucronata	0.1	
Eulalia aurea	0.2	
Grevillea berryana	0.2	CAR90.01
Hakea lorea subsp. *lorea*	1	
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	Cvopp.06
Hibiscus brachychlaenus	0.1	Car48-02
Jasminum didymum subsp. *lineare*	0.1	
Ptilotus calostachyus	0.1	
Ptilotus obovatus	0.1	
Ptilotus rotundifolius	0.3	
Senna artemisioides subsp. *oligophylla*	0.1	
Senna glutinosa subsp. *glutinosa*	0.1	
Senna glutinosa subsp. *luerssenii*	0.1	
Seringia elliptica	0.1	
Solanum lasiophyllum	0.1	
Tribulus suberosus	0.1	
Triodia vanleeuwenii	45	

East Jimblebar & Caramulla

Site: CAR-49

Described by CvdB & SC
Date 14/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
223646mE; 7414859mN
Soil Silty Clay Loam
Rock Type BIF
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation Low *Triodia vanleeuwenii* hummock grassland with tall open woodland of *Acacia aptaneura* over tall to mid open *Acacia sericophylla, Senna glutinosa* subsp. *luerssenii* and *Eremophila latrobei* subsp. *latrobei* shrubland

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	10	
Acacia sericophylla	2	
Acacia sp.	1	Car49-02
Anthobolus leptomerioides	0.1	
Cynanchum viminale subsp. *australe*	0.1	
Enchylaena tomentosa var. *tomentosa*	0.1	
Eremophila ? capricornica	0.1	Car89.02
Eremophila forrestii	0.1	
Eremophila latrobei subsp. *filiformis*	0.3	Car41.01
Eremophila latrobei subsp. *latrobei*	0.3	CAR48.01
Evolvulus alsinoides var. *villosicalyx*	0.1	
Psydrax latifolia	0.1	
Psydrax suaveolens	0.1	
Ptilotus obovatus	0.1	
Rhagodia sp. Hamersley (M. Trudgen 17794)	0.1	Car49-01
Senna glutinosa subsp. *luerssenii*	1	
Solanum lasiophyllum	0.1	
Tribulus suberosus	0.1	
Triodia vanleeuwenii	45	

East Jimblebar & Caramulla

Site: CAR-51

Described by CvdB & SC
Date 18/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
220724mE; 7412673mN
Soil Silty Clay Loam
Rock Type BIF
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation Low *Triodia vanleeuwinii* hummock grassland with low open shrubland of *Acacia hilliana*, *Calytrix* and *Seringia* with sparse tall *Grevillea wickhamii* and *Acacia pruinocarpa* shrubs

SPECIES LIST:

Name	Cover	Specimen
Acacia adoxa var. *adoxa*	0.1	
Acacia bivenosa	0.2	
Acacia hilliana	7	
Acacia pruinocarpa	1	
Calytrix desolata	3	
Eremophila latrobei subsp. *latrobei*	0.1	CAR48.01
Eriachne mucronata	0.1	
Grevillea berryana	0.1	CAR90.01
Grevillea wickhamii subsp. *hispidula*	1	CAR52.02
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	Cvopp.06
Lamarchea sulcata	0.5	Car51-01
Senna glutinosa subsp. *glutinosa*	0.2	
Seringia elliptica	3	
Triodia vanleeuwenii	45	

East Jimblebar & Caramulla

Site: CAR-52

Described by CvdB & SC
Date 17/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
219488mE; 7409771mN
Soil Silty Loam
Rock Type Dolerite
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia vanleeuwenii* low hummock grassland with *Grevillea wickhamii*, *Grevillea berryana* and *Acacia pruinocarpa* tall scattered shrubs over *Ptilotus rotundifolius* and *Tribulus suberosus* low scattered shrubs

SPECIES LIST:

Name	Cover	Specimen
? *Chrysopogon fallax*	0.1	Car52.03
Acacia adsurgens	0.1	Cvopp.12
Acacia dictyophleba	0.1	
Acacia pachyacra	0.1	
Acacia pruinocarpa	0.1	
Calytrix desolata	0.1	
Cymbopogon ambiguus	0.1	
Duperreya commixta	0.1	
Enchylaena tomentosa var. *tomentosa*	0.1	
Eremophila forrestii	0.1	
Eulalia aurea	0.1	
Goodenia triodiophila	0.1	CAR48.03
Grevillea wickhamii subsp. *hispidula*	0.1	CAR52.02
Hakea lorea subsp. *lorea*	0.1	
Rhagodia sp. Hamersley (M. Trudgen 17794)	0.1	Car52.01
Solanum lasiophyllum	0.1	
Triodia vanleeuwenii	50	Car52.04

East Jimblebar & Caramulla

Site: CAR-53

Described by CvdB & SC
Date 15/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
221686mE; 7413695mN
Soil Silty Loam
Rock Type CID
Veg Condition Very Good
Fire Age Old (6+ yr)

Vegetation *Eremophila cuneifolia*, *Frankenia cinerea* and *Senna* sp. Meekatharra low open shrubland with *Acacia sericophylla* tall to mid sparse shrubland over *Enteropogon ramosus*, *Eragrostis setifolia* and *Eulalia aurea* scattered tussock grasses

SPECIES LIST:

Name	Cover	Specimen
Acacia sericophylla	2	
Anthobolus leptomerioides	0.1	
Aristida contorta	0.1	
Boerhavia coccinea	0.1	
Brachyachne dielsii	0.1	Car53.01
Dactyloctenium radulans	0.1	
Enteropogon ramosus	1	
Eragrostis setifolia	1	
Eremophila cuneifolia	10	
Eremophila forrestii	0.1	
Eulalia aurea	0.1	
Frankenia setosa	3	Car82.01
Lepidium platypetalum	0.1	Car86.05
Maireana pyramidata	0.1	
Ptilotus obovatus	0.1	
Sclerolaena cuneata	0.1	
Senna sp. Meekatharra (E. Bailey 1-26)	0.1	CAR30.01
Solanum lasiophyllum	0.1	
Trianthema triquetrum	0.1	Car53.02

East Jimblebar & Caramulla **Site:** CAR-54

Described by CvdB & SC
Date 14/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
221421mE; 7414855mN
Soil Silty Clay Loam
Rock Type BIF
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation Low *Acacia aptaneura*, *A. pteraneura* and *A*. sp. over mid sparse shrubs over low open hummock grassland of *Triodia vanleeuwenii*

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	3	
Acacia pruinocarpa	0.3	
Acacia pteraneura	10	
Acacia sp.	7	CAR08.02
Acacia sp.	3	CAR49.02
Duperreya commixta	0.1	
Eragrostis eriopoda	0.1	
Eremophila forrestii	0.1	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Eulalia aurea	0.2	
Maireana sp.	0.1	Car54-03
Malvaceae sp.	0.2	Car54-04
Malvaceae sp.	0.1	
Marsdenia australis	0.1	
Psydrax latifolia	0.1	
Psydrax suaveolens	0.1	
Ptilotus obovatus	0.1	
Rhagodia sp. Hamersley (M. Trudgen 17794)	0.1	Car54-02
Senna artemisioides subsp. *helmsii*	0.1	
Senna sp.	0.1	Car54-01
Solanum lasiophyllum	0.1	
Triodia vanleeuwenii	20	

East Jimblebar & Caramulla

Site: CAR-55

Described by CvdB & SC
Date 17/04/2019
Type Quadrat 100m x 25m
Season Poor
Location MGA Zone 51
221015mE; 7413596mN
Soil Sandy Clay Loam
Rock Type BIF
Veg Condition Very Good
Fire Age Old (6+ yr)

Vegetation Tall *Acacia sericophylla* shrubland with low sparse *Acacia aptaneura* shrubland over isolated clumps of hummock grasses

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	3	
Acacia pruinocarpa	0.1	
Acacia pteraneura	1	
Acacia sericophylla	30	
Acacia tetragonophylla	0.1	
Acacia victoriae	0.1	
Anthobolus leptomerioides	0.1	
Cenchrus ciliaris	0.5	
Chrysopogon fallax	0.1	
Duperreya commixta	0.1	
Enchylaena tomentosa var. *tomentosa*	0.1	
Eremophila cuneifolia	0.5	
Eremophila forrestii	0.1	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Eriachne mucronata	0.1	
Eucalyptus ? xerothermica	2	Car55-01
Eulalia aurea	0.1	
Lepidium platypetalum	0.1	Car86.05
Maireana thesioides	0.1	Car55-02
Paspalidium clementii	0.1	Car86.06
Psydrax latifolia	0.1	
Psydrax suaveolens	0.1	
Ptilotus obovatus	0.1	
Rhagodia sp. Hamersley (M. Trudgen 17794)	0.2	
Santalum spicatum	0.2	
Senna glutinosa subsp. *luerssenii*	0.1	
Senna sp. Meekatharra (E. Bailey 1-26)	0.1	CAR30.01
Triodia pungens	5	

East Jimblebar & Caramulla

Site: CAR-56

Described by CvdB & SC
Date 15/04/2019
Type Quadrat 100m x 25m
Season Poor
Location MGA Zone 51
220097mE; 7414976mN
Soil Silty Clay Loam
Rock Type BIF
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation Low *Acacia aptaneura* woodland over mid open shrubland over low open hummock grassland of *Triodia basedowii*

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	30	
Acacia pruinocarpa	0.1	
Acacia sp.	0.2	CAR49.02
Acacia tetragonophylla	0.2	
Cymbopogon ambiguus	0.1	
Dodonaea petiolaris	1.5	
Enchylaena tomentosa var. *tomentosa*	0.1	
Eragrostis eriopoda	0.1	
Eremophila forrestii	1	
Eremophila fraseri subsp. *fraseri*	0.3	
Eremophila latrobei subsp. *filiformis*	0.2	Car41.01
Eulalia aurea	0.2	
Malvaceae sp.	1	CAR54.04
Psydrax latifolia	0.2	
Psydrax suaveolens	0.1	
Ptilotus obovatus	0.1	
Ptilotus roei	0.1	
Rhagodia sp. Hamersley (M. Trudgen 17794)	0.1	Car56-02
Santalum spicatum	0.2	
Senna ? *sp.* Meekatharra (E. Bailey 1-26) x ?	0.1	Car56-01
Senna artemisioides subsp. *helmsii*	0.1	
Senna artemisioides subsp. *oligophylla*	0.1	
Triodia basedowii	15	
Triodia pungens	0.2	

East Jimblebar & Caramulla

Site: CAR-72

Described by CvdB & SC
Date 18/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
217438mE; 7411985mN
Soil Sandy Loam
Rock Type None Discernible
Veg Condition Good
Fire Age Old (6+ yr)

Vegetation Mid open *Triodia pungens* hummock grassland with mid open *Cenchrus* tussock grassland with tall sparse *Acacia ancistrocarpa* shrubland with sparse *Corymbia hamersleyana* trees

SPECIES LIST:

Name	Cover	Specimen
Acacia ancistrocarpa	5	
Acacia dictyophleba	0.5	
Acacia pachyacra	0.1	
Bonamia erecta	0.1	
Cenchrus ciliaris	15	
Chrysocephalum apiculatum subsp. *pilbare*nse	0.1	CAR25.01
Chrysopogon fallax	0.2	
Corchorus sp.	0.1	
Corymbia hamersleyana	2	
Cymbopogon ambiguus	0.1	
Dodonaea coriacea	0.1	
Duperreya commixta	0.1	
Eragrostis eriopoda	0.1	
Eremophila longifolia	0.1	
Euphorbia tannensis subsp. *eremophila*	0.1	Cvopp.04
Hakea lorea subsp. *lorea*	0.2	
Hibiscus burtonii	0.1	Car74-01
Hybanthus aurantiacus	0.1	
Ptilotus obovatus	0.1	
Rhagodia sp. Hamersley (M. Trudgen 17794)	0.1	Car72-01
Scaevola parvifolia subsp. *pilbarae*	0.1	
Senna artemisioides subsp. *helmsii*	0.1	
Senna artemisioides subsp. *oligophylla*	0.2	
Solanum lasiophyllum	0.1	
Triodia basedowii	0.5	
Triodia pungens	20	

East Jimblebar & Caramulla **Site:** CAR-74

Described by CvdB & SC
Date 18/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
219628mE; 7413612mN
Soil Silty Clay Loam
Rock Type BIF
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Acacia aptaneura* low open woodland over mid to low sparse *Senna* and *Eremophila* shrubs over isolated clumps of hummock grasses

SPECIES LIST:

Name	Cover	Specimen
? *Chrysopogon fallax*	0.1	CAR52.03
Acacia aptaneura	15	
Acacia sericophylla	0.3	
Acacia tetragonophylla	0.2	
Anthobolus leptomerioides	0.1	
Aristida sp.	0.1	
Dodonaea petiolaris	0.1	
Duperreya commixta	0.1	
Eragrostis sp.	0.1	Car38.01
Eremophila ? *capricornica*	0.5	Car89.02
Eremophila forrestii	0.2	
Eremophila latrobei subsp. *filiformis*	0.3	Car41.01
Eriachne mucronata	0.1	Car81-01
Goodenia triodiophila	0.1	CAR48.03
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	Cvopp.06
Hibiscus burtonii	0.1	Car74-01
Maireana triptera	0.1	
Malvaceae sp.	0.1	CAR54.04
Psydrax latifolia	0.1	
Psydrax suaveolens		
Ptilotus axillaris	0.1	
Ptilotus obovatus	0.1	
Rhagodia sp. Hamersley (M. Trudgen 17794)	0.1	Car74-02
Santalum spicatum	0.3	
Scaevola spinescens	0.1	
Sclerolaena cuneata	0.1	
Senna artemisioides subsp. *helmsii*	0.1	
Senna glutinosa subsp. *luerssenii*	0.5	
Solanum lasiophyllum	0.1	
Tribulus suberosus	0.1	
Triodia pungens	0.3	
Triodia vanleeuwenii	5	

East Jimblebar & Caramulla

Site: CAR-75

Described by CvdB & SC
Date 14/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
220704mE; 7414412mN
Soil Silty Clay Loam
Rock Type BIF
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia vanleeuwenii* low hummock grassland tall sparse *Acacia marramamba*, *A. aptaneura* and *A. dictyophleba* shrubs over mid sparse *Senna glutinosa* subsp. *luerssenii*, *Senna glutinosa* subsp. *pruinosa* and *Acacia marramamba* shrubs

SPECIES LIST:

Name	Cover	Specimen
Acacia ? pyrifolia var. *morrisonii*	0.2	Car75-01
Acacia adsurgens	2	
Acacia ancistrocarpa	0.1	
Acacia marramamba	1	
Calytrix desolata	0.1	
Cymbopogon ambiguus	0.1	
Eremophila ? capricornica	0.1	Car89.02
Eulalia aurea	0.1	
Grevillea wickhamii subsp. *hispid*ula	0.5	CAR52.02
Hakea lorea subsp. *lorea*	0.2	
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	Cvopp.06
Ptilotus calostachyus	0.1	
Ptilotus rotundifolius	0.2	
Senna artemisioides subsp. *helm*sii	0.1	
Senna glutinosa subsp. *luerssenii*	2	
Solanum lasiophyllum	0.1	
Tribulus suberosus	0.2	
Triodia vanleeuwenii	40	

East Jimblebar & Caramulla

Site: CAR-76

Described by CvdB & SC
Date 8/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
235351mE; 7411898mN
Soil Sandy Loam
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation Tall sparse *Acacia aptaneura*, *A. ancistrocarpa* and *Hakea lorea* shrubland with low isolated clumps of hummock and tussock grasses

SPECIES LIST:

Name	Cover	Specimen
Acacia ? *aptaneura* (short/broad phyllode variant)		CVopp.01
Acacia ancistrocarpa	1.5	
Acacia aptaneura	3	
Aristida inaequiglumis	1	CAR76.02
Corymbia candida subsp. *dipsodes*	0.2	Cvopp.03
Corymbia hamersleyana	0.2	
Eremophila forrestii	0.1	
Eulalia aurea	0.2	
Hakea lorea subsp. *lorea*	1	
Indigofera sp.	0.1	
Psydrax latifolia	0.1	
Ptilotus obovatus	0.1	
Rhagodia eremaea	0.1	
Rhagodia sp. Hamersley (M. Trudgen 17794)	0.2	CAR76-01
Senna artemisioides subsp. *helmsii*	0.1	
Senna artemisioides subsp. *oligophylla*	0.1	
Solanum lasiophyllum	0.1	
Triodia basedowii	1	

East Jimblebar & Caramulla

Site: CAR-79

Described by CvdB & SC
Date 10/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
229466mE; 7412587mN
Soil Sandy Clay Loam
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Acacia aptaneura* sparse low trees over *Acacia* sp. mulga and *Eremophila fraseri* mid sparse shrubs over *Eremophila margarethae* low sparse shrubs over isolated clumps of hummock grasses

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	7	
Acacia pruinocarpa	0.3	
Acacia pteraneura	0.5	
Acacia sp.	1	CAR08.02
Anthobolus leptomerioides	0.2	
Aristida contorta	0.1	
Aristida inaequiglumis	0.1	
Corymbia hamersleyana	1	
Cymbopogon ambiguus	0.1	
Cynanchum viminale subsp. *australe*	0.1	
Eremophila forrestii	0.1	
Eremophila fraseri subsp. *fraseri*	0.3	
Eremophila margarethae	0.3	CAR10-03
Eulalia aurea	0.1	
Fimbristylis sp.	0.1	
Hakea lorea subsp. *lorea*	0.1	
Psydrax latifolia	0.3	
Ptilotus obovatus	0.2	
Ptilotus schwartzii	0.1	Car07-01
Senna ? *glaucifolia* x ?	0.1	Car42.02
Senna artemisioides subsp. *helmsii*	0.1	
Sida ectogama	0.1	
Solanum lasiophyllum	0.1	
Triodia basedowii	5	

East Jimblebar & Caramulla

Site: CAR-80

Described by CvdB & SC
Date 11/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
226510mE; 7411822mN
Soil Sandy Clay Loam
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia basedowii* low hummock grassland with *Acacia ancistrocarpa*, *Acacia pachyacra* and *Hakea lorea* subsp. *lorea* mid to tall sparse shrubland with *Corymbia hamersleyana* low scattered trees

SPECIES LIST:

Name	Cover	Specimen
Acacia ancistrocarpa	1	
Acacia dictyophleba	0.1	
Acacia pachyacra	0.1	
Acacia sericophylla	0.1	CAR14.01
Anthobolus leptomerioides	0.1	
Cymbopogon ambiguus	0.1	
Eulalia aurea	0.1	
Hakea lorea subsp. *lorea*	0.1	
Kennedia prorepens	0.1	CAR01.02
Ptilotus obovatus	0.1	
Senna artemisioides subsp. *hel*msii	0.1	
Sida sp.	0.1	
Triodia basedowii	60	

East Jimblebar & Caramulla **Site:** CAR-81

Described by CvdB & SC
Date 17/04/2019
Type Quadrat 100m x 25m
Season Poor
Location MGA Zone 51
220580mE; 7410218mN
Soil Clay Loam
Rock Type BIF
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation Tall *Acacia aptaneura* woodland over open *Triodia basedowii* hummock grassland with mid to low isolated shrubs

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	20	
Acacia pruinocarpa	0.5	
Acacia sp.	0.5	CAR49.02
Cheilanthes sieberi subsp. *sieberi*	0.1	Car86.01
Corymbia deserticola subsp. *deser*ticola	2	
Dodonaea petiolaris	0.3	
Eremophila forrestii	0.1	
Eremophila fraseri subsp. *fraseri*	0.3	
Eremophila latrobei subsp. *filifor*mis	0.1	Car41.01
Eriachne mucronata	0.1	Car81-01
Marsdenia australis	0.1	
Paspalidium rarum	0.1	Car95-02
Perotis rara	0.1	
Psydrax latifolia	0.1	
Psydrax suaveolens	0.1	
Ptilotus axillaris	0.1	
Senna ? sp. Meekatharra (E. Bailey 1-26) x ?	0.2	Car56-01
Senna artemisioides subsp. *helms*ii	0.2	
Senna notabilis	0.1	
Tribulus suberosus	0.1	
Triodia basedowii	15	Car81-02

East Jimblebar & Caramulla

Site: CAR-82

Described by CvdB & SC
Date 13/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
224151mE; 7413762mN
Soil Silty Loam
Rock Type CID
Veg Condition Very Good
Fire Age Old (6+ yr)

Vegetation *Acacia sericophylla* tall open shrubland over *Eremophila cuneifolia*, *Senna* mid to low sparse shrubland with *Acacia pteraneura* low scattered trees

SPECIES LIST:

Name	Cover	Specimen
Acacia pteraneura	1	
Acacia sericophylla	20	
Acacia tetragonophylla	0.1	
Enchylaena tomentosa var. *tom*entosa	0.1	
Eragrostis setifolia	0.1	
Eremophila cuneifolia	5	
Eremophila latrobei subsp. *filif*ormis	0.1	Car41.01
Eremophila sp.	0.1	
Eulalia aurea	0.1	
Frankenia setosa	0.1	Car82.01
Maireana pyramidata	0.1	
Maireana triptera	0.1	
Ptilotus exaltatus	0.1	
Ptilotus obovatus	0.1	
Rhagodia eremaea	0.1	
Salsola australis	0.1	
Sclerolaena cornishiana	0.1	
Sclerolaena cuneata	0.1	
Senna sp. Meekatharra (E. Bailey 1-26)	1	CAR22.03

East Jimblebar & Caramulla **Site:** CAR-83

Described by CvdB & SC
Date 14/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
222580mE; 7414190mN
Soil Silty Clay Loam
Rock Type BIF
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation Low *Triodia vanleeuwenii* hummock grassland with low *Acacia aptaneura* sparse woodland over tall shrubland of *A. sericophylla* over mid *Senna* and *Eremophila* shrubs

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	7	
Acacia pruinocarpa	1.5	
Acacia sericophylla	3	Car83-01
Anthobolus leptomerioides	0.2	
Aristida sp.	0.1	
Cymbopogon ambiguus	0.1	
Dodonaea petiolaris	0.1	
Duperreya commixta	0.1	
Eremophila cuneifolia	0.2	
Eremophila forrestii	0.2	
Eremophila latrobei subsp. *latrobei*	0.3	CAR48.01
Eulalia aurea	0.1	
Grevillea berryana	0.2	CAR90.01
Psydrax suaveolens	0.1	
Senna glutinosa subsp. *luerssenii*	1	
Senna glutinosa subsp. *pruinosa*	1	
Triodia vanleeuwenii	45	

East Jimblebar & Caramulla **Site:** CAR-85

Described by CvdB & SC
Date 18/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
219680mE; 741266mN
Soil Clay Loam
Rock Type BIF
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation Low *Acacia aptaneura* and *Acacia* sp. over open *Triodia basedowii* hummock grassland

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	3	
Acacia pachyacra	0.3	
Acacia sp.	25	CAR49.02
Cleome viscosa	0.1	
Eragrostis eriopoda	0.1	
Eragrostis sp.	0.1	Car38.01
Eremophila forrestii	0.3	
Hakea lorea subsp. *lorea*	0.3	
Psydrax latifolia	0.2	
Rhagodia sp. Hamersley (M. Trudgen 17794)	0.1	Car85-01
Triodia basedowii	20	

East Jimblebar & Caramulla **Site:** CAR-86

Described by CvdB & SC
Date 14/04/2019
Type Quadrat 100m x 25m
Season Poor
Location MGA Zone 51
220461mE; 7413882mN
Soil Clay Loam
Rock Type None Discernible
Veg Condition Good
Fire Age Old (6+ yr)

Vegetation *Acacia sericophylla*, *Acacia tetragonophylla* and *Santalum spicatum* tall shrubland over *Eriachne mucronata*, *Cenchrus ciliaris* and *Cymbopogon ambiguus* low sparse tussock grassland with *Acacia aptaneura* low scattered trees.

SPECIES LIST:

Name	Cover	Specimen
Abutilon sp.	0.1	Car86.07
Acacia aptaneura	1	
Acacia bivenosa x *sclerosperma* subsp. *sclerosperma*	0.1	
Acacia sericophylla	10	
Acacia tetragonophylla	8	
Bidens bipinnata	0.1	Car86.02
Bulbostylis barbata	0.1	
Cenchrus ciliaris	1	
Cheilanthes sieberi subsp. *sieberi*	0.1	Car86.01
Cullen sp.	0.1	CAR86.10
Cymbopogon ambiguus		
Cynanchum viminale subsp. *australe*	0.1	
Digitaria brownii	0.1	Car86.08
Dodonaea petiolaris	1	
Duperreya commixta	0.1	
Eragrostis cumingii	0.1	Car86.04
Eremophila cuneifolia	0.1	
Eriachne mucronata	2	
Eulalia aurea	0.1	
Evolvulus alsinoides var. *villosicalyx*	0.1	
Gossypium robinsonii	0.1	
Lepidium platypetalum	0.1	Car86.05
Paspalidium clementii	0.1	Car86.06
Perotis rara	0.1	
Psydrax suaveolens	0.1	
Pterocaulon sphacelatum	0.1	CAR30.02
Ptilotus obovatus	0.1	
Rhagodia sp. Hamersley (M. Trudgen 17794)	0.1	Car86.09
Santalum lanceolatum	0.1	
Santalum spicatum	0.1	
Senna artemisioides	0.1	
Senna artemisioides subsp. *helmsii*	0.1	
Senna glutinosa subsp. *luerssenii*	0.1	
Senna stricta	0.1	
Triodia pungens	0.1	

East Jimblebar & Caramulla

Site: CAR-87

Described by CvdB & SC
Date 18/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
218748mE; 7413353mN
Soil Silty Loam
Rock Type CID
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia vanleeuwenii* low open hummock grassland with *Acacia aptaneura* low sparse woodland over *Senna stricta*, *Eremophila cuneifolia* and *Eremophila demissa* mid to low sparse shrubland

SPECIES LIST:

Name	Cover	Specimen
Acacia aptaneura	8	
Acacia tetragonophylla	0.1	
Anthobolus leptomerioides	0.1	
Cymbopogon ambiguus	0.1	
Cynanchum viminale subsp. *australe*	0.1	
Dodonaea petiolaris	0.1	
Duperreya commixta	0.1	
Eremophila ? capricornica	1	Car89.02
Eremophila cuneifolia	1	
Eremophila forrestii	0.1	
Eremophila latrobei subsp. *filiformis*	0.1	Car41.01
Eremophila latrobei subsp. *latrobei*	0.1	CAR48.01
Eriachne mucronata	0.1	Car81-01
Grevillea berryana	0.1	CAR90.01
Maireana sp.	0.1	
Psydrax latifolia	0.1	
Psydrax suaveolens	0.1	
Senna artemisioides subsp. *helmsii*	0.1	
Senna glutinosa subsp. *luerssenii*	0.1	
Senna stricta	1	CAR39.01
Solanum lasiophyllum	0.1	
Tribulus suberosus	0.1	
Triodia pungens	0.1	
Triodia vanleeuwenii	25	

East Jimblebar & Caramulla

Site: CAR-88

Described by CvdB & SC
Date 9/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
231563mE; 7412593mN
Soil Loamy Sand
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia basedowii* mid hummock grassland with *Hakea lorea*, *Santalum lanceolatum* and *Acacia ancistrocarpa* mid to tall scattered shrubs with *Corymbia hamersleyana* low scattered trees

SPECIES LIST:

Name	Cover	Specimen
Acacia ancistrocarpa	0.1	
Bonamia erecta	0.1	
Corymbia hamersleyana	0.1	
Dicrastylis cordifolia	0.1	
Hakea lorea subsp. *lorea*	1	
Indigofera sp.	0.1	
Kennedia prorepens	0.1	CAR01.02
Santalum lanceolatum	0.1	
Senna artemisioides subsp. *hel*msii	0.1	
Triodia basedowii	55	

East Jimblebar & Caramulla

Site: CAR-89

Described by CvdB & SC
Date 9/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
230801mE; 7411969mN
Soil Loamy Sand
Rock Type None Discernible
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia basedowii* mid open hummock grassland with *Eulalia aurea*, *Chrysopogon fallax* and *Aristida inaequiglumis* mid open tussock grassland with *Acacia sericophylla* and *Hakea lorea* tall sparse shrubland with *Corymbia hamersleyana* low scattered trees

SPECIES LIST:

Name	Cover	Specimen
Acacia ancistrocarpa	0.1	
Acacia sericophylla	2	CAR14.01
Aristida inaequiglumis	0.1	
Chrysopogon fallax	2	
Corymbia hamersleyana	3	
Cymbopogon ambiguus	0.1	
Eremophila ? capricornica	0.1	Car89.02
Eremophila margarethae	0.1	CAR10-03
Eulalia aurea	10	
Hakea lorea subsp. *lorea*	1	
Isotropis atropurpurea	0.1	
Kennedia prorepens	0.1	CAR01.02
Psydrax latifolia	0.1	
Ptilotus obovatus	0.1	
Rhagodia eremaea	0.1	
Senna artemisioides subsp. *helms*ii		
Seringia elliptica	0.1	
Solanum lasiophyllum	0.1	
Triodia basedowii	15	

East Jimblebar & Caramulla

Site: CAR-90

Described by CvdB & SC
Date 10/04/2019
Type Quadrat 50m x 50m
Season Poor
Location MGA Zone 51
229130mE; 7413183mN
Soil Silty Clay Loam
Rock Type BIF
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Triodia vanleeuwenii* low hummock grassland with tall *Grevillea berryana* sparse shrubs over low *Calytrix* and *Senna* sparse shrubs

SPECIES LIST:

Name	Cover	Specimen
Acacia ancistrocarpa	0.4	
Acacia aptaneura	0.5	
Acacia marramamba	0.2	
Anthobolus leptomerioides	0.1	
Calytrix desolata	0.3	
Cymbopogon ambiguus	0.1	
Eremophila ? jucunda	0.3	
Eremophila fraseri subsp. *fraseri*	0.2	
Eulalia aurea	0.2	
Grevillea berryana	4	Car90-01
Ptilotus calostachyus	0.1	
Ptilotus obovatus	0.1	
Rhagodia eremaea	0.1	
Senna glutinosa subsp. *glutinosa*	0.1	
Senna glutinosa subsp. *luerssenii*	0.3	
Solanum lasiophyllum	0.1	
Tribulus suberosus	0.1	
Triodia vanleeuwenii	40	

East Jimblebar & Caramulla

Site: CAR-91

Described by CvdB & SC
Date 13/04/2019
Type Relevé
Season Poor
Uniformity
Location MGA Zone 51
224168mE; 7413931mN
Soil Silty Loam
Rock Type CID
Veg Condition Very Good
Fire Age Old (6+ yr)

Vegetation *Eremophila cuneifolia*, *Senna* sp. Meekatharra and *Maireana triptera* low scattered shrubs with *Acacia sericophylla* mid scattered shrubs with *Acacia pteraneura* tall scattered shrubs

SPECIES LIST:

Name
Maireana triptera

East Jimblebar & Caramulla

Site: CAR-92

Described by CvdB & SC
Date 14/04/2019
Type Relevé
Season Poor
Location MGA Zone 51
223287mE; 7414941mN
Soil Silty Loam
Rock Type CID
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Acacia* sp., *Acacia pruinocarpa* and *Acacia aptaneura* low open woodland over *Triodia vanleeuwenii* low sparse hummock grassland with *Eremophila latrobei*, *Dodonaea coriacea* mid scattered shrubs

East Jimblebar & Caramulla

Site: CAR-94

Described by CvdB & SC
Date 14/04/2019
Type Relevé
Season Poor
Location MGA Zone 51
222455mE; 7414457mN
Soil Silty Loam
Rock Type CID
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Acacia aptaneura*, *Acacia* sp. and *Acacia pruinocarpa* low open woodland over *Dodonaea petiolaris*, *Acacia sericophylla* mid to tall sparse shrubland over *Triodia vanleeuwenii* low sparse hummock grassland.

East Jimblebar & Caramulla **Site:** CAR-95

Described by CvdB & SC
Date 15/04/2019
Type Quadrat 100m x 25m
Season Poor
Location MGA Zone 51
219615mE; 7414393mN
Soil Sandy Loam
Rock Type Mudstone
Veg Condition Very Good
Fire Age Old (6+ yr)
Vegetation Low open *Acacia aptaneura* woodland over tall sparse *Acacia* shrubland over isolated hummock and tussock grasses

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Acacia adsurgens	0.2				
Acacia aptaneura	15				
Acacia pruinocarpa	0.3				
Acacia pruinocarpa	0.2				
Acacia sericophylla	11				
Acacia sp.	0.1			CAR49.02	
Acacia tetragonophylla	0.3				
Anthobolus leptomerioides	0.1				
Aristida contorta	0.1				
Cenchrus ciliaris	0.1				
Chrysopogon fallax	0.1				
Cleome oxalidea	0.1			Car95-01	
Cleome viscosa	0.1				
Corymbia hamersleyana	5				
Cymbopogon ambiguus	0.1				
Digitaria ctenantha	0.1			Car95-03	
Duperreya commixta	0.1				
Eremophila ? *capricornica*	0.1			Car89.02	
Eremophila forrestii	0.1				
Eremophila latrobei subsp. *filiformis*	0.1			Car41.01	
Eremophila latrobei subsp. *latrobei*	0.1			CAR48.01	
Eriachne mucronata	1				
Eriachne pulchella	0.1				
Evolvulus alsinoides var. *villosicalyx*	0.1				
Glycine sp.	0.1				
Hibiscus coatesii	0.1			Cvopp.13	
Malvaceae sp.	0.2			CAR54.04	
Paspalidium rarum	0.1			Car95-02	
Perotis rara	0.1				
Rhynchosia australis	0.1				
Santalum lanceolatum	0.1				
Tephrosia sp. clay soils (S. van Leeuwen et al. PBS 0273)					
Themeda triandra	0.1				
Triodia basedowii	0.1				
Triodia pungens	0.5				
Triodia vanleeuwenii	0.1				

East Jimblebar & Caramulla

Site: CAR-96

Described by CvdB & SC
Date 17/04/2019
Type Relevé
Season Poor
Location MGA Zone 51
222142mE; 7410022mN
Soil Silty Loam
Rock Type Dolerite
Veg Condition Excellent
Fire Age Old (6+ yr)

Vegetation *Acacia aptaneura* and *Acacia sericophylla* tall sparse shrubland over *Eriachne mucronata* low scattered tussock grasses with *Triodia vanleeuwenii* low scattered hummock grasses.

Appendix C: Vegetation Structure Definition

Vegetation classification for the Pilbara (based on Specht (1970) as modified by Aplin (1979) and Trudgen (2002))

Height Class	Canopy Cover				
	100-70%	70-30%	30-10%	10-2%	<2%
Trees > 30 m	High Closed Forest	High Open Forest	High Woodland	High Open Woodland	Scattered Tall Trees
Trees 10-30 m	Closed Forest	Open Forest	Woodland	Open Woodland	Scattered Trees
Trees < 10 m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland	Scattered Low Trees
Mallee	Closed Mallee	Mallee	Open Mallee	Very Open Mallee	Scattered Mallee
Shrubs > 2 m	Closed Scrub	Open Scrub	High Shrubland	High Open Shrubland	Scattered Tall Shrubs
Shrubs 1-2 m	Closed Heath	Open Heath	Shrubland	Open Shrubland	Scattered Shrubs
Shrubs < 1 m	Low Closed Heath	Low Open Heath	Low Shrubland	Low Open Shrubland	Scattered Low Shrubs
Hummock Grass	Closed Hummock Grassland	Hummock Grassland	Open Hummock Grassland	Very Open Hummock Grassland	Scattered Hummock Grasses
Tussock Grass	Closed Tussock Grassland	Tussock Grassland	Open Tussock Grassland	Very Open Tussock Grassland	Scattered Tussock Grasses
Bunch Grass	Closed Bunch Grassland	Bunch Grassland	Open Bunch Grassland	Very Open Bunch Grassland	Scattered Bunch Grasses
Sedges	Closed Sedges	Sedge	Open Sedges	Very Open Sedges	Scattered Sedges
Herbs	Closed Herbs	Herbs	Open Herbs	Very Open Herbs	Scattered Herbs

Appendix D: Vegetation Condition Definition

Vegetation Condition Scale (adapted from Keighery (1994) and Trudgen (2002))

Condition Scale	Description
Excellent (1)	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement
Very Good (2)	Some relatively slight signs of damage caused by human activities since European settlement. For example, some sings of damage to tree trunks cause by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good (3)	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor (4)	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 (5)	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 (6)	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 E: Key Findings from the Literature Review

Study details	Methods	Results	Significant findings	Limitations
Dames and Moore (1993) Ecological Observations Jimblebar Railway Line **Client**: BHP Billiton Iron Ore **Type**: Ecological Survey **Location**: BHP Pilbara tenure **Timing**: November 1992	• Observational Ecological Survey of Borrow Pit areas • 41 Releve sites	• No significant results	• No significant findings	• No significant limitations
BHP IO (1994) Jimblebar Mine Site Biological Survey **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: BHP Pilbara tenure, Jimblebar Mine **Timing**: June 1994	• 22 detailed floristic sampling sites	• 132 flora taxa • One introduced taxon	• No significant findings	• No significant limitations
Ecologia (1996) Jimblebar Rail Spur Biological Assessment Survey **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: BHP Pilbara tenure **Timing**: June 1995	• 2 detailed floristic sampling sites	• 106 flora taxa • Four introduced taxa	• No significant findings	• No significant limitations

Study details	Methods	Results	Significant findings	Limitations
Ecologia (1999) Jimblebar Flora & Soil Survey **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: BHP Pilbara tenure, Jimblebar Mine **Timing**: June 1998	• 20 detailed floristic sampling sites	• 179 flora taxa • 40 families • 90 genera • Four introduced taxa	• No significant findings	• No significant limitations
Biota (2004) Jimblebar – Wheelarra Hill 3 Flora and Fauna Assessment **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: BHP Pilbara tenure, Jimblebar Mine **Timing**: August 2003	• 8 detailed floristic sampling sites	• 227 flora taxa prior to survey, with an additional 134 taxa recorded • One introduced taxon	• *Eriachne sp.* Hamersley Range hilltops (S van Leeuwen 4199) (P1)[2]	• No significant limitations

[2] This taxon is not current and is now formerly known as *Eriachne lanata* which is no longer listed as a Priority taxon (WAH, 1998-).

Study details	Methods	Results	Significant findings	Limitations
Ecologia (2004a) Jimblebar-Wheelarra Hill Expansion Biological Study **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: BHP Pilbara tenure, Jimblebar Mine **Timing**: February – March 2004	• 44 detailed floristic sampling sites	• 181 flora taxa • One introduced taxon	• No significant findings	• No significant limitations
Ecologia (2004b) OB 18 Flora and Fauna Review **Client**: BHP Billiton Iron Ore **Type**: Targeted **Location**: BHP Pilbara tenure, OB 18 **Timing**: July 2004	• Targeted searching	• 155 flora taxa • One introduced taxon	• *Rhodanthe frenchii* (P2)[3]	• No significant limitations

[3] This record is most likely erroneous as the identification of this taxon was not confirmed through the WAH and the collection represents a 300 km range extension to the east. It has not been recorded locally during numerous surveys over a 15 year period since the original record.

Study details	Methods	Results	Significant findings	Limitations
Ecologia (2005a) Jimblebar East Exploration Project Biological Survey **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: BHP Pilbara tenure, Jimblebar East **Timing**: February 2005	• 126 detailed floristic sample sites	• 155 flora taxa • One introduced taxon	• No significant findings	• No significant limitations
Ecologia (2005b) Jimblebar Wye Rail Junction Priority Flora and Riparian Vegetation Assessment **Client**: BHP Billiton Iron Ore **Type**: Targeted Survey and Riparian Vegetation Assessment **Location**: BHP Pilbara tenure **Timing**: July 2005	• Targeted searching and mapping	• -	• *Eremophila* sp. Ophthalmia Range (D. Brearley s.n. 20/3/2004) (P1)[4] and *Gymnanthera cunninghamii* (P3)	• No significant limitations

[4] This taxon is not current and is now formerly known as *Eremophila margarethae* which is no longer listed as a Priority taxon (WAH, 1998-).

Study details	Methods	Results	Significant findings	Limitations
ecologia (2006a) Jimblebar Marra Mamba Exploration Biological Survey **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: Jimblebar Marra Mamba **Timing**: May 2006	• 105 detailed floristic sample sites	• 267 flora taxa • 45 families • 119 genera • Four introduced taxa • Four vegetation types	• *Goodenia nuda* (P3, now P4) and *Triumfetta leptacantha* (P3)[5] • One flora species of interest, *Wurmbea deserticola*	• Some impacts from cattle grazing and weed infestation.
ecologia (2007) Hashimoto Exploration Project Biological Survey: Flora and Vegetation **Client**: BHP Billiton Iron Ore **Type**: Two Phase Detailed Flora Survey **Location**: Hashimoto Project Area M266SA **Timing**: August/September 2005 and February 2006	• 44 detailed floristic sampling sites	• 372 flora species • 43 families • 129 genera • Four weed taxa • Seven landscape vegetation types	• *Goodenia nuda* (P3, now a P4) • *Goodenia* sp. Rudall River (R.P. Hart 972) (P2)[6]	• Survey was completed at end of the dry season. • Recent fires impacted on structure and diversity.

[5] No longer listed as a Priority taxon (WAH, 1998-).

[6] More recently known as *Goodenia hartiana* (P2) (WAH, 1998-), however further work has indicated that these records are the common *Goodenia* sp. Sandy Creek (R.D. Royce 1653).

Study details	Methods	Results	Significant findings	Limitations
ENV (2007d) West Jimblebar Exploration Lease Flora and Vegetation Assessment – Management Recommendations **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: West Jimblebar exploration lease **Timing**: May 2007	• 29 detailed floristic sample sites (quadrats) • 33 relevés • Desktop survey	• 318 flora taxa • 44 families • 113 genera • Three introduced taxa • 12 broad vegetation units • Condition of vegetation ranged from very good to excellent.	• *Goodenia nuda* (P3, now P4). • Two species of interest: *Thyridolepis xerophila* and *Poaceae* sp. • No threatened flora recorded. • No TECs or PECs	• No significant limitations.
ENV (2007d) OB 18 Flora and Vegetation Assessment Phase II **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: OB 18 **Timing**: July and August 2006	• 71 detailed floristic sample sites (quadrats)	• 276 flora taxa. • Two introduced taxa	• No significant findings	• No significant limitations

Study details	Methods	Results	Significant findings	Limitations
ENV (2007d) Jimblebar Stage 2, Levee Banks and Communications Tower Redevelopment Flora and Vegetation Assessments **Client**: BHP Billiton Iron Ore **Type**: Two Phase Detailed Flora Survey **Location**: Jimblebar Mine **Timing**: April - June 2007	• 4 detailed floristic sample sites (quadrats)	• 103 flora taxa. • Five introduced taxa.	• No significant findings	• Survey considered to have occurred following below average rainfall
ENV (2007d) RGP4 Jimblebar Rail Loop Flora and Vegetation Assessment **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: Jimblebar Mine **Timing**: November – December 2006	• 4 detailed floristic sample sites (quadrats)	• 65 flora taxa • Two introduced taxa	• No significant findings	• No significant limitations

Study details	Methods	Results	Significant findings	Limitations
ENV (2007d) Rapid Growth Project 5: Repeater 9 Access Road Flora and Vegetation Assessment **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: Rapid Growth Project 5: Repeater 9 Access Road **Timing**: June 2008	• 6 detailed floristic sample sites (quadrats)	• 163 flora taxa • 14 introduced taxa	• *Rostellularia adscendens* var. l*atifolia* (P3)	• Survey considered to have occurred following well below average rainfall
ENV (2007d) Jimblebar Access Road Flora and Vegetation Assessment **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: Jimblebar Access Road **Timing**: May 2007	• 22 detailed floristic sample sites (quadrats)	• 112 flora taxa • Three introduced taxa	• No significant findings	• Survey considered to have occurred following well below average rainfall

Study details	Methods	Results	Significant findings	Limitations
ENV (2007d) Draft Report for Wheelarra Hill (Jimblebar Mine Site) Priority Species Verification – Goodenia hartiana Species Verification **Client**: BHP Billiton Iron Ore **Type**: Targeted Survey **Location**: Jimblebar Mine **Timing**: September 2007	• Targeted	• 6 sites containing records of *Goodenia hartiana* were verified	• No significant findings	• Survey considered to have occurred following well below average rainfall
ENV (2007d) Mesa Gap Biological Survey **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: BHP Billiton Iron Ore tenement **Timing**: September 2007	• 40 detailed floristic sample sites (quadrats)	• 133 flora taxa	• No significant findings	• No significant limitations
ENV (2007d) OB17 Flora and Vegetation Survey **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: BHP Billiton Iron Ore tenement **Timing**: October 2008	• -	• 61 flora taxa	• No significant findings	• Survey considered to have occurred following well below average rainfall

Study details	Methods	Results	Significant findings	Limitations
ENV (2007d) Jimblebar Spur 2 Flora and Vegetation Assessment **Client**: BHP Billiton Iron Ore **Type**: Reconnaissance (formerly level 1) Flora Survey **Location**: Jimblebar Mine **Timing**: September 2009	• 10 detailed floristic sample sites (quadrats) • 4 relevés	• 152 flora taxa. • 33 families. • 79 genera. • Three introduced taxa. • 10 broad vegetation units.	• No significant findings	• No significant limitations
ENV (2007d) Newman to Jimblebar Transmission Line and Newman Town Substation Flora and Vegetation Assessment **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: Jimblebar Mine, Newman townsite **Timing**: April 2009	• 48 detailed floristic sample sites (quadrats) • 19 relevés • Desktop	• 365 flora taxa. • 49 families. • 147 genera. • 15 introduced taxa. • 21 broad vegetation units.	• *Goodenia nuda* (P3, now a P4)	• No significant limitations

Study details	Methods	Results	Significant findings	Limitations
ENV (2007d) Caramulla Exploration Area Flora and Vegetation Survey and Fauna Assessment **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey and Fauna Habitat Assessment **Location**: Caramulla Exploration Area **Timing**: December 2008	• 26 detailed floristic sample sites (quadrats) • 22 relevés • Desktop	• 225 flora taxa • 37 families • Two introduced taxa • 16 broad vegetation units	• *Crotalaria smithiana* (P1, now a P3) • Three slight range extensions	• No significant limitations
ENV (2007d) Eastern Pilbara Accommodation Camp Flora and Fauna Assessment **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: Eastern Pilbara Accommodation Camp **Timing**: October – November 2008	• 15 detailed floristic sample sites (quadrats)	• 115 flora taxa	• No significant findings	• Survey considered to have occurred following well below average rainfall

Study details	Methods	Results	Significant findings	Limitations
ENV (2007d) Wheelarra Hill Iron Ore Mine Modification Flora and Fauna Assessment **Client**: BHP Billiton Iron Ore **Type**: Two Phase Detailed Flora Survey **Location**: Wheelarra Hill **Timing**: October – November 2008, January 2009	• 22 detailed floristic sample sites (quadrats)	• 146 flora taxa • Two introduced taxa	• *Goodenia nuda* (P3, now a P4)	• Survey in October considered to have occurred following well below average rainfall
Astron (2010b) Ophthalmia Dam (and downstream) Phreatophytic Vegetation Assessment **Client**: BHP Billiton Iron Ore **Type**: Phreatophytic vegetation desktop assessment **Location**: Ophthalmia Dam **Timing**: December 2009	• Desktop assessment	• None related to flora and vegetation surveys	• None related to flora and vegetation surveys.	• Bounded by the scope and availability of information on hydrology and hydrogeology.
Astron (2010b) Jimblebar Wye Targeted Declared Rare Flora and Priority Listed Flora Assessment **Client**: BHP Billiton Iron Ore **Type**: Targeted **Location**: Jimblebar Mine **Timing**: March and June 2010	• Targeted survey	• Nothing to report	• *Gymnanthera cunninghamii* (P3)	• No significant limitations

Study details	Methods	Results	Significant findings	Limitations
Astron (2010b) RGP6 Jimblebar Hub (Water Pipeline) Flora and Vegetation Assessment **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: Jimblebar Mine **Timing**: November 2010	• 16 detailed floristic sample sites	• 166 flora taxa • Two introduced taxa	• No significant findings	• No significant limitations
Outback Ecology (2010) Jimblebar Flora and Vegetation Assessment **Client**: BHP Billiton Iron Ore **Type**: Multi Phase Detailed Flora Survey **Location**: Jimblebar **Timing**: July 2008, September 2008, January 2009 and March 2009	• 128 detailed floristic sample sites	• 326 flora taxa • 42 families • 111 genera • Six introduced taxa • 21 vegetation associations • 12 broad floristic formations • Vegetation condition ranged from degraded to excellent	• Three Priority flora: *Josephinia* sp. Marandaroo (M.E. Trudgen 1554)[7] (P1), *Goodenia nuda* (P3, now P4) and *Acacia balsamea* (P4)[8] • No TECs or PECs	• No significant constraints

[7] Is an informal synonym of *Josephinia eugeniae* which is not listed as a Priority taxon (WAH, 1998-).

[8] No longer listed as a Priority taxon (WAH, 1998-).

Study details	Methods	Results	Significant findings	Limitations
Outback Ecology (2010) OB 31 Flora and Vegetation Assessment **Client**: BHP Billiton Iron Ore **Type**: Two Phase Detailed Flora Survey **Location**: OB 31 **Timing**: February and March 2011	• 29 detailed floristic sample sites	• 206 flora taxa • Three introduced taxa	• No significant findings	• No significant constraints
Astron (2012) Level 1 flora and fauna surveys along the Great Northern Highway for Jimblebar mine module transport **Client**: BHP Billiton Iron Ore **Type**: Reconnaissance Flora Survey and Level 1 Fauna Survey **Location**: Great Northern Highway, west of Jimblebar **Timing**: August 2011	• 3 detailed floristic sample sites	• 52 flora taxa • 14 families • 26 genera • One introduced taxon	• No significant findings	• No significant constraints
Astron (2012) Wheelarra Hill North Level 2 Flora and Vegetation Assessment **Client**: BHP Billiton Iron Ore **Type**: Two Phase Detailed Flora Survey **Location**: Wheelarra Hill **Timing**: May and October 2011	• 83 detailed floristic sample sites	• 441 flora taxa • Four introduced taxa	• Nine range extensions: *Sclerolaena minuta, Eragrostis olida, Oldenlandia galioides, Evolvulus alsinoides* var. *decumbens, Phyllanthus erwinii, Phyllanthus maderaspatensis, Santalum spicatum, Cyperus ixiocarpus, Abutilon cunninghamii,* and two possible range extensions; *Tephrosia* aff. *sphaerospora, Hibiscus* aff. *apodus*	• No significant constraints

Study details	Methods	Results	Significant findings	Limitations
Astron (2012) South West Jimblebar Flora and Vegetation Survey **Client**: BHP Billiton Iron Ore **Type**: Single Phase Detailed Flora Survey **Location**: Jimblebar **Timing**: March 2011	• 19 detailed floristic sample sites	• 202 flora taxa • Four introduced taxa	• Two unconfirmed Priority flora taxa: *Aristida ?jerichoensis* var. *subspinulifera* (P3), *Goodenia ?nuda* (P4) • Five range extensions: *Alloteropsis cimicina, Brachyscome ciliaris* var. *ciliaris, Evolvulus alsinoides* var. *decumbens, Tephrosia sphaerospora, Tribulopis angustifolia*	• No significant constraints
Onshore (2014b) Orebody 17/18 Derived Vegetation Association Mapping Report **Client**: BHP Billiton Iron Ore **Type**: Desktop Assessment **Location**: Orebody 17/18 **Timing**: 2013	Desktop assessment	• No significant results	• No significant findings	• No significant constraints

Study details	Methods	Results	Significant findings	Limitations
(Onshore, 2014a) **Client**: BHP Billiton Iron Ore **Type**: Mapping Consolidation **Location**: BHP Pilbara tenure **Timing**: Mapping consolidation completed in 2015. Additional field surveys completed in July and August 2013	A combination of: • Review of historical surveys; • Field surveys to fill 'gaps'; • Consolidation of vegetation mapping; • Review significant plant taxa; • Review of introduced weed taxa; • Consolidation of vegetation condition mapping; and • Review and consolidation of raw and spatial data	• 15 landform types described and mapped. • 218 vegetation associations classified, under 53 broad floristic formations.	• Themeda grasslands on cracking clay TEC present. • Six PECs represented in the Study Area • 57 significant plant taxa including one threatened[9], 14 P1, 11 P2, 26 P3, and four P4. • 56 introduced weed taxa, including seven recognised as Declared Plant Pests under the BAM Act. • Three introduced weed taxa are listed as WoNS (**Jatropha gossypifolia, *Parkinsonia aculeata* and **Tamarix aphylla*).	• Timing of historical field surveys. • Detail in raw data lacking. • Variability in scope and resources for previous baseline surveys. • Variability in completeness of raw data. • Vegetation classification variable. • Vegetation mapping linework and overlapping datasets. • Misidentification of keystone plant taxa. • Gaps in vegetation datasets.
Onshore (2014b) OB18 to OB31 Infrastructure Corridor Targeted Flora Survey **Client**: BHP Billiton Iron Ore **Type**: Targeted **Location**: OB18 to OB31 **Timing**: September 2014	• Targeted	• -	• *Triodia* sp. Mt Ella (M.E. Trudgen 12739) (P3) and *Goodenia nuda* (P4)	• Assessment limited to the availability of relevant literature and data.

[9] *Lepidium catapycnon* is no longer listed as a Threatened flora species. It is now listed as Priority 4.

Study details	Methods	Results	Significant findings	Limitations
Onshore (2014b) Dynasty Tenement E52/2591 Flora and Vegetation Desktop Assessment **Client**: BHP Billiton Iron Ore **Type**: Desktop Assessment **Location**: Dynasty tenement E52/2591 **Timing**: February 2014	• Desktop assessment	• Six baseline flora and vegetation studies adjacent. • Nine vegetation associations likely to occur. • Six broad floristic formations likely to occur	• Eight priority taxa considered likely to occur • No TECs or PECs	• Assessment limited to the availability of relevant literature and data
Onshore (2014b) Level 2 Flora and Vegetation Assessment Orebody 31 **Client**: BHP Billiton Iron Ore **Type**: Two-phase Detailed Flora Survey **Location**: Orebody 31 **Timing**: October 2013	• 45 detailed floristic sample sites	• 280 flora taxa • Two introduced taxa	• *Triodia* sp. Mt Ella (M.E.Trudgen 12739) (P3), *Rhagodia* sp. Hamersley (M. Trudgen 12739) (P3), *Acacia* sp. East Fortescue (J. Bull & D. Roberts ONS A 27.01) (P1)[10]	• No significant survey limitations
Onshore (2014b) OB 31 / Wheelarra Hill North Targeted Significant Flora Survey **Client**: BHP Billiton Iron Ore **Type**: Targeted **Location**: OB 31 / Wheelarra Hill **Timing**: April 2014	• Targeted Survey	• 280 flora taxa • Two introduced taxa	• *Acacia* sp. East Fortescue (J. Bull & D. Roberts ONS A 27.01) (P1), *Rhagodia* sp. Hamersley (M. Trudgen 12739) (P3), *Triodia* sp. Mt Ella (M.E. Trudgen 12739) (P3), *Goodenia nuda* (P4), *Acacia cleilandii* (Range extension)	• No significant survey limitations

[10] More recently known as *Acacia corusca* and is still listed as a Priority 1 taxon.

Study details	Methods	Results	Significant findings	Limitations
Syrinx (2014) South West Jimblebar Level 2 Flora and Vegetation Survey **Client**: BHP Billiton Iron Ore **Type**: Two Phase Level 2 Flora and Vegetation Survey **Location**: South West Jimblebar Tenement **Timing**: March 2011 and August/September 2013	• 38 detailed floristic sites (quadrats) • Ten relevés • Targeted surveys	• 330 flora taxa • 44 families • 137 genera • Seven introduced taxa. • 13 vegetation associations. • Nine broad floristic formations • Vegetation condition ranged from Good to Excellent	• No threatened flora • Three priority listed flora: *Aristida jerichoensis* var. *subspinulifera* (P1), *Vittadinia* sp. Coondewanna Flats (S. van Leeuwen 4684) (P1) and *Euphorbia inappendiculata* var. *inappendiculata* (P2) • Five range extensions • No WoNS or Declared Plant Pests • No TECs or PECs	• No significant survey limitations
Onshore (2015a) Targeted Flora Survey *Acacia* sp. East Fortescue **Client**: BHP Billiton Iron Ore **Type**: Targeted Flora Survey **Location**: OB31 and regional surrounds **Timing**: March and August 2015	• Targeted survey for *Acacia* sp. East Fortescue (J. Bull & D. Roberts ONS A 27.01)	• 567 plants from three populations recorded	• Restricted in occurrence	• None discussed

Study details	Methods	Results	Significant findings	Limitations
Onshore (2015b) Dynasty and West Jimblebar Level 2 Flora and Vegetation Survey **Client**: BHP Billiton Iron Ore **Type**: Level 2 Flora and Vegetation Survey **Location**: Dynasty and West Jimblebar **Timing**: February/March 2015	• 29 detailed floristic sites (quadrats) • 142 relevé plots	• 263 plant taxa • 36 families • 106 genera • Four introduced taxa • 26 vegetation association • 11 broad floristic formations	• No threatened flora • Three priority listed flora: *Ipomoea racemigera* (P2), *Goodenia nuda* (P4) and *Goodenia berringbinensis* (P4) • No TECs and PECs	• No significant limitations
Onshore (2016) Level 2 Riparian & Aquatic Flora & Vegetation Survey Jimblebar Creek and Innawally Pool **Client**: BHP Billiton Iron Ore **Type**: Single Season Level 2 Riparian and Aquatic Flora and Vegetation Survey **Location**: Jimblebar Creek and Innawally Pool **Timing**: May 2016	• 15 detailed floristic sample sites • 75 relevé sites sampled • Targeted conservation significant flora searches • Weed mapping	• 242 plant taxa • 42 families • 117 genera • Five introduced taxa • 11 vegetation association from five broad floristic formations • Vegetation condition ranged from excellent to good	• Two priority flora: *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) and *Goodenia nuda* (P4) • No TECs or PECs	• None discussed

Study details	Methods	Results	Significant findings	Limitations
Onshore (2018b) Shearers West Detailed Flora and Vegetation Survey **Client**: BHP Western Australian Iron Ore **Type**: Detailed Flora and Vegetation Survey **Location**: Shearers West **Timing**: May 2018	• 49 detailed flora sites (quadrats) • Relevé sampling • Targeted flora surveys • Weed survey and mapping	• 262 flora taxa • 39 families • 110 genera • Six weed taxa • 18 vegetation associations • Nine broad floristic formations	• No threatened or priority listed taxa • Two range extensions: *Euphorbia multifaria* and *Ipomoea coptica* • No TECs or PECs • No WoNS or Declared Plant Pests	• No survey-specific limitations
Onshore (2018a) Reconnaissance Flora and Vegetation Survey Caramulla **Client**: BHP Western Australian Iron Ore **Type**: Reconnaissance Flora and Vegetation Survey **Location**: Caramulla **Timing**: February and June 2018	• 115 releves • Targeted flora surveys	• Five weed taxa • 30 vegetation associations • 12 broad floristic formations	• Five priority flora: *Eremophila capricornica* (P1), *Ipomoea racemigera* (P2), *Crotalaria smithiana* (P3), *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) and *Goodenia nuda* (P4) • Two species of interest • No WoNS or Declared Plant Pests	• Poor seasonal conditions • Poor access conditions
Onshore (2018c) Vegetation Survey and Desktop Assessment Caramulla Creek **Client**: BHP Western Australian Iron Ore **Type**: Reconnaissance and Desktop Flora and Vegetation Survey **Location**: Caramulla Creek **Timing**: June 2018	• 60 releves • Six transects	• Two introduced flora species • 21 vegetation associations • 14 broad floristic formations • Condition ranged from very good to degraded	• Two priority flora: *Eremophila capricornica* (P1) and *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) • Two vegetation associations support groundwater dependent vegetation	• Poor access

Study details	Methods	Results	Significant findings	Limitations
Astron (2019) Caramulla Creek Flora and Vegetation Survey **Client**: BHP Western Australian Iron Ore **Type**: Reconnaissance Flora and Vegetation Survey **Location**: Caramulla Creek **Timing**: October 2018	• 63 releves • 38 detailed mapping points • Targeted flora survey	• 197 confirmed vascular flora taxa • 39 families • Seven weed taxa • 27 vegetation units • Condition ranked excellent to poor	• One priority taxon, *Crotalaria smithiana* (P3)	• Some limitations associated with seasonality • Poor access • Fire
Onshore (2019) Jimblebar North Reconnaissance Flora and Vegetation Survey **Client**: BHP Western Australian Iron Ore **Type**: Reconnaissance Flora and Vegetation Survey **Location**: Jimblebar North **Timing**: September 2018	• 174 releves • Targeted flora survey	• Two weeds • 34 vegetation associations • 14 broad floristic formations • Condition excellent to degraded	• Two priority listed flora: *Eremophila capricornica* (P1) and *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)	• Poor season

Appendix F: Database Search Results

Parks and Wildlife Service (DBCA, 2018c)

EPBC Act Protected Matters Search (DoEE, 2018)

NatureMap (DBCA, 2018a)

Atlas of Living Australia (ALA, 2018a)

Western Australian Organism List (DPIRD, 2018)

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Acanthaceae	*Dipteracanthus australasicus*			•						
Aizoaceae	*Trianthema glossostigmum*			•						
Aizoaceae	*Trianthema pilosum*			•						
Aizoaceae	*Trianthema triquetrum*			•						
Alismataceae	*Sagittaria platyphylla*					•				Y
Amaranthaceae	*Alternanthera angustifolia*			•						
Amaranthaceae	*Alternanthera denticulata*			•						
Amaranthaceae	*Amaranthus centralis*	•							3	
Amaranthaceae	*Amaranthus cuspidifolius*			•						
Amaranthaceae	*Gomphrena canescens*			•						
Amaranthaceae	*Gomphrena cunninghamii*			•	•					
Amaranthaceae	*Gomphrena kanisii*			•	•					
Amaranthaceae	*Gomphrena lanata*			•						
Amaranthaceae	*Gomphrena sordida*			•						
Amaranthaceae	*Ptilotus aervoides*			•						
Amaranthaceae	*Ptilotus aphyllus*			•	•					
Amaranthaceae	*Ptilotus astrolasius*			•						
Amaranthaceae	*Ptilotus auriculifolius*			•						
Amaranthaceae	*Ptilotus axillaris*			•						
Amaranthaceae	*Ptilotus calostachyus*			•						
Amaranthaceae	*Ptilotus carinatus*			•						
Amaranthaceae	*Ptilotus clementii*			•						
Amaranthaceae	*Ptilotus drummondii*			•						
Amaranthaceae	*Ptilotus gaudichaudii*			•						
Amaranthaceae	*Ptilotus gomphrenoides*			•						

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Amaranthaceae	*Ptilotus helipteroides*			•						
Amaranthaceae	*Ptilotus incanus*			•						
Amaranthaceae	*Ptilotus nobilis*			•						
Amaranthaceae	*Ptilotus obovatus*			•						
Amaranthaceae	*Ptilotus polystachyus*			•						
Amaranthaceae	*Ptilotus roei*			•						
Amaranthaceae	*Ptilotus rotundifolius*			•						
Amaranthaceae	*Ptilotus schwartzii*			•						
Amaranthaceae	*Ptilotus subspinescens*	•							3	
Amaranthaceae	*Ptilotus tetrandrus*	•							1	
Amaranthaceae	*Ptilotus wilsonii*	•							1	
Apocynaceae	*Calotropis procera*					•				Y
Apocynaceae	*Cryptostegia madagascariensis*					•				Y
Apocynaceae	*Cynanchum floribundum*			•	•					
Apocynaceae	*Gymnanthera cunninghamii*	•		•					3	
Araceae	*Pistia stratiotes*					•				Y
Araceae	*Zantedeschia aethiopica*					•				Y
Araliaceae	*Hydrocotyle ranunculoides*					•				Y
Araliaceae	*Trachymene oleracea*			•						
Asparagaceae	*Asparagus asparagoides*					•				Y
Asteraceae	*Bidens bipinnata*				•					Y
Asteraceae	*Blumea tenella*			•						
Asteraceae	*Calocephalus beardii*			•						
Asteraceae	*Calocephalus pilbarensis*			•	•					
Asteraceae	*Calocephalus* sp. Wittenoom (A.S.George 1082)				•					

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Asteraceae	*Calotis latiuscula*	•		•					3	
Asteraceae	*Calotis multicaulis*			•						
Asteraceae	*Centipeda minima* subsp. *macrocephala*			•						
Asteraceae	*Centipeda thespidioides*			•	•					
Asteraceae	*Chondrilla juncea*					•				Y
Asteraceae	*Chrysocephalum apiculatum* subsp. *pilbarense*			•						
Asteraceae	*Chrysocephalum gilesii*			•						
Asteraceae	*Chrysocephalum pterochaetum*			•						
Asteraceae	*Flaveria trinervia*			•						Y
Asteraceae	*Gnephosis arachnoidea*			•	•					
Asteraceae	*Iotasperma sessilifolium*	•		•					3	
Asteraceae	*Minuria integerrima*			•	•					
Asteraceae	*Minuria* sp. Little Sandy Desert (S. van Leeuwen 4919)	•							1	
Asteraceae	*Olearia stuartii*			•						
Asteraceae	*Onopordum acaulon*					•				Y
Asteraceae	*Peripleura arida*			•						
Asteraceae	*Pluchea dentex*			•						
Asteraceae	*Pluchea dunlopii*			•	•					
Asteraceae	*Pluchea ferdinandi-muelleri*			•	•					
Asteraceae	*Pluchea rubelliflora*			•	•					
Asteraceae	*Podolepis capillaris*			•						
Asteraceae	*Podolepis eremaea*			•						
Asteraceae	*Pseudognaphalium luteoalbum*			•						
Asteraceae	*Pterocaulon sphacelatum*			•						
Asteraceae	*Pterocaulon sphaeranthoides*			•						

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Asteraceae	*Rhodanthe charsleyae*			•						
Asteraceae	*Rhodanthe floribunda*			•	•					
Asteraceae	*Roebuckiella similis*			•						
Asteraceae	*Rutidosis helichrysoides*			•						
Asteraceae	*Rutidosis helichrysoides* subsp. *helichrysoides*			•						
Asteraceae	*Schoenia cassiniana*			•						
Asteraceae	*Silybum marianum*					•				Y
Asteraceae	*Streptoglossa decurrens*			•	•					
Asteraceae	*Streptoglossa macrocephala*			•						
Asteraceae	*Vittadinia arida*				•					
Asteraceae	*Vittadinia* sp. Coondewanna Flats (S. van Leeuwen 4684)	•		•					1	
Asteraceae	*Xanthium spinosum*					•				Y
Asteraceae	*Xanthium strumarium*					•				Y
Asteraceae	*Xerochrysum boreale*	•							3	
Bixaceae	*Cochlospermum macnamarae*	•							1	
Boraginaceae	*Echium plantagineum*					•				Y
Boraginaceae	*Halgania erecta*			•						
Boraginaceae	*Halgania solanacea* var. Mt Doreen (G.M. Chippendale 4206)			•						
Boraginaceae	*Heliotropium cunninghamii*			•	•					
Boraginaceae	*Heliotropium heteranthum*			•						
Boraginaceae	*Trichodesma zeylanicum* var. *zeylanicum*			•						
Brassicaceae	*Lepidium catapycnon*	•		•					4	
Brassicaceae	*Lepidium echinatum*			•						
Brassicaceae	*Lepidium muelleri-ferdinandii*			•						
Brassicaceae	*Lepidium oxytrichum*			•	•					

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Brassicaceae	*Lepidium pedicellosum*			•						
Brassicaceae	*Lepidium phlebopetalum*			•						
Brassicaceae	*Lepidium pholidogynum*			•						
Brassicaceae	*Stenopetalum anfractum*			•						
Brassicaceae	*Stenopetalum decipiens*			•	•					
Brassicaceae	*Stenopetalum velutinum*			•						
Cactaceae	*Austrocylindropuntia cylindrica*					•				Y
Cactaceae	*Austrocylindropuntia subulata*					•				Y
Cactaceae	*Cylindropuntia fulgida*					•				Y
Cactaceae	*Cylindropuntia imbricata*					•				Y
Cactaceae	*Cylindropuntia kleiniae*					•				Y
Cactaceae	*Cylindropuntia pallida*					•				Y
Cactaceae	*Cylindropuntia tunicata*					•				Y
Cactaceae	*Opuntia elata*					•				Y
Cactaceae	*Opuntia elatior*					•				Y
Cactaceae	*Opuntia engelmannii*					•				Y
Cactaceae	*Opuntia ficus-indica*					•				Y
Cactaceae	*Opuntia microdasys*					•				Y
Cactaceae	*Opuntia monacantha*					•				Y
Cactaceae	*Opuntia polyacantha*					•				Y
Cactaceae	*Opuntia puberula*					•				Y
Cactaceae	*Opuntia stricta*					•				Y
Cactaceae	*Opuntia tomentosa*					•				Y
Campanulaceae	*Wahlenbergia tumidifructa*			•	•					
Capparaceae	*Capparis spinosa*			•						

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Caryophyllaceae	*Polycarpaea corymbosa*			•	•					
Caryophyllaceae	*Polycarpaea corymbosa* var. *corymbosa*			•						
Caryophyllaceae	*Polycarpaea holtzei*			•						
Caryophyllaceae	*Polycarpaea involucrata*			•						
Caryophyllaceae	*Polycarpaea longiflora*			•	•					
Celastraceae	*Macgregoria racemigera*			•						
Celastraceae	*Stackhousia clementii*	•							3	
Chenopodiaceae	*Atriplex semilunaris*			•						
Chenopodiaceae	*Atriplex spinulosa*	•							1	
Chenopodiaceae	*Dysphania kalpari*			•						
Chenopodiaceae	*Dysphania melanocarpa*			•						
Chenopodiaceae	*Dysphania rhadinostachya* subsp. *inflata*			•						
Chenopodiaceae	*Dysphania rhadinostachya* subsp. *rhadinostachya*			•						
Chenopodiaceae	*Maireana amoena*			•						
Chenopodiaceae	*Maireana carnosa*			•						
Chenopodiaceae	*Maireana georgei*			•						
Chenopodiaceae	*Maireana melanocoma*			•						
Chenopodiaceae	*Maireana planifolia*			•						
Chenopodiaceae	*Maireana prosthecochaeta*	•		•					3	
Chenopodiaceae	*Maireana pyramidata*			•	•					
Chenopodiaceae	*Maireana thesioides*			•	•					
Chenopodiaceae	*Maireana tomentosa*			•						
Chenopodiaceae	*Maireana triptera*			•						
Chenopodiaceae	*Maireana villosa*			•						
Chenopodiaceae	*Rhagodia eremaea*			•						

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Chenopodiaceae	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	•		•					3	
Chenopodiaceae	*Sclerolaena convexula*			•						
Chenopodiaceae	*Sclerolaena cornishiana*			•						
Chenopodiaceae	*Sclerolaena costata*			•						
Chenopodiaceae	*Sclerolaena densiflora*			•						
Chenopodiaceae	*Sclerolaena diacantha*			•						
Chenopodiaceae	*Sclerolaena eriacantha*			•						
Chenopodiaceae	*Sclerolaena lanicuspis*			•	•					
Chenopodiaceae	*Sclerolaena minuta*			•	•					
Chenopodiaceae	*Tecticornia bibenda*	•							1	
Chenopodiaceae	*Tecticornia medua*	•							3	
Chenopodiaceae	*Tecticornia* sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063)	•		•					1	
Chenopodiaceae	*Tecticornia globulifera*	•							1	
Chenopodiaceae	*Tecticornia willisii*	•							1	
Cleomaceae	*Cleome viscosa*			•						
Colchicaceae	*Wurmbea deserticola*			•						
Convolvulaceae	*Bonamia erecta*			•						
Convolvulaceae	*Bonamia rosea*			•						
Convolvulaceae	*Duperreya commixta*			•						
Convolvulaceae	*Evolvulus alsinoides*				•					
Convolvulaceae	*Evolvulus alsinoides* var. *decumbens*			•						
Convolvulaceae	*Evolvulus alsinoides* var. *villosicalyx*			•						
Convolvulaceae	*Ipomoea muelleri*			•						
Convolvulaceae	*Ipomoea plebeia*			•						

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Convolvulaceae	*Ipomoea racemigera*	•		•					2	
Cucurbitaceae	*Citrullus lanatus*			•						Y
Cyperaceae	*Bulbostylis barbata*			•	•					
Cyperaceae	*Bulbostylis turbinata*			•						
Cyperaceae	*Cyperus betchei subsp. commiscens*			•						
Cyperaceae	*Cyperus bifax*			•	•					
Cyperaceae	*Cyperus concinnus*			•						
Cyperaceae	*Cyperus cunninghamii*			•						
Cyperaceae	*Cyperus difformis*			•						
Cyperaceae	*Cyperus iria*			•	•					
Cyperaceae	*Cyperus ixiocarpus*			•						
Cyperaceae	*Cyperus pulchellus*			•						
Cyperaceae	*Cyperus squarrosus*			•	•					
Cyperaceae	*Cyperus vaginatus*			•	•					
Cyperaceae	*Eleocharis pallens*			•	•					
Cyperaceae	*Fimbristylis dichotoma*			•						
Cyperaceae	*Fimbristylis elegans*			•						
Cyperaceae	*Fimbristylis eremophila*			•						
Cyperaceae	*Fimbristylis microcarya*			•	•					
Cyperaceae	*Fimbristylis sieberiana*	•							3	
Cyperaceae	*Fimbristylis simulans*			•						
Cyperaceae	*Lipocarpha microcephala*			•	•					
Cyperaceae	*Schoenoplectiella dissachantha*			•						
Cyperaceae	*Schoenoplectiella laevis*			•						
Ditrichaceae	*Eccremidium arcuatum*			•						

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Droseraceae	*Drosera finlaysoniana*			•						
Elatinaceae	*Bergia pedicellaris*			•						
Euphorbiaceae	*Euphorbia boophthona*			•						
Euphorbiaceae	*Euphorbia coghlanii*			•						
Euphorbiaceae	*Euphorbia inappendiculata*				•					
Euphorbiaceae	*Euphorbia inappendiculata* var. *inappendiculata*	•		•					2	
Euphorbiaceae	*Euphorbia porcata*			•	•					
Euphorbiaceae	*Jatropha gossypiifolia*					•				Y
Fabaceae	*Acacia adoxa var. adoxa*			•						
Fabaceae	*Acacia adsurgens*			•						
Fabaceae	*Acacia ancistrocarpa*			•						
Fabaceae	*Acacia aphanoclada*	•							1	
Fabaceae	*Acacia aptaneura*			•	•					
Fabaceae	*Acacia arida*			•						
Fabaceae	*Acacia ayersiana*			•						
Fabaceae	*Acacia balsamea*			•						
Fabaceae	*Acacia bivenosa*			•	•					
Fabaceae	*Acacia bivenosa* x *sclerosperma* subsp. *sclerosperma*			•						
Fabaceae	*Acacia bromilowiana*	•		•					4	
Fabaceae	*Acacia catenulata* subsp. *occidentalis*			•						
Fabaceae	*Acacia citrinoviridis*			•						
Fabaceae	*Acacia clelandii*			•						
Fabaceae	*Acacia coriacea* subsp. *pendens*			•						
Fabaceae	*Acacia cuspidifolia*			•						
Fabaceae	*Acacia cyperophylla* var. *omearana*	•							1	

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Fabaceae	*Acacia dictyophleba*			•						
Fabaceae	*Acacia effusa*	•							3	
Fabaceae	*Acacia fecunda*	•							1	
Fabaceae	*Acacia hilliana*			•						
Fabaceae	*Acacia inaequilatera*			•						
Fabaceae	*Acacia kempeana*			•						
Fabaceae	*Acacia ligulata*			•						
Fabaceae	*Acacia macraneura*			•						
Fabaceae	*Acacia maitlandii*			•						
Fabaceae	*Acacia marramamba*			•						
Fabaceae	*Acacia melleodora*			•						
Fabaceae	*Acacia monticola*			•						
Fabaceae	*Acacia mulganeura*			•	•					
Fabaceae	*Acacia orthocarpa*			•						
Fabaceae	*Acacia pachyacra*			•						
Fabaceae	*Acacia paraneura*			•						
Fabaceae	*Acacia pruinocarpa*			•						
Fabaceae	*Acacia pteraneura*			•	•					
Fabaceae	*Acacia pyrifolia*				•					
Fabaceae	*Acacia pyrifolia* var. *morrisonii*			•						
Fabaceae	*Acacia pyrifolia* var. *pyrifolia*			•						
Fabaceae	*Acacia ramulosa* var. *linophylla*			•						
Fabaceae	*Acacia rhodophloia*			•	•					
Fabaceae	*Acacia sclerosperma*			•	•					
Fabaceae	*Acacia sclerosperma* subsp. *sclerosperma*			•						

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Fabaceae	*Acacia sericophylla*			•						
Fabaceae	*Acacia sibirica*			•						
Fabaceae	*Acacia corusca*[11]			•					1	
Fabaceae	*Acacia* sp. Jimblebar (S. van Leeuwen 1342)			•						
Fabaceae	*Acacia* sp. Nullagine (B.R. Maslin 4955)	•							1	
Fabaceae	*Acacia subcontorta*			•						
Fabaceae	*Acacia subtiliformis*	•		•					3	
Fabaceae	*Acacia synchronicia*			•	•					
Fabaceae	*Acacia tenuissima*			•						
Fabaceae	*Acacia trudgeniana*			•						
Fabaceae	*Acacia tumida* var. *pilbarensis*			•						
Fabaceae	*Acacia victoriae*			•						
Fabaceae	*Acacia wanyu*			•						
Fabaceae	*Aenictophyton reconditum* subsp. *macrophyllum*			•						
Fabaceae	*Alhagi maurorum*					•				Y
Fabaceae	*Cajanus marmoratus*			•						
Fabaceae	*Crotalaria smithiana*	•		•					3	
Fabaceae	*Cullen cinereum*			•						
Fabaceae	*Cullen lachnostachys*			•						
Fabaceae	*Daviesia arthropoda*	•							3	
Fabaceae	*Glycine canescens*			•						
Fabaceae	*Gompholobium oreophilum*			•						
Fabaceae	*Indigofera ammobia*	•							3	

[11] This taxon was formerly known as *Acacia* sp. East Fortescue (J. Bull & D. Roberts ONS A 27.01) (J.P.Bull, 2019)

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Fabaceae	*Indigofera colutea*			•						
Fabaceae	*Indigofera georgei*			•						
Fabaceae	*Indigofera gilesii*	•		•					3	
Fabaceae	*Indigofera ixocarpa*	•							2	
Fabaceae	*Indigofera monophylla*			•						
Fabaceae	*Isotropis atropurpurea*			•						
Fabaceae	*Isotropis parviflora*	•		•					2	
Fabaceae	*Jacksonia aculeata*			•						
Fabaceae	*Kennedia prorepens*			•						
Fabaceae	*Mirbelia ramulosa*			•						
Fabaceae	*Mirbelia viminalis*			•						
Fabaceae	*Muelleranthus trifoliolatus*			•						
Fabaceae	*Parkinsonia aculeata*		•			•				Y
Fabaceae	*Petalostylis cassioides*			•						
Fabaceae	*Petalostylis labicheoides*			•						
Fabaceae	*Prosopis glandulosa* x *velutina*					•				Y
Fabaceae	*Senna alata*					•				Y
Fabaceae	*Senna artemisioides* subsp. *helmsii*			•						
Fabaceae	*Senna artemisioides* subsp. *oligophylla*			•						
Fabaceae	*Senna glutinosa*				•					
Fabaceae	*Senna glutinosa* subsp. *glutinosa*			•						
Fabaceae	*Senna glutinosa* subsp. *pruinosa*			•						
Fabaceae	*Senna glutinosa* subsp. x *luerssenii*			•						
Fabaceae	*Senna hamersleyensis*			•						
Fabaceae	*Senna notabilis*			•						

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Fabaceae	*Senna obtusifolia*					•				Y
Fabaceae	*Senna* sp. Billabong (J.D. Alonzo 721)			•						
Fabaceae	*Senna symonii*			•						
Fabaceae	*Senna venusta*			•						
Fabaceae	*Swainsona decurrens*			•	•					
Fabaceae	*Swainsona oroboides*			•						
Fabaceae	*Tephrosia oxalidea*			•						
Fabaceae	*Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186)			•						
Fabaceae	*Tephrosia* sp. clay soils (S. van Leeuwen et al. PBS 0273)			•						
Fabaceae	*Tephrosia* sp. deserts (J.R. Maconochie 1403)			•						
Fabaceae	*Tephrosia* sp. Newman (A.A. Mitchell PRP 29)			•	•					
Fabaceae	*Tephrosia* sp. Northern (K.F. Kenneally 11950)			•						
Fabaceae	*Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)			•	•					
Fabaceae	*Tephrosia* sp. Willowra (G.M.Chippendale 4809)			•	•					
Fabaceae	*Ulex europaeus*					•				Y
Fabaceae	*Vigna lanceolata*				•					
Fabaceae	*Vigna lanceolata* var. *lanceolata*			•						
Fabaceae	*Vigna* sp. Hamersley Clay (A.A. Mitchell PRP 113)			•						
Frankeniaceae	*Frankenia glomerata*	•							4	
Frankeniaceae	*Frankenia setosa*			•	•					
Goodeniaceae	*Brunonia australis*			•						
Goodeniaceae	*Dampiera candicans*			•						
Goodeniaceae	*Dampiera cinerea*			•						
Goodeniaceae	*Goodenia armitiana*			•						
Goodeniaceae	*Goodenia berringbinensis*	•		•					4	

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Goodeniaceae	*Goodenia lamprosperma*			•						
Goodeniaceae	*Goodenia lyrata*	•							3	
Goodeniaceae	*Goodenia microptera*			•						
Goodeniaceae	*Goodenia modesta*	•							3	
Goodeniaceae	*Goodenia muelleriana*			•	•					
Goodeniaceae	*Goodenia nuda*	•		•					4	
Goodeniaceae	*Goodenia pedicellata*	•							1	
Goodeniaceae	*Goodenia prostrata*			•						
Goodeniaceae	*Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727)	•		•					3	
Goodeniaceae	*Goodenia* sp. Sandy Creek (R.D. Royce 1653)			•	•					
Goodeniaceae	*Goodenia tenuiloba*			•						
Goodeniaceae	*Goodenia triodiophila*			•						
Goodeniaceae	*Goodenia vilmoriniae*			•						
Goodeniaceae	*Scaevola acacioides*			•						
Goodeniaceae	*Scaevola browniana*			•						
Goodeniaceae	*Scaevola browniana* subsp. *browniana*			•						
Goodeniaceae	*Scaevola parvifolia* subsp. *pilbarae*			•						
Goodeniaceae	*Scaevola spinescens*			•	•					
Goodeniaceae	*Velleia connata*			•						
Goodeniaceae	*Velleia glabrata*			•						
Gyrostemonaceae	*Codonocarpus cotinifolius*			•						
Haloragaceae	*Gonocarpus ephemerus*			•						
Haloragaceae	*Haloragis gossei*			•						
Iridaceae	*Moraea flaccida*					•				Y
Iridaceae	*Moraea miniata*					•				Y

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Lamiaceae	*Dicrastylis cordifolia*			•						
Lamiaceae	*Dicrastylis kumarinensis*			•						
Lamiaceae	*Dicrastylis mitchellii*	•		•					1	
Lamiaceae	*Newcastelia cephalantha*			•						
Lamiaceae	*Newcastelia hexarrhena*			•						
Lamiaceae	*Teucrium pilbaranum*	•							2	
Lauraceae	*Cassytha capillaris*			•						
Loganiaceae	*Mitrasacme connata*			•						
Loranthaceae	*Amyema fitzgeraldii*			•						
Loranthaceae	*Amyema gibberula* var. *gibberula*			•						
Loranthaceae	*Amyema preissii*			•						
Lythraceae	*Ammannia multiflora*			•						
Lythraceae	*Rotala diandra*			•						
Malvaceae	*Abutilon amplum*			•						
Malvaceae	*Abutilon fraseri*			•						
Malvaceae	*Abutilon lepidum*			•						
Malvaceae	*Abutilon macrum*			•						
Malvaceae	*Abutilon malvifolium*			•	•					
Malvaceae	*Abutilon oxycarpum*			•	•					
Malvaceae	*Abutilon oxycarpum* subsp. Prostrate (A.A. Mitchell PRP 1266)			•						
Malvaceae	*Abutilon* sp. Dioicum (A.A. Mitchell PRP 1618)			•						
Malvaceae	*Abutilon* sp. Pilbara (W.R. Barker 2025)			•						
Malvaceae	*Androcalva luteiflora*			•						
Malvaceae	*Corchorus crozophorifolius*			•						
Malvaceae	*Corchorus lasiocarpus*			•	•					

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Malvaceae	*Corchorus lasiocarpus* subsp. *lasiocarpus*			•						
Malvaceae	*Corchorus lasiocarpus* subsp. *parvus*			•						
Malvaceae	*Corchorus sidoides*			•	•					
Malvaceae	*Corchorus sidoides* subsp. *sidoides*			•						
Malvaceae	*Corchorus* sp. Hamersley Range hilltops (S. van Leeuwen 3826)			•						
Malvaceae	*Corchorus tridens*			•						
Malvaceae	*Gossypium hirsutum*			•						
Malvaceae	*Hibiscus arenicola*			•						
Malvaceae	*Hibiscus austrinus* var. *austrinus*			•						
Malvaceae	*Hibiscus burtonii*			•	•					
Malvaceae	*Hibiscus campanulatus*			•					1	
Malvaceae	*Hibiscus haynaldii*			•						
Malvaceae	*Hibiscus* sp. Carnarvon (S. van Leeuwen 5110)	•							1	
Malvaceae	*Hibiscus sturtii*			•	•					
Malvaceae	*Hibiscus sturtii* var. *truncatus*			•						
Malvaceae	*Hibiscus verdcourtii*			•						
Malvaceae	*Malvastrum americanum*			•	•					Y
Malvaceae	*Seringia elliptica*			•						
Malvaceae	*Seringia nephrosperma*			•						
Malvaceae	*Sida arsiniata*			•						
Malvaceae	*Sida brownii*			•	•					
Malvaceae	*Sida calyxhymenia*			•						
Malvaceae	*Sida cardiophylla*			•						
Malvaceae	*Sida echinocarpa*			•						
Malvaceae	*Sida ectogama*			•	•					

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Malvaceae	*Sida fibulifera*			•						
Malvaceae	*Sida kingii*			•						
Malvaceae	*Sida* sp. Barlee Range (S. van Leeuwen 1642)	•							3	
Malvaceae	*Sida* sp. dark green fruits (S. van Leeuwen 2260)			•						
Malvaceae	*Sida* sp. Excedentifolia (J.L. Egan 1925)			•						
Malvaceae	*Sida* sp. Pilbara (A.A. Mitchell PRP 1543)			•						
Malvaceae	*Sida* sp. Shovelanna Hill (S. van Leeuwen 3842)			•						
Malvaceae	*Sida* sp. tiny glabrous fruit (A.A. Mitchell PRP1152)			•						
Malvaceae	*Sida* sp. verrucose glands (F.H. Mollemans 2423)			•						
Malvaceae	*Triumfetta leptacantha*			•						
Malvaceae	*Triumfetta maconochieana*			•						
Malvaceae	*Waltheria virgata*			•						
Molluginaceae	*Hypertelis cerviana*			•						
Molluginaceae	*Trigastrotheca molluginea*			•						
Montiaceae	*Calandrinia balonensis*			•						
Montiaceae	*Calandrinia stagnensis*			•						
Montiaceae	*Calandrinia tepperiana*			•						
Myrtaceae	*Calytrix carinata*			•						
Myrtaceae	*Corymbia aspera*			•						
Myrtaceae	*Corymbia candida*			•						
Myrtaceae	*Corymbia candida* subsp. *dipsodes*			•						
Myrtaceae	*Corymbia deserticola* subsp. *deserticola*			•						
Myrtaceae	*Corymbia ferriticola*			•						
Myrtaceae	*Corymbia hamersleyana*			•						
Myrtaceae	*Eucalyptus camaldulensis* subsp. *obtusa*			•						

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Myrtaceae	*Eucalyptus kingsmillii*			•						
Myrtaceae	*Eucalyptus leucophloia*			•						
Myrtaceae	*Eucalyptus leucophloia* subsp. *leucophloia*			•						
Myrtaceae	*Eucalyptus repullulans*			•						
Myrtaceae	*Eucalyptus rowleyi*	•		•					3	
Myrtaceae	*Eucalyptus semota*	•							1	
Myrtaceae	*Eucalyptus socialis*			•	•					
Myrtaceae	*Eucalyptus trivalva*			•						
Myrtaceae	*Eucalyptus xerothermica*			•						
Myrtaceae	*Lamarchea sulcata*			•						
Myrtaceae	*Melaleuca glomerata*			•						
Nyctaginaceae	*Boerhavia coccinea*			•						
Nyctaginaceae	*Boerhavia repleta*			•						
Orobanchaceae	*Buchnera linearis*			•						
Orobanchaceae	*Striga squamigera*			•						
Phrymaceae	*Peplidium maritimum*			•						
Phyllanthaceae	*Phyllanthus erwinii*			•	•					
Phyllanthaceae	*Phyllanthus maderaspatensis*			•						
Phyllanthaceae	*Phyllanthus virgatus*			•						
Phyllanthaceae	*Synostemon rhytidospermus*			•						
Plantaginaceae	*Stemodia viscosa*			•	•					
Poaceae	*Acrachne racemosa*			•						
Poaceae	*Alloteropsis cimicina*			•	•					
Poaceae	*Amphipogon caricinus*			•						
Poaceae	*Amphipogon sericeus*			•						

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Poaceae	*Aristida contorta*			•	•					
Poaceae	*Aristida holathera*			•						
Poaceae	*Aristida inaequiglumis*			•	•					
Poaceae	*Aristida jerichoensis*				•					
Poaceae	*Aristida jerichoensis* var. *subspinulifera*	•		•					3	
Poaceae	*Aristida lazaridis*	•		•					2	
Poaceae	*Cenchrus setiger*			•						Y
Poaceae	*Chloris pectinata*			•						
Poaceae	*Chloris pumilio*			•						
Poaceae	*Chrysopogon fallax*			•						
Poaceae	*Cymbopogon ambiguus*			•	•					
Poaceae	*Cymbopogon obtectus*			•	•					
Poaceae	*Cynodon dactylon*			•						Y
Poaceae	*Cynodon prostratus*			•						
Poaceae	*Dichanthium fecundum*			•						
Poaceae	*Dichanthium sericeum* subsp. *sericeum*			•						
Poaceae	*Digitaria brownii*			•						
Poaceae	*Digitaria ctenantha*			•						
Poaceae	*Digitaria longiflora*			•	•					
Poaceae	*Diplachne fusca* subsp. *muelleri*			•						
Poaceae	*Echinochloa colona*			•						Y
Poaceae	*Elytrophorus spicatus*			•						
Poaceae	*Enneapogon caerulescens*			•						
Poaceae	*Enneapogon robustissimus*			•						
Poaceae	*Eragrostis cumingii*			•						

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Poaceae	*Eragrostis dielsii*			•						
Poaceae	*Eragrostis elongata*			•	•					
Poaceae	*Eragrostis eriopoda*			•						
Poaceae	*Eragrostis leptocarpa*			•						
Poaceae	*Eragrostis olida*			•	•					
Poaceae	*Eragrostis pergracilis*			•						
Poaceae	*Eragrostis speciosa*			•						
Poaceae	*Eragrostis tenellula*			•						
Poaceae	*Eragrostis xerophila*			•						
Poaceae	*Eriachne aristidea*			•						
Poaceae	*Eriachne lanata*			•	•					
Poaceae	*Eriachne mucronata*			•						
Poaceae	*Eriachne obtusa*			•						
Poaceae	*Eriachne pulchella* subsp. *dominii*			•						
Poaceae	*Eriachne tenuiculmis*			•						
Poaceae	*Eriochloa pseudoacrotricha*			•						
Poaceae	*Eulalia aurea*			•						
Poaceae	*Iseilema eremaeum*			•						
Poaceae	*Iseilema membranaceum*			•						
Poaceae	*Leptochloa digitata*			•						
Poaceae	*Monachather paradoxus*			•	•					
Poaceae	*Panicum decompositum*			•						
Poaceae	*Panicum effusum*			•						
Poaceae	*Paraneurachne muelleri*			•						
Poaceae	*Paspalidium clementii*			•						

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Poaceae	*Paspalidium constrictum*			•						
Poaceae	*Paspalidium rarum*			•						
Poaceae	*Perotis rara*			•						
Poaceae	*Schizachyrium fragile*			•						
Poaceae	*Setaria surgens*			•						
Poaceae	*Sporobolus actinocladus*			•						
Poaceae	*Sporobolus australasicus*			•						
Poaceae	*Themeda* sp. Hamersley Station (M.E. Trudgen 11431)	•		•					3	
Poaceae	*Thyridolepis xerophila*			•						
Poaceae	*Tragus australianus*			•						
Poaceae	*Triodia angusta*			•						
Poaceae	*Triodia basedowii*			•	•					
Poaceae	*Triodia birriliburu*	•							3	
Poaceae	*Triodia longiceps*			•						
Poaceae	*Triodia melvillei*			•						
Poaceae	*Triodia pungens*			•						
Poaceae	*Triodia schinzii*			•	•					
Poaceae	*Triodia* sp. Mt Ella (M.E. Trudgen 12739)	•		•					3	
Poaceae	*Triodia vanleeuwenii*			•						
Poaceae	*Tripogonella loliiformis*			•						
Poaceae	*Xerochloa imberbis*			•						
Poaceae	*Yakirra australiensis* var. *australiensis*			•						
Polygalaceae	*Polygala glaucifolia*			•						
Polygalaceae	*Comesperma sabulosum*	•		•					3	
Polygalaceae	*Comesperma viscidulum*	•							4	

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Polygonaceae	*Rumex vesicarius*			•						Y
Portulacaceae	*Portulaca cyclophylla*			•						
Portulacaceae	*Portulaca filifolia*			•						
Portulacaceae	*Portulaca oleracea*			•						
Portulacaceae	*Portulaca pilosa*			•						Y
Primulaceae	*Samolus* sp. Fortescue Marsh (A. Markey & R. Coppen FM 9702)	•		•					1	
Proteaceae	*Grevillea juncifolia*				•					
Proteaceae	*Grevillea juncifolia* subsp. *juncifolia*			•						
Proteaceae	*Grevillea saxicola*	•							3	
Proteaceae	*Grevillea striata*			•	•					
Proteaceae	*Hakea lorea* subsp. *lorea*			•						
Proteaceae	*Hakea preissii*			•						
Pteridaceae	*Cheilanthes austrotenuifolia*			•	•					
Pteridaceae	*Cheilanthes lasiophylla*			•	•					
Rhamnaceae	*Cryptandra monticola*			•						
Rhamnaceae	*Ventilago viminalis*			•						
Rhamnaceae	*Ziziphus mauritiana*					•				Y
Ricciaceae	*Riccia crinita*			•						
Rosaceae	*Rubus ulmifolius*					•				Y
Rubiaceae	*Oldenlandia galioides*			•	•					
Rubiaceae	*Psydrax suaveolens*			•	•					
Ruppiaceae	*Ruppia polycarpa*			•						
Santalaceae	*Anthobolus leptomerioides*			•						
Santalaceae	*Santalum lanceolatum*			•	•					
Santalaceae	*Santalum spicatum*			•						

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Sapindaceae	*Diplopeltis stuartii* var. *stuartii*			•						
Sapindaceae	*Dodonaea coriacea*			•						
Scrophulariaceae	*Eremophila anomala*	•							1	
Scrophulariaceae	*Eremophila appressa*	•							1	
Scrophulariaceae	*Eremophila capricornica*	•		•					1	
Scrophulariaceae	*Eremophila cuneifolia*			•						
Scrophulariaceae	*Eremophila fraseri* subsp. *fraseri*			•						
Scrophulariaceae	*Eremophila jucunda* subsp. *jucunda*			•						
Scrophulariaceae	*Eremophila lachnocalyx*			•						
Scrophulariaceae	*Eremophila lanceolata*			•	•					
Scrophulariaceae	*Eremophila maculata* subsp. *maculata*	•		•						
Scrophulariaceae	*Eremophila magnifica* subsp. *magnifica*	•		•					4	
Scrophulariaceae	*Eremophila magnifica* subsp. *velutina*	•							3	
Scrophulariaceae	*Eremophila margarethae*			•						
Scrophulariaceae	*Eremophila oppositifolia*				•					
Scrophulariaceae	*Eremophila oppositifolia* subsp. *angustifolia*			•						
Scrophulariaceae	*Eremophila platycalyx* subsp. *platycalyx*			•						
Scrophulariaceae	*Eremophila pusilliflora*	•							2	
Scrophulariaceae	*Eremophila rhegos*	•		•					1	
Scrophulariaceae	*Eremophila rigida*	•		•					3	
Scrophulariaceae	*Eremophila* sp. Hamersley Range (K. Walker KW 136)	•		•					1	
Scrophulariaceae	*Eremophila* sp. West Angelas (S. van Leeuwen 4068)	•		•					1	
Scrophulariaceae	*Eremophila youngii* subsp. *lepidota*	•		•					4	
Solanaceae	*Nicotiana benthamiana*			•						
Solanaceae	*Nicotiana occidentalis*			•						

Family	Taxon	DBCA	EPBC Act	NatureMap	ALA	WAOL	Conservation Rating			Introduced
							EPBC Act	WC Act	DBCA	
Solanaceae	*Nicotiana umbratica*	•							3	
Solanaceae	*Solanum austropiceum*			•						
Solanaceae	*Solanum centrale*			•						
Solanaceae	*Solanum cleistogamum*			•	•					
Solanaceae	*Solanum elaeagnifolium*					•				Y
Solanaceae	*Solanum elatius*			•						
Solanaceae	*Solanum lasiophyllum*			•						
Solanaceae	*Solanum linnaeanum*					•				Y
Solanaceae	*Solanum morrisonii*			•						
Solanaceae	*Solanum piceum*			•						
Solanaceae	*Solanum* sp. Mosquito Creek (A.A. Mitchell et al. AAM 10795)	•							1	
Stylidiaceae	*Stylidium weeliwolli*	•							3	
Tamaricaceae	*Tamarix aphylla*		•			•				Y
Verbenaceae	*Lantana camara*					•				Y
Violaceae	*Hybanthus aurantiacus*			•						
Zygophyllaceae	*Tribulus astrocarpus*			•	•					
Zygophyllaceae	*Tribulus eichlerianus*			•						
Zygophyllaceae	*Tribulus macrocarpus*			•						
Zygophyllaceae	*Tribulus minutus*	•							1	
Zygophyllaceae	*Tribulus terrestris*			•						Y

Appendix G: Conservation Significant Flora Likelihood of Occurrence

Source

A: Threatened and Priority Flora Database (DBCA, 2018c)

B: Western Australian Herbarium Specimen Database (DBCA, 2018c)

C: NatureMap (DBCA, 2018a)

Taxon	EPBC Act	WC Act	DBCA	Source[1]	Habit and Habitat[2]	Habitat within Study Area	Within Current Known Distribution	Distance to Nearest Record	Recorded within Study Area	Likelihood of Occurrence
Acacia aphanoclada			1	D	Slender, wispy shrub, 1.7-5 m high. Fl. yellow, Aug to Oct. Skeletal stony soils. Rocky hills, ridges & rises	No	No	>160 km N	No	Highly Unlikely
Acacia bromilowiana			4	A, B	Tree or shrub, to 12 m high, bark dark grey, fibrous; phyllodes more or less glaucous & slightly pruinose; inflorescence in spikes. Fl. yellow/pink, Jul to Aug. Red skeletal stony loam, orange-brown pebbly, gravel loam, laterite, banded ironstone, basalt. Rocky hills, breakaways, scree slopes, gorges, creek beds	Potential	Yes	>32 km NW	No	Possible
Acacia cyperophylla var. *omearana*			1	B, D	Tree, 4-10 m high, 'minni-ritchi' bark. Fl. yellow, Mar to Apr. Stony & gritty alluvium. Along drainage lines	Yes	No	>170 km N	No	Highly Unlikely
Acacia effusa			3	D	Low, dense, spreading, somewhat viscid shrub, 0.3-1 m high, bark 'minni-ritchi'. Fl. yellow, May to Aug. Stony red loam. Scree slopes of low ranges	No	No	>100 km W	No	Highly Unlikely
Acacia fecunda			1	D	Erect, obconic shrub, to 3 m high, bark grey, smooth becoming yellow-brown on upper branches; phyllodes more or less sub-glaucous with a slight sheen; inflorescence of spikes. Fl. yellow, May or Aug. Quartzite gibbers over grey-red skeletal soil. Along shallow creeks and drainage lines, hills, road verges	No	No	>170 km N	No	Highly Unlikely
Acacia corusca[12]			1	A, C	Erect, dense woody shrub with rounded growth form, to 5 m (7 m) high and 4 m wide. Diagnostic characters include flat phyllodes with anastomosing nerves, cylindrical spikes, separated calyx lobes, gland about 10 mm above the pulvinus, dense red brown glandular trichomes on new growth and edges of phyllodes (small hairlets). Fl. Spring to August. Low undulating weathered ironstone hills, often on breakaways and rocky drainage lines dissecting hills	No	No	>43km ENE	No	Unlikely
Acacia sp. Nullagine (B.R. Maslin 4955)			1	A, D	Erect, spindly shrub, to 3 m high, bark minni-ritchi, grey above, red underneath. Rocky clay. Low-lying areas between rocky hills	No	No	>195 km N	No	Highly Unlikely

[12] This taxon was formerly known as *Acacia* sp. East Fortescue (J. Bull & D. Roberts ONS A 27.01) (Bull *et al.*, 2019)

Taxon	EPBC Act	WC Act	DBCA	Source[1]	Habit and Habitat[2]	Habitat within Study Area	Within Current Known Distribution	Distance to Nearest Record	Recorded within Study Area	Likelihood of Occurrence
Acacia subtiliformis			3	A, B, C	Spindly, slender, erect shrub, to 3.5 m high, phyllodes green, new growth slightly viscid, resinous, aromatic; inflorescence in heads to 6 mm diameter; peduncles red. Fl. yellow, Jun. On rocky calcrete plateau	No	No	>35 km N	No	Unlikely
Amaranthus centralis			3	B, D	Annual herb, decumbent or erect to 0.6 m high. Grows in red sand in ephemeral watercourses, sandy to clayey loam on riverbanks and edges of permanent pools in eucalypt lined channels, or acacia shrubland	No	No	>50 km N	No	Highly Unlikely
Aristida jerichoensis var. *subspinulifera*			3	A, B, C, D	Compactly tufted perennial, grass-like or herb, 0.3-0.8 m high, lemma groove muricate. Hardpan plains	Potential	Yes	>12 km N	No	Likely
Aristida lazaridis			2	A, B, C	Tufted perennial, grass-like or herb, 0.4-1.5 m high. Fl. green/purple, Apr. Sand or loam	Potential	No	>35 km NW	No	Unlikely
Atriplex spinulosa			1	A, B, D	Monoecious, erect, rounded annual, herb, ca 0.2 m high	No	No	>170 km N	No	Highly Unlikely
Cochlospermum macnamarae			1	D	Spreading, multi-stemmed shrub to c. 2 m high and 3 m wide. Fl. Yellow. Upper slopes of low hills. Shallow, stony soil closely underlain by granitic bedrock. Granite outcrops, granite boulder piles	No	No	>190 km N	No	Highly Unlikely
Comesperma sabulosum			3	D	Annual, herb, to 0.4 m high. Fl. yellow, Jun. Regeneration site on floodplain. Sandy areas, dunes	No	Yes	>92 km SE	No	Highly Unlikely
Comesperma viscidulum			4	D	Spreading, glabrescent, perennial subshrub to 0.3 m high. Red-brown cracking clay soils associated with basalts on Chichester Plateau	No	No	>147 km SE	No	Highly Unlikely
Crotalaria smithiana			3	C, D	Annual, herb, to 0.4 m high. Fl. yellow, Jun. Regeneration site on floodplain	No	No	>32 km NE	No	Highly Unlikely
Daviesia arthropoda			3	D	Spiny, bushy shrub, to 1 m high. Fl. yellow-brown. Dunes.	No	No	>205 km SE	No	Highly Unlikely
Dicrastylis mitchellii			1	D	Shrub, to about 0.3 m high. Sand or clay soils. Around dunes	No	No	>140 km W	No	Highly Unlikely
Eremophila anomala			1	D	Shrub. Fl. white, Aug to Sep. Basalt outcrop	No	No	>170 km SE	No	Highly Unlikely

Taxon	EPBC Act	WC Act	DBCA	Source[1]	Habit and Habitat[2]	Habitat within Study Area	Within Current Known Distribution	Distance to Nearest Record	Recorded within Study Area	Likelihood of Occurrence
Eremophila appressa			1	D	Spreading, weeping, open shrub, 1-3 m high. Ironstone gravel. Ridge slopes	No	No	>95 km S	No	Highly Unlikely
Eremophila capricornica			1	C	Compact, sometimes prostrate, shrub, with greyish foliage, to 1 m high. Fl. purple. Rocky plains	Yes	Yes	>40 km E	No	Unlikely
Eremophila magnifica subsp. magnifica			4	A, B, C	Shrub, 0.5-1.5 m high. Fl. blue-purple, Aug to Sep. Skeletal soils over ironstone. Summits and rocky scree slopes	Yes	No	7.5 km N	No	Likely
Eremophila magnifica subsp. *velutina*			3	A, B, C, D	Shrub, 0.5-1.5 m high. Fl. blue-purple, Aug to Sep. Skeletal soils over ironstone. Summits and rocky scree slopes	Yes	Yes	>30 km S	No	Possible
Eremophila pusilliflora			2	A	Low spreading shrub, to 0.8 m high. Drainage lines, broad depressions, flood plains. Red sandy loam	No	No	>110 km W	No	Highly Unlikely
Eremophila rhegos			1	A, B, C	Erect shrub, ca 1 m high. Fl. blue-purple-white, Sep. Skeletal stony loam over granite	No	No	>40 km S	No	Highly Unlikely
Eremophila rigida			3	A, B, C, D	Bushy shrub, 0.3-4 m high. Fl. cream, Sep. Red sand alluvium. Hardpan plains, stony clay depressions	Potential	No	>15 km S	No	Unlikely
Eremophila sp. Hamersley Range (K. Walker KW 136)			1	A, B, C, D	Erect shrub 1-3.5 m tall. Grows in open rocky slopes, gullies and rock faces associated with large hills and cliffs	Yes	Yes	>12 km N	No	Possible
Eremophila sp. West Angelas (S. van Leeuwen 4068)			1	A, B, C	Spindly whip shrub, to 3 m high. Skeletal soils over banded ironstone (Brockman Iron Formation). High in landscape, steep rocky slopes and scree, often on summits	No	No	>45 km W	No	Highly Unlikely
Eremophila youngii subsp. *lepidota*			4	A, B, C	Dense, spreading shrub, (0.2-)1-3 m high. Fl. purple-red-pink, Jan or Mar or Jun or Aug to Sep. Stony red sandy loam. Flats plains, floodplains, sometimes semi-saline, clay flats	Potential	Yes	>28 km NE	No	Unlikely
Eucalyptus rowleyi			3	D	Lignotuberous mallee 3-5 m tall. Fl. white, Nov-Jun. Restricted to the plains of the upper De Grey River system	No	No	>62 km NE	No	Highly Unlikely
Eucalyptus semota			1	D	Mallee or tree, 2-9 m high, bark rough & peeling on trunk, smooth above. Clay. Quartz outcrops	Potential	No	>150 km S	No	Highly Unlikely
Euphorbia inappendiculata var. *inappendiculata*			2	C	Spreading, procumbent herb, to 0.4 m high. Fl. pink, Aug. Clay soils. Among broken rocky screes	Potential	Yes	>35 km E	No	Unlikely

Taxon	EPBC Act	WC Act	DBCA	Source[1]	Habit and Habitat[2]	Habitat within Study Area	Within Current Known Distribution	Distance to Nearest Record	Recorded within Study Area	Likelihood of Occurrence
Fimbristylis sieberiana			3	D	Shortly rhizomatous, tufted perennial, grass-like or herb (sedge), 0.25-0.6 m high. Fl. brown, May to Jun. Mud, skeletal soil pockets. Pool edges, sandstone cliffs	No	No	>75 km NW	No	Highly Unlikely
Frankenia glomerata			4	D	Prostrate shrub. Fl. pink-white, Nov. White sand	No	No	>130 km SE	No	Highly Unlikely
Goodenia berringbinensis			4	A, B, C	Ascending annual, herb, 0.1-0.3 m high. Fl. yellow, Oct. Red sandy loam, often clay. Along watercourses, soaks	No	No	>30 km E	No	Unlikely
Goodenia lyrata			3	A, D	Prostrate herb, with lyrate leaves. Fl. yellow, Aug. Red sandy loam. Near claypan	No	No	>100 km W	No	Highly Unlikely
Goodenia modesta			3	A, D	Herb, to 0.5 m high. Fl. yellow, probably Jan to Dec. Red loam, sand	Yes	No	>100 km SE	No	Highly Unlikely
Goodenia nuda			4	A, B, C	Erect to ascending herb, to 0.5 m high. Fl. yellow, Apr to Aug	Yes	Yes	1 km N	No	Highly Likely
Goodenia pedicellata			1	A, D	Single-stemmed perennial, herb (with dense, cottony and strigose hairs), to 0.25 m high. Rocky clayey soils. Rocky slopes and crests of small hills	No	No	>230 km W	No	Highly Unlikely
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)			3	A, B, C, D	Open, erect annual or biennial, herb, to 0.2 m high. Fl. yellow. Red-brown clay soil, calcrete pebbles. Low undulating plain, swampy plains	No	Yes	>15 km NE	No	Possible
Grevillea saxicola			3	B, D	Shrub or small tree (1.0-)2.5-7.0 m tall. Fl. Cream to pale yellow, late spring to early autumn. Orange-brown to red-brown loam soils on the upper scree/breakaway slopes and crests, associated with banded iron formation outcrops	No	No	>55 km NW	No	Highly Unlikely
Gymnanthera cunninghamii			3	A, B, C	Erect emergent shrub, milky sap, 1-2 m high. Fl. cream-yellow-green, Jan to Dec. Sandy soils. Major drainage lines, rocky creeks	No	Yes	>20 km NE	No	Unlikely
Hibiscus aff. *campanulatus*			1	A	Erect shrub to 2 m high. Fl. large white-pink showy. Sandy soils. Drainage lines, gullies, base of breakaways. Associated with ironstone	Potential	No	>15 km N	No	Unlikely

Taxon	EPBC Act	WC Act	DBCA	Source[1]	Habit and Habitat[2]	Habitat within Study Area	Within Current Known Distribution	Distance to Nearest Record	Recorded within Study Area	Likelihood of Occurrence
Hibiscus sp. Carnarvon (S. van Leeuwen 5110)			1	A, B, D	Upright, erect perennial, herb or shrub, to 2 m high. Fl. mauve. Sandy soils. Creeks and drainage lines	Potential	No	>185 km S	No	Highly Unlikely
Indigofera ammobia			3	A	Many-stemmed shrub, to 0.5 m high. Fl. green & purple, Sep. Red sand. Sand dunes	No	No	>270 km NE	No	Highly Unlikely
Indigofera gilesii			3	A, B, C	Shrub, to 1.5 m high. Fl. purple-pink, May or Aug. Pebbly loam. Amongst boulders & outcrops, hills	Yes	No	>15 km N	No	Possible
Indigofera ixocarpa			2	D	Shrub, to 1 m high. Fl. pink, May. Skeletal red soils over massive ironstone	No	No	>170 km N	No	Highly Unlikely
Iotasperma sessilifolium			3	A	Erect herb. Fl. pink. Cracking clay, black loam. Edges of waterholes, plains	No	No	>82 km NE	No	Highly Unlikely
Ipomoea racemigera			2	A, B, C, D, E	Creeping annual, herb or climber. Fl. white	Potential	Yes	5 km N	No	Likely
Isotropis parviflora			2	A, B, C	Shrub, 0.1 m high. Fl. white/pink, Mar. Valley slopes, slopes of ironstone plateau	Yes	Yes	>28 km E	No	Possible
Lepidium catapycnon			4	A, B, C, D	Open, woody perennial, herb or shrub, 0.2-0.3 m high, stems zigzag. Fl. white, Oct. Skeletal soils. Hillsides	No	No	7 km N	No	Likely
Maireana prosthecochaeta			3	A, B, C, D	Open, densely-leaved shrub, 0.3-0.6 m high. Laterite. Hills, salty places	No	No	>35 km SW	No	Highly Unlikely
Minuria sp. Little Sandy Desert (S. van Leeuwen 4919)			1	D	Shrub, to 0.5 m high. Saline clay soils. Flood plains, low lying areas, salt lakes	No	No	>130 km SE	No	Highly Unlikely
Nicotiana umbratica			3	D	Erect, short-lived annual or perennial, herb, 0.3-0.7 m high. Fl. white, Apr to Jun. Shallow soils. Rocky outcrops and boulders, granite	No	No	>170 km N	No	Highly Unlikely
Ptilotus subspinescens			3	D	Compact shrub, to 0.8 m high. Gentle rocky slopes, screes and the bases of screes	No	No	>230 km W	No	Highly Unlikely
Ptilotus tetrandrus			1	D	Annual, herb, 0.15-0.3 m high. Fl. Oct. Loamy sand.	No	No	>140 km S	No	Highly Unlikely
Ptilotus wilsonii			1	D	Shrub, ca 0.5 m high. Fl. green-white, Oct. Stony gravelly soils. Rocky hills	No	No	>170 km N	No	Highly Unlikely
Rhagodia sp. Hamersley (M. Trudgen 17794)			3	A	Shrub, sometimes scrambling to 4 m high. Recorded from mulga on cracking clays	No	Yes	>27 km S	No	Unlikely

Taxon	EPBC Act	WC Act	DBCA	Source[1]	Habit and Habitat[2]	Habitat within Study Area	Within Current Known Distribution	Distance to Nearest Record	Recorded within Study Area	Likelihood of Occurrence
Samolus sp. Fortescue Marsh (A. Markey & R. Coppen FM 9702)			1	D	Erect perennial herb 0.3-1.0 m high. Flat flood-out area alongside freshwater pool and channel of upper Fortescue River. Channel and water hole landform of Marsh Land system	Potential	Yes	85 km N	No	Highly Unlikely
Sida sp. Barlee Range (S. van Leeuwen 1642)			3	D	Spreading shrub, to 0.5 m high. Fl. yellow, Aug. Skeletal red soils pockets. Steep slope	Potential	No	>47km N	No	Unlikely
Solanum sp. Mosquito Creek (A.A. Mitchell et al. AAM 10795)			1	D	Upright grey shrub, growing up to 1 m tall. Semi saline clay plain or depressions with light brown clay	Potential	No	>160 km N	No	Highly Unlikely
Stackhousia clementii			3	D	Dense broom-like perennial, herb, to 0.45 m high. Fl. green/yellow/brown. Skeletal soils. Sandstone hills	No	No	>115 km NW	No	Highly Unlikely
Stylidium weeliwolli			3	D	Annual, herb, 0.1-0.25 m high, throat appendages 4, rod-shaped. Fl. pink & red, Aug to Sep. Gritty sand soil, sandy clay. Edge of watercourses	No	No	>65 km NW	No	Highly Unlikely
Synostemon hamersleyensis			1	D	Shrub to 1 m high. Steep slopes, scree, cliffs, gorges. Ironstone	Potential	No	>95 km NW	No	Highly Unlikely
Tecticornia bibenda			1	A	Erect or spreading shrub, 0.5-1.2 m high. Fl. Aug to Oct. Red-brown saline sand with some clay over calcrete and gypsum. Near the edges of gypsiferous playas and salt lakes on flat to gently undulating terrain	No	No	>138 km SE	No	Highly Unlikely
Tecticornia sp. Christmas Creek (K.A. Shepherd & T. Colmer et. Al. KS 1063)			1	D	Perennial shrub to 0.8 m high. Widespread across the saline flats of the Fortescue Marsh on red-brown clay	No	Yes	>85 km N	No	Highly Unlikely
Tecticornia sp. Sunshine Lake (K.A. Shepherd et al. KS 867)			1	D	Perennial shrub to 0.5 m high. At salt lake edges, saline flats. On red-brown clay loam	No	No	>165 km SE	No	Highly Unlikely
Tecticornia willisii			1	D	Erect shrub to 1 m high. Bright chloritic green vegetative articles. Single florets in opposite decurrent pairs, anthers exerted. Salt flats, edge of lakes	No	No	>130 km S2	No	Highly Unlikely

Taxon	EPBC Act	WC Act	DBCA	Source[1]	Habit and Habitat[2]	Habitat within Study Area	Within Current Known Distribution	Distance to Nearest Record	Recorded within Study Area	Likelihood of Occurrence
Teucrium pilbaranum			2	D	Upright shrub, 0.2 m high. Fl. white, May or Sep. Clay. Crab hole plain in a river floodplain, margin of calcrete table	No	No	>105 km NE	No	Highly Unlikely
Themeda sp. Hamersley Station (M.E. Trudgen 11431)			3	A, B, C	Tussocky perennial, grass-like or herb, 0.9-1.8 m high. Fl. Aug. Red clay. Clay pan, grass plain	Potential	No	10 km N	No	Possible
Tribulus minutus			1	A, B	Prostrate herb, plants villous; leaflet pairs 5-7; petals 2.5-7 mm long; spines on fruit not well-developed	No	No	>280 km N	No	Highly Unlikely
Triodia birriliburu			3	D	Hummock grass to 1 m tall, scapes extending to another 1 m high. Sandy soils. Dunes, dune crests	Potential	No	>95 km SE	No	Highly Unlikely
Triodia sp. Mt Ella (M.E. Trudgen 12739)			3	A, B, C	Perennial, grass-like or herb, 0.4 m high. Light orange-brown, pebbly loam. Amongst rocks & outcrops, gully slopes	Potential	Yes	>15 km N	No	Possible
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)			1	A, C	Erect annual herb with scabrous hairs and adnate cauline leaves. Red-brown sandy clay loam. Drainage lines, floodplains	Potential	Yes	>35 km E	No	Unlikely
Xerochrysum boreale			3	D	Erect perennial, branched herb to 50 cm high. Loamy, sandy or gravelly soils on grassland or woodland, sometimes seasonally inundated areas	No	No	>40 km NW	No	Highly Unlikely

1: Habit and Habitat descriptions from WAH (1998-)

Appendix H: Introduced Flora Database Results

Family	Taxon	Common Name	WoNS	DPP	Ecological	Invasiveness	Source
Fabaceae	*Alhagi maurorum*	Camelthorn	No	Yes	Not assessed	Not assessed	A
Asparagaceae	*Asparagus asparagoides*	Bridal creeper	Yes	Yes	Not assessed	Not assessed	A
Cactaceae	*Austrocylindropuntia cylindrica*		Yes	Yes	Not assessed	Not assessed	A
Cactaceae	*Austrocylindropuntia subulata*	Eve's needle	Yes	Yes	Not assessed	Not assessed	A
Asteraceae	*Bidens bipinnata*	Bipinnate Beggartick	No	No	Unknown	Rapid	D
Apocynaceae	*Calotropis procera*	Rubber bush	No	Yes	Not assessed	Not assessed	A
Poaceae	*Cenchrus setiger*	Birdwood Grass	No	No	High	Rapid	C
Asteraceae	*Chondrilla juncea*	Skeleton weed	No	Yes	Not assessed	Not assessed	A
Cucurbitaceae	*Citrullus lanatus*	Pie Melon	No	No	Unknown	Moderate	C
Apocynaceae	*Cryptostegia madagascariensis*	Madagascar rubber vine	No	Yes	Not assessed	Not assessed	A
Cactaceae	*Cylindropuntia fulgida*	Coral Cactus	Yes	Yes	High	Slow	A
Cactaceae	*Cylindropuntia imbricata*	Rope pear	Yes	Yes	Not assessed	Not assessed	A
Cactaceae	*Cylindropuntia kleiniae*	Klein's pencil cactus	Yes	Yes	Not assessed	Not assessed	A
Cactaceae	*Cylindropuntia pallida*	White-spined hudson pear	Yes	Yes	Not assessed	Not assessed	A
Cactaceae	*Cylindropuntia tunicata*	Thistle cholla	Yes	Yes	Not assessed	Not assessed	A
Poaceae	*Cynodon dactylon*	Couch	No	No	High	Rapid	C
Poaceae	*Echinochloa colona*	Awnless Barnyard Grass	No	No	High	Rapid	C
Boraginaceae	*Echium plantagineum*	Paterson's curse	No	Yes	Not assessed	Not assessed	A
Asteraceae	*Flaveria trinervia*	Speedy Weed	No	No	Not assessed	Not assessed	C
Araliaceae	*Hydrocotyle ranunculoides*	Water pennywort	No	Yes	Not assessed	Not assessed	A
Euphorbiaceae	*Jatropha gossypiifolia*	Bellyache bush	Yes	Yes	Not assessed	Not assessed	A
Verbenaceae	*Lantana camara*	Lantana	Yes	Yes	Not assessed	Not assessed	A
Malvaceae	*Malvastrum americanum*	Spiked malvastrum	No	No	High	Rapid	C, D
Iridaceae	*Moraea flaccida*	One-leaf cape tulip	No	Yes	Not assessed	Not assessed	A

Family	Taxon	Common Name	WoNS	DPP	Ecological	Invasiveness	Source
Iridaceae	*Moraea miniata*	Two-leaf cape tulip	No	Yes	Not assessed	Not assessed	A
Asteraceae	*Onopordum acaulon*	Stemless thistle	No	Yes	Not assessed	Not assessed	A
Cactaceae	*Opuntia elata*	Riverina pear	Yes	Yes	Not assessed	Not assessed	A
Cactaceae	*Opuntia elatior*	Red-flower prickly pear	Yes	Yes	Not assessed	Not assessed	A
Cactaceae	*Opuntia engelmannii*	Engelman pear	Yes	Yes	Not assessed	Not assessed	A
Cactaceae	*Opuntia ficus-indica*	Indian fig	Yes	Yes	Not assessed	Not assessed	A
Cactaceae	*Opuntia microdasys*	Teddy bear cactus	Yes	Yes	Not assessed	Not assessed	A
Cactaceae	*Opuntia monacantha*	Drooping tree pear	Yes	Yes	Not assessed	Not assessed	A
Cactaceae	*Opuntia polyacantha*	Plain's prickly pear	Yes	Yes	Not assessed	Not assessed	A
Cactaceae	*Opuntia puberula*	Nopal de Tortuga	Yes	Yes	Not assessed	Not assessed	A
Cactaceae	*Opuntia stricta*	Common prickly pear	Yes	Yes	High	Rapid	A
Cactaceae	*Opuntia tomentosa*	Velvet prickly pear	Yes	Yes	Not assessed	Not assessed	A
Fabaceae	*Parkinsonia aculeata*	Parkinsonia	Yes	Yes	High	Rapid	A, B
Araceae	*Pistia stratiotes*	Water lettuce	No	Yes	Not assessed	Not assessed	A
Portulacaceae	*Portulaca pilosa*	Pink purslane	No	No	Not assessed	Not assessed	C
Fabaceae	*Prosopis glandulosa* x *velutina*	Mesquite	Yes	Yes	High	Rapid	A
Rosaceae	*Rubus ulmifolius*	Elmleaf blackberry	Yes	Yes	Not assessed	Not assessed	A
Polygonaceae	*Rumex vesicarius*	Ruby Dock	No	No	High	Rapid	C
Alismataceae	*Sagittaria platyphylla*	Delta arrowhead	Yes	Yes	Not assessed	Not assessed	A
Fabaceae	*Senna alata*	Seven-golden-candlesticks	No	Yes	Not assessed	Not assessed	A
Fabaceae	*Senna obtusifolia*	Sicklepod senna	No	Yes	Not assessed	Not assessed	A
Asteraceae	*Silybum marianum*	Variegated thistle	No	Yes	Not assessed	Not assessed	A
Solanaceae	*Solanum elaeagnifolium*	Silver nightshade	Yes	Yes	Not assessed	Not assessed	A
Solanaceae	*Solanum linnaeanum*	Apple of Sodom	No	Yes	Not assessed	Not assessed	A

Family	Taxon	Common Name	WoNS	DPP	Ecological	Invasiveness	Source
Tamaricaceae	*Tamarix aphylla*	Athel Pine	Yes	Yes	High	Rapid	A, B
Fabaceae	*Ulex europaeus*	Gorse	Yes	Yes	Not assessed	Not assessed	A
Asteraceae	*Xanthium spinosum*	Thorny burweed	No	Yes	Not assessed	Not assessed	A
Asteraceae	*Xanthium strumarium*	Noogoora bush	No	Yes	Not assessed	Not assessed	A
Araceae	*Zantedeschia aethiopica*	Arum lily	No	Yes	Not assessed	Not assessed	A
Rhamnaceae	*Ziziphus mauritiana*	Chinese apple	No	Yes	Not assessed	Not assessed	A

Source: A - WAOL (DPIRD, 2018); B - PMST (DoEE, 2018); C - NatureMap (DBCA, 2018a); D - ALA (2018b)

Appendix I: Flora Composition

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Aizoaceae												
Trianthema glossostigmum		12										
Trianthema oxycalyptrum		1										
Trianthema pilosum		1										1
Trianthema sp. indet		1										
Trianthema triquetrum												1
Amaranthaceae												
Alternanthera angustifolia												1
Alternanthera nana		1										
Alternanthera nodiflora								1				
Amaranthus sp. indet		1										
Gomphrena canescens subsp. *canescens*		26	19									
Gomphrena kanisii		2						1				
Gomphrena sp. indet	1		1									
Ptilotus aervoides		2										4
Ptilotus astrolasius		21	1					1				
Ptilotus calostachyus	3	25	8					1				7
Ptilotus aervoides	1											
Ptilotus clementii		2										
Ptilotus exaltatus	3	20	2									1
Ptilotus helipteroides		3										
Ptilotus incanus			1									
Ptilotus xerophilus		2										
Ptilotus obovatus	22		2					2				39
Ptilotus obovatus var. *obovatus*		5	15									
Ptilotus polystachyus		6	19									
Ptilotus roei		2	3									

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Ptilotus rotundifolius	4	12										7
Ptilotus schwartzii	2	1										4
Ptilotus schwartzii var. *schwartzii*		1										
Ptilotus sp. indet	2							1				
Apocynaceae												
Cynanchum floribundum	1							1				1
Cynanchum viminale subsp. *australe*	2		1									5
Marsdenia australis		1										
Vincetoxicum lineare		3	5									3
Asteraceae												
Asteraceae sp. indet		1										
Bidens bipinnata		6		4	5	4	1					3
Brachyscome iberidifolia		2										
Calotis hispidula		1										
Chrysocephalum aff. *apiculatum*		4	4									
Chrysocephalum apiculatum								1				
Chrysocephalum apiculatum subsp. *pilbarense*												3
Chrysocephalum eremaeum		10										
Chrysocephalum gilesii		1										
Chrysocephalum pterochaetum		10	2					1				
Chrysocephalum sp. indet		1										
Flaveria trinervia		1										
Gnephosis brevifolia		1										
Pluchea dentex								1				
Pluchea dunlopii		1										
Pseudognaphalium luteoalbum		1										
Pterocaulon sp. indet		1										

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Pterocaulon sphacelatum			2									2
Pterocaulon sphaeranthoides		16	7									
Roebuckiella ciliocarpa		1										
Streptoglossa adscendens			4									
Streptoglossa bubakii	1											
Streptoglossa macrocephala			1									
Streptoglossa odora	1											
Streptoglossa sp. indet	1	2										
Boraginaceae												
Halgania solanacea	9		1									
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)		21	10									12
Heliotropium sp. indet		1										1
Heliotropium tenuifolium		7										
Trichodesma zeylanicum	2	5										1
Trichodesma zeylanicum var. *zeylanicum*		5	3									
Brassicaceae												
Lepidium muelleri-ferdinandii		1										
Lepidium pedicellosum												1
Lepidium pholidogynum	1											
Lepidium platypetalum	2											3
Stenopetalum anfractum		5										
Stenopetalum decipiens	1											
Stenopetalum pedicellare		3										
Stenopetalum sp. indet		2										
Campanulaceae												
Wahlenbergia tumidifructa								1				
Capparaceae												

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Capparis lasiantha												1
Caryophyllaceae												
Polycarpaea corymbosa var. *corymbosa*		14	2									
Polycarpaea longiflora								1				
Celastraceae												
Stackhousia intermedia		1	1									
Chenopodiaceae												
Atriplex codonocarpa	1											
Chenopodium sp. indet		1										
Dissocarpus paradoxus	1											
Dysphania kalpari			2									
Dysphania rhadinostachya subsp. *rhadinostachya*		1										
Enchylaena tomentosa	1		1									
Enchylaena tomentosa var. *tomentosa*												14
Maireana cf. *pyramidata*	1											
Maireana cf. *triptera*								1				
Maireana georgei	2	4						2				2
Maireana melanocoma		1										1
Maireana planifolia		5	3					1				
Maireana platycarpa	2											
Maireana pyramidata												2
Maireana sp. indet	1	4										3
Maireana thesioides												1
Maireana tomentosa subsp. *tomentosa*	1											
Maireana triptera	5											2
Maireana villosa		4	2					1				1
Rhagodia eremaea	11	6	1					1				18

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Rhagodia sp. Hamersley (M. Trudgen 17794)		1	11					2	114	6	10	31
Salsola australis		3	1									1
Sclerolaena cornishiana								1				4
Sclerolaena costata		1										
Sclerolaena cuneata	1											3
Sclerolaena lanicuspis	1											
Cleomaceae												
Cleome oxalidea		4	1									1
Cleome viscosa	2	12	8					1				8
Convolvulaceae												
Bonamia erecta								1				6
Bonamia media		3										
Bonamia rosea	6	10	26									
Duperreya commixta		14	2					3				16
Evolvulus alsinoides	1							3				
Evolvulus alsinoides var. *villosicalyx*		10	5									3
Ipomoea calobra		2										
Ipomoea muelleri	1											5
Cucurbitaceae												
Cucumis argenteus	1	2	3									
Cucumis variabilis												1
Cyperaceae												
Bulbostylis barbata		17										1
Cyperus iria		2										1
Cyperus ixiocarpus								1				2
Cyperus sp. indet		1										
Cyperus vaginatus	1							1				

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Fimbristylis dichotoma		23						2				
Fimbristylis simulans		11										
Fimbristylis sp. indet		5										2
Euphorbiaceae												
Euphorbia australis		4										
Euphorbia australis var. *subtomentosa*								1				
Euphorbia biconvexa								1				
Euphorbia boophthona			1									
Euphorbia coghlanii		1										
Euphorbia sp. indet		1	1									
Euphorbia tannensis subsp. *eremophila*		1										11
Fabaceae												
Acacia acradenia	2											
Acacia adoxa var. *adoxa*		20										1
Acacia adsurgens		2	3									7
Acacia aff. *catenulata*			4									
Acacia aff. *inaequilatera*			8									
Acacia ancistrocarpa	12	11	26									16
Acacia aneura	2	1										1
Acacia aptaneura	26							3				45
Acacia ayersiana			3									2
Acacia balsamea					2							
Acacia bivenosa	3	13										5
Acacia bivenosa x *sclerosperma* subsp. *sclerosperma*												1
Acacia catenulata subsp. *occidentalis*												1
Acacia cf. *synchronicia*	1											
Acacia citrinoviridis	7	1										6

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Acacia coriacea subsp. *pendens*	1	1						1				7
Acacia dictyophleba		14	11					2				6
Acacia fuscaneura								1				
Acacia hilliana	4	16	4									4
Acacia inaequilatera	5	1	1									3
Acacia kempeana												1
Acacia macraneura		23										
Acacia marramamba	2	5										3
Acacia melleodora	6											
Acacia pachyacra	10	2	23					1				14
Acacia paraneura			20					1				
Acacia pruinocarpa	19	25	19					1				20
Acacia pteraneura								4				6
Acacia pyrifolia	1	2						1				
Acacia pyrifolia var. *morrisonii*												1
Acacia pyrifolia var. *pyrifolia*												5
Acacia rhodophloia	1	1										2
Acacia sclerosperma	2							1				
Acacia sclerosperma subsp. *sclerosperma*												5
Acacia sericophylla			2									6
Acacia sibirica	8	1						1				
Acacia sp. indet												14
Acacia subcontorta	4							1				
Acacia synchronicia	1	1						1				
Acacia tenuissima		3										
Acacia tetragonophylla	8	11	5					3				22
Acacia trudgeniana		4										3

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Acacia victoriae												2
Acacia wanyu	13	1						1				15
Cullen leucochaites		1										
Cullen sp. indet												1
Glycine canescens								1				
Glycine sp. indet												1
Gompholobium oreophilum		11	4									
Gompholobium polyzygum	3	1										
Indigofera boviperda												1
Indigofera georgei		4	8									
Indigofera linnaei												1
Indigofera monophylla		23	5									
Indigofera sp. indet									1			2
Isotropis atropurpurea		2	2									1
Isotropis sp. Arid zone (G. Byrne 2775)		2										
Kennedia prorepens	6	1	14					1				9
Petalostylis cassioides		1										
Petalostylis labicheoides		4										1
Rhynchosia minima		1										1
Rhynchosia sp. indet		1										
Senna artemisioides subsp. *filifolia*								1				
Senna artemisioides subsp. *helmsii*	13	17	17					1				32
Senna artemisioides subsp. *oligophylla*	9	12	8					3				17
Senna artemisioides subsp. *oligophylla* x *helmsii*	4											
Senna artemisioides subsp. x *sturtii*	2	5										
Senna ferraria		1										
Senna glaucifolia			4					1				

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Senna glutinosa	1											
Senna glutinosa subsp. *glutinosa*	4	14	1									3
Senna glutinosa subsp. *pruinosa*	3	6						1				3
Senna glutinosa subsp. x *luerssenii*	13	4	1					2				17
Senna notabilis	1	3	1									1
Senna sp. indet		1	1									13
Senna sp. Meekatharra (E. Bailey 1-26)	3											8
Senna stricta	3											5
Sesbania cannabina												2
Tephrosia aff. *clementii*			1									
Tephrosia clementii		5										
Tephrosia rosea	1											
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)								1				1
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	2		3									
Tephrosia sp. clay soils (S. van Leeuwen et al. PBS 0273)												1
Tephrosia sp. indet												1
Tephrosia sp. Newman (A.A. Mitchell PRP 29)								1				
Tephrosia supina												1
Tephrosia uniovulata		1										
Frankeniaceae												
Frankenia setosa	1											2
Goodeniaceae												
Brunonia australis			6									
Dampiera candicans	1	6	2									
Goodenia azurea			1									
Goodenia lamprosperma	3											1

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Goodenia microptera	2	4										
Goodenia muelleriana		2										
Goodenia nuda		3		1	2	3		1	6			1
Goodenia prostrata		3										1
Goodenia sp. indet		2	2					1				
Goodenia sp. Sandy Creek (R.D. Royce 1653)	2	30										
Goodenia stobbsiana	1	1										
Goodenia triodiophila		24										4
Goodenia vilmoriniae								1				
Scaevola aff. *browniana*		18	1									
Scaevola amblyanthera								1				
Scaevola browniana		5										
Scaevola parvifolia	3											
Scaevola parvifolia subsp. *pilbarae*		5	19					1				5
Scaevola sp. indet			1									
Scaevola spinescens	2	1						1				5
Gyrostemonaceae												
Codonocarpus cotinifolius	3	10	2									1
Haloragaceae												
Haloragis trigonocarpa		3										
Lamiaceae												
Dicrastylis cordifolia	2		21									3
Newcastelia cephalantha												1
Lauraceae												
Cassytha capillaris		1										
Loranthaceae												
Amyema fitzgeraldii		1	3					1				6

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Amyema sanguinea var. *sanguinea*												1
Lysiana casuarinae		2										
Lysiana sp. indet		1										
Malvaceae												
Abutilon cryptopetalum												1
Abutilon lepidum		2										
Abutilon leucopetalum		3	1									
Abutilon otocarpum	1	1						1				
Abutilon oxycarpum		1										
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	3											
Abutilon sp. indet	3							1				
Androcalva loxophylla			2									
Androcalva luteiflora		2						1				
Corchorus crozophorifolius								1				
Corchorus incanus		1										
Corchorus incanus subsp. *lithophilus*		1										
Corchorus sidoides subsp. *sidoides*		13	1									
Corchorus sp. indet		4										1
Gossypium australe												2
Gossypium robinsonii												1
Hibiscus brachychlaenus												1
Hibiscus burtonii	3	18	11									2
Hibiscus coatesii		3										2
Hibiscus sp. Gardneri (A.L. Payne PRP 1435)								2				
Hibiscus sp. indet		2										3
Hibiscus sturtii	2											
Hibiscus sturtii var. *campylochlamys*		7										2

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Hibiscus sturtii var. *platychlamys*		2	1					1				
Hibiscus sturtii var. *truncatus*		15	5					1				1
Malvaceae sp. indet												8
Malvastrum americanum	1							1				
Seringia elliptica	15	4	6									9
Seringia nephrosperma		3	1									1
Seringia sp. indet		9										
Sida aff. *cardiophylla*			22									
Sida aff. *fibulifera*		4	4									
Sida arenicola	1	21	15									
Sida calyxhymenia	3	1										
Sida cardiophylla	1	11	1									
Sida clementii		11										
Sida ectogama		4	3					1				2
Sida fibulifera	1	6						1				3
Sida platycalyx	1											5
Sida sp. dark green fruits (S. van Leeuwen 2260)		3										1
Sida sp. Excedentifolia (J.L. Egan 1925)		4										
Sida sp. Golden calyces glabrous (H.N. Foote 32)								1				
Sida sp. indet	2	5	1									1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)		1										
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)								1				
Triumfetta chaetocarpa												1
Marsileaceae												
Marsilea sp. indet												1
Molluginaceae												
Trigastrotheca molluginea		3										1

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Montiaceae												
Calandrinia sp. indet		1										
Myrtaceae												
Calytrix carinata	4	13	1									5
Corymbia aspera	1	2						1				
Corymbia candida	2											
Corymbia candida subsp. *dipsodes*												7
Corymbia deserticola		7										
Corymbia deserticola subsp. *deserticola*		1	2									4
Corymbia ferriticola			3									
Corymbia hamersleyana	10	8	17					2				21
Eucalyptus camaldulensis	1											
Eucalyptus camaldulensis subsp. *obtusa*								1				4
Eucalyptus gamophylla	1		1									3
Eucalyptus leucophloia	1											
Eucalyptus leucophloia subsp. *leucophloia*		2										1
Eucalyptus victrix								1				2
Eucalyptus xerothermica												1
Lamarchea sulcata		2										1
Melaleuca glomerata	1											4
Nyctaginaceae												**3**
Boerhavia coccinea												3
Boerhavia sp. indet		11										
Oleaceae												
Jasminum didymum subsp. *lineare*												2
Phyllanthaceae								**1**				
Phyllanthus maderaspatensis								1				

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Plantaginaceae												
Stemodia grossa		1										
Stemodia sp. indet		8										
Poaceae												
Amphipogon sericeus	1	21	3					1				
Amphipogon sp. indet		1										
Aristida calycina		7										
Aristida cf. *contorta*	4											
Aristida cf. *inaequiglumis*	2											
Aristida contorta	5	26	29					2				7
Aristida holathera												2
Aristida holathera var. *holathera*			6									
Aristida inaequiglumis	6		6					2				12
Aristida ingrata			1									
Aristida latifolia		3										2
Aristida obscura		3										
Aristida sp. indet	2	4										9
Cenchrus ciliaris	2	10	4	5	9	11	3	13	7	10	8	14
Cenchrus setiger										4	7	
Chloris pectinata		1										
Chrysopogon fallax		7						3				13
Cymbopogon ambiguus		1						1				34
Cymbopogon obtectus	1	14	32					3				
Cymbopogon sp. indet	11	19										
Dactyloctenium radulans		3										2
Dichanthium sericeum subsp. *humilius*		1										
Digitaria brownii		4						1				1

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Digitaria ctenantha												1
Enneapogon caerulescens								1				
Enneapogon intermedius			2									
Enneapogon polyphyllus		11	4									1
Enneapogon purpurascens		1										
Enneapogon sp. indet	2	1										
Enteropogon ramosus		1						1				1
Eragrostis cumingii		5										1
Eragrostis dielsii												1
Eragrostis elongata								1				2
Eragrostis eriopoda	5	20	24					3				12
Eragrostis falcata		15										
Eragrostis lanipes		6										
Eragrostis pergracilis		1										
Eragrostis setifolia	1	1										6
Eragrostis sp. indet	4	3										4
Eragrostis tenellula			1					1				
Eragrostis xerophila								1				
Eriachne aristidea		2	17									
Eriachne benthamii												2
Eriachne cf. *mucronata*	1											
Eriachne helmsii	3	1	29									1
Eriachne lanata		1						1				
Eriachne mucronata		13	10					2				13
Eriachne pulchella												1
Eriachne pulchella subsp. *dominii*		23										
Eriachne sp. indet	2	2										1

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Eulalia aurea	8	9	9					3				43
Monachather paradoxus		1	1									
Panicum effusum			1					1				
Paraneurachne muelleri		15	5					3				4
Paspalidium clementii		10										2
Paspalidium rarum		6										2
Perotis rara		22	1									4
Poaceae sp. indet		6	1									
Themeda avenacea		1										
Themeda sp. indet	17	12										
Themeda triandra		1						3				9
Triodia aff. *basedowii*		1										
Triodia basedowii	19	33	1					2				31
Triodia lanigera			33									
Triodia pungens	2	3						2				10
Triodia schinzii	1		8					1				2
Triodia sp. indet	2											
Triodia vanleeuwenii								2				20
Triodia wiseana	9		1									
Tripogonella loliiformis		3										
Urochloa subquadripara		1										
Yakirra australiensis var. *australiensis*		2										
Portulacaceae												
Portulaca oleracea		13										
Portulaca pilosa		1										
Proteaceae												
Grevillea berryana	3	14										10

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Grevillea cf. *juncifolia*	2											
Grevillea juncifolia	3											
Grevillea striata	1											
Grevillea wickhamii	7	19										
Grevillea wickhamii subsp. *hispidula*		2	9									6
Hakea chordophylla		15	26									
Hakea lorea	16											
Hakea lorea subsp. *lorea*		6	3					2				31
Pteridaceae												
Cheilanthes sieberi subsp. *sieberi*	2	8	3									3
Cheilanthes sp. indet	3	1										1
Rubiaceae												
Psydrax latifolia	12	7	10									26
Psydrax suaveolens		1	2									11
Synaptantha tillaeacea var. *tillaeacea*		1										
Santalaceae												
Anthobolus leptomerioides		3	16					1				25
Exocarpos aphyllus	13											
Santalum lanceolatum	4	4	1									4
Santalum spicatum			1									6
Sapindaceae												
Diplopeltis stuartii var. *stuartii*												2
Dodonaea coriacea	1	4	8									3
Dodonaea petiolaris		9	3					1				13
Dodonaea sp. indet			1									
Dodonaea viscosa	1											
Dodonaea viscosa subsp. *spatulata*	6											

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Scrophulariaceae												
Eremophila capricornica									37	2	38	11
Eremophila compacta		4										
Eremophila compacta subsp. *compacta*								2				
Eremophila cuneifolia	4	1										8
Eremophila exilifolia	1	12						1				1
Eremophila forrestii	14	10										31
Eremophila forrestii subsp. *forrestii*		1	10					2				
Eremophila fraseri												14
Eremophila fraseri subsp. *fraseri*	10	5	5					2				
Eremophila jucunda	7											
Eremophila jucunda subsp. *jucunda*												2
Eremophila jucunda subsp. *pulcherrima*		2										
Eremophila lanceolata	1											1
Eremophila latrobei		1										
Eremophila latrobei subsp. *filiformis*	7	13	8									22
Eremophila latrobei subsp. *glabra*		3										
Eremophila latrobei subsp. *latrobei*	4	4						1				11
Eremophila longifolia		1										1
Eremophila margarethae												8
Eremophila sp. indet		1										1
Solanaceae												
Nicotiana rosulata subsp. *rosulata*			6									
Solanum centrale		13	1									2
Solanum cleistogamum								1				2
Solanum horridum		3	3									
Solanum lasiophyllum	23	35	20					1				34

Species	Survey ID											
	382	401	461	466	469	1034	1038	10068	10159	10169	10175	10228
Solanum phlomoides			1									
Solanum sp. indet		2										
Solanum sturtianum		1										
Surianaceae												
Stylobasium spathulatum												1
Violaceae												
Hybanthus aurantiacus		22	14					2				2
Zygophyllaceae												
Roepera sp. indet		1										
Tribulopis angustifolia		4										
Tribulus hirsutus		1										
Tribulus macrocarpus		1										1
Tribulus sp. indet		4										
Tribulus suberosus	8	17						1				16
Tribulus terrestris								1				

Appendix J: Conservation Significant Flora Locations

Latitude	Longitude	Survey ID	Date	Species	Individuals
-23.3631	120.2694833	10159	21/02/2018	*Eremophila capricornica*	1
-23.3952	120.4145655	10228	2019-04-11	*Eremophila capricornica*	10
-23.3835	120.2787122	10228	2019-04-16	*Eremophila capricornica*	10
-23.3858	120.2968707	10228	2019-04-16	*Eremophila capricornica*	10
-23.39	120.2981082	10228	2019-04-16	*Eremophila capricornica*	10
-23.3921	120.2833022	10228	2019-04-14	*Eremophila capricornica*	10
-23.3524	120.275308	10228	2019-04-18	*Eremophila capricornica*	10
-23.3642	120.270448	10228	2019-04-14	*Eremophila capricornica*	10
-23.3806	120.3243931	10228	2019-04-18	*Eremophila capricornica*	10
-23.3561	120.2575499	10228	2019-04-09	*Eremophila capricornica*	10
-23.3646	120.2948666	10159	20/02/2018	*Eremophila capricornica*	1
-23.3717	120.2577753	10228	2019-04-15	*Eremophila capricornica*	10
-23.3809	120.3179822	10169	18/06/2018	*Eremophila capricornica*	10
-23.3652	120.3110547	10169	18/06/2018	*Eremophila capricornica*	200
-23.3712	120.2431177	10159	23/06/2018	*Eremophila capricornica*	75
-23.364	120.2894035	10159	23/06/2018	*Eremophila capricornica*	21
-23.3645	120.2973714	10159	23/06/2018	*Eremophila capricornica*	3
-23.3672	120.2502887	10159	23/06/2018	*Eremophila capricornica*	40
-23.3689	120.2472526	10159	23/06/2018	*Eremophila capricornica*	10
-23.3696	120.244883	10159	23/06/2018	*Eremophila capricornica*	15
-23.3666	120.2606839	10159	23/06/2018	*Eremophila capricornica*	70
-23.3698	120.244838	10159	23/06/2018	*Eremophila capricornica*	85
-23.3702	120.2443018	10159	23/06/2018	*Eremophila capricornica*	35
-23.3709	120.2427534	10159	23/06/2018	*Eremophila capricornica*	150
-23.3669	120.2597194	10159	23/06/2018	*Eremophila capricornica*	30
-23.3641	120.2885121	10159	23/06/2018	*Eremophila capricornica*	20
-23.3637	120.2876976	10159	23/06/2018	*Eremophila capricornica*	7
-23.3669	120.2577651	10159	23/06/2018	*Eremophila capricornica*	2
-23.364	120.2876627	10159	23/06/2018	*Eremophila capricornica*	6
-23.3666	120.2616125	10159	23/06/2018	*Eremophila capricornica*	70
-23.3655	120.3016711	10159	23/06/2018	*Eremophila capricornica*	150
-23.3653	120.2787488	10159	23/06/2018	*Eremophila capricornica*	1
-23.3642	120.2860651	10159	23/06/2018	*Eremophila capricornica*	7
-23.3648	120.2786127	10159	23/06/2018	*Eremophila capricornica*	60
-23.3703	120.2717149	10159	23/06/2018	*Eremophila capricornica*	1
-23.3669	120.2634543	10159	23/06/2018	*Eremophila capricornica*	1
-23.367	120.2623477	10159	23/06/2018	*Eremophila capricornica*	1
-23.3673	120.2618621	10159	23/06/2018	*Eremophila capricornica*	60
-23.368	120.2626118	10159	23/06/2018	*Eremophila capricornica*	70
-23.3665	120.262447	10159	23/06/2018	*Eremophila capricornica*	1
-23.366	120.2622132	10159	23/06/2018	*Eremophila capricornica*	14
-23.3641	120.2622324	10159	23/06/2018	*Eremophila capricornica*	80
-23.367	120.2607161	10159	23/06/2018	*Eremophila capricornica*	20
-23.3676	120.2564305	10159	23/06/2018	*Eremophila capricornica*	50
-23.3669	120.2513803	10159	23/06/2018	*Eremophila capricornica*	16
-23.3707	120.2440186	10159	23/06/2018	*Eremophila capricornica*	120
-23.3639	120.2936182	10159	23/06/2018	*Eremophila capricornica*	40

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-23.3652	120.2785359	10159	23/06/2018	*Eremophila capricornica*	10
-23.3638	120.296232	10159	23/06/2018	*Eremophila capricornica*	40
-23.3568	120.3018975	10175	13/09/2018	*Eremophila capricornica*	8
-23.3561	120.3009817	10175	13/09/2018	*Eremophila capricornica*	55
-23.3563	120.2998149	10175	13/09/2018	*Eremophila capricornica*	1
-23.359	120.3051499	10175	13/09/2018	*Eremophila capricornica*	25
-23.3565	120.252964	10175	13/09/2018	*Eremophila capricornica*	80
-23.3583	120.255909	10175	13/09/2018	*Eremophila capricornica*	8
-23.3521	120.2577499	10175	13/09/2018	*Eremophila capricornica*	2
-23.3604	120.2634666	10175	13/09/2018	*Eremophila capricornica*	48
-23.3572	120.2765999	10175	13/09/2018	*Eremophila capricornica*	80
-23.3603	120.2800833	10175	13/09/2018	*Eremophila capricornica*	60
-23.3612	120.2085017	10175	16/09/2018	*Eremophila capricornica*	85
-23.3563	120.3017333	10175	13/09/2018	*Eremophila capricornica*	120
-23.3545	120.2989333	10175	13/09/2018	*Eremophila capricornica*	40
-23.3541	120.2989499	10175	13/09/2018	*Eremophila capricornica*	40
-23.3525	120.2997333	10175	13/09/2018	*Eremophila capricornica*	5
-23.3529	120.3010999	10175	13/09/2018	*Eremophila capricornica*	2
-23.354	120.3017166	10175	13/09/2018	*Eremophila capricornica*	50
-23.3549	120.3019833	10175	13/09/2018	*Eremophila capricornica*	80
-23.3592	120.3057333	10175	13/09/2018	*Eremophila capricornica*	15
-23.3574	120.2541999	10175	13/09/2018	*Eremophila capricornica*	100
-23.3578	120.2551499	10175	13/09/2018	*Eremophila capricornica*	8
-23.3575	120.2587333	10175	13/09/2018	*Eremophila capricornica*	100
-23.356	120.2568499	10175	13/09/2018	*Eremophila capricornica*	55
-23.356	120.2557833	10175	13/09/2018	*Eremophila capricornica*	40
-23.3556	120.2543666	10175	14/09/2018	*Eremophila capricornica*	3
-23.3559	120.2543999	10175	13/09/2018	*Eremophila capricornica*	62
-23.3569	120.2545499	10175	13/09/2018	*Eremophila capricornica*	85
-23.3582	120.2546999	10175	13/09/2018	*Eremophila capricornica*	95
-23.3618	120.2581333	10175	13/09/2018	*Eremophila capricornica*	21
-23.362	120.2593333	10175	13/09/2018	*Eremophila capricornica*	40
-23.3614	120.2613499	10175	13/09/2018	*Eremophila capricornica*	130
-23.3607	120.2669166	10175	13/09/2018	*Eremophila capricornica*	30
-23.3601	120.2683833	10175	13/09/2018	*Eremophila capricornica*	90
-23.3577	120.2715999	10175	13/09/2018	*Eremophila capricornica*	2
-23.3565	120.2769166	10175	13/09/2018	*Eremophila capricornica*	70
-23.3586	120.2810833	10175	13/09/2018	*Eremophila capricornica*	100
-23.3562	120.2814166	10175	13/09/2018	*Eremophila capricornica*	95
-23.3555	120.2804333	10175	15/09/2018	*Eremophila capricornica*	130
-23.3609	120.2656301	10228	2019-04-15	*Eremophila capricornica*	75
-23.371	120.2032918	401	25/08/2005	*Goodenia nuda*	1
-23.3963	120.4214323	10159	19/02/2018	*Goodenia nuda*	15
-23.3967	120.4194166	10159	18/02/2018	*Goodenia nuda*	15
-23.3968	120.4212833	10159	19/02/2018	*Goodenia nuda*	20
-23.3966	120.4186166	10159	18/02/2018	*Goodenia nuda*	5
-23.3965	120.4219166	10159	19/02/2018	*Goodenia nuda*	20

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-23.3741	120.3616999	10159	19/02/2018	*Goodenia nuda*	10
-23.3891	120.2190833	10068	28/05/2016	*Goodenia nuda*	50
-23.401	120.2967158	10228	2019-04-15	*Goodenia nuda*	1
-23.3711	126.215169	1034	1/01/2009	*Goodenia nuda*	1
-23.3724	126.2019222	1034	1/01/2007	*Goodenia nuda*	1
-23.3647	126.267723	1034	1/01/2009	*Goodenia nuda*	1
-23.3711	120.215169	469		*Goodenia nuda*	1
-23.3647	120.267723	469		*Goodenia nuda*	1
-23.3716	120.2180716	466		*Goodenia nuda*	1
-23.3724	120.2019222	401		*Goodenia nuda*	1
-23.3724	120.201934	401	21/02/2006	*Goodenia nuda*	1
-23.3534	120.3078714	10169	19/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	5
-23.3532	120.3168196	10169	19/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3779	120.2390198	401	29/08/2005	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	0
-23.392	120.2765897	461	9/02/2005	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	0
-23.3909	120.2762212	461	9/02/2005	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	0
-23.3874	120.2821497	461	10/02/2005	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	0
-23.3867	120.2877776	461	10/02/2005	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	0
-23.3842	120.2998356	461	10/02/2005	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	0
-23.3901	120.34957	461	12/02/2005	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	0
-23.391	120.3496297	461	12/02/2005	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	0
-23.3904	120.3437146	461	13/02/2005	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	0
-23.388	120.3378571	461	14/02/2005	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	0
-23.3894	120.3378576	461	14/02/2005	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	0
-23.389	120.3378666	461	14/02/2005	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	0
-23.3654	120.2490472	10228	2019-04-09	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3657	120.249251	10228	2019-04-09	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3654	120.249025	10228	2019-04-08	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3654	120.2490274	10228	2019-04-08	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.376	120.311715	10228	2019-04-17	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.4018	120.3078405	10228	2019-04-16	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3798	120.3663437	10228	2019-04-16	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	5
-23.3687	120.3503622	10228	2019-04-16	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3687	120.3506101	10228	2019-04-16	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3687	120.3502901	10228	2019-04-14	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3686	120.350285	10228	2019-04-17	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3561	120.2575372	10228	2019-04-14	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3719	120.2680766	10228	2019-04-17	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	7
-23.3563	120.2573496	10228	2019-04-15	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	5
-23.3928	120.4218793	10159	19/02/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3967	120.4194166	10159	18/02/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	10
-23.3957	120.4177499	10159	18/02/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3645	120.3875076	10159	19/02/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3561	120.257526	10228	2019-04-18	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3561	120.2575464	10228	2019-04-18	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3741	120.3616999	10159	19/02/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	5
-23.3689	120.3506999	10159	20/02/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2

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-23.3564	120.2573512	10228	2019-04-08	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3563	120.2573468	10228	2019-04-18	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3563	120.2573544	10228	2019-04-14	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3646	120.2948666	10159	20/02/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3713	120.2974333	10159	21/02/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3741	120.2960999	10159	21/02/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3777	120.2964999	10159	21/02/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3751	120.2909666	10159	20/02/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3808	120.3155305	10169	18/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3799	120.3098182	10169	19/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.369	120.3087672	10169	18/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3645	120.3105797	10169	18/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3747	120.3021791	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3749	120.3022533	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3746	120.3023386	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3751	120.3026306	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.375	120.3022125	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3751	120.3026306	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3752	120.3022481	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.375	120.3028091	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3754	120.3024984	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3749	120.3029	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3747	120.3031185	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3747	120.301886	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3756	120.3006362	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3749	120.3010217	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3756	120.2998159	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3751	120.3007053	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.376	120.298448	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.375	120.3000714	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3761	120.2977127	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3752	120.2988449	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.376	120.2969706	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3754	120.2984595	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.376	120.2965023	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3755	120.2976964	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.376	120.2961333	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3755	120.2972652	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3761	120.2958161	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3755	120.2967278	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	6
-23.3761	120.2952872	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3754	120.2963569	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.376	120.2944983	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3755	120.2961515	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	5
-23.3769	120.2923195	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3755	120.2957886	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3773	120.2897006	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1

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-23.3757	120.2954821	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3791	120.2857034	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	5
-23.3758	120.2952837	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3791	120.2857034	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3759	120.2948909	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3795	120.2850799	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	4
-23.3758	120.2946482	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3796	120.2844314	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3757	120.2944167	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3794	120.2840146	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	5
-23.3763	120.2924667	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	5
-23.3793	120.2837039	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3764	120.2918211	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3793	120.2832349	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3772	120.2883143	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3792	120.2826707	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3787	120.286034	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3791	120.2824472	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.379	120.2834669	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.379	120.2824288	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3787	120.2827091	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3789	120.2823336	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3786	120.2827218	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.379	120.2822643	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3786	120.2820769	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3794	120.2822165	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3787	120.2820241	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3794	120.2823821	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3789	120.2821682	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3804	120.2825677	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3835	120.2828562	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3825	120.2823483	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	5
-23.3853	120.282604	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3832	120.2825787	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3861	120.2827337	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3837	120.282402	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3874	120.2856706	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.386	120.2830192	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3835	120.2901507	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3867	120.2830646	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3842	120.2890025	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3821	120.2991545	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3828	120.2916305	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.379	120.3022492	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3819	120.2965677	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3787	120.3026665	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3822	120.2996521	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1

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-23.3787	120.3031656	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3819	120.299648	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3783	120.3030159	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3817	120.2995833	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.378	120.3044802	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3777	120.3043676	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3774	120.305293	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3773	120.3049344	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3758	120.3076719	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3758225	120.3076719	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3762414	120.3063141	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3742474	120.311605	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3742474	120.311605	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3756944	120.3070487	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3748277	120.3112315	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3748277	120.3112315	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3754565	120.3073859	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3754565	120.3073859	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3742589	120.3091212	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3742589	120.3091212	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3670293	120.2623477	10159	23/06/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3706605	120.2010499	10068	27/05/2016	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	50
-23.3706605	120.2010499	10068	27/05/2016	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	50
-23.3566945	120.3012931	10175	13/09/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3593597	120.3074999	10175	13/09/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3582787	120.255909	10175	13/09/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3609013	120.2659931	10175	14/09/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3580766	120.2773333	10175	14/09/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	6
-23.3540765	120.2989499	10175	13/09/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3536931	120.2991666	10175	13/09/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	4
-23.3586264	120.3020999	10175	13/09/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3613364	120.3056279	10175	13/09/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3581766	120.2810166	10175	13/09/2018	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.4013044	120.2964939	10228	2019-04-15	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3880096	120.4029414	10228	2019-04-08	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	2
-23.3869094	120.4040824	10228	2019-04-09	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3735091	120.3860695	10228	2019-04-14	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3656088	120.2492644	10228	2019-04-16	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3696303	120.3841349	10228	2019-04-16	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3689017	120.3825107	10228	2019-04-16	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3634479	120.3738422	10228	2019-04-17	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3608421	120.2657278	10228	2019-04-15	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3607734	120.2658804	10228	2019-04-17	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	3
-23.3608802	120.2655827	10228	2019-04-17	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	1
-23.3609155	120.2653837	10228	2019-04-17	*Rhagodia* sp. Hamersley (M. Trudgen 17794)	4

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