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OCTOBER 2015

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ENVIRONMENT

IRON BRIDGE AND FORTESCUE METALS GROUP
NORTH STAR AERODROME
FLORA LEVEL 2 AND FAUNA LEVEL 1 ASSESSMENT

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ACRONYMS

BAM Act	Biosecurity and Agriculture Management Act 2007
BOM	Bureau of Meteorology
DAFWA	Department of Agriculture and Food Western Australia
DEC	Department of Environment and Conservation (now DPaW)
DoE	The Department of Environment (formerly DSEWPaC)
DPaW	Department of Parks and Wildlife
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (now DoE)
ESA	Environmentally Sensitive Area
ESCAVI	Executive Steering Committee for Australia Vegetation Information
EPA	Environmental Protection Authority
EP Act	Environmental Protection Act 1986
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
IBRA	Interim Biogeographic Regionalisation for Australia
IUCN	International Union for Conservation of Nature
NVIS	National Vegetation Information System
PEC	Priority Ecological Community
TEC	Threatened Ecological Community
TPFL	Threatened and Priority Flora Database
TPList	Threatened and Priority Flora List
WA	Western Australia
WAHERB	Western Australian Herbarium
WAOL	Western Australian Organism List
WC Act	Wildlife Conservation Act 1950
WONS	Weeds of National Significance

EXECUTIVE SUMMARY

Introduction

IB Operations Pty Ltd (IBO) is developing the North Star Magnetite Project (the Project), on behalf of the joint venture partners FMG Iron Bridge (Aust) Pty Ltd (FMGIB) and Formosa Steel IB Pty Ltd (Formosa). The Project is located approximately 110 km south of Port Hedland in the Pilbara region of Western Australia. FMGIB commissioned *ecologia* Environment to conduct a Level 2 flora and vegetation and a Level 1 vertebrate fauna assessment of the proposed North Star Aerodrome (the study area) an area of approximately 6,230 ha, located west of the North Star project (Figure 1.1).

Flora and Vegetation

A single phase, Level 2 flora and vegetation assessment of the study area was conducted and surveyed over five person days, from the 22 to 26 August 2015. A total of 23 quadrats were sampled at the study area. In addition, transects were traversed to target flora of conservation significance, introduced flora and to provide opportunistic collections of taxa not recorded within the quadrats.

A total of 221 vascular plant taxa, representing 41 families and 113 genera were recorded.

No EPBC Act listed or WC Act listed Threatened Flora or Priority Flora taxa were recorded at the study area. One potential new species; *Triumfetta* aff. *ramosa* was recorded.

The literature review identified seventeen conservation significant taxa as occurring within 40 km of the study area. Of these, six were considered to have a high likelihood of occurrence within the study area; *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (Priority 1), *Heliotropium muticum* (Priority 1), *Euphorbia clementii* (Priority 2), *Gymnanthera cunninghamii* (Priority 3), *Nicotiana umbratica* (Priority 3) and *Phyllanthus hebecarpus* (Priority 3). Despite the presence of suitable habitat for *Abutilon* sp. Pritzelianum (Priority 1), *Heliotropium muticum* (Priority 1), *Euphorbia clementii* (Priority 2)*, Gymnanthera cunninghamii* (Priority 3), *Phyllanthus hebecarpus* (Priority 3) and *Goodenia nuda* (Priority 3) none of these taxa were recorded in the study area.

No Weeds of National Significance (WONS) or Declared Weeds were recorded from the study area. Seven environmental weeds were recorded; **Aerva javanica*, **Cenchrus ciliaris*, **Cenchrus setiger*, **Chloris barbata*, **Citrullus lanata*, **Flaveria trinervia* and **Malvastrum americanum*.

Most of the vegetation of the study area was assessed as either Excellent or Very Good condition, characterised by low levels of grazing and introduced species. The condition of the major creek line running through the west of the study area was rated as Good, with the vegetation significantly disturbed by high levels of grazing and introduced flora. A large proportion of the northern section of the study area has been recently burnt (<2 years).

A total of nine floristically distinct vegetation units, were described and delineated within the study area. The most widespread vegetation units were *ChAiTb/Tw* (+/-*Corymbia hamersleyana* isolated low trees, over *Acacia inaequilatera*, *Acacia acradenia* and *Grevillea wickhamii* sparse shrubland, over *Triodia basedowii* and/or *Triodia wiseana* open hummock grassland) representing 2,080.6 ha (33.4% of the study area) and *AaAiTl* (+/-*Acacia ancistrocarpa* and/or *Acacia inaequilatera* sparse tall shrubland, over *Triodia lanigera* open hummock grassland) representing 2,080.6 ha (33.4% of the study area).

No Commonwealth (EPBC Act) or state listed (WC Act) Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) are known to occur within 40 km of the study area and no vegetation units likely to represent them were recorded at the study area.

No ecosystems at risk for the Chichester subregion of the Pilbara (Kendrick and McKenzie 2001) or vegetation units likely to represent them were recorded at the study area.

Two vegetation units at the study area are considered significant (EPA 2004b):

- *AiGaTw* (*Acacia inaequilatera* isolated tall shrubs, over *Gossypium australe* sparse mid shrubland, over *Triodia wiseana* open hummock grassland) is significant as it is scarce, has a different combination of species and restricted to an uncommon landform in the region (dolerite dyke); and
- *EcMgCc (Eucalyptus camaldulensis* open low to mid woodland, over +/-*Melaleuca glomerata*, *Acacia ampliceps* and *Melaleuca linophylla* sparse tall shrubland, over **Cenchrus ciliaris* open tussock grassland) is significant as it is restricted to an uncommon landform in the local area (river) and acts as a refuge for phreatophytic flora species. This unit is also considered a Groundwater Dependent Ecosystem.

Fauna

A single phase Level 1 vertebrate fauna assessment was completed in conjunction with the flora and vegetation assessment. A non-systematic sampling method, including diurnal active searches and camera trapping was conducted as well as targeted searches for potential conservation significant fauna species.

The literature review identified a total of 330 fauna species potentially occurring in the study area. This includes 51 native and 7 introduced mammal species, 150 bird species, 114 reptiles and eight amphibian species. Of the potential species recorded in the literature review, 25 are of conservation significance, comprising 10 mammal, 12 bird and three reptile species.

Six broad fauna habitat types were identified within the study area; rocky plain with spinifex, rocky spinifex hill, major river, sandy plain, granite outcrop and dolerite dyke. In general, major river, dolerite dyke and sandy plain habitat types are locally significant due their potential to support local conservation significant fauna.

The field survey recorded a total of 30 fauna species from direct sightings and indirect evidence such as scats, tracks and calls, including six mammal, 18 bird and 12 reptile species. Four species of conservation significance were recorded:

- Northern Quoll (EPBC Act Endangered, WC Act Schedule 1, DPaW Endangered);
- Rainbow Bee-eater (EPBC Act Migratory, WC Act Schedule 3);
- Australian Bustard (DPaW Priority 4); and
- Western Pebble-mound Mouse (DPaW Priority 4).

Eleven additional significant fauna species were assessed during the literature review as having a high likelihood of occurrence at the study area (Greater Bilby, Pilbara Leaf-nosed Bat, Brush-tailed Mulgara, Long-tailed Dunnart, Ghost Bat, Fork-tailed Swift, Eastern Great Egret, Grey Falcon, Star Finch, Pilbara Olive Python and *Ctenotus nigrilineatus*) and four as a medium likelihood of occurrence (Spectacled Hare-wallaby, Wood Sandpiper, Peregrine Falcon and Gane's Blind Snake).

1 INTRODUCTION

1.1 PROJECT BACKGROUND

IB Operations Pty Ltd (IBO) is developing the North Star Magnetite Project (the Project), on behalf of the joint venture partners FMG Iron Bridge (Aust) Pty Ltd (FMGIB) and Formosa Steel IB Pty Ltd (Formosa). The Project is located approximately 110 km south of Port Hedland in the Pilbara region of Western Australia.

FMGIB commissioned *ecologia* Environment to conduct a Level 2 flora and vegetation and a Level 1 vertebrate fauna assessment of the proposed North Star Aerodrome (the study area), an area of approximately 6,230 ha located west of the North Star project (Figure 1.1).

1.2 LEGISLATIVE FRAMEWORK

1.2.1 Guiding Principles

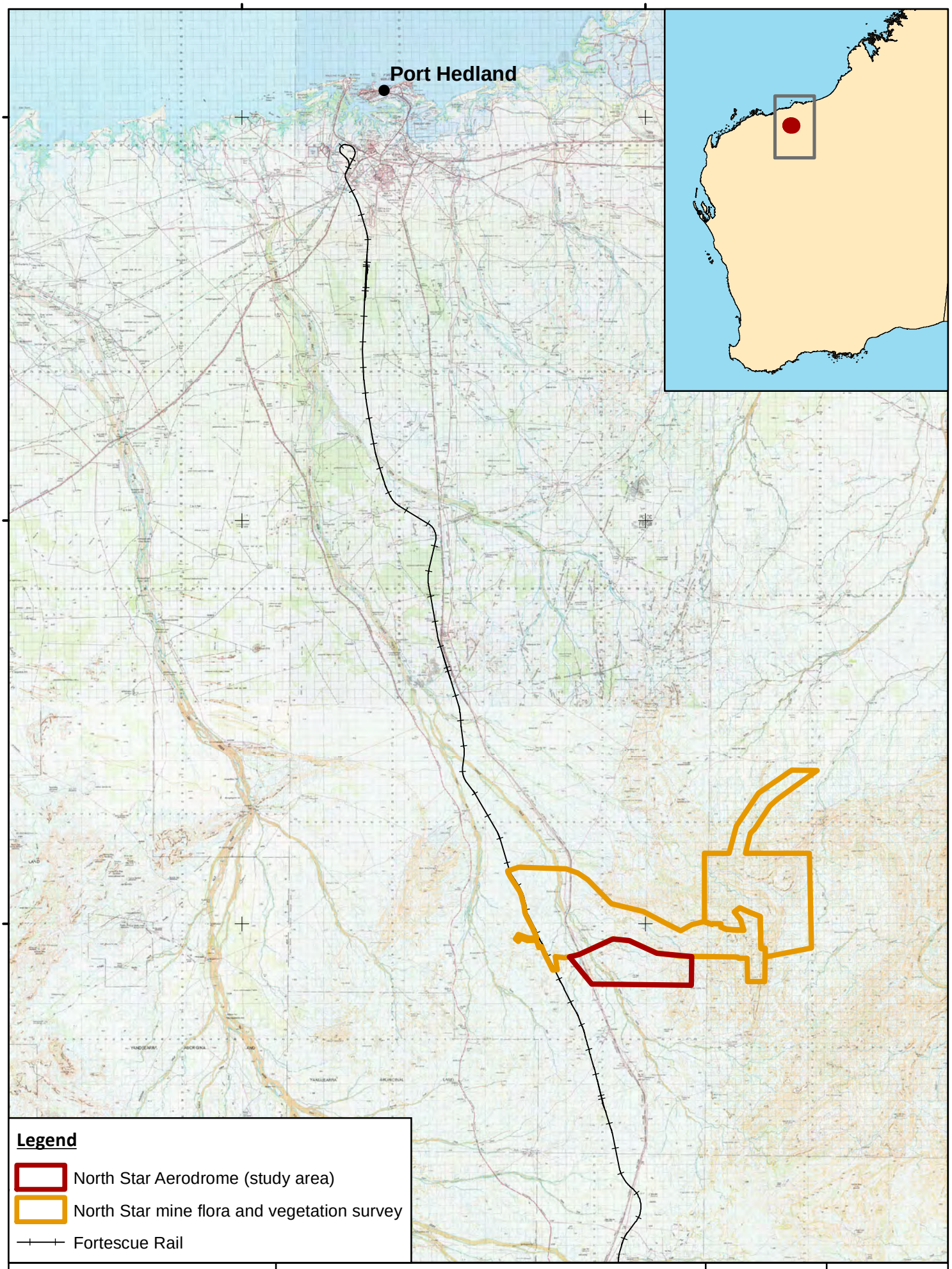
The surveys were designed to comply with Level 2 (flora and vegetation) and Level 1 (fauna) guidelines as described in the following documents:

Flora and Vegetation

- Environmental Protection Authority (EPA) Guidance Statement No. 51: *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004a);
- EPA Position Statement No. 3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA 2002b);
- Fortescue's Flora and Vegetation Assessment Guidelines (100-GU-EN-0005).

Fauna

- EPA Guidance Statement No. 56: *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA 2002a);
- Technical Guide – *Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA and DEC 2010);
- Fortescue's Terrestrial Vertebrate Fauna Assessment Guidelines (100-GU-EN-0006);
- Survey Guidelines for Australia's Threatened Mammals (DSEWPaC 2011c);
- Survey Guidelines for Australia's Threatened Bats (DSEWPaC 2011b);
- Survey Guidelines for Australia's Threatened Birds (DSEWPaC 2010); and
- Survey Guidelines for Australia's Threatened Reptiles (DSEWPaC 2011d).



Legend

- North Star Aerodrome (study area)
- North Star mine flora and vegetation survey
- Fortescue Rail

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Kilometres

Absolute Scale - 1:600,000

The North Star Aerodrome study area

Figure: 1.1
Project: 1648

Drawn: MH
Date: 18/08/2015

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

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1.3 SURVEY OBJECTIVES

The Environmental Protection Authority's (EPA) objectives with regard to the management of native flora, fauna and vegetation are to:

- Avoid adverse impacts on biological diversity comprising the different plants and animals and the ecosystems they form, at the levels of genetic, species and ecosystem diversity;
- Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities;
- Protect Threatened Flora and Fauna consistent with the provisions of the WC Act; and
- Protect other flora and fauna species of conservation significance.

The primary objective of this flora and fauna assessment is to provide sufficient information to the EPA to assess the impact of the proposed development on the flora, vegetation and fauna of the study area, thereby ensuring that the EPA objectives will be upheld.

Specifically providing:

- A review of background information (including existing environment review and database searches);
- An inventory of flora and fauna species observed at the study area;
- An inventory and a map of species of conservation significance recorded or likely to occur within the study area and surrounds;
- An inventory and a map of introduced flora species recorded at the study area;
- An inventory of vegetation types and flora and fauna species occurring at the study area, incorporating recent published and unpublished records;
- A map and detailed description of vegetation types (to National Vegetation Information Systems (NVIS) Level V: Association) occurring in the study area and an assessment of which vegetation units potentially represent TEC or PECs;
- A map and detailed description of fauna habitats at the study area;
- A map of the vegetation condition and discussion on the type of disturbances encountered;
- An appraisal of the current knowledge base for the area, including a review of previous surveys conducted in the area relevant to the current study; and
- A review of significance, including the conservation status, of species recorded at the study area.

1.4 CONSERVATION SIGNIFICANT FLORA, VEGETATION AND FAUNA DEFINITIONS

1.4.1 Significant Flora

As described in EPA Guidance Statement 51 (EPA 2004a), flora may be considered conservation significant if it is:

- Declared Rare (Threatened, EPBC Act and/or WC Act, categories provided in Appendix A); or
- Priority Flora (categories are provided in Appendix A).

Other reasons that flora may be significant include:

- Range extensions,
- Keystone species,
- Relic species,
- Potential novel or new species,
- Restricted subspecies, varieties or naturally occurring hybrids; and
- Local endemism/a restricted distribution.

1.4.2 Significant Vegetation and Communities

As described in EPA Guidance Statement 51 (EPA 2004a), vegetation may be considered conservation significant if it is:

- Listed as a Threatened Ecological Community (TEC, categories provided in Appendix A); or
- The known post-European extent is below a threshold level.

Other reasons that vegetation may be significant include:

- Scarcity (based on likely distribution and landform type);
- Unusual species (based on other surveys conducted in the area);
- Novel combination of species (based on other surveys conducted in the area);
- A role as refuge (based on if the vegetation provides refuge for flora during any stress i.e. drought, fire etc. and can include gorges, phreatophytic species etc.);
- A role as a key habitat for threatened species or large populations representing a significant proportion of the local to regional total population of a species;
- Being representative of the range of a unit, at the extremes of range, recently discovered range extensions, outliers or isolated outliers of a main range; and
- A restricted distribution (based on other surveys conducted in the area).

In addition to that listed in Guidance Statement No. 51, vegetation is considered significant if it is:

- A state listed TEC or Priority Ecological Communities (PECs, categories provided in Appendix A); or
- Considered an ecosystem at risk for the IBRA sub-region (Kendrick and McKenzie 2001).

1.4.3 Significant Fauna

As described in EPA Guidance Statement 56 (EPA 2004c) fauna may be considered conservation significant if it is:

- Protected by international agreement or treaty (i.e. migratory fauna);
- Specially protected (Threatened, categories provided in Appendix A); or
- Priority Fauna (categories provided in Appendix A).

Other reasons that fauna may be significant include:

- Short range endemics;
- Species that have declining populations or distributions;
- Species at the extremes of their range, or isolated outlying populations; and
- Species that are undescribed.

1.5 INTRODUCED FLORA

1.5.1 Weeds of National Significance

At a national level there are 32 weeds listed as Weeds of National Significance (WONS). *The Commonwealth National Weeds Strategy: A Strategic Approach to Weed Problems of National Significance* (2012b) describes broad goals and objectives to manage these weeds.

1.5.2 Declared Pests (Weeds)

The *Biosecurity and Agriculture Management Act 2007* (BAM Act) (Department of Agriculture and Food Western Australia (DAFWA) 2007) seeks to prevent serious animal and plant pests and diseases from entering the State and becoming established, and to minimise the spread and impact of any that are already present.

The current Declared Pest, Western Australian Organism List (WAOL) was published on 1 May 2013 (DAFWA 2013). The BAM Act categorises Declared Pests in one of three control categories; C1 Exclusion, C2 Eradication and C3 Management (Appendix A).

1.5.3 Environmental Weeds

A second and much more extensive categorisation of weeds has been developed by DPaW in the State Environmental Weed Strategy (The Department of Conservation and Land Management (CALM) 1999). Weeds listed as Environmental Weeds are ranked into four categories:

- High: a species which scores yes to all three of the above criteria. A rating of high indicates a species that should be prioritised for control and/or research;
- Moderate: a species which scores yes for two of the above criteria. A rating of moderate indicates a species which should be monitored. Control or research should be directed to it if funds are available;
- Mild: a species which scores yes to one of the criteria. A mild rating indicates monitoring or control if appropriate; and
- Low: a species which does not score yes for any of the criteria. A low rating indicates a low requirement for monitoring.

1.6 EXISTING ENVIRONMENT

1.6.1 Climate

The study area is located in the Pilbara region of Western Australia. The Pilbara experiences an arid-tropical climate with two distinct seasons; a hot summer from October to April and a mild winter from May to September. Temperatures are generally high, with summer temperatures frequently exceeding 40°C. Light frosts occasionally occur inland during July and August.

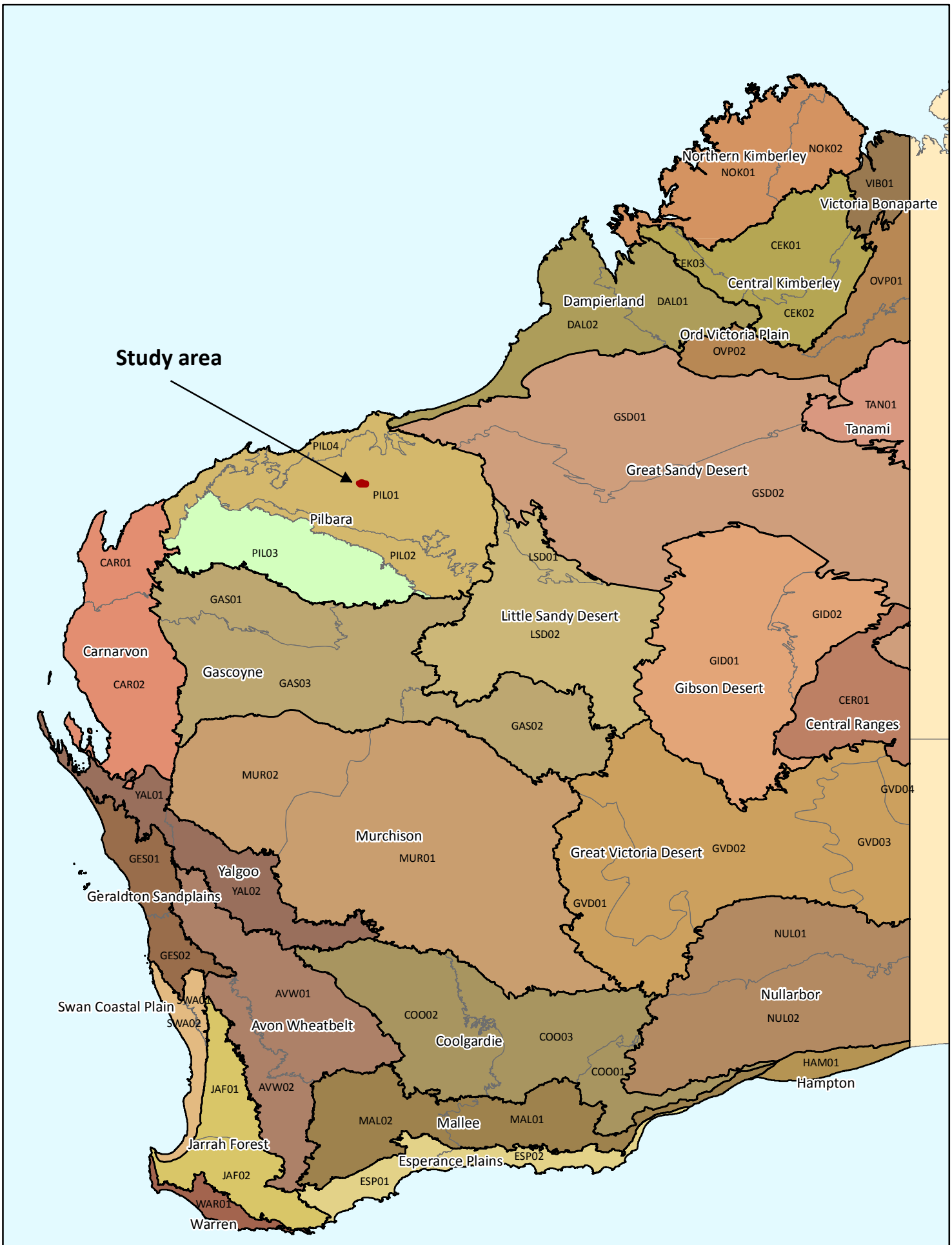
Rainfall is generally localised and unpredictable (some years have recorded zero rainfall), and temperatures are high, resulting in annual evaporation exceeding rainfall by as much as 500 mm per year. Most of the Pilbara has a bimodal rainfall distribution; from November to March rains result from tropical storms producing sporadic thunderstorms. Tropical cyclones moving south also bring heavy rains. From May to June extensive cold fronts move eastwards across the state, occasionally reaching the Pilbara and these fronts usually produce only light rains. Surface water can be found in some pools and springs all year round, although watercourses generally flow intermittently due to the short wet season (Beard 1975).

1.6.2 Biogeographic Region

The study area is situated within the Pilbara region of the Interim Biogeographic Regionalisation of Australia 7 (IBRA) (Department of the Sustainability, Environment, Water, Population and Communities (DSEWPaC 2012a) (Figure 1.2).

The Pilbara biogeographic region comprises four sub regions: Hamersley, Fortescue Plains, Chichester and Roebourne. The study area is situated entirely within the Chichester sub region.

The Chichester sub region comprises the northern section of the Pilbara Craton. Undulating Archaean granite and basalt plains include significant areas of basaltic ranges. Plains support a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on ranges. The climate is semi desert tropical and receives 300 mm of rainfall annually. Drainage occurs to the north via numerous rivers (e.g. De Grey, Oakover, Nullagine, Shaw, Yule and Sherlock). The sub regional area is 9,044,560 ha (Kendrick and McKenzie 2001).



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Kilometres

Absolute Scale - 1:10,000,000

IBRA Biogeographic region of the study area

Figure: 1.2
Project ID: 1648

Drawn: MH
Date: 18/08/2015

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

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The Chichester sub region is considered to have five ecosystems, associated with flora and vegetation, at risk (Kendrick and McKenzie 2001):

- *Heliotropium, Eragrostis* community on seepages near Mt Montagu, Chichester Range;
- Cracking clay communities of the Chichester Range and Mungaroona Range;
- Specific snakewood communities. Between Roy Hill and Marillana Stations;
- Saltbush Shrublands (de Grey River west side); and
- Saltbush community of the duplex plains - Mosquito Creek series (Nullagine).

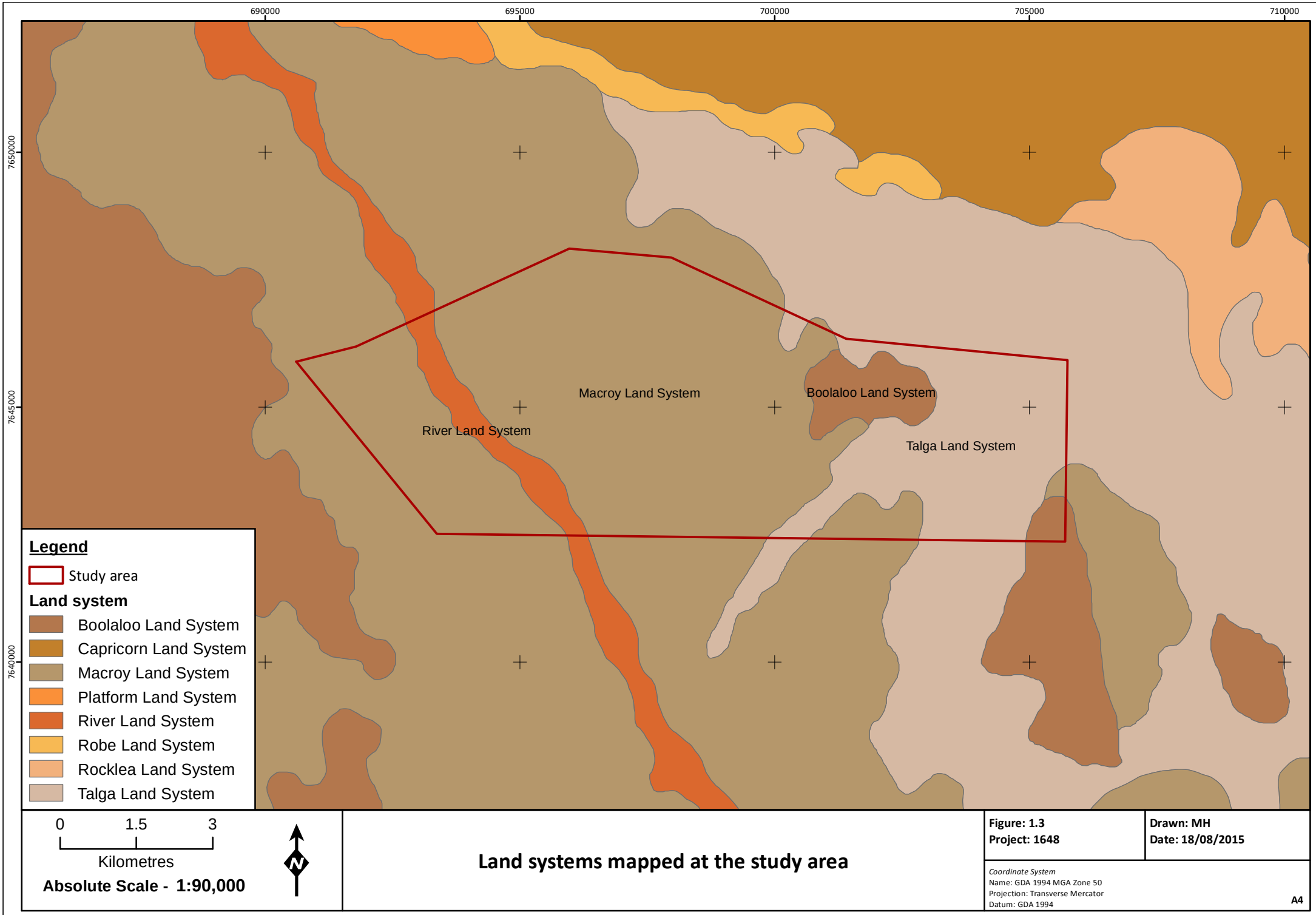
1.6.3 Land Systems

Van Vreeswyk *et al.* (2004) undertook a regional inventory of the Pilbara rangelands to document the land systems present and their condition. The Pilbara Regional Inventory (PRI) covered 181,723 km^2, bounded by the Indian Ocean and Roebourne Plains to the north and west, extending to Broome in the north-east and the Ashburton River catchment in the south. The extent of each of the land systems vary greatly, with almost half the area comprised of just six land systems: Augustus, Little Sandy, Newman, Nita, Rocklea and Uaroo (Van Vreeswyk *et al.* 2004).

Four land systems occur within the study area (Table 1.1, Figure 1.3). Macroy is the dominant land system, occupying 68 percent of the study area, followed by Talga which occupies 22 percent. The area of each land system mapped within the study area represents less than 0.1 percent of the total extent of each land system within the Pilbara IBRA region.

Table 1.1 – Land systems mapped at the study area

Land System	Description	Total area in Pilbara (ha)	Total area in study area (ha)	Proportion in study area (%)	Percentage of total extent within Pilbara (%)
Boolaloo	Granite hills, domes and tor fields and sandy plains with shrubby spinifex grasslands	247,392	352	6	<0.1
Macroy	Stony plains and occasional tor fields based on granite supporting hard and soft spinifexes	1,333,614	4,255	68	<0.1
River	Active flood plains and major rivers supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands	591,433	279	4	<0.1
Talga	Hills and ridges of greenstone and chert and stony plains supporting hard and soft spinifex grasslands	212,619	1,345	22	<0.1
Total	-	-	**6,231**	**100**	-



Land systems mapped at the study area

Figure: 1.3
Project: 1648

Drawn: MH
Date: 18/08/2015

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

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1.6.4 Regional Vegetation

The study area lies within Beard's (1975) Pilbara region of the Eremaean Botanical Province, part of a series of maps completed by Beard *et al.* from 1974 to 1981 throughout Western Australia. The vegetation mapping was reinterpreted to reflect the National Vegetation Information System (NVIS) (ESCAVI 2003) standards, taxonomic revisions and digitised (Shepherd *et al.* 2001).

Beards vegetation units are mapped to represent the extent prior to European settlement and once digitised by Shepherd (2001), the Government of Western Australia (2014) has mapped the post-European (current) extent and the percent of the current extent remaining within the Pilbara region is provided in Table 1.2.

Three vegetation units occur within the study area (Table 1.2, Figure 1.4). Unit 93 is the dominant unit, occupying 69 percent of the study area, followed by unit 82 which occupies 27 percent and both of these units are widespread in the Pilbara IBRA region. Of the three units at the study area, 619 is the most restricted, as it is associated with major drainage rivers, a relatively uncommon landscape feature in the Pilbara region.

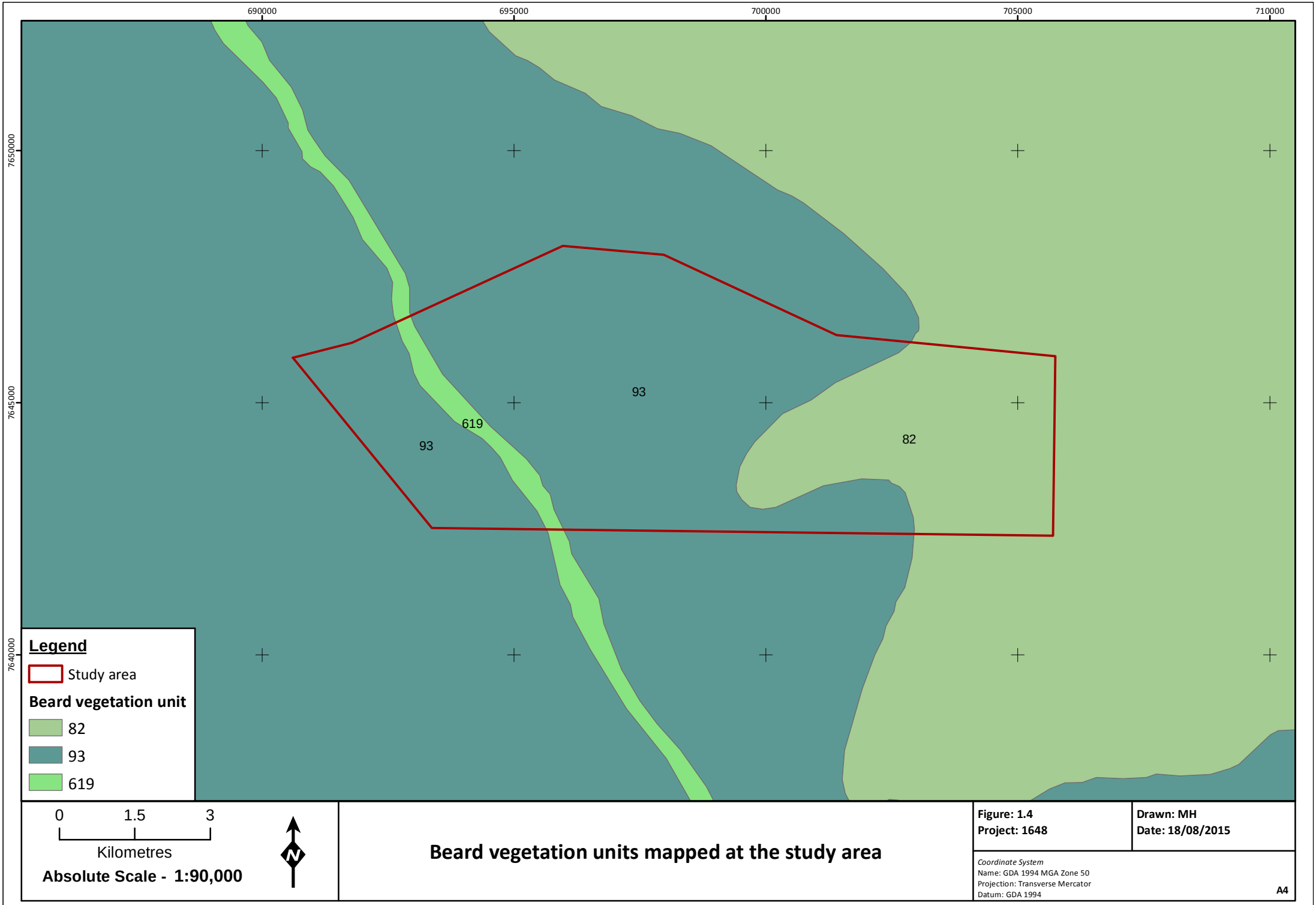
Table 1.2 – Vegetation units of the study area

Code	Source description	Level 4 sub association	Key species	Current extent (ha)^	% remaining^	Extent of study area (ha)	% of study area
82	Hummock grasslands, low tree steppe; snappy gum (*Eucalyptus leucophloia)* over *Triodia wiseana*	*Eucalyptus* open woodland / *Triodia* open hummock grassland	*Eucalyptus leucophloia* *Triodia wiseana* *Triodia pungens*	2,550,899	99.5	1,710	27
93	Hummock grasslands, shrub steppe; Kanji over soft spinifex	*Grevillea* mixed sparse shrubland	*Grevillea pyramidalis* *Hakea lorea* *Senna* spp. *Grevillea wickhamii*	3,0378,471	99.9	4,313	69
619	Medium woodland; river gum (*Eucalyptus camaldulensis*)	*Eucalyptus* woodland / *Acacia* mixed isolated shrubs	*Eucalyptus camaldulensis* *Melaleuca leucadendron Acacia coriacea* *Crotalaria cunninghamii* *Gossypium robinsonii*	118,117	99.3	207	3

^ for the Pilbara IBRA region

1.6.5 Conservation Reserves

There are no DPaW managed lands or ESAs within 40 km of the study area.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Study area
Beard vegetation unit
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Beard vegetation units mapped at the study area
Figure: 1.4
Project: 1648
Drawn: MH
Date: 18/08/2015
Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994
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1.7 LITERATURE REVIEW

1.7.1 Flora and Vegetation

Database searches were conducted for the North Star significant flora and vegetation survey plan (Fortescue 2014) which encompassed the current study area with a buffer of 40 km. Databases searched to determine flora species and communities of significance that have been recorded in the vicinity of the study area are provided in Table 1.3.

Table 1.3 – Flora and vegetation databases searched

Database	Custodian	Search Details
EPBC Act Protected Matters Database	DoE	Records within 40 km of the study area
Threatened and Priority Flora Database (TPFL)	Department of Parks and Wildlife (DPaW)	Records within 40 km of the study area (Search reference 45-0914FL)
Threatened and Priority Flora List (TPList)	DPaW	Place names within 40 km of the study area (Search reference 45-0914FL)
Western Australian Herbarium Specimen Database (WAHERB)	DPaW	Records within 40 km of the study area (Search reference 45-0914FL)
Threatened and Priority Ecological Communities Database	DPaW	Records within 40 km of the study area (Search reference n/a)
Fortescue's internal database	Fortescue	All known records of species from Fortescue database within 40 km
Nature Map	DPaW	Records within 40 km of the study area

In addition, a number of surveys have been conducted in the vicinity of the study area and have been included in the literature review (Table 1.4).

Table 1.4 – Previous flora and vegetation survey reports within the vicinity of the study area

Report	Reference
Vegetation and Flora Survey of the Proposed Stage A Rail Corridor	Biota (2004)
Supplementary Vegetation and Flora Surveys of the Port Hedland to Cloudbreak Rail Corridor and Associated Borrow Pits and Infrastructure	Coffey (2007)
North Star Vegetation and Flora Assessment	*ecologia* (2012c)
North Star Access Corridor Flora and Fauna Assessment	*ecologia* (2012b)
Canning Basin Borefield and Pipeline Single Phase Flora and Vegetation Assessment	*ecologia* (2012a)
Pityrodia sp. Marble Bar Targeted Flora Survey	*ecologia* (2012d)
North Star Slurry and Infrastructure Corridors Targeted Flora and Vegetation Survey	*ecologia* (2015b)

A search of the DPaW TEC and PEC database for the study area was conducted during the North Star flora and vegetation assessment (*ecologia* 2012c).

No Commonwealth or state listed TECs or PECs are known to occur within 40 km of the study area.

1.7.2 Significant Flora

The likelihood of occurrence of significant flora recorded during the database searches was assessed based on distribution and known habitat preference using the criteria shown in Table 1.5.

Table 1.5 – Criteria used to assess likelihood of occurrence of significant flora

Likelihood	Criteria
High	Due to the proximity of previous records (<5 km) or the presence of suitable habitat, the taxon is considered highly likely to occur within the study area or the taxon has previously been recorded.
Moderate	The habitat specificity of the taxon is broadly defined and habitat could possibly occur at the study area and there are records within 20 km of the study area or there is insufficient information available to exclude the possibility of occurrence at the study area.
Low	The habitat specificity of the taxon is well defined from previous records and the habitat is considered unlikely to be present within the study area; or there are no records within 20 km of the study area.

Threatened Flora

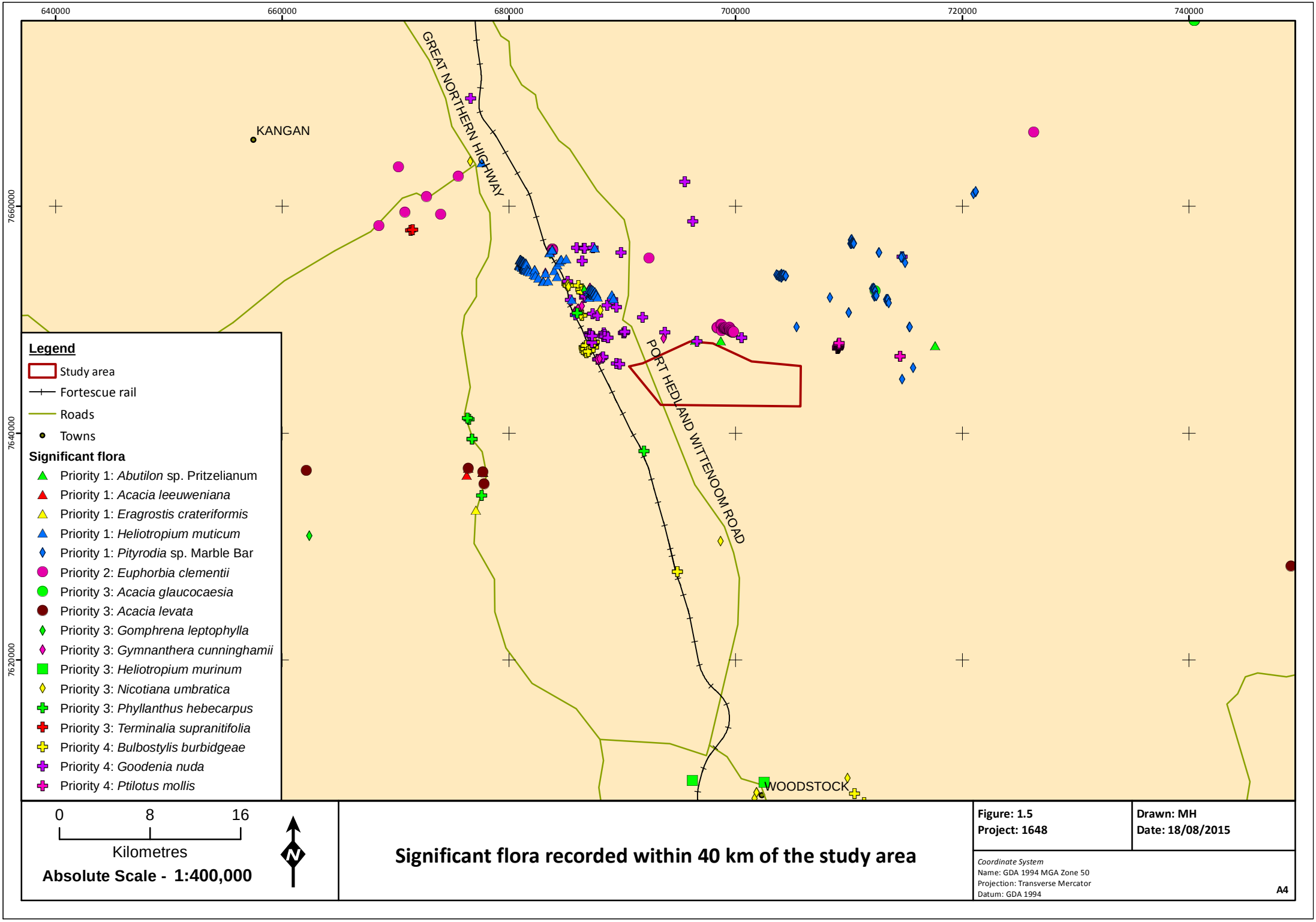
Three EPBC Act and WC Act listed Threatened Flora taxa have been recorded in the Pilbara Bioregion: *Aluta quadrata, Lepidium catapycnon* and *Thryptomene wittweri*. None of these species were identified during the database searches as likely to occur within the study area.

Priority Flora

Seventeen Priority Flora taxa were identified from the literature review as occurring within 40 km of the study area (Figure 1.5). An additional five are listed on the Threatened and Priority Flora List (TPList) although no specific location information is available. The likelihood of occurrence for all taxa recorded during the literature review is described in Appendix B and the taxa with a high or moderate likelihood of occurrence are listed in Table 1.6.

Table 1.6 – Significant flora with high or moderate likelihood of occurrence at the study area

Likelihood of occurrence	Status	Taxon
High	Priority 1	*Abutilon* sp. Pritzelianum (S. van Leeuwen 5095)
		Heliotropium muticum
	Priority 2	*Euphorbia clementii*
	Priority 3	*Gymnanthera cunninghamii*
		Nicotiana umbratica
		Phyllanthus hebecarpus
	Priority 4	*Bulbostylis burbidgeae*
		Goodenia nuda
Moderate	Priority 1	*Acacia leeuweniana*
		Pityrodia sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)
	Priority 3	*Acacia glaucocaesia*
		Acacia levata
	Priority 4	*Ptilotus mollis*


640000
660000
680000
700000
720000
740000
7660000
7640000
7620000
KANGAN
GREAT NORTHERN HIGHWAY
PORT HEDLAND WITTENOOM ROAD
WOODSTOCK
Legend
Study area
Fortescue rail
Roads
Towns
Significant flora
Priority 1: Abutilon sp. Pritzelianum
Priority 1: Acacia leeuweniana
Priority 1: Eragrostis crateriformis
Priority 1: Heliotropium muticum
Priority 1: Pityrodia sp. Marble Bar
Priority 2: Euphorbia clementii
Priority 3: Acacia glaucocaesia
Priority 3: Acacia levata
Priority 3: Gomphrena leptophylla
Priority 3: Gymnanthera cunninghamii
Priority 3: Heliotropium murinum
Priority 3: Nicotiana umbratica
Priority 3: Phyllanthus hebecarpus
Priority 3: Terminalia supranitifolia
Priority 4: Bulbostylis burbidgeae
Priority 4: Goodenia nuda
Priority 4: Ptilotus mollis
0
8
16
Kilometres
Absolute Scale - 1:400,000
N
Significant flora recorded within 40 km of the study area
Figure: 1.5
Project: 1648
Drawn: MH
Date: 18/08/2015
Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994
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1.7.3 Vertebrate Fauna

Three databases were consulted in the preparation of potential fauna lists for the study area (Table 1.7). The online database NatureMap (DPaW 2015a) encompasses several datasets, including the WA Museum, the DPaW Threatened Fauna database and the DPaW Survey Return database. The results from previous vertebrate fauna surveys within the vicinity of the study area were also consulted (Table 1.8).

Table 1.7 – Fauna databases searched

Database	Custodian	Search Details
NatureMap (includes DPaW Threatened Fauna Database)	DPaW	Records within 40 km of the study area
EPBC Act Protected Matters Search Tool	DoE	Records within 40 km of the study area
Birdata	BirdLife Australia	Records within one degree cell
Internal database	*ecologia*	One Level 1 survey, three Level 2 surveys (1 one-phase, 2 two-phase), and three Targeted Fauna surveys.

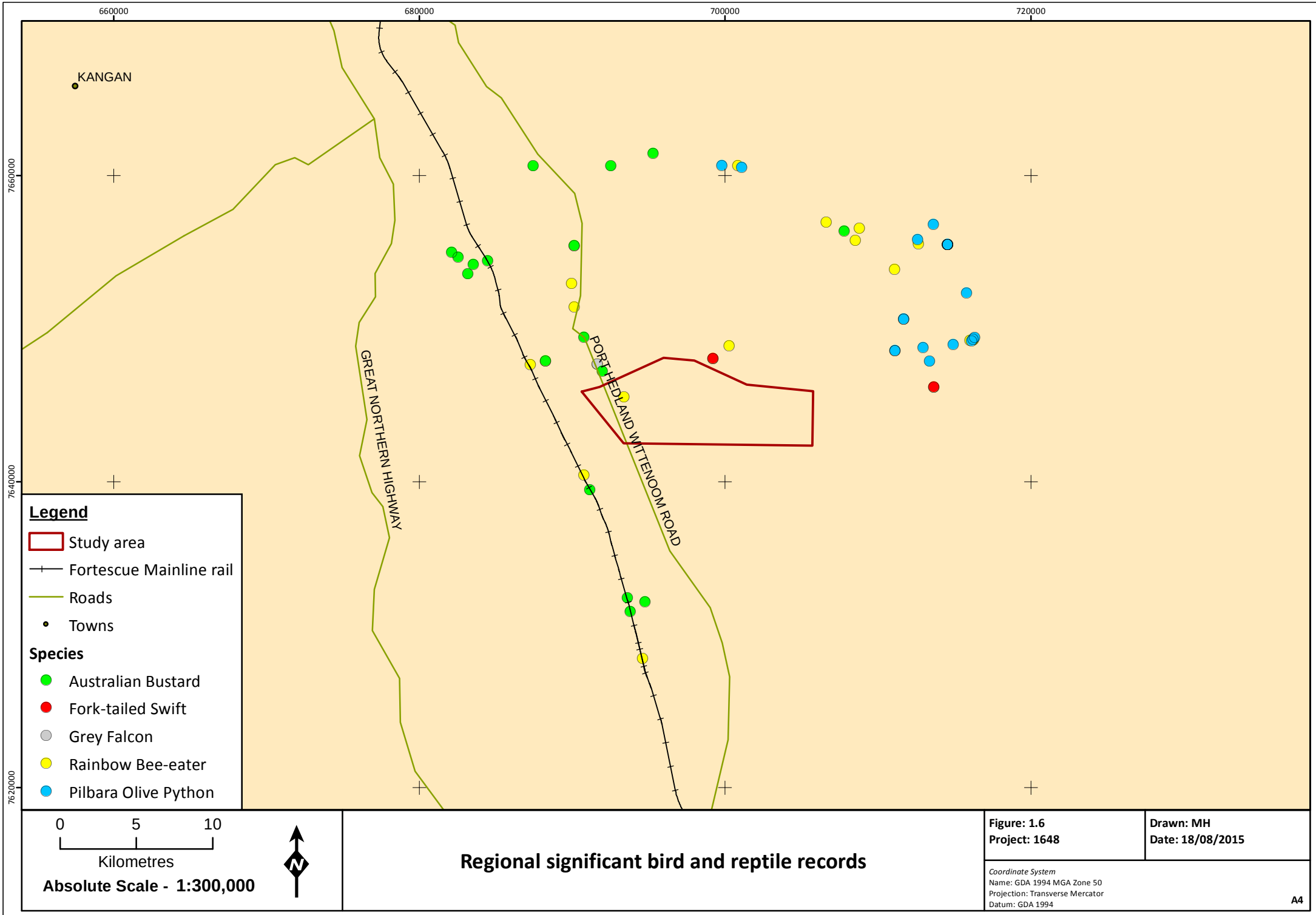
Table 1.8 – Previous vertebrate fauna survey reports within the vicinity of the study area

Report	Reference
Panorama Project Area two-phase Level 2 survey	(Bamford and Wilcox 2001)
FMG stage B rail corridor one-phase Level 2 survey	(Biota 2005)
Panorama Project mine site and haul road targeted fauna survey	(Biota 2007)
Sulphur springs targeted bat survey	(Molhar 2007)
Spinifex Ridge Molybdenum Project Two-phase Level 2 survey and additional one-phase survey	(Outback Ecology 2006)
Wodgina Project Bat and Northern Quoll monitoring	(Outback Ecology 2010)
Mount Dove two-phase Level 2 fauna survey	(Outback Ecology 2011)
North Star Level 2 targeted conservation significant fauna assessment	(*ecologia* 2011a)
North Star Level 2 terrestrial fauna assessment	(*ecologia* 2011b)
North Star Access Corridor flora and fauna assessment	(*ecologia* 2012b)
North Star EPBC Act listed species monitoring	(*ecologia* 2014b)
Additional Rail Infrastructure EPBC-listed species monitoring	(*ecologia* 2015a)

The literature review identified a total of 330 fauna species with the potential to occur in the study area. This includes 51 native and 7 introduced mammal species, 150 bird species, 114 reptiles and eight amphibian species. These are listed in Appendix C.

Included in the species recorded in the literature review are a total of 25 conservation significant vertebrate fauna species that have the potential to occur in the study area, comprising 10 mammal species, 12 bird species and three reptile species. Previous records of conservation significant fauna recorded in the region are mapped in Figure 1.6 and Figure 1.7.

All potential conservation significant species recorded in the literature review had their likelihood of occurrence assessed, based on the methodology described in Section 2.3.1. The results of this analysis are discussed in Section 4.



Regional significant bird and reptile records

Figure: 1.6
Project: 1648

Drawn: MH
Date: 18/08/2015

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

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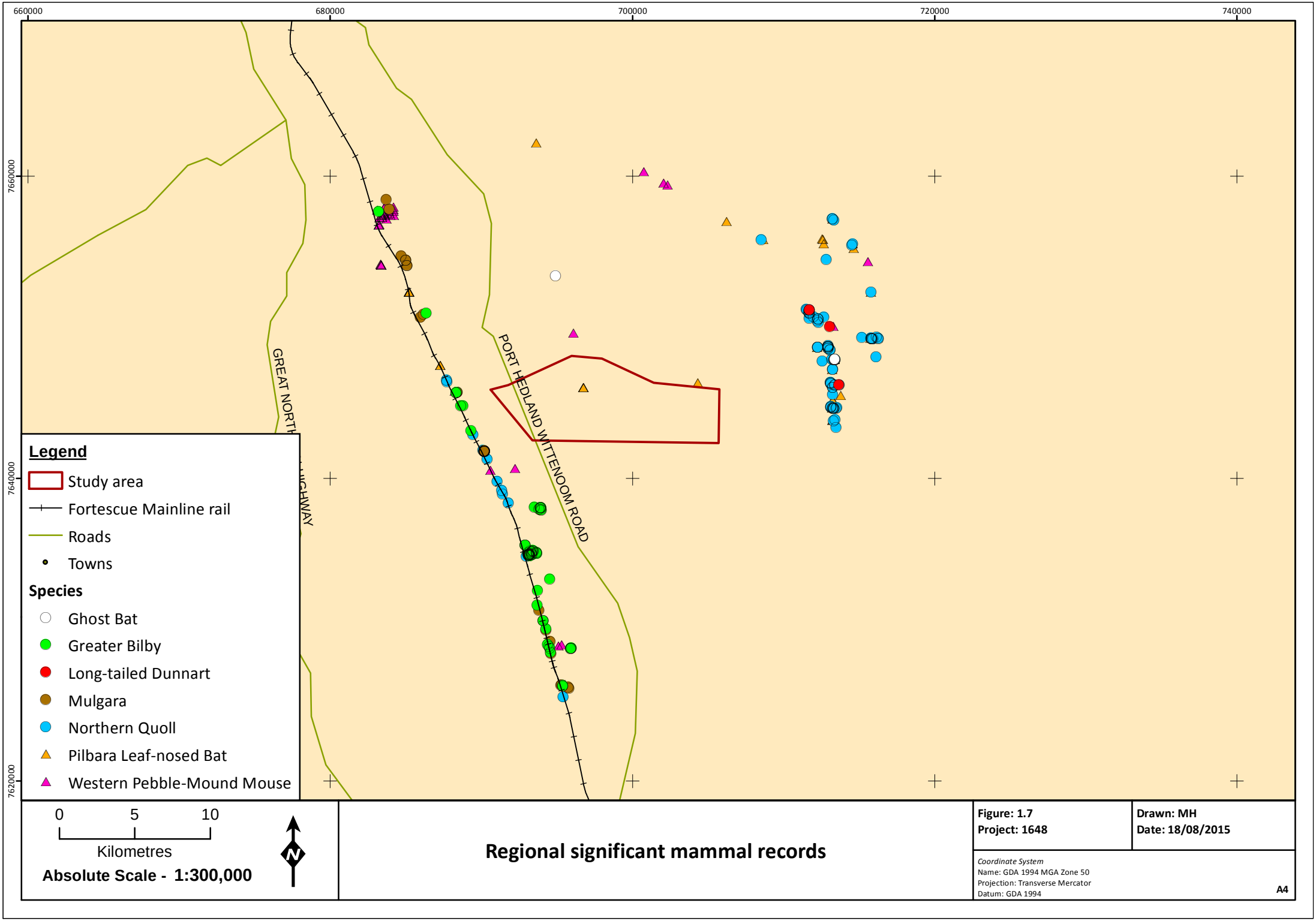

Regional significant mammal records

Figure: 1.7
Project: 1648

Drawn: MH
Date: 18/08/2015

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

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2 METHODOLOGY

2.1.1 Survey Timing

The fauna, flora and vegetation survey was conducted by one botanist and one zoologist between the 22 and 26 August 2015.

2.1.2 Weather Preceding the Survey

Rainfall data is available from the North Star mine site, approximately 5 km east of the study area and for Indee Station, located 60 km north-west of the study area and is shown in Figure 2.1 (BoM 2015). Rainfall recorded in the three months prior to the field survey at Indee (206.3 mm from May to July) was 146.4 mm more than the long-term average of 59.9 mm (1909-2015) for the same period (Figure 2.1). At the North Star mine site, data in the months preceding the field survey indicated that there was a higher than average rainfall during January, March and May, providing favourable conditions for the survey.

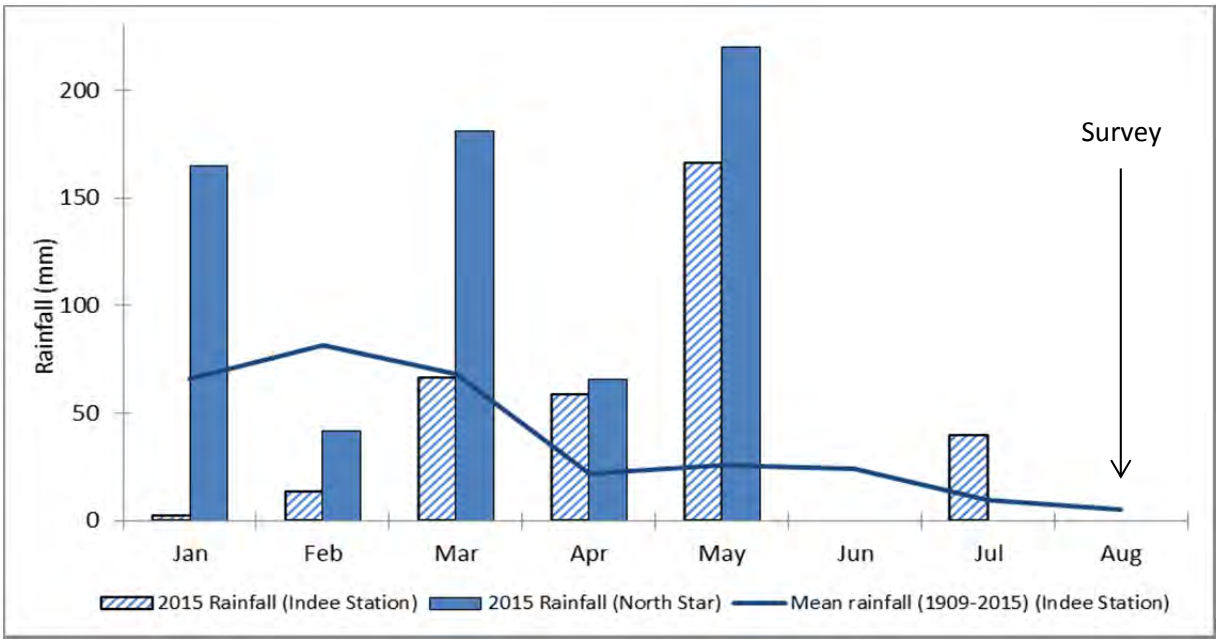


Figure 2.1 – Rainfall data for North Star mine and Indee Station

2.2 FLORA AND VEGETATION

A single phase, Level 2 flora and vegetation assessment of the study area was conducted from the 22 to 26 August 2015. Previous Level 2 flora and vegetation surveys, supporting environmental approvals, have been conducted of the adjacent North Star mine project area by *ecologia* in 2012 (*ecologia,* 2012a, 2012b and 2012c) Survey methodologies were based on the legislative framework and guidelines listed in Section 1.2.

The general approach of the flora and vegetation survey is sampling within bounded quadrats for statistical analysis, supplemented by a series of transects and releves or unbounded quadrats.

2.2.1 Quadrats and Releves

A total of 23 non-permanent quadrats were established and sampled within the study area (Figure 2.2). Quadrat locations were selected using a combination of aerial photography, topographic features, land systems and field observations to represent the diversity of vegetation and habitats present. All quadrats were 2,500 m^2 and the following parameters were recorded:

- All observed flora species and the average height, percentage cover (using the ranges cited by NVIS) and observable presence/absence of fruit/flowers for each;

- Vegetation structure (National Vegetation Information System (NVIS) Level V;
- Vegetation condition scale (Trudgen 1991), which is based on the criteria in Table 2.1;
- Estimated time since fire;
- GPS co-ordinates of all corners;
- Panorama digital photograph of the vegetation, taken from the north-west corner facing south-east;
- The landform element (morphological type, position and element type);
- The presence of rock outcrops (type and abundance);
- Soil type (colour, profile, field texture and surface type); and
- Slope and aspect.

Site information for each quadrat is presented in Appendix D and electronically in Appendix E.

2.2.2 Releves

In addition, nine releves were sampled to aid in the delineation of the vegetation in recently burnt areas. Releves are unbounded sampling points, and the following was recorded:

- Dominant flora species (using the ranges cited by NVIS) and observable presence/absence of fruit/flowers for each;
- Vegetation structure (NVIS Level V);
- Vegetation condition scale (Trudgen 1991), which is based on the criteria in Table 2.1;
- Estimated time since fire;
- GPS co-ordinate;
- Digital image of the vegetation;
- The landform element (morphological type, position and element type);
- The presence of rock outcrops (type and abundance);
- Soil type (colour, profile, field texture and surface type); and
- Slope and aspect.

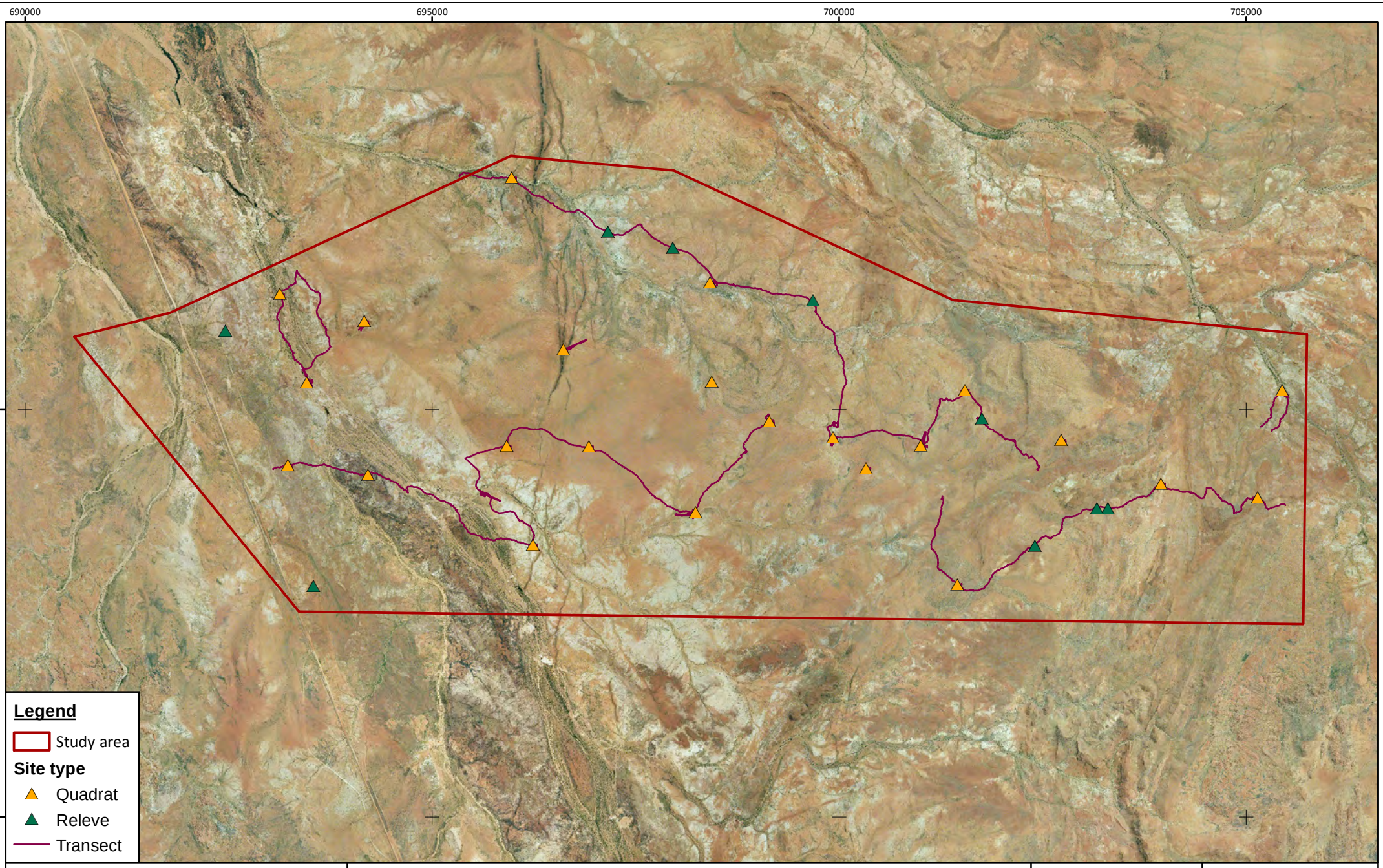
Site information for each releve is presented in Appendix D and locations are provided in the electronic data supply in Appendix E.

2.2.3 Targeted Significant and Additional Flora Searches

Significant flora identified during the database searches were targeted by using aerial imagery to identify suitable vegetation types and habitat (listed for each taxon in Appendix B). The targeted flora searches involved a series of transects which were traversed on foot to locate significant flora, introduced flora and to provide opportunistic collections of taxa not recorded within the quadrats. Transects walked at the study area are mapped in Figure 2.2.

2.2.4 Taxonomy

Nomenclature of the species recorded follow the protocols of the West Australian Herbarium (Western Australian Herbarium 1998-2015). All plant species were identified by Dr. Palitha Jayasekera, a plant taxonomist with eight years' experience in flora of the Pilbara.



Flora quadrats, releves and transects surveyed at the study area

Figure: 2.2
Project: 1648

Drawn: MH
Date: 18/08/2015

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

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2.2.5 Vegetation Mapping

Vegetation mapping is the delineation of plant communities or vegetation units based on distinctive characteristics that these communities share such as the vegetation structure, dominant species and species composition. A combination of aerial photography, the vegetation unit grouping during statistical analysis (Section 2.2.6) and ground truthing was used to interpret the vegetation patterns of the study area and allow for the vegetation mapping.

Vegetation units are described based on the National Vegetation Information System (NVIS) methodology (ESCAVI 2003) and are described to two hierarchical levels:

- Broad floristic formation level (level III) where the dominant growth form, crown cover, height and dominant land cover genus are described for the upper or most ecologically or structurally dominant stratum; and
- Association level (level V) where the dominant growth form, height and crown cover for three species are described for three strata (upper, middle and ground).

2.2.6 Statistical Analysis

Statistical analysis provides an objective means of defining vegetation units and provides insight into the hierarchical relationship between communities based on the degree of similarity in species composition and abundance.

Multivariate analysis was conducted using the site by species matrix data collected from the 23 quadrats sampled during the field survey in addition to 208 quadrats previously sampled during surveys completed at North Star. In order to best align the vegetation analysis, the data from the species by site matrix was treated in that:

- Data was transformed to cover weighted;
- Taxa were removed from the data or grouped together if they could not be confidently identified to a consistent taxonomic level and there was a possibility of confusion with other similar taxa;
- Annual taxa were removed; and
- Subspecies and varieties were combined to the species level only where identification in the field is difficult.

This site by species matrix was then used to perform a cluster analysis to produce a dendrogram of dissimilarity between the quadrats. Cluster analysis was performed on the cover weighted site by species matrix using an association matrix of the Bray-Curtis coefficient with the multivariate program SYSTAT^{TM}. The resultant dendrogram was used in the definition of hierarchy of vegetation assemblages. The site by species matrix used for the analysis is provided electronically in Appendix E.

2.2.7 Vegetation Condition Mapping

The vegetation condition of the study area was classified and mapped using the average condition recorded from quadrats in each vegetation unit. Condition is assessed based on criteria listed in Table 2.1 as described by Trudgen (1991).

Table 2.1 – Vegetation condition assessment (Trudgen 1991)

Vegetation Condition	Criteria
Pristine	Pristine or nearly so, no obvious sign of disturbance.
Excellent	Vegetation structure intact; disturbance affecting individual species; weeds are non-aggressive species.
Very good	Vegetation structure altered; obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires; the presence of some more aggressive weeds; dieback; logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires; the presence of some very aggressive weeds at high density; partial clearing; dieback and grazing.
Degraded or Poor	Very few values remaining.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs.

2.2.8 Fire History

The fire history of the study area was mapped by delineating boundaries of burn scars while walking transects and driving through the study area and extrapolating. Although there was an extensive burn in the north of the study area, quadrats could be surveyed in patches of unburnt vegetation and the pre-burn vegetation communities delineated. In areas where the burn was too extensive for sampling quadrats, releves were surveyed to distinguish these communities as they are not used in the statistical analysis.

2.3 VERTEBRATE FAUNA

Prior to the development of survey methods, a review was undertaken of factors likely to influence survey design and intensity (EPA (2004d), Table 2.2). Based on this review, a desktop assessment and Level 1 fauna survey in accordance with relevant guidelines (EPA 2004c; EPA and DEC 2010) was considered to be appropriate.

Table 2.2 – Factors likely to influence survey design

Factor	Comment
Bioregion – level of existing survey-knowledge of the region and associated ability to predict accurately	*ecologia* has previously completed a two-phase Level 2 survey, targeted conservation significant fauna surveys and EPBC listed species monitoring of the nearby North Star Project area. A number of previous surveys have been completed in the surrounding region.
Landform special characteristics/specific fauna/specific context of the landform characteristics and their distribution and rarity in the region	The landforms associated with the study area are typical for the region and do not represent any rare or unique characteristics.
Lifeforms, life cycles, types of assemblages and seasonality (e.g. migration) of species likely to be present	Not applicable to a Level 1 survey of this nature; survey was largely habitat-based assessment and assessment of likelihood of occurrence for potential targeted conservation significant fauna.
Level of existing knowledge and results of previous regional sampling (e.g. species accumulation curves, species/area curves)	A total of 12 previous surveys incorporated in to literature review plus relevant databases providing good existing knowledge.

Factor	Comment
Number of different habitats or degree of similarity between habitats within a study area	The survey was undertaken to determine the different habitat types present at the study area.
Climatic constraints (e.g. temperature or rainfall that preclude certain sampling methods)	No climatic constraints were experienced.
Sensitivity of the environment to the proposed activities	No ESAs at the study area.
Size, shape and location of the proposed activities	The study area encompasses a much larger area then the actual direct impact area. The specific location of the airstrip has not yet been identified, but is of relatively small area.
Scale and impact of the proposal	The actual disturbance area of the airstrip will be much smaller than surveyed.

2.3.1 Conservation Significant Fauna Likelihood of Occurrence Assessment

An assessment of likelihood of occurrence for conservation significant fauna recorded during the desktop assessment was determined by examining the following:

- Fauna habitats known to exist within the study area and their condition as assessed during the survey;
- Distance of previously recorded conservation significant species from the study area;
- Frequency of occurrence of conservation significant species records in the region; and
- Time passed since conservation significant species were recorded within, or nearby the study area.

Each conservation or biologically significant fauna species potentially occurring at the study area was assigned a likelihood of occurrence based on the four categories described in Table 2.3.

Table 2.3 – Criteria used to assess likelihood of occurrence of conservation significant fauna

Likelihood of occurrence	Criteria
Recorded	Species recorded during the current survey at the study area.
High	Species recorded within, or in proximity to, the study area within 20 years; suitable habitat occurs in the study area.
Medium	Species recorded within, or in proximity to, the study area more than 20 years ago. Species recorded outside study area, but within 50 km; suitable habitat occurs in the study area.
Low	Species rarely or not recorded, within 50 km, and/or suitable habitat does not occur in the study area.

The level of available information for each species was also taken into consideration so that species were not allocated a low likelihood of occurrence due to insufficient survey information or cryptic behaviours and ecology, in accordance with the precautionary principle.

2.3.2 Sampling Methods

The survey methods adopted by *ecologia* are aligned with EPA Guidance Statement No. 56, Position Statement No. 3 (EPA 2002a) and *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA and DEC 2010). The survey was undertaken using a variety of opportunistic survey methods.

Diurnal active searching

Active searches for mammal and reptile species were completed throughout the study area. Search techniques included checking beneath the bark of dead trees, investigating old logs, stumps and dead free-standing trees, raking leaf litter, investigating burrows and over-turning logs and stones. Tracks, diggings, scats, burrows and nests were also recorded where possible. Bird species were also

recorded during active searches. Each active search was completed over a one hour period, totalling 19 hours search effort.

Camera trapping

Camera trapping utilising motion cameras was completed at a total of 13 sites. Cameras were baited with sardines in an attempt to lure animals to the area. Reconyx HC500 Hyperfire motion cameras were used. All cameras are triggered by movement using highly sensitive passive infra-red motion sensors that function both during the day and at night. Cameras were deployed for a total of 208 hours.

Bat echolocation call recordings

A Song Meter 2 (SM2Bat) device was utilised in the field for recording bat echolocation calls. On the first night of deployment the SM2Bat device was vandalised and rendered unusable for the remainder of the field survey resulting in no bat call echolocation recordings. Given the extensive survey effort surrounding the study area from previous surveys, it was determined an accurate assessment on potential bat species could be made via desktop analysis of previous records.

2.3.3 Sampling Sites

Vertebrate fauna sampling sites are listed in Appendix F, provided electronically in Appendix E and mapped on Figure 2.3.

2.3.4 Targeted Conservation Significant Fauna Surveying

Prior to the commencement of the field survey, the preferred habitat of conservation significant species that potentially occur in the study area was determined. These habitats were identified and targeted during the field survey. In particular, targeted assessments for species with high conservation value and assessed as high likelihood of occurrence were made, these species including; Northern Quoll, Pilbara Leaf-nosed Bat and Pilbara Olive Python.

Northern Quoll (*Dasyurus hallucatus*)

Diurnal active searches were completed in areas of suitable Northern Quoll foraging and denning habitat. Secondary evidence of Northern Quoll such as tracks and scats were also searched for. Additionally, motion cameras were utilised in areas that represented suitable Northern Quoll habitat. Motion cameras were baited with sardines in an attempt to lure Northern Quoll to the area.

Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*)

Bat echolocation call recordings were unable to be made in the field due to SM2Bat device vandalism (Section 2.3.2). A habitat assessment was conducted and potential roost caves and foraging habitat were searched for.

Pilbara Olive Python (*Liasis olivaceus barroni*)

Diurnal active searches were completed in areas of potential Pilbara Olive Python habitat. Individuals were searched for along with secondary evidence as sloughed skins and remains.

2.3.5 Fauna Habitat Mapping

A fauna habitat type broadly describes an area of habitat that is distinguishable in its vegetation and land features from its surroundings, and is likely to support a different (or species specific) fauna assemblage to that found in other fauna habitat types. Particular attention is also paid to the likelihood that certain species are present which tend to be found only in that specific habitat type. Fauna habitat types were identified, described and mapped using the following existing information:

- IBRA sub regions;

- Aerial photography; and
- Beard vegetation associations (Shepherd *et al.* 2001).
- During the survey, additional information was also collected to aid in habitat mapping, including:
- Landform;
- Vegetation type and structure; and
- Composition of terrestrial fauna community.

2.3.6 Fauna Taxonomy and Nomenclature

Nomenclature for mammals, reptiles and amphibians within this report follows the *Western Australian Museum Checklist of the Vertebrates of Western Australia* and birds according to Christidis and Boles (2008). References used for fauna identification are listed in Table 2.4.

Table 2.4 – References used for identification

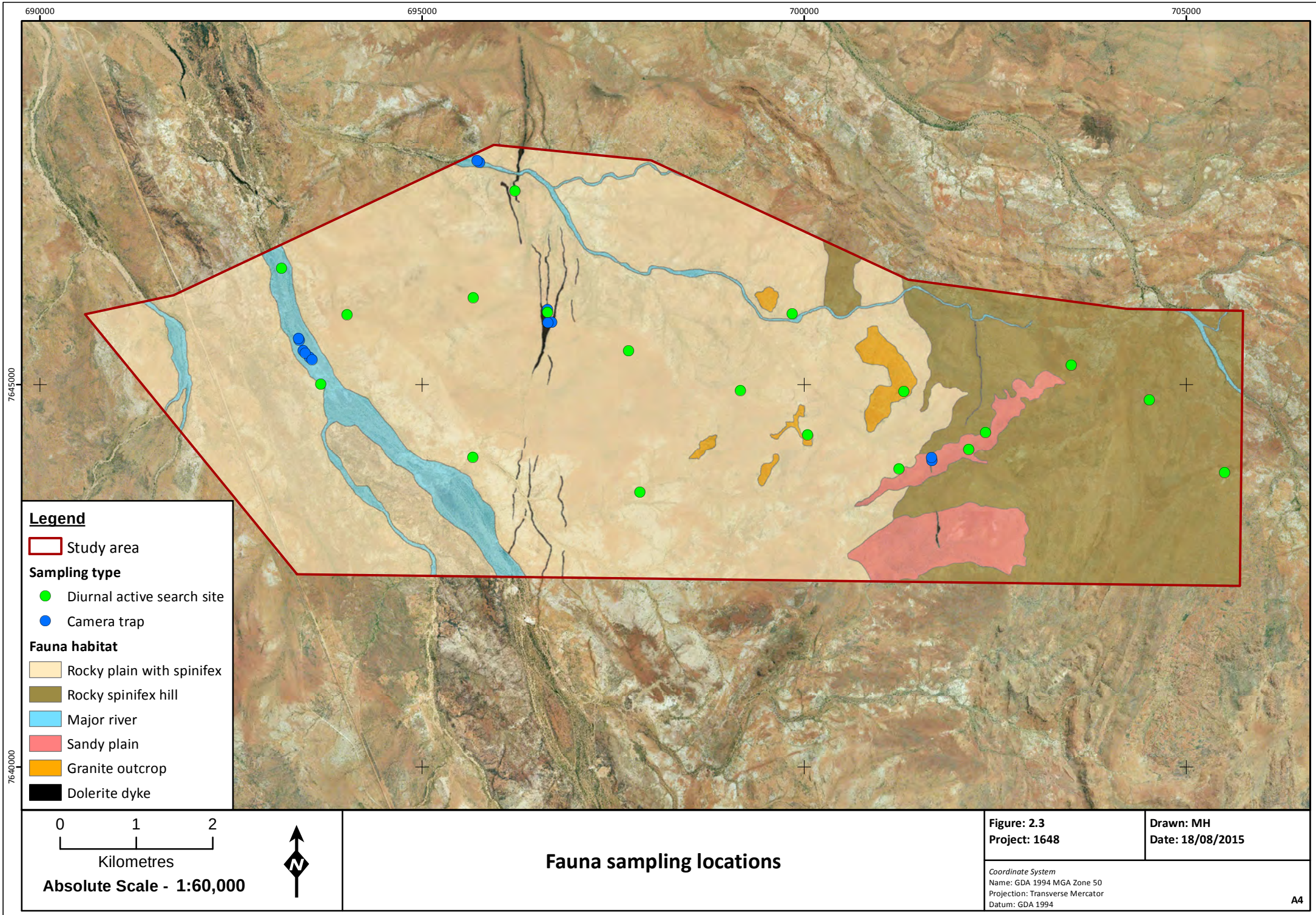
Fauna group	Reference
Mammals	Menkhorst and Knight (2011), Van Dyck and Strahan (2008)
Bats	Churchill (1998), Menkhorst and Knight (2011)
Birds	Morecombe (2000), Pizzey & Knight (2013)
Reptiles	Wilson and Swan (2010), Cogger (2000)
Amphibians	Tyler and Doughty (2009), Cogger (2000)

2.4 PROJECT TEAM AND LICENCES

The flora and fauna assessment described in this document was planned, coordinated and executed by those summarised and under the following licences listed in Table 2.5.

Table 2.5 – Project team and licences

Project Staff			
Name	**Qualification**	**Role**	**Project role**
Shaun Grein	B. App. Sc; Grad. Dip. Nat Res.	Managing Director	Project management, quality control
Melissa Hay	Bsc. (Hons)	Senior Botanist/Ecologist	Project management, field survey and reporting
Bruce Greatwich	Bsc.	Senior Zoologist/Ecologist	Reporting
Sean White	Bsc.	Zoologist	Field survey
Palitha Jayasekara	PhD	Botanist/Taxonomist	Flora identifications
Licences			
This assessment was conducted under the authorisation of the following licences issued by DPaW:			
Name	**Licence Number**	**Licence**	
Melissa Hay	SL 011 414	Licence to take flora for scientific purposes	


690000
695000
700000
705000
7645000
7640000
Legend
Study area
Sampling type
Diurnal active search site
Camera trap
Fauna habitat
Rocky plain with spinifex
Rocky spinifex hill
Major river
Sandy plain
Granite outcrop
Dolerite dyke
0
1
2
Kilometres
Absolute Scale - 1:60,000
N
Fauna sampling locations
Figure: 2.3
Project: 1648
Drawn: MH
Date: 18/08/2015
Coordinate System
Name: GDA 1994 MGA Zone 50
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Datum: GDA 1994
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3 RESULTS

3.1 FLORA

A total of 221 vascular plant taxa were recorded from the study area. Of these, 76 (34.4%) were annuals or short-lived perennials and seven were introduced species. The composition of the flora of the study area is summarised in Table 3.1. A complete list of taxa recorded, including opportunistic collections and partially identified specimens, is included in Appendix G and all flora data is provided electronically in Appendix E.

Table 3.1 – Floristic information at the study area and the wider vicinity

Number of taxa recorded	Number of families	Number of genera	Number of families represented by a single taxon	Number of genera represented by a single taxon
221	41	113	19	72

The families and genera represented by the greatest number of taxa, and the most frequently recorded species at the study area are listed in Table 3.2. The most species-rich families were Fabaceae and Poaceae and *Acacia* and *Triodia* were the most species rich genera. *Acacia inaequilatera* and *Triodia epactia* were the most frequently occurring taxa and were both recorded from 57% of the quadrats surveyed.

Table 3.2 – Most commonly recorded families, genera and taxa

Most taxa per family	Most taxa per genus	Most frequently recorded taxa
Fabaceae (46 taxa)	*Acacia* (11 taxa)	*Acacia inaequilatera* (13 records; 57% of quadrats)
Poaceae (41 taxa)	*Triodia* (8 taxa)	*Triodia epactia* (13 records; 57% of quadrats)
Malvaceae (22 taxa)	*Ptilotus* (6 taxa)	*Ptilotus astrolasius* (12 records; 52% of quadrats)
Amaranthaceae (10 taxa)	*Senna* (6 taxa)	*Acacia ancistrocarpa* (12 records; 52% of quadrats)
Asteraceae (10 taxa)	*Cyperus* (5 taxa)	*Gossypium australe* (12 records; 52% of quadrats)
Cyperaceae (8 taxa)	*Eriachne* (5 taxa)	*Gossypium australe* (10 records; 43% of quadrats)
Myrtaceae (8 taxa)	*Hibiscus* (5 taxa)	*Indigofera monophylla* (10 records; 43% of quadrats)

Species richness within quadrats varied from 11 to 76 taxa, with a mean species richness of 27.2 ± 18.7 (n=23). The quadrat with the highest species richness of 76 taxa was located on a major drainage line and the three quadrats with the lowest species richness with 11 taxa each, recorded on rocky hillslopes.

3.1.1 Survey Adequacy

From the floristic data collected from the 23 quadrats at the study area, the predicted flora taxa richness, as calculated by ICE Mean and Chao 2 Mean, is 215 and 213 taxa respectively. The total number of taxa recorded from quadrats was 177 (excluding opportunistic collections and potential duplicates), which represents between 82.3 and 83.1 percent of the predicted richness at the study area (Figure 3.1).

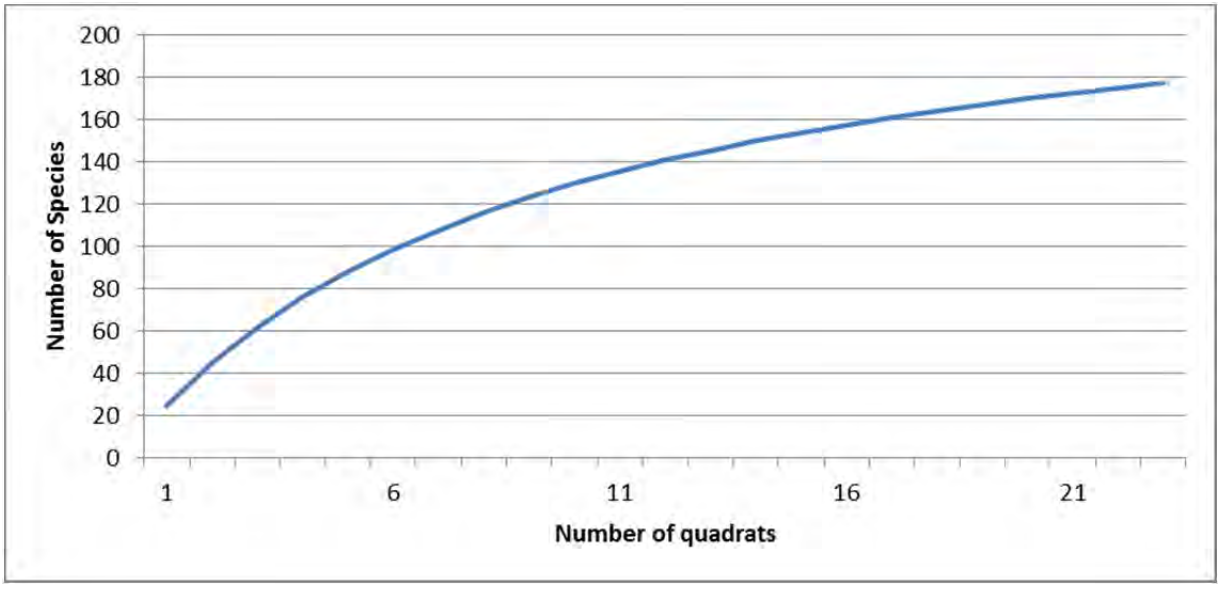


Figure 3.1 – SAC analysis for the study area

3.1.2 Flora of Conservation Significance

Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia)

No EPBC Act listed Threatened Flora taxa were recorded at the study area.

Wildlife Conservation Act 1950 (Western Australia)

No WC Act listed Threatened Flora taxa were recorded at the study area.

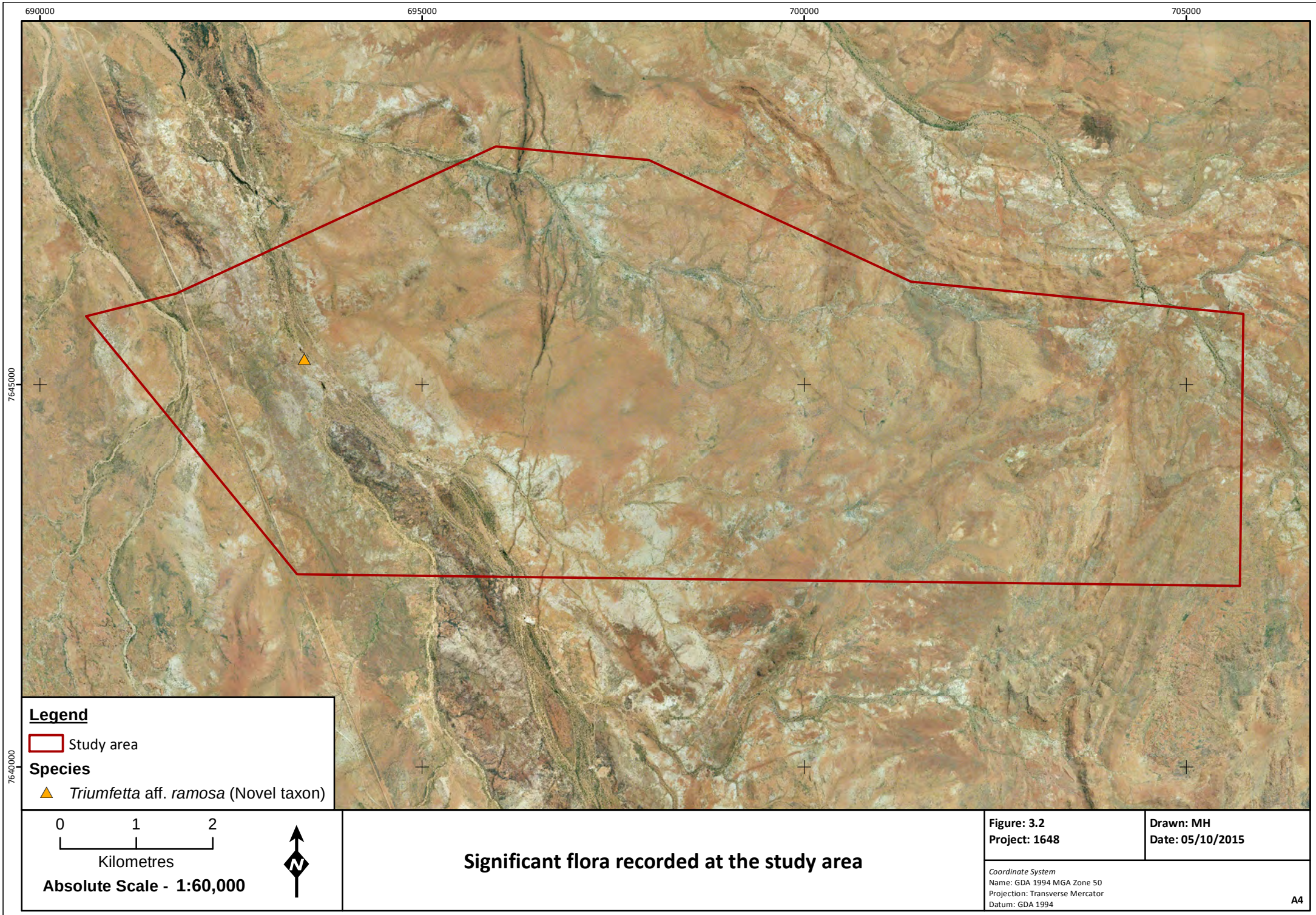
Priority Flora

No Priority Flora were recorded at the study area.

Other Significant Flora

One potentially novel taxon, *Triumfetta* aff. *ramosa* was recorded at the study area and is a recognised as a potential new species (S Dillion 2015, pers. comm., 17 September).

T. aff. *ramosa* was recorded at one location along the branch of the Turner River that runs through the west portion of the study area. The location of *T.* aff. *ramosa* recorded at the study area is provided in Appendix H, is mapped on Figure 3.2 and the TPRF form for submission to the Western Australian Herbarium is provided electronically in Appendix E.



Significant flora recorded at the study area

Figure: 3.2
Project: 1648

Drawn: MH
Date: 05/10/2015

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

A4

3.1.3 Introduced Flora

Weeds of National Significance

No WONs were recorded at the study area.

Declared Pest (Weeds)

No Declared Pests (Weed) species were recorded at the study area.

Environmental Weeds

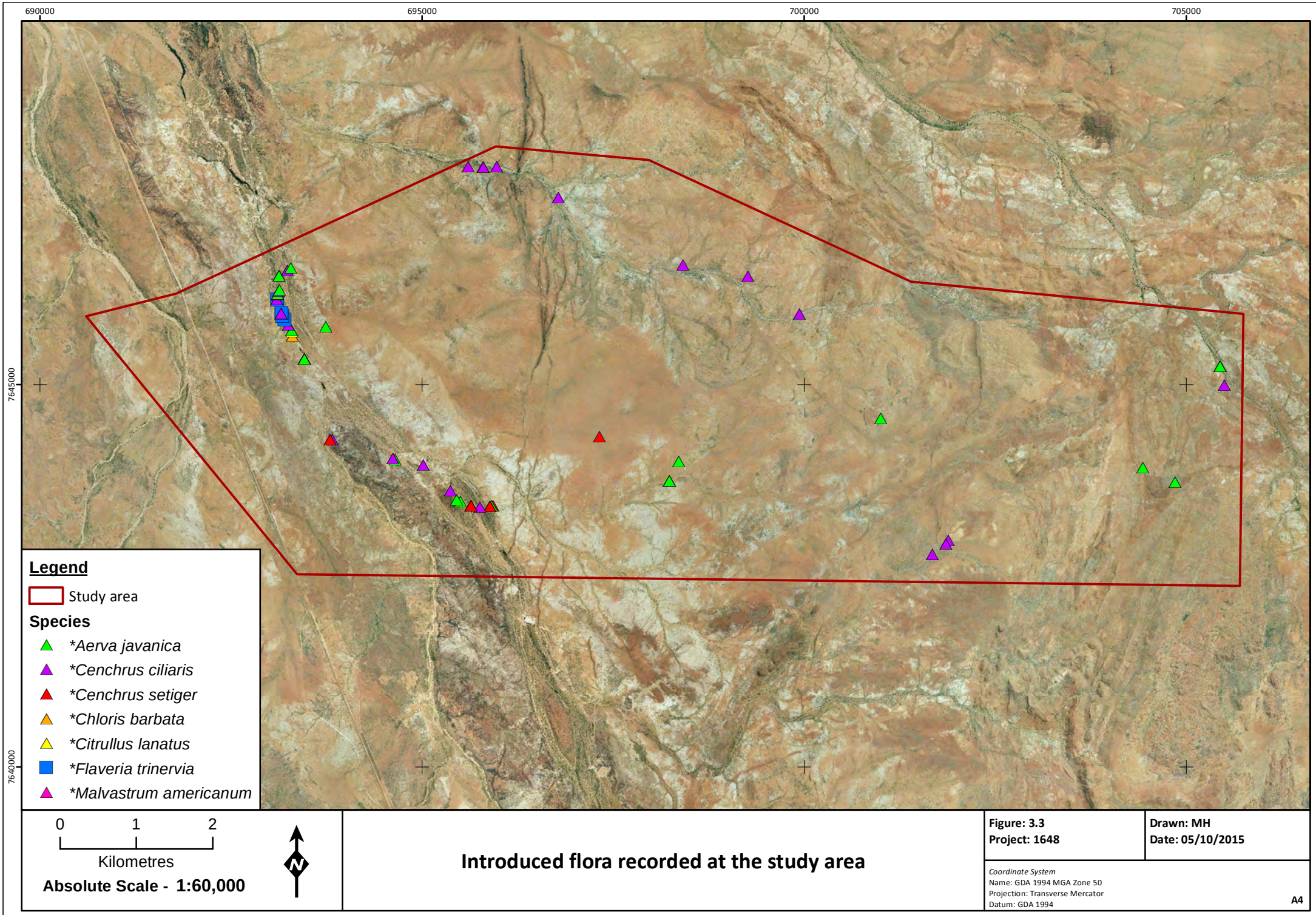
Seven environmental weeds were recorded at the study area These are listed Table 3.3, coordinates provided in Appendix H and they are mapped in Figure 3.3. Generally the rivers, creeks and floodplains had a high weed cover, often with *Cenchrus* spp. forming the dominant lower stratum. The DPaW environmental risk assessment status for each of these weeds is presented in Table 3.4 and based on these rankings, five of these species have a high environmental risk at the study area.

Table 3.3 – Introduced flora recorded at the study area and wider vicinity

Taxon	Number of plants at the study area	Habitat recorded on at the study area
**Aerva javanica*	981	River, creeklines, floodplains and hillslopes
**Cenchrus ciliaris*	119,351	River, creeklines, floodplains and disturbed areas
**Cenchrus setiger*	3,406	River, creeklines and floodplains
**Chloris barbata*	101	River
**Citrullus lanatus*	1	River
**Flaveria trinervia*	31	River
**Malvastrum americanum*	7	River, creekline and disturbed areas

Table 3.4 – DPaW environmental risk assessment status

Taxon	Environmental Rating	Current Distribution	Abundance	Ecological Impact	Invasiveness	Feasibility of Control	General Trend	Status
**Aerva javanica*	High	Moderate	Abundant	High	Rapid	High-Medium	Increasing	Established
**Cenchrus ciliaris*	High	High	Abundant	High	Rapid	Low	Increasing	Established
**Cenchrus setiger*	High	High	Abundant	High	Rapid	Low	Increasing	Established
**Chloris barbata* (assessed as *Chloris* sp.)	Low	Moderate	Common	High	Rapid	Unknown	Increasing	Established
**Citrullus lanatus*	Low	Low	-	Low	Rapid	Low	-	-
**Flaveria trinervia* (not assessed)	-	-	-	-	-	-	-	-
**Malvastrum americanum*	Mod	High	Abundant	High	Rapid	Low	Increasing	Established



Introduced flora recorded at the study area

Figure: 3.3
Project: 1648

Drawn: MH
Date: 05/10/2015

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

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3.2 VEGETATION

3.2.1 Vegetation Units

Nine vegetation units were described and mapped from the study area. Two units dominate the vegetation of the study area: *AaAiTl (+/-Acacia ancistrocarpa* and/or *Acacia inaequilatera* sparse tall shrubland, over *Triodia lanigera* open hummock grassland) and; *ChAiTb/Tw* (+/-*Corymbia hamersleyana* isolated low trees, over *Acacia inaequilatera*, *Acacia acradenia* and *Grevillea wickhamii* sparse shrubland, over *Triodia basedowii* and/or *Triodia wiseana* open hummock grassland). These units were widespread across the undulating plains and low hills.

The eastern side of the study area was characterised by steeper ironstone hill slopes and mapped as unit: *AiAaTw* (+/-*Acacia inaequilatera* and *Acacia acradenia* sparse mid shrubland, over *Triodia wiseana* open hummock grassland). Small drainage channels dissected these hills and were mapped as unit: *At* (*Acacia tumida* subsp. *pilbarensis* tall shrubland (+/-*Grevillea wickhamii*), over *Triodia wiseana* hummock grassland).

The major rivers and creek lines of the study area were mapped as unit: *EcMgCc* (*Eucalyptus camaldulensis* open low to mid woodland, over +/-*Melaleuca glomerata, Acacia ampliceps* and *Melaleuca linophylla* sparse tall shrubland, over *Cenchrus ciliaris* open tussock grassland), while the minor drainage lines and creeks were mapped as unit: *ApImTe* (*Acacia pyrifolia* subsp. *pyrifolia*, *Acacia tumida* subsp. *pilbarensis* and *Acacia acradenia* open tall shrubland, over *Indigofera monophylla, Corchorus parviflorus* and *Tephrosia rosea* sparse low shrubland, over *Triodia epactia* open hummock grassland). Floodplain areas surrounding the major and minor waterways were often occupied by unit: *PfCcTe* (*Pluchea ferdinandi-muelleri* (+/-*Acacia stellaticeps*) sparse low shrubland, over *Triodia epactia* sparse hummock grassland and *Cenchrus ciliaris* sparse tussock grassland).

Several areas within the central portion of the study area were dominated by outcropping granite domes and boulders and were mapped as: *AtCcTe* (*Acacia tumida* subsp. *pilbarensis* sparse to open tall shrubland, over *Cajanus cinereus, Indigofera monophylla* and *Corchorus parviflorus* sparse low shrubland, over *Triodia epactia* open hummock grassland).

Linear outcropping dolerite dykes running north-south through the study area were mapped as: *AiGaTw* (*Acacia inaequilatera* isolated tall shrubs, over *Gossypium australe* sparse mid shrubland, over *Triodia wiseana* open hummock grassland).

The vegetation units of the study area are further described in Table 3.5, the extent of each mapped on Figure 3.4 and the regional dendrogram used to delineate the units is provided electronically in Appendix E.

3.2.2 Vegetation Condition and Fire History

The majority of vegetation within the study area was rated as Excellent or Very Good condition, with low levels of grazing and introduced species. The major creek line running through the west of the study area was mapped as Good, with the vegetation significantly disturbed by high levels of grazing and introduced flora.

A large proportion of the northern section of the study area was burnt recently (<2 years). The estimated burn area is mapped in Figure 3.6.

3.2.3 Groundwater Dependent Ecosystems

One vegetation unit considered to be a GDE was described and delineated: *EcMgCc* (*Eucalyptus camaldulensis* open low to mid woodland, over +/-*Melaleuca glomerata, Acacia ampliceps* and *Melaleuca linophylla* sparse tall shrubland, over *Cenchrus ciliaris* open tussock grassland. This unit was restricted to the major waterways at the study area and dominated by the known phreatophytic species; *Eucalyptus camaldulensis* subsp. *obtusa* and often associated with *Melaleuca argentea*. The extent of the GDE vegetation unit at the study area is mapped in Figure 3.4.

Table 3.5 – Vegetation of the study area

Vegetation unit mapping code	Quadrats	Vegetation description (NVIS Level III and Level VI)	Associated species	Area (ha & % of the study area), average species richness and landform
AaAiTl	Q003, Q005, Q006, Q014, Q017, Q019, Q020, R108 NS285, NS211, NS217, NS248, NS239, NS249, NS286, NS282, NS109	*Triodia* open hummock grassland. +/-*Acacia ancistrocarpa* and/or *Acacia inaequilatera* sparse tall shrubland, over *Triodia lanigera* open hummock grassland.	*Grevillea wickhamii* *Indigofera monophylla* *Senna glutinosa* subsp. *glutinosa* *Triodia epactia* *Gossypium australe* *Ptilotus astrolasius* *Solanum phlomoides* *Acacia bivenosa* *Corchorus parviflorus* *Ptilotus calostachyus*	**Area**: 2,080.6 ha (33.4%) **Average perennial species richness (mean ± SE):** 15.9 ± 3.9 **Landform**: Undulating plains, +/-rocky ironstone

Vegetation unit mapping code	Quadrats	Vegetation description (NVIS Level III and Level VI)	Associated species	Area (ha & % of the study area), average species richness and landform
AiAaTw	Q015, Q016, R104, R105, R107 NS264, NS60, NS139, NS133, NS143, NS146, NS152, NS119	*Triodia* open hummock grassland. +/-*Acacia inaequilatera* and *Acacia acradenia* sparse mid shrubland, over *Triodia wiseana* open hummock grassland.	*Acacia bivenosa* *Acacia spondylophylla* *Bonamia media* *Corchorus laniflorus* *Eucalyptus leucophloia* subsp. *leucophloia* *Grevillea wickhamii* *Hakea lorea* subsp. *lorea* *Hybanthus aurantiacus* *Ptilotus astrolasius* *Senna glutinosa* subsp. *glutinosa*	**Area**: 1,311 ha (21%) **Average perennial species richness (mean ± SE):** 9.7 ± 3.9 **Landform**: Rocky ironstone hill slope

Vegetation unit mapping code	Quadrats	Vegetation description (NVIS Level III and Level VI)	Associated species	Area (ha & % of the study area), average species richness and landform
AiGaTw	Q021 NS97, NS98, NS274	*Triodia* open hummock grassland. *Acacia inaequilatera* isolated tall shrubs, over *Gossypium australe* sparse mid shrubland, over *Triodia wiseana* open hummock grassland.	*Acacia acradenia* *Cajanus cinereus* *Corchorus laniflorus* *Cymbopogon obtectus* *Gomphrena cunninghamii* *Indigofera colutea* *Mollugo molluginea* *Tephrosia* sp. Bungaroo Creek *Tribulus platypterus* *Tribulus platypterus* *Triumfetta chaetocarpa*	**Area**: 51.9 ha (0.8%) **Average perennial species richness (mean ± SE):** 14.8 ± 1.7 **Landform**: Dolerite dyke

Vegetation unit mapping code	Quadrats	Vegetation description (NVIS Level III and Level VI)	Associated species	Area (ha & % of the study area), average species richness and landform
ApImTe	Q004, Q010 NS136, NS200, NS262, NS201, NS265, NS210, NS213, NS144, NS271, NS261, NS204, NS233, NS276, NS279	*Acacia* spp. open tall shrubland. *Acacia pyrifolia* subsp. *pyrifolia*, *Acacia tumida* subsp. *pilbarensis* and *Acacia acradenia* open tall shrubland, over *Indigofera monophylla, Corchorus parviflorus* and *Tephrosia rosea* sparse low shrubland, over *Triodia epactia* open hummock grassland.	*Corymbia hamersleyana* *Eucalyptus victrix* *Acacia bivenosa* *Ptilotus astrolasius* *Chrysopogon fallax* *Stemodia grossa* *Hybanthus aurantiacus* *Senna notabilis* *Polymeria ambigua* *Bonamia linearis* *Goodenia stobbsiana* *Cyperus vaginatus* *Cenchrus ciliaris* *Pluchea ferdinandi-muelleri*	**Area**: 64.5 ha (1%) **Average perennial species richness (mean ± SE):** 29.7 ± 8 **Landform**: Minor drainage and creek lines

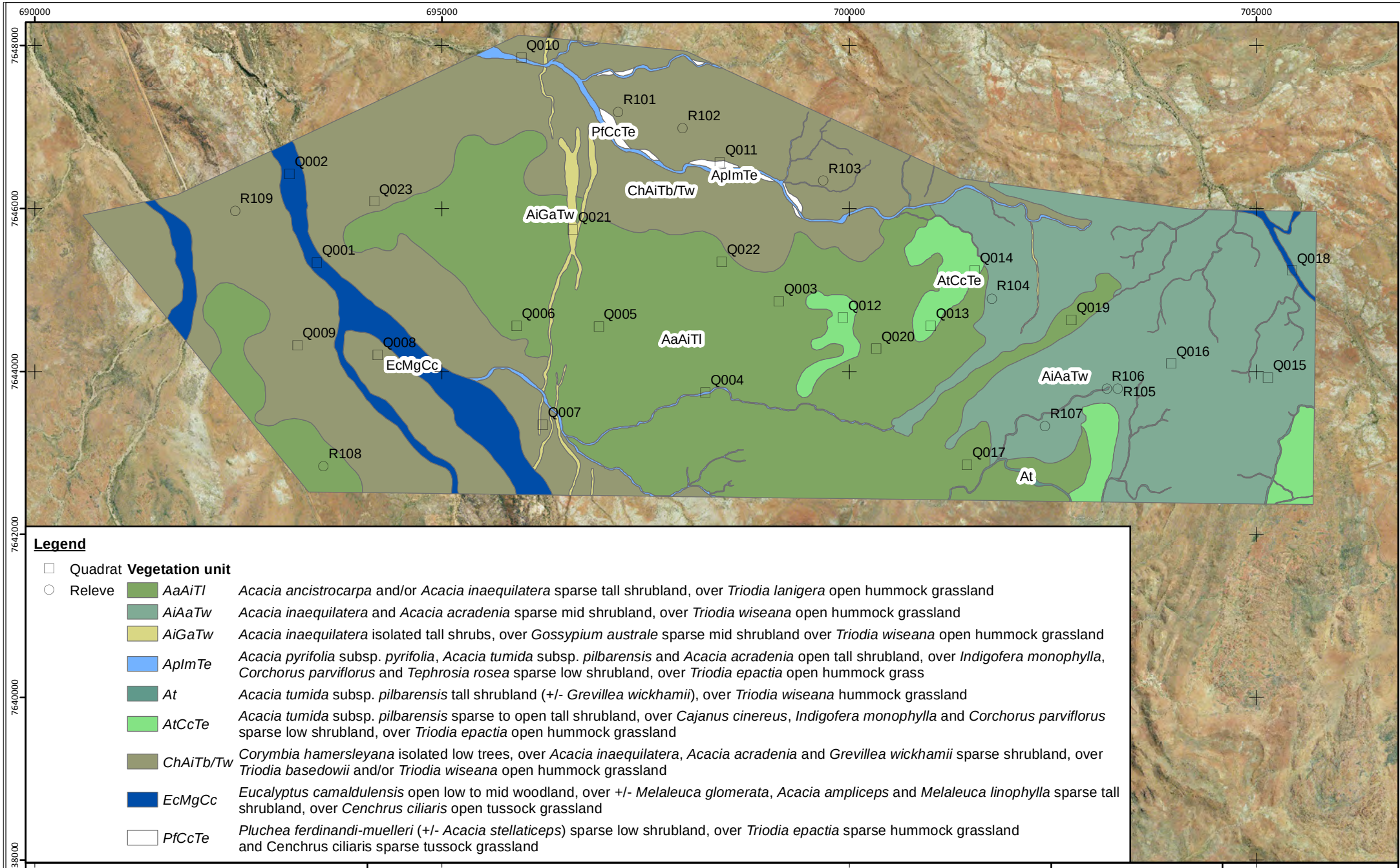
Vegetation unit mapping code	Quadrats	Vegetation description (NVIS Level III and Level VI)	Associated species	Area (ha & % of the study area), average species richness and landform
At	R106 NS128, NS163, NS165, NS229, NS238, NS277, NS278, NS299	*Acacia* tall shrubland *Acacia tumida* subsp. *pilbarensis* tall shrubland (+/-*Grevillea wickhamii*), over *Triodia wiseana* hummock grassland.	*Acacia acradenia* *Corymbia hamersleyana* *Cymbopogon obtectus* *Eriachne mucronata* *Grevillea wickhamii* *Hybanthus aurantiacus* *Indigofera monophylla* *Triodia epactia*	**Area**: 29.4 ha (0.5%) **Average perennial species richness (mean ± SE):** n/a **Landform**: Minor drainage lines and gullies on and between rocky hills

Vegetation unit mapping code	Quadrats	Vegetation description (NVIS Level III and Level VI)	Associated species	Area (ha & % of the study area), average species richness and landform
AtCcTe	Q012, Q013, R103	*Triodia* open hummock grassland. *Acacia tumida* subsp. *pilbarensis* sparse to open tall shrubland, over *Cajanus cinereus, Indigofera monophylla* and *Corchorus parviflorus* sparse low shrubland, over *Triodia epactia* open hummock grassland.	*Tripogon loliiformis* *Chrysopogon fallax* *Eriachne mucronata* *Hibiscus sturtii* *Gossypium australe* *Aristida holathera* *Abutilon lepidum* *Zornia albiflora*	**Area**: 205.5 ha (3.3%) **Average perennial species richness (mean ± SE):** 21.5 ± 6.4 **Landform**: Outcropping granite slabs and boulders

Vegetation unit mapping code	Quadrats	Vegetation description (NVIS Level III and Level VI)	Associated species	Area (ha & % of the study area), average species richness and landform
ChAiTb/Tw	Q007, Q008, Q009, Q023, R101, R102, R109 NS87, NS50, NS64, NS284, NS227, NS263	*Triodia* open hummock grassland. +/-*Corymbia hamersleyana* isolated low trees, over *Acacia inaequilatera*, *Acacia acradenia* and *Grevillea wickhamii* sparse shrubland, over *Triodia basedowii* and/or *Triodia wiseana* open hummock grassland.	*Acacia ancistrocarpa* *Ptilotus calostachyus* *Goodenia stobbsiana* *Petalostylis labicheoides* *Bonamia media* *Acacia stellaticeps* *Indigofera monophylla* *Senna artemisioides* subsp. *oligophylla* *Corchorus laniflorus* *Senna glutinosa* subsp. *glutinosa*	**Area**: 2,221.8 ha (35.7%) **Average perennial species richness (mean ± SE):** 13.7 ± 3.9 **Landform**: Rocky ironstone/calcrete undulating plains and hill sides

Vegetation unit mapping code	Quadrats	Vegetation description (NVIS Level III and Level VI)	Associated species	Area (ha & % of the study area), average species richness and landform
EcMgCc	Q001, Q002, Q018 NS125	*Eucalyptus* open woodland *Eucalyptus camaldulensis* open low to mid woodland, over +/- *Melaleuca glomerata, Acacia ampliceps* and *Melaleuca linophylla* sparse tall shrubland, over *Cenchrus ciliaris* open tussock grassland.	*Acacia pyrifolia* subsp. *pyrifolia* *Acacia trachycarpa* *Acacia coriacea* *Aerva javanica* *Atalaya hemiglauca* *Crotalaria cunninghamii* *Cyperus vaginatus* *Melaleuca argentea* *Sesbania cannabina* *Stemodia grossa* *Rhynchosia minima* *Triodia epactia*	**Area**: 248.7 ha (4%) **Average perennial species richness (mean ± SE):** 22.5 ± 6.5 **Landform**: Major river/creek beds

Vegetation unit mapping code	Quadrats	Vegetation description (NVIS Level III and Level VI)	Associated species	Area (ha & % of the study area), average species richness and landform
PfCcTe	Q011 NS061, NS042, NS048	*Pluchea* open shrubland *Pluchea ferdinandi-muelleri* (+/-*Acacia stellaticeps*) sparse low shrubland, over *Triodia epactia* sparse hummock grassland and *Cenchrus ciliaris* sparse tussock grassland.	*Acacia trachycarpa* *Chrysopogon fallax* *Corchorus tectus* *Eriachne lanata* *Sporobolus australasicus* *Stemodia grossa* *Triodia secunda*	**Area**: 16.6 ha (0.3%) **Average perennial species richness (mean ± SE):** 12.3 ± 7.2 **Landform**: Floodplain



Legend

Quadrat **Vegetation unit**

Releve

AaAiTl	*Acacia ancistrocarpa* and/or *Acacia inaequilatera* sparse tall shrubland, over *Triodia lanigera* open hummock grassland
AiAaTw	*Acacia inaequilatera* and *Acacia acradenia* sparse mid shrubland, over *Triodia wiseana* open hummock grassland
AiGaTw	*Acacia inaequilatera* isolated tall shrubs, over *Gossypium australe* sparse mid shrubland over *Triodia wiseana* open hummock grassland
ApImTe	*Acacia pyrifolia* subsp. *pyrifolia*, *Acacia tumida* subsp. *pilbarensis* and *Acacia acradenia* open tall shrubland, over *Indigofera monophylla*, *Corchorus parviflorus* and *Tephrosia rosea* sparse low shrubland, over *Triodia epactia* open hummock grass
At	*Acacia tumida* subsp. *pilbarensis* tall shrubland (+/- *Grevillea wickhamii*), over *Triodia wiseana* hummock grassland
AtCcTe	*Acacia tumida* subsp. *pilbarensis* sparse to open tall shrubland, over *Cajanus cinereus*, *Indigofera monophylla* and *Corchorus parviflorus* sparse low shrubland, over *Triodia epactia* open hummock grassland
ChAiTb/Tw	*Corymbia hamersleyana* isolated low trees, over *Acacia inaequilatera*, *Acacia acradenia* and *Grevillea wickhamii* sparse shrubland, over *Triodia basedowii* and/or *Triodia wiseana* open hummock grassland
EcMgCc	*Eucalyptus camaldulensis* open low to mid woodland, over +/- *Melaleuca glomerata*, *Acacia ampliceps* and *Melaleuca linophylla* sparse tall shrubland, over *Cenchrus ciliaris* open tussock grassland
PfCcTe	*Pluchea ferdinandi-muelleri* (+/- *Acacia stellaticeps*) sparse low shrubland, over *Triodia epactia* sparse hummock grassland and Cenchrus ciliaris sparse tussock grassland

0 1 2

Kilometres

Absolute Scale - 1:60,000

N

Vegetation mapping of the study area

Figure: 3.4
Project: 1648

Drawn: MM
Date: 08/10/2015

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

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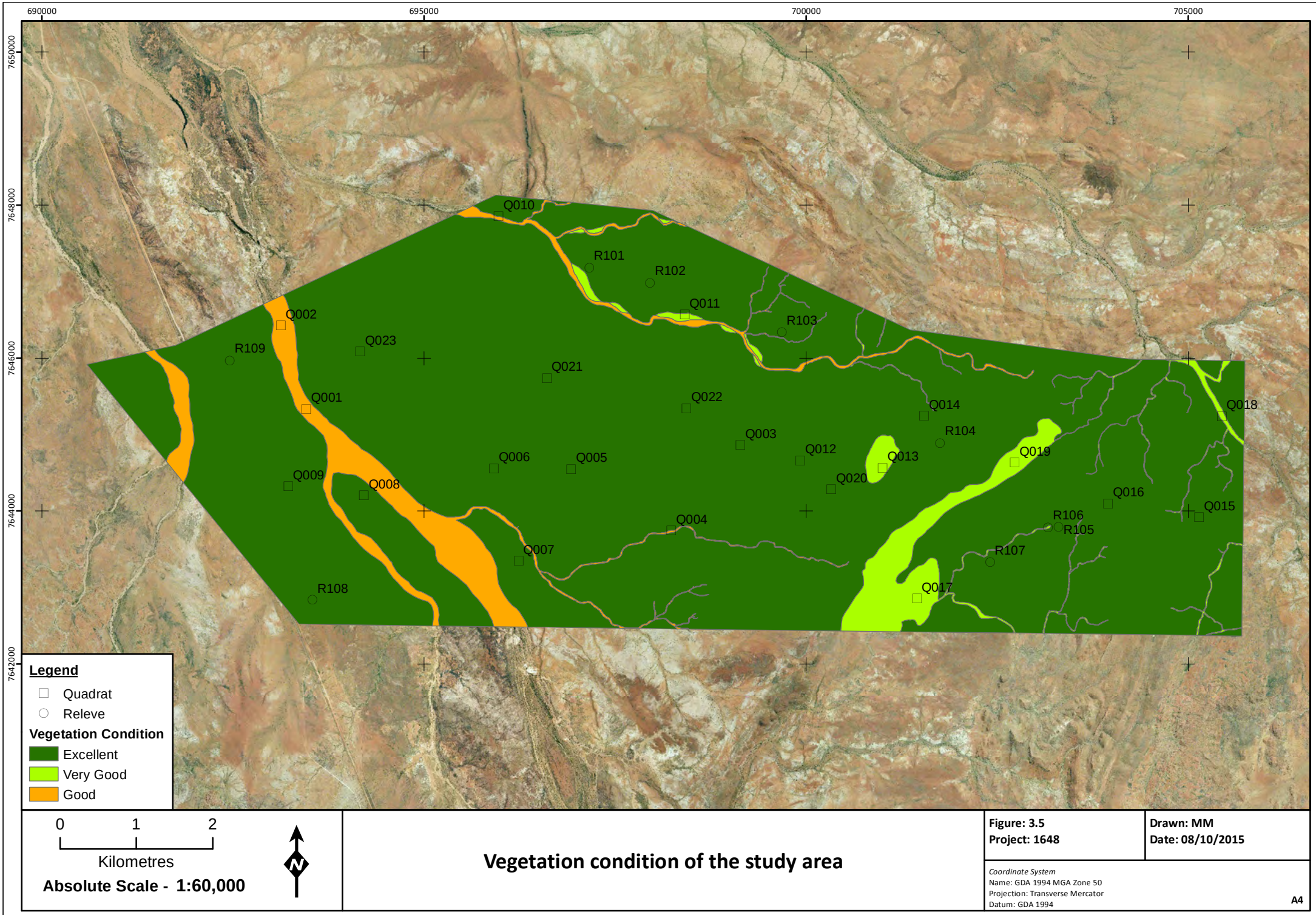
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Legend
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Vegetation Condition
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Absolute Scale - 1:60,000
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Vegetation condition of the study area
Figure: 3.5
Project: 1648
Drawn: MM
Date: 08/10/2015
Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
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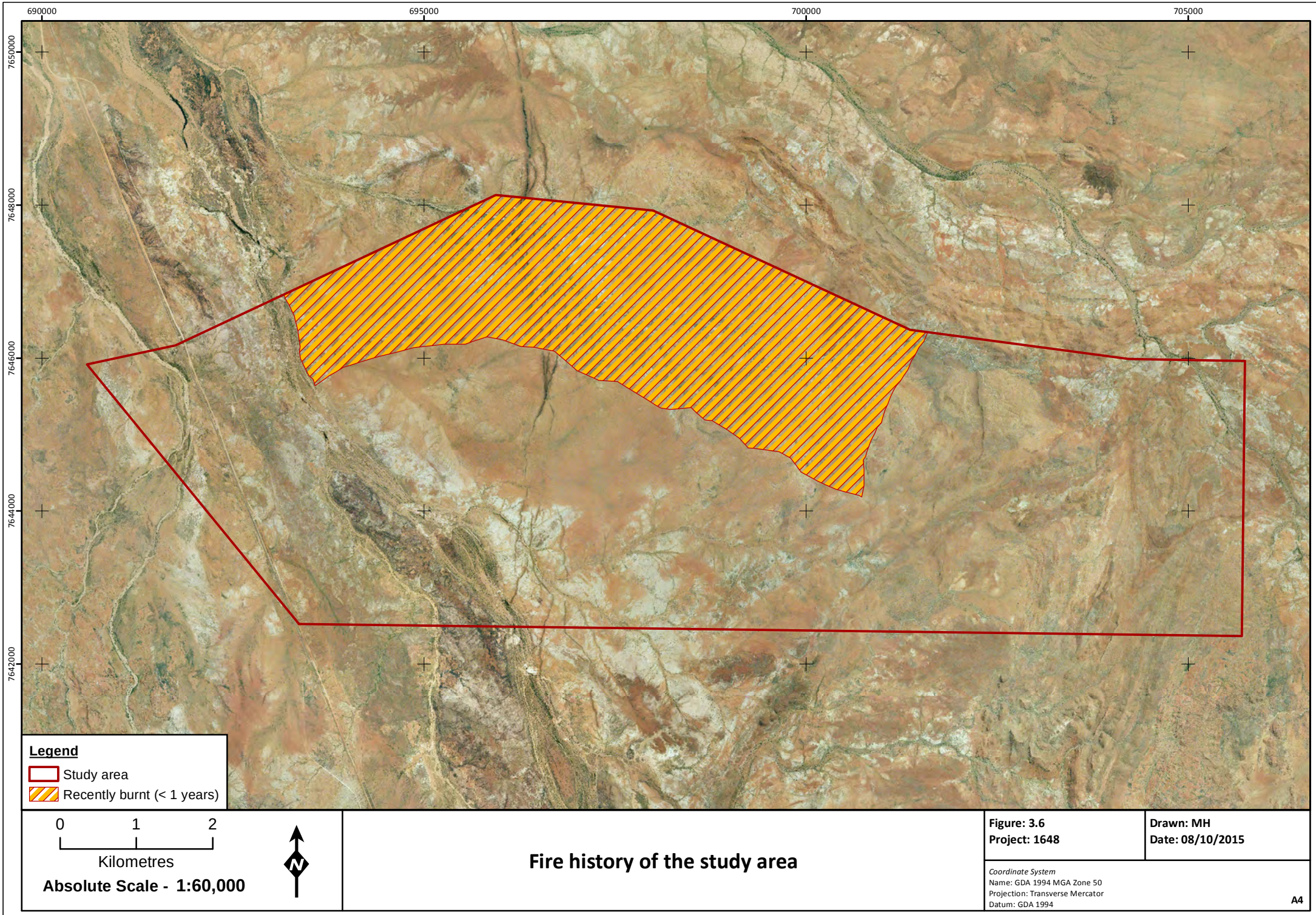

Fire history of the study area

Figure: 3.6
Project: 1648

Drawn: MH
Date: 08/10/2015

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

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3.3 FLORA AND VEGETATION SURVEY LIMITATIONS AND CONSTRAINTS

Limitations of the current survey are summarised in Table 3.6. Given that there were no limitations associated with the flora and vegetation survey, it is considered that an appropriate level of survey has been undertaken that accords with the EPA guidelines.

Table 3.6 – Summary of survey limitations: flora and vegetation

Constraint	Relevant (yes/no)	Comment
Sources of information and availability of contextual information (i.e. pre-existing background versus new material)	No	Broad scale (1:1,000,000) vegetation mapping by Shepherd *et al* (2001) based on the mapping by Beard (1975) is available. Many recent surveys have been conducted in the vicinity of the study area including the Level 2 Flora and Vegetation of the North Star Project area directly adjacent.
The scope (i.e. what life forms were sampled)	No	The vascular flora of the study area was sampled in accordance with Guidance Statement 51.
Proportion of flora collected and identified (based on sampling, timing and intensity)	No	Species accumulation curve analysis suggests that 82.3 and 83.1% of the taxa expected to be present were recorded at the study area. Of the taxa recorded, 34.4% were annuals or short lived perennials.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	No	The quadrat density was considered more than adequate to map the vegetation communities at the study area and a sufficient number of transects were traversed through areas of potential Priority Flora habitat.
Mapping reliability	No	Good quality aerial imagery was available and the number and spatial distribution of quadrats was considered adequate for definition of vegetation within the study area.
Timing/weather/ season/ cycle	No	The survey was conducted at a time of the year when conditions were considered to be excellent for surveying, with 34.4% of all taxa recorded either annuals or short lived perennials and the rainfall in the three months preceding the survey, 146.4 mm more than the long term average for the same period.
Disturbances (e.g. fire, flood, accidental human intervention)	No	There were no natural or human interventions that constrained the survey of the study area.
Intensity (in retrospect, was the intensity adequate?)	No	A one phase Level 2 survey was conducted at the study area. Due to the multiple flora and vegetation surveys conducted in the area and incorporated into the desktop results, it is considered adequate survey intensity. The species accumulation curve suggests that 82.3 and 83.1% of species present. Quadrats were distributed evenly across the study area and considered adequate to map the vegetation.
Resources	No	A total of 5 person-days were expended.
Access issues	No	All parts of the study area were accessible by walking from existing vehicle tracks.
Experience levels (e.g. degree of expertise in plant identification to taxon level)	No	The senior botanist, who was responsible for planning, reporting and conducting the survey, has nine years' of experience conducting botanical surveys. The taxonomist responsible for plant identifications has a Doctorate in botanical taxonomy and has completed identifications for many projects within WA. Where necessary, additional external expertise (from WA Herbarium) was sought to assist with plant identifications.

3.4 VERTEBRATE FAUNA

3.4.1 Fauna habitats

Six broad fauna habitat types were identified within the study area and are listed below in Table 3.7 and mapped on Figure 3.13. The area of each broad fauna habitat type has been calculated and is shown in Table 3.7. A description of each broad habitat type is given in the following sections. Where applicable, habitat descriptions were aligned with those previously mapped for the North Star project (*ecologia* 2011b).

The dominant fauna habitat type from the study area is rocky plain with spinifex, which occurs throughout the majority of the study area. Rocky spinifex hill is the second dominant habitat type, occurring exclusively within the eastern portion of the study area. The four remaining habitat types occupy small portions of the study area (0.4-4.4%) (Table 3.7).

No fauna habitats are restricted to the study area, with fauna habitats within the study area common habitat types across the landscape, with the exception of dolerite dyke. The dolerite dyke habitat type is less commonly seen in the region, however, the habitat features provided by dolerite dyke (typically rocky boulder piles and crevices) are seen within granite boulder and rocky ridge/outcrop/breakaway habitats which are common in the surrounding region. In general, major river, dolerite dyke and sandy plain habitat types are locally significant due their potential to support local conservation significant fauna. As noted above, these locally significant habitats (or habitat features in the case of dolerite dyke) occur at a regional level.

Table 3.7 – Fauna habitats within the study area

Fauna habitat	Area in study area (ha)	Percentage of study area (%)
Rocky plain with spinifex	4,226.5	67.9
Rocky spinifex hill	1,400.5	22.5
Major river	276.5	4.4
Sandy plain	234.1	3.8
Granite outcrop	69.4	1.1
Dolerite dyke	22.1	0.4
Total	**6,229.1**	**100**

Rocky plain with spinifex

The rocky plain with spinifex habitat type is the dominant habitat type of the study area, occupying 4,226.5 ha (67.9%) (Table 3.7, Figure 3.7). The habitat type occurs throughout the central and western areas of the study area. The habitat is characterised by stony soil and plain landscape features. Dominant tree species are scattered *Corymbia hamersleyana* over scattered *Acacia inaequilatera* and *Acacia ancistrocarpa* with spinifex (*Triodia lanigera, Triodia basedowii* and *Triodia wiseana*) hummock grasslands (Figure 3.7).

Some variation occurs within this broad habitat type, with minor areas with sandier soil texture existing around low, minor granite outcrops. Additionally, minor drainage lines containing denser *Acacia* spp. Shrubs are found throughout the habitat.

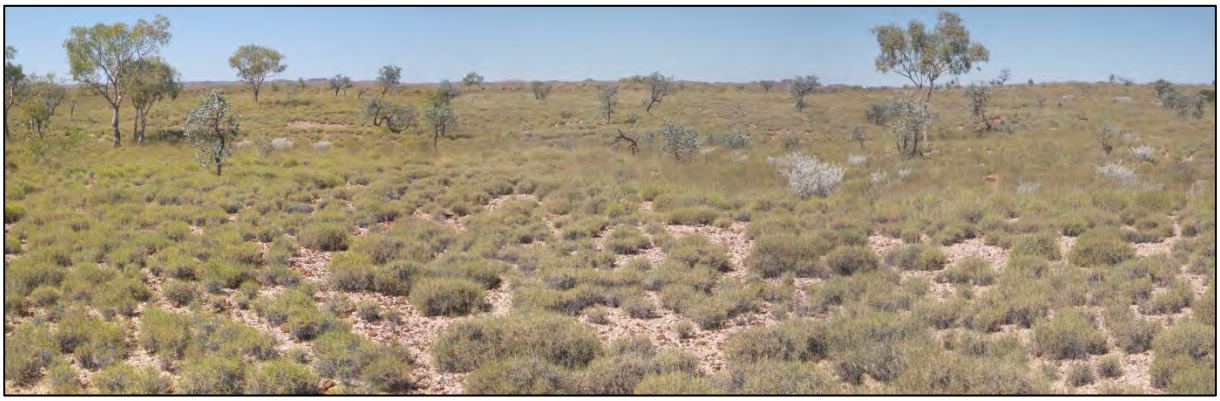


Figure 3.7 – Representative photograph of rocky plain with spinifex habitat

Rocky spinifex hill

The rocky spinifex hill is the second most common habitat type within the study area, occupying 1,400.5 ha (22.5%) (Table 3.7, Figure 3.8). The stony hills landform feature is the dominant characteristic of this habitat type. Hills are typically rounded with no significant outcropping containing ridges or cliffs. The rocky spinifex hill habitat occurs exclusively in the eastern edge of the study area. Vegetation is dominated by spinifex (*Triodia wiseana*) hummock grassland, with scattered *Acacia inaequilatera* and *Acacia acradenia* shrubs and scattered *Eucalyptus leucophloia* trees.

Figure 3.8 – Representative photograph of rocky spinifex hill habitat

Major river

Within the study area the major river habitat type is associated with the Turner River and its associated tributaries (Figure 3.9). The major river habitat type occupies 276.5 ha (4.4%) of the study area (Table 3.7). Turner River itself flows through the western portion of the study area.

Associated soil substrate is coarse river sand, with large, mature *Eucalyptus camaldulensis* occurring along the river banks, along with occasional patches of *Melaleuca argentea*. The mature trees provide numerous tree hollows and woodland structure, important habitat features for various fauna species, including a number of potential conservation significant fauna species (Section 3.4.5). Shrub and grass species are scattered but mostly dominated by *Cenchrus ciliaris* tussock grassland and *Triodia epactia* hummock grassland.

Figure 3.9 – Representative photograph of Major river habitat

Sandy plain

The sandy plain habitat type occurs in two patches in the eastern portion of the study area and covers a total area of 234.1 ha (3.8%) (Table 3.7, Figure 3.10). The sandy plain habitat type occurs in association with footslopes of surrounding rocky hills and minor drainage lines.

Vegetation consists of spinifex hummock grassland (*Triodia lanigera*), with the tall shrub species *Acacia acradenia* and patches of the small shrub *Acacia stellaticeps*. Trees in the area are scattered *Corymbia hamersleyana*. Soil substrate is orange/red medium coarse sand of lose strength (Figure 3.10). The sandy soil substrate is important in supporting a number of burrowing fauna species, including a number of potential conservation significant fauna species (Section 3.4.5).

Figure 3.10 – Representative photograph of sandy plain habitat

Granite outcrop

A number of major granite outcrops exist within the central portion of the study area (Figure 3.11). The granite outcrop habitat is one of the least common habitat types, occupying 69.4 ha (1.1%) of the study area (Table 3.7). The granite outcrop habitat type occurs within the more extensive rocky plain with the spinifex habitat type. The granite outcrop habitat type is likely to be under-represented in habitat mapping as it is difficult to distinguished minor outcropping unable from aerial photography.

Granite outcrops were typically low smooth domes, with no significant boulder piles present. Vegetation is largely absent from the rocky surfaces. Fringing vegetation consists of *Acacia tumida* subsp. *pilbarensis* scattered tall shrubs and *Triodia epactia* sparse hummock grassland on coarse, orange sand (Figure 3.11).

Figure 3.11 – Representative photograph of granite outcrop habitat

Dolerite dyke

The dolerite dyke habitat type is the least common habitat type within the study area, occupying only 22.1 ha (0.4%) of the study area (Table 3.7). Several dolerite dykes occur in the central and eastern areas of the study area, where they run in narrow north-south linear formations (Figure 3.12).

Although this habitat occupies a small proportion of the study area, it provides unique habitat features that are absent from other habitat types. The exposed rocky outcropping contains numerous patches of boulder piles providing protected voids and cavities, acting as important potential refuge for a number of mammal and reptile species, including a number of potential conservation significant fauna (Section 3.4.5). Vegetation is almost exclusively spinifex hummocks (*Triodia wiseana*), with scattered *Gossypium australe* and *Acacia inaequilatera* shrubs (Figure 3.12).

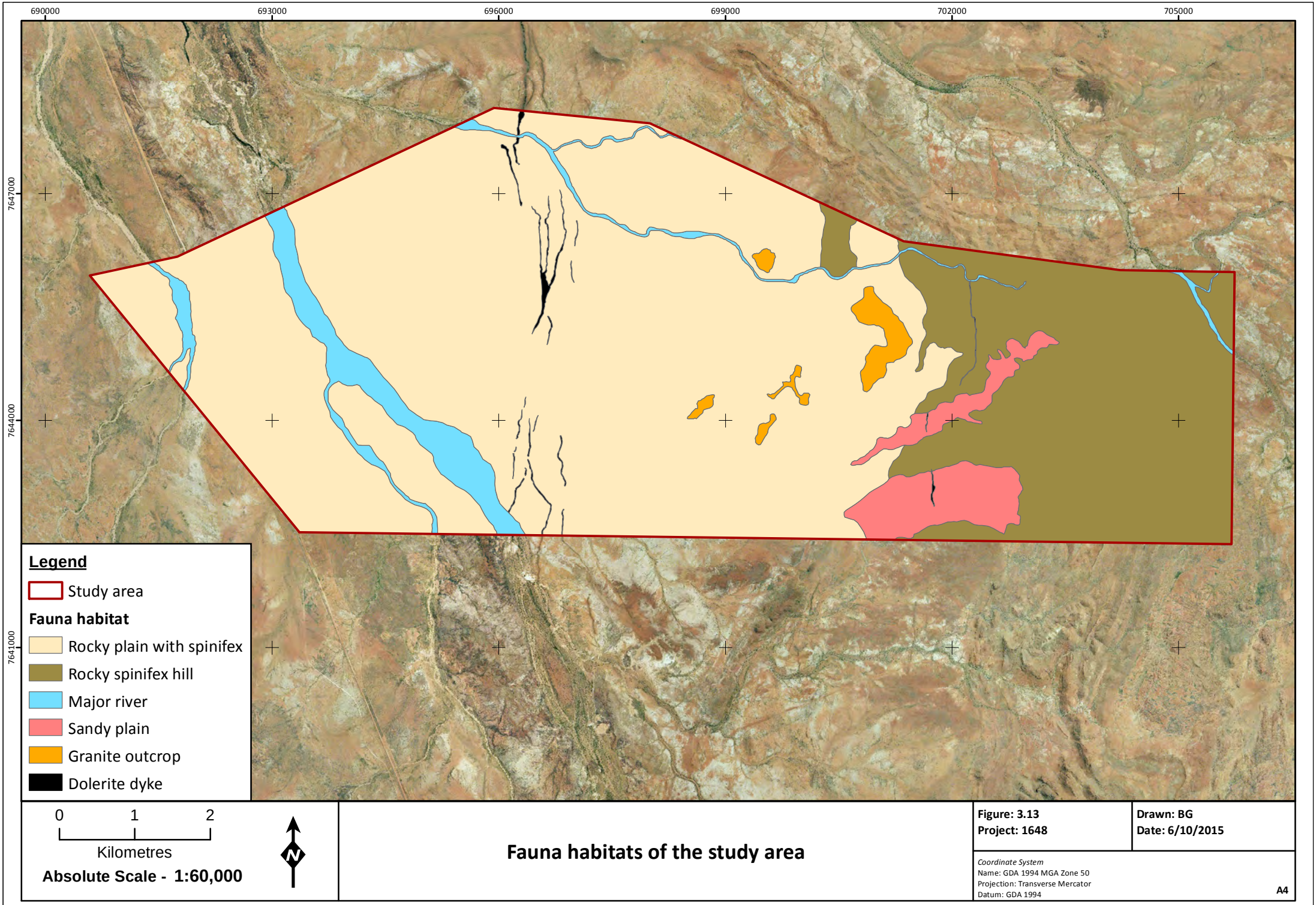
Figure 3.12 – Representative photograph of dolerite dyke habitat

3.4.2 Potential Conservation Significant Fauna Likelihood of Occurrence Assessment

Based on the methodology described in Section 2.3.1 and the habitats recorded within the study area (Section 3.4.1), the likelihood of occurrence for all 25 potential conservation significant fauna has been assessed and summarised in Table 3.8.

A total of six species were recorded as low likelihood, four species as medium likelihood and 15 species recorded as high likelihood or recorded during the current survey.

Species assessed as a having a medium or high likelihood of occurrence, or were recorded on the current survey, are discussed in greater detail in Section 4.3. Species assessed as having a low likelihood of occurrence are not discussed further.



Fauna habitats of the study area

Figure: 3.13
Project: 1648

Drawn: BG
Date: 6/10/2015

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

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Table 3.8 – Likelihood of occurrence assessment of potential conservation significant fauna

Species	Conservation significance			Habitat	Previous records	Likelihood of occurrence[#]
	EPBC Act	WC Act	DPaW			
Mammals						
Northern Quoll *Dasyurus hallucatus*	EN	S1	EN	Most common on dissected rocky escarpments, but also found in eucalypt forest and woodland (Oakwood 2008).	Numerous previous records within 40 km of the study area including resident population at the North Star project area (*ecologia* 2014b).	**RECORDED (Secondary evidence)**
Greater Bilby *Macrotis lagotis*	VU	S1	VU	Variety of habitats on soft soil including spinifex hummock grassland, acacia shrubland, open woodland and cracking clays (Johnson 2008; Menkhorst and Knight 2011)	Recorded within 10 km of study area during additional rail infrastructure monitoring (*ecologia* 2015a) with numerous regional records (DPaW 2015a).	**HIGH**
Crest-tailed Mulgara *Dasycercus cristicauda*	VU	S1		Sand dunes with a sparse cover of canegrass (*Zygochloa paradoxa*), or salt lake surrounds with Nitre Bush (*Nitraria billardieri*); burrows typically found on dunes rather than swales or flats (Masters 2008)	Historical records from NatureMap (DPaW 2015a) likely to be Brush-tailed Mulgara.	**LOW**
Pilbara Leaf-nosed Bat *Rhinonicteris aurantia* (Pilbara form)	VU	S1	VU	Roost in caves with high humidity (95%) and temperature (32°C). Forage along water bodies with fringing vegetation.	Recorded at nearby North Star Project (*ecologia* 2011a, b) and numerous regional records (DPaW 2015a).	**HIGH**
Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*)			P3	Inhabits grasslands, open forests, open woodlands and tall shrublands and shelters during the day under tussocks of spinifex.	A number of nearby records within 40 km of the study area (DPaW 2015a) and recorded on two previous surveys (Appendix C). Species rarely recorded in the Pilbara in previous decade (DPaW 2015a).	**MEDIUM**
Brush-tailed Mulgara *Dasycercus blythi*			P4	Sand plains and gibber plains with moderately dense spinifex with open 'runways' between clumps.	Recorded from numerous nearby locations in close vicinity to the study area (Appendix C, DPaW 2015a)	**HIGH**
Long-tailed Dunnart *Sminthopsis longicaudata*			P4	Rocky hills, ranges and escarpments with spinifex.	Previously recorded at North Star project area (*ecologia* 2011b).	**HIGH**
Ghost Bat *Macroderma gigas*			P4	Roost in caves, rock piles and abandoned mines.	Recorded at nearby North Star Project (*ecologia* 2011a, b) and numerous regional records (DPaW 2015a).	**HIGH**
Lakeland Downs Mouse (Short-tailed Mouse) *Leggadina lakedownensis*			P4	Spinifex and tussock grassland on cracking clays. Also acacia shrubland, samphire and woodlands (Moro and Kutt 2008; Menkhorst and Knight 2011).	Some regional records but absence of nearby records (DPaW 2015a).	**LOW**
Western Pebble-mound Mouse *Pseudomys chapmani*			P4	Footslopes of rocky ranges and rocky hills where the ground has continuous small pebbles and vegetated by spinifex.	Commonly recorded in the region with numerous nearby records (Appendix C, DPaW 2015a).	**RECORDED**
Birds						
Fork-tailed Swift *Apus pacificus*	M	S3	IA	Aerial over a variety of habitat types, movements often associated with summer storm fronts (Johnstone and Storr 1998; Pizzey and Knight 2003).	Relatively few regional records but recorded nearby from previous North Star Project (*ecologia* 2011b).	**HIGH**
Eastern Great Egret *Ardea modesta*	M	S3	IA	Wide range of wetland habitats, including floodwaters, rivers, shallows of wetlands, intertidal mudflats (Johnstone and Storr 1998).	Relatively few regional records (Appendix C) but likely to occur within major rivers when water present.	**HIGH**
Cattle Egret *Ardea ibis*	M	S3	IA	Grassy habitats, shallow wetlands and waterbodies, particularly damp pastures (Johnstone and Storr 1998).	Recorded from DoE protected matters search only (Appendix C).	**LOW**

Species	Conservation significance			Habitat	Previous records	Likelihood of occurrence[#]
	EPBC Act	WC Act	DPaW			
White-bellied Sea-Eagle *Haliaeetus leucogaster*	M	S3	IA	Offshore islands, coasts, estuaries, coastal lakes. Occasionally inland along larger watercourses (Johnstone and Storr 1998).	Recorded from DoE protected matters search only (Appendix C).	**LOW**
Oriental Plover *Charadrius veredus*	M	S3	IA	Open plains, including samphire; bare rolling country; bare claypans; open ground near inland swamps.	Not recorded on any previous surveys (Appendix C) with one regional record on NatureMap (DPaW 2015a).	**LOW**
Wood Sandpiper *Tringa glareola*	M	S3	IA	Mainly shallow, fresh waters, river pools, claypans; occasionally brackish swamps; rarely salt lakes, estuaries and intertidal mudflats.	Few previous records but may occur at water pools within major rivers following rain.	**MEDIUM**
Oriental Pratincole *Glareola maldivarum*	M	S3	IA	Plains, shallow wet and dry edges in open bare wetlands, tidal mudflats, beaches.	Recorded from DoE protected matters search only (Appendix C).	**LOW**
Rainbow Bee-eater *Merops ornatus*	M	S3	IA	Open country, most vegetation types, dunes, banks; prefer lightly wooded, preferably sandy, country near water (Johnstone and Storr 1998; Pizzey and Knight 2003).	Commonly recorded in the region with numerous nearby previous records (Appendix C, DPaW 2015a).	**RECORDED**
Grey Falcon *Falco hypoleucos*		S1	VU	Generally open inland plains and woodland.	Rarely recorded due to large home ranges but previously recorded within North Star Project area (*ecologia* 2011b) and at a number of locations along mainline (*ecologia* 2014a). Possible for a breeding pair to occur within the study area.	**HIGH**
Peregrine Falcon *Falco peregrinus*		S4	Other	Wide variety of habitats; woodlands, treed grasslands, wetlands, timbered watercourses, rocky gorges, cities. Breeds on ledges on cliffs, outcrops, quarries, and city buildings, in hollow trees, or in abandoned nests of other raptors (Johnstone and Storr 1998; Pizzey and Knight 2003).	Few surrounding records and recorded on one previous survey (Appendix C, DPaW 2015a).	**MEDIUM**
Australian Bustard *Ardeotis australis*			P4	Open grasslands, shrublands, chenopod flats and low heathland (Johnstone and Storr 1998; Simpson and Day 2010).	Numerous previous records in close proximity to the study area and recorded on eight previous surveys (Appendix C, DPaW 2015a).	**RECORDED**
Star Finch (western) *Neochmia ruficauda clarescens*			P4	Vegetation around watercourses, particularly thick reed beds.	Few regional records but one nearby record from Turner River (DPaW 2015a).	**HIGH**
Reptiles						
Pilbara Olive Python *Liasis olivaceus barroni*	VU	S1	VU	Watercourses and areas of permanent water in rocky gorges, escarpments and gullies.	Regularly recorded from nearby North Star Project where a resident population exists (*ecologia* 2011a, b, 2014b).	**HIGH**
Gane's Blind Snake *Ramphotyphlops ganei*			P1	Variety of habitats; thought to prefer moist gorges.	Few surrounding records (Appendix C, DPaW 2015a).	**MEDIUM**
Ctenotus nigrilineatus	-	-	P1	Spinifex near granite outcrops.	One recent record approximately 18 km south of Project area. Three older records (1988 and 1990) approximately 30 km south of Project area (DPaW 2015a).	**HIGH**

3.4.3 Species Recorded

The field survey recorded a total of 36 fauna species from direct sightings and indirect evidence such as scats and calls, including six mammal, 18 bird and 12 reptile species (Table 3.9).

Table 3.9 – Vertebrate fauna recorded from the study area

Common name	Scientific name
Mammals	
Northern Quoll	*Dasyurus hallucatus*
Woolley's Pseudantechinus	*Pseudantechinus woolleyae*
Euro	*Macropus robustus*
Western Pebble-mound Mouse	*Mus musculus*
Common Rock-rat	*Zyzomys argurus*
Cow*	*Bos taurus*
Birds	
Spinifex Pigeon	*Geophaps plumifera*
Diamond Dove	*Geopelia cuneata*
Spotted Nightjar	*Eurostopodus argus*
White-necked Heron	*Ardea pacifica*
Brown Falcon	*Falco berigora*
Australian Bustard	*Ardeotis australis*
Little Button-quail	*Turnix velox*
Galah	*Eolophus roseicapillus*
Budgerigar	*Melopsittacus undulatus*
Sacred Kingfisher	*Todiramphus sanctus*
Rainbow Bee-eater	*Merops ornatus*
Yellow-throated Miner	*Manorina flavigula*
Crimson Chat	*Epthianura tricolor*
Australian Magpie	*Cracticus tibicen*
Willie Wagtail	*Rhipidura leucophrys*
Torresian Crow	*Corvus orru*
Magpie-lark	*Grallina cyanoleuca*
Zebra Finch	*Taeniopygia guttata*
Reptiles	
Gecko	*Gehyra punctata*
Long-nosed Dragon	*Amphibolurus longirostris*
Ring-tailed Dragon	*Ctenophorus caudicinctus*
Slender Blue-tongue	*Cyclodomorphus melanops*
Skink	*Carlia munda*
Skink	*Morethia ruficauda*
Skink	*Ctenotus inornatus*
Leopard Ctenotus	*Ctenotus pantherinus*
Broad-banded Sand Swimmer	*Eremiascincus richardsonii*
Spiny-tailed monitor	*Varanus acanthurus*
Black-headed Monitor	*Varanus tristis tristis*
Western Brown Snake	*Pseudonaja mengdeni*

* Introduced species

3.4.4 Conservation Significant Fauna Species Recorded

A total of four species of conservation significance were recorded during the survey; Northern Quoll (EPBC Act Endangered, WC Act Schedule 1, DPaW Endangered), Rainbow Bee-eater (EPBC Act Migratory, WC Act Schedule 3), Australian Bustard (DPaW Priority 4) and Western Pebble-mound Mouse (DPaW Priority 4). These records are summarised below in Table 3.10 and are mapped in

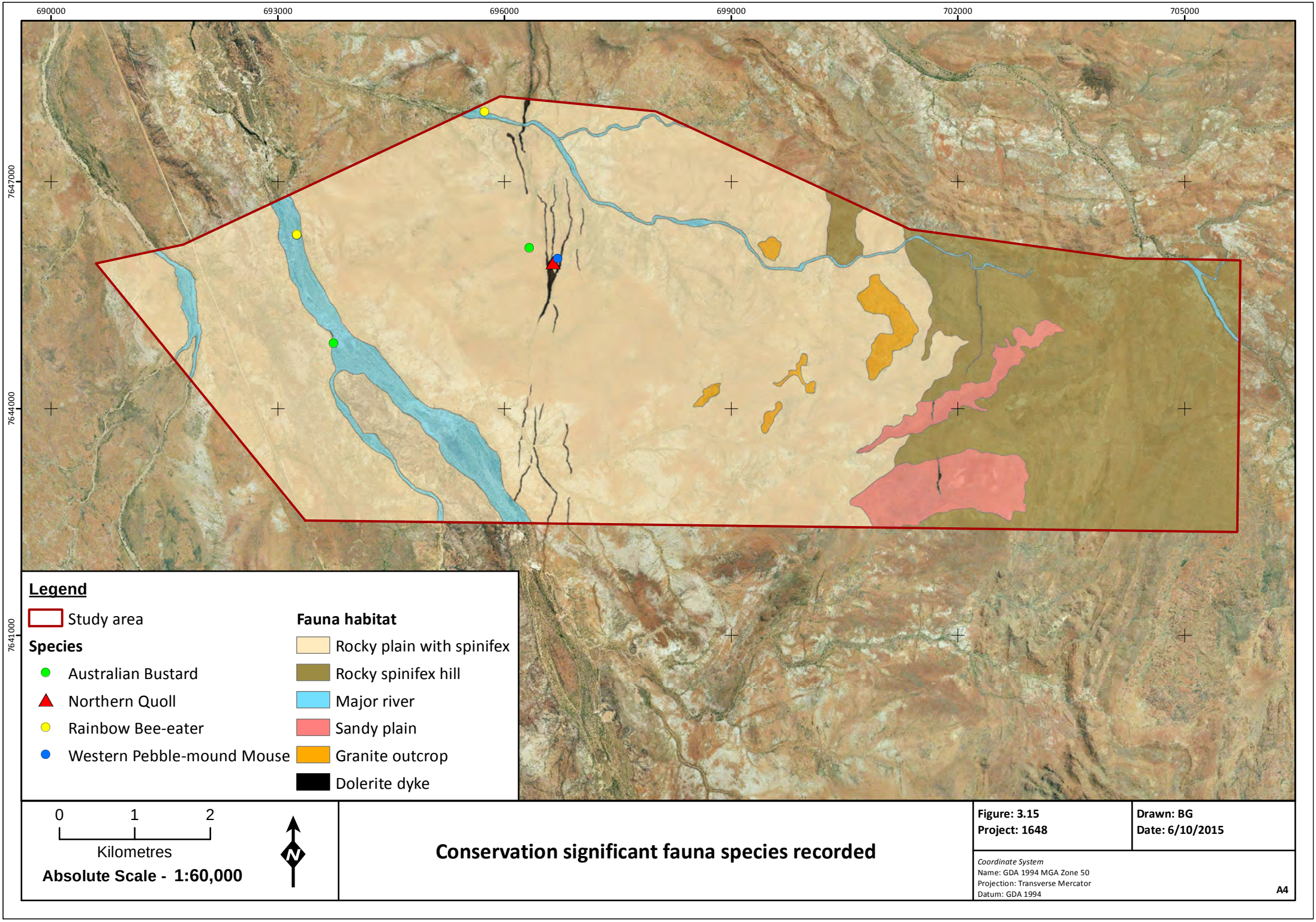
Figure 3.15. The Northern Quoll record consisted of a single scat recorded within suitable denning habitat and based on the size, shape and content of scat, was considered most likely to be Northern Quoll (Figure 3.14).

Table 3.10 – Conservation significant fauna recorded at the study area

Species	Count	Location Name	Easting	Northing	Notes
Mammals					
Northern Quoll *Dasyurus hallucatus*	1	OS2	696640	7645930	Scat
Western Pebble-mound Mouse *Pseudomys chapmani*	1	OS6	696705	7645986	Active mound
Birds					
Rainbow Bee-eater *Merops ornatus*	1	OS3	695733	7647929	Opportunistic sighting
Rainbow Bee-eater *Merops ornatus*	1	OS7	693247	7646300	Opportunistic sighting
Rainbow Bee-eater *Merops ornatus*	1	OS10	693247	7646300	Opportunistic sighting
Australian Bustard *Ardeotis australis*	1	OS1	693734	7644862	Opportunistic sighting
Australian Bustard *Ardeotis australis*	1	OS4	696325	7646130	Opportunistic sighting

GDA94 Zone 50

Figure 3.14 – Northern Quoll scat recorded



Conservation significant fauna species recorded

Figure: 3.15
Project: 1648

Drawn: BG
Date: 6/10/2015

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

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3.4.5 Potential Conservation Significant Fauna Habitat Utilisation

A summary of the habitat types recorded and the potential usage of conservation significant fauna is provided in Table 3.11. Species assessed as low likelihood of occurrence were not included. When the fauna habitats of the study area are compared, the, major river, dolerite dyke and sandy plain habitat types are of relative local importance due their suitability in supporting conservation significant fauna.

Table 3.11 – Summary of potential conservation significant fauna habitat within the study area

Species	Potential breeding/roosting		Potential foraging/dispersal	
	Habitat type	Area (ha)	Habitat type	Area (ha)
Northern Quoll *Dasyurus hallucatus*	Dolerite dyke	22.1	Major river	276.5
Greater Bilby *Macrotis lagotis*	Sandy plain	234.1	-	-
Pilbara Leaf-nosed Bat *Rhinonicteris aurantia* (Pilbara form)	-	-	Major river Rocky spinifex hill	1,677
Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*)	-	-	Rocky plain with spinifex	4,226.5
Brush-tailed Mulgara *Dasycercus blythi*	Sandy plain	234.1	-	-
Long-tailed Dunnart *Sminthopsis longicaudata*	Dolerite dyke	22.1	Rocky spinifex hill	1,400.5
Ghost Bat *Macroderma gigas*	-	-	Rocky spinifex hill Major river	1,677
Western Pebble-mound Mouse *Pseudomys chapmani*	Rocky spinifex hill	1,400.5	Rocky plain with spinifex	4,226.5
Fork-tailed Swift *Apus pacificus*	-	-	Rocky plain with spinifex Rocky spinifex hill	5,627
Eastern Great Egret *Ardea modesta*	-	-	Major river	276.5
Wood Sandpiper *Tringa glareola*	-	-	Major river	276.5
Rainbow Bee-eater *Merops ornatus*	Major river	276.5	-	-
Grey Falcon *Falco hypoleucos*	Major river	276.5	Rocky plain with spinifex Rocky spinifex hill	5,627
Peregrine Falcon *Falco peregrinus*	-	-	Rocky plain with spinifex Rocky spinifex hill Major river	5,903.5
Australian Bustard *Ardeotis australis*	-	-	Rocky plain with spinifex Sandy plain	4,460.6
Star Finch (western) *Neochmia ruficauda clarescens*	-	-	Major river	276.5
Pilbara Olive Python *Liasis olivaceus barroni*	Dolerite dyke Major river	298.6	-	-
Gane's Blind Snake *Ramphotyphlops ganei*	-	-	Rocky plain with spinifex Rocky spinifex hill	5,627
Ctenotus nigrilineatus	Rocky plain with spinifex Granite outcrop	4,295.9	-	-

4 DISCUSSION

4.1 FLORA OF SIGNIFICANCE

No Threatened taxa listed under the EPBC Act or WC Act were recorded from the study area.

No Priority Flora taxa were recorded at the study area.

Eight Priority flora taxa recorded during the literature review were considered to have a high likelihood of occurrence in the study area due to close proximity of previous records and the presence of suitable habitat within the study area: *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (Priority 1), *Heliotropium muticum* (Priority 1), *Euphorbia clementii* (Priority 2), *Gymnanthera cunninghamii* (Priority 3), *Nicotiana umbratica* (Priority 3), *Phyllanthus hebecarpus* (Priority 3), *Bulbostylis burbidgeae* (Priority 4) and *Goodenia nuda* (Priority 4).

However, despite the presence of suitable habitat for *Abutilon* sp. Pritzelianum (P1), *Heliotropium muticum* (P1), *Euphorbia clementii* (P2), *Gymnanthera cunninghamii* (P3), *Phyllanthus hebecarpus* (P3) and *Goodenia nuda* (P3), none of these taxa were recorded from the study area.

Suitable habitat for *Nicotiana umbratica* (P3) and *Bulbostylis burbidgeae* (P4) was not encountered at the study area, as the outcropping granite was mostly large bare slabs rather than boulders that often support and provide shelter for these species.

One potential new taxon; *Triumfetta* aff. *ramosa* was recorded at the study area and is therefore considered significant. It was recorded in one location along the creek banks of the Turner River, a restricted habitat type in the local area.

4.2 VEGETATION OF SIGNIFICANCE

No TECs, PECs or vegetation units likely to represent them were recorded at the study area.

No ecosystems at risk (section 1.6.2) or vegetation units likely to represent them were recorded at the study area.

The vegetation recorded at the study area has been compared to the vegetation mapped from the North Star Project in Table 4.1 and one vegetation unit, *AiGaTw* is restricted in the local area.

The significance of the vegetation within the study area has been determined in Table 4.2 based on the list of criteria in Guidance Statement No. 51 (see section 1.4). On the basis of these criteria, two vegetation units within the study area are considered significant:

- *AiGaTw* (*Acacia inaequilatera* isolated tall shrubs, over *Gossypium australe* sparse mid shrubland, over *Triodia wiseana* open hummock grassland) is significant as it is scarce, has a different combination of species and is restricted to an uncommon landform in the region (dolerite dyke); and
- *EcMgCc (Eucalyptus camaldulensis* open low to mid woodland, over +/-*Melaleuca glomerata*, *Acacia ampliceps* and *Melaleuca linophylla* sparse tall shrubland, over *Cenchrus ciliaris* open tussock grassland is significant as it is restricted to an uncommon landform in the local area (river), acts as a refuge for phreatophytic flora species and provides habitat for the novel species; *Triumfetta* aff. *ramosa*.

Two additional units are scarce as they occur on restricted landform types (drainage lines), but likely to be widespread based on the landform on which they occur on:

- *ApImTe (Acacia pyrifolia subsp. pyrifolia, Acacia tumida subsp. pilbarensis and Acacia acradenia open tall shrubland, over Indigofera monophylla, Corchorus parviflorus and Tephrosia rosea* sparse low shrubland, over *Triodia epactia* open hummock grassland); and
- *At (Acacia tumida* subsp. *pilbarensis* tall shrubland (+/-*Grevillea wickhamii*), over *Triodia wiseana* hummock grassland).

Table 4.1 - Comparing North Star Project vegetation mapping and vegetation units with the current study

Unit	Vegetation unit (current study)	Area mapped at the study area (ha)	Area mapped at the NS study area (ha)	Corresponding vegetation unit(s) from the North Star Project	Total area mapped (ha) (current study area & NS study area)	Distribution of vegetation unit
AaAiTl	+/-*Acacia ancistrocarpa* and/or *Acacia inaequilatera* sparse tall shrubland, over *Triodia lanigera* open hummock grassland	2,080.6	670	SpTl: *Solanum phlomoides* isolated low shrubs, over *Triodia lanigera* open hummock grassland	2,944	Widespread
			193	Tl: *Triodia lanigera* open hummock grassland		
AiAaTw	+/-*Acacia inaequilatera* and *Acacia acradenia* sparse mid shrubland, over *Triodia wiseana* open hummock grassland	1,311	2,206	AaTw2: *Acacia acradenia* open mid shrubland, over *Triodia wiseana* hummock grassland	12,302	Widespread
			4,549	Tw4: *Triodia wiseana* hummock grassland		
			4,236	Tw3: *Triodia wiseana* and *Triodia basedowii* hummock grassland		
AiGaTw	*Acacia inaequilatera* isolated tall shrubs, over *Gossypium australe* sparse mid shrubland, over *Triodia wiseana* open hummock grassland	51.9	28	GaTw: *Gossypium australe* sparse mid shrubland, over *Triodia wiseana* open hummock grassland	79.9	Restricted
ApImTe	*Acacia pyrifolia* subsp. *pyrifolia*, *Acacia tumida* subsp. *pilbarensis* and *Acacia acradenia* open tall shrubland, over *Indigofera monophylla, Corchorus parviflorus* and *Tephrosia rosea* sparse low shrubland, over *Triodia epactia* open hummock grassland	64.5	1,101	ApTp: *Acacia pyrifolia, Acacia acradenia* and *Tephrosia rosea* mid shrubland, over *Triodia pungens* open hummock grassland	1,734	Widespread
			316	Ap: *Acacia pyrifolia, Gossypium robinsonii* and *Tephrosia rosea* mid shrubland		
			211	GwTp: *Grevillea wickhamii* sparse tall shrubland, over *Triodia pungens* open hummock grassland		
			42	ChAbTp: *Corymbia hamersleyana* open low woodland, over *Acacia bivenosa* mid shrubland, over *Triodia pungens* open hummock grassland		
At	*Acacia tumida* subsp. *pilbarensis* tall shrubland (+/-*Grevillea wickhamii*), over *Triodia wiseana* hummock grassland	29.4	444	At: *Acacia tumida, Grevillea wickhamii* and *Indigofera monophylla* shrubland	473	Widespread
AtCcTe	*Acacia tumida* subsp. *pilbarensis* sparse to open tall shrubland, over *Cajanus cinereus, Indigofera monophylla* and *Corchorus parviflorus* sparse low shrubland, over *Triodia epactia* open hummock grassland	205.5	1,501	Did not group with any North Star units, likely to be due to quadrat placement, the most similar is: Tp: *Triodia pungens* open hummock grassland	1,706	Widespread
ChAiTb/ Tw	+/-*Corymbia hamersleyana* isolated low trees, over *Acacia inaequilatera, Acacia acradenia* and *Grevillea wickhamii* sparse shrubland, over *Triodia basedowii* and/or *Triodia wiseana* open hummock grassland	2,221.8	2,206	AaTw2: *Acacia acradenia* open mid shrubland, over *Triodia wiseana* hummock grassland	3,568	Widespread
			1,140	AiTb: *Acacia inaequilatera, Acacia acradenia* and *Grevillea wickhamii* sparse shrubland, over *Triodia basedowii* and *Triodia wiseana* hummock grassland		
EcMgCc	*Eucalyptus camaldulensis* open low to mid woodland, over +/-*Melaleuca glomerata*, *Acacia ampliceps* and *Melaleuca linophylla* sparse tall shrubland, over *Cenchrus ciliaris* open tussock grassland	248.7	1,355	Cc: ± *Eucalyptus victrix* ± *Eucalyptus camaldulensis* open mid woodland, over *Cenchrus ciliaris* tussock grassland	1,603.7	Widespread
PfCcTe	*Pluchea ferdinandi-muelleri* (+/-*Acacia stellaticeps*) sparse low shrubland, over *Triodia epactia* sparse hummock grassland and *Cenchrus ciliaris* sparse tussock grassland	16.6	163	PfTp: *Pluchea ferdinandi-muelleri* open low shrubland, over *Triodia pungens* sparse hummock grassland	179.6	Widespread

Table 4.2 – Determining the significance of the vegetation of the study area

Unit	Vegetation unit	Scarcity	Unusual species	Novel combination	Role as refuge for flora	Key habitat for Threatened Species (flora)	Representative of the range of the unit	Restricted distribution
AaAiTl	*+/-Acacia ancistrocarpa* and/or *Acacia inaequilatera* sparse tall shrubland, over *Triodia lanigera* open hummock grassland.	No, common in the area	No	No	No	No	No	No, widespread landform and mapped extent
AiAaTw	*+/-Acacia inaequilatera* and *Acacia acradenia* sparse mid shrubland, over *Triodia wiseana* open hummock grassland.	No, common in the area	No	No	No	No	No	No, widespread landform and mapped extent
AiGaTw	*Acacia inaequilatera* isolated tall shrubs, over *Gossypium australe* sparse mid shrubland, over *Triodia wiseana* open hummock grassland.	Yes, restricted to the Dolerite dyke landform which is not common	No	Different suite of species to what is usually seen on a rocky outcrop	Potentially providing refuge for flora in between boulders	No	Was recorded to the north during the North Star study	Yes, restricted to the Dolerite dyke landform which is not commonly known
ApImTe	*Acacia pyrifolia* subsp. *pyrifolia*, *Acacia tumida* subsp. *pilbarensis* and *Acacia acradenia* open tall shrubland, over *Indigofera monophylla, Corchorus parviflorus* and *Tephrosia rosea* sparse low shrubland, over *Triodia epactia* open hummock grassland.	Restricted to uncommon landform in the local area (minor creekline)	High diversity in these minor creeklines (the two quadrats recorded 77 and 62 taxa) in the study area	No	No	No	No	No. Landform is widespread
At	*Acacia tumida* subsp. *pilbarensis* tall shrubland (+/- *Grevillea wickhamii*), over *Triodia wiseana* hummock grassland.	Restricted to uncommon landform (minor creekline)	No	No	No	No	No	No. Landform is widespread
AtCcTe	*Acacia tumida* subsp. *pilbarensis* sparse to open tall shrubland, over *Cajanus cinereus, Indigofera monophylla* and *Corchorus parviflorus* sparse low shrubland, over *Triodia epactia* open hummock grassland.	No, common in the area	No	No	No	No	No	No, widespread landform and mapped extent
ChAiTb/ Tw	*+/-Corymbia hamersleyana* isolated low trees, over *Acacia inaequilatera, Acacia acradenia* and *Grevillea wickhamii* sparse shrubland, over *Triodia basedowii* and/or *Triodia wiseana* open hummock grassland.	No, common in the area	No	No	No	No	No	No, widespread landform and mapped extent
EcMgCc	*Eucalyptus camaldulensis* open low to mid woodland, over *+/-Melaleuca glomerata*, *Acacia ampliceps* and *Melaleuca linophylla* sparse tall shrubland, over *Cenchrus ciliaris* open tussock grassland.	Restricted to uncommon landform in the local area (river)	One novel taxon recorded within (*Triumfetta* aff. *ramosa*)	No	Yes, phreatophytic species and annuals	No	No	No. Landform is widespread
PfCcTe	*Pluchea ferdinandi-muelleri* (*+/-Acacia stellaticeps*) sparse low shrubland, over *Triodia epactia* sparse hummock grassland and *Cenchrus ciliaris* sparse tussock grassland.	Restricted to uncommon landform in the local area (floodplain)	No	No	No	No	No	No. Landform is widespread

4.3 CONSERVATION SIGNIFICANT VERTEBRATE FAUNA SPECIES DESCRIPTIONS

Eighteen conservation significant vertebrate fauna species were evaluated as having a medium or high likelihood of occurrence (or were recorded from) within the study area, Table 3.8). These species are discussed in further detail below.

4.3.1 Mammals

Northern Quoll (*Dasyurus hallucatus*)

Conservation status: EPBC Act Endangered, WC Act Schedule 1 (Endangered)

Distribution and habitat: The Northern Quoll formerly occurred across northern Australia, from the Pilbara region in Western Australia to south-eastern Queensland. A 75% reduction of available habitat occurred during the 20th century, so that the species is now restricted to the Pilbara and northern Kimberley in Western Australia, and discrete populations across the Northern Territory and eastern Queensland (Braithwaite and Griffiths 1994). Northern Quolls are most common on dissected rocky escarpments, but are also found in eucalypt forest and woodland (Oakwood 2008). They are both arboreal and terrestrial and use a variety of den sites, including rock crevices, tree hollows, logs, termite mounds and goanna burrows (Oakwood 2008).

Ecology: Northern Quolls are the smallest of the Australian quolls. Northern Quolls are nocturnal and opportunistic omnivores feeding primarily on small vertebrates, large insects and soft fruits. Breeding tends to occur near creeklines, where individuals go to drink when water is available (Oakwood 2008).

The most common cause of adult Northern Quoll mortality is predation by dingoes, feral cats, snakes, owls and kites (Maxwell *et al.* 1996; Oakwood 2008). Other causes of mortality include predation by domestic dogs, motor vehicle strikes and pesticide poisoning. The level of predation is increased through the removal of groundcover by fire.

Likelihood of occurrence: Recorded (Secondary evidence). The Northern Quoll was recorded during the current survey through secondary evidence (scats) within the dolerite dyke habitat type. This habitat type is uncommon in the region though isn't considered critical habitat for Northern Quoll (DSEWPaC 2011a). However, the boulder piles create numerous crevices and voids that provide potentially suitable denning and breeding habitat for Northern Quoll. Northern Quoll area also expected to forage and disperse along the major river habitats of the study area.

Greater Bilby (*Macrotis lagotis*)

Conservation status: EPBC Act Vulnerable, WC Act Schedule 1 (Vulnerable).

Distribution and habitat: Once common over 70% of mainland Australia's arid and semi-arid regions, Greater Bilbies are currently patchily distributed through the Tanami, Great Sandy and Gibson Deserts and extend west to the Pilbara region (Maxwell *et al.* 1996). Isolated populations also occur in south-west Queensland and to the north-east of Alice Springs. Greater Bilbies occur in a variety of habitats, including spinifex grassland, *Acacia* shrubland, open woodland and cracking clays (Maxwell *et al.* 1996; Johnson 2008). The species underwent a sudden and widespread collapse in population size in the early 1900s, and the distribution may still be contracting and fragmenting. Reasons for the decline include predation by feral predators on both young and adult Bilbies, competition from rabbits and livestock, reduced food as a result of changed fire regimes, and drought (Maxwell *et al.* 1996; O'Malley 2006; Johnson 2008).

Ecology: The Greater Bilby is a nocturnal marsupial with soft, silky fur (Pavey 2006a). It uses its strong forelimbs and claws to construct an extensive tunnel system of up to 3 m long and 1.8 m deep in which it shelters during the day. Its long tongue is an adaptation to its specialised diet of seeds, insects, bulbs, fruit and fungi (Johnson 2008).

Likelihood of occurrence: High. The Greater Bilby was not recorded on the current survey, however resident populations have been recorded from similar habitat within 10 km of the study area (*ecologia* 2015a). The Greater Bilby is likely to be restricted to the sandy plain habitat type, associated with minor drainage lines feeding in to Turner River. These habitat characteristics are consistent with resident populations currently being monitored along Fortescue's Mainline rail (*ecologia* 2015a).

Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia* (Pilbara form))

Conservation status: EPBC Act Vulnerable, WC Act Schedule 1 (Vulnerable).

Distribution and habitat: The Pilbara Leaf-nosed Bat is the Pilbara form of the Orange Leaf-nosed Bat (*Rhinonicteris aurantia*). While it is considered a separate form, formal reclassification has been hampered by the small sample size of the Pilbara population (Armstrong 2008).

Recent evidence suggests two main stronghold areas for the Pilbara Leaf-nosed Bat; in the western Pilbara and north of Marble Bar (Armstrong 2008). In the western Pilbara, they roost in caves formed in gorges that dissect siliceous sedimentary geology. They are most often observed in flight over waterholes in gorges, although they are rare even in the Hamersley Ranges where this habitat is common (Armstrong 2008). The Pilbara Leaf-nosed Bat roosts in disused mines and areas of high relief with gorges and watercourses (Armstrong 2001). They are unlikely to occur in the shallow 'breakaway' caves that occur along mesas and strike ridges.

Ecology: At dusk, Pilbara Leaf-nosed Bats emerge from their roosting sites to forage in gorges, small gullies and large watercourses for insects (van Dyck and Strahan 2008). They are susceptible to disturbance and will abandon roost caves if disturbed. Colonies in mines in the eastern Pilbara are subject to several pressures, including human visitation, and the collapse and flooding of disused mines (Armstrong 2008; DEWHA 2008c).

Likelihood of occurrence: High. The Pilbara Leaf-nosed Bat has been recorded from nearby North Star Project where a resident population is known to occur (Bullen 2013). No potential roost cave habitat exists within the study area. However, the major river habitat types, in particular Turner River is likely to provide wet season roost and foraging habitat for the Pilbara Leaf-nosed Bat, and therefore is likely to be resident during the wet season period.

Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*)

Conservation status: DPaW Priority 3.

Distribution and habitat: This mainland subspecies of the Spectacled Hare-wallaby is a medium-sized wallaby found across northern Australia and in the Pilbara region. It inhabits grasslands, open forests, open woodlands and tall shrublands, and shelters during the day under *Triodia* tussocks (DEWHA 2008a).

Ecology: The Spectacled Hare-wallaby is solitary, but up to three individuals may occasionally be seen feeding together. Breeding takes place throughout the year. Its diet consists of grass and herbs. It is well adapted to harsh conditions; it has a low urine production and the water turnover is far less than has been measured in any other mammal of comparative size (Burbidge and Johnson 2008).

Likelihood of occurrence: Medium, resident – breeding. The Spectacled Hare-wallaby has been rarely reported from the Pilbara region over the previous 10 years (DPaW 2015a). A recent road kill specimen was obtained by *ecologia* approximately 20 km west of the study area, suggesting the species is persisting in the region. The likelihood of occurrence has therefore been assigned as medium, and if the species occurs within the study area it is likely to be a resident, breeding population.

Brush-tailed Mulgara (*Dasycercus blythi*)

Conservation status: DPaW Priority 4. The Brush-tailed Mulgara has only recently been reclassified and separated from the genetically and morphologically distinct Crest-tailed Mulgara (*Dasycercus*

cristicauda; EPBC Act Vulnerable) (Woolley 2006). As such, the more widespread Brush-tailed Mulgara is not listed in the EPBC Act, but is listed as Priority 4 (fauna in need of monitoring) on the DPaW Priority and Threatened Fauna list (2010).

Distribution and habitat: Brush-tailed Mulgara occur in spinifex grasslands throughout much of the arid zone, digging burrows in flats between low sand dunes (Woolley 2008). Believed to be generally solitary, Brush-tailed Mulgara construct several single-entranced, multi-tunnelled burrows within their home range (Woolley 2008). According to Koertner *et al.* (2007), home ranges and burrows encompass both mature spinifex and open regrowth areas, with Brush-tailed Mulgara not preferring either habitat type over the other. However, utilisation of open habitats might increase the risk of predation, especially following fire.

Ecology: Brush-tailed Mulgara are nocturnal hunters, feeding on arthropods and small vertebrates. Breeding is thought to occur from late winter to spring (Woolley 2008).

Likelihood of occurrence: High. The Brush-tailed Mulgara has been recorded at numerous nearby locations, in particular along Fortescue's Mainline rail (*ecologia* 2015a). The sandy plain habitat type represents suitable habitat for this species, where a resident, breeding population is expected to occur.

Long-tailed Dunnart (*Sminthopsis longicaudata*)

Conservation status: DPaW Priority 4.

Distribution and habitat: Long-tailed Dunnarts are mostly found in rocky country in the western arid zone and occasionally in open country with a gravel/stony mantle. Although rarely encountered, in Western Australia they occur in the Pilbara, Murchison, north-eastern Goldfields, Ashburton and Gibson Desert regions (Burbidge *et al.* 2008).

Ecology: The Long-tailed Dunnart is a small, carnivorous marsupial, distinguished from other *Sminthopsis* species by the length of its brush-tipped tail; more than twice the head-body length (Burbidge *et al.* 2008). The species feeds on arthropods such as beetles, ants, spiders, cockroaches, centipedes, grasshoppers and larvae. Its long tail is muscular at the base, allowing it to be held in a variety of positions, probably acting as a balancer; this, along with striated foot pads, suggest it is adapted to climbing (Burbidge *et al.* 2008).

Threatening processes have not yet been identified as only little is known about this species. Threats could include inappropriate fire regimes and habitat modification as a result of the activities of introduced herbivores such as Horses and Cows, invasion by Buffel Grass and predation by feral cats and foxes (Pavey 2006b).

Likelihood of occurrence: High. The Long-tailed Dunnart has previously been recorded from the nearby North Star Project (*ecologia* 2011b). Suitable habitat for the Long-tailed Dunnart exists within the dolerite dyke and rocky hills habitat types.

Ghost Bat (*Macroderma gigas*)

Conservation status: DPaW Priority 4.

Distribution and habitat: The Ghost Bat has a patchy but widespread distribution across northern Australia. Preferred roosting habitats in the Pilbara include caves beneath bluffs of low, rounded hills composed of Marra Mamba geology, and granite rock piles. Ghost Bats have also been known to roost in large colonies within sandstone caves, under boulder piles and in abandoned mines (Churchill 1998). Ghost Bats disperse widely during the non-breeding season but require warm caves with high relative humidity (80%) for rearing their young (Toop 1985). These maternity caves are uncommon with only eleven recorded in the Pilbara region (three natural caves and eight mines) (Armstrong and Anstee 2000).

Ecology: The Ghost Bat is carnivorous and takes prey to an established feeding site to be eaten. These feeding sites are usually a rock overhang or small cave, and are easily recognised by the accumulation of discarded prey parts littering the floor (Richards *et al.* 2008). Foraging occurs in an area of approximately 60 ha, in a radius of approximately 2 km from the bats' roost (Tidemann *et al.* 1985).

Likelihood of occurrence: High. The Ghost Bat has previously been recorded at the nearby North Star Project area (*ecologia* 2011b) and Mainline rail (*ecologia* 2015a). No suitable caves for roosting or breeding exist in the study area, therefore the Ghost Bat is likely to occur as a transient visitor only.

Western Pebble-mound Mouse (*Pseudomys chapmani*)

Conservation Status: DPaW Priority 4.

Distribution and Habitat: The Western Pebble-mound Mouse occurs across central and southern Pilbara and extends into the smaller ranges of the Little Sandy Desert (Start 2008). Abandoned mounds have been found in the Gascoyne and Murchison, indicating a recent decline in distribution. This decline is most likely attributable to foxes and exotic herbivores (Start 2008). However, the species appears relatively secure in its remaining range (Start 2008). The Western Pebble-mound Mouse inhabits gently sloping hills of rocky ranges where the ground is stony and vegetated by spinifex with a sparse overstorey of eucalypts and scattered shrubs of *Senna*, *Acacia* and *Ptilotus* spp.

Ecology: In suitable habitats, pebble mounds of this species can be found in large numbers, although not all of these mounds are active and occupied by Pebble-mound Mice at the same time. The demographic structure of the groups that inhabit the mounds and their patterns of movement around the mounds is still unknown (Anstee 1996; Anstee *et al.* 1997). Mounds can cover an area of 0.5 to 9.0 m^2, and a single mound can house up to 25 mice (Start 2008). Breeding occurs throughout the year with females producing several litters of four young per year (Start 2008).

Likelihood of Occurrence: Recorded. A single active mound was recorded during the current survey with the species commonly recorded in the region. The rocky plain within spinifex and rocky spinifex hill habitat types represent suitable habitat for the Western Pebble-mound Mouse. This species is likely to occur within the study area as a resident, breeding population.

4.3.2 Birds

Fork-tailed Swift (*Apus pacificus*)

Conservation status: EPBC Act Migratory, WC Act Schedule 3.

Distribution and habitat: The Fork-tailed Swift is a small, insectivorous species with a white throat and rump, and a deeply forked tail (Morcombe 2000). Its distribution spans from central Siberia and throughout Asia, breeding in north-east and mid-east Asia, and wintering in Australia and south New Guinea. It is a relatively common trans-equatorial migrant from October to April throughout mainland Australia (Simpson and Day 2004). In Western Australia the species begins to arrive in the Kimberley in late September, the Pilbara in November and the South-west by mid-December (Johnstone and Storr 1998). In Western Australia the Fork-tailed Swift is considered uncommon to moderately common near the north-west, west and south-east coasts, common in the Kimberley and rare or scarce elsewhere (Johnstone and Storr 1998).

Ecology: Fork-tailed swifts are nomadic in response to broad-scale weather pattern changes. They are attracted to thunderstorms where they can be seen in flocks, occasionally of up to 2,000 birds. They rarely land, living almost exclusively in the air and feeding entirely on aerial insects, especially nuptial swarms of beetles, ants, termites and native bees (Simpson and Day 2004).

Likelihood of occurrence: High. The Fork-tailed Swift was not recorded on the current survey, however the species was not present in Australia at the time of field survey. This species has a high

likelihood of occurrence within the study area where it will occur as a migratory visitor. As this species is purely aerial while in Australia, it will not directly utilise the study area.

Eastern Great Egret (*Ardea modesta*)

Conservation status: EPBC Act Migratory, WC Act Schedule 3.

Distribution and habitat: Eastern Great Egrets mainly inhabit shallow waterbodies; both fresh (lakes, lagoons, swamps and floodwaters) and saline (mangrove creeks, estuaries and tidal pools) (Johnstone and Storr 1998). They occur across a large part of Western Australia, including the South-west, Kimberley and Pilbara (Johnstone and Storr 1998). The Eastern Great Egret is common to very common in the well-watered Kimberley flatlands, and scarce to moderately common elsewhere within its range (Johnstone and Storr 1998).

Ecology: This species' diet consists predominantly of small fish and crustaceans. Eastern Great Egrets breed colonially in trees standing in water around wooded swamps and river pools, 4-13 m above water (Morcombe 2000). The nest is built as a rough, loose, shallow platform. Four eggs are laid in summer in the Kimberley and during the spring in regions further south (Johnstone and Storr 1998).

Likelihood of occurrence: High. The Eastern Great Egret was not recorded during the current assessment, it has been assessed as a high likelihood of occurrence where it is likely to occur as a transient visitor only. It is likely to utilise major river habitat type only.

Wood Sandpiper (*Tringa glareola*)

Distribution and Habitat: The Wood Sandpiper breeds in the Europe and northern Asia during the austral winter, migrating south to Africa, south Asia and Australia for the austral summer (Johnstone and Storr 1998). The species is a regular migrant to Western Australia in small numbers, mostly from August to May (Johnstone and Storr 1998). It occurs most commonly in coastal, better-watered regions of the state but will visit areas of suitable habitat in the interior (Johnstone and Storr 1998). In Australia, the species typically occurs around the muddy or grassy margins of freshwater wetlands, including swamps, lagoons, river pools, dams, bore overflows and sewage ponds (Johnstone and Storr 1998; Pizzey and Knight 2003).

Ecology: The Wood Sandpiper is a sharp-tailed wader with long legs, a black bill and a long neck, dark brown back and wings and white spots (Simpson and Day 2004). The Wood Sandpiper is a trans-equatorial migrant, breeding in the northern hemisphere and migrating long distances to winter in the southern hemisphere. In Australia, the species typically occurs in singles, pairs or small parties (Johnstone and Storr 1998).

Likelihood of Occurrence: Medium. The Wood Sandpiper was not recorded on the current survey, however few individuals occur in Australia at the time of the field survey. This species has a medium likelihood of occurrence within the study area, where it may occur as a transient visitor utilising pools of water for foraging within the major rivers habitat type.

Rainbow Bee-eater (*Merops ornatus*)

Conservation status: EPBC Act Migratory, WC Act Schedule 3, DPaW International Agreement.

Distribution and habitat: The Rainbow Bee-eater is scarce to common throughout much of Western Australia, except for the arid interior, preferring lightly wooded, preferably sandy country near water (Johnstone and Storr 1998).

Ecology: In Western Australia the Rainbow Bee-eater can occur as a resident, breeding visitor, post-nuptial nomad, passage migrant or winter visitor. It nests in burrows usually dug at a slight angle on flat ground, sandy banks or cuttings, and often at the margins of roads or tracks (Simpson and Day 2004). Eggs are laid at the end of the metre-long tunnel from August to January (Boland 2004).

Rainbow Bee-eaters are most susceptible to predation during breeding, as it spends significantly more time on the ground in this period.

Likelihood of occurrence: Recorded. The Rainbow Bee-eater was recorded on three occasions during the current survey (Table 3.10). Suitable breeding habitat occurs within the sandy banks of the major rivers habitat type, and is therefore likely to breed within the study area.

Grey Falcon (*Falco hypoleucos*)

Conservation status: WC Act Schedule 1, DPaW Vulnerable.

Distribution and habitat: Grey Falcons are a rare, nomadic species sparsely distributed across much of arid and semi-arid Australia. In Western Australia, they are restricted to the northern half, occurring in a variety of habitats ranging from wooded drainage systems through to open spinifex plains. Grey Falcons once occurred across much of Western Australia, with sightings as far south as York and New Norcia during colonial times. However, the current distribution is now thought to be restricted to north of 26 °S (Johnstone and Storr 1998). Because the distribution of this species is scarce over an extremely large area, sightings of this species are very uncommon.

The Grey Falcon occurs in a wide variety of arid habitats, including open woodlands, open acacia shrublands, hummock and tussock grasslands and low shrublands, and may also be seen around swamps and waterholes that attract prey (Ehmann and Watson 2008).

Ecology: Like other falcons, this species preys primarily on birds such as parrots and pigeons, although reptiles and mammals are also taken (Ehmann and Watson 2008). Two to three eggs are laid in winter in the nests of other birds of prey and ravens, typically in tall eucalypt trees near water (Garnett and Crowley 2000; Ehmann and Watson 2008).

Likelihood of occurrence: High. The Grey Falcon was not recorded on the current survey. However two adults accompanied by three juvenile birds were previously recorded in close proximity during the North Star Project assessment (*ecologia* 2011b), suggesting a local breeding pair is present. The major river habitat type represents suitable breeding habitat for Grey Falcon, therefore there is potential for a single breeding pair to occur within the study area.

Peregrine Falcon (*Falco peregrinus*)

Conservation status: WC Act Schedule 4, DPaW Specially Protected Fauna.

Distribution and habitat: This nomadic or sedentary falcon is widespread in many parts of Australia and some of Australia's continental islands, but absent from most deserts and the Nullarbor Plain. The species is considered to be moderately common in the Stirling Range, uncommon in the Kimberley, Hamersley and Darling Ranges, and rare or scarce elsewhere (Johnstone and Storr 1998). The Peregrine Falcon occurs most commonly near cliffs along coasts, rivers and ranges, and around wooded watercourses and lakes.

Ecology: Peregrine Falcons feed almost entirely on birds, especially parrots and pigeons. They nest primarily on ledges on cliffs, granite outcrops and in quarries, but may also nest in tree hollows around wetlands. Eggs are predominantly laid in September (Johnstone and Storr 1998; Olsen *et al.* 2006).

Likelihood of occurrence: Medium. The Peregrine Falcon has been assessed as a medium likelihood of occurrence, due to relatively few regional records (DPaW 2015b) and absence of typical breeding habitat. It is likely to occur as a foraging transient visitor only.

Australian Bustard (*Ardeotis australis*)

Conservation Status: DPaW Priority 4.

Distribution and Habitat: The Australian Bustard occurs Australia-wide and utilises a number of open habitats, including open or lightly wooded grasslands, chenopod flats, plains and heathlands (Johnstone and Storr 1998).

Ecology: It is a nomadic species, ranging over very large areas, and its abundance varies locally and seasonally from scarce to common, largely dependent on rainfall and food availability. The Australian Bustard has an omnivorous diet, feeding on grasses, seeds, fruit, insects and small vertebrates (Johnstone and Storr 1998; Simpson and Day 2010).

Although the population size is still substantial, there has been a large historical decline in abundance, particularly south of the tropics, but also across northern Australia (Garnett and Crowley 2000). This is a result of hunting, degradation of its grassland habitat by sheep and rabbits, and predation by foxes and cats (Frith 1976; Garnett and Crowley 2000). Australian Bustards readily desert nests in response to disturbance by humans, sheep or cattle (Garnett and Crowley 2000).

Likelihood of Occurrence: Recorded. The Australian Bustard was recorded at two locations in the study area (Table 3.10) and has previously been recorded throughout the region (DPaW 2015b). The Australian Bustard is likely to be resident within the study area and breed on suitable habitat (rocky plain with spinifex and sandy plain).

Star Finch (western subspecies) (*Neochmia ruficauda subclarescens*)

Conservation status: DPaW Priority 4.

Distribution and habitat: The western subspecies of the Star Finch is found across northern Australia, including the Pilbara region where it is patchily distributed, with occasional concentrations at Exmouth and Millstream. Typical Star Finch habitat consists of long grass or rushes around swamps and lagoons or permanent pools. It is also found in irrigated crops and pastures (Johnstone and Storr 2004).

Ecology: It feeds mainly on small grass seeds, but also flying ants, termites, and other small insects and spiders. It usually occurs in pairs or small flocks. Breeding occurs between February and October. Both parents incubate the eggs and care for the young (Johnstone and Storr 2004).

Likelihood of occurrence: High. The Star Finch was not recorded within the study area, however it has been assessed as having a high likelihood of occurrence. It is most likely to occur as a transient visitor within the major river habitat type following rainfall when pools of water and rushes develop.

4.3.3 Reptiles

Pilbara Olive Python (*Liasis olivaceus barroni*)

Conservation status: EPBC Act Vulnerable, WC Act Schedule 1 (Vulnerable).

Distribution and habitat: The Pilbara subspecies of the Olive Python only occurs in the ranges of the Pilbara region of Western Australia. It inhabits watercourses and areas of permanent water in rocky gorges and gullies (Pearson 2006).

Ecology: This subspecies is an adept swimmer, often hunting in water, feeding on a variety of vertebrates such as rock wallabies, fruit bats, ducks and pigeons. Individuals spend the cooler winter months sheltering in caves and rock crevices. In the warmer months the pythons can move widely, usually in close proximity to water and rock outcrops (DEWHA 2008b). In late winter or early spring males will travel large distances to find, and mate with, females (Pearson 2006).

Population size estimates are difficult due to the Olive Python's cryptic nature and lack of reliable trapping or census techniques (DEWHA 2008b). The main threats to this subspecies come from

predation by feral cats and foxes, particularly of juveniles, competition with foxes for food, and destruction of habitat (Pearson 2006).

Likelihood of occurrence: High. The Pilbara Olive Python is known to occur from gorge/gully habitat types previously recorded at the North Star Project area (*ecologia* 2011a, b, 2014b). The dolerite dyke and major river habitat types both potentially represent suitable breeding habitat for this species.

Gane's Blind Snake (*Ramphotyphlops ganei*)

Conservation status: DPaW Priority 1.

Distribution and habitat: Very little is known about this elusive blind snake due to its fossorial lifestyle. Blind snakes are exclusively insectivorous, and like other members of their genus, *R. ganei* probably burrow into social insect colonies to feed on termites and ants, as well as their eggs and pupae (Wilson and Swan 2010). *R. ganei* has been found within the Pilbara region between Newman and Pannawonica (Wilson and Swan 2010).

Ecology: It has been suggested that *R. ganei* prefer to live in subterranean habitats near moist gullies and gorges (Wilson and Swan 2010), although there is a record from sandy soil vegetated with spinifex. This species is most likely threatened by removal of suitable habitat, and by drilling and/or any other mining activities impacting the subterranean environment.

Likelihood of occurrence: Medium. This species was not recorded during the North Star Project assessment, however given the cryptic ecology of the species, it may remain undetected. It has therefore been assessed as a medium likelihood of occurrence.

Ctenotus nigrilineatus

Conservation Status: DPaW Priority 1.

Distribution and Habitat: The distribution of this species is restricted to a relatively small area, within about 100 km of Marble Bar. The holotype, as well as two subsequent specimens, were collected from near Woodstock (Storr 1990, NatureMap). Specimens collected to date had been found in spinifex at the base of granite outcrops, and so it is assumed that this is the preferred habitat of *Ctenotus nigrilineatus* (Storr 1990).

Ecology: There is no information available on the ecology of this species. However, it may be assumed that it is similar to that of other *Ctenotus* species, which are generally described as swift, sun-loving skinks that bask and forage on exposed surfaces (in the case of *Ctenotus nigrilineatus*, most likely on the surfaces of granite outcrops), and shelter in narrow crevices (Wilson and Swan 2010).

Likelihood of occurrence: High. *Ctenotus nigrilineatus* has a very restricted distribution, with only approximately 40 known records. The western edge of the known distribution occurs near the study area. Given the proximity of the study area to previous records and the presence and linkage of suitable habitat to previous records (rocky plain with spinifex and granite outcrop), this species is assessed as having a high likelihood of occurrence within the study area.

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5 CONCLUSIONS

5.1 FLORA AND VEGETATION

Most of the flora and vegetation communities of the study area are widely distributed and are not considered significant for the Pilbara region. The significant features of the flora and vegetation identified from the study area include:

- A potential new taxon; *Triumfetta* aff. *ramosa;*
- The presence of suitable habitat within the study area for *Abutilon* sp. Pritzelianum (P1), *Heliotropium muticum* (P1), *Euphorbia clementii* (P2), *Gymnanthera cunninghamii* (P3), *Phyllanthus hebecarpus* (P3) and *Goodenia nuda* (P3);
- Vegetation unit *AiGaTw* (*Acacia inaequilatera* isolated tall shrubs, over *Gossypium australe* sparse mid shrubland, over *Triodia wiseana* open hummock grassland) is significant as it is locally scarce, is comprised of a different combination of species to similar landforms and is restricted to an uncommon landform in the region (dolerite dyke); and
- Vegetation unit *EcMgCc (Eucalyptus camaldulensis* open low to mid woodland, over +/- *Melaleuca glomerata*, *Acacia ampliceps* and *Melaleuca linophylla* sparse tall shrubland, over **Cenchrus ciliaris* open tussock grassland) is considered significant as it is restricted to an uncommon landform in the local area (river), acts as a refuge for phreatophytic flora species and provides habitat for the 'unusual species': *Triumfetta* aff. *ramosa.* It is also considered to be a GDE due to dominance of the unit by *Eucalyptus camaldulensis*, a recognised phreatophyte.

5.2 FAUNA

The fauna assemblages at the study area are common and not considered significant for the Pilbara region. The most significant vertebrate fauna features of the study area include:

- The presence of species of conservation significance; Northern Quoll, Rainbow Bee-eater, Australian Bustard and Western Pebble-mound Mouse;
- Eleven additional conservation significant fauna species identified from the literature review have a high likelihood of occurrence at the study area (Greater Bilby, Pilbara Leaf-nosed Bat, Brush-tailed Mulgara, Long-tailed Dunnart, Ghost Bat, Fork-tailed Swift, Eastern Great Egret, Grey Falcon, Star Finch, Pilbara Olive Python and *Ctenotus nigrilineatus*); and
- In general, major river, dolerite dyke and sandy plain habitat types are locally significant due their potential to support local conservation significant fauna. However, these locally significant habitats (or habitat features in the case of dolerite dyke) occur at a regional level.

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APPENDIX A CONSERVATION CODES

Threatened (WCAct) and Priority Flora Categories

Code	Definition
T	**Threatened Flora – (Declared Rare Flora – Extant)** Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection and have been gazetted as such (Schedule 1 under the *Wildlife Conservation Act 1950*).
X	**Presumed Extinct Flora (Declared Rare Flora - Extinct)** Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such Schedule 2 under the *Wildlife Conservation Act 1950*).
P1	**Priority One – Poorly Known Species** Species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
P2	**Priority Two – Poorly Known Species** Species that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
P3	**Priority Three – Poorly Known Species** Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities 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 localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
P4	**Priority Four – Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	**Priority Five - Conservation Dependent species** Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Threatened Flora (EPBC Act) Categories

Code	Definition
Ex	**Extinct** Taxa which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
ExW	**Extinct in the Wild** Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or 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.
CE	**Critically Endangered** Taxa which 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.
E	**Endangered** Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
V	**Vulnerable** Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent** Taxa which at a particular time if, at that time, the species is the focus of a specific conservation programme, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Definition of codes for Threatened Ecological Communities

Code	Definition
PD: Presumed Totally Destroyed	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant
CR: Critically Endangered	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future.
EN: Endangered	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future.
VU: Vulnerable	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future.

Definition of codes for Priority Ecological Communities

Code	Definition
P1: Priority One	Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or Pastoral lands, urban areas, active mineral leases) and for which current threats exist. 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.
P2: Priority Two	Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat 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.
P3: Priority Three	(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 within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) Communities made up of large, and/or widespread occurrences that may or 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, and inappropriate fire regimes. 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.
P4: Priority Four	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. (a) 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. (b) 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 Vulnerable. (c) Ecological communities that have been removed from the list of threatened communities during the past five years. P5: Priority Five 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.
P5: Priority Five	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.

Control categories for Declared Pests (Weeds)

Declared plant category	Description
C1 - Exclusion	Pests assigned to this category are not established in WA and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2 - Eradication	Pests assigned to this category are present in WA in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3 - Management	Pests assigned to this category are established in WA 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.

Definition of codes for Threatened Fauna (WC Act)

Code	Definition
T (Schedule 1)	Fauna that is rare or likely to become extinct Taxa that have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction or otherwise in need of special protection, and have been gazetted as such. Further categorised as: CR Critically Endangered – considered to be facing an extremely high risk of extinction in the wild EN Endangered – considered to be facing a very high risk of extinction in the wild VU Vulnerable – considered to be facing a high risk of extinction in the wild.
X (Schedule 2)	Presumed Extinct Fauna Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
IA (Schedule 3)	Birds protected under an international agreement. Birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction are declared to be fauna that is in need of special protection.
S (Schedule 4)	Other specially protected fauna Fauna that is in need of special protection, otherwise than for the reasons mentioned [in Schedule 1 – 3].]

Definition of codes for Priority Fauna

Code	Definition
P1	**Priority One** Taxa with few, poorly known populations on threatened lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
P2	**Priority Two** Taxa with few, poorly known populations on conservation lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
P3	**Priority Three** Taxa with several, poorly known populations, some on conservation lands. Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
P4	**Priority Four** Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.
P5	**Priority Five** Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Definition of codes for Threatened Fauna (EPBC Act)

Code	Definition
Ex	**Extinct** Taxa not definitely located in the wild during the past 50 years
ExW	**Extinct in the Wild** Taxa known to survive only in captivity
CE	**Critically Endangered** Taxa facing an extremely high risk of extinction in the wild in the immediate future
E	**Endangered** Taxa facing a very high risk of extinction in the wild in the near future
V	**Vulnerable** Taxa facing a high risk of extinction in the wild in the medium-term
NT	**Near Threatened** Taxa that risk becoming Vulnerable in the wild
CD	**Conservation Dependent** Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classified as Vulnerable or more severely threatened.
DD	**Data Deficient (Insufficiently Known)** Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.

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APPENDIX B THREATENED AND PRIORITY FLORA LIKELIHOOD OF OCCURRENCE

Status	Taxa	Habitat	Bioregion	Distance from study area	Likelihood of occurrence
Priority 1	*Abutilon* sp. Pritzelianum (S. van Leeuwen 5095)	Sandplains	PIL, CAR, MUR	0.1 km north	High
Priority 1	*Acacia leeuweniana*	Gritty, skeletal red-grey sandy loam, light orange-brown gravelly sand, granite	PIL	16 km south-west	Moderate
Priority 1	*Acacia* sp. Marble Bar (J.G. & M.H. Simmons 3499)^	n/a	PIL	>40 km	Low
Priority 1	*Corchorus* sp. Yarrie (J. Bull & D. Roberts CAL 01.05)^	Rocky ironstone hillslope. Gully.	PIL	>40 km	Low
Priority 1	*Desmodium pullenii*^	Red brown clay over ironstone. Laterite.	NK	>40 km	Low
Priority 1	*Eragrostis crateriformis*	Clayey loam or clay. Creek banks, depressions	PIL	15 km south-west	Low
Priority 1	*Eremophila maculata* subsp. *filifolia*^	Plain. Red sand.	PIL	>40 km	Low
Priority 1	*Heliotropium muticum*	Red silty sand	PIL	6 km north-west	High
Priority 1	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	Ironstone hill slopes	PIL	4 km north-east	Moderate
Priority 1	*Tephrosia andrewii*^	Sand. Pindan country.	DL	>40 km	Low
Priority 2	*Euphorbia clementii*	Sandplains, gravelly hillsides, stony grounds	PIL	1.5 km north	High
Priority 3	*Acacia glaucocaesia*	Red loam, sandy loam, clay. Floodplains	PIL	10 km north-east	Moderate
Priority 3	*Acacia levata*	On rocky calcrete plateaus	PIL	16 km south-west	Moderate
Priority 3	*Gomphrena leptophylla*	Open flats, sandy creek beds, edges salt pans & marshes, stony hillsides.	PIL, DL	8 km north-east	Low
Priority 3	*Gymnanthera cunninghamii*	Sandy soils along watercourses	PIL, CAR, GSD	1.2 km north	High
Priority 3	*Heliotropium murinum*	Red sand. Plains.	PIL	30 km south	Low
Priority 3	*Nicotiana umbratica*	Shallow soils. Rocky outcrops	PIL	6 km north-west	High
Priority 3	*Phyllanthus hebecarpus*	Granite outcrop, red sandy loam, drainage line.	PIL	6 km north-west	High
Priority 3	*Terminalia supranitifolia*	Sand amongst basalt rocks	PIL	21 km north-west	Low
Priority 4	*Bulbostylis burbidgeae*	Granitic soils. Granite outcrops, cliff bases.	PIL	4 km north-west	High
Priority 4	*Goodenia nuda*	Drainage lines, skeletal soils, loams	PIL	<1 km north	High
Priority 4	*Ptilotus mollis*	Stony hills and screes.	MWST, PIL	4 km north-east	Moderate

^ = recorded on the TP LIST, no coordinates available.

APPENDIX C VERTEBRATE FAUNA LITERATURE REVIEW RESULTS

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Mammals

Family and Species	Common name	EPBC Act	WC Act	DPaW	*ecologia* Internal Database	(Bamford and Wilcox 2001)	(Biota 2005)	(Biota 2007)	(Molhar 2007)	(Outback Ecology 2006)	(Outback Ecology 2010)	(Outback Ecology 2011)	(*ecologia* 2011a)	(*ecologia* 2011b)	(*ecologia* 2012b)	(*ecologia* 2014b)	(*ecologia* 2015a)	NatureMap	DPaW Threatened Fauna Database	DoE Protected Matters Database	Current Survey
TACHYGLOSSIDAE																					
Tachyglossus aculeatus	Echidna				S	•	S			•		•						•			
DASYURIDAE																					
Dasycercus blythi	Brush-tailed Mulgara			**P4**	S		S	S									•	•	•	•	
Dasycercus cristicauda	Crest-tailed Mulgara	**VU**	**S1**															•	•		
Dasykaluta rosamondae	Little Red Kaluta				•		•			•		•		•				•			
Dasyurus hallucatus	Northern Quoll	**EN**	**S1**	**EN**	•	•	S	•			•	•	•	•		•	•	•	•	•	
Ningaui ridei	Wongai Ningaui						•														
Ningaui timealeyi	Pilbara Ningaui				•	•	•			•				•				•			
Planigale sp.	Planigale				•	•	•			•		•		•				•			
Pseudantechinus roryi	Rory's Pseudantechinus				•	•												•			
Pseudantechinus woolleyae	Woolley's Pseudantechinus									•				Δ				•			•
Sminthopsis longicaudata	Long-tailed Dunnart			**P4**				•						•							
Sminthopsis macroura	Stripe-faced Dunnart				•		•			•		•						•			
Sminthopsis ooldea	Ooldea Dunnart																	•			
Sminthopsis youngsoni	Lesser Hairy-footed Dunnart						•			•				•				•			
THYLACOMYIDAE																					
Macrotis lagotis	Greater Bilby	**VU**	**S1**	**VU**													•	•	•	•	
PHALANGERIDAE																					
Trichosurus vulpecula arnhemensis	Northern Brushtail Possum																	•			
MACROPODIDAE																					
Lagorchestes conspicillatus leichardti	Spectacled Hare-wallaby			**P3**		•		•										•	•		
Macropus robustus	Euro				•	•	•			•		•		•	•			•			•
Macropus rufus	Red Kangaroo				•							•						•			
Petrogale rothschildi	Rothschild's Rock-wallaby				•	•	•							•				•			
MEGADERMATIDAE																					
Macroderma gigas	Ghost Bat			**P4**	•	•		•		•		•	•	Δ		•	•	•	•		
HIPPOSIDERIDAE																					
Rhinonicteris aurantius	Pilbara Leaf-nosed Bat	**VU**	**S1**	**VU**	•	•		•	•			•	•	•		•	•	•	•	•	
EMBALLONURIDAE																					
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat				•							•						•			
Taphozous georgianus	Common Sheathtail Bat				•	•				•		•		•				•			
MOLOSSIDAE																					
Chaerophon jobensis	Northern Freetail Bat				•																
Mormopterus beccarii	Beccari's Freetail Bat				•																
Tadarida australis	White-striped Freetail Bat				•	•															
VESPERTILIONIDAE																					
Chalinolobus gouldii	Gould's Wattled Bat				•		•					•		•				•			
Nyctophilus geoffroyi	Lesser Long-eared Bat				•									•							
Nyctophilus bifax daedalus	Northwestern Long-eared Bat				•					•											
Scotorepens greyii	Little Broad-nosed Bat				•		•					•		•				•			
Vespadelus finlaysoni	Finlayson's Cave Bat				•	•	•			•		•		•				•			

Family and Species	Common name	EPBC Act	WC Act	DPaW	*ecologia* Internal Database	(Bamford and Wilcox 2001)	(Biota 2005)	(Biota 2007)	(Molhar 2007)	(Outback Ecology 2006)	(Outback Ecology 2010)	(Outback Ecology 2011)	(*ecologia* 2011a)	(*ecologia* 2011b)	(*ecologia* 2012b)	(*ecologia* 2014b)	(*ecologia* 2015a)	NatureMap	DPaW Threatened Fauna Database	DoE Protected Matters Database	Current Survey
MURIDAE																					
Notomys alexis	Spinifex Hopping-mouse				•					•		•									
Leggadina lakedownensis	Short-tailed Mouse			**P4**	•		•											•	•		
Pseudomys chapmani	Western Pebble-mound mouse			**P4**	•	•				•		•		•	S			•	•		S
Pseudomys delicatulus	Delicate Mouse					•	•							•				•			
Pseudomys desertor	Desert Mouse				•	•	•			•				•				•			
Pseudomys hermannsburgensis	Sandy Inland Mouse				•		•			•		•		•				•			
Zyzomys argurus	Common Rock-rat				•	•	•			•				•				•			•
CANIDAE																					
Canis lupus dingo	Dingo				•	•				•		•			•						
INTRODUCED MAMMALS																					
Mus musculus	House Mouse				•	•	•											•			
Canis lupus familiaris	Dog				•		•					•						•			
Vulpes vulpes	Fox											•									
Felis catus	Cat				•	•	•			•		•		•	•			•			
Equus asinus	Donkey				•	•	•					•			•			•			
Camelus dromedarius	Camel				•	•	•					•		•				•			
Bos taurus	Cow				•		•					•		•	•			•			

S = secondary sign evidence

Birds

Family and Species	Common name	EPBC Act	WC Act	DPaW	*ecologia* Internal Database	(Bamford and Wilcox 2001)	(Biota 2005)	(Biota 2007)	(Molhar 2007)	(Outback Ecology 2006)	(Outback Ecology 2010)	(Outback Ecology 2011)	(*ecologia* 2011a)	(*ecologia* 2011b)	(*ecologia* 2012b)	(*ecologia* 2014b)	(*ecologia* 2015a)	Birdata	NatureMap	DPaW Threatened Fauna Database	DoE Protected Matters Database	Current Survey
CASUARIIDAE																						
Dromaius novaehollandiae	Emu				•							•										
PHASIANIDAE																						
Coturnix pectoralis	Stubble Quail				•																	
Coturnix ypsilophora	Brown Quail					•						•		•	•			•	•			
ANATIDAE																						
Dendrocygna eytoni	Plumed Whistling-duck																	•				
Cygnus atratus	Black Swan				•									•				•				
Tadorna tadornoides	Australian Shelduck																	•				
Malacorhynchus membranaceus	Pink-eared Duck																		•			
Anas gracilis	Grey Teal				•									•				•	•			
Anas superciliosa	Pacific Black Duck				•	•								•				•	•			
Aythya australis	Hardhead																	•	•			
PODICIPEDIDAE																						
Tachybaptus novaehollandiae	Australasian Grebe				•													•	•			
Poliocephalus poliocephalus	Hoary-headed Grebe																	•				
COLUMBIDAE																						
Phaps chalcoptera	Common Bronzewing				•	•						•		•	•			•	•			
Phaps histrionica	Flock Bronzewing																			•		
Ocyphaps lophotes	Crested Pigeon				•	•						•		•	•			•	•			
Geophaps plumifera	Spinifex Pigeon				•	•						•		•	•			•	•			•
Geopelia cuneata	Diamond Dove				•	•								•	•			•	•			•
Geopelia striata	Peaceful Dove				•	•								•				•	•			
PODARGIDAE																						
Podargus strigoides	Tawny Frogmouth				•	•								•					•			
EUROSTOPODIDAE																						
Eurostopodus argus	Spotted Nightjar				•	•						•		•				•	•			•
AEGOTHELIDAE																						
Aegotheles cristatus	Australian Owlet-nightjar				•	•								•				•	•			
APODIDAE																						
Apus pacificus	Fork-tailed Swift	**M**	**S3**		•									•					•		•	
ANHINGIDAE																						
Anhinga novaehollandiae	Australasian Darter/ Darter					•	•			•				•				•	•			
PHALACROCORACIDAE																						
Microcarbo melanoleucos	Little Pied Cormorant				•	•				•								•	•			
Phalacrocorax carbo	Great Cormorant																	•				
Phalacrocorax sulcirostris	Little Black Cormorant					•				•								•	•			
Phalacrocorax varius	Pied Cormorant																	•				
PELECANIDAE																						
Pelecanus conspicillatus	Australian Pelican					•				•								•	•			
CICONIIDAE																						

Family and Species	Common name	EPBC Act	WC Act	DPaW	*ecologia* Internal Database	(Bamford and Wilcox 2001)	(Biota 2005)	(Biota 2007)	(Molhar 2007)	(Outback Ecology 2006)	(Outback Ecology 2010)	(Outback Ecology 2011)	(*ecologia* 2011a)	(*ecologia* 2011b)	(*ecologia* 2012b)	(*ecologia* 2014b)	(*ecologia* 2015a)	Birdata	NatureMap	DPaW Threatened Fauna Database	DoE Protected Matters Database	Current Survey
Ephippiorhynchus asiaticus	Black-necked Stork					•	•			•								•	•			
ARDEIDAE																						
Ardea pacifica	White-necked Heron				•	•				•									•			•
Ardea modesta	Eastern Great Egret	**M**	**S3**			•				•								•	•		•	
Egretta novaehollandiae	White-faced Heron				•	•	•			•				•				•	•			
Ardea ibis	Cattle Egret	**M**	**S3**																		•	
Egretta garzetta	Little Egret									•								•	•			
Nycticorax caledonicus	Nankeen Night Heron					•												•	•			
THRESKIORNITHIDAE																						
Threskiornis spinicollis	Straw-necked Ibis				•	•												•	•			
Platalea flavipes	Yellow-billed Spoonbill									•												
ACCIPITRIDAE																						
Elanus axillaris	Black-shouldered Kite				•	•	•			•								•	•			
Lophoictinia isura	Square-tailed Kite				•		•							•				•				
Hamirostra melanosternon	Black-breasted Buzzard						•															
Haliaeetus leucogaster	White-bellied Sea-Eagle	**M**	**S3**																		•	
Haliastur sphenurus	Whistling Kite				•	•	•			•		•		•	•			•	•			
Milvus migrans	Black Kite						•			•				•				•	•			
Accipiter fasciatus	Brown Goshawk				•	•	•								•			•	•			
Accipiter cirrocephalus	Collared Sparrowhawk				•	•	•							•				•	•			
Circus assimilis	Spotted Harrier				•	•	•			•					•			•	•			
Circus approximans	Swamp Harrier						•															
Aquila audax	Wedge-tailed Eagle				•	•	•			•		•		•				•	•			
Hieraaetus morphnoides	Little Eagle				•	•	•											•				
FALCONIDAE																						
Falco cenchroides	Nankeen Kestrel				•	•	•			•		•		•	•			•	•			
Falco berigora	Brown Falcon				•	•	•			•		•		•	•			•	•			•
Falco longipennis	Australian Hobby						•			•								•	•			
Falco hypoleucos	Grey Falcon		**S1**	**VU**	•		•							•				•	•	•		
Falco subniger	Black Falcon																	•	•			
Falco peregrinus	Peregrine Falcon		**S4**				•												•	•		
RALLIDAE																						
Gallirallus philippensis	Buff-banded Rail													•								
Porzana tabuensis	Spotless Crake				•																	
Fulica atra	Eurasian Coot									•								•	•			
OTIDIDAE																						
Ardeotis australis	Australian Bustard			**P4**	•	•	•	•		•		•		•	•			•	•	•		•
BURHINIDAE																						
Burhinus grallarius	Bush Stone-curlew				•	•	•	•		•				•				•	•	•		
RECURVIROSTRIDAE																						
Himantopus himantopus	Black-winged Stilt				•		•											•				
CHARADRIIDAE																						
Charadrius veredus	Oriental Plover	**M**	**S3**																•		•	

Family and Species	Common name	EPBC Act	WC Act	DPaW	*ecologia* Internal Database	(Bamford and Wilcox 2001)	(Biota 2005)	(Biota 2007)	(Molhar 2007)	(Outback Ecology 2006)	(Outback Ecology 2010)	(Outback Ecology 2011)	(*ecologia* 2011a)	(*ecologia* 2011b)	(*ecologia* 2012b)	(*ecologia* 2014b)	(*ecologia* 2015a)	Birdata	NatureMap	DPaW Threatened Fauna Database	DoE Protected Matters Database	Current Survey
Elseyornis melanops	Black-fronted Dotterel				•	•	•			•				•				•	•			
Erythrogonys cinctus	Red-kneed Dotterel																		•			
Vanellus tricolor	Banded Lapwing																		•			
SCOLOPACIDAE																						
Tringa glareola	Wood Sandpiper	**M**	**S3**		•														•			
TURNICIDAE																						
Turnix velox	Little Button-quail				•	•	•			•				•	•			•	•			•
LARIDAE																						
Chlidonias hybrida	Whiskered Tern													•								
GLAREOLIDAE																						
Glareola maldivarum	Oriental Pratincole	**M**	**S3**																		•	
Stiltia isabella	Australian Pratincole																	•				
CACATUIDAE (PSITTACIDAE)																						
Eolophus roseicapillus	Galah				•	•	•			•		•		•	•			•	•			•
Cacatua sanguinea	Little Corella				•	•	•			•		•		•				•	•			
Nymphicus hollandicus	Cockatiel				•	•	•			•				•	•			•	•			
PSITTACIDAE																						
Barnardius zonarius	Australian Ringneck				•	•				•		•		•				•	•			
Melopsittacus undulatus	Budgerigar				•	•	•			•				•	•			•	•			•
CUCULIDAE																						
(Centropodidae) *Centropus phasianinus*	Pheasant Coucal				•	•				•				•				•	•			
Chalcites basalis	Horsfield's Bronze-Cuckoo				•	•	•			•		•		•				•	•			
Chalcites osculans	Black-eared Cuckoo				•														•			
Cacomantis pallidus	Pallid Cuckoo				•	•	•			•				•				•	•			
STRIGIDAE																						
Ninox connivens	Barking Owl																	•	•			
Ninox novaeseelandiae	Southern Boobook				•		•			•		•		•	•			•	•			
TYTONIDAE																						
Tyto javanica	Eastern Barn Owl				•																	
HALCYONIDAE																						
Dacelo leachii	Blue-winged Kookaburra				•	•	•			•				•				•	•			
Todiramphus pyrrhopygius	Red-backed Kingfisher				•	•	•			•		•		•	•			•	•			
Todiramphus sanctus	Sacred Kingfisher				•	•	•							•				•	•			•
MEROPIDAE																						
Merops ornatus	Rainbow Bee-eater	**M**	**S3**		•	•	•			•		•		•	•			•	•		•	•
CLIMACTERIDAE																						
Climacteris melanura	Black-tailed Treecreeper																	•				
PTILINORHYNCHIDAE																						
Ptilonorhynchus guttatus	Western Bowerbird				•	•				•		•		•				•	•			
MALURIDAE																						
Malurus lamberti	Variegated Fairy-wren				•	•	•			•		•		•	•			•	•			
Malurus leucopterus	White-winged Fairy-wren				•		•			•		•		•	•			•	•			

Family and Species	Common name	EPBC Act	WC Act	DPaW	*ecologia* Internal Database	(Bamford and Wilcox 2001)	(Biota 2005)	(Biota 2007)	(Molhar 2007)	(Outback Ecology 2006)	(Outback Ecology 2010)	(Outback Ecology 2011)	(*ecologia* 2011a)	(*ecologia* 2011b)	(*ecologia* 2012b)	(*ecologia* 2014b)	(*ecologia* 2015a)	Birdata	NatureMap	DPaW Threatened Fauna Database	DoE Protected Matters Database	Current Survey
Stipiturus ruficeps	Rufous-crowned Emu-wren					•				•								•				
Amytornis striatus	Striated Grasswren				•	•				•				•				•	•			
ACANTHIZIDAE																						
Smicrornis brevirostris	Weebill				•	•	•			•				•				•	•			
Gerygone fusca	Western Gerygone				•	•				•								•	•			
Acanthiza robustirostris	Slaty-backed Thornbill				•		•															
Acanthiza uropygialis	Chestnut-rumped Thornbill				•		•															
Acanthiza apicalis	Inland Thornbill				•																	
PARDALOTIDAE																						
Pardalotus rubricatus	Red-browed Pardalote				•	•	•			•				•				•	•			
Pardalotus striatus	Striated Pardalote				•	•				•								•	•			
MELIPHAGIDAE																						
Certhionyx variegatus	Pied Honeyeater					•													•			
Lichenostomus virescens	Singing Honeyeater				•	•	•			•		•		•	•			•	•			
Lichenostomus keartlandi	Grey-headed Honeyeater				•	•				•				•				•	•			
Lichenostomus plumulus	Grey-fronted Honeyeater											•						•	•			
Lichenostomus penicillatus	White-plumed Honeyeater				•	•	•					•		•	•			•	•			
Manorina flavigula	Yellow-throated Miner				•	•	•			•		•		•	•			•	•			•
Acanthagenys rufogularis	Spiny-cheeked Honeyeater				•		•			•				•					•			
Conopophila whitei	Grey Honeyeater				•														•			
Epthianura tricolor	Crimson Chat				•	•	•			•		•		•	•			•	•			•
Sugomel niger	Black Honeyeater				•		•			•					•			•				
Lichmera indistincta	Brown Honeyeater				•		•			•				•	•				•			
Melithreptus gularis	Black-chinned Honeyeater				•	•				•				•				•	•			
POMATOSTOMIDAE																						
Pomatostomus temporalis	Grey-crowned Babbler				•					•				•	•			•	•			
Pomatostomus superciliosus	White-browed Babbler				•		•											•				
PSOPHODIDAE (CINCLOSOMATIDAE)																						
Cinclosoma castaneothorax	Chestnut-breasted Quail-thrush						•															
NEOSITTIDAE																						
Daphoenositta chrysoptera	Varied Sittella						•															
CAMPEPHAGIDAE																						
Coracina maxima	Ground Cuckoo-shrike				•														•			
Coracina novaehollandiae	Black-faced Cuckoo-shrike				•	•	•			•		•		•	•			•	•			
Lalage sueurii	White-winged Triller				•	•	•			•				•				•	•			
PACHYCEPHALIDAE																						
Pachycephala rufiventris	Rufous Whistler				•	•	•			•		•		•				•	•			
Colluricincla harmonica	Grey Shrike-thrush				•	•				•				•				•	•			
Oreoica gutturalis	Crested Bellbird				•	•	•			•		•		•				•	•			
ARTAMIDAE																						
Artamus leucorhynchus	White-breasted Woodswallow									•												
Artamus personatus	Masked Woodswallow				•		•							•	•			•				
Artamus cinereus	Black-faced Woodswallow				•	•	•			•		•		•	•			•	•			

Family and Species	Common name	EPBC Act	WC Act	DPaW	*ecologia* Internal Database	(Bamford and Wilcox 2001)	(Biota 2005)	(Biota 2007)	(Molhar 2007)	(Outback Ecology 2006)	(Outback Ecology 2010)	(Outback Ecology 2011)	(*ecologia* 2011a)	(*ecologia* 2011b)	(*ecologia* 2012b)	(*ecologia* 2014b)	(*ecologia* 2015a)	Birdata	NatureMap	DPaW Threatened Fauna Database	DoE Protected Matters Database	Current Survey
Artamus minor	Little Woodswallow				•	•				•				•				•	•			
Cracticus torquatus	Grey Butcherbird				•		•			•		•		•					•			
Cracticus nigrogularis	Pied Butcherbird				•	•	•			•		•		•	•			•	•			
Cracticus tibicen	Australian Magpie					•	•			•				•				•	•			•
RHIPIDURIDAE (DICRURIDAE)																						
Rhipidura albiscapa	Grey Fantail																	•				
Rhipidura leucophrys	Willie Wagtail				•	•	•			•		•		•	•			•	•			•
CORVIDAE																						
Corvus bennetti	Little Crow				•										•			•	•			
Corvus orru	Torresian Crow				•	•	•			•		•		•				•	•			•
MONARCHIDAE (DICRURIDAE)																						
Grallina cyanoleuca	Magpie-lark				•	•	•			•		•		•	•			•	•			•
PETROICIDAE																						
Petroica goodenovii	Red-capped Robin				•		•															
Melanodryas cucullata	Hooded Robin				•		•			•								•	•			
ALAUDIDAE																						
Mirafra javanica	Horsfield's Bushlark				•		•							•				•	•			
ACROCEPHALIDAE (SYLVIIDAE)																						
Acrocephalus australis	Australian Reed-Warbler				•					•								•	•			
MEGALURIDAE (SYLVIIDAE)																						
Cincloramphus mathewsi	Rufous Songlark				•	•	•			•				•				•	•			
Cincloramphus cruralis	Brown Songlark					•	•			•		•		•				•	•			
Eremiornis carteri	Spinifex-bird				•	•	•			•		•		•				•	•			
HIRUNDINIDAE																						
Cheramoeca leucosterna	White-backed Swallow																	•				
Hirundo neoxena	Welcome Swallow				•														•			
Hirundo rustica	Barn Swallow																				•	
Petrochelidon ariel	Fairy Martin				•		S			•				•				•	•			
Petrochelidon nigricans	Tree Martin				•	•				•				•				•	•			
NECTARINIIDAE (DICAEIDAE)																						
Dicaeum hirundinaceum	Mistletoebird					•	•			•								•	•			
ESTRILDIDAE																						
Taeniopygia guttata	Zebra Finch				•	•	•			•		•		•	•			•	•			•
Neochmia ruficauda subclarescens	Star Finch (western)			**P4**	•					•				•				•				
Emblema pictum	Painted Finch				•	•	•			•		•		•	•			•	•			
MOTACILLIDAE																						
Anthus novaeseelandiae	Australasian Pipit				•		•			•		•		•	•			•	•			

Reptiles

Family and Species	Common name	EPBC Act	WC Act	DEC	*ecologia* Internal Database	(Bamford and Wilcox 2001)	(Biota 2005)	(Biota 2007)	(Molhar 2007)	(Outback Ecology 2006)	(Outback Ecology 2010)	(Outback Ecology 2011)	(*ecologia* 2011a)	(*ecologia* 2011b)	(*ecologia* 2012b)	(*ecologia* 2014b)	(*ecologia* 2015a)	NatureMap	DPaW Threatened Fauna Database	DoE Protected Matters Database	Current Survey
CHELUIDAE																					
Chelodina steindachneri	Flat-shelled Turtle						•							•				•			
DIPLODACTYLIDAE																					
Crenadactylus ocellatus	Clawless Gecko					•				•				•				•			
Diplodactylus conspicillatus	Fat-tailed Gecko				•		•			•		•		•				•			
Diplodactylus galaxias	Northern Pilbara Beak-faced Gecko													•							
Diplodactylus mitchelli					•																
Diplodactylus savagei	Southern Pilbara Beak-faced Gecko				•					•				•				•			
Lucasium stenodactylum	Sand-plain Gecko				•		•			•				•				•			
Lucasium wombeyi					•		•			•				•				•			
Oedura marmorata	Marbled Velvet Gecko				•					•		•		•				•			
Rhynchoedura ornata	Beaked Gecko				•					•		•		•				•			
Strophurus elderi					•	•	•			•				•				•			
Strophurus jeanae							•											•			
Strophurus wellingtonae					•		•														
CARPHODACTYLIDAE																					
Nephrurus levis							•			•				•				•			
Nephrurus wheeleri					•					•											
GEKKONIDAE																					
Gehyra pilbara	Pilbara Dtella					•				•		•						•			
Gehyra punctata	Spotted Dtella				•	•								•				•			•
Gehyre purparescens	Purplish Dtella											•									
Gehyra variegata	Tree Dtella				•	•	•			•		•		•				•			
Heteronotia binoei	Bynoe's Gecko				•	•	•			•		•		•				•			
Heteronotia planiceps	Bynoe's Prickly Dtella																	•			
Heteronotia spelea	Desert Cave Gecko				•					•		•		•				•			
PYGOPODIDAE																					
Delma butleri					•													•			
Delma elegans					•		•			•				•				•			
Delma fraseri						•								•							
Delma haroldi																					
Delma nasuta					•	•	•			•				•				•			
Delma pax					•	•	•			•				•				•			
Delma tincta					•		•			•				•				•			
Lialis burtonis					•	•	•			•		•		•				•			
Pygopus nigriceps					•									•				•			
SCINCIDAE																					
Carlia munda					•	•	•			•		•		•				•			•
Carlia triacantha					•		•					•		•				•			
Cryptoblepharus buchananii					◊	◊								•							
Cryptoblepharus ustulatus					◊	◊								•				•			
Ctenotus ariadnae							•														
Ctenotus duricola					•		•			•		•		•				•			

Family and Species	Common name	EPBC Act	WC Act	DEC	*ecologia* Internal Database	(Bamford and Wilcox 2001)	(Biota 2005)	(Biota 2007)	(Molhar 2007)	(Outback Ecology 2006)	(Outback Ecology 2010)	(Outback Ecology 2011)	(*ecologia* 2011a)	(*ecologia* 2011b)	(*ecologia* 2012b)	(*ecologia* 2014b)	(*ecologia* 2015a)	NatureMap	DPaW Threatened Fauna Database	DoE Protected Matters Database	Current Survey
Ctenotus grandis					•		•			•		•		•				•			
Ctenotus hanloni										•											
Ctenotus helenae					•		•			•		•		•				•			
Ctenotus inornatus																					•
Ctenotus leonhardii					•													•			
Ctenotus nigrilineatus				**P1**														•	•		
Ctenotus pantherinus	Leopard Ctenotus				•		•			•		•		•	•			•			•
Ctenotus piankai														•							
Ctenotus rubicundus					•	•	•							•				•			
Ctenotus saxatilis	Rock Ctenotus				•	•	•			•		•		•				•			
Ctenotus schomburgkii							•							•				•			
Ctenotus serventyi																		•			
Ctenotus uber					•																
Cyclodomorphus melanops	Spinifex Slender Blue-tongue				•	•	•			•				•				•			•
Egernia ebsisolus	Eastern Pilbara Spiny-tailed Skink				•									•	•			•			
Egernia formosa						•				•				•				•			
Egernia pilbarensis										•											
Eremiascincus fasciolatus	Narrow-banded Sand-swimmer																	•			
Eremiascincus isolepis										•											
Eremiascincus richardsonii	Broad-banded Sand-swimmer																	•			•
Lerista bipes					•		•			•		•		•				•			
Lerista clara																		•			
Lerista flammicauda										•											
Lerista jacksoni	(L.muelleri group)													•				•			
Lerista muelleri					•	•	•							•				•			
Lerista verhmens														•				•			
Lerista zietzi							•														
Liopholis striata	Night Skink											•						•			
Menetia greyii					•		•			•				•				•			
Menetia surda						•				•								•			
Morethia ruficauda					•	•				•		•		•				•			•
Notoscincus butleri										•											
Notoscincus ornatus					•	•	•			•				•				•			
Proablepharus reginae					•	•	•							•				•			
Tiliqua multifasciata	Central Blue-tongue				•		•			•				•				•			
AGAMIDAE																					
Amphibolurus longirostris	Long-nosed Dragon				•	•	•			•				•				•			•
Caimanops amphiboluroides	Mulga Dragon				•		•														
Ctenophorus caudicinctus	Ring-tailed Dragon				•	•	•			•		•		•	•			•			•
Ctenophorus isolepis	Central Military Dragon				•		•			•		•		•	•			•			
Ctenophorus nuchalis	Central Netted Dragon				•					•		•		•	•			•			
Ctenophorus reticulatus	Western Netted Dragon				•													•			
Ctenophorus scutulatus	Lozenge-marked Dragon				•																
Diporiphora winneckei	Canegrass Dragon											•									

Family and Species	Common name	EPBC Act	WC Act	DEC	*ecologia* Internal Database	(Bamford and Wilcox 2001)	(Biota 2005)	(Biota 2007)	(Molhar 2007)	(Outback Ecology 2006)	(Outback Ecology 2010)	(Outback Ecology 2011)	(*ecologia* 2011a)	(*ecologia* 2011b)	(*ecologia* 2012b)	(*ecologia* 2014b)	(*ecologia* 2015a)	NatureMap	DPaW Threatened Fauna Database	DoE Protected Matters Database	Current Survey
Diporiphora valens					•									•				•			
Pogona minor	Dwarf Bearded Dragon				•					•		•		•				•			
Tympanocryptis cephalus	Pebble Dragon				•		•														
VARANIDAE																					
Varanus acanthurus	Spiny-tailed Monitor				•	•	•			•				•				•			•
Varanus brevicauda	Short-tailed Pygmy Monitor				•		•			•				•				•			
Varanus bushi	Pilbara Monitor				•																
Varanus caudolineatus	Stripe-tailed Monitor				•																
Varanus eremius	Pygmy Desert Monitor				•		•			•		•		•				•			
Varanus giganteus	Perentie				•	•								•				•			
Varanus gouldii	Gould's Monitor				•		•					•		•				•			
Varanus panoptes	Yellow-spotted Monitor				•		•			•				•	•			•			
Varanus pilbarensis	Pilbara Rock Monitor				•					•				•				•			
Varanus tristis	Black-headed Monitor				•					•				•				•			•
TYPHLOPIDAE																					
Ramphotyphlops ammodytes					•		•					•		•				•			
Ramphotyphlops ganei				**P1**														•	•		
Ramphotyphlops grypus	Beaked Blind Snake				•		•			•				•				•			
Ramphotyphlops pilbarensis	Pilbara Blind Snake									•		•									
BOIDAE																					
Antaresia perthensis	Pygmy Python				•	•	•							•							
Antaresia stimsoni	Stimson's Python				•		•			•				•				•			
Aspidites melanocephalus	Black-headed Python				•		•														
Liasis olivaceus barroni	Pilbara Olive Python	**VU**	**S1**	**VU**	•								•	•		•		•	•	•	
ELAPIDAE																					
Acanthophis wellsi	Pilbara Death Adder									•				•							
Brachyurophis approximans	NW Shovel-nosed Snake				•		•			•				•				•			
Brachyurophis fasciolata	Narrow-banded Shovel-nosed Snake																	•			
Demansia psammophis	Yellow-faced Whipsnake				•		•			•				•				•			
Demansia rufescens	Rufous Whipsnake				•	•	•			•				•				•			
Furina ornata	Moon Snake				•		•			•		•		•				•			
Parasuta monachus	Monk Snake				•					•				•							
Pseudechis australis	Mulga Snake				•		•			•				•	•			•			
Pseudonaja mengdeni	Western Brown Snake				•					•				•				•			•
Pseudonaja modesta	Ringed Brown Snake				•					•		•		•				•			
Suta fasciata	Rosen's Snake						•							•				•			
Suta punctata	Spotted Snake						•											•			
Vermicella snelli	Bandy Bandy																	•			

Amphibians

Family and Species	Common name	EPBC Act	WC Act	DEC	*ecologia* Internal Database	(Bamford and Wilcox 2001)	(Biota 2005)	(Biota 2007)	(Molhar 2007)	(Outback Ecology 2006)	(Outback Ecology 2010)	(Outback Ecology 2011)	(*ecologia* 2011a)	(*ecologia* 2011b)	(*ecologia* 2012b)	(*ecologia* 2014b)	(*ecologia* 2015a)	NatureMap	DPaW Threatened Fauna Database	DoEProtected Matters Database	Current Survey
HYLIDAE																					
Cyclorana australis	Giant Frog						•						•	•				•			
Cyclorana maini	Sheep Frog				•		•			•		•	•	•				•			
Litoria rubella	Little Red Tree Frog				•	•	•			•			•	•				•			
LIMNODYNASTIDAE																					
Neobatrachus sutor	Shoemaker Frog																	•			
Notaden nichollsi	Desert Spadefoot						•						•	•				•			
Platyplectrum spenceri	Centralian Burrowing Frog				•		•						•	•	•			•			
MYOBATRACHIDAE																					
Uperoleia glandulosum	Northwest Toadlet				◊	◊	◊			◊			◊	◊				◊			
Uperoleia saxalitis sp. nov.	Northwest Toadlet				◊	◊	◊			◊			◊	◊				◊			

◊ *U. russelli* has been recently split up, previous records can be either *U. glandulosum* or *U. saxatilis* sp. nov.

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APPENDIX D FLORA QUADRAT DATA

Site:	Q001		
Botanist:	Melissa Hay	**Date:**	8/22/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0693464 7645336
Habitat:	River (>30m)	**Soil:**	Sand (brown/white)
Surface layer:	Loose; rocky	**Rocks:**	Granite; (10-30%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Good (Weeds; Animal Tracks; Grazing)		

Taxa	Canopy cover (%)	Stratum
Acacia ampliceps	1	Shrub (>2 m); Shrub (1-2 m)
Acacia coriacea	5	Shrub (>2 m); Tree (<10 m)
Acacia trachycarpa	2	Shrub (>2 m)
Aerva javanica	0.1	Shrub (<1 m)
Ammannia baccifera	0.1	Herb
Atalaya hemiglauca	0.1	Shrub (<1 m)
Calandrinia quadrivalvis	0.1	Herb
Cenchrus ciliaris	5	Tussock Grass (<1 m)
Cenchrus setiger	0.1	Tussock Grass (<1 m)
Chloris barbata	0.1	Tussock Grass (<1 m)
Cleome viscosa	0.1	Herb
Corchorus parviflorus	0.1	Shrub (<1 m)
Corchorus sp.	0.1	Shrub (<1 m)
Corchorus tectus	0.1	Shrub (<1 m)
Crotalaria cunninghamii subsp. *sturtii*	0.1	Shrub (1-2 m)
Cyperus squarrosus	0.1	Sedge (<1 m)
Cyperus vaginatus	0.1	Sedge (<1 m)
Dactyloctenium radulans	0.1	Tussock Grass (<1 m)
Dichanthium sericeum	0.1	Tussock Grass (<1 m)
Digitaria brownii	0.1	Tussock grass (<1 m)
Eragrostis cumingii	0.1	Tussock Grass (<1 m)
Eragrostis tenellula	0.1	Tussock Grass (<1 m)
Eriachne aristidea	0.1	Tussock Grass (<1 m)
Eriachne benthamii	0.1	Tussock Grass (<1 m)
Eucalyptus camaldulensis subsp. *obtusa*	2	Tree (<10 m)
Euphorbia australis	0.1	Herb
Euphorbia biconvexa	0.1	Herb
Hybanthus aurantiacus	0.1	Shrub (<1 m)
Malvastrum americanum	0.1	Shrub (<1 m)
Melaleuca glomerata	10	Shrub (>2 m); Shrub (1-2 m)
Melaleuca linophylla	10	Shrub (1-2 m)
Panicum decompositum	0.1	Tussock Grass (<1 m)
Phyllanthus maderaspatensis	0.1	Herb
Pluchea dentex	0.1	Shrub (<1 m)
Polycarpaea longiflora	0.1	Herb
Rhynchosia minima	0.1	Shrub (<1 m)
Senna notabilis	0.1	Shrub (<1 m)
Sesbania cannabina	0.1	Shrub (<1 m)
Sida echinocarpa	0.1	Shrub (<1 m)
Stemodia grossa	0.1	Shrub (<1 m)
Triodia epactia	1	Hummock grass (<1 m)
Triumfetta aff. *ramosa*	0.1	Shrub (<1 m)
Wahlenbergia tumidifructa	0.1	Herb

Site:	Q002		
Botanist:	Melissa Hay	**Date:**	8/22/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0693124 7646421
Habitat:	River (>30m)	**Soil:**	Sand (brown/white)
Surface layer:	Loose; rocky	**Rocks:**	Ironstone; Granite; Few (<10%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Good (Weeds; Animal Tracks; Grazing; Faeces)		

Taxa	Canopy cover (%)	Stratum
Acacia ampliceps	2	Shrub (>2 m)
Acacia coriacea	3	Shrub (>2 m); Tree (<10 m)
Acacia trachycarpa	3	Shrub (>2 m)
Aerva javanica	0.1	Shrub (<1 m)
Atalaya hemiglauca	0.1	Shrub (<1 m)
Calandrinia quadrivalvis	0.1	Herb
Cassytha capillaris	0.1	Climber
Cenchrus ciliaris	5	Tussock Grass (<1 m)
Cenchrus setiger	2	Tussock Grass (<1 m)
Cleome viscosa	0.1	Herb
Corchorus laniflorus	0.1	Shrub (<1 m)
Corchorus sp.	0.1	Shrub (<1 m)
Crotalaria cunninghamii subsp. *sturtii*	0.1	Shrub (1-2 m)
Cyperus vaginatus	1	Sedge (<1 m)
Eucalyptus camaldulensis subsp. *obtusa*	3	Tree (<10 m)
Euphorbia australis	0.1	Herb
Euphorbia biconvexa	0.1	Herb
Hibiscus austrinus var. *austrinus*	0.1	Shrub (1-2 m)
Hybanthus aurantiacus	0.1	Shrub (<1 m)
Melaleuca argentea	8	Tree (<10 m)
Melaleuca glomerata	5	Shrub (>2 m)
Melaleuca linophylla	25	Shrub (1-2 m)
Paspalidium basicladum	0.1	Tussock Grass (<1 m)
Phyllanthus maderaspatensis	0.1	Shrub (<1 m)
Polycarpaea longiflora	0.1	Herb
Ptilotus fusiformis	0.1	Herb
Rhynchosia minima	0.1	Shrub (<1 m)
Solanum ?lasiophyllum	0.1	Shrub (<1 m)
Stemodia grossa	1	Shrub (<1 m)
Synaptantha tillaeacea var. *tillaeacea*	0.1	Herb
Triodia epactia	5	Hummock grass (<1 m)
Wahlenbergia tumidifructa	0.1	Herb

Site:	Q003		
Botanist:	Melissa Hay	**Date:**	8/23/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0699143 7644866
Habitat:	Plain	**Soil:**	Sandy-clay (red/orange)
Surface layer:	Crust; rocky	**Rocks:**	Ironstone; (30-70%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia ancistrocarpa	10	Shrub (>2 m)
Acacia inaequilatera	3	Shrub (>2 m)
Acacia maitlandii	0.1	Shrub (1-2 m)
Bonamia erecta	0.1	Shrub (<1 m)
Corchorus tectus	0.1	Shrub (<1 m)
Gossypium australe	0.1	Shrub (<1 m)
Grevillea wickhamii subsp. *aprica*	0.1	Shrub (>2 m)
Indigofera monophylla	0.1	Shrub (<1 m)
Ptilotus astrolasius	0.1	Shrub (<1 m)
Senna glutinosa subsp. *glutinosa*	0.1	Shrub (1-2 m)
Senna glutinosa subsp. *pruinosa*	0.1	Shrub (1-2 m)
Triodia epactia	0.1	Hummock grass (<1 m)
Triodia lanigera	40	Hummock grass (<1 m)
Tripogon loliiformis	0.1	Tussock Grass (<1 m)

Site:	Q004		
Botanist:	Melissa Hay	**Date:**	8/23/2015
Quadrat size:	10 x 250 m	**NW corner (GDA94):**	50K 0698240 7643741
Habitat:	Drainage line on plain	**Soil:**	Sand; sandy-clay (red/orange)
Surface layer:	Loose; crust	**Rocks:**	Ironstone; Calcrete; Granite; Few (<10%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Good (Weeds; Animal Tracks; Grazing; Faeces)		

Taxa	Canopy cover (%)	Stratum
Acacia bivenosa	10	Shrub (>2 m); Shrub (1-2 m)
Acacia coriacea subsp. *pendens*	0.1	Shrub (<1 m)
Acacia elachantha	2	Shrub (>2 m)
Acacia stellaticeps	15	Shrub (<1 m)
Acacia tumida var. *pilbarensis*	5	Shrub (>2 m)
Aerva javanica	0.1	Shrub (<1 m)
Ammannia baccifera	0.1	Herb
Bonamia erecta	0.1	Shrub (<1 m)
Bulbostylis barbata	0.1	Sedge (<1 m)
Cajanus cinereus	0.1	Shrub (1-2 m)
Calandrinia quadrivalvis	0.1	Herb
Calandrinia stagnensis	0.1	Herb
Calocephalus beardii	0.1	Herb
Cassytha capillaris	0.1	Climber
Cenchrus ciliaris	3	Tussock Grass (<1 m)
Chrysopogon fallax	0.1	Tussock Grass (<1 m)
Cleome viscosa	0.1	Herb
Corchorus parviflorus	0.1	Shrub (<1 m)
Crotalaria cunninghamii subsp. *sturtii*	0.1	Shrub (1-2 m)
Cymbopogon ambiguus	0.1	Tussock Grass (<1 m)
Cyperus blakeanus	0.1	Sedge (<1 m)
Cyperus vaginatus	0.1	Sedge (<1 m)
Eragrostis cumingii	0.1	Tussock Grass (<1 m)
Eragrostis tenellula	0.1	Tussock Grass (<1 m)
Eriachne mucronata	0.1	Tussock Grass (<1 m)
Eulalia aurea	0.1	Tussock Grass (<1 m)
Euphorbia biconvexa	0.1	Herb
Goodenia microptera	0.1	Herb
Gossypium australe	0.1	Shrub (<1 m)
Grevillea wickhamii subsp. *hispidula*	0.1	Shrub (>2 m)
Hakea lorea subsp. *lorea*	0.1	Shrub (>2 m)
Heteropogon contortus	0.1	Tussock Grass (<1 m)
Hybanthus aurantiacus	0.1	Shrub (<1 m)
Indigofera monophylla	0.1	Shrub (<1 m)
Ipomoea muelleri	0.1	Climber
Isotropis atropurpurea	0.1	Shrub (<1 m)
Malvastrum americanum	0.1	Shrub (1-2 m)
Panicum decompositum	0.1	Tussock Grass (<1 m)
Paraneurachne muelleri	1	Tussock Grass (<1 m)
Phyllanthus maderaspatensis	0.1	Herb
Pluchea dentex	0.1	Shrub (<1 m)
Pluchea ferdinandi-muelleri	0.1	Shrub (<1 m)
Pluchea rubelliflora	0.1	Shrub (<1 m)
Pluchea tetranthera	0.1	Shrub (<1 m)
Pterocaulon sphacelatum	0.1	Shrub (<1 m)
Ptilotus aervoides	0.1	Herb
Rhynchosia minima	0.1	Shrub (<1 m)
Schenkia australis	0.1	Herb
Schizachyrium fragile	0.1	Tussock Grass (<1 m)
Senna glutinosa subsp. *glutinosa*	0.1	Shrub (1-2 m)
Senna notabilis	0.1	Shrub (<1 m)
Sida arenicola	0.1	Shrub (<1 m)
Solanum diversiflorum	0.1	Shrub (<1 m)
Solanum piceum	0.1	Shrub (<1 m)
Stemodia grossa	0.1	Shrub (<1 m)
Tephrosia supina	0.1	Shrub (<1 m)
Themeda triandra	3	Tussock Grass (<1 m)
Trachymene oleracea	0.1	Herb
Triodia epactia	30	Hummock grass (<1 m)
Triumfetta chaetocarpa	0.1	Shrub (<1 m)
Wahlenbergia tumidifructa	0.1	Herb
Zygophyllum iodocarpum	0.1	Shrub (<1 m)

Site:	Q005		
Botanist:	Melissa Hay	**Date:**	8/23/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0696926 7644550
Habitat:	Plain	**Soil:**	Sandy-clay (red/orange)
Surface layer:	Crust; rocky	**Rocks:**	Quartz; Granite; (30-70%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia ancistrocarpa	1	Shrub (>2 m); Shrub (1-2 m)
Acacia inaequilatera	5	Shrub (>2 m)
Bonamia erecta	0.1	Shrub (<1 m)
Corchorus tectus	0.1	Shrub (<1 m)
Gossypium australe	0.1	Shrub (<1 m)
Grevillea pyramidalis subsp. *leucadendron*	0.1	Shrub (>2 m)
Indigofera monophylla	0.1	Shrub (<1 m)
Isotropis atropurpurea	0.1	Shrub (<1 m)
Ptilotus astrolasius	0.1	Shrub (<1 m)
Senna glutinosa subsp. *glutinosa*	0.1	Shrub (1-2 m)
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	0.1	Shrub (<1 m)
Triodia epactia	0.1	Hummock grass (<1 m)
Triodia lanigera	40	Hummock grass (<1 m)

Site:	Q006		
Botanist:	Melissa Hay	**Date:**	8/23/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0695915 7644552
Habitat:	Plain	**Soil:**	Sandy-clay (red/orange)
Surface layer:	Crust	**Rocks:**	No rocks
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia ancistrocarpa	5	Shrub (>2 m)
Acacia inaequilatera	1	Shrub (>2 m)
Acacia stellaticeps	10	Shrub (<1 m)
Bonamia linearis	0.1	Herb
Corchorus tectus	0.1	Shrub (<1 m)
Goodenia microptera	0.1	Herb
Grevillea wickhamii	0.1	Shrub (>2 m)
Mollugo molluginea	0.1	Herb
Paraneurachne muelleri	0.1	Tussock Grass (<1 m)
Pluchea tetranthera	0.1	Shrub (<1 m)
Ptilotus astrolasius	0.1	Shrub (<1 m)
Senna glutinosa subsp. *glutinosa*	0.1	Shrub (<1 m)
Sida cardiophylla	0.1	Shrub (<1 m)
Triodia epactia	0.1	Hummock grass (<1 m)
Triodia lanigera	25	Hummock grass (<1 m)

Site:	Q007		
Botanist:	Melissa Hay	**Date:**	8/23/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0696232 7643332
Habitat:	Hillslope - midslope	**Soil:**	Sandy-clay (orange/brown)
Surface layer:	Rocky	**Rocks:**	Ironstone; Calcrete; Quartz; (>70%)
Slope:	Gentle	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia ancistrocarpa	0.1	Shrub (>2 m)
Acacia inaequilatera	5	Shrub (>2 m); Shrub (1-2 m)
Bonamia pilbarensis	0.1	Shrub (<1 m)
Corymbia hamersleyana	2	Mallee (<3m)
Indigofera rugosa	1	Shrub (<1 m)
Ptilotus astrolasius	0.1	Shrub (<1 m)
Scaevola amblyanthera var. *centralis*	0.1	Shrub (<1 m)
Senna artemisioides subsp. *oligophylla*	0.1	Shrub (<1 m)
Senna glaucifolia	0.1	Shrub (1-2 m)
Senna glutinosa subsp. *glutinosa*	0.1	Shrub (1-2 m)
Solanum chippendalei	0.1	Shrub (<1 m)
Triodia basedowii	15	Hummock grass (<1 m)
Triodia wiseana	20	Hummock grass (<1 m)
Zygophyllum iodocarpum	0.1	Shrub (<1 m)

Site:	Q008		
Botanist:	Melissa Hay	**Date:**	8/23/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0694208 7644201
Habitat:	Undulating plain	**Soil:**	Sandy-clay (red/brown)
Surface layer:	Rocky	**Rocks:**	Ironstone (>70%)
Slope:	Gentle	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia ancistrocarpa	2	Shrub (>2 m); Shrub (1-2 m)
Acacia inaequilatera	4	Shrub (>2 m)
Acacia stellaticeps	0.1	Shrub (<1 m)
Cassytha capillaris	0.1	Climber
Goodenia stobbsiana	0.1	Shrub (<1 m)
Grevillea wickhamii	0.1	Shrub (>2 m)
Indigofera rugosa	0.1	Shrub (<1 m)
Ptilotus astrolasius	0.1	Shrub (<1 m)
Triodia basedowii	10	Hummock grass (<1 m)
Triodia wiseana	30	Hummock grass (<1 m)
Zygophyllum iodocarpum	0.1	Shrub (<1 m)

Site:	Q009		
Botanist:	Melissa Hay	**Date:**	8/23/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0693226 7644321
Habitat:	Undulating plain	**Soil:**	Sandy-clay (red/brown)
Surface layer:	Rocky	**Rocks:**	Ironstone (>70%)
Slope:	Gentle	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia acradenia	8	Shrub (>2 m); Shrub (1-2 m)
Acacia inaequilatera	2	Shrub (>2 m)
Eriachne mucronata	0.1	Tussock Grass (<1 m)
Goodenia stobbsiana	0.1	Shrub (<1 m)
Grevillea wickhamii	0.1	Shrub (>2 m)
Petalostylis labicheoides	0.1	Shrub (>2 m)
Ptilotus astrolasius	0.1	Shrub (<1 m)
Ptilotus calostachyus	0.1	Herb
Triodia basedowii	3	Hummock grass (<1 m)
Triodia lanigera	20	Hummock grass (<1 m)
Triodia wiseana	10	Hummock grass (<1 m)

Site:	Q010		
Botanist:	Melissa Hay	**Date:**	8/24/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0695974 7647856
Habitat:	Major Creek (5-30m)	**Soil:**	Sand; Orange; White;
Surface layer:	Loose; rocky	**Rocks:**	Basalt; Few (<10%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Good (Weeds; Animal Tracks; Grazing; Faeces)		

Taxa	Canopy cover (%)	Stratum
Abutilon lepidum	0.1	Shrub (<1 m)
Acacia ampliceps	0.1	Shrub (1-2 m)
Acacia bivenosa	0.1	Shrub (1-2 m)
Acacia coriacea subsp. *pendens*	0.1	Shrub (1-2 m)
Acacia pyrifolia var. *pyrifolia*	0.1	Shrub (>2 m)
Acacia stellaticeps	0.1	Shrub (<1 m)
Acacia trachycarpa	15	Shrub (>2 m)
Amaranthus undulatus	0.1	Herb
Ammannia baccifera	0.1	Herb
Boerhavia coccinea	0.1	Shrub (<1 m)
Bonamia pannosa	0.1	Herb
Bulbostylis barbata	0.1	Sedge (<1 m)
Calandrinia quadrivalvis	0.1	Herb
Calandrinia stagnensis	0.1	Herb
Cenchrus ciliaris	15	Tussock Grass (<1 m)
Chrysopogon fallax	0.1	Tussock Grass (<1 m)
Cleome viscosa	0.1	Herb
Corchorus parviflorus	0.1	Shrub (<1 m)
Corchorus sp.	0.1	Shrub (<1 m)
Crotalaria cunninghamii subsp. *sturtii*	0.1	Shrub (1-2 m)
Cucumis variabilis	0.1	Climber
Cymbopogon ambiguus	0.1	Tussock Grass (<1 m)
Cyperus vaginatus	1	Sedge (<1 m)
Dactyloctenium radulans	0.1	Tussock Grass (<1 m)
Eragrostis cumingii	0.1	Tussock Grass (<1 m)
Eragrostis dielsii	0.1	Tussock Grass (<1 m)
Eragrostis tenellula	0.1	Tussock Grass (<1 m)
Eriachne benthamii	3	Tussock Grass (<1 m)
Eriachne mucronata	0.1	Tussock Grass (<1 m)
Eriachne pulchella subsp. *pulchella*	0.1	Tussock Grass (<1 m)
Eucalyptus camaldulensis subsp. *obtusa*	5	Tree (<10 m)
Eulalia aurea	0.1	Tussock Grass (<1 m)
Euphorbia australis	0.1	Herb
Euphorbia biconvexa	0.1	Herb
Evolvulus alsinoides var. *villosicalyx*	0.1	Herb
Goodenia microptera	0.1	Herb
Goodenia muelleriana	0.1	Herb
Grevillea pyramidalis subsp. *leucadendron*	0.1	Shrub (1-2 m)
Grevillea wickhamii	0.1	Shrub (<1 m)
Heliotropium cunninghamii	0.1	Shrub (<1 m)
Hibiscus austrinus var. *austrinus*	0.1	Shrub (1-2 m)
Hybanthus aurantiacus	0.1	Shrub (<1 m)
Indigofera colutea	0.1	Shrub (<1 m)
Isotropis atropurpurea	0.1	Shrub (<1 m)
Marsilea drummondii	0.1	Herb
Mollugo molluginea	0.1	Herb
Phyllanthus erwinii	0.1	Herb

Taxa	Canopy cover (%)	Stratum
Phyllanthus maderaspatensis	0.1	Herb
Pluchea ferdinandi-muelleri	0.1	Shrub (<1 m)
Pluchea rubelliflora	0.1	Shrub (<1 m)
Polycarpaea holtzei	0.1	Herb
Polycarpaea longiflora	0.1	Herb
Ptilotus aervoides	0.1	Herb
Ptilotus fusiformis	0.1	Herb
Rhynchosia minima	0.1	Shrub (<1 m)
Schenkia australis	0.1	Herb
Senna notabilis	0.1	Shrub (<1 m)
Sesbania cannabina	0.1	Shrub (<1 m)
Setaria dielsii	0.1	Tussock Grass (<1 m)
Sida arenicola	0.1	Shrub (<1 m)
Solanum chippendalei	0.1	Tree (<10 m)
Solanum diversiflorum	0.1	Shrub (<1 m)
Stemodia grossa	0.1	Shrub (<1 m)
Stemodia viscosa	0.1	Herb
Swainsona kingii	0.1	Herb
Synaptantha tillaeacea var. *tillaeacea*	0.1	Herb
Tephrosia clementii	0.1	Shrub (<1 m)
Tribulus hirsutus	0.1	Shrub (<1 m)
Trichodesma zeylanicum	0.1	Herb
Triodia epactia	5	Hummock grass (<1 m)
Triodia secunda	0.1	Hummock grass (<1 m)
Triumfetta chaetocarpa	0.1	Shrub (<1 m)
Vigna lanceolata var. *lanceolata*	0.1	Herb
Wahlenbergia tumidifructa	0.1	Herb
Waltheria indica	0.1	Shrub (<1 m)
Zygophyllum iodocarpum	0.1	Herb

Site:	Q011		
Botanist:	Melissa Hay	**Date:**	8/24/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 698410 7646566
Habitat:	Floodplain	**Soil:**	Sand; sandy-clay (brown/orange)
Surface layer:	Loose; crust	**Rocks:**	Quartz; Granite; (10-30%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Very Good (Weeds; Animal Tracks; Grazing)		

Taxa	Canopy cover (%)	Stratum
Acacia stellaticeps	4	Shrub (1-2 m)
Cenchrus ciliaris	0.1	Tussock Grass (<1 m)
Cleome viscosa	0.1	Herb
Dactyloctenium radulans	0.1	Tussock Grass (<1 m)
Eragrostis cumingii	0.1	Tussock Grass (<1 m)
Eragrostis tenellula	0.1	Tussock Grass (<1 m)
Eriachne aristidea	1	Tussock Grass (<1 m)
Eriachne mucronata	0.1	Tussock Grass (<1 m)
Euphorbia biconvexa	0.1	Herb
Euphorbia biconvexa	0.1	Herb
Goodenia microptera	0.1	Herb
Pluchea ferdinandi-muelleri	8	Shrub (1-2 m)
Sesbania cannabina	0.1	Shrub (1-2 m)
Sida arenicola	0.1	Shrub (1-2 m)
Triodia epactia	20	Hummock grass (<1 m)
Triodia secunda	5	Hummock grass (<1 m)

Site:	Q012		
Botanist:	Melissa Hay	**Date:**	8/24/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0699925 7644658
Habitat:	Rocky outcrop	**Soil:**	Sandy-clay (orange/brown)
Surface layer:	Crust; rocky	**Rocks:**	Granite; (>70%)
Slope:	Negligible/gentle	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Abutilon lepidum	0.1	Shrub (1-2 m)
Acacia tumida var. *pilbarensis*	12	Shrub (>2 m)
Aristida contorta	0.1	Tussock Grass (<1 m)
Aristida holathera var. *holathera*	0.1	Tussock Grass (<1 m)
Bonamia pannosa	0.1	Herb
Bulbostylis barbata	0.1	Sedge (<1 m)
Cajanus cinereus	0.1	Shrub (<1 m)
Chrysopogon fallax	0.1	Tussock Grass (<1 m)
Cleome viscosa	0.1	Herb
Corchorus parviflorus	0.1	Shrub (<1 m)
Crotalaria medicaginea var. *neglecta*	0.1	Herb
Eriachne mucronata	0.1	Tussock Grass (<1 m)
Eriachne pulchella	0.1	Tussock Grass (<1 m)
Eriachne pulchella subsp. *pulchella*	0.1	Tussock Grass (<1 m)
Euphorbia australis	0.1	Herb
Fimbristylis dichotoma	0.1	Sedge (<1 m)
Gomphrena canescens subsp. *canescens*	0.1	Herb
Goodenia microptera	0.1	Herb
Gossypium australe	0.1	Shrub (<1 m)
Grevillea pyramidalis subsp. *leucadendron*	0.1	Shrub (<1 m)
Hibiscus sturtii	0.1	Shrub (<1 m)
Indigofera monophylla	0.1	Shrub (<1 m)
Mollugo molluginea	0.1	Herb
Paspalidium basicladum	0.1	Tussock Grass (<1 m)
Polycarpaea corymbosa	0.1	Herb
Polycarpaea holtzei	0.1	Herb
Polycarpaea longiflora	0.1	Herb
Ptilotus fusiformis	0.1	Herb
Schizachyrium fragile	0.1	Tussock Grass (<1 m)
Trachymene oleracea	0.1	Herb
Tribulus hirsutus	0.1	Herb
Triodia epactia	20	Hummock grass (<1 m)
Triodia lanigera	1	Hummock grass (<1 m)
Tripogon loliiformis	0.1	Tussock Grass (<1 m)
Zornia albiflora	0.1	Herb

Site:	Q013		
Botanist:	Melissa Hay	**Date:**	8/24/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0701013 7644554
Habitat:	Rocky outcrop	**Soil:**	Sandy-clay (orange/brown)
Surface layer:	Crust; rocky	**Rocks:**	Granite; (>70%)
Slope:	Negligible/gentle	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Very Good (Grazing; Faeces)		

Taxa	Canopy cover (%)	Stratum
Abutilon lepidum	0.1	Shrub (<1 m)
Acacia tumida var. *pilbarensis*	20	Shrub (>2 m)
Aerva javanica	0.1	Shrub (1-2 m)
Amaranthus undulatus	0.1	Herb
Aristida holathera var. *holathera*	1	Tussock Grass (<1 m)
Bulbostylis barbata	0.1	Sedge (<1 m)
Cajanus cinereus	5	Shrub (1-2 m)
Cheilanthes sieberi subsp. *sieberi*	0.1	Herb
Chrysopogon fallax	0.1	Tussock Grass (<1 m)
Corchorus parviflorus	0.1	Shrub (<1 m)
Cucumis variabilis	0.1	Climber
Digitaria brownii	0.1	Tussock Grass (<1 m)
Eragrostis cumingii	0.1	Tussock Grass (<1 m)
Eragrostis eriopoda	0.1	Tussock Grass (<1 m)
Eriachne mucronata	1	Tussock Grass (<1 m)
Eriachne pulchella	0.1	Tussock Grass (<1 m)
Gomphrena canescens subsp. *canescens*	0.1	Herb
Goodenia microptera	0.1	Herb
Gossypium australe	0.1	Shrub (<1 m)
Hibiscus sturtii	0.1	Shrub (<1 m)
Indigofera monophylla	0.1	Shrub (<1 m)
Jasminum didymum subsp. *lineare*	0.1	Shrub (1-2 m)
Keraudrenia nephrosperma	0.1	Shrub (<1 m)
Mollugo molluginea	0.1	Herb
Paraneurachne muelleri	0.1	Tussock Grass (<1 m)
Perotis rara	0.1	Tussock Grass (<1 m)
Polycarpaea corymbosa	0.1	Herb
Polycarpaea longiflora	0.1	Herb
Schizachyrium fragile	0.1	Tussock Grass (<1 m)
Senna notabilis	0.1	Shrub (<1 m)
Sida cardiophylla	0.1	Shrub (1-2 m)
Sida rohlenae	0.1	Shrub (<1 m)
Tephrosia supina	0.1	Shrub (<1 m)
Trachymene oleracea	5	Herb
Triodia epactia	10	Hummock grass (<1 m)
Tripogon loliiformis	5	Tussock Grass (<1 m)
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)	0.1	Climber
Zornia albiflora	0.1	Herb

Site:	Q014		
Botanist:	Melissa Hay	**Date:**	8/24/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0701545 7645242
Habitat:	Floodplain	**Soil:**	Sandy-clay (orange/brown)
Surface layer:	Rocky	**Rocks:**	Granite; (>70%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia ancistrocarpa	0.1	Shrub (<1 m)
Acacia bivenosa	0.1	Shrub (<1 m)
Acacia hilliana	15	Shrub (<1 m)
Acacia spondylophylla	3	Shrub (<1 m)
Acacia stellaticeps	10	Shrub (<1 m)
Grevillea pyramidalis subsp. *leucadendron*	0.1	Shrub (<1 m)
Grevillea wickhamii subsp. *aprica*	0.1	Shrub (>2 m)
Pluchea tetranthera	0.1	Shrub (<1 m)
Senna notabilis	0.1	Shrub (<1 m)
Trachymene oleracea	0.1	Herb
Triodia epactia	1	Hummock grass (<1 m)
Triodia lanigera	25	Hummock grass (<1 m)

Site:	Q015		
Botanist:	Melissa Hay	**Date:**	8/22/2015
Quadrat size:	40 X 62.5 m	**NW corner (GDA94):**	50K 0705138 7643924
Habitat:	Hillslope - ridgetop	**Soil:**	Sandy-clay (red/orange)
Surface layer:	Rocky	**Rocks:**	Ironstone (>70%)
Slope:	Gentle/moderate	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia acradenia	0.1	Shrub (1-2 m)
Acacia inaequilatera	3	Shrub (>2 m)
Acacia spondylophylla	0.1	Shrub (<1 m)
Bonamia pilbarensis	0.1	Shrub (<1 m)
Eriachne mucronata	0.1	Tussock Grass (<1 m)
Eucalyptus leucophloia subsp. *leucophloia*	0.1	Shrub (<1 m)
Grevillea wickhamii	0.1	Shrub (1-2 m)
Hakea lorea subsp. *lorea*	0.1	Shrub (>2 m)
Indigofera monophylla	0.1	Shrub (<1 m)
Polygala isingii	0.1	Herb
Ptilotus astrolasius	0.1	Shrub (<1 m)
Solanum chippendalei	0.1	Shrub (<1 m)
Triodia wiseana	25	Hummock grass (<1 m)

Site:	Q016		
Botanist:	Melissa Hay	**Date:**	8/25/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0703954 7644095
Habitat:	Hillslope - midslope	**Soil:**	Sandy-clay (red/brown)
Surface layer:	Rocky	**Rocks:**	Ironstone (>70%)
Slope:	Gentle	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia acradenia	0.1	Shrub (1-2 m)
Acacia hilliana	1	Shrub (<1 m)
Acacia inaequilatera	2	Shrub (>2 m)
Acacia spondylophylla	2	Shrub (<1 m)
Bonamia pilbarensis	0.1	Herb
Eucalyptus leucophloia subsp. *leucophloia*	4	Tree (<10 m)
Grevillea wickhamii	0.1	Shrub (>2 m)
Ptilotus calostachyus	0.1	Herb
Senna glutinosa subsp. *glutinosa*	0.1	Shrub (1-2 m)
Triodia brizoides	3	Hummock grass (<1 m)
Triodia wiseana	30	Hummock grass (<1 m)

Site:	Q017		
Botanist:	Melissa Hay	**Date:**	8/25/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0701449 7642853
Habitat:	Plain	**Soil:**	Sand; sandy-clay (red/orange)
Surface layer:	Loose	**Rocks:**	No rocks
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Very Good (Animal Tracks; Grazing; Faeces)		

Taxa	Canopy cover (%)	Stratum
Acacia acradenia	15	Shrub (>2 m)
Acacia ancistrocarpa	3	Shrub (>2 m)
Acacia inaequilatera	3	Shrub (>2 m)
Acacia maitlandii	0.1	Shrub (<1 m)
Aristida holathera var. *holathera*	0.1	Tussock Grass (<1 m)
Boerhavia coccinea	0.1	Herb
Bonamia erecta	1	Shrub (<1 m)
Bonamia linearis	0.1	Climber
Bulbostylis barbata	0.1	Sedge (<1 m)
Chrysopogon fallax	0.1	Tussock grass (<1 m)
Eragrostis eriopoda	0.1	Tussock grass (<1 m)
Eriachne mucronata	0.1	Tussock Grass (<1 m)
Eriachne pulchella subsp. *pulchella*	0.1	Tussock Grass (<1 m)
Gossypium australe	0.1	Shrub (<1 m)
Indigofera monophylla	0.1	Shrub (<1 m)
Paraneurachne muelleri	0.1	Tussock Grass (<1 m)
Portulaca oleracea	0.1	Herb
Ptilotus astrolasius	0.1	Shrub (<1 m)
Senna artemisioides subsp. *helmsii*	0.1	Shrub (1-2 m)
Senna artemisioides subsp. *oligophylla*	0.1	Shrub (1-2 m)
Senna glutinosa subsp. *glutinosa*	0.1	Shrub (1-2 m)
Sida arenicola	0.1	Shrub (<1 m)
Trianthema triquetra	0.1	Herb
Tribulus hirsutus	0.1	Herb
Triodia lanigera	25	Hummock grass (<1 m)
Triodia schinzii	1	Hummock grass (<1 m)

Site:	Q018		
Botanist:	Melissa Hay	**Date:**	8/25/2015
Quadrat size:	25 x 100 m	**NW corner (GDA94):**	50K 0705435 7645239
Habitat:	Major Creek (5-30m)	**Soil:**	Sandy-clay (orange/brown)
Surface layer:	Rocky	**Rocks:**	Ironstone; Calcrete; Quartz; Granite; (>70%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Very Good (Weeds; Animal Tracks; Grazing; Faeces)		

Taxa	Canopy cover (%)	Stratum
Acacia ampliceps	3	Shrub (>2 m)
Acacia pyrifolia var. *pyrifolia*	15	Shrub (>2 m)
Acacia trachycarpa	1	Shrub (1-2 m)
Acacia tumida var. *pilbarensis*	0.1	Shrub (>2 m)
Aerva javanica	0.1	Shrub (<1 m)
Atalaya hemiglauca	1	Shrub (>2 m)
Cajanus cinereus	0.1	Shrub (1-2 m)
Cenchrus ciliaris	15	Tussock Grass (<1 m)
Cleome viscosa	0.1	Herb
Crotalaria cunninghamii subsp. *sturtii*	0.1	Shrub (1-2 m)
Cucumis variabilis	0.1	Climber
Cymbopogon ambiguus	0.1	Tussock Grass (<1 m)
Cyperus vaginatus	0.1	Sedge (<1 m)
Dysphania rhadinostachya subsp. *rhadinostachya*	0.1	Herb
Enneapogon cylindricus	0.1	Tussock Grass (<1 m)
Eucalyptus camaldulensis subsp. *obtusa*	20	Tree (<10 m)
Eucalyptus victrix	10	Tree (<10 m)
Euphorbia australis	0.1	Herb
Euphorbia biconvexa	0.1	Herb
Gossypium australe	0.1	Shrub (>2 m)
Melaleuca glomerata	1	Shrub (>2 m)
Melaleuca linophylla	5	Shrub (>2 m)
Petalostylis labicheoides	0.1	Shrub (>2 m)
Phyllanthus maderaspatensis	0.1	Herb
Pluchea ferdinandi-muelleri	0.1	Shrub (<1 m)
Pluchea rubelliflora	0.1	Shrub (<1 m)
Polycarpaea longiflora	0.1	Herb
Rhynchosia minima	0.1	Herb
Senna notabilis	0.1	Shrub (<1 m)
Sesbania cannabina	0.1	Shrub (<1 m)
Solanum chippendalei	0.1	Shrub (<1 m)
Stemodia grossa	0.1	Shrub (<1 m)
Tephrosia clementii	0.1	Shrub (<1 m)
Triodia epactia	10	Hummock grass (<1 m)
Triodia longiceps	1	Hummock grass (<1 m)

Site:	Q019		
Botanist:	Melissa Hay	**Date:**	8/26/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0702728 7644627
Habitat:	Plain	**Soil:**	Sand; sandy-clay (brown/orange)
Surface layer:	Loose	**Rocks:**	Granite; (10-30%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Very Good (Animal Tracks; Grazing; Faeces)		

Taxa	Canopy cover (%)	Stratum
Acacia acradenia	15	Shrub (>2 m)
Acacia ancistrocarpa	1	Shrub (>2 m)
Acacia inaequilatera	0.1	Shrub (>2 m)
Acacia maitlandii	0.1	Shrub (>2 m)
Aristida holathera var. *holathera*	0.1	Tussock Grass (<1 m)
Bonamia erecta	2	Shrub (<1 m)
Bonamia linearis	0.1	Herb
Corchorus tectus	0.1	Shrub (<1 m)
Corymbia hamersleyana	2	Tree (<10 m)
Cymbopogon obtectus	0.1	Tussock Grass (<1 m)
Dampiera candicans	0.1	Shrub (<1 m)
Eragrostis eriopoda	1	Tussock Grass (<1 m)
Gossypium australe	0.1	Shrub (<1 m)
Grevillea wickhamii	0.1	Shrub (1-2 m)
Hakea lorea subsp. *lorea*	0.1	Shrub (>2 m)
Indigofera monophylla	0.1	Shrub (<1 m)
Paraneurachne muelleri	2	Tussock Grass (<1 m)
Ptilotus astrolasius	0.1	Shrub (<1 m)
Senna artemisioides subsp. *helmsii*	0.1	Shrub (1-2 m)
Senna artemisioides subsp. *oligophylla*	0.1	Shrub (<1 m)
Sida arenicola	0.1	Shrub (<1 m)
Sida cardiophylla	0.1	Shrub (<1 m)
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	0.1	Shrub (<1 m)
Tephrosia virens	0.1	Shrub (1-2 m)
Triodia lanigera	35	Hummock grass (<1 m)

Site:	Q020		
Botanist:	Melissa Hay	**Date:**	8/26/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0700337 7644283
Habitat:	Undulating plain	**Soil:**	Sandy-clay (red/orange)
Surface layer:	Rocky	**Rocks:**	Ironstone; quartz(>70%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia ancistrocarpa	7	Shrub (>2 m); Shrub (1-2 m)
Acacia inaequilatera	2	Shrub (>2 m)
Aristida contorta	0.1	Tussock Grass (<1 m)
Bonamia pilbarensis	0.1	Herb
Corymbia hamersleyana	0.1	Shrub (>2 m)
Gossypium australe	0.1	Shrub (<1 m)
Grevillea wickhamii subsp. *hispidula*	0.1	Shrub (>2 m)
Indigofera monophylla	0.1	Shrub (<1 m)
Mollugo molluginea	0.1	Herb
Ptilotus astrolasius	0.1	Shrub (<1 m)
Ptilotus calostachyus	0.1	Herb
Scaevola browniana	0.1	Herb
Senna glutinosa subsp. *glutinosa*	0.1	Shrub (1-2 m)
Sida cardiophylla	0.1	Shrub (1-2 m)
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	0.1	Shrub (<1 m)
Triodia lanigera	25	Hummock grass (<1 m)
Tripogon loliiformis	0.1	Tussock Grass (<1 m)

Site:	Q021		
Botanist:	Melissa Hay	**Date:**	8/26/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0696617 7645741
Habitat:	Rocky outcrop	**Soil:**	Sand; sandy-clay (red/orange)
Surface layer:	Rocky	**Rocks:**	Dolerite (>70%)
Slope:	Moderate	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	0.1	Shrub (<1 m)
Acacia ancistrocarpa	0.1	Shrub (>2 m)
Acacia inaequilatera	1	Shrub (>2 m)
Amaranthus undulatus	0.1	Herb
Aristida contorta	0.1	Tussock grass (<1 m)
Boerhavia coccinea	0.1	Herb
Corchorus laniflorus	0.1	Shrub (<1 m)
Cymbopogon ambiguus	1	Tussock Grass (<1 m)
Evolvulus alsinoides var. *villosicalyx*	0.1	Climber
Gomphrena cunninghamii	0.1	Herb
Gossypium australe	5	Shrub (<1 m)
Hibiscus goldsworthii	0.1	Shrub (<1 m)
Indigofera trita	0.1	Shrub (<1 m)
Paspalidium basicladum	0.1	Tussock Grass (<1 m)
Polycarpaea longiflora	0.1	Herb
Solanum chippendalei	0.1	Shrub (<1 m)
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	0.1	Shrub (<1 m)
Trichosanthes cucumerina	1	Climber
Triodia wiseana	45	Hummock grass (<1 m)
Triumfetta chaetocarpa	0.1	Shrub (<1 m)

Site:	Q022		
Botanist:	Melissa Hay	**Date:**	8/26/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0698435 7645345
Habitat:	Undulating plain	**Soil:**	Sandy-clay (red/orange)
Surface layer:	Crust; rocky	**Rocks:**	Granite; (10-30%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia ancistrocarpa	0.1	Shrub (<1 m)
Acacia inaequilatera	5	Shrub (>2 m)
Aristida holathera var. *holathera*	0.1	Tussock Grass (<1 m)
Boerhavia coccinea	0.1	Herb
Bonamia erecta	0.1	Shrub (<1 m)
Bulbostylis barbata	0.1	Sedge (<1 m)
Cleome viscosa	0.1	Herb
Corchorus laniflorus	0.1	Shrub (<1 m)
Gossypium australe	0.1	Shrub (1-2 m)
Grevillea pyramidalis subsp. *leucadendron*	0.1	Shrub (>2 m)
Indigofera monophylla	0.1	Shrub (<1 m)
Ptilotus aervoides	0.1	Herb
Ptilotus astrolasius	0.1	Shrub (<1 m)
Ptilotus fusiformis	0.1	Herb
Schizachyrium fragile	0.1	Tussock Grass (<1 m)
Senna notabilis	0.1	Shrub (<1 m)
Sida arenicola	0.1	Shrub (1-2 m)
Sida cardiophylla	0.1	Shrub (<1 m)
Solanum chippendalei	0.1	Shrub (<1 m)
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	0.1	Shrub (<1 m)
Tribulus hirsutus	0.1	Herb
Triodia epactia	10	Hummock grass (<1 m)
Triodia lanigera	20	Hummock grass (<1 m)
Tripogon loliiformis	0.1	Tussock Grass (<1 m)
Zygophyllum iodocarpum	0.1	Herb

Site:	Q023		
Botanist:	Melissa Hay	**Date:**	8/26/2015
Quadrat size:	50 x 50 m	**NW corner (GDA94):**	50K 0694164 7646081
Habitat:	Hillslope - midslope	**Soil:**	Sandy-clay (red/orange)
Surface layer:	Rocky	**Rocks:**	Ironstone; Calcrete; Granite; (>70%)
Slope:	Gentle/moderate	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia acradenia	3	Shrub (>2 m)
Acacia ancistrocarpa	0.1	Shrub (>2 m)
Bonamia pilbarensis	0.1	Shrub (<1 m)
Corymbia hamersleyana	0.1	Shrub (1-2 m)
Cymbopogon ambiguus	0.1	Tussock Grass (<1 m)
Enneapogon cylindricus	0.1	Tussock Grass (<1 m)
Eriachne mucronata	0.1	Tussock Grass (<1 m)
Gomphrena cunninghamii	0.1	Herb
Gossypium australe	0.1	Shrub (1-2 m)
Grevillea pyramidalis subsp. *leucadendron*	0.1	Shrub (1-2 m)
Grevillea wickhamii	0.1	Shrub (1-2 m)
Hakea lorea subsp. *lorea*	0.1	Shrub (>2 m)
Paraneurachne muelleri	0.1	Tussock Grass (<1 m)
Ptilotus astrolasius	0.1	Shrub (<1 m)
Ptilotus calostachyus	0.1	Herb
Scaevola browniana	0.1	Shrub (<1 m)
Senna artemisioides subsp. *oligophylla*	0.1	Shrub (<1 m)
Senna glutinosa subsp. *glutinosa*	0.1	Shrub (1-2 m)
Triodia basedowii	25	Hummock grass (<1 m)
Triodia wiseana	15	Hummock grass (<1 m)
Zygophyllum iodocarpum	0.1	Herb

Site:	R101		
Botanist:	Melissa Hay	**Date:**	8/24/2015
Quadrat size:	n/a	**NW corner (GDA94):**	50K 0697162 7647184
Habitat:	Undulating plain	**Soil:**	Sandy-clay (orange/brown)
Surface layer:	Rocky	**Rocks:**	Calcrete; Granite; (>70%)
Slope:	Negligible	**Time since fire:**	1-2 years
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia inaequilatera	5	Shrub (>2 m)
Corchorus parviflorus	5	Shrub (<1 m)
Corymbia hamersleyana	2	Tree (<10 m)
Ptilotus clementii	0.1	Herb
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	0.1	Shrub (<1 m)
Triodia lanigera	10	Hummock grass (<1 m)
Triodia wiseana	5	Hummock grass (<1 m)
Zornia albiflora	0.1	Shrub (<1 m)

Site:	R102		
Botanist:	Melissa Hay	**Date:**	8/24/2015
Quadrat size:	n/a	**NW corner (GDA94):**	50K 0697957 7646984
Habitat:	Plain	**Soil:**	Sand; sandy-clay (red/orange)
Surface layer:	Rocky	**Rocks:**	Granite; (>70%)
Slope:	Negligible	**Time since fire:**	< 1 year
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia ancistrocarpa	7	Shrub (1-2 m)
Acacia inaequilatera	2	Shrub (>2 m)
Corchorus parviflorus	3	Shrub (<1 m)
Indigofera monophylla	0.1	Shrub (<1 m)
Triodia lanigera	15	Hummock grass (<1 m)

Site:	R103		
Botanist:	Melissa Hay	**Date:**	8/24/2015
Quadrat size:	n/a	**NW corner (GDA94):**	50K 0699687 7646334
Habitat:	Undulating plain	**Soil:**	Sandy-clay (orange/brown)
Surface layer:	Rocky	**Rocks:**	Quartz; Granite; (>70%)
Slope:	Gentle	**Time since fire:**	< 1 year
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Corchorus parviflorus	2	Shrub (<1 m)
Senna glutinosa subsp. *glutinosa*	0.1	Shrub (1-2 m)
Triodia epactia	5	Hummock grass (<1 m)
Triodia lanigera	5	Hummock grass (<1 m)

Site:	R104		
Botanist:	Melissa Hay	**Date:**	8/24/2015
Quadrat size:	n/a	**NW corner (GDA94):**	50K 0701754 7644896
Habitat:	Hillslope - midslope	**Soil:**	Sandy-clay (red/orange)
Surface layer:	Rocky	**Rocks:**	Ironstone (>70%)
Slope:	Gentle	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia hilliana	10	Shrub (<1 m)
Acacia inaequilatera	3	Shrub (>2 m)
Acacia spondylophylla	2	Shrub (<1 m)
Corymbia hamersleyana	0.1	Tree (<10 m)
Triodia wiseana	35	Hummock grass (<1 m)

Site:	R105		
Botanist:	Melissa Hay	**Date:**	8/25/2015
Quadrat size:	n/a	**NW corner (GDA94):**	50K 0703304 7643791
Habitat:	Floodplain	**Soil:**	Sandy-clay (orange/brown)
Surface layer:	Rocky	**Rocks:**	Ironstone (>70%)
Slope:	Negligible/gentle	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia hilliana	10	Shrub (<1 m)
Acacia spondylophylla	5	Shrub (<1 m)
Corymbia hamersleyana	1	Tree (<10 m)
Grevillea wickhamii	15	Shrub (>2 m)
Triodia brizoides	15	Hummock grass (<1 m)
Triodia epactia	10	Hummock grass (<1 m)
Triodia wiseana	5	Hummock grass (<1 m)

Site:	R106		
Botanist:	Melissa Hay	**Date:**	8/25/2015
Quadrat size:	n/a	**NW corner (GDA94):**	50K 0703164 7643788
Habitat:	Drainage Line on footslope	**Soil:**	Sandy-clay (orange/brown)
Surface layer:	Rocky	**Rocks:**	Ironstone (>70%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia tumida var. *pilbarensis*	50	Shrub (>2 m)
Corymbia hamersleyana	1	Tree (<10 m)
Eriachne mucronata	0.1	Tussock Grass (<1 m)
Grevillea wickhamii	5	Shrub (>2 m)
Triodia wiseana	50	Hummock grass (<1 m)

Site:	R107		
Botanist:	Melissa Hay	**Date:**	8/25/2015
Quadrat size:	n/a	**NW corner (GDA94):**	50K 0702405 7643328
Habitat:	Hillslope - ridgetop	**Soil:**	Sandy-clay (orange/brown)
Surface layer:	Rocky	**Rocks:**	Ironstone (>70%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia hilliana	10	Shrub (<1 m)
Acacia inaequilatera	3	Shrub (>2 m)
Acacia spondylophylla	2	Shrub (<1 m)
Grevillea wickhamii	1	Shrub (>2 m)
Triodia lanigera	25	Hummock grass (<1 m)

Site:	R108		
Botanist:	Melissa Hay	**Date:**	8/26/2015
Quadrat size:	n/a	**NW corner (GDA94):**	50K 0693543 7642835
Habitat:	Undulating plain	**Soil:**	Sandy-clay (red/orange)
Surface layer:	Rocky	**Rocks:**	Ironstone (>70%)
Slope:	Negligible	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia acradenia	0.1	Shrub (1-2 m)
Acacia ancistrocarpa	10	Shrub (>2 m)
Ptilotus calostachyus	0.1	Herb
Senna glutinosa subsp. *glutinosa*	0.1	Shrub (1-2 m)
Triodia lanigera	30	Hummock grass (<1 m)

Site:	R109		
Botanist:	Melissa Hay	**Date:**	8/26/2015
Quadrat size:	n/a	**NW corner (GDA94):**	50K 0692459 7645975
Habitat:	Undulating plain	**Soil:**	Sandy-clay (red/orange)
Surface layer:	Rocky	**Rocks:**	Ironstone; quartz(>70%)
Slope:	Negligible/gentle	**Time since fire:**	No evidence
Vegetation condition and disturbance:	Excellent		

Taxa	Canopy cover (%)	Stratum
Acacia acradenia	2	Shrub (1-2 m)
Acacia inaequilatera	0.1	Shrub (>2 m)
Corymbia hamersleyana	2	Tree (<10 m)
Grevillea wickhamii	0.1	Shrub (1-2 m)
Triodia basedowii	20	Hummock grass (<1 m)
Triodia wiseana	5	Hummock grass (<1 m)

APPENDIX E ELECTRONIC APPENDICES

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Electronic Appendices:

E.1: FMG data supply

E.2: Site by species matrix (this study and regional)

E.3: Regional dendrogram

E.4: Photographs

E.5: Shapefiles

E.6 TPRF Form

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APPENDIX F FAUNA SAMPLING LOCATIONS

Site	Easting	Northing
Camera trap		
MC1	693444	7645447
MC2	693526	7645358
MC3	693470	7645409
MC4	693563	7645324
MC5	696640	7645981
MC6	695751	7647904
MC7	696694	7645811
MC8	696644	7645808
MC9	701669	7644002
MC10	701665	7644046
MC11	693393	7645581
MC12	695719	7647929
MC13	693381	7645607
Diurnal active search		
Opp1	696641	7645944
Opp2	693671	7645005
Opp3	699165	7644916
Opp4	697702	7645440
Opp5	697851	7643591
Opp6	695670	7646132
Opp7	695663	7644052
Opp8	694018	7645915
Opp9	696213	7647529
Opp10	700043	7644339
Opp11	701239	7643897
Opp12	703494	7645255
Opp13	702371	7644374
Opp14	705499	7643853
Opp15	704518	7644797
Opp16	702152	7644152
Opp17	701304	7644906
Opp18	699843	7645924
Opp19	693161	7646518

GDA94 Zone 50

APPENDIX G FLORA SPECIES LIST

Family	Taxa	Introduced flora
Aizoaceae	*Trianthema triquetra*	
Amaranthaceae	*Aerva javanica*	Introduced flora
Amaranthaceae	*Amaranthus undulatus*	
Amaranthaceae	*Gomphrena canescens* subsp. *canescens*	
Amaranthaceae	*Gomphrena cunninghamii*	
Amaranthaceae	*Ptilotus aervoides*	
Amaranthaceae	*Ptilotus astrolasius*	
Amaranthaceae	*Ptilotus calostachyus*	
Amaranthaceae	*Ptilotus clementii*	
Amaranthaceae	*Ptilotus fusiformis*	
Amaranthaceae	*Ptilotus nobilis* subsp. *nobilis*	
Apocynaceae	*Sarcostemma viminale* subsp. *australe*	
Araliaceae	*Trachymene oleracea* subsp. *oleracea*	
Asteraceae	*Calocephalus beardii*	
Asteraceae	*Flaveria trinervia*	Introduced flora
Asteraceae	*Peripleura arida*	
Asteraceae	*Pluchea dentex*	
Asteraceae	*Pluchea ferdinandi-muelleri*	
Asteraceae	*Pluchea rubelliflora*	
Asteraceae	*Pluchea tetranthera*	
Asteraceae	*Pterocaulon sphacelatum*	
Asteraceae	*Rhodanthe margarethae*	
Asteraceae	*Streptoglossa odora*	
Boraginaceae	*Heliotropium chrysocarpum*	
Boraginaceae	*Heliotropium crispatum*	
Boraginaceae	*Heliotropium cunninghamii*	
Boraginaceae	*Trichodesma zeylanicum* var. *zeylanicum*	
Brassicaceae	*Lepidium pholidogynum*	
Campanulaceae	*Wahlenbergia tumidifructa*	
Caryophyllaceae	*Polycarpaea corymbosa* var. *corymbosa*	
Caryophyllaceae	*Polycarpaea holtzei*	
Caryophyllaceae	*Polycarpaea longiflora*	
Celastraceae	*Stackhousia* sp. swollen gynophore (W.R. Barker 2041)	
Chenopodiaceae	*Dysphania kalpari*	
Chenopodiaceae	*Dysphania rhadinostachya*	
Chenopodiaceae	*Salsola australis*	
Cleomaceae	*Cleome viscosa*	
Convolvulaceae	*Bonamia erecta*	
Convolvulaceae	*Bonamia linearis*	
Convolvulaceae	*Bonamia pannosa*	
Convolvulaceae	*Bonamia pilbarensis*	
Convolvulaceae	*Evolvulus alsinoides* var. *villosicalyx*	
Convolvulaceae	*Ipomoea muelleri*	
Convolvulaceae	*Polymeria ambigua*	
Cucurbitaceae	*Citrullus lanatus*	Introduced flora
Cucurbitaceae	*Cucumis variabilis*	
Cucurbitaceae	*Trichosanthes cucumerina* var. *cucumerina*	
Cyperaceae	*Bulbostylis barbata*	
Cyperaceae	*Cyperus blakeanus*	
Cyperaceae	*Cyperus cunninghamii*	
Cyperaceae	*Cyperus difformis*	

Family	Taxa	Introduced flora
Cyperaceae	*Cyperus squarrosus*	
Cyperaceae	*Cyperus vaginatus*	
Cyperaceae	*Fimbristylis dichotoma*	
Cyperaceae	*Schoenoplectus dissachanthus*	
Euphorbiaceae	*Euphorbia australis*	
Euphorbiaceae	*Euphorbia biconvexa*	
Euphorbiaceae	*Euphorbia boophthona*	
Euphorbiaceae	*Euphorbia schultzii*	
Fabaceae	*Acacia acradenia*	
Fabaceae	*Acacia ampliceps*	
Fabaceae	*Acacia ancistrocarpa*	
Fabaceae	*Acacia bivenosa*	
Fabaceae	*Acacia coriacea*	
Fabaceae	*Acacia coriacea* subsp. *pendens*	
Fabaceae	*Acacia elachantha*	
Fabaceae	*Acacia hilliana*	
Fabaceae	*Acacia inaequilatera*	
Fabaceae	*Acacia maitlandii*	
Fabaceae	*Acacia orthocarpa*	
Fabaceae	*Acacia pyrifolia* var. *pyrifolia*	
Fabaceae	*Acacia spondylophylla*	
Fabaceae	*Acacia stellaticeps*	
Fabaceae	*Acacia trachycarpa*	
Fabaceae	*Acacia tumida var. pilbarensis*	
Fabaceae	*Cajanus cinereus*	
Fabaceae	*Crotalaria cunninghamii*	
Fabaceae	*Crotalaria medicaginea* var. *neglecta*	
Fabaceae	*Cullen lachnostachys*	
Fabaceae	*Cullen leucanthum*	
Fabaceae	*Cullen leucochaites*	
Fabaceae	*Indigofera colutea*	
Fabaceae	*Indigofera linifolia*	
Fabaceae	*Indigofera monophylla*	
Fabaceae	*Indigofera rugosa*	
Fabaceae	*Indigofera trita*	
Fabaceae	*Isotropis atropurpurea*	
Fabaceae	*Petalostylis labicheoides*	
Fabaceae	*Rhynchosia minima*	
Fabaceae	*Senna artemisioides* subsp. *helmsii*	
Fabaceae	*Senna artemisioides* subsp. *oligophylla*	
Fabaceae	*Senna glaucifolia*	
Fabaceae	*Senna glutinosa* subsp. *glutinosa*	
Fabaceae	*Senna glutinosa* subsp. *pruinosa*	
Fabaceae	*Senna notabilis*	
Fabaceae	*Sesbania cannabina*	
Fabaceae	*Swainsona formosa*	
Fabaceae	*Swainsona kingii*	
Fabaceae	*Tephrosia clementii*	
Fabaceae	*Tephrosia* sp. B Kimberley Flora (C.A. Gardner 7300)	
Fabaceae	*Tephrosia* sp. Bungaroo Creek (M.E. Trudgen 11601)	
Fabaceae	*Tephrosia supina*	
Fabaceae	*Tephrosia virens*	

Family	Taxa	Introduced flora
Fabaceae	*Vigna lanceolata*	
Fabaceae	*Vigna* sp. Hamersley Clay (A.A. Mitchell PRP 113)	
Fabaceae	*Zornia albiflora*	
Gentianaceae	*Schenkia australis*	
Goodeniaceae	*Dampiera candicans*	
Goodeniaceae	*Goodenia microptera*	
Goodeniaceae	*Goodenia muelleriana*	
Goodeniaceae	*Goodenia stobbsiana*	
Goodeniaceae	*Goodenia triodiophila*	
Goodeniaceae	*Scaevola amblyanthera* var. *centralis*	
Goodeniaceae	*Scaevola browniana* subsp. *browniana*	
Lauraceae	*Cassytha capillaris*	
Lythraceae	*Ammannia baccifera*	
Malvaceae	*Abutilon fraseri* subsp. *fraseri*	
Malvaceae	*Abutilon lepidum*	
Malvaceae	*Abutilon* sp. Dioicum (A.A. Mitchell PRP 1618)	
Malvaceae	*Corchorus laniflorus*	
Malvaceae	*Corchorus parviflorus*	
Malvaceae	*Corchorus* sp.	
Malvaceae	*Corchorus tectus*	
Malvaceae	*Gossypium australe*	
Malvaceae	*Gossypium robinsonii*	
Malvaceae	*Hibiscus austrinus* var. *austrinus*	
Malvaceae	*Hibiscus burtonii*	
Malvaceae	*Hibiscus coatesii*	
Malvaceae	*Hibiscus goldsworthii*	
Malvaceae	*Hibiscus sturtii*	
Malvaceae	*Keraudrenia nephrosperma*	
Malvaceae	*Malvastrum americanum*	Introduced flora
Malvaceae	*Sida arenicola*	
Malvaceae	*Sida cardiophylla*	
Malvaceae	*Sida echinocarpa*	
Malvaceae	*Sida rohlenae* subsp. *rohlenae*	
Malvaceae	*Triumfetta* aff. *ramosa*	Novel taxon
Malvaceae	*Triumfetta chaetocarpa*	
Malvaceae	*Waltheria indica*	
Marsileaceae	*Marsilea drummondii*	
Marsileaceae	*Marsilea hirsuta*	
Molluginaceae	*Mollugo molluginea*	
Moraceae	*Ficus brachypoda*	
Myrtaceae	*Corymbia hamersleyana*	
Myrtaceae	*Eucalyptus camaldulensis*	
Myrtaceae	*Eucalyptus leucophloia* subsp. *leucophloia*	
Myrtaceae	*Eucalyptus victrix*	
Myrtaceae	*Melaleuca argentea*	
Myrtaceae	*Melaleuca eleuterostachya*	
Myrtaceae	*Melaleuca glomerata*	
Myrtaceae	*Melaleuca linophylla*	
Nyctaginaceae	*Boerhavia coccinea*	
Oleaceae	*Jasminum didymum* subsp. *lineare*	
Phyllanthaceae	*Flueggea virosa* subsp. *melanthesoides*	
Phyllanthaceae	*Phyllanthus erwinii*	

Family	Taxa	Introduced flora
Phyllanthaceae	*Phyllanthus maderaspatensis*	
Plantaginaceae	*Stemodia grossa*	
Plantaginaceae	*Stemodia viscosa*	
Poaceae	*Aristida contorta*	
Poaceae	*Aristida holathera* var. *holathera*	
Poaceae	*Cenchrus ciliaris*	Introduced flora
Poaceae	*Cenchrus setiger*	Introduced flora
Poaceae	*Chloris barbata*	Introduced flora
Poaceae	*Chrysopogon fallax*	
Poaceae	*Cymbopogon ambiguus*	
Poaceae	*Cymbopogon obtectus*	
Poaceae	*Dactyloctenium radulans*	
Poaceae	*Dichanthium sericeum*	
Poaceae	*Digitaria brownii*	
Poaceae	*Enneapogon caerulescens*	
Poaceae	*Enneapogon cylindricus*	
Poaceae	*Eragrostis cumingii*	
Poaceae	*Eragrostis dielsii*	
Poaceae	*Eragrostis eriopoda*	
Poaceae	*Eragrostis tenellula*	
Poaceae	*Eriachne aristidea*	
Poaceae	*Eriachne benthamii*	
Poaceae	*Eriachne melicacea*	
Poaceae	*Eriachne mucronata*	
Poaceae	*Eriachne pulchella*	
Poaceae	*Eriachne pulchella* subsp. *pulchella*	
Poaceae	*Eulalia aurea*	
Poaceae	*Heteropogon contortus*	
Poaceae	*Panicum decompositum*	
Poaceae	*Paraneurachne muelleri*	
Poaceae	*Paspalidium basicladum*	
Poaceae	*Perotis rara*	
Poaceae	*Schizachyrium fragile*	
Poaceae	*Setaria dielsii*	
Poaceae	*Sporobolus australasicus*	
Poaceae	*Themeda triandra*	
Poaceae	*Triodia basedowii*	
Poaceae	*Triodia brizoides*	
Poaceae	*Triodia epactia*	
Poaceae	*Triodia lanigera*	
Poaceae	*Triodia longiceps*	
Poaceae	*Triodia schinzii*	
Poaceae	*Triodia secunda*	
Poaceae	*Triodia wiseana*	
Poaceae	*Tripogon loliiformis*	
Polygalaceae	*Polygala isingii*	
Portulacaceae	*Calandrinia quadrivalvis*	
Portulacaceae	*Calandrinia stagnensis*	
Portulacaceae	*Portulaca oleracea*	
Proteaceae	*Grevillea pyramidalis* subsp. *leucadendron*	
Proteaceae	*Grevillea wickhamii*	
Proteaceae	*Grevillea wickhamii* subsp. *aprica*	

Family	Taxa	Introduced flora
Proteaceae	*Grevillea wickhamii* subsp. *hispidula*	
Proteaceae	*Hakea lorea* subsp. *lorea*	
Pteridaceae	*Cheilanthes sieberi* subsp. *sieberi*	
Rubiaceae	*Oldenlandia crouchiana*	
Rubiaceae	*Synaptantha tillaeacea* var. *tillaeacea*	
Sapindaceae	*Atalaya hemiglauca*	
Solanaceae	*Nicotiana benthamiana*	
Solanaceae	*Solanum ?lasiophyllum*	
Solanaceae	*Solanum chippendalei*	
Solanaceae	*Solanum diversiflorum*	
Solanaceae	*Solanum piceum*	
Typhaceae	*Typha domingensis*	
Violaceae	*Hybanthus aurantiacus*	
Zygophyllaceae	*Tribulus hirsutus*	
Zygophyllaceae	*Tribulus occidentalis*	
Zygophyllaceae	*Tribulus platypterus*	
Zygophyllaceae	*Tribulus suberosus*	
Zygophyllaceae	*Zygophyllum iodocarpum*	

APPENDIX H SIGNIFICANT AND INTRODUCED FLORA LOCATIONS

Status	Taxa	Zone	Easting	Northing	Number of Plants
Novel Species	*Triumfetta* aff. *ramosa*	50K	693461	7645336	1
Introduced Flora	*Aerva javanica*	50K	693461	7645336	1
Introduced Flora	*Aerva javanica*	50K	693127	7646425	1
Introduced Flora	*Aerva javanica*	50K	698235	7643743	1
Introduced Flora	*Aerva javanica*	50K	701001	7644562	1
Introduced Flora	*Aerva javanica*	50K	705438	7645238	1
Introduced Flora	*Aerva javanica*	50K	704852	7643731	20
Introduced Flora	*Aerva javanica*	50K	704428	7643918	100
Introduced Flora	*Aerva javanica*	50K	693291	7645704	5
Introduced Flora	*Aerva javanica*	50K	693110	7646191	10
Introduced Flora	*Aerva javanica*	50K	693133	7646239	100
Introduced Flora	*Aerva javanica*	50K	693279	7646529	300
Introduced Flora	*Aerva javanica*	50K	693740	7645757	10
Introduced Flora	*Aerva javanica*	50K	698355	7644000	10
Introduced Flora	*Aerva javanica*	50K	695911	7643413	1
Introduced Flora	*Aerva javanica*	50K	695887	7643410	20
Introduced Flora	*Aerva javanica*	50K	695637	7643421	100
Introduced Flora	*Aerva javanica*	50K	695501	7643477	100
Introduced Flora	*Aerva javanica*	50K	695451	7643494	100
Introduced Flora	*Aerva javanica*	50K	694648	7644021	100
Introduced Flora	*Cenchrus ciliaris*	50K	693461	7645336	20
Introduced Flora	*Cenchrus ciliaris*	50K	693127	7646425	20
Introduced Flora	*Cenchrus ciliaris*	50K	698235	7643743	10
Introduced Flora	*Cenchrus ciliaris*	50K	695974	7647853	20
Introduced Flora	*Cenchrus ciliaris*	50K	698411	7646567	1
Introduced Flora	*Cenchrus ciliaris*	50K	705438	7645238	40
Introduced Flora	*Cenchrus ciliaris*	50K	701882	7642965	1,000
Introduced Flora	*Cenchrus ciliaris*	50K	701853	7642916	1,000
Introduced Flora	*Cenchrus ciliaris*	50K	701676	7642779	1,000
Introduced Flora	*Cenchrus ciliaris*	50K	705495	7644993	1,000
Introduced Flora	*Cenchrus ciliaris*	50K	693248	7645785	50
Introduced Flora	*Cenchrus ciliaris*	50K	693213	7645839	1,000
Introduced Flora	*Cenchrus ciliaris*	50K	693170	7645893	1,000
Introduced Flora	*Cenchrus ciliaris*	50K	693157	7645936	1,000
Introduced Flora	*Cenchrus ciliaris*	50K	693097	7646113	100
Introduced Flora	*Cenchrus ciliaris*	50K	693107	7646178	100
Introduced Flora	*Cenchrus ciliaris*	50K	693125	7646227	10,000
Introduced Flora	*Cenchrus ciliaris*	50K	693235	7646499	10,000
Introduced Flora	*Cenchrus ciliaris*	50K	695757	7643399	10,000
Introduced Flora	*Cenchrus ciliaris*	50K	695637	7643421	10,000
Introduced Flora	*Cenchrus ciliaris*	50K	695367	7643611	10,000
Introduced Flora	*Cenchrus ciliaris*	50K	695014	7643947	10,000
Introduced Flora	*Cenchrus ciliaris*	50K	694619	7644041	10,000
Introduced Flora	*Cenchrus ciliaris*	50K	693823	7644278	1,000
Introduced Flora	*Cenchrus ciliaris*	50K	695606	7647850	10,000
Introduced Flora	*Cenchrus ciliaris*	50K	695800	7647845	10,000
Introduced Flora	*Cenchrus ciliaris*	50K	696784	7647448	10,000
Introduced Flora	*Cenchrus ciliaris*	50K	699261	7646417	10,000
Introduced Flora	*Cenchrus ciliaris*	50K	699938	7645922	1,000
Introduced Flora	*Cenchrus setiger*	50K	693461	7645336	1
Introduced Flora	*Cenchrus setiger*	50K	693127	7646425	10
Introduced Flora	*Cenchrus setiger*	50K	693202	7645849	1,000
Introduced Flora	*Cenchrus setiger*	50K	693107	7646179	100
Introduced Flora	*Cenchrus setiger*	50K	697321	7644320	1,000
Introduced Flora	*Cenchrus setiger*	50K	695931	7643416	1,000

Status	Taxa	Zone	Easting	Northing	Number of Plants
Introduced Flora	*Cenchrus setiger*	50K	695886	7643412	100
Introduced Flora	*Cenchrus setiger*	50K	695637	7643421	100
Introduced Flora	*Cenchrus setiger*	50K	693796	7644285	100
Introduced Flora	*Chloris barbata*	50K	693461	7645336	1
Introduced Flora	*Chloris barbata*	50K	693300	7645634	100
Introduced Flora	*Citrullus lanatus*	50K	693295	7645696	1
Introduced Flora	*Flaveria trinervia*	50K	693202	7645849	1
Introduced Flora	*Flaveria trinervia*	50K	693170	7645893	10
Introduced Flora	*Flaveria trinervia*	50K	693157	7645933	10
Introduced Flora	*Flaveria trinervia*	50K	693105	7646111	10
Introduced Flora	*Malvastrum americanum*	50K	693461	7645336	1
Introduced Flora	*Malvastrum americanum*	50K	698235	7643743	1
Introduced Flora	*Malvastrum americanum*	50K	695796	7647847	5

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