

Newman-Roy Hill Transmission Line Survey

Alinta Energy



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Newman-Roy Hill Transmission Line Survey

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Acronyms and Abbreviations

ARRP Act (1976)	Western Australian <i>Agriculture and Related Resource Protection Act (1976)</i>
BoM	Bureau of Meteorology
CALM	Department of Conservation and Land Management (now DEC)
DEC	Western Australian Department of Environment and Conservation
DMP	Western Australian Department of Mines and Petroleum
DSEWPaC	Commonwealth Department of Sustainability, Environment, Water, Populations and Communities
Ecoscope	Ecoscope (Australia) Pty Ltd
EPA	Western Australian Environmental Protection Authority
EP Act (1986)	Western Australian <i>Environmental Protection Act (1986)</i>
EPBC Act (1999)	Commonwealth <i>Environment Protection and Biodiversity Conservation Act (1999)</i>
ESA	Environmentally Sensitive Area
EWSWA	Environmental Weed Strategy for Western Australia
GDE	Groundwater Dependent Ecosystem
GWA	Government of Western Australia
GPS	Global Positioning System
<i>ibid.</i>	(Latin) <i>ibidem</i> , meaning ‘the same place’ (refers to the previously quoted reference)
NHT	National Heritage Trust
NVIS	National Vegetation Inventory System
OEPA	Office of the Environmental Protection Authority
PEC	Priority Ecological Community
PF	Priority Flora, also known as Priority Listed Flora
P1, P2, P3, P4, P5	Priority Flora rankings (see Table 14); also codes for degree of control required for Declared Plants
RX	Range extension (n = northern, e = eastern, s = southern, w = western)
<i>sens. lat.</i>	(Latin) <i>sensu lato</i> , meaning ‘in the broad sense’
TEC	Threatened Ecological Community
TF	Threatened Flora (formerly termed Declared Rare Flora, DRF)
WAH	Western Australian Herbarium
WAHERB	Western Australian Herbarium specimen
WC Act (1950)	Western Australian <i>Wildlife Conservation Act (1950)</i>

Executive Summary

Alinta Energy commissioned Ecoscape to undertake a Level 2 Flora and Vegetation assessment and Level 1 Fauna assessment of a 2460 ha, 123 km long alignment from near Newman to approximately 65 km south of Nullagine. Due to access and time constraints, 81 km of the alignment was surveyed in August 2012.

The assessments included background 'desktop' research and a reconnaissance (field) survey to verify the accuracy of the background research. Targeted searches for conservation significant flora and fauna species and significant ecological communities were also conducted.

The desktop assessment of the biological environment for the entire alignment identified:

- The Department of Environment and Conservation (DEC) Ecological Communities database search (search reference 20-0712EC) identified the *Endangered* TEC 'Ethel Gorge', described as 'Ethel Gorge aquifer stygobiont community' and *Priority 1* PEC 'Fortescue Marsh (Marsh Land System)' to within approximately 5km of the transmission line Study Area
- there were two Threatened Flora (TF) and 94 Priority Listed Flora (PF) species identified from the DEC database search request, NatureMap query and Commonwealth (DSEWPaC) online databases of the transmission line area and 15 km buffer; none of which have been recorded from within the Study Area
- there were 17 Threatened, Priority listed or other Specially Protected Fauna species identified from the DEC database search of the Study Area (precise buffer distance not stated)
- seven Threatened and five Migratory Fauna species were identified by the Environment Protection and Biodiversity Conservation (EPBC) Protected Matters Search Tool as potentially occurring in the Study Area and 10 km buffer
- a search of the *NatureMap* database and previous fauna survey reports indicates two additional Priority Fauna species that may be expected to occur, and nine additional Migratory shorebirds that have been recorded close to the Study Area
- the fauna species of highest conservation significance that are recorded close to or have been predicted to occur in the Study Area are Northern Quoll (*Dasyurus hallucatus*, Endangered), Crest-tailed Mulgara (*Dasyercus cristicauda*, Vulnerable), Greater Bilby (*Macrotis lagotis*, Vulnerable), Pilbara Leaf-nosed Bat (*Rhinioncteris aurantia*, Vulnerable), Pilbara Olive Python (*Liasis olivaceus barroni*, Vulnerable), and Night Parrot (*Pezoporus occidentalis*, Endangered).

The Level 2 Flora and Vegetation survey, conducted during August 4-9, 2012, described and mapped the vegetation types, documented the vascular flora, identified species and vegetation types of particular conservation significance and reported on significant infestation of introduced plants in the Study Area. The field survey was conducted between poles 42 and 130, except for a 1.3 km section at Kalgan Creek that was inaccessible due to roadworks.

The field survey resulted in 264 vascular flora species being recorded, however the survey timing resulted in a low degree of confidence in some identifications, particularly grass species, although none were likely to be of conservation significance. Four PF species were recorded plus one potential P4 (*Goodenia ?nuda* due to poor flowering material):

- *Eremophila pilosa* (P1) was recorded from two populations and was associated with vegetation types **Tb** and **VfEc**
- *Eremophila youngii* subsp. *lepidota* (P4) was recorded from two populations, one previously unrecorded, and was associated with vegetation types **AapEfTe/AsyAc**, **AsyTI** and **EvAscPs**
- *Goodenia ?nuda* (P4) was recorded from a single population, however the identification is unconfirmed
- *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) from three populations associated with vegetation types **AapAscTe**, **EvAscCc** and **VfEc**. Although the identification of this species is not absolutely certain, it is considered as being highly likely (almost certain)
- *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3) was identified from one population associated with vegetation type **AapEfTe/AsyAc**.

The introduced species recorded from the Study Area were:

- **Aerva javanica* (Kapok Weed)
- **Bidens bipinnata* (Bipinnate Beggartick)
- **Cenchrus ciliaris* (Buffel Grass), that formed significant infestations especially on the Fortesue River floodplain and was a dominant species in two vegetation types, **CcAscCc** and **EvAscCc**, and was characteristic in vegetation types **AscTe** and **VfEc**
- **Heliotropium europaeum* (Heliotrope) (Declared Plant but not in Shire of East Kimberley)
- **Malvastrum americanum* (Spiked Malvastrum)
- **Portulaca oleracea* (Purslane)
- **Tribulus ?terrestris* (Caltrop); although the identification of this species is uncertain, it has previously been collected from within 5 km of the collection site during this survey thus the identification is likely
- **Vachellia farnesiana* (Mimosa Bush) that formed a dominant species in two vegetation types, **EvVfPs** and **VfEc**, and was characteristic in vegetation type **EvAscPs**.

Thirteen vegetation types were identified during the field survey, including one mosaic type:

- **AapAscTe**, *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland (non-growing Mulga)
- **AapEfTe/AsyAc**, mosaic of *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forrestii* subsp. *forrestii*, *Acacia tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequiglumis* mid- low open hummock grassland/mid-low open tussock grassland AND *Acacia synchronicia*

tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland. Grove- intergrove Mulga (sheet flow dependent vegetation). It also occurred in a mosaic with vegetation type **Tb**

- **AbiTe**, *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland, in the valleys of the Ophthalmia Range. It also occurred as a mosaic with vegetation type **AbiT**.
- **AbiT**, *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hilliana* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees, in the Ophthalmia Range.
- **AscTe**, *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and **Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland, near Kalgan Creek
- **AsyT**, *Acacia synchronicia* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland, on potentially slightly saline soils
- **CcAscC**, *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over **Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland, on low lying areas and associated with minor drainage lines
- **EvAscC**, *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and **Vachellia farnesiana* tall-mid sparse shrubland over **Cenchrus ciliaris*, **Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland, associated with the Fortescue River and other minor floodplains
- **EvAscP**, *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, **Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland, that formed an ecotone between the floodplain and Mulga grove-intergrove vegetation
- **EvVfP**, *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with **Vachellia farnesiana* mid scattered shrubs, associated with the Fortescue River
- **Sc**, *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland, on clay flats
- **Tb**, *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs. This was the most commonly recorded vegetation type, and was associated with sandplains. At times it was dominated by *T. longiceps*.

- **VfEc**, **Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Enneapogon caerulescens*, **Cenchrus ciliaris* and **Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees, on calcrete rises.

A conservation significance risk assessment identified vegetation types **AapEfTe/AsyAc** and **EvVfPs** as having the highest local significance, with vegetation types **EvAscCc** and **EvAscPs** also identified as having local significance. It should be noted, however, that, within the Study Area, most riparian vegetation (including **EvVfPs**, **EvAscCc** and **EvAscPs**) was impacted by grazing and frequently in Poor condition and thus has reduced conservation significance than areas in better condition. Vegetation types **Tb** and **VfEc** also have a degree of significance as they harbour P1 species *Eremophila pilosa*.

Vegetation type **EvVfPs** (occupying 3.71 ha), containing *Eucalyptus camaldulensis* subsp. *refulgens*, is considered to represent a Groundwater Dependent Ecosystem. Although the water use physiology of *Eucalyptus victrix* is less understood, vegetation containing this species (vegetation types **CcAscCc**, occupying 30.79 ha, **EvAscCc**, occupying 62.40 ha and **EvAscPs**, occupying 29.23 ha) are also potentially representative of a Groundwater Dependent Ecosystem.

The fauna reconnaissance survey conducted during August 4-9, 2012, recorded presence of conservation significant species Mulgara (*Dasyercus cristicauda*, EPBC VU, or *D. blythi*, DEC P4), Australian Bustard (*Ardeotis australis*, DEC P4), Bush Stone-curlew (*Burhinus grallarius*, DEC P4), and Rainbow Bee-eater (*Merops ornatus*, EPBC Migratory) either within the Study Area or in contiguous similar habitats. Evidence of Western Pebble-mound Mouse (*Pseudomys chapmani*, DEC P4) was also observed, but may not be recent. Based on the survey and other data, current presence of some conservation significant species (including Northern Quoll, Pilbara Leaf-nosed Bat and Pilbara Olive Python) is considered to be highly unlikely.

1.0 Introduction

1.1 Project Overview

Ecoscape was commissioned by Alinta DEWAP Pty Ltd (Alinta Energy) to undertake a Level 1 Fauna survey and a Level 2 Vegetation and Flora survey in accordance with the Environmental Protection Authority (EPA) Guidance Statements for Environment Impact Assessment.

1.1.1 STUDY AREA LOCATION

The 2460 ha proposed transmission line corridor (the Study Area, **Figure 1**), consisting of a corridor 123 km long and 100 m either side of a central line, is located between the Hamersley Range and Chichester Range within the Pilbara bioregion of Western Australia. The proposed corridor roughly follows the Newman-Marble Bar Road.

The nearest towns are Newman and Roy Hill, which fall within the Study Area boundary, and Nullagine, located approximately 65 km to the north of the northern end of the Study Area. The alignment and Study Area fall entirely within the Shire of East Pilbara.



Figure 1: Study Area location

1.2 Project Objectives

The project objectives include a level 2 flora and vegetation assessment and targeted conservation significant flora searches compliant with:

- *Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) No. 51 - Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (known as *Guidance Statement No. 51*) (Environmental Protection Authority, EPA 2004a)
- *Terrestrial Biological Surveys as an Element of Biodiversity Protection Position Statement No. 3* (EPA 2002).

The project also includes a level 1 fauna survey compliant with *Position Statement No. 3* (EPA 2002).

The assessment consisted of:

- background research or 'desktop' study at the locality scale involving a search of all sources of literature, data and map-based information
- a flora and vegetation field survey, resulting in an understanding of flora species and vegetation types present, and their representation over a broader area
- targeted searches for significant flora species and vegetation, including Threatened Ecological Communities (TECs), Threatened Flora (TF), Priority Ecological Communities (PECs), Priority-listed Flora (PF) and Declared Plants
- a reconnaissance survey of the Study Area to determine the different fauna habitat types as well as undertake low level sampling and opportunistic observations of the fauna present
- a report that includes figures and maps showing flora and vegetation recording locations, significant flora species, introduced flora species, vegetation assemblages/communities and vegetation condition, fauna habitat types and significant fauna species locations.

1.3 Previous Biological Surveys

Reports reviewed for information relevant to the Study Area include:

- EPA (2005) *Pilbara Iron Ore & Infrastructure Project: East-West Railway and Mine Sites (Stage B) - Fortescue Metals Group. Report and recommendations of the Environmental Protection Authority*
- ENVIRON Australia Pty Ltd (2009) *Roy Hill 1 Iron Ore Mining Project: Stage 2 Environmental Referral*
- EPA (2009a) *Roy Hill 1 Iron Ore Mining Project Stage 1 - Roy Hill Iron Ore Pty Ltd. Report and Recommendations of the Environmental Protection Authority. Report 1342*
- EPA (2009c) *Roy Hill 1 Iron Ore Mining Project Stage 2 - Roy Hill Iron Ore Pty Ltd. Report and Recommendations of the Environmental Protection Authority. Report 1345*
- Everard and Bamford (2009) *Fauna Assessment of the BC Iron Nullagine Iron Ore Project*

- Outback Ecology Services (2009) *Jimblebar Iron Ore Project - Terrestrial Vertebrate Fauna Assessment*
- McKenzie et al (2009) *A Biodiversity Survey of the Pilbara Region of Western Australia, 2002 - 2007*
- Bamford Consulting Ecologists & Ecoscape (2012) *Fauna Assessment - Nyidinghu Iron Ore Project*
- Everard et al. (2012) *Vertebrate Fauna Assessment of the Iron Valley Project Area*
- Ninnox (2009) *A Fauna Survey of the Proposed Hope Downs 4 Mining Area, near Newman, Western Australia*
- Davis et al. (2005) *Fauna survey of proposed Iron Ore Mine, Cloud Break*
- Phoenix (2011a; 2011b) *Level 1 fauna habitat assessment and targeted mulgara survey for the FerrAus Pilbara Project; and Consolidated report on vertebrate fauna surveys conducted for the FerrAus Pilbara Project*
- Ecologia (2006) *Roy Hill Iron Ore Project Terrestrial Vertebrate Fauna Assessment*
- Everard and Bamford (2009) *Fauna Assessment of the BC Iron Nullagine Iron Ore Project*
- Ecoscape (2011a) *Cookes Creek Terrestrial and Subterranean Fauna Survey*
- How and Dell (2004) *Reptile assemblage of the Abydos Plain, north-eastern Pilbara, Western Australia*
- How and Cooper (2002) *Terrestrial small mammals of the Abydos Plain in the north-eastern Pilbara, Western Australia.*

2.0 Existing Environment

2.1 Physical Environment

2.1.1 CLIMATE

The Pilbara region experiences an arid climate, which is influenced by two air masses, the Indian tropical maritime air moving in from the west or north-west, and the tropical continental air from the inland. During the warmer part of the year, there is a hot low-pressure system over the region resulting in clear skies and very high temperatures from November to February with average maximum temperatures generally between 35°C and 40°C. During the winter months the average maximum temperature generally falls to between 22°C and 30°C, the range of which is generally greater in inland areas away from the moderating effects of onshore winds common in coastal areas (Australian Government 2009).

The Pilbara lies south of the area normally penetrated by the northwest monsoon in the summer months, and is only occasionally influenced by weather systems of the westerly circulation in the winter months. Rainfall is therefore low and variable. The majority of rainfall occurs between December and March, as the result of moist tropical storms and cyclones originating in the north, with a pronounced dry period between August and November (Australian Government 2009).

Figure 2 outlines monthly rainfall and temperature averages for the Newman Airport BoM site, located approximately 9km from the southern end of the Study Area (BoM 2012a).

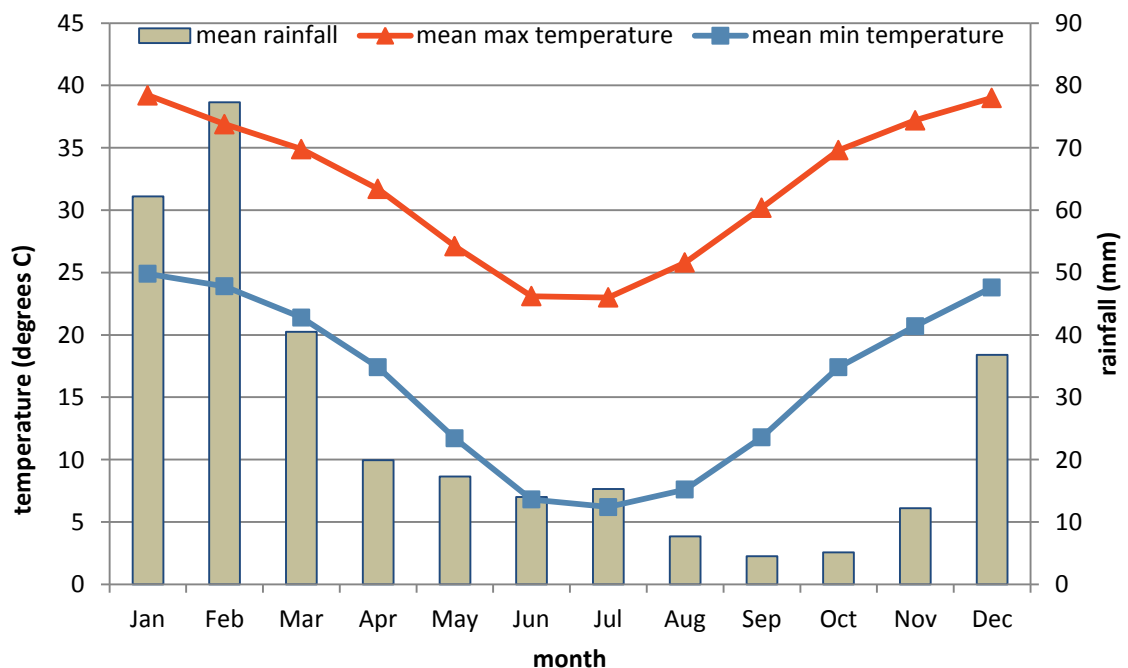


Figure 2: Monthly rainfall and temperature averages for Newman Airport BoM site (BoM 2012a)

2.1.2 GEOLOGY

Table 1 shows the geological units that occur in the Study Area (Seymour *et al.* 1988). Digital map data is unavailable for the Study Area so determination of units is based on interpretation of a geo-referenced image of the Wyloo 1:250,000 map sheet.

Table 1: Geological units

Unit	Description
Czc	Colluvium-partly consolidated quartz and rock fragments in silt and sand matrix; old valley-fill deposits
Czk	Calcrete - sheet carbonate usually formed in major drainage lines
Czr	Hematite-goethite deposits on banded iron-formation and adjacent scree deposits
Hb	BROCKMAN IRON FORMATION: banded iron-formation, chert and minor shale (2490+-20 Ma, U-Pb)
Hj	WEELI WOLLI FORMATION: interlayered banded iron-formation and metadoleritic sills, minor shale
Hjd	Medium- to coarse-grained massive grey-green metadolerite sills, usually foliated
Hm	MARRA MAMBA IRON FORMATION: chert, ferruginous chert and banded iron-formation with minor shale
Ho	BOOLGEEDA IRON FORMATION: fine-grained, finely laminated, dark grey-brown to black, flaggy iron-formation; minor chert, jaspilite and shale
Hw	WOONGARRA VOLCANICS: quartz - or feldspar-phyric rhyolite and rhyodacite as sills or flows; tuff and minor jaspilitic banded iron-formation (2470 +- 30 Ma, U-Pb; 2370 Ma, Rb-Sr)
Qa	Alluvium_unconsolidated silt, sand, and gravel; in drainage channels and on adjacent floodplains
Qc	Colluvium - unconsolidated quartz and rock fragments in soil
Qs	Eolian deposit-sand; in sheets and longitudinal dunes
Qw	Alluvium and colluvium-red-brown sandy and clayey soil; on low slopes and sheetwash areas

2.1.3 LAND SYSTEMS

As part of the rangeland resource surveys, the then Department of Agriculture comprehensively described and mapped the biophysical resources of the Pilbara, together with an evaluation of the condition of the soils and vegetation (from a an agricultural perspective) throughout (Van Vreeswyk *et al.* 2004). As part of this process an inventory of land types, land systems and land units with particular use capabilities, habitats or conservation values were established to assist in land use planning. According to this mapping, the following land systems (grouped according to land type on the basis of a combination of landform, soil, vegetation, and drainage characteristics) occur within the Study Area (**Table 2, Map 1**). Approximately 82 ha of the Study Area is mapped as being included in the Gascoyne bioregion, however no equivalent publication detailing land systems is available for inclusion in this report.

Table 2: Descriptions of land types and systems occurring in the transmission line Study Area (Van Vreeswyk et al. 2004)

Unit	Description	Geomorphology
Land type 2		
Newman Land System (NEW)	Rugged ironstone ridges, plateaux and mountains; hard spinifex pastures in good to excellent condition; no erosion.	Erosional (BIF, outcrop and stony mantle)
Rocklea Land System (ROC)	Rugged basalt hills and dissected plateaux; poorly accessible, not degraded or eroded.	Erosional (steep stony slopes, small channels and stony interfluves, minor gilgai plains)
Land type 16		
Elimunna Land System (ELI)	Stony plains on basalt supporting sparse acacia and cassia shrublands and patchy tussock grasslands.	Mainly depositional (level to gently undulating, some low hills, some gilgai)
Land type 4		
Boolgeeda Land System (BGD)	Stony lower slopes and plains below hill systems; not degraded or eroded.	Depositional (colluvial/alluvial lower slopes, stony, derived from Newman LS)
Land type 28		
Divide Land System (DIV)	Sandplains and occasional dunes supporting shrubby hard spinifex grasslands.	Depositional (aeolian sand, sandy loam)
Land type 31		
Fan Land System (FAN)	Hardpan plains and gilgai plains supporting groved mulga shrublands and minor tussock grasslands.	Depositional (alluvial/colluvial, sandy, near-level)
Jamindie Land System (JAM)	Stony hardpan plains and rises supporting groved mulga shrublands, occasionally with spinifex understorey.	Depositional (alluvial/colluvial, partly stony incl. laterite, clay)
Washplain Land System (WSP)	Hardpan plains supporting groved mulga shrublands	Depositional (alluvial clay, stony or sandy in parts)
Land type 34		
Narbung Land System (NAB)	Alluvial wash plains with prominent internal drainage foci supporting snakewood and mulga shrublands with halophytic low shrubs.	Depositional (alluvial, sandy)
Land type 39		
Turee Land System (TUR)	Stony alluvial plains with gilgaied and non-gilgaied surfaces supporting tussock grasslands and grassy shrublands.	Depositional (alluvial/colluvial, clay, partly stony)
Land type 40		
Warri Land System (WAI)	Low calcrete platforms and plains supporting mulga and cassia shrublands	Depositional (calcrete, colluvial gravel, alluvial clay)
Land type 42		
Coolibah Land System (COB)	Flood plains with weakly gilgaied clay soils supporting coolibah woodlands with tussock grass understorey.	Depositional (alluvial clay, some sand, calcrete)
River Land System (RIV)	Flood plains and terraces flanking major rivers and creeks; little pasture degradation or erosion.	Floodplains and terraces (sand, cobbles)

The extent of the land systems outlined above within the transmission line Study Area are indicated in **Table 4**.

Table 3: Extent of land systems within the Study Area and regional representation

Land System	Extent within study area (km ²)	Proportion of study area (%)	Pilbara extent (km ²)	Representation (%) within the study area
Boolgeeda	0.15	1.22	7748	0.002
Coolibah	0.44	3.62	1014	0.043
Divide	4.30	35.58	5293	0.081
Elimunna	1.12	9.29	617	0.182
Fan	1.36	11.27	1482	0.092
Jamindie	1.79	14.86	2074	0.086
Narbung	0.49	4.07	159	0.309
Newman	1.23	10.15	14580	0.008
River	0.36	3.01	4088	0.009
Rocklea	0.17	1.41	22993	0.001
Turee	0.28	2.34	581	0.049
Warri	0.14	1.18	305	0.047
Washplain	0.24	2.01	917	0.026

2.1.4 DRAINAGE

A major drainage line, the Fortescue River, crosses the Study Area in the northern section. The Fortescue River also intersects the Study Area a number of times in the southern section, close to Newman.

In the northern portion of the Study Area both Kulbee Creek and Kulkinbah Creek intersect the Study Area and in the southern portion Kalgan Creek intersects once, approximately 25 km north of Newman. **Map 1** shows the drainage associated with the Study Area.

2.2 Biological Environment

2.2.1 BIOGEOGRAPHIC REGION

The Study Area is located within the Pilbara and Gascoyne biogeographic regions as defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (DSEWPaC 2011). Biogeographic regions are delineated on the basis of similar climate, geology, landforms, vegetation and fauna. The Pilbara biogeographic region includes four subregions; the Hamersley, Fortescue Plains, Chichester and Roebourne subregions (Thackway & Cresswell 1995). The Gascoyne biographic region includes three subregions; Ashburton, Augustus and Carnegie. The Study Area falls mostly within the Fortescue Plain subregion described in the 2002 Biodiversity Audit of Western Australia's 53 Biogeographical Subregions (McKenzie *et al.* 2003) as:

Alluvial plains and river frontage. Extensive salt marsh, mulga-bunch grass, and short grass communities on alluvial plains in the east. Deeply incised gorge systems in the western (lower) part of the drainage. River gum woodlands fringe the drainage lines. Northern limit of Mulga (Acacia aneura). An extensive calcrete aquifer (originating within a palaeo-drainage valley) feeds numerous permanent springs in the central Fortescue, supporting large permanent wetlands with extensive stands of river gum and

cadjeput Melaleuca woodlands. Climatic conditions are semi desert tropical, with average rainfall of 300 mm, falling mainly in summer cyclonic events. Drainage occurs to the north-west.

A small proportion of the Study Area's southern end falls in the Hamersley and Augustus biographic subregions described by McKenzie et al. (2003) as:

Hamersley: Mountainous area of Proterozoic sedimentary ranges and plateaux, dissected by gorges (basalt, shale and dolerite). Mulga low woodland over bunch grasses on fine textured soils in valley floors and Eucalyptus leucophloia over Triodia brizoides on skeletal soils of the ranges. The climate is Semi-desert tropical, average 300mm rainfall, usually in summer cyclonic or thunderstorm events. Winter rain is not uncommon. Drainage into either the Fortescue (to the north), the Ashburton to the south, or the Robe to the west.

Augustus: Rugged low Proterozoic sedimentary and granite ranges divided by broad flat valleys. Also includes the Narryera Complex and Bryah Basin of the Proterozoic Capricorn Orogen (on northern margin of the Yilgarn Craton), as well as the Archaean Marymia and Sylvania Inliers. Although the Gascoyne River System provides the main drainage of this subregion, it is also the headwaters of the Ashburton and Fortescue Rivers. There are extensive areas of alluvial valley-fill deposits. Mulga woodland with Triodia occur on shallow stony loams on rises, while the shallow earthy loams over hardpan on the plains are covered by Mulga parkland. A desert climate with bimodal rainfall.

2.2.2 ENVIRONMENTALLY SENSITIVE AREAS

Environmentally sensitive areas (ESAs) are protected under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. There are a number of ESAs within Western Australia where exceptions in regulations do not apply. Section 51B of the EP Act allows the minister to declare ESAs.

Map 2 shows an ESA associated with the TEC 'Ethel Gorge aquifer stygobiont community' intersecting with a small portion of the Study Areas southern region. A larger ESA associated with the PEC 'Fortescue Marsh (Marsh Land System)' falls within 2 km of the Study Area however, the Study Area does not intersect with this PEC.

2.2.3 FLORA

2.2.3.1 Conservation Significant Flora Species

For the purposes of this report, conservation significant flora species are those that are listed by the Department of Environment and Conservation (DEC) as Threatened Flora (TF) and Priority Flora (PF). Flora species are classified as TF or listed as Priority Flora (PF) where populations are geographically restricted or threatened by local processes.

TF species (previously known in Western Australian as Declared Rare Flora (DRF)) are listed by the DEC and are protected under the Western Australian *Wildlife Conservation Act (WC Act)* (1950). Rare flora species, as they are termed in the *WC Act*, are gazetted under Sub-section 2 of Section 23F, thereby making it an offence to remove or damage rare flora without Ministerial approval.

Some TF species have additional legislative protection by being listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* (Commonwealth of Australia 1999).

Definitions of the Commonwealth (DSEWPac) categories are provided in **Table 17** in **Appendix One**.

There are six categories covering State-listed TF and PF species (DEC 2011), which are outlined in **Table 18** in **Appendix One**. PF for Western Australia are regularly reviewed by the DEC whenever new information becomes available. Species are removed from the list or their status is altered when they no longer meet the requirements outlined in **Table 18**.

DEC Database Search

The DEC Threatened Flora database search (DEC reference 10-0712FL, conducted for the Transmission Line Study Area and 20 km buffer in 2012) identifies TF and PF data from validated populations of TF and some PF from the Threatened Flora Database (DEFL), specimens in the Western Australian Herbarium (WAHERB). Combined, TF and PF species are referred to as *conservation significant flora species*.

Ninety six conservation significant vascular flora taxa (species, subspecies and varieties) were identified from the DEC Threatened Flora database search as occurring within 20 km of the Transmission Line Study Area (**Table 23, Appendix Two**). Locations of those with known co-ordinates are shown on **Map 2**.

Two TF taxa, *Lepidium catapycnon* and *Thryptomene wittweri*, were identified by the DEC database search, along with 30 P1 taxa, 14 P2 taxa, 45 P3 taxa and five P4 taxa as occurring within the database search area.

The conservation significant flora species identified by the DEC database search request that have been recorded within 5km of the Transmission Line Study Area are:

- *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662); 2.5 km south from the southern end of the Study Area.
- *Crotalaria smithiana*; 3.9 km east from the southern region of the Study Area
- *Eremophila pilosa*; 750 m west from the central region of the Study Area
- *Eremophila spongiorcarpa*; 1.9 km west from the northern region of the Study Area
- *Eremophila youngii* subsp. *lepidota*; 750 m west from the northern region of the Study Area

- *Goodenia nuda*; 1 km west from the northern region of the Study Area
- *Gymnanthera cunninghamii*; 550m east from the southern section of the Study Area
- *Rhagodia* sp. Hamersley (M. Trudgen 17794); 4 km north from the northern tip of the Study Area
- *Tecticornia medusa*; 350 m west from the northern region of the Study Area.

The DEC Threatened Flora database search does not identify other *significant flora* species, described in *Guidance Statement No. 51* (EPA2004a) as including keystone or relictual species, those having anomalous features, range extremities, range extensions, population outliers, restricted subtaxa and hybrids, local endemics or poorly reserved species.

Commonwealth Protected Matters Search

A review of the DSEWPac online databases (Protected Matters Search Tool and Species Profile and Threats Database) was also conducted to identify any additional threatened flora with Commonwealth protection nearby. The results of the Protected Matters Search are reproduced in **Appendix Three**.

One additional threatened flora species was identified within 10 km of the Study Area through the DSEWPac database search, *Pityrodia augustensis*. The species is listed under the *EPBC Act* as Vulnerable.

NatureMap Search

The results of a NatureMap (DEC 2012b) search are presented in **Appendix Four**.

The NatureMap search identified 824 plant species that have been recorded from within a simplified version of the Study Area (a rectangle encompassing most northern, southern, western and eastern extents). Eight additional conservation significant plant species were identified through the NatureMap database search:

- *Acacia glaucocaesia* (P3)
- *Ampelopteris prolifera* (P3)
- *Aristida lazaridis* (P3)
- *Elatine macrocalyx* (P2)
- *Euphorbia stevenii* (Caustic Bottletree) (P3)
- *Gompholobium karijini* (P2)
- *Isotropis parviflora* (P2)
- *Phragmites karka* (Tropical Reed) (P3)

2.2.4 VEGETATION

2.2.4.1 Vegetation Association Mapping

During the 1970s, John Beard and associates conducted a systematic survey of native vegetation, describing the vegetation systems in Western Australia at a scale of 1:250 000 in the south-west and at a scale of 1:1 000 000 in less developed areas. The vegetation survey of Western Australia maps and explanatory memoirs (1974-1981) are credited to J.S. Beard (or Beard with various co-authors).

Beard's vegetation maps attempted to depict the native vegetation as it was presumed to be at the time of settlement, and is known as the pre-European vegetation type and extent. It has since been developed in digital form by Shepherd *et al.* (2002). The extent of the pre-European vegetation associations within the Study Area are displayed in **Map 3**.

The extents of the pre-European vegetation associations identified from the Pilbara bioregion portion of the Study Area (Government of Western Australia 2011) are listed in **Table 5**. The Pilbara bioregion occupies 17,821,309.90 ha.

Table 4: Vegetation associations (Pilbara bioregion)

Vegetation Association	Pilbara Bioregion			Extent within the study area	
	Pre-European Extent (ha)	Current Extent (ha)	% Remaining	Extent (ha)	Proportion (%)
18 - Low woodland; mulga (<i>Acacia aneura</i>)	676,557	672,424	99.39	102.83	4.26
29 - Sparse low woodland; mulga, discontinuous in scattered groups	1,133,220	1,132,939	99.98	1136.23	47.02
82 - Hummock grasslands, low tree steppe; snappy gum over <i>Triodia wiseana</i>	2,563,583	2,550,899	99.51	222.90	9.22
111 - Hummock grasslands, shrub steppe; <i>Eucalyptus gamophylla</i> over hard spinifex	550,287	550,232	99.99	702.25	29.06
157 - Hummock grasslands, grass steppe; hard spinifex, <i>Triodia wiseana</i>	198,634	197,098	99.23	9.09	0.38
197 - Sedgeland; sedges with scattered medium trees; coolabah over various sedges & forbes	47,420	47,400	99.96	115.70	4.79
562 - Mosaic: Low woodland; mulga in valleys / Hummock grasslands, open low tree-steppe; snappy gum over <i>Triodia wiseana</i>	103,607	103,607	100.00	39.18	1.62
676 - Succulent steppe; samphire	92,363	92,303	99.93	6.20	0.26

The extents of the pre-European vegetation associations identified from the Gascoyne bioregion portion of the Study Area (Government of Western Australia 2011) are listed in **Table 5**. The Gascoyne bioregion occupies 18,075,219.48 ha.

Table 5: Vegetation associations (Gascoyne bioregion)

Vegetation Association	Gascoyne Bioregion			Extent within the study area	
	Pre-European Extent (ha)	Current Extent (ha)	% Remaining	Extent (ha)	Proportion (%)
29 - Sparse low woodland; mulga, discontinuous in scattered groups	780,622	780,429	99.98	82.00	3.39

2.2.4.2 Threatened and Priority Ecological Communities

Threatened Ecological Communities (TECs) are categorised at both State level (DEC 2010) and Commonwealth level (Commonwealth of Australia 1999), while Priority Ecological Communities (PECs) are classed at State level (DEC 2010). The status of the State and Commonwealth ratings are summarised in **Table 19** and **Table 20** in **Appendix One**.

According to the TECs listed on the DEC database endorsed by the Minister for the Environment (DEC 2012c), there are two State-listed TECs within the Pilbara bioregion:

- The *vulnerable* ‘*Themeda* grasslands on cracking clays (Hamersley Station, Pilbara)’. This TEC is described as grassland plains dominated by the perennial *Themeda* (kangaroo grass) and many annual herbs and grasses.
- The *endangered* ‘Ethel Gorge aquifer stygobiont community’.

There are no Commonwealth-listed TECs within the Pilbara bioregion (DSEWPaC 2009).

There are 30 PECs listed as occurring in the Pilbara bioregion (DEC 2012d).

DEC Ecological Communities Database Search

The DEC Ecological Communities database search (search reference 20-0712EC) identified the following TEC and PEC as occurring within approximately 5km of the Alinta transmission line Study Area:

- the *endangered* TEC ‘Ethel Gorge’, described as ‘Ethel Gorge aquifer stygobiont community’
- the *Priority 1* PEC ‘Fortescue Marsh (Marsh Land System)’ described as ‘Extensive, episodically inundated samphire marsh at the upper terminus of the Fortescue River and the western end of Goodiadarrie Hills. It is regarded as the largest ephemeral wetland in the Pilbara. It is a highly diverse ecosystem with fringing mulga woodlands (on the northern side), samphire shrublands and groundwater dependant riparian ecosystems. It is an arid wetland utilized by waterbirds and supports a rich diversity of restricted aquatic and terrestrial invertebrates. Recorded locality for night parrot and bilby and several other threatened vertebrate fauna.

Endemic *Eremophila* species, populations of priority flora and several near endemic and new to science samphires’.

The DEC Ecological Communities database search does not identify other *significant vegetation* described in *Guidance Statement No. 51* (EPA 2004a), including scarce vegetation types; communities including unusual species or a novel combination of species; vegetation acting as a refuge or key habitat for threatened species; vegetation representative of a range of a unit, or vegetation having a restricted distribution.

Map 2 displays the locations of the TECs identified from the DEC database search.

2.2.4.3 Protected Matters Search

A search conducted using the DSEWPac (2012) online databases (Protected Matters Search Tool and Species Profile and Threats Database) identified no other protected matters from the Study Area. The search results are shown in **Appendix Three**.

2.2.4.4 Groundwater Dependent Ecosystems

Groundwater Dependent Ecosystems (GDEs) are defined as ecosystems that are dependent on groundwater for their survival at some stage of their lifecycle (Eamus 2009b).

Hatton and Evans (1998) identified four types of GDEs based on their geographic setting:

1. Terrestrial vegetation – vegetation communities and dependent fauna that have seasonal or episodic dependence on groundwater
2. River base flow systems – aquatic and riparian ecosystems that exist in or adjacent to streams that are fed by groundwater base flow
3. Aquifer and cave ecosystems
4. Wetlands.

Eamus *et al.* (2006) identified three primary classes based on type of groundwater reliance:

1. Aquifer and cave ecosystems
2. All ecosystems dependent on the surface expression of groundwater;
 - a) river base flows
 - b) wetlands, swamplands
 - c) seagrass beds in estuaries
 - d) floodplains
 - e) mound springs
 - f) riparian vegetation
 - g) saline discharge to lakes
 - h) low lying forests

3. All ecosystems dependent on the subsurface presence of groundwater, often accessed via the capillary fringe (non-saturated zone above the water table) when roots penetrate this zone;
 - a) River Red Gum (*Eucalyptus camaldulensis*) forests
 - b) Banksia woodlands
 - c) Riparian vegetation in the wet/dry tropics.

In the Pilbara, riparian vegetation is generally determined to be vegetation associated with major or mid-sized drainage lines, and dominated most commonly by *Eucalyptus camaldulensis* subsp. *refulgens* and *E. victrix*.

Phreatophytic Species

Phreatophytic species rely on groundwater sources for water intake (eg Maunsell Australia Pty Ltd 2006); essentially the water requirements of phreatophytes are greater than can be provided from the surface soil profile (e.g. riparian vegetation) or they are dependent on free water availability (e.g. wetland species). They frequently show low tolerance to extended water stress due to a lack of physiological and/or morphological adaptation to drought, and respond to significant water deficit by a decline in health and eventual death (*ibid.*).

Phreatophytic species known to occur in or close to the Study Area include:

- *Eucalyptus camaldulensis* subsp. *refulgens*, which is regarded as a facultative phreatophyte that is dependent on groundwater for part of its lifecycle and/or in times of drought. This species has been reported to be tolerant of groundwater falls of up to 4 m per year (Maunsell Australia Pty Ltd 2006), has both lateral and sinker roots and is tolerant of waterlogging (Grierson 2010).
- *Eucalyptus victrix*, which may be regarded as a facultative phreatophyte (Froend 2009). It is considered to be relatively drought tolerant and likely to be tolerant of gradual declines to the watertable (to a degree) (Maunsell Australia Pty Ltd 2006). *Eucalyptus victrix* has lateral and sinker roots (ie a dimorphic root system) but is not tolerant of waterlogging (Grierson 2010). There is some conjecture that this species is actually a vadophyte (i.e. relies on water from within the soil surface profile, and is independent of groundwater) or weakly phreatophytic (Resource and Environmental Management Pty Ltd 2007). However, Eamus (2009a, point 3.2.2i) presents evidence that at least one *E. victrix* population has been considered to be an obligate phreatophyte. Froend (2009) considers that there is likely to be variability in water sources used depending on hydrological habitat.
- wetland species including *Melaleuca argentea* and *Cyperus vaginatus*.

Facultative phreatophytes can switch their water source from groundwater in times of drought to water in the soil surface profile in times of rain (Grierson 2010). Obligate phreatophytes are dependent on groundwater for their survival.

It is uncertain which, if any, of other species commonly associated with riparian areas are facultative phreatophytes or vadophytes (ie the plant's water requirements are entirely accessed from the soil surface profile). *Corymbia candida* is frequently associated with low-lying areas that may be periodically inundated (e.g. Ecoscape 2012c), and is possibly a facultative phreatophyte (Astron Environmental Services 2008). However, until there is evidence that this species accesses groundwater, it is not considered to be indicative of GDEs.

GDEs within the Study Area

GDE and presence of phreatophytic species cannot be directly correlated as some phreatophytic species are dependent on free water availability (i.e. wetland species), and do not access groundwater.

For the purposes of this survey, only phreatophytes that are known to access groundwater (i.e. *Eucalyptus camaldulensis* subsp. *refulgens* and *E. victrix*) are considered to indicate a GDE.

2.2.5 FAUNA

2.2.5.1 Conservation Significant Fauna

The conservation status of fauna species is assessed under both the *EPBC Act* (Commonwealth of Australia 1999) and the *WC Act* (1950). The significance levels for fauna used in the *EPBC Act* (1999) are those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN) and reviewed by Mace and Stuart (1994). *EPBC Act* (1999) categories are listed in **Table 17, Appendix One**.

The *WC Act* (1950) uses a set of Schedules but also classifies species using some of the IUCN categories. DEC Schedules, which provide special protection to listed fauna under the *WC Act* (1950) and definitions are shown in **Table 18, Appendix One**. Under a memorandum of understanding between DEC and DSEWPaC, taxa listed as threatened by DEC are automatically listed under the *EPBC Act* (1999).

In Western Australia, the DEC has produced a supplementary list of Priority Fauna which are not considered *Threatened* under the *WC Act* (1950) but for which the DEC considers there is cause for concern. Some Priority species are also assigned to the IUCN Conservation Dependent category. It is important to recognise that such Priority Lists have no statutory standing, but are used to assist the DEC when considering which fauna are most in need of more surveys or other investigations, in order to establish their status in the wild.

The Priority Fauna List for Western Australia includes taxa organised by priority codes that either:

- have recently been removed from the schedule of threatened fauna

- have a restricted range, are uncommon or are declining in range and/or abundance, but which do not meet the criteria for inclusion on the schedule of threatened fauna
- have been nominated for consideration for the schedule of threatened fauna and for which there is insufficient information for the advisory committee to make an assessment of their status
- are worthy of inclusion on such a list, as determined by the DEC.

The Priority Fauna List for Western Australia is reviewed by the DEC whenever new information on relevant taxa becomes available. Taxa are removed from the list by the DEC as they cease to meet the requirements identified above.

Vertebrate taxonomy in this report follows the WAM checklists last updated Feb 2011, except for birds where the classification and sequence follows Christidis and Boles (2008).

A DEC database search identified 17 conservation significant fauna species (Threatened, Priority or other specially protected) as known to occur in the East Pilbara (**Table 6**). No spatial data or precise buffer distance from the Study Area was provided, but relevant records can mostly be located in NatureMap (DEC 2012b).

Table 6. DEC Threatened and Priority Fauna search results

Species Name	Common Name	EPBC Act Status	WC Act Status	DEC Status	No. of records
<i>Pezoporus occidentalis</i>	Night Parrot	EN	S1	EN	1
<i>Dasyurus hallucatus</i>	Northern Quoll	EN	S1	EN	2
<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	VU	S1	VU	3
<i>Petrogale lateralis lateralis</i>	Black-flanked Rock-wallaby	VU	S1	VU	4
<i>Falco peregrinus</i>	Peregrine Falcon		S4		9
<i>Ramphotyphlops ganeii</i>	Pilbara Blindsnake			P1	12
<i>Ctenotus uber johnstonei</i>	Balgo Spotted Ctenotus			P2	3
<i>Lerista macropisthopus remota</i>	Robust Lerista			P2	4
<i>Ardeotis australis</i>	Australian Bustard			P4	68
<i>Burhinus grallarius</i>	Bush Stone-curlew			P4	7
<i>Dasyercus blythi</i>	Brush-tailed Mulgara			P4	2
<i>Falco hypoleucos</i>	Grey Falcon			P4	3
<i>Leggadina lakedownensis</i>	Short-tailed Mouse			P4	9
<i>Macroderma gigas</i>	Ghost Bat			P4	3
<i>Oreoica gutturalis gutturalis</i>	Crested Bellbird (southern)			P4	2
<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse			P4	49
<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart			P4	2

2.2.5.2 EPBC Protected Matters Search

Results of the *Protected Matters Search Tool* identified the following Threatened and Migratory fauna species as potentially occurring within 10 km of the Study Area (**Table 7**).

Table 7. Protected Matters Search Tool Results (fauna)

Scientific Name	Common Name	EPBC Act Status	Type of Presence
THREATENED SPECIES			
Birds			
<i>Pezoporus occidentalis</i>	Night Parrot	Endangered	Species or habitat likely to occur
<i>Polytelis alexandrae</i>	Princess Parrot	Vulnerable	Species or habitat may occur
Mammals			
<i>Dasyercus cristicauda</i>	Crest-tailed Mulgara	Vulnerable	Species or habitat likely to occur
<i>Dasyurus hallucatus</i>	Northern Quoll	Endangered	Species or habitat likely to occur
<i>Macrotis lagotis</i>	Greater Bilby	Vulnerable	Species or habitat known to occur
<i>Rhinoncteris aurantia</i> (Pilbara form)	Pilbara Leaf-nosed Bat	Vulnerable	Species or habitat likely to occur
Reptiles			
<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	Vulnerable	Species or habitat may occur
MIGRATORY SPECIES			
Migratory Marine Birds			
<i>Apus pacificus</i>	Fork-tailed Swift		Species or habitat may occur
<i>Ardea modesta [=alba]</i>	Eastern Great Egret		Species or habitat may occur
<i>Ardea ibis</i>	Cattle Egret		Species or habitat may occur
Migratory Terrestrial Species			
<i>Merops ornatus</i>	Rainbow Bee-eater		Species or habitat may occur
<i>Pezoporus occidentalis</i>	Night Parrot	Endangered	Species or habitat likely to occur
Migratory Wetland Species			
<i>Ardea modesta [=alba]</i>	Eastern Great Egret		Species or habitat may occur
<i>Ardea ibis</i>	Cattle Egret		Species or habitat may occur
<i>Charadrius veredus</i>	Oriental Plover		Species or habitat may occur
LISTED MARINE SPECIES			
Birds			
<i>Apus pacificus</i>	Fork-tailed Swift		Species or habitat may occur
<i>Ardea modesta [=alba]</i>	Great Egret		Species or habitat may occur
<i>Ardea ibis</i>	Cattle Egret		Species or habitat may occur
<i>Charadrius veredus</i>	Oriental Plover		Species or habitat may occur
<i>Merops ornatus</i>	Rainbow Bee-eater		Species or habitat may occur

2.2.5.3 NatureMap and other resources

Searches of DEC's online *NatureMap* database (DEC 2012b) identified fauna species that have been recorded in the general vicinity of the Study Area (**Appendix Four, Table 24**). This list was compared with reports on previous fauna surveys in the eastern Pilbara, including both actual records and assessments of the fauna considered likely or potentially to occur. This approach is used because sampling in parts of the Study Area is quite sparse and many species are represented by few records, but there is evidence for only weak geographic variation in vertebrate fauna composition across the Pilbara (Burbidge et al. 2010; Doughty et al. 2011; Gibson & McKenzie 2009).

In addition to those listed in **Table 6** and **Table 7**, the following conservation significant fauna species are considered to potentially occur in the broad vicinity of the Study Area, and discussed further below:

Table 8. Threatened and Priority fauna species potentially occurring in Study Area but not recorded by DEC or predicted by PMST

Species Name	Common Name	EPBC Act Status	WC Act Status	DEC Status	presence
<i>Notoryctes caurinus</i>	Northern Marsupial Mole	EN	S1	EN	unlikely
<i>Planigale</i> spp. 1 & 2	Planigales				likely
<i>Lagorchestes conspicillatus leichardti</i>	Spectacled Hare-wallaby (mainland)			P3	unlikely
<i>Ctenotus nigrilineatus</i>	Pinstriped Finesnout Ctenotus			P1	possible
<i>Liopholis kintorei</i> (or <i>Egernia kintorei</i>)	Great Desert Skink	VU	S1	VU	unlikely
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	M	S3		unlikely
Scolopacidae (9 spp)	Migratory waders	M	S3		possible
<i>Hydroprogne caspia</i> (or <i>Sterna caspia</i>)	Caspian Tern	M	S3		unlikely
<i>Neochmia ruficauda subclarescens</i>	Western Star Finch			P4	possible

3.0 Methods

3.1 Flora and Vegetation Assessment

This assessment was conducted as a single season Level 2 flora and vegetation assessment, undertaken to be compliant with:

- *Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessments in Western Australia* (EPA 2004a)
- *Terrestrial Biological Surveys as an Element of Biodiversity Protection Position Statement No. 3* (EPA 2002).

Advice was sought from DEC's Biogeography Program Leader & Partnerships Manager (Dr Stephen van Leeuwen) as to whether a single season field survey was likely to be accepted by the OEPA as a suitable Level 2 survey. The advice received (via email 14 June 2012, **Appendix Five**) indicated that the proposed survey was likely to be acceptable to the OEPA, dependent on the Study Area being 'along the road'.

Level 2 assessments incorporate background research and a reconnaissance survey as preparation for a more intensive and detailed survey. As the area has been well surveyed previously (e.g. **Section 1.3**), the reconnaissance survey was conducted during the Level 2 field survey.

Level 2 assessments require one or more visits in the main flowering season and replication of survey effort.

In order to determine the overall value of the vegetation and flora of the Study Area, data collected during the field survey was used to:

- describe and map the vegetation types of the Study Area to indicate the distribution and relative abundance of each vegetation unit and to help to define units of particular conservation value
- document the vascular flora of the area and provide a measure of the overall floristic richness
- identify species and vegetation types of particular conservation significance
- identify significant infestations of introduced plant species and occurrence of Declared Plants.

3.1.1 FIELD SURVEYS

The field survey was conducted by Lyn Atkins (flora collecting permit SL009823) and Hayley Hughes (SL009824), assisted by Tom Lucey and Haylee D'Agui during August 4-9, 2012. The field survey duration was dictated by accommodation availability in Newman. The extent of the alignment included in the survey was dictated largely by the status of discussions between Alinta and underlying leaseholders, and to a lesser degree by time constraints.

The complete Study Area was from near Newman to near Roy Hill. Desktop data refer to the entire extent, following the alignment supplied at the time of field survey. The field survey results discussed below apply only to the surveyed section.

The field survey covered approximately 81 km between pole 42 and pole 130 at Noreena Roy Hill Road. Within this (but not included in the field survey distance calculation), a section of approximately 1.3 km (26 ha, located approximately between poles 70 and 73 on either side of Kalgan Creek) was not accessible due to roadworks and was not surveyed. Another section, 8 km long between approximately poles 192 and 291, was not surveyed for conservation significant flora species but is included in the field survey results as the results from the surrounding area can be interpreted to include this area.

3.1.1.1 Floristic Survey

The vegetation and floristic data were collected and described from 16 floristic quadrats (abbreviated to 'quadrats'), 50 m x 50 m in dimension or equivalent area if linear (e.g. along a drainage line), which is in line with the DEC's Draft *Technical Guide - Flora and Vegetation Surveys for Environmental Impact Assessment. Version 1, February 2012* (EPA & DEC 2012) and *Guidance Statement No. 51* (EPA 2004a).

Floristic, biological and physical data was collected and recorded from each of these quadrats. The flora records provided the names used in the vegetation descriptions and contributed to the flora species lists and frequency of occurrence data. Various parameters relating to the individual quadrats were used to assist in both the description of vegetation types and the determination of flora distribution, particularly in terms of defining associated landforms.

The quadrats were distributed throughout the vegetation types recorded over the Study Area. The quadrats were unmarked, but were orientated in a north-south and east-west direction, except where they were located in linear vegetation types (e.g. drainage lines). The co-ordinates of the north-western corner of the quadrat were recorded.

The following parameters were recorded at each quadrat:

- MGA coordinates recorded in GDA 94 datum using a hand-held Global Positioning System (GPS), to an accuracy usually within 5 m

- plant species and their attributes required to form National Vegetation Inventory System (NVIS, National Heritage Trust 2003) vegetation description based on the height and estimated cover of dominant species
- an inventory of all species, with estimated maximum height and percent foliage cover
- description of landform and habitat
- broad description of surface soil type and stony surface mantle
- percentage of litter cover and depth
- percentage of bare ground
- evidence of grazing, mining exploration activities, weed invasion, frequent fires etc. Fire effects were only considered a negative impact if they were caused by repeated burning (e.g. for pastoral purposes).

Photographs of the vegetation at each site were taken from the north-west corner (or nearest equivalent for linear quadrats) of each quadrat using a digital camera.

Information on the vegetation of the Study Area was also described using brief relevés. Forty three relevés were recorded. The data collected from each relevé included:

- MGA coordinate recorded in GDA 94 datum using a hand-held Global Positioning System (GPS), to an accuracy usually within 5 m
- digital photograph of representative vegetation
- NVIS (NHT 2003) vegetation description based on the height and estimated cover of dominant species
- description of landform and habitat, recorded at Level V
- broad description of surface soil type and stony surface mantle
- evidence of grazing, mining exploration activities, weed invasion, frequent fires etc. Fire effects were only considered a negative impact if they were caused by repeated burning (e.g. for pastoral purposes)
- presence of conservation significant flora species in the vicinity.

73.33 km of the Study Area were traversed on foot. A flora species inventory was collected from opportunistic observations during the foot survey and quadrat and relevé recordings.

Voucher specimens of species that could not be identified with certainty and potential conservation significant taxa were collected, assigned a unique number to facilitate tracking of data, and pressed in the field. Specimens collected were dried and treated in accordance with the requirements of the WAH.

3.1.1.2 Flora Identification and Data Entry

Voucher specimens were identified by Ecoscape (Stephen Kern) to infrataxa (subspecies, variety, affinity or hybrid) level where possible, using appropriate publications, and/or comparison with pressed specimens housed at the WAH.

Nomenclature was checked against the current listing of scientific names recognised by the WAH and listed on FloraBase (WAH 1998-) and updated as necessary.

All raw site data was entered into a Microsoft Access database, with species names entered following formal identification of the collected specimens.

3.1.1.3 Conservation Significant Flora

Approximately 73 km of the 81 km Study Area were searched on foot for conservation significant flora species. The search was conducted by two surveyors walking a roughly parallel line along the 200 m wide Study Area alignment, meandering where necessary to inspect plants that resembled known conservation significant species, were different to other plants in the area, to search behind clumps of vegetation that obscured line-of-sight or to inspect different landforms or small-scale differences in vegetation. Where possible the surveyors were separated by 40-50 m to best cover the Study Area alignment.

In order to assist with identification in the field, survey teams had access to literature, including images (where available) of conservation significant species identified by the DEC database search. Specimens of PF species were collected for identification purposes.

Having undertaken an *ad hoc* risk assessment, Ecoscape considered the portion of the Study Area not included in the foot search was unlikely to have *Eremophila pilosa* (P1) as it was away from the previously recorded population and the vegetation types and land systems in which *E. pilosa* had previously been recorded were not present.

3.1.1.4 Introduced Species

Introduced species were opportunistically recorded.

Flora species were considered to be introduced if they are listed as such on FloraBase (WAH 1998-).

3.1.1.5 Vegetation Description

Vegetation was described from each of the quadrats using the height and estimated cover of dominant and characteristic species of each stratum, based on the NVIS (NHT 2003). Up to three species per stratum from each stratum (upper, mid and ground) were used to formulate vegetation descriptions for each quadrat and relevé and to formulate vegetation type descriptions.

3.1.1.6 Vegetation Condition

Vegetation condition of the quadrats, relevés and Study Area were assessed using the adapted Keighery Vegetation Condition Scale for Eremaean and Northern Botanical Provinces included in the Draft *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA & DEC 2012), **Table 22**.

The vegetation condition of the Study Area was assessed by extrapolating the value recorded for each quadrat and relevé and applying the condition to the vegetation type in the vicinity and from 'spot' evaluations recorded during traverses through the Study Area.

3.1.1.7 Other Significant Vegetation Types (Locally Significant Vegetation Types)

Whilst having no formal statutory protection, *Guidance Statement No. 51* (EPA 2004a) lists several reasons why vegetation may be considered to be significant in addition to its listing as a TEC or PEC or because the extent is below a minimum threshold. These reasons, which may apply at a number of scales but are not defined in detail, include:

- scarcity
- unusual species
- novel combinations of species
- role as a refuge
- 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 (particularly a good local and/or regional example of a unit in 'prime' habitat, at the extremes of range, recently discovered range extension or isolated outliers of the main range)
- restricted distribution.

Vegetation displaying any of the above attributes can be considered to be 'locally significant', and are detailed in the assessment.

3.1.2 FIELD SURVEY TIMING

The field survey was conducted in early August 2012. The seasonal conditions were considered to be 'above average' (**Figure 3**) (and summer rainfall considerably above average, **Figure 4**) most plants had flowered (and were still identifiable) or were flowering during the field survey. However, the dry period (below average rainfall) from April until the field survey was apparent during the field survey.

The survey was not conducted in the season following rain as outlined in *Guidance Statement No.51*. However based on the extent of the previous wet season in the area, advice from DEC sought prior to commencement of the survey (Section 3.1 and Appendix Five), Ecoscape is confident in the accuracy of species identification and the completeness of the survey results.

Although still identifiable by experienced botanists, annual grasses (e.g. *Aristida contorta*, *Sporobolus australasicus*) and many grasses on the Fortescue River floodplain (at the northern end of the Study Area) had dehisced. However, all conservation significant grasses identified by the DEC database search request as potentially occurring within the Study Area are not known from the Fortescue River floodplain (in the vicinity of the Study Area).

Similarly, all *Triodia* species (except *T. basedowii*) had dehisced and had no, or poor quality, reproductive material. Except for *T. basedowii*, identification of *Triodia* species are based on vegetative form and may not be correct (e.g. *T. epactia*, *T. melvillei*, *T. pungens* and *T. schinzii* are all soft, resinous species that occur within the general area, and may all occur within the Study Area but were indistinguishable at the time of field survey). However, none of the *Triodia* species recorded from the Study Area are conservation significant species identified by the DEC database search as potentially occurring in the area.

Mulga species were also largely devoid of reproductive material, which is frequently required for identification. Therefore, except for *Acacia macraneura* and *A. paraneura*, identification of Mulga is tentative. None are of conservation significance.

The lack of certainty in relation to these identifications is considered a negligible constraint as none is likely to be of conservation significance. These identifications are not required to determine vegetation type significance.

The timing of the field survey was optimal for identifying most likely high priority (P1) taxa (*Eremophila pilosa*). Early August coincided with the anticipated flowering period making it easy to identify this species by flowers or flower buds.

Western Australian Rainfall Deciles 1 December 2011 to 31 August 2012
 Distribution Based on Gridded Data
 Product of the National Climate Centre

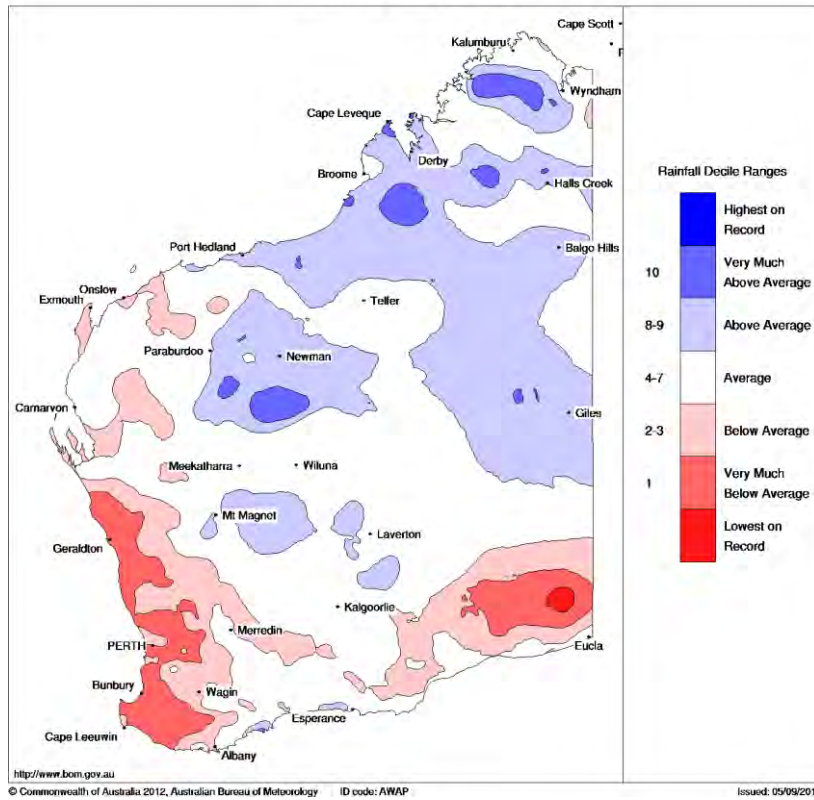


Figure 3: Western Australian rainfall deciles December 2011-August 2012 (BoM 2012b)

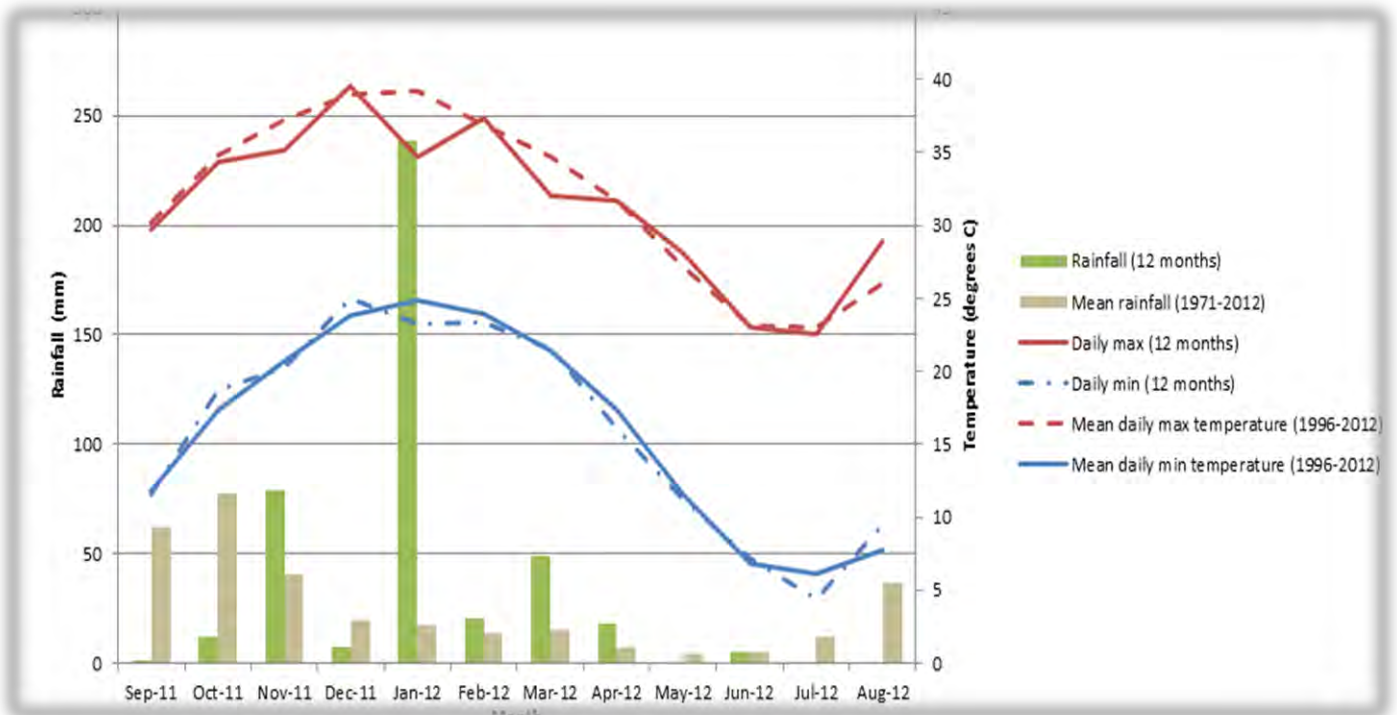


Figure 4: Rainfall and temperature data for Newman Airport BoM station 2011-2012 (BoM 2012a)

3.2 Flora and Vegetation Significance

3.2.1 STUDY AREA FLORISTIC ANALYSIS

PATN© software (Belbin & Collins 2006) was used to undertake statistical analysis and generate floristic groups using the data collected from the floristic quadrats; relevé data were not included in the analysis. PATN analysis has been used for several local floristic analyses including Gibson et al. (1994) for the Swan Coastal Plain, and is routinely used for regional floristic analysis in the Pilbara by ME Trudgen and E Griffin (eg Ecoscape 2010; 2011b).

PATN is a multivariate analysis tool that generates estimates of association (resemblance, affinity, distance) between sets of objects described by a suite of variables (attributes), and classifies the objects into groups and condenses the information and displays the patterns in the data graphically.

PATN offers a choice of data transformations prior to multivariate analysis. In this case, because the analysis used presence / absence data, the Kulczynski similarity coefficient was the appropriate association to use as it has proven to be a good estimation of association for ecological applications (Belbin & Collins 2006). This was followed by Flexible UPMGA (Un-weighted Pair Group Using Arithmetic Averaging) fusion to produce clusters of related objects (species); these are the floristic groups that are displayed as a dendrogram. For this analysis, dominant species were given a weighting whereas other species recorded from the quadrats were unweighted.

Interpretation of these purely floristic groups into recognisable and mappable on-ground units is required to identify vegetation types. This interpretation is largely based on dominant species from each stratum. Generally, quadrats that are closely floristically related on the dendrogram form identifiable vegetation units, however, as presence-absence data is used in the analysis and there is no weighting given to dominant species, at times the floristic groups are not easily related to on-ground vegetation types. Vegetation types are therefore determined as a combination of floristic analysis and on-ground interpretation.

3.2.2 REGIONAL FLORA AND VEGETATION SIGNIFICANCE

The reports listed in **Section 1.3** (and others) were reviewed to assess similarities and differences between the flora and vegetation of nearby areas.

3.3 Fauna and Habitat Assessment

3.3.1 FIELD ASSESSMENT

The reconnaissance survey and habitat assessment was undertaken from August 3 – 6 2012, by Natalie Randall and John Scanlon, both Senior Environmental Scientists (Zoologists). Fieldwork was carried out under DEC Licence No. SF008773.

The Study Area was accessed at various points from the Newman – Marble Bar road, using other 4WD tracks where available but mostly on foot.

The survey method comprised:

- assessment of habitat suitability for target species based on visual inspection of terrain, vegetation and soils, and opportunistic recording of fauna present, with reference to mapped land systems and vegetation types
- walking transects of potentially suitable habitat areas by day, searching for burrows, tracks, scats and other signs of target species
- when tracks, burrows or other potential indicators of target species were observed, assessment of their specific identity based on location, size, and associated traces. Where these were considered likely to pertain to target species or not determinable with certainty in the field, photographs were taken and GPS locations recorded, and searches extended or intensified (if necessary) to identify any other evidence of occupation within 50 m
- subsequent consultation with Bruce Turner (Principal Environmental Scientist, Ecoscape) and Mike Bamford (Bamford Consulting Ecologists) to reach consensus identification of burrows, tracks and other traces.

Opportunistic observations of fauna other than the target species were also made during the day whilst driving and walking the Study Area. Nocturnal searches were not conducted. References utilised for identification include Menkhorst & Knight (2004) for mammals, Wilson & Swan (2008) for reptiles, Simpson & Day (2004) for birds, Triggs (1996) for scats and tracks, and Thompson & Thompson (2007; 2008) for burrows.

3.3.2 INTERPRETATION OF SPECIES LISTS

Species lists generated from the desktop review are generous as they include records drawn from a large region and possibly from environments not represented in the project area. Therefore, some species that were returned by one or more of the data searches have been excluded because their ecology, combined with the environments within the Study Area, make it highly unlikely that these species would be present. In general, however, species returned by the desktop review process are expected in the Study Area whether or not they were recorded during field surveys.

Interpretation of species lists generated through the desktop review included assigning an expected status within the project area to species of conservation significance. This is particularly important for birds that may naturally be migratory or nomadic, and for some mammals that can also be mobile or irruptive. The status categories used are:

- Resident: species with a population permanently present in the project area;
- Regular migrant or visitor: species that occur within the project area regularly in at least moderate numbers, such as part of annual cycle;

- Irregular Visitor: species that occur within the project area irregularly such as nomadic and irruptive species. The length of time between visitations could be decades but when the species is present, it uses the project area in at least moderate numbers and for some time;
- Vagrant: species that occur within the project area unpredictably, in small numbers and/or for very brief periods. Therefore, the project area is unlikely to be of important for the species; and
- Locally extinct: species that has not been recently recorded in the local area and therefore is almost certainly no longer present in the project area.

4.0 Results

4.1 Flora Survey

Floristic quadrat details are included in **Appendix Six**, and the complete flora inventory in **Appendix Seven**.

A total of 264 vascular flora taxa (including species, subspecies, varieties, hybrids, affinities and forms) were recorded from floristic quadrats, relevés, opportunistic observations and conservation significant flora searches (**Table 25**).

Thirty eight identified families and 110 identified genera are represented in the Study Area. The most commonly represented families are:

- Fabaceae (including the former Mimosaceae, Caesalpiniaceae and Papilionaceae); 48 taxa (one introduced, and including two *Acacia* species with a degree of uncertainty in regard to their identification and one that was only identified to potential genus (?*Glycine* sp.). One of the *Acacia* species may represent a duplication)
- Poaceae; 41 taxa (one introduced, and including two identified only to genus level, one identified only to family level – these may represent duplications – , and one given a tentative name)
- Chenopidaceae; 25 taxa (three identified only to genus level that may represent duplications)
- Malvaceae; 24 taxa (one introduced, one identified only to family level, three identified only to genus level and five with an element of doubt in relation to their identifications – these may all represent duplications)
- Amaranthaceae; 15 taxa (two identified only to genus level that may represent duplications).

The most commonly represented genera are *Acacia* (27 taxa, including two given tentative names, one of which may represent duplication), *Ptilotus* (11 taxa, although one was identified only to genus and represent a duplication), *Senna* (10 taxa, most of which were identified to subspecies and hybrid level), *Goodenia* (nine taxa, including two given tentative names and one identified only to genus level that may represent duplications) and *Eragrostis* (six taxa)

The most commonly encountered species were *Triodia epactia* recorded from 20 quadrats and relevés, *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* (18 quadrats and relevés), *Acacia aptaneura* and **Cenchrus ciliaris* (17 quadrats and relevés) and *Acacia ancistrocarpa* (16 quadrats and relevés).

Species Range Extents

Based on the records included on NatureMap (DEC 2007-), two P3 species are considered to represent a range extremity and a range extension:

- *Rhagodia* sp. Hamersley (M. trudgen 17794), if confirmed as this species, is a new population on the eastern edge of its known extent
- *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) represents a new population, and a range extension of approximately 45 km to the east of the previously known south-eastern extremity.

Taxa ranges and range extensions were assessed using the NatureMap (DEC 2007-) distance measuring tool.

4.1.1 CONSERVATION SIGNIFICANT FLORA

4.1.1.1 Environmental Protection and Biodiversity Conservation Act 1999

No plant taxon recorded in the Study Area is listed as Threatened pursuant to Schedule 1 of the *EPBC Act* (1999).

4.1.1.2 Wildlife Conservation Act 1950

No plant taxon recorded in the survey is gazetted as a TF pursuant to Subsection 2 of Section 23F of the *WC Act* (1950).

4.1.1.3 Priority Flora

The Priority Flora recorded from the Study Area are listed and briefly described below. Their locations are included in **Table 9** and shown on **Map 4**. Threatened and Priority Flora Report Forms are included in **Appendix Eight**.

Table 9: Priority Flora species locations (GDA 94, Zone 50)

Species	Cons. Code	Vegetation	mE	mN	Population Size
<i>Eremophila pilosa</i>	P1	Tb	808314	7465060	<10
<i>Eremophila pilosa</i>	P1	Tb	808513	7467940	<10
<i>Eremophila pilosa</i>	P1	Tb	808519	7468130	50+
<i>Eremophila pilosa</i>	P1	Tb	808509	7468230	<10
<i>Eremophila pilosa</i>	P1	Tb	808532	7468330	<10
<i>Eremophila pilosa</i>	P1	Tb	808558	7468430	<10
<i>Eremophila pilosa</i>	P1	Tb	808595	7468900	<10
<i>Eremophila pilosa</i>	P1	Tb	808575	7469180	<10
<i>Eremophila pilosa</i>	P1	Tb	808580	7469270	<10
<i>Eremophila pilosa</i>	P1	Tb	808597	7469300	<10
<i>Eremophila pilosa</i>	P1	Tb	808603	7469330	<10
<i>Eremophila pilosa</i>	P1	Tb	808604	7469530	<10
<i>Eremophila pilosa</i>	P1	Tb	808621	7469670	<10
<i>Eremophila pilosa</i>	P1	Tb	808677	7469800	<10

Species	Cons. Code	Vegetation	mE	mN	Population Size
<i>Eremophila pilosa</i>	P1	Tb	808636	7469900	<10
<i>Eremophila pilosa</i>	P1	Tb	808616	7470150	<10
<i>Eremophila pilosa</i>	P1	Tb	808661	7470290	<10
<i>Eremophila pilosa</i>	P1	Tb	808753	7470380	<10
<i>Eremophila pilosa</i>	P1	Tb	808713	7470410	<10
<i>Eremophila pilosa</i>	P1	Tb	808729	7471170	<10
<i>Eremophila pilosa</i>	P1	Tb	808759	7471850	10 to 50
<i>Eremophila pilosa</i>	P1	VfEc	808838	7472620	<10
<i>Eremophila pilosa</i>	P1	VfEc	808887	7472620	<10
<i>Eremophila pilosa</i>	P1	VfEc	808841	7472670	<10
<i>Eremophila pilosa</i>	P1	VfEc	808892	7472670	<10
<i>Eremophila pilosa</i>	P1	VfEc	809009	7475750	<10
<i>Eremophila pilosa</i>	P1	VfEc	808989	7476420	<10
<i>Eremophila pilosa</i>	P1	VfEc	808997	7476480	<10
<i>Eremophila pilosa</i>	P1	VfEc	808985	7476530	<10
<i>Eremophila pilosa</i>	P1	VfEc	808526	7478120	<10
<i>Eremophila pilosa</i>	P1	VfEc	808431	7478470	<10
<i>Eremophila pilosa</i>	P1	VfEc	808391	7478610	<10
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AsyTl	796512	7428870	10 to 50
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AsyTl	796486	7428880	10 to 50
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AsyTl	796505	7428940	10 to 50
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AsyTl	796515	7428980	10 to 50
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AsyTl	796519	7429050	10 to 50
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AapEfTe/AsyAc	796575	7429160	10 to 50
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AsyTl	796816	7429650	10 to 50
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AsyTl	796930	7430050	10 to 50
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AsyTl	796958	7430070	<10
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AsyTl	796990	7430080	<10
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AsyTl	797008	7430100	<10
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AsyTl	797009	7430160	<10
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AapEfTe/AsyAc	804141	7488320	1
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AapEfTe/AsyAc	803815	7488960	10 to 50
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AapEfTe/AsyAc	803747	7489280	10 to 50
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AapEfTe/AsyAc	803702	7489290	1
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AapEfTe/AsyAc	803787	7489430	10 to 50
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	AapEfTe/AsyAc	803802	7489560	<10
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	EvAscPs	803904	7489730	10 to 50
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	EvAscPs	803797	7489750	1
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	EvAscPs	803953	7489920	<10
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	EvAscPs	804044	7490020	<10
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	EvAscPs	804134	7490380	<10
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	EvAscPs	805564	7494210	10 to 50
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	EvAscCc	805613	7494550	1
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	EvAscCc	805625	7494550	<10
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	EvAscCc	805613	7494550	<10
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	EvAscCc	805755	7494850	<10
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	EvAscCc	805762	7494910	<10
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	EvAscCc	805784	7494960	<10
<i>Goodenia ?nuda</i>	P4	Tb	803960	7443980	<10
<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794)	P3	AapAscTe	796232	7428500	1

Species	Cons. Code	Vegetation	mE	mN	Population Size
<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794)	P3	VfEc	809013	7475590	1
<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794)	P3	EvAscCc	805839	7495120	1
<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431)	P3	AapEfTe/AsyAc	800731	7436650	10 to 50

Priority flora descriptions are derived from FloraBase (WAH 1998-) descriptions and field observations.

***Eremophila pilosa* (P1)**

Eremophila pilosa is a low shrub to 0.8 m high with purple flowers (WAH 1998-). Within the Study Area it was generally of smaller stature (approximately 0.4-0.6 m high), and whilst the flowers were purple, they varied from mid-purple to darker purple and the upper flower lobes were variously shallowly or deeply incised. The leaves were distinctively grey and hairy. **Plate 1** and **Plate 2** illustrate this species.

Within the Study Area *E. pilosa* occurred as two apparent populations over approximately 8.5 km of the Study Area alignment separated by approximately 1 km, with a small number of outlier individuals to the south (**Map 4**). Whilst *E. pilosa* within the Study Area apparently consists of two populations (plus outliers), the survey did not include areas outside of the alignment and it is likely that the populations are contiguous (ie a single population).

E. pilosa is known from six records listed on NatureMap (DEC 2007-), distributed over two or three populations (**Figure 5**). This Study Area is within the vicinity of the population represented by two blue dots in **Figure 5**. Several hundred individuals were recorded within the alignment; the population as a whole in the vicinity would number in the thousands of plants. Within the alignment, the plants were sparsely spaced although frequently occurring in an open grouping. **Plate 3** shows the typical plant spacing, with two *E. pilosa* individuals clearly visible (the low grey shrub in the open area in the centre midground and one in the right foreground between, and partly obscured by, two *Triodia* clumps) and up to five other individuals scattered indistinctly throughout the image area.

Within the Study Area, *E. pilosa* was recorded mostly from open areas dominated by *Triodia basedowii* or, at times more densely, in areas dominated by *T. longiceps*.



Plate 1: *Eremophila pilosa* flowers and foliage



Plate 2: *Eremophila pilosa* form

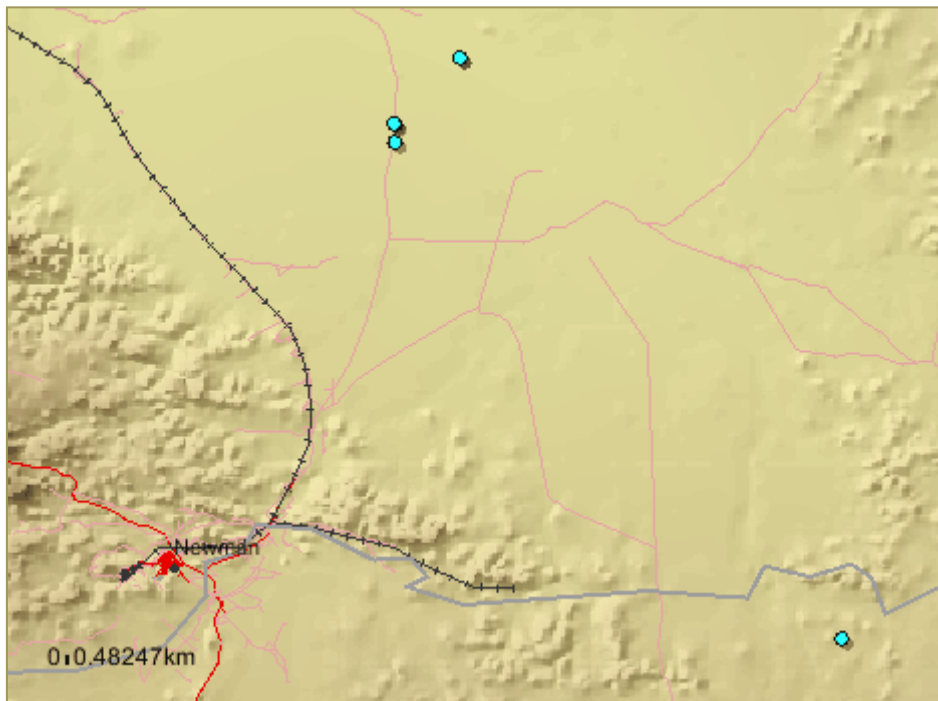


Figure 5: *Eremophila pilosa* records from NatureMap (DEC 2007-), accessed September 19, 2012



Plate 3: *Eremophila pilosa* spacing (relevé AERL-7)

***Eremophila youngii* subsp. *lepidota* (P4)**

Eremophila youngii subsp. *lepidota* is described as a dense, spreading shrub to 3 m high, with purple-red-pink flowers and occurring on flats, plains, floodplains and clay flats (WAH 1998-). Within the Study Area it was a dense shrub (when smaller) to somewhat more open shrub (when larger) up to 4 m high, frequently occurring as a dominant mid-stratum species. **Plate 4** and **Plate 5** illustrate *E. youngii* subsp. *lepidota*.

Within the Study Area, *E. youngii* subsp. *lepidota* occurred as three discrete populations; two of these were near the northern extent of the Study Area and were separated by the Fortescue River floodplain, and one to the south of Kalgan Creek (**M**).

NatureMap (DEC 2007-) lists 29 records of *E. youngii* subsp. *lepidota*, including one from the Northern Territory. Within Western Australia, it occurs in the Carnarvon, Gascoyne, Little Sandy Desert and Pilbara bioregions. **Figure 6** shows the NatureMap records closest to the Study Area. The overlaid 'A', 'B' and 'C' indicate the approximate locations of the populations recorded during this survey. 'A' and 'B' are likely to be associated with previously known populations, however 'C' (south of Kalgan Creek) appears to be a new population.



Plate 4: *Eremophila youngii* subsp. *lepidota* flowers and foliage



Plate 5: *Eremophila youngii* subsp. *lepidota* form

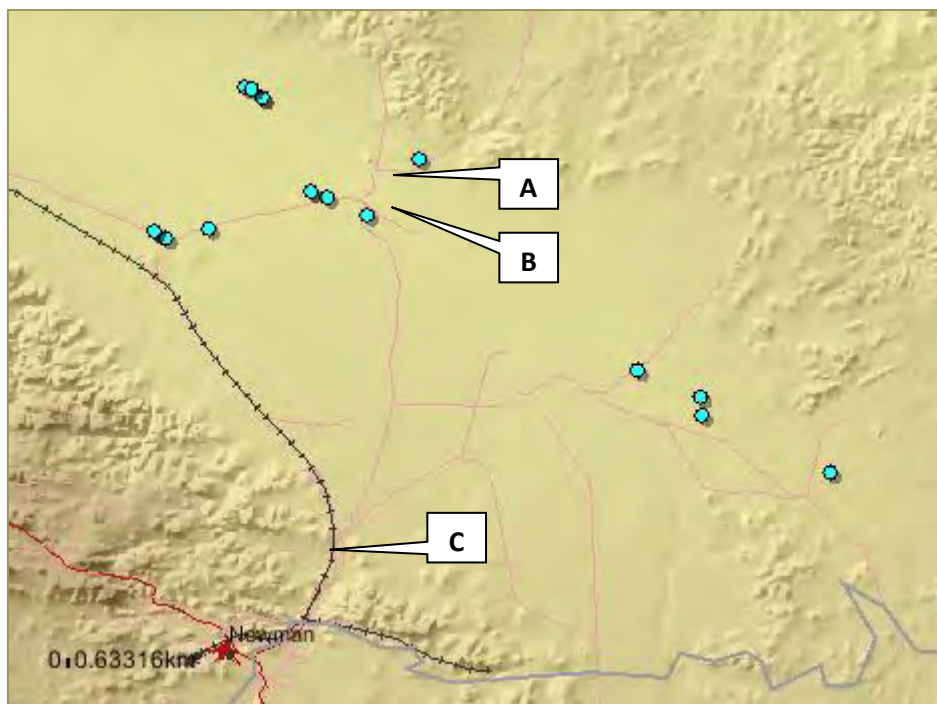


Figure 6: Nearby *Eremophila youngii* subsp. *lepidota* records from NatureMap (DEC 2007-), accessed September 19, 2012, and the current survey (A, B, C)

***Goodenia nuda* (P4)**

FloraBase (WAH 1998-) describes *Goodenia nuda* as an erect or ascending herb to 0.5 m with yellow flowers. Ecoscape has previously recorded this species from numerous locations in the Pilbara (eg Ecoscape 2012b), indicating that it is sparsely distributed but apparently not rare.

NatureMap (DEC 2007-) lists 54 records of *Goodenia nuda*, mainly from the Pilbara but also from the Great Sandy Desert and Gascoyne bioregions.

The specimen collected during this survey has only been tentatively identified as this species, however if confirmed it will be an approximate 20 km southerly range extension (within the Pilbara), **Figure 7**.

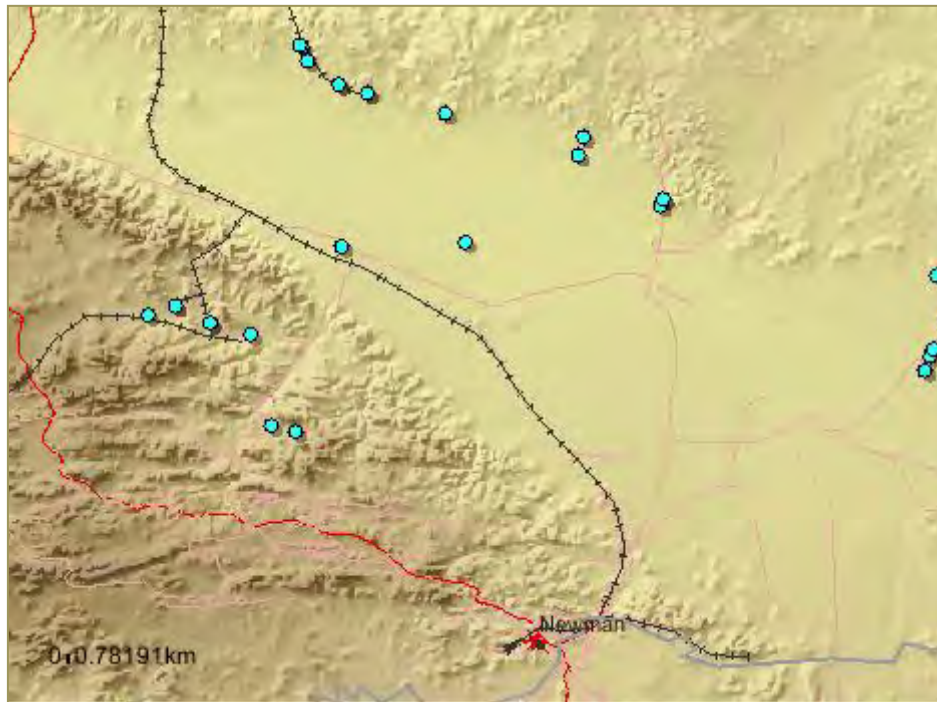


Figure 7: nearby *Goodenia nuda* records from NatureMap (DEC 2007-), accessed September 20, 2012

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

There is no description of *Rhagodia* sp. Hamersley (M. Trudgen 17794) included on FloraBase (WAH 1998-). Ecoscape has previously recorded this species from areas to the west of this Study Area (eg Ecoscape 2012b) where it is generally an erect shrub to 1.5 m high, often growing through other shrubs. In Ecoscape's experience it differs largely from the more common *R. eremaea* in its slightly narrower leaves and lack of 'fishy' smell when the leaves are crushed.

Two plants were collected and one other recorded as a co-ordinae (**Map 4**) during the survey, however the usual distinctive features (leaf shape and smell) were not as clear-cut as Ecoscape's previous surveys have indicated, and the identification is not certain. Due to the lack of distinctiveness of the *Rhagodia* sp. in the area, other, very sparsely spaced, individuals that may also be *Rhagodia* sp. Hamersley (M. Trudgen 17794) may occur.

NatureMap (DEC 2007-) lists 22 records of *Rhagodia* sp. Hamersley from the Gascoyne and Pilbara bioregions (**Figure 8**). If confirmed as this species, the specimens collected during this survey represent new populations, on the eastern edge of its known distribution.

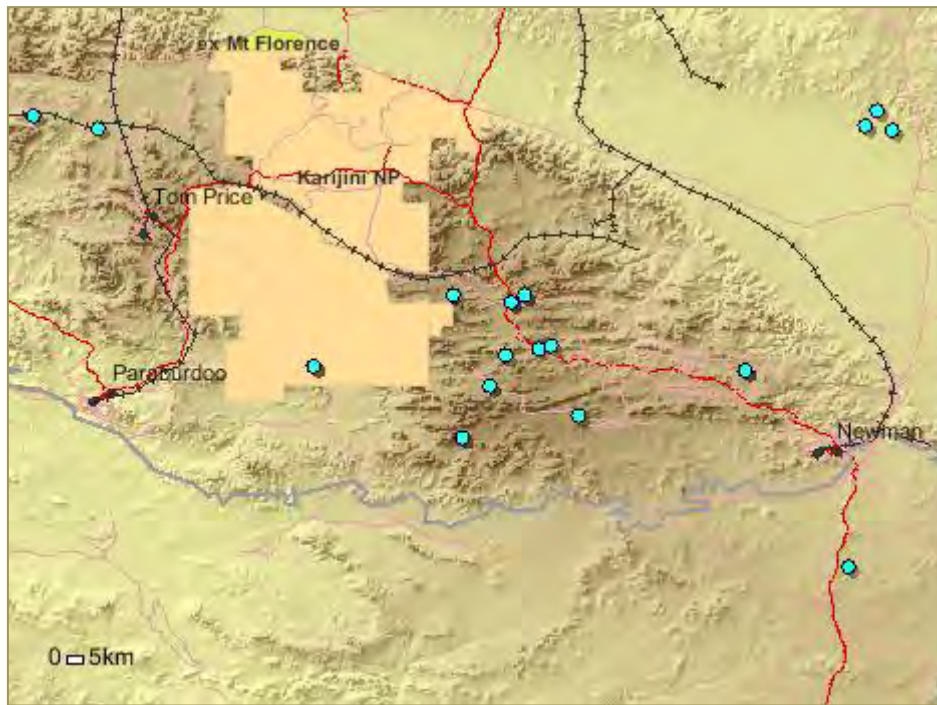


Figure 8: *Rhagodia* sp. Hamersley records from NatureMap (DEC 2007-), accessed September 19, 2012

***Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3)**

Themeda sp. Hamersley Station (M.E. Trudgen 11431) is described as perennial tussock grass to 1.8 m high, occurring in clay pans and grass plains (WAH 1998-). Ecoscape has previously conducted surveys in which this species has featured (e.g. a specific survey for the ‘*Themeda* grasslands on cracking clays (Hamersley Station, Pilbara)’ TEC, (Ecoscape 2012a)). Ecoscape’s experience indicates that *Themeda* sp. Hamersley Station differs from the more common *T. triandra* in being mostly taller, more robust and having a distinctive purplish colouration to the leaf and yellow colouration to the culm.

One population of *Themeda* sp. Hamersley Station was recorded from the Study Area (**Map 4**). **Plate 6** and **Plate 7** illustrate this species.

Themeda sp. Hamersley Station is known from 22 records listed on NatureMap (DEC 2007-), all from the Pilbara bioregion. This record of *Themeda* sp. Hamersley Station represents a new population, and a range extension of approximately 45 km to the east of the previously known south-eastern extremity (**Figure 9**).



Plate 6: *Themeda* sp. Hamersley Station seed head



Plate 7: *Themeda* sp. Hamersley Station form

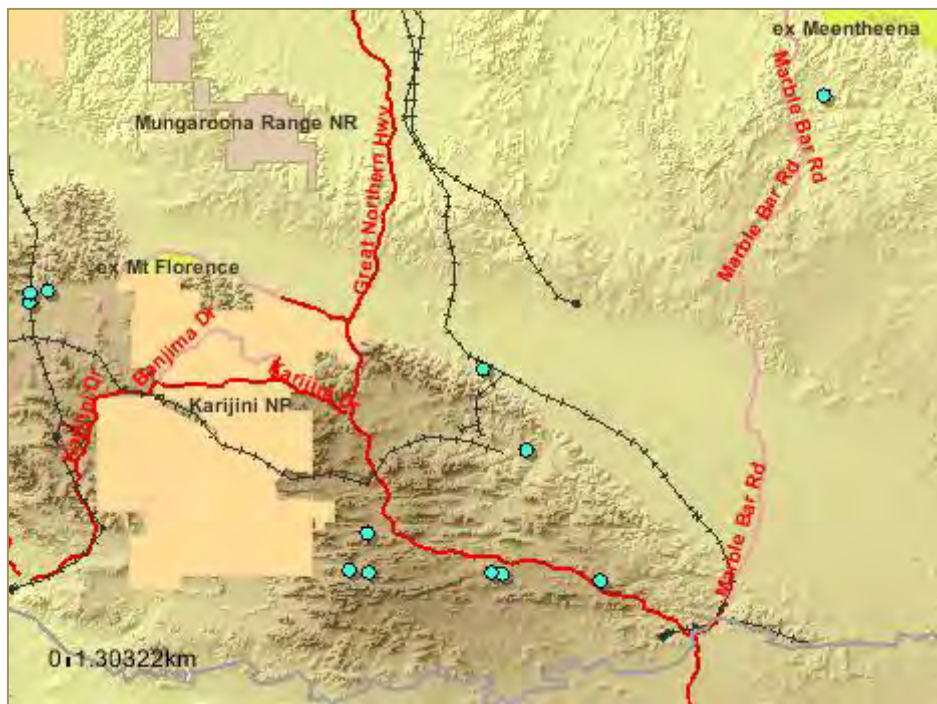


Figure 9: Nearby *Themeda* sp. Hamersley Station records from NatureMap (DEC 2007-), accessed September 19, 2012

4.1.2 INTRODUCED FLORA

Seven or eight (one species has only tentatively been identified) introduced species were recorded from quadrats or opportunistic observations during the field survey.

The introduced species recorded from the Study Area are:

- **Aerva javanica* (Kapok Weed)
- **Bidens bipinnata* (Bipinnate Beggartick)

- **Cenchrus ciliaris* (Buffel Grass)
- **Heliotropium europaeum* (Heliotrope)
- **Malvastrum americanum* (Spiked Malvastrum)
- **Portulaca oleracea* (Purslane)
- **Tribulus terrestris* (Caltrop)
- **Vachellia farnesiana* (Mimosa Bush).

**Heliotropium europaeum* is listed as a Declared Plant elsewhere in Western Australia but is not listed for the Shire of East Pilbara. No other Declared Plants were recorded during the survey.

No Weeds of National Significance (Weeds Australia 2012b), plants listed on the National Environmental Alert List (DSEWPaC 2012a), listed as Sleeper Weeds (DSEWPaC 2012b) or listed as Species Targeted for Eradication (DSEWPaC 2012d) were recorded from the Study Area.

One species, tentatively identified as **Tribulus terrestris* as the collected specimen was of poor quality, is listed as a Target Species for Biological Control (Weeds Australia 2012a). Whilst it is not possible to be certain of the identification of this specimen, NatureMap (DEC 2007-) indicates that 150 specimens of **Tribulus terrestris* have been recorded from Western Australia, including at least one from close to the Study Area (**Figure 10**) thus it is likely that the identification is correct.



Figure 10: Nearby **Tribulus terrestris* records from NatureMap (DEC 2007-), accessed September 20, 2012

4.1.2.1 Introduced Flora Descriptions

Descriptions of introduced species are based on field observations, supplemented with information from Hussey *et al.* (2007) and FloraBase (WAH 1998-), and NatureMap (DEC 2007-) for distribution data.

****Aerva javanica* (Kapok weed)**

**Aerva javanica* is a perennial herb to 1.6 m high (approximately 0.8 m high in the Study Area) with greyish white flowers throughout much of the year. It is usually associated with disturbed areas and drainage lines, and is found throughout much of northern Western Australia.

Within the Study Area it occurred in isolated patches, and did not form significant infestations.

****Bidens bipinnata* (Bipinnate Beggartick)**

**Bidens bipinnata* is an annual herb to 1.5 m high, although usually approximately 0.5 m high in the Study Area. **Bidens bipinnata* is found throughout much of the north of Western Australia.

Within the Study Area it was associated with Mulga groves but did not form significant infestations.

****Cenchrus ciliaris* (Buffel Grass)**

**Cenchrus ciliaris* is a perennial tussock-forming grass to 1 m high, although usually approximately 0.5 m high in the Study Area. It is generally associated with clay loam soil of drainage lines and floodplains, and is more common in grazed areas. **Cenchrus ciliaris* was either deliberately planted for pasture or accidentally introduced (Van Vreeswyk *et al.* 2004), and has been known from the Pilbara bioregion since the early 1900s (Keighery 2010).

It formed clumps in isolated areas within the Study Area and was a significant component (frequently as the dominant understorey species along drainage lines). It also occurred on the Fortescue River Floodplain, however this area was, in most places, heavily grazed and it was not possible to determine if it may have been a dominant species in some areas.

**Cenchrus ciliaris* was one of the most frequently recorded species in the Study Area; it occurred in 17 (28%) of quadrats and relevés.

****Heliotropium europaeum* (Heliotrope)**

**Heliotropium europaeum* is an annual herb to 0.6 m high with white flowers. It is generally found in the south-west of Western Australia, where it is a Declared Plant.

It was recorded from one quadrat in the Study Area, near the northern end of the surveyed area on the Fortescue River floodplain, in heavily grazed *Eucalyptus victrix* and *Acacia aptaneura* low sparse woodland. There is only one other record of this species from the Pilbara bioregion (Warrawagine

Station, approximately 260 km north-east of Newman), although ENVIRON Australia Pty Ltd (2009) reported it as occurring in Roy Hill Stage 2, north of the Study Area. It is a significant finding of scientific interest, although not a range extension. As it is not a Declared Plant in the Shire of East Pilbara, it is not considered of concern.

Identification of this species is tentative due to the poor quality specimen, however there are no other similar species so the identification is likely to be correct.

****Malvastrum americanum* (Spiked Malvastrum)**

**Malvastrum americanum* is a perennial herb or shrub to 1.3 m high, although within the Study Area it was generally less than 0.5 m high. It is usually, but not always, associated with drainage lines and floodplains and has a wide distribution through northern and arid Western Australia.

Within the Study Area it was a dominant understorey species on the Fortescue River floodplain and an occasional occurrence elsewhere.

****Portulaca oleracea* (Purslane)**

**Portulaca oleracea* is a succulent prostrate to decumbent annual herb. It is found throughout much of Western Australia, however there is some dispute if it is native or introduced: FloraBase (WAH 1998-) considers **Portulaca oleracea* to be 'alien' (introduced), whereas Hussey *et al.* (2007) consider it to be native, except in the south-west.

Within the Study Area it was sparsely distributed in grazed areas, but was not observed on the Fortescue River floodplain.

****Tribulus terrestris* (Caltrop)**

**Tribulus terrestris* is a prostrate annual with yellow flowers and spiny spherical fruit. Hussey *et al.* (2007) consider that some forms may be native to Western Australia. It is found throughout most of the state.

Although the identification is not conclusive due to the poor quality of the specimen, *T. terrestris* has previously been recorded from less than 5 km from the location it was collected from during this survey, thus it is likely to be correctly identified.

****Vachellia farnesiana* (Mimosa Bush)**

**Vachellia farnesiana* is an erect spinescent tree or, more usually, shrub to 4 m high. It is widely distributed through the north of Western Australia, however it occurs sporadically in areas closer to Perth. Hussey *et al.* (2007) consider it to have been introduced to Australia prior to European settlement.

Within the Study Area it was a dominant or characteristic species of the midstratum on the Fortescue River floodplain.

4.1.2.2 Introduced Species Rankings

Table 10 lists the introduced species ('*'; weeds) recorded for the Study Area, with their *Invasive Plant Prioritisation Process for the DEC* (DEC 2012a) and *Environmental Weed Strategy for Western Australia* (EWSWA, CALM 1999) rankings.

Table 10: DEC (2012a) and EWSWA (CALM 1999) rankings

Species	Potential Dist.	Current Dist.	Abundance	Ecological Impact	Invasiveness	Feasibility of control	Status	EWSWA
* <i>Aerva javanica</i>	L	M	A	H	R	H-M	EST	High
* <i>Bidens bipinnata</i>	H	H	-	U	R	L	-	Unrated
* <i>Cenchrus ciliaris</i>	H	H	A	H	R	L	EST	High
* <i>Heliotropium europaeum</i>	Not listed for the Pilbara							Low
* <i>Malvastrum americanum</i>	L	H	A	H	R	L	EST	Moderate
* <i>Portulaca oleracea</i>	-	-	-	L	-	-	-	Low
* <i>Tribulus terrestris</i>	L	L		L	S	H	-	Low
* <i>Vachellia farnesiana</i>	L	H	C	H	R	L	EST	High

Table codes:

- o H = high, M= moderate, L = low (impact or feasibility of control)
- o O = occasional (light – scattered individuals), C = common (medium – scattered patches), A = abundant (isolated plants interspersed)
- o R= rapid, S = slow, U = unknown
- o EST = established
- o EWSWA risk rating for invasiveness, distribution and environmental impact criteria (High = three criteria, Moderate = two criteria, Mild = one criteria, Low = scoring on none of the criteria).

Table column headings:

- o Potential distribution = area of potential habitat in the region that could be occupied or the area at risk of invasion by the weed
- o Current distribution = area of habitat in the region currently occupied by the weed
- o Abundance = density class across one or more IBRA regions in the DEC Region
- o Ecological impact = impact of species within the Region, from low impact (causes minimal disruption to ecological processes or loss of biodiversity) to high (causes acute disruption of ecological processes, dominates and/or significantly alters vegetation structure, composition and function of ecosystems)
- o Invasiveness = rate of spread of a weed in native vegetation, encompassing factors of establishment, reproduction (time to seeding, seed production, vegetative reproduction) and dispersal (wind, water, flying animals, ground animals, deliberate human spread, accidental human spread, vehicles, produce contaminant)
- o Feasibility of control = the longer a coordinated control program takes to achieve its desired goal, the more expensive and less feasible it becomes. Key factors to consider include how widespread a weed is, ease of finding infestations, cost of controlling infestations, difficulty of limiting the weed's dispersal, willingness of landholders and governments to control the weed, and commercial use of the plant

- o Status = defines whether the species is outside the region, considered emerging (density class of occasional), established (density class of common or abundant) or unknown.

4.2 Vegetation Assessment

Due to time limitations, the emphasis during the field survey was placed on identifying botanical constraints to clearing, i.e. identifying the presence and locations of conservation significant flora and vegetation. Consequently the vegetation was described using a combination of 50 m x 50 m floristic quadrats and brief relevés that were quicker to record, in which only the physical environment and dominant and characteristic species were recorded.

4.2.1 VEGETATION TYPES

Thirteen vegetation types, including one mosaic, were identified from the Study Area during the field survey and subsequent analysis and interpretation. The floristic analysis dendrogram using the quadrat data is included in **Appendix Nine**.

These vegetation types and their extents are included in **Table 11**, and shown on **Map 5**.

Roadworks near Kalgan Creek restricted access to 25 ha, which was not surveyed.

Table 11: Vegetation types and their extents within the Study Area

Map Code	Vegetation Type	Quadrat/Relevé	Area (ha)	Proportion
AapAscTe	<i>Acacia aptaneura</i> tall open shrubland over <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> and <i>A. synchronicia</i> sparse mid shrubland over <i>Triodia epactia</i> , <i>Eremophila cuneifolia</i> and <i>Ptilotus nobilis</i> var. <i>nobilis</i> mid open shrubland	AHH1221R, AHH1222R, AHH1231Q	44.36	2.73
AapEfTe/ AsyAc	Mulga grove: <i>Acacia aptaneura</i> , <i>A. pruinocarpa</i> and <i>A. paraneura</i> low woodland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Acacia tetragonophylla</i> and <i>E. youngii</i> subsp. <i>lepidota</i> tall-mid sparse shrubland over <i>Triodia epactia</i> , <i>Aristida contorta</i> and <i>A. inaequiglumis</i> mid- low open hummock grassland/mid-low open tussock grassland Mulga intergrove: <i>Acacia synchronicia</i> tall open/sparse shrubland over <i>Aristida contorta</i> , <i>Sclerolaena</i> spp. and <i>Senna</i> sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland	AERL2, AERL14, AERL16, AERL17, AHH1201R, AHH1203R, AHH1204R, AHH1206R, AHH1212Q AEQL4, AHH1202R, AHH1205R	322.22	19.82
Mosaic	AapEfTe/AsyAc/Tb		29.34	1.80

Map Code	Vegetation Type	Quadrat/Relevé	Area (ha)	Proportion
AbiTe	<i>Acacia bivenosa</i> , <i>A. ancistrocarpa</i> and <i>A. sclerosperma</i> subsp. <i>sclerosperma</i> tall-mid open shrubland over <i>Triodia epactia</i> and <i>T. wiseana</i> mid-low hummock grassland	AEQL5, AEQL9, AERL10, AERL11, AERL12, AHH1220R, AHH1232Q	60.77	3.74
Mosaic	AbiTe/AbiTw		10.96	0.67
AbiTw	<i>Acacia bivenosa</i> mid sparse shrubland over <i>Triodia wiseana</i> , <i>Acacia hilliana</i> and <i>T. epactia</i> low open hummock grassland/low open-sparse shrubland with <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> low scattered trees	AEQL6, AEQL8, AHH1213R, AHH1214R, AHH1215R, AHH1216R, AHH1217R	59.80	3.68
AscTe	<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> and <i>A. synchronicia</i> tall sparse shrubland over <i>Triodia epactia</i> , <i>Eragrostis eriopoda</i> and <i>*Cenchrus ciliaris</i> tall hummock grassland/low sparse tussock grassland	AEQL1, AERL1	48.77	3.00
AsyTI	<i>Acacia synchronicia</i> mid sparse shrubland over <i>Triodia longiceps</i> , <i>Aristida contorta</i> and <i>Sclerolaena</i> spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland	AERL13, AERL15, AHH1230Q	31.06	1.91
CcAscCc	<i>Corymbia candida</i> subsp. <i>dipsodes</i> and <i>Eucalyptus victrix</i> low open woodland-isolated trees over <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> tall sparse shrubland over <i>*Cenchrus ciliaris</i> and <i>Triodia epactia</i> mid tussock grassland/mid open hummock grassland	AEQL7, AHH1218R, AHH1219R	30.79	1.89
EvAscCc	<i>Eucalyptus victrix</i> , <i>Acacia aptaneura</i> and <i>Atalaya hemiglauca</i> open woodland over <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> , <i>Eremophila youngii</i> subsp. <i>lepidota</i> and <i>*Vachellia farnesiana</i> tall-mid sparse shrubland over <i>*Cenchrus ciliaris</i> , <i>*Malvastrum americanum</i> and <i>Salsola australis</i> low sparse tussock grassland/low sparse forbland	AHH1224R, AHH1225R	62.40	3.84
EvAscPs	<i>Eucalyptus victrix</i> and <i>Acacia aptaneura</i> low open-sparse woodland over <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> , <i>*Vachellia farnesiana</i> and <i>A. tetragonophylla</i> mid sparse shrubland over mixed Poaceae spp. low open tussock grassland	AEQL3, AERL18, AHH1229Q	29.23	1.80
EvVfPs	<i>Eucalyptus victrix</i> , <i>E. camaldulensis</i> subsp. <i>refulgens</i> and <i>Atalaya hemiglauca</i> mid open forest over Poaceae sp. mid open tussock grassland with <i>*Vachellia farnesiana</i> mid scattered shrubs	AHH1228R	3.71	0.23
Sc	<i>Sclerolaena cornishiana</i> and <i>S. bicornis</i> var. <i>bicornis</i> low sparse chenopod shrubland	AHH1223R	4.31	0.26

Map Code	Vegetation Type	Quadrat/Relevé	Area (ha)	Proportion
Tb	<i>Triodia basedowii</i> , <i>T. longiceps</i> and <i>Paraneurachne muelleri</i> mid-low open hummock grassland/low sparse tussock grassland with <i>Acacia ancistrocarpa</i> and <i>A. pachyacra</i> tall-mid scattered shrubs	AEQL2, AERL3, AERL4, AERL5, AERL6, AERL7, AERL8, AERL9, AHH1207R, AHH1209R, AHH1211R, AHH1212R, AHH1220R	678.58	41.73
VfEc	* <i>Vachellia farnesiana</i> and <i>Senna glutinosa</i> subsp. <i>luerssenii</i> x <i>pruinosa</i> mid sparse shrubland over <i>Enneapogon caerulscens</i> , * <i>Cenchrus ciliaris</i> and * <i>Aerva javanica</i> low scattered tussock grassland/low sparse forbland with <i>Acacia aptaneura</i> and <i>A. paraneura</i> low scattered trees	AHH1226R, AHH1227R	184.84	11.37
N/A	Roadworks		25.00	1.54
TOTAL			1626.13	100.00

Vegetation type map codes are derived from the first letter of the genus and species of the dominant species of each stratum, but not including emergent strata. The exception is for *Acacia* species that are identified using the first two letters of the species name.

AapAscTe

Vegetation description: *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland. Other common species include **Cenchrus ciliaris* and *Eragrostis eriopoda*, *Eremophila cuneifolia*, *E. Eremophila latrobei* subsp. *latrobei* and many Poaceae and Chenopodiaceae species.

This vegetation type is non-growing Mulga (**Plate 8**) that also has areas of low vegetation that are often dominated by *Eremophila cuneifolia* (**Plate 9**).

Two relevés and one quadrat (AHH1221R, AHH1222R, AHH1231Q) were recorded in this vegetation type, that occurred south of the Kalgan Creek but north of the Ophthalmia Range (approximately pole 62 to 65), and occupied 44.36 ha.

The condition of this vegetation type ranged from Good to Very good. Cattle were observed near this vegetation type and signs of grazing were evident.

Only one quadrat of this vegetation type was included in the floristic analysis (**Appendix Nine**) that indicated that the vegetation type is most similar to vegetation types **AsyTI** that occurred immediately to the north and vegetation type **AsyAc** that was the intergrove component of the mosaic vegetation type **AapEfTe/AsyAc**.

Rhagodia sp. Hamersley (M.Trudgen 17794) (P3) was recorded from this vegetation type.



Plate 8: Vegetation type AapAscTe (relevé AHH1221R)



Plate 9: Vegetation type AapAscTe (quadrat AHH1234Q)

AapEfTe/AsyAc

This vegetation type was growing Mulga, and consisted of a mosaic of Mulga grove (vegetation type **AapEfTe**) and intergrove (vegetation type **AsyAc**).

AapEfTe Mulga grove:

Vegetation description: *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forrestii* subsp. *forrestii*, *Acacia tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequiglumis* mid- low open hummock grassland/mid-low open tussock grassland. Other common species include *Acacia pruinocarpa*, *Acacia sclerosperma* subsp. *sclerosperma*, *Acacia tetragonophylla*, *Eremophila cuneifolia* and *Sclerolaena cornishiana*. The Mulga species also include *Acacia macraneura*.

Plate 10 illustrate this vegetation type that was recorded from eight relevés and one quadrat (AERL2, AERL14, AERL16, AERL17, AHH1201R, AHH1203R, AHH1204R, AHH1206R, AHH1212Q). There were several occurrences of this vegetation type within the Study Area, that in total occupied 322.22 ha. This vegetation type also occurred in a small-scale mosaic with vegetation type **Tb** (this section occupying 29.34 ha), in which the components occurred at a scale too small to be mapped as individual units.

The condition of this vegetation type ranged from Poor to Very good, depending on the impacts of cattle grazing.

Only one quadrat of this vegetation type was included in the floristic analysis (**Appendix Nine**) that indicated that the vegetation type is most floristically similar to vegetation type **AbiTw** that occurred on the hills of the Ophthalmia Range, however the relationship was not considered to be closely similar and a larger number of quadrats is likely to indicate a different relationship. The floristic analysis indicated that the Mulga grove vegetation type **AapEfTe** was not floristically similar to the intergrove vegetation type **AsyAc**, however they occurred in close proximity and could not be mapped as a separate unit.

E. youngii subsp. *lepidota* (P4) was a characteristic species of this vegetation type and intergrove vegetation type **AsyAc** in the more northern portion of this Study Area. *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) was also recorded from this vegetation type.

AsyAc Mulga intergrove:

Vegetation description: *Acacia synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland. Other common species include *Eremophila youngii*

subsp. *lepidota* and several *Chenopodiaceae* species. The *Sclerolaena* species recorded from this vegetation type include *S. costata*, *S. cuneata*, *S. densiflora* and *S. lanicuspis*.

Plate 11 illustrates this vegetation type that was recorded from two relevés and one quadrat (AEQL4, AHH1202R, AHH1205R).

The condition of this vegetation type ranged from Good-Very good depending on the impacts of cattle grazing.



Plate 10: Vegetation type AapEfTe, Mulga grove (relevé AHH1204R)



Plate 11: Vegetation type AsyAc Mulga intergrove (relevé AHH1202R)

AbiTe

Vegetation description: *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland. Other common species include *Cenchrus ciliaris*, *Eragrostis eriopoda* and *Eucalyptus gamophylla*.

This vegetation type was recorded from four relevés and three quadrats (AEQL5, AEQL9, AERL10, AERL11, AERL12, AHH1220R, AHH1232Q). It occurred on valley floors (**Plate 12**) and immediately adjacent lower slopes of the Ophthalmia Range (**Plate 13**) where it occupied 60.77 ha. At times it formed a mosaic with the vegetation type that occurred on the Ophthalmia Range (**AbiTw**); this mosaic occupied 10.96 ha.

The valley floors in this area often appeared to be minor sand dunes.

The vegetation condition Good to Excellent, being mostly Very good.

Three quadrats were included in the floristic analysis, all of which grouped closely together (**Appendix Nine**). This vegetation type was most floristically similar to vegetation type AscTe.

No PF species were recorded from within this vegetation type.



Plate 12: Vegetation type AbiTe, valley floor (relevé AERL11)



Plate 13: Vegetation type AbiTe, lower slope immediately adjacent to valley (relevé AERL10)

AbiTw

Vegetation description: *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hilliana* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees. Other common species include **Cenchrus ciliaris*, *Corymbia hamersleyana*, *Eriachne mucronata*, *Polycarpaea involucrata*, *Paraneurachne muelleri* and *Ptilotus* spp.

Five relevès and two quadrats (AEQL6, AEQL8, AHH1213R, AHH1214R, AHH1215R, AHH1216R, AHH1217R) were recorded in this vegetation type that occurred on hillslopes and crests of the Ophthalmia Range. **Plate 14** illustrates this vegetation type. The extent of **AbiTw** was 59.80 ha. It also occurred in a small scale mosaic with the valley floor vegetation type **AbiTe**; this mosaic occupied 10.96 ha.

The condition of this vegetation type ranged from Poor (on some lower slopes) to Excellent

Two quadrats of this vegetation type were included in the floristic analysis (**Appendix Nine**) that indicated this vegetation type to form a discrete floristic group.

No PF species were recorded from within this vegetation type.



Plate 14: Vegetation type AbiTw (relevé AHH1216R)

AscTe

Vegetation description: *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and **Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland. Other common species include *Eremophila* species and several Poaceae spp.

This vegetation type (**Plate 15**) occurred near the Kalgan Creek confluence with the Fortescue River, approximately between pole 70 and pole 81. It occupied 48.77 ha.

One quadrat and one relevé (AEQL1, AERL1) were recorded in this vegetation type.

The condition of this vegetation type ranged from Good to Very good, with signs of cattle grazing frequently observed.

Only one quadrat of this vegetation type was included in the floristic analysis (**Appendix Nine**). The dendrogram indicated that this vegetation type is most closely floristically allied with vegetation type **AbiTe** that occurred in the valleys of the Ophthalmia Range.

No PF species were recorded from within this vegetation type.



Plate 15: Vegetation type AscTe (relevé AERL1)

AsyTI

Vegetation description: *Acacia synchronicia* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland. Other common species include *Acacia aptaneura*, *Eragrostis dielsii*, *E. falcata*, *Sporobolus australasicus* and Chenopodiaceae species. The *Sclerolaena* species include *S. beagleholei*, *S. densiflora* and *S. eriacantha*.

Two relevés and one quadrat (AERL13, AERL15, AHH1230Q) were recorded from this vegetation type, that occurred on soil that appeared to be slightly saline. Most of the vegetation was similar to **Plate 16** however there were some lower lying areas (minor depressions) dominated by Chenopodiaceae spp. (**Plate 17**). There were two occurrences of this vegetation type, approximately between poles 63 and 69, and poles 187 and 190. The total extent was 31.06 ha.

The condition of this vegetation type ranged from Good to Very good.

Only one quadrat of this vegetation type was included in the floristic analysis (**Appendix Nine**) that indicated that this vegetation type is floristically most similar to the Mulga intergrove vegetation type **AsyAc**.

The P4 species *Eremophila youngii* subsp. *lepidota* was associated with this vegetation type in the southern extent, and is a new population of this species but not a range extension.



Plate 16: Vegetation type AstTI (relevé AERL13)



Plate 17: Vegetation type AsyTI, depression (relevé AERL15)

CcAscCc

Vegetation description: *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over **Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland. Other common species include *Acacia citrinoviridis* (associated with drainage lines), *Chrysopogon fallax*, *Eragrostis eriopoda*, *Salsola australis* and *Themeda triandra*.

One quadrat and two relevés (AEQL7, AHH1218R, AHH1219R) were recorded from this vegetation type that occurred on flat, low-lying areas near or with minor drainage lines. There was one occurrence of this vegetation type, between poles 46 and 49, that are illustrated in **Plate 18** and **Plate 19**. CcAscCc occupied 30.79 ha.

The condition of this vegetation type ranged from Poor to Good, largely as a result of cattle grazing and presence of weeds.

Only one quadrat was included in the floristic analysis (**Appendix Nine**) that indicated that this vegetation type is most floristically similar to the other vegetation type occurring on valley floors within the Ophthalmia Range, **AbiTe**.

No PF species were recorded from within this vegetation type.



Plate 18: Vegetation type AstTI (quadrat AEQL7)



Plate 19: Vegetation type AsyTI, depression (relevé AHH1219R)

EvAscCc

Vegetation description: *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and **Vachellia farnesiana* tall-mid sparse shrubland over **Cenchrus ciliaris*, **Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland. Other common species include *Acacia synchronica*.

Two relevés (AHH1224R, AHH1225R) were recorded from this vegetation type that that was associated with the Fortescue River and other minor floodplains, illustrated in **Plate 20**. There were two occurrences of this vegetation type, approximately between poles 218 and 223 and poles 227 and 229. **EvAscCc** occupied 62.40 ha.

The condition of this vegetation type ranged from Very poor to Good as a result of cattle grazing.

Eremophila youngii subsp. *lepidota* (P4) and *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) both occurred in this vegetation type.



Plate 20: Vegetation type EvAscCc (relevé AHH1225R)

EvAscPs

Vegetation description: *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, **Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland. Other common species include **Cenchrus ciliaris*, *Salsola australis*, *Sclerolaena cornishiana*, *Sclerolaena costata* and *Sporobolus australasicus*. This vegetation type is grazed and most grasses were not identifiable.

Two quadrats and one relevé (AEQL3, AERL18, AHH1229Q) were recorded in this vegetation type (**Plate 21**), which formed an ecotone between the floodplain vegetation **EvAscCc** and calcrete vegetation type **VfEc** and Mulga grove-intergrove vegetation type **AapEfTe/AsyAc**. **EvAscPs** occupied 29.23 ha.

The condition of this vegetation type ranged Poor to Very good, depending on degree of cattle grazing.

The two quadrats included in the floristic analysis (**Appendix Nine**) formed a close pair in the dendrogram that were only loosely similar to other quadrats from other vegetation types.

Eremophila youngii subsp. *lepidota* (P4) was recorded from within this vegetation type.



Plate 21: Vegetation type EvAscPs (quadrat AEQL3)

EvVfPs

Vegetation description: *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with **Vachellia farnesiana* mid scattered shrubs. The understorey Poaceae sp. was unidentifiable due to lack of reproductive material.

One relevé (AHH1228R) described this vegetation type that was associated with the banks of the Fortescue River (**Plate 22**). EvVfPs occupied 3.71 ha.

The condition of this vegetation type was Poor due to the impacts of cattle grazing and trampling.

No PF species were recorded from within this vegetation type.



Plate 22: Vegetation type EvVfPs (relevé AHH1228R)

Sc

Vegetation description: *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland.

One relevé was recorded on this vegetation type (AHH1223R) that occurred on clay flats and clay pans at the northern portion of the surveyed Study Area (**Plate 23**). **Sc** occupied 4.31 ha.

The vegetation condition ranged from Poor to Good as a result of cattle grazing, with some areas almost devoid of vegetation.

No PF species were recorded from within this vegetation type.



Plate 23: Vegetation type Sc (relevé AHH1223R)

Tb

Vegetation description: *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs. Other common species include *Aristida contorta*, *Aristida inaequilatera*, *Bonamia erecta*, *Eremophila pilosa*, *Ptilotus asterolasius* and *Senna notabilis*. The mid stratum, and occasionally upper stratum, emergent species were very variable and included several *Acacia* species (including *A. aptaneura* and *A. paraneura*), *Corymbia deserticola* subsp. *deserticola*, *Eucalyptus gamophylla* and *Grevillea* species.

This vegetation type was largely an open tussock grassland dominated by *Triodia basedowii* with scattered emergent shrubs (**Plate 24**) however at times *T. basedowii* was replaced by *T. longiceps* (**Plate 25**), usually in slight depressions. The boundary between areas dominated by the two *Triodia* species merged, forming a broad ecotone in most places (e.g. **Plate 26**; the green hummocks are *T. basedowii* and the grey hummocks are *T. longiceps*) and the two were not able to be mapped as separate units.

Two quadrats and 11 relevés (AEQL2, AERL3, AERL4, AERL5, AERL6, AERL7, AERL8, AERL9, AHH1207R, AHH1208Q, AHH1209R, AHH1211R, AHH1220R) were recorded from this vegetation type. This was the most common vegetation type, occupying 678.58 ha (41.73% of the total surveyed Study Area (**Table 11**)).

The condition of this vegetation type ranged from Good to Very Good and Excellent, with most areas being in Very good to Excellent condition. Cattle grazing appeared to be less frequent in this vegetation type, possibly due to the lack of palatable grass and herbaceous species.

Two quadrats were included in the floristic analysis (**Appendix Nine**) that indicated that these quadrats were floristically closely related, and largely not similar to other quadrats (and thus vegetation types) included in the analysis.

The P1 species *Eremophila pilosa* was most commonly associated with this vegetation type, where it was largely widely spaced (e.g. the low grey shrub visible centre foreground in **Plate 26**) but also occurred as individuals in loose clumps (e.g. **Plate 27** that illustrates the most dense occurrence of *E. pilosa*). *E. pilosa* appeared to favour, but was not confined to, areas with *T. longiceps*.



Plate 24: Vegetation type Tb; the more usual form dominated by *T. basedowii* (relevé AERL3)



Plate 25: Vegetation type Tb; dominated by *T. longiceps* (relevé AHH1211R)



Plate 26: Vegetation type Tb; ecotone (relevé AERL8)



Plate 27: Vegetation type Tb; most dense *Eremophila pilosa* area

VfEc

Vegetation description: **Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Enneapogon caerulscens*, **Cenchrus ciliaris* and **Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees.

Two relevès (AHH1226R, AHH1227R) were recorded from this vegetation type that occurred on calcrete rises in the northern portion of the surveyed Study Area, north of the Fortescue River approximately between poles 223 and 226. VfEc occupied 184.84 ha.

Plate 28 and **Plate 29** illustrate this vegetation type.

Eremophila pilosa (P1) and *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) were recorded from within this vegetation type.



Plate 28: Vegetation type VfEc (relevé AHH1226R)



Plate 29: Vegetation type VfEc (relevé AHH1227R)

4.2.2 STUDY AREA FLORISTIC ANALYSIS

Floristic analysis of the quadrat data was undertaken using PATN (Belbin & Collins 2006). Relevé data was not included in the analysis.

The Study Area floristic analysis dendrogram is reproduced in **Appendix Nine**.

The dendrogram shows some clear floristic groupings that correspond well with observed vegetation types (defined by dominant and characteristic species) and landforms.

Interpretation of the vegetation types in relation to floristic units is discussed in **Section 4.2.1**.

4.2.3 CONSERVATION SIGNIFICANT VEGETATION TYPES

4.2.3.1 Threatened or Priority Ecological Communities

No vegetation assessed as being, or likely to be considered, as a TEC or PEC was recorded from the Study Area.

4.2.3.2 Groundwater Dependent Ecosystems

Vegetation including *Eucalyptus camaldulensis*

Eucalyptus camaldulensis subsp. *refulgens* is widely regarded as being characteristic of a GDE (see **Section 2.2.4.4**). This species was a component of vegetation type **EvVfPs**, thus this vegetation type can be considered to represent a GDE.

EvVfPs occupied 3.71 ha of the Study Area.

Eucalyptus victrix-dominated vegetation

Current evidence does not clearly indicate if *Eucalyptus victrix* is groundwater dependent or not. In some populations it has been demonstrated to be at most weakly phreatophytic (ie able to access groundwater) and tolerant of lowered groundwater tables (Batini 2008; EPA & Hamersley Iron Pty Ltd 2010; Maunsell Australia Pty Ltd 2006). Other populations are considered to be not dependent on groundwater (eg Resource and Environmental Management Pty Ltd 2007). However, the EPA has required monitoring of *E. victrix* populations in Karijini National Park that may be impacted by groundwater drawdown as a result of activities in the nearby Marandoo Mine (EPA & Hamersley Iron Pty Ltd 2010) and Eamus (2009a) discusses a population of *E. victrix* that is considered to be groundwater dependent, indicating the potential for *E. victrix*-dominated vegetation to be considered as a GDE.

Based on the evidence listed above (and others; not quoted), it is not possible to conclude if *E. victrix* is dependent on groundwater or not. However the precautionary principle outlined in *Position Statement No. 7 – Principles of Environmental Protection* (EPA2004b) should be followed and *E. victrix* considered to be at least partly groundwater dependent and therefore potentially characteristic of a GDE.

Four vegetation types are either dominated or characterised by *Eucalyptus victrix*; **CcAscCc** (occupying 30.79 ha), **EvAscCc** (occupying 29.23 ha), **EvAscPs** (occupying 62.40 ha) and **EvVfPs** (see above). The three first listed vegetation types can be considered to potentially represent a GDE.

4.2.3.3 Sheet Flow Dependent Communities

Grove-intergrove Mulga is considered to be dependent on surface water flows to regenerate, and are therefore vulnerable to changes in surface hydrology including mounding and lowered surfaces associated with roads and tracks.

The mosaic vegetation type **AapEfTe/AsyAc** is considered to be grove-intergrove Mulga.

4.2.3.4 Other Measures of Vegetation Type Significance

In *Guidance Statement No. 51* (2004a), the EPA lists several reasons why vegetation may be considered to be significant in addition to its listing as a TEC or PEC or because the extent is below a minimum threshold. These reasons, which may apply at a number of scales but are not defined in detail, include:

- scarcity
- unusual species
- novel combinations of species
- role as a refuge
- 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 (particularly a good local and/or regional example of a unit in 'prime' habitat, at the extremes of range, recently discovered range extension or isolated outliers of the main range)
- restricted distribution.

Locally significant vegetation, unless it is a TEC, do not have any form of statutory protection.

Vegetation type **Tb** that was the main habitat for P1 species *Eremophila pilosa* may be considered to perform the role of key habitat for the species. However, P1 species are not considered as *threatened species*; rather they are poorly known, with no known populations on conservation lands (**Table 18**).

Vegetation significance is discussed in **Section 5.2**.

4.2.4 VEGETATION CONDITION

Vegetation condition was assessed both within quadrats and relevès (which were recorded in areas considered typical of the vegetation type) and extrapolated to the surrounding area, and from 'spot recordings' noted during traverses through the Study Area.

The extents and proportion of each vegetation condition rating category (using the adapted Keighery Vegetation Condition Scale (EPA & DEC 2012)) is shown in **Table 12**. **Map 6** shows the vegetation condition of the Study Area.

Table 12: Vegetation condition, assessed using the adapted Keighery Vegetation Condition Scale (EPA & DEC 2012)

Condition Rating	Excellent	Very good	Good	Poor	Very poor	Degraded	N/A
Extent (ha)	785.84	646.66	107.99	35.43	25.20	0	25.00
Proportion (%)	48.33	39.77	6.64	2.18	1.55	0	1.54

Plate 30 illustrates the Very poor condition of parts of the Fortescue River floodplain (vegetation type **EvAscCc**), in which little native vegetation remains. Note, however, that due to the heavy grazing it was largely not possible to identify the ground stratum grass species, thus they may be native or introduced.



Plate 30: Very poor condition vegetation (vegetation type EvAscCc)

4.3 Adequacy of Sampling

A species accumulation curve is generated to display adequacy of sampling: if the curve has reached (or nearly reached) an asymptote, it is considered likely that most species have been recorded from the Study Area. **Figure 11** displays the species accumulation curve for the Study Area.

The species accumulation curve was generated by the computer programme *Species Diversity and Richness* (Pisces Conservation Ltd 2007) using 10 random selections of sample order. It indicates that most species would have been recorded from the Study Area however, ideally, additional quadrats would be required to record the full complement of species within the Study Area.

It is Ecoscape’s interpretation that the southern portion of the Study Area, in the Ophthalmia Range in which most vegetation diversity was recorded, is adequately recorded, however the more northern

floodplain areas were less adequately surveyed. Additional survey at a different time of year (preferably March-April) would be required to identify grasses, however, given the heavy grazing in the area, identification may not be possible even during this optimal period.

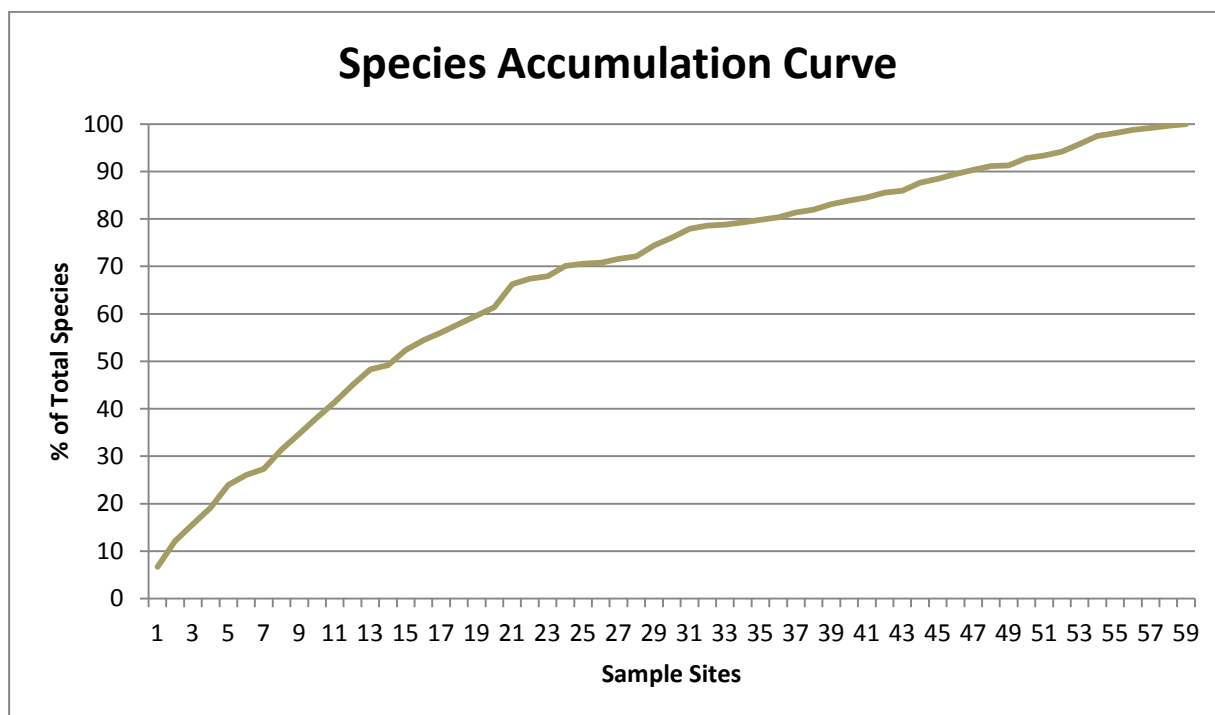


Figure 11: Species accumulation curve

4.4 Botanical Limitations

The botanical limitations (constraints) on the survey results are described in

Table 13: Botanical limitations

Possible Limitations	Constraints (Yes/No); Significant, Moderate or Negligible	Comments
Competency/experience of the consultant botanist	No constraints	Lead survey staff have relevant recent experience surveying in the Pilbara region. Plant identifications were undertaken by experienced staff.
Proportion of the flora identified	Negligible	264 taxa were identified from the surveys. 5.68% of taxa records were not identifiable to species level. Several of these are likely to represent taxa that were identified during this survey but were not able to be identified to species level due to lack of diagnostic material (particularly sterile Poaceae). None of these unidentified taxa resemble any currently listed TF or PF taxa.
Sources of information (historic/recent or new data)	No constraints	The Study Area has been the subject of several biological surveys in the past as there are several active and prospective mines in the area. Sources of information are sufficient to determine the validity of this survey.

Possible Limitations	Constraints (Yes/No); Significant, Moderate or Negligible	Comments
Proportion of the task achieved and further work that may need to be undertaken	Negligible (for surveyed area)	A small section was not surveyed on foot for conservation significant flora species, however the unsurveyed area is highly unlikely to contain TF as the habitat of the known Pilbara TF was not present in this area. P4 species are known to occur in this area, however this species is extremely common (and a dominant mid stratum species) thus the overall population is not threatened by the small amount clearing anticipated.
Timing/weather/season/cycle	Negligible-moderate	The survey was conducted during August, which is not considered optimal to identify plants in the area. However, the rainfall was considered average, thus providing no constraints on the presence of ephemeral species and a negligible to moderate constraint in terms of the ability to identify ephemerals and grass species due to lack of reproductive material. However, no TF species were anticipated in the area due to lack of suitable habitat, and no specimens were considered likely to have been TF. The known P1 species in the area, <i>Eremophila pilosa</i> , was flowering during the field survey and readily identifiable.
Intensity of survey	No constraints (for surveyed area)	Ecoscope considered the survey of sufficient intensity to identify botanical constraints in relation to the proposed clearing.
Completeness (e.g. was relevant area fully surveyed)	Negligible (for surveyed area)	Approximately 10% of the field survey was not covered by a foot traverse, however the flora and vegetation of the unsurveyed area is sufficiently understood to anticipate no botanical constraints to the proposed clearing.
Resources (e.g. degree of expertise available for plant identification)	Negligible	Sufficient resources were available..
Availability of contextual (e.g. bioregional) information for the Study Area	Negligible	Adequate information was available.

4.5 Fauna and Habitat

4.5.1 HABITAT TYPES

Components of 'habitat type' that affect whether a particular vertebrate species is likely to be present or absent at a site include (among others) topography, rock type, soil type, vegetation structure, presence/absence of particular plant taxa or size/age classes, and waterbodies.

For this report, the habitat types of the Study Area are represented by Land Systems as described and mapped by Van Vreeswyk *et al* (2004), as the field survey confirmed that they are reasonably distinct from each other (often with boundaries clearly perceptible on the ground and/or aerial view) and more or less uniform internally (**Map 7**). Brief descriptions of land systems and their extents within the Study Area are provided in **Table 2** and **Table 3** (Section **2.1.3**). Recognition of a smaller

number of habitat types (e.g. by 'lumping' of land systems) would obscure differences relevant to the known requirements or associations of at least some of the conservation significant fauna species.

Approximately one third of the Study Area lies within the Divide Land System (sandplain and Spinifex with scattered shrubs), with smaller proportions (5-15%) in Jamindie LS (hardpan clay and stony lag with mulga groves and Spinifex), Fan LS (hardpan clay and sandy loam with mulga groves and tussock grass), Newman LS (banded ironstone hills with Spinifex), and Elimunna LS (stony plains and low hills with shrubland and tussock grass), and 1-5% of the area in each of the remaining eight systems.

4.5.2 HABITAT CONDITION

The condition of habitat was relatively good through most of the Study Area, and generally corresponds to the vegetation condition (4.2.4). Disturbance and degradation was associated both with existing infrastructure (road, rail, minor tracks) intersecting or adjacent to the Study Area, and grazing by introduced stock. Degradation of understorey vegetation, with loss of grass cover or replacement by weeds, was particularly evident in the *Eucalyptus victrix* woodland with and without *Acacia tetragonophylla* (Coolibah and Warri LS), but also in some patches in other habitat types.

4.5.3 FAUNA OBSERVATIONS

The following fauna species were recorded based on sightings, scats, tracks, burrows or calls during the reconnaissance survey, including the Study Area and nearby sites. Conservation significant species are indicated in **bold**:

Mammals (4 native, 4 introduced and one or more indeterminate species)

- ***Dasyercus sp.*** (Mulgara) burrows, tracks (DIV, Plate 31)
- *Macropus rufus* (Red Kangaroo) sightings, tracks, scats
- *Oryctolagus cuniculus* (Rabbit) scats, possible burrows (WSP)
- ***Pseudomys chapmani*** (Western Pebble-mound Mouse) inactive mound (NEW)
- Muridae indet. (mice) tracks
- *Bos taurus* (European Cattle) scats, tracks
- *Equus caballus* (Horse) scats, tracks
- *Canis lupus dingo* (Dingo) sighting, scats, tracks
- *Felis catus* (Feral Cat) scats, tracks

Reptiles (5 native species)

- *Ctenophorus isolepis* (Military Dragon) frequent sightings
- *Ctenophorus nuchalis/reticulatus* (Netted Dragon sp.) sighting
- *Varanus eremius* (Pygmy Desert Monitor) found dead
- *Varanus giganteus* (Perentie) track
- *Varanus gouldii/panoptes* (Sand Goanna sp.) tracks

Birds (42 native species)

- *Dromaius novaehollandiae* (Emu) tracks
- *Cygnus atratus* (Black Swan) sightings, Ophthalmia Dam
- *Tachybaptus novaehollandiae* (Australasian Grebe) sightings, Ophthalmia Dam
- *Ocyphaps lophotes* (Crested Pigeon) sightings
- *Geopelia cuneata* (Diamond Dove) frequent sightings
- *Phalacrocorax carbo/sulcirostris* (Black Cormorant sp.) sightings, Ophthalmia Dam
- *Threskiornis spinicollis* (Straw-necked Ibis) sightings, Newman
- *Hamirostra melanosternon* (Black-breasted Buzzard) sighting
- *Haliastur sphenurus* (Whistling Kite) frequent sightings
- *Aquila audax* (Wedge-tailed Eagle) frequent sightings, roadkill
- *Hieraeetus morphnoides* (Little Eagle) sighting
- *Falco cenchroides* (Australian Kestrel) frequent sightings
- *Falco berigora* (Brown Falcon) sightings
- ***Ardeotis australis*** (Australian Bustard) sightings, frequent tracks
- ***Burhinus grallarius*** (Bush Stone-curlew) tracks
- *Turnix velox* (Little Button-quail) frequent sightings, tracks
- *Eolophus roseicapillus* (Galah) sightings, calls
- *Cacatua sanguinea* (Little Corella) sightings
- *Nymphicus hollandicus* (Cockatiel) frequent sightings
- *Barnardius zonarius* (Australian Ringneck) sightings, calls
- *Melopsittacus undulatus* (Budgerigar) frequent sightings, calls
- *Todiramphus sanctus/pyrrhopygia* (Kingfisher sp.) sightings, nest-holes
- ***Merops ornatus*** (Rainbow Bee-eater) sightings, Ophthalmia Dam
- *Malurus leucopterus* (White-winged Fairy-wren) sighting, calls
- *Malurus lamberti* (Variegated Fairy-wren) calls
- *Smicronis brevirostris* (Weebill) sightings, calls
- *Pardalotus rubricatus* (Red-browed Pardalote) calls
- *Lichenostomus virescens* (Singing Honeyeater) sightings, calls
- *Lichenostomus penicillatus* (White-plumed Honeyeater) sightings, calls
- *Manorina flavigula* (Yellow-throated Miner) sightings, calls
- *Acanthagenys rufogularis* (Spiny-cheeked Honeyeater) sighting
- *Coracina novaehollandiae* (Black-faced Cuckoo-shrike) sightings, calls
- *Pachycephala rufiventris* (Rufous Whistler) calls
- *Colluricincla harmonica* (Grey Shrike-thrush) calls
- *Artamus minor* (Little Woodswallow) frequent sightings
- *Cracticus nigrogularis* (Pied Butcherbird) sightings, calls
- *Rhipidura leucophrys* (Willie Wagtail) sightings, calls

- *Corvus bennetti* (Little Crow) sightings, calls
- *Corvus orru* (Torresian Crow) sightings, calls
- *Grallina cyanoleuca* (Magpie-Lark) sightings, calls
- *Taeniopygia guttata* (Zebra Finch) frequent sightings, calls, nests
- *Emblema pictum* (Painted Finch) sighting

Tracks of small mammals in dry sand did not retain sufficient detail of pads and digits for identification, but one Mulgara track was identified based on its gait and relatively large size (**Plate 32**). Smaller tracks could represent several other species of murid rodents and/or dasyurids.

No evidence was observed that would indicate presence of Northern Quoll, Greater Bilby, Pilbara Leaf-nosed Bat, or Pilbara Olive Python. Suitable denning habitat for Northern Quoll is considered to be present in the southern part of the Study Area, where rock outcrops with crevices and small caves occur close to riparian woodland in Newman and Elimunna LS (**Plate 33, Plate 34**).

Rabbit scat was identified at one location (GDA84 Zone 50 796390 mE, 7428743 mN, WSP land system; **Plate 35**).

Bird tracks in the dried mud of a spoon drain (805940 mE, 7484099 mN) could represent either a heron Ardeidae (potentially one of the Migratory-listed Egret species *Ardea modesta* and *A. ibis*) or ibis Threskiornithidae (e.g. Straw-necked, *Threskiornis spinicollis*). The tracks may have been several months old.

Localities of conservation significant species are listed in **Table 14**. Not all localities for Bustard tracks were recorded using GPS because they were very common in several areas.

Table 14. Locality records for conservation significant fauna

Species	Evidence	Land System	GDA84 Zone 50 mE*	GDA84 Zone 50 mN	Plate
Mulgara	diggings	DIV	808849	7472604	
	burrow	DIV	807598	7455458	Plate 31
	burrow	DIV	807561	7455433	
	track	DIV	807397	7455397	Plate 32
Pebble-mound Mouse	pebble mound (inactive)	NEW	793594	7422689	
Bustard	track	DIV nr NAB	806224	7484728	
	track	DIV	808824	7472601	
	track	DIV	808873	7472541	Plate 36
	track	FAN nr DIV	807797	7459867	
	track	FAN nr DIV	807939	7459855	
	track	FAN nr DIV	807903	7459804	

Species	Evidence	Land System	GDA84 Zone 50 mE*	GDA84 Zone 50 mN	Plate
	track	DIV	807214	7455444	
	track	DIV	807451	7455376	
	sighting (2), track	RIV nr FAN	798425	7431365	
Bush Stone- curlew	track	RIV/WSP	793502	7430857	Plate 37
Rainbow Bee- eater	sighting	RIV	794274	7415976	

* Eastings are shown for GDA84 Zone 50, but some actually lie in Zone 51



Plate 31. Mulgara burrows, Divide Land System



Plate 32. Mulgara track



Plate 33. Banded Ironstone outcrop adjacent to Fortescue River in Ophthalmia Range, potential Northern Quoll habitat



Plate 34. Calcrete caprock on low hill, potential Northern Quoll habitat in Elimunna Land System



Plate 35. Rabbit scat, Ophthalmia Range



Plate 36. Bustard and Emu tracks



Plate 37. Bush Stone-curlew track, Kalgan Pool road

4.5.4 FAUNA INVENTORY

Including records from the survey, previous reports, NatureMap records and interpretation of habitat requirements, the vertebrate fauna considered to potentially occur within the Study Area includes six

species of fish, 13 frogs, 53 mammals, 122 reptiles, and 191 birds (**Appendix Four, Table 24**). The fauna species actually recorded represent 17% of the mammals, 5% of the reptiles and 22% of the birds that could potentially occur.

5.0 Discussion

5.1 Flora

There were 264 vascular flora species identified from the quadrats, relevés, opportunistic and conservation significant flora searches conducted in the Study Area. The species accumulation curve (**Figure 11**) indicates that additional survey would have been required to identify more species, however Ecoscape considers the survey intensity to be sufficient to identify the botanical constraints to the proposed clearing. Ecoscape also considers that the flora inventory would have increased if the survey had been conducted earlier in the season (ie March-June).

The seasonal conditions in the wet season prior to the field survey were above average (**Figure 4**) thus ephemeral species were anticipated to be present. However the dry period immediately before the field survey, that was conducted in August, meant that many grass species, in particular, had desiccated and some identifications are tentative (including for many *Triodia* species), although none were likely to have been of conservation significance.

5.1.1 CONSERVATION SIGNIFICANT FLORA SPECIES

No flora taxa listed as TF under either the Commonwealth *EPBC Act* (1999) or Western Australian *WC Act* (1950) were recorded during the survey.

There are only two TF species known from the Pilbara (WAH 1998-), *Lepidium catapycnon* and *Thryptomene wittweri*. Both are known from hillslopes, including scree slopes with a generally southerly aspect. Neither have previously been recorded from within the Study Area. *Lepidium catapycnon* has been recorded from approximately 9 km west of the town of Newman (approximately 9 km from the southern end of the area encompassed by the field survey), and *Thryptomene wittweri* from over 100 km to the west.

Five PF species were recorded from the Study Area:

- *Eremophila pilosa* (P1) was recorded from two populations and was associated with vegetation types **Tb** and **VfEc**
- *Eremophila youngii* subsp. *lepidota* (P4) was recorded from two populations, one previously unrecorded, and was associated with vegetation types **AapEfTe/AsyAc**, **AsyTI** and **EvAscPs**
- *Goodenia ?nuda* (P4) was recorded from a single population, however the identification is as yet unconfirmed
- *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) from three populations associated with vegetation types **AapAscTe**, **EvAscCc** and **VfEc**. Although the identification of this species is not absolutely certain, it is considered as being highly likely (almost certain)
- *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3) was identified from one population associated with vegetation type **AapEfTe/AsyAc**.

Of these, *Rhagodia* sp. Hamersley is a new population on the eastern edge of its known extent, and *Themeda* sp. Hamersley Station represents a new population with a range extension of approximately 45 km eastwards.

5.1.1.1 Conservation Significant Flora Risk Assessment

Approximately 90% of the field survey Study Area was traversed on foot during targeted searches for conservation significant flora. Despite this, it is possible that some species may have been overlooked or were not identifiable during the field survey (ie not flowering), or occurred in the unsurveyed area. In order to achieve a better understanding of the likelihood of conservation significant species occurring within the Study Area, a risk assessment of the potential for these taxa, as identified by the DEC database search, Table 23: DEC database, NatureMap and DSEWPaC search results, Threatened and Priority flora to occur was undertaken (**Table 26**).

The likelihood of a species occurring in the Study Area is based on the following attributes, as listed on FloraBase (WAH 1998-; WAH & DEC 2012) and tailored to Pilbara populations and including recent information from recent nearby surveys. The attributes were the:

- broad soil type usually associated with the species
- broad landform usually associated with the species
- usual vegetation (characteristic species) with which the species is usually associated
- species having previously been recorded from within approximately 50 km of the Study Area (considered as 'nearby').

The likelihood rating is assigned using the following categories:

- Does occur (ie it was recorded within the Study Area); denoted as 'Recorded'
- Almost certain: it is expected to occur within the Study Area (but was not recorded); broadly, all of the required attributes are present in the Study Area
- Possible: it may occur within the Study Area; two or three of the required attributes (including records from nearby) are present in the Study Area
- Unlikely: it could occur but is not expected; one- three of the required attributes are present in the Study Area but it is not known from nearby (in the case of three attributes, it is not known from within 100 km)
- Almost none: no attributes other than having been recorded nearby or one or two attributes but not known from within 100 km
- None (Rare): the species characteristics include none of the required attributes of soil, landform, associated vegetation and having previously been recorded nearby, and as such it almost certainly does not occur within the Study Area.

The conservation significant flora most likely to occur in the Study Area but not recorded during the field survey are:

- *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662) (P1)

- *Helichrysum oligochaetum* (P1)
- *Amaranthus centralis* (P3)
- *Gymnanthera cunninghamii* (P3)
- *Indigofera gilesii* subsp. *gilesii* (P3)
- *Iotasperma sessilifolium* (P3).

Despite the above species being identified as the most likely to occur, the narrow (linear) nature of the Study Area may not encounter any individuals within it, even if nearby. As an example, *Gymnanthera cunninghamii* is known from within a few hundred metres of the Study Area, but was not encountered. The data and co-ordinates for this specimen record indicate that it was associated with a significant drainage line. The Study Area did not encompass the drainage line although it was very close.

5.1.2 RANGE EXTENTIONS

Based on the records included on NatureMap (DEC 2007-), one flora taxa recorded from the Study Area, *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3) is considered to represent range extensions (ie it is outside its previously recorded range), whilst another, *Rhagodia* sp. Hamersley (M. trudgen 17794) (P3) is at the edge of its known distribution.

That only one taxon was recorded outside of its usual extent is considered to be due to the area having been well-surveyed in the past.

There is no statutory protection of species found outside their usual extents, however *Guidance Statement No. 51* (EPA 2004a) considers species that have recently discovered range extensions or are isolated outliers of the main range to be 'significant flora', and should be taken into consideration when defining the scale and nature of impacts on biodiversity.

5.1.3 INTRODUCED SPECIES

Seven or eight introduced species were identified from the Study Area: **Aerva javanica* (Kapok Weed), **Bidens bipinnata* (Bipinnate Beggartick), **Cenchrus ciliaris* (Buffel Grass), **Heliotropium europaeum* (Heliotrope), **Malvastrum americanum* (Spiked Malvastrum), **Portulaca oleracea* (Purslane), **Tribulus terrestris* (Caltrop), **Vachellia farnesiana* (Mimosa Bush). **Tribulus terrestris* is not identified with certainty, however there is an existing record within 5 km thus the identification is likely.

None of these introduced species are recognised under the *ARRP Act 1976* as Declared Plants in the Shire of East Pilbara, (GWA 2009), nor as WONS (Weeds Australia 2012b).

5.2 Vegetation Significance

5.2.1 VEGETATION CONSERVATION SIGNIFICANCE

Thirteen vegetation types, including one mosaic, were identified from the Study Area:

- **AapAscTe**, *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland
- **AapEfTe/AsyAc**, mosaic of *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forrestii* subsp. *forrestii*, *Acacia tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequiglumis* mid- low open hummock grassland/mid-low open tussock grassland AND *Acacia synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland, that also occurred in a mosaic with vegetation type **Tb**
- **AbiTe**, *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland, that also occurred as a mosaic with vegetation type **AbiT**
- **AbiT**, *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hilliana* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
- **AscTe**, *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and **Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland
- **AsyTI**, *Acacia synchronicia* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
- **CcAscCc**, *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over **Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland
- **EvAscCc**, *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and **Vachellia farnesiana* tall-mid sparse shrubland over **Cenchrus ciliaris*, **Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland
- **EvAscPs**, *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, **Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland

- **EvVfPs**, *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with **Vachellia farnesiana* mid scattered shrubs
- **Sc**, *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland
- **Tb**, *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
- **VfEc**, **Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Enneapogon caerulescens*, **Cenchrus ciliaris* and **Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees.

Unless specifically discussed below, the vegetation of the Study Area is of no particular significance.

5.2.1.1 TECs and PECs

No vegetation recorded from the Study Area was considered to match the descriptions of any currently recognised TEC or PEC in the Pilbara.

5.2.1.2 Local Conservation Significance

A number of reports (**Table 28**), many of them EPA recommendations reports, were reviewed to determine if any vegetation of the Study Area was similar to any vegetation from nearby areas that was considered to have significance. A summary of relevant findings is included in **Table 28**.

The following broad vegetation types are considered significant in a number of these reports:

- phreatophytic (partly groundwater dependent) riparian vegetation dominated by *Eucalyptus camaldulensis* and *E. victrix*, due largely to impacts of groundwater drawdown from mine dewatering or diverted drainage
- Mulga, considered to be susceptible to changes to surface water hydrology
- saltmarsh vegetation (none of which occurred in the Study Area)
- vegetation harbouring conservation significant (PF) species.

The above vegetation types or attributes (e.g. landform) concur with the definition of significant vegetation in *Guidance Statement 51* (EPA 2004a) due to them having a restricted distribution or being a key habitat for threatened species.

In order to define significance of vegetation types within the Study Area, a risk assessment matrix was developed. The significance of each vegetation type in the Study Area is calculated using the following parameters:

- a) Small extent.

- b) Restricted to as specific landform/soil/habitat type (e.g. calcrete, clay, gully, mesa, high hilltop, scree).
- c) Restricted to riparian areas.
- d) Contains Mulga (sheet flow dependent vegetation; non-growing Mulga, but not vegetation that has Mulga as a minor component).
- e) Supports PF or undescribed species.
- f) Is vulnerable to disturbance (e.g. fire sensitive vegetation, vulnerable to weed invasion or surface water changes).
- g) Has a significant ephemeral species component (ie has high but variable species diversity).

Each of the above attributes was given a score, based on importance attributed to the various factors in the reviewed reports (**Table 28**). Whilst the scores are subjective and based on Ecoscape's interpretation, they do give an indication of significance. The scores and rationale are:

- a) Score 1 if the vegetation type occupies 1-5% of the Study Area, score 2 if it occupies <1% (rationale: greater significance for small extent)
- b) Score 1 if the vegetation type occurs on a landform, soil or habitat type that occupies only a restricted extent but is not confined to that area although it must largely be so, score 2 if the vegetation type only occurs on that landform, soil or habitat type (rationale: greater significance for vegetation confined to restricted areas, with lesser significance if they also occur elsewhere)
- c) Riparian/GDE areas are considered significant in most of the reviewed reports. They were given a score of 1 because they generally have other attributes that also contribute to the total (e.g. they are vulnerable to disturbance), and a score of 2 if they contain vegetation that is considered to represent a GDE (ie has *Eucalyptus camaldulensis* subsp. *refulgens*).
- d) Mulga vegetation is considered significant in most of the reviewed reports, and various forms are considered as an 'Ecosystem at Risk' (CALM 2002). Most reports consider Mulga groves (Sheet Flow Dependent Vegetation, SFDV, also known as grove-intergrove Mulga) to be of greater significance (here given a score of 2), but valley floor Mulga (non-growing) is also significant (score 1).
- e) Vegetation providing habitat for conservation significant flora species is considered significant in most reviewed reports. A score of 1 is given to vegetation providing habitat for a P3 or P4 species, and a score of 2 given to vegetation providing habitat for TF, P1, P2, multiple species of P3 or P4, and undescribed species.
- f) Vegetation considered vulnerable to disturbance is given a score of 1.
- g) Many of the reviewed reports consider vegetation types with a high ephemeral component to be of significance; score 1
- h) Vegetation already recognised as having conservation significance is given a score of 1 if it is a recognised (or appreciably similar to) a PEC and a score of 2 if it recognised as a TEC.

Based on the risk assessment (**Table 28, Appendix 11**), vegetation types **AapEfTe/AsyAc** and **EvVfPs** have the highest local significance (score 6, highlighted in darker blue in **Table 28**), with vegetation types **EvAscCc** and **EvAscPs** also identified as having local significance (score 5, highlighted in lighter blue in **Table 28**). **AapEfTe/AsyAc** is grove-intergrove (or sheet flow dependent) Mulga. The others are riparian/GDE vegetation, although it should be noted that, within the Study Area, most riparian vegetation was impacted by grazing and frequently in Poor condition and thus has reduced conservation significance than areas in better condition.

5.2.1.3 Groundwater Dependent Ecosystems

Vegetation containing *Eucalyptus camaldulensis* subsp. *refulgens* (vegetation type **EvVfPs**, dominated by *E. victrix*) and therefore considered to represent a GDE occupied 3.71 ha (0.23%) of the Study Area, along the banks of the Fortescue River. However the condition of this vegetation type was Poor due to the impacts of livestock grazing.

Three other vegetation types dominated or characterised by *Eucalyptus victrix* were recorded from the Study Area; **CcAscCc** (occupying 30.79 ha, 1.89% of the Study Area), **EvAscCc** (occupying 62.40 ha, 3.84%) and **EvAscPs** (occupying 29.23 ha, 1.80%).

There is some debate if *Eucalyptus victrix* is dependent on groundwater or not, however the precautionary principle outlined in *Position Statement No. 7 – Principles of Environmental Protection* (EPA2004b) should be followed and *E. victrix* considered to be at least partly groundwater dependent and therefore potentially characteristic of a GDE.

The *Eucalyptus victrix*-dominated/characterized vegetation types are the most heavily grazed in the Study Area, and their condition ranges from Very poor (especially the Fortescue River floodplain vegetation type **EvAscCc**) to Very good. Therefore, the conservation value of these vegetation types is reduced.

5.2.1.4 Vegetation Supporting Priority Flora

Vegetation types that support PF also have a degree of significance. Within the Study Area, 14 vegetation types (of a total of 24 types) support PF. The vegetation types supporting PF are **AapAscTe**, ⁺**AapEfTe/AsyAc**, **AsyTI**, ⁺**EvAscCc**, ⁺**EvAscPs**, **Tb** and **VfEc**. Those suffixed by “+” have been considered (in **Section 5.2.1.2**) to have a degree of local significance. The unmarked vegetation types have been considered to have no local significance. However, vegetation types **Tb** and **VfEc** harbour the P1 species, *Eremophila pilosa*, and therefore have added significance.

PF and the vegetation supporting them have no statutory protection unless listed as a TEC.

5.3 Vegetation Condition

The vegetation condition of the Study Area was assessed using the adapted Keighery Vegetation Condition Scale for Eremaean and Northern Botanical Provinces included in the Draft *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA & DEC 2012), **Table 22**.

Vegetation condition of the Study Area ranged from Very Poor to Excellent (**Table 12**).

Overall, 88.1% of the Study Area was in Very good or Excellent condition. The difference between these two ratings are generally due to minor differences in recorder interpretation, or low levels of grazing impacts or small areas of weed cover. Both can be interpreted as displaying only minor (or no) obvious impacts of European man.

The lesser condition areas (Good, Poor and Very poor) occupied 10.37 of the Study Area and were generally associated with riparian and valley floor (particularly floodplain or outwash plain) vegetation types. Cattle, and perhaps horse, grazing (direct sightings, hoofprints including trails, trampled soil and vegetation, grazed shrubs, faeces) and presence of introduced species (particularly **Cenchrus ciliaris* and **Vachellia farnesiana*) were the main factors contributing to rating vegetation as being in Good (or lower) condition.

5.4 Fauna

5.4.1 LIKELIHOOD OF OCCURRENCE OF CONSERVATION SIGNIFICANT SPECIES

Table 15 gives brief summaries of habitat requirements, inferred occupancy status (see section 3.3.2) and estimate of maximum likely impact of proposed clearing for species listed in **Table 6 - Table 8**. Categories of impact used are *negligible* (no decline in local population likely) and *minor* (short-term local decline possible, no long-term effects on viability). The Table is based on more detailed species profiles provided in **Appendix Twelve**

5.4.2 OCCURRENCE OF CONSERVATION SIGNIFICANT SPECIES IN RELATION TO LAND SYSTEMS

Table 16 is based on the attributes of species listed in the preceding section and those of the Land Systems intersecting the Study Area, and indicates known (+) or predicted potential occurrence (p) of species in each LS. Any impacts would be limited to habitat types in which the species actually or potentially occur.

Table 15. Summary of habitat, occupancy status and potential impact of proposed clearing for conservation significant fauna species

Family	Species	Common Name	EPBC Act status	WC Act status	DEC status	DEC Threatened fauna database	EPBC Act PMST	Preferred habitat	Occupancy status	Potential Impacts
MAMMALS										
Thylacomyidae	<i>Macrotis lagotis</i>	Greater Bilby	V U	S 1	VU		K	Sandy desert, cracking clay and shrubland	Inferred to be locally extinct	None
Dasyuridae	<i>Dasyercus cristicauda</i>	Crest-tailed Mulgara	V U	S 1	VU		L	Sanplains and dunefileds	One or both species recorded	Minor impact to population
	<i>Dasyercus blythi</i>	Brush-tailed Mulgara			P 4	2		Sandplains and gibber plains		
	<i>Dasyurus hallucatus</i>	Northern Quoll	E N	S 1	EN	2	L	Gorges, riparian woodland, breakaways, boulder piles	Occasional visitor, potential; for future establishment	No impact to population, minor impact to habitat
	<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart			P 4	2		Rocky scree and plateaux	Likely resident or irruptive visitor	Negligible
Notoryctidae	<i>Notoryctes caurinus</i>	Northern Marsupial Mole	E N	S 1	EN		-	Dunefields with shrubs and spinifex	Outside known or likely range	None
Macropodidae	<i>Lagorchestes conspicillatus leichardti</i>	Spectacled Hare-wallaby			P 3			Woodland, shrubland, sandplain with spinifex	Locally extinct except for known remnants (Jimblebar, Nullagine)	None
	<i>Petrogale lateralis lateralis</i>	Black-flanked Rock-wallaby	V U	S 1	VU	4	-	Cliffs and boulder piles	Locally extinct	None
Megadermatidae	<i>Macroderma gigas</i>	Ghost Bat			P 4	3		Humid caves, riparian woodland, shrubland and grassland	Likely resident or regular visitor	Minor impact to foraging habitat, potentially to day roosts
Hipposideridae	<i>Rhinonictis aurantia</i>	Pilbara Leaf-nosed Bat	V U	S 1	VU		L	Deep humid caves and adits, riparian	Possible occasional visitor, unlikely to be	Minor to negligible impact to foraging

Family	Species	Common Name									
			EPBC Act status	WC Act status	DEC status	DEC Threatened fauna database	EPBC Act PMST	Preferred habitat	Occupancy status	Potential Impacts	
								woodland, rocky hills, gorges	resident	habitat only	
Muridae	<i>Leggadina lakedownensis</i>	Short-tailed Mouse			P 4	9		Grassland and savannah woodland	Likely resident or irruptive visitor	Negligible	
	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse			P 4	49		Gravel slopes and hilltops with Spinifex and scattered shrubs	Likely resident	Negligible to minor impact possible	
REPTILES											
Scincidae	<i>Ctenotus nigrilineatus</i>	Pinstriped Finesnout Ctenotus			P 1			Spiifex, rock outcrops	Possible resident (outside known range, likely absent)	Negligible to minor impact possible	
	<i>Ctenotus uber johnstonei</i> (aff.)	Balgo Spotted Ctenotus			P 2	3		Chenopod and Acacia shrubland, rocky hills	Likely resident	Negligible to minor impact possible	
	<i>Lerista macropisthopus remota</i>	Robust Slider			P 2	4		Acacia, mallee or Corymbia woodland with litter	Likely resident in southern part	Negligible to minor impact possible	
Typhlopidae	<i>Ramphotyphlops ganei</i>	Pilbara Blindsnake			P 1	12		Gorges in rocky hills, floodplain, spinifex	Likely resident	Negligible to minor impact possible	
Pythonidae	<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	V U	S 1	VU	3	M	Rocky hills and gorges near waterholes	Possible resident (near edge of range, likely absent)	Negligible to minor impact possible	
BIRDS											
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift	M	S 3			M	Aerial, all habitats	Likely regular visitor, non-breeding	None	
Ardeidae	<i>Ardea modesta</i>	Eastern Great Egret	M	S 3			M	Permanent and temporary wetlands	Likely occasional visitor, non-breeding	Negligible to minor impact possible	
	<i>Ardea ibis</i>	Cattle Egret	M	S 3			M	Permanent and	Likely occasional visitor	Negligible to minor	

Family	Species	Common Name									
			EPBC Act status	WC Act status	DEC status	DEC Threatened fauna database	EPBC Act PMST	Preferred habitat	Occupancy status	Potential Impacts	
								temporary wetlands, pasture		impact possible	
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	M	S 3			-	Large watercourses	Occasional visitor, non-breeding	Negligible to minor impact possible (riparian woodland)	
Falconidae	<i>Falco hypoleucos</i>	Grey Falcon			P 4	3		Open woodland, shrublands and grasslands, nests in eucalypts near watercourses	Likely resident, possibly breeding	Negligible to minor impact possible (riparian woodland)	
	<i>Falco peregrinus</i>	Peregrine Falcon		S 4	S	9		Rocky hills, open woodland, margins of grassland, nests on cliffs or large eucalypts	Likely resident, possibly breeding	Negligible to minor impact possible (riparian woodland)	
Otididae	<i>Ardeotis australis</i>	Australian Bustard			P 4	68		Grassland, open woodland and shrubland	Resident	Negligible impact (minor if breeding)	
Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew			P 4	7		Open woodland with grass and fallen wood	Resident	Negligible impact (minor if breeding)	
Charadriidae	<i>Charadrius veredus</i>	Oriental Plover	M	S 3			M	Short grassland, saltmarsh	Occasional visitor	Negligible	
Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	M	S 3			-	Permanent and temporary wetlands, saltmarsh	Occasional visitors	Negligible	
	<i>Tringa nebularia</i>	Common Greenshank	M	S 3			-				
	<i>Tringa stagnatilis</i>	Marsh Sandpiper	M	S 3			-				
	<i>Tringa glareola</i>	Wood Sandpiper	M	S 3			-				
	<i>Calidris ruficollis</i>	Red-necked Stint	M	S 3			-				
	<i>Calidris subminuta</i>	Long-toed Stint	M	S 3			-				

Family	Species	Common Name									
			EPBC Act status	WC Act status	DEC status	DEC Threatened fauna database	EPBC Act PMST	Preferred habitat	Occupancy status	Potential Impacts	
	<i>Calidris melanotos</i>	Pectoral Sandpiper	M	S 3			-				
	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	M	S 3			-				
	<i>Calidris ferruginea</i>	Curlew Sandpiper	M	S 3			-				
Psittacidae	<i>Polytelis alexandrae</i>	Princess Parrot	V U		P 4		M	Sandplains with open savannah woodland	Possible occasional visitor	None	
	<i>Pezoporus occidentalis</i>	Night Parrot	E N	S 1	CR	1	L	Chenopod shrubland, Spinifex, proximity to water	Occasional visitor or sparse resident	Negligible	
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	M	S 3			M	Open woodlands, sandy areas near watercourses	Likely resident	Negligible	
Pachycephalidae	<i>Oreoica g. gutturalis</i>	Cr. Bellbird (southern)			P 4	2		Shrublands, low woodland, heath, grasslands	Absent (northern subspecies is likely resident)	None	
Estrildidae	<i>Neochmia ruficauda subclarescens</i>	Star Finch (western)			P 4			Grassland near watercourses	Likely resident	Negligible	

Table 16. Possible or confirmed occurrence of conservation significant fauna species in Land Systems intersected by the Study Area

Symbols: - unlikely to occur, p possibly (or probably) occurs, + recorded in August 2012 survey (sightings, distinctive tracks), * one of two species recorded based on distinctive burrows, but not distinguishable from each other.

Family	Species	Common Name	NEW LS	BGD LS	ROC LS	ELI LS	WSP LS	RIV LS	FAN LS	DIV LS	NAB LS	COB LS	WAI LS	TUR LS	JAM LS
MAMMALS															
Thylacomyidae	<i>Macrotis lagotis</i>	Greater Bilby	-	-	-	p	p	-	p	p	-	-	-	-	p
Dasyuridae	<i>Dasyercus cristicauda</i>	Crest-tailed Mulgara	-	p	-	-	p	-	p	P*	-	-	-	-	p
	<i>Dasyercus blythi</i>	Brush-tailed Mulgara	-	p	-	-	p	-	p	P*	-	-	-	-	p
	<i>Dasyurus hallucatus</i>	Northern Quoll	p	-	p	-	-	p	-	-	-	-	-	-	-
	<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart	p	p	p	-	-	-	-	-	-	-	-	-	-
Macropodidae	<i>Lagorchestes conspicillatus leichardti</i>	Spectacled Hare-wallaby	-	-	-	-	-	-	-	-	-	-	-	-	-
	<i>Petrogale lateralis lateralis</i>	Black-flanked Rock-wallaby	-	-	-	-	-	-	-	-	-	-	-	-	-
Megadermatidae	<i>Macroderma gigas</i>	Ghost Bat	p	p	p	-	-	p	-	-	-	-	-	-	p
Hipposideridae	<i>Rhinonicteris aurantia</i>	Pilbara Leaf-nosed Bat	-	-	-	-	-	-	-	-	-	-	-	-	-
Muridae	<i>Leggadina lakedownensis</i>	Short-tailed Mouse	-	-	-	p	p	p	p	p	p	p	p	p	p
	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	p	p	p	-	-	-	-	-	-	-	-	-	p
REPTILES															
Scincidae	<i>Ctenotus nigrilineatus</i>	Pinstriped Finesnout Ctenotus	p	p	p	p	-	-	p	p	-	-	-	-	p
	<i>Ctenotus uber johnstonei</i> (aff.)	Balgo Spotted Ctenotus	p	p	p	p	-	-	p	-	p	p	p	p	p
	<i>Lerista macropisthopus remota</i>	Robust Slider	-	-	-	p	p	-	p	-	-	-	-	-	-
Typhlopidae	<i>Ramphotyphlops ganei</i>	Pilbara Blindsnake	p	-	p	-	-	p	-	p	-	-	-	-	-
Pythonidae	<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	p	-	p	-	-	p	-	-	-	-	-	-	-
BIRDS															
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift	p	p	p	p	p	p	p	p	p	p	p	p	p
Ardeidae	<i>Ardea modesta</i>	Eastern Great Egret	-	-	-	-	-	p	-	-	p	p	-	-	-
	<i>Ardea ibis</i>	Cattle Egret	-	-	-	-	-	p	-	-	p	p	-	-	-

Family	Species	Common Name	NEW LS	BGD LS	ROC LS	ELI LS	WSP LS	RIV LS	FAN LS	DIV LS	NAB LS	COB LS	WAI LS	TUR LS	JAM LS
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	-	-	-	-	-	p	-	-	-	-	-	-	-
Falconidae	<i>Falco hypoleucos</i>	Grey Falcon	-	-	-	-	-	p	-	-	-	-	-	-	-
	<i>Falco peregrinus</i>	Peregrine Falcon	P	-	-	-	-	p	-	-	-	-	-	-	-
Otididae	<i>Ardeotis australis</i>	Australian Bustard	-	-	-	p	p	+	+	+	+	p	p	p	p
Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew	-	-	-	p	+	p	p	-	-	p	-	p	p
Charadriidae	<i>Charadrius veredus</i>	Oriental Plover	-	-	-	-	-	-	-	p	-	-	-	p	-
Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	-	-	-	-	-	p	-	-	p	p	-	-	-
	<i>Tringa nebularia</i>	Common Greenshank	-	-	-	-	-	p	-	-	p	p	-	-	-
	<i>Tringa stagnatilis</i>	Marsh Sandpiper	-	-	-	-	-	p	-	-	p	p	-	-	-
	<i>Tringa glareola</i>	Wood Sandpiper	-	-	-	-	-	p	-	-	p	p	-	-	-
	<i>Calidris ruficollis</i>	Red-necked Stint	-	-	-	-	-	p	-	-	p	p	-	-	-
	<i>Calidris subminuta</i>	Long-toed Stint	-	-	-	-	-	p	-	-	p	p	-	-	-
	<i>Calidris melanotos</i>	Pectoral Sandpiper	-	-	-	-	-	p	-	-	p	p	-	-	-
	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	-	-	-	-	-	p	-	-	p	p	-	-	-
	<i>Calidris ferruginea</i>	Curlew Sandpiper	-	-	-	-	-	p	-	-	p	p	-	-	-
Psittacidae	<i>Polytelis alexandrae</i>	Princess Parrot	-	-	-	-	-	-	-	-	-	-	-	-	-
	<i>Pezoporus occidentalis</i>	Night Parrot	-	-	-	-	-	-	p	p	p	-	-	-	p
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	p	p	p	p	p	p	p	p	p	p	p	p	p
Pachycephalidae	<i>Oreoica g. gutturalis</i>	Cr. Bellbird (southern)	-	-	-	-	-	-	-	-	-	-	-	-	-
Estrildidae	<i>Neochmia ruficauda subclaescens</i>	Star Finch (western)	-	-	-	-	-	p	-	-	-	-	-	-	-

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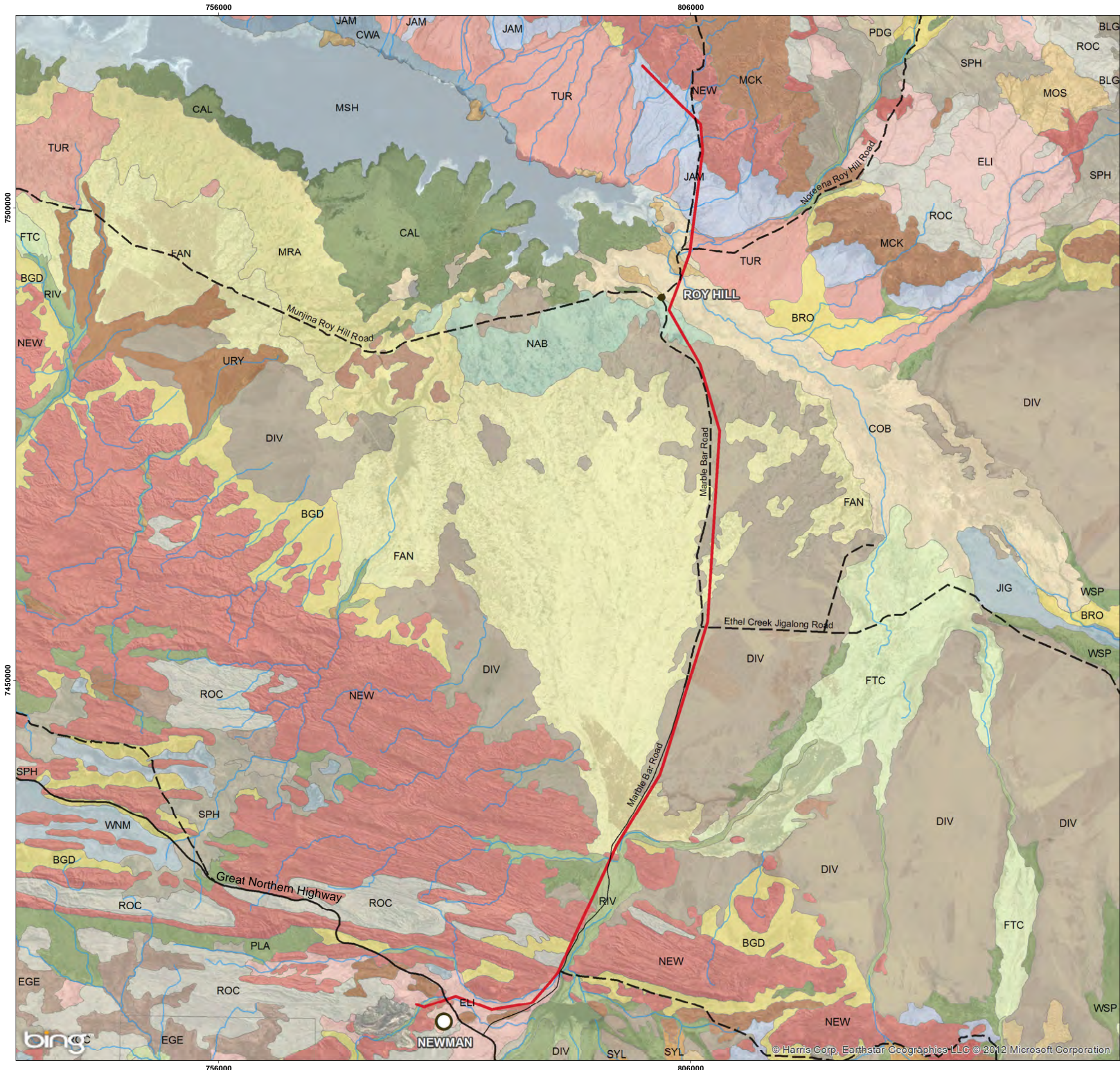
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Maps

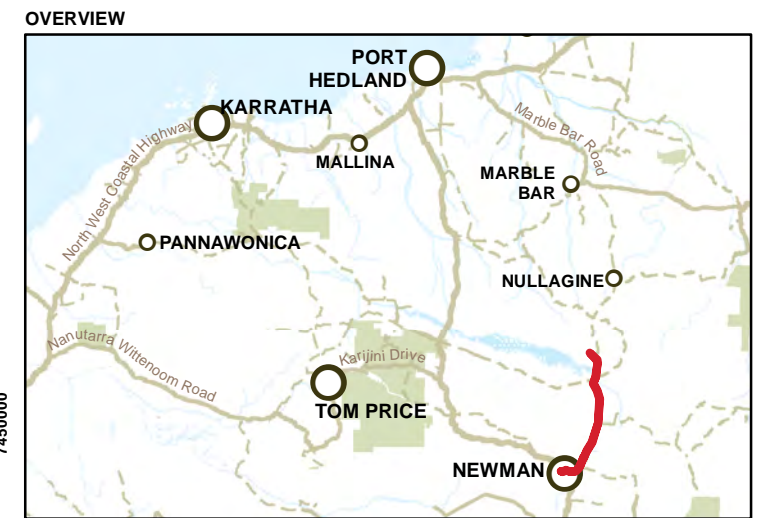


LEGEND

Study Area

Land Systems (DAFWA 2007)

ADR, Adrian Land System	MOS, Mosquito Land System
BGD, Boolgeeda Land System	MRA, Marillana Land System
BLF, Balfour Land System	MSH, Marsh Land System
BLG, Billygoat Land System	NAB, Narbung Land System
BRO, Brockman Land System	NIR, Nirran Land System
CAD, Cadge Land System	NON, Nooingnin Land System
CAL, Calcrete Land System	OAK, Oakover Land System
CHA, Charley Land System	PDG, Pindering Land System
COB, Coolibah Land System	PLA, Platform Land System
CWA, Cowra Land System	PRA, Prairie Land System
DIV, Divide Land System	RBT, Robertson Land System
EGE, Egerton Land System	RIV, River Land System
ELI, Elimunna Land System	ROB, Robe Land System
FAN, Fan Land System	ROC, Rocklea Land System
FTC, Fortescue Land System	SPH, Spearhole Land System
JAM, Jamindie Land System	SYL, Sylvania Land System
JIG, Jigalong Land System	TAB, Table Land System
JUR, Jurrawarrina Land System	TLG, Talga Land System
KUM, Kumina Land System	TUR, Turee Land System
KUN, Kunderong Land System	URY, Urandy Land System
LAB, Lake Bed Land System	WAI, Warri Land System
LAT, Laterite Land System	WNM, Wannamunna Land System
MCK, McKay Land System	WSP, Washplain Land System
	ZEB, Zebra Land System



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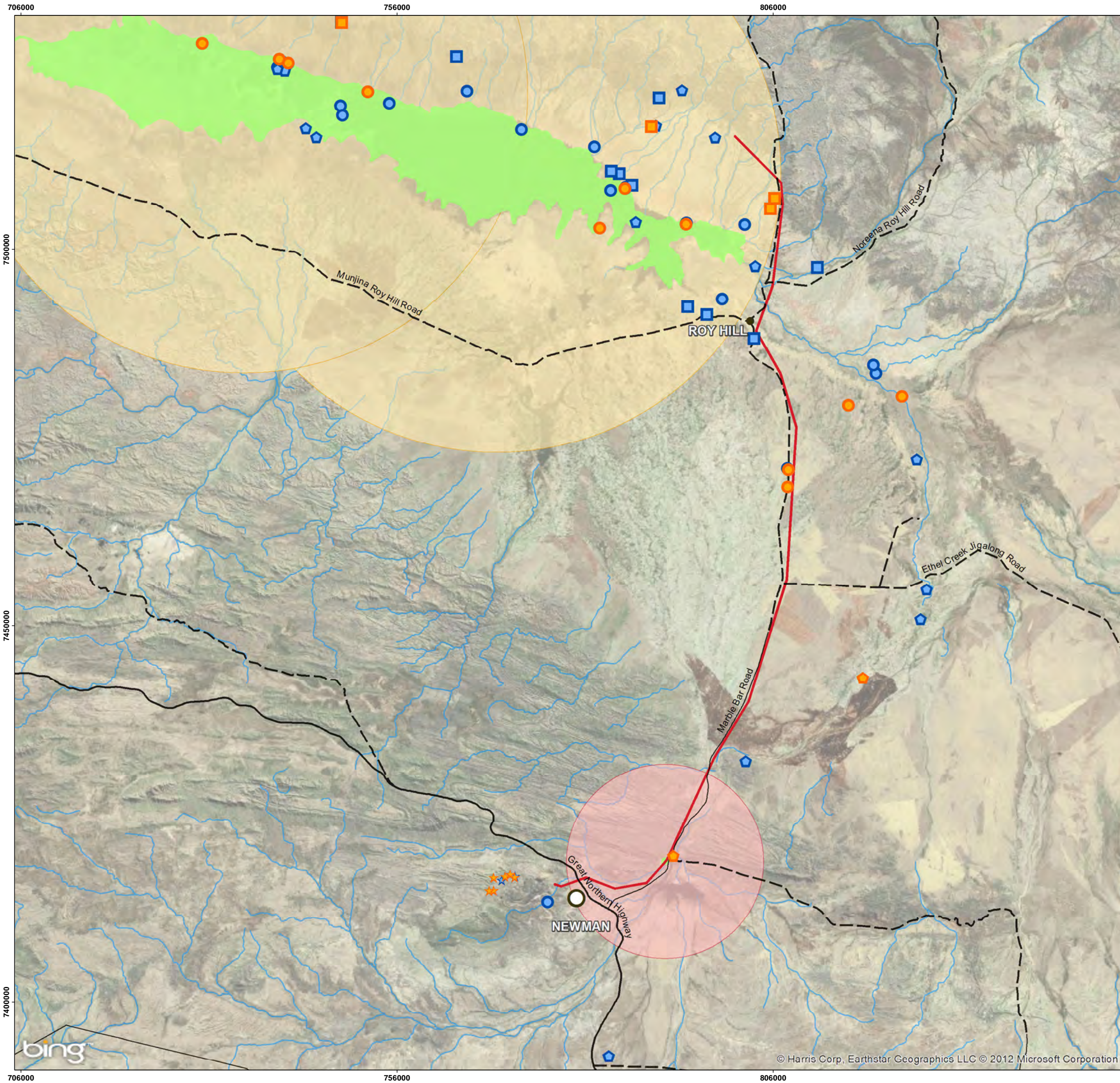


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DATE: 09-12 PROJECT NO: 2817-12

NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

LAND SYSTEMS MAP 1





- LEGEND**
- Study Area
 - Environmentally Sensitive Areas (DEC 2010)
 - DEC Ecological Communities Database**
 - TEC: Ethel Gorge Aquifer Stygobiont Community
 - PEC: Fortescue Marsh (Marsh Land System)
 - Drainage
 - Roads and Tracks**
 - Highway
 - Road; sealed
 - - - Road; unsealed
 - DEC Threatened Flora Database**
 - ★ Threatened
 - Priority 1
 - ▲ Priority 2
 - ◆ Priority 3
 - Priority 4
 - WA Herbarium**
 - ★ Threatened
 - Priority 1
 - ▲ Priority 2
 - ◆ Priority 3
 - Priority 4



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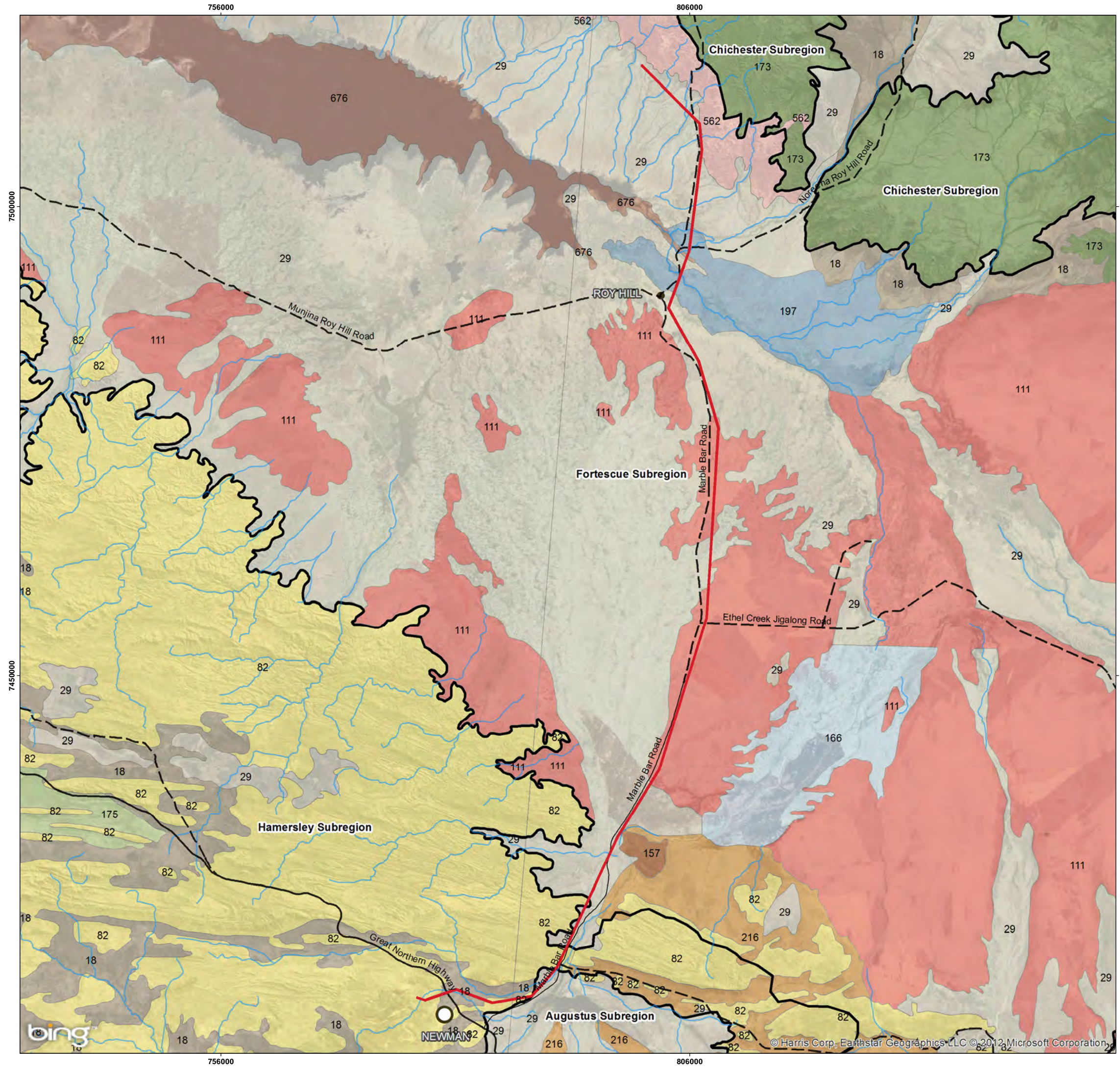


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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY
**CONSERVATION SIGNIFICANT FLORA LOCATIONS
AND TEC/PEC ADMINISTRATIVE BOUNDARIES**

MAP 2





LEGEND

- █ Study Area
- IBRA Subregions

PreEuropean Vegetation (DAFWA 2006)

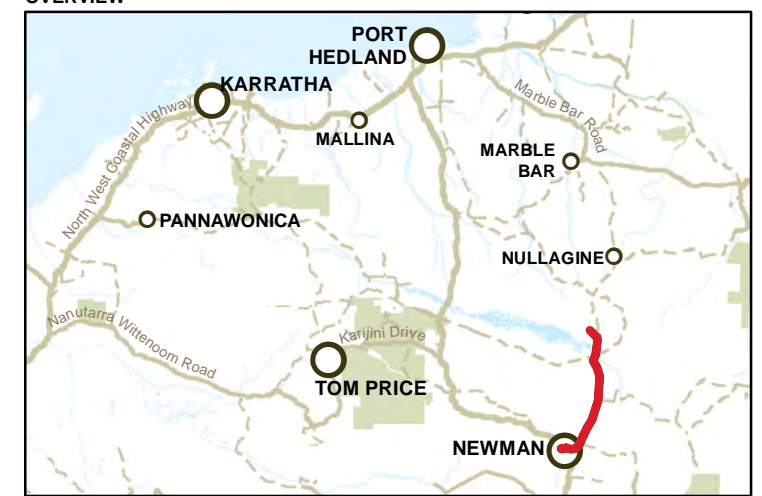
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- 28
- 29
- 82
- 111
- 157
- 166
- 173
- 175
- 197
- 216
- 562
- 676

Roads and Tracks

- Highway
- Road; sealed
- Road; unsealed
- Drainage

OVERVIEW



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North Fremantle WA 6159
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web: www.ecoscape.com.au

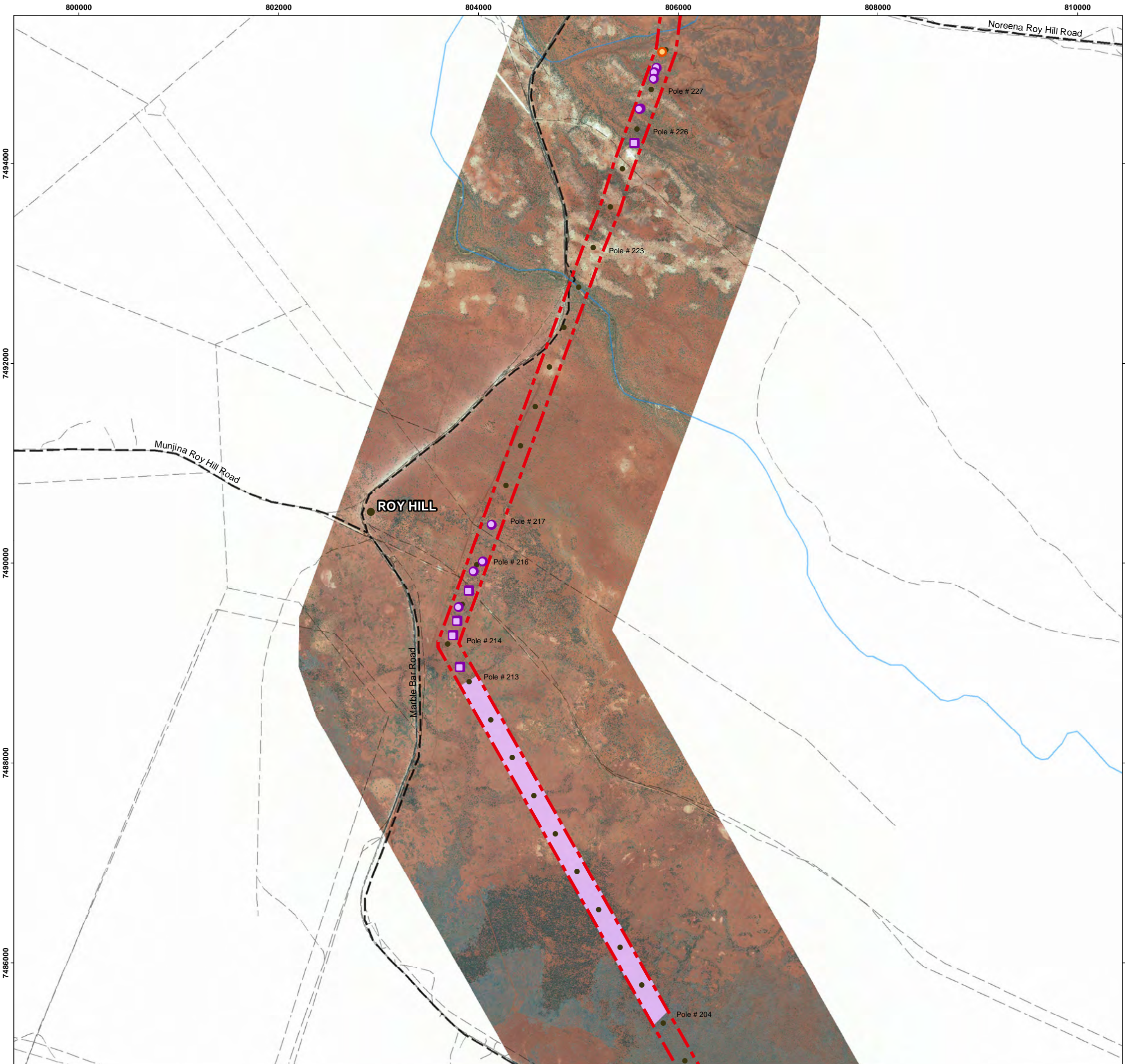


AUTHOR: RD CHECKED: JN
DATE: 09-12 PROJECT NO: 2817-12

NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

BEARD VEGETATION MAPPING
MAP 3

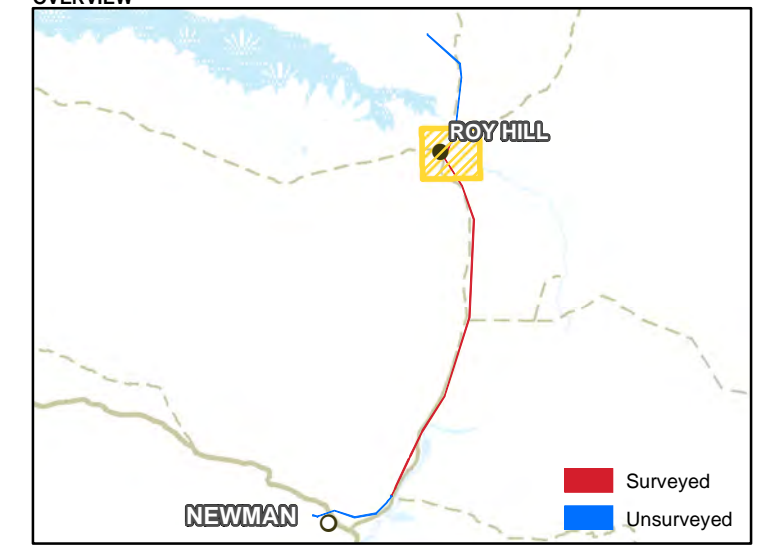




LEGEND

- Pole Locations
- ▭ Study Area
- Roads and Tracks**
- Highway
- Road; sealed
- - Road; unsealed
- +— Railway
- Drainage
- Conservation Significant Flora**
- Individual plants within 50 m
- P3 *Rhagodia* sp. *Hammersley*, 1 plant
- P4 *Eremophila youngii* subsp. *lepidota*, less than 10 plants
- P4 *Eremophila youngii* subsp. *lepidota*, 10-50 plants
- Groups of plants
- P4 *Eremophila youngii* subsp. *lepidota* (sparse - less than 0.5% cover)

OVERVIEW



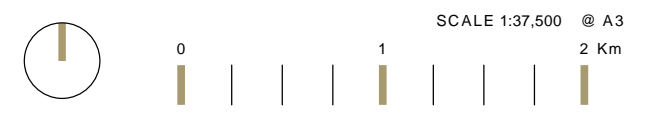
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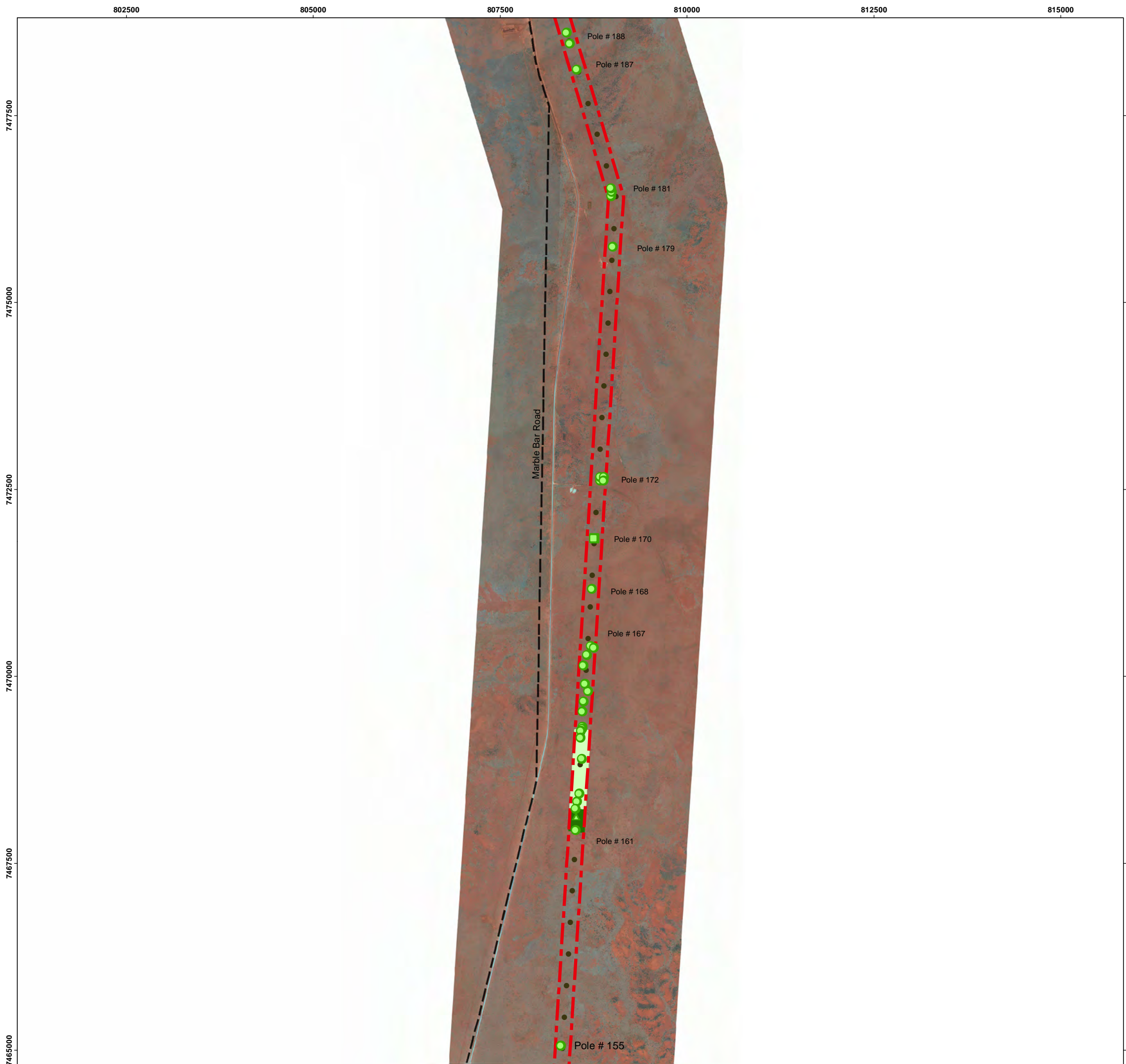


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DATE: 09-12 PROJECT NO: 2817-12

NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

CONSERVATION SIGNIFICANT FLORA
MAP 4a

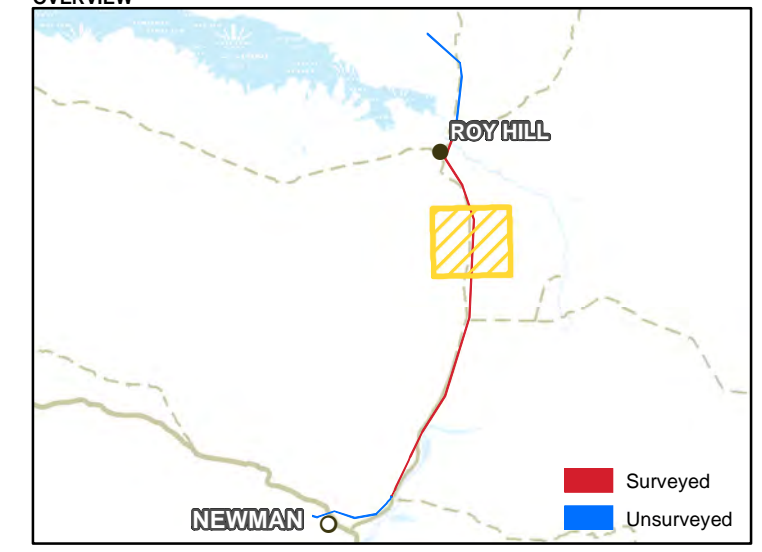




LEGEND

- Pole Locations
- ▭ Study Area
- Roads and Tracks**
- Highway
- Road; sealed
- - Road; unsealed
- + Railway
- Drainage
- Conservation Significant Flora**
- Individual plants within 50 m
- P1 *Eremophila pilosa*, less than 10 plants
- P1 *Eremophila pilosa*, 10-50 plants
- △ P1 *Eremophila pilosa*, 50+ plants
- P3 *Rhagodia* sp. *Hamersley*, 1 plant
- Groups of plants
- P1 *Eramophila pilosa* (sparse - less than 0.5% cover)
- P1 *Eramophila pilosa* (moderate 0.5% - 1% cover)

OVERVIEW



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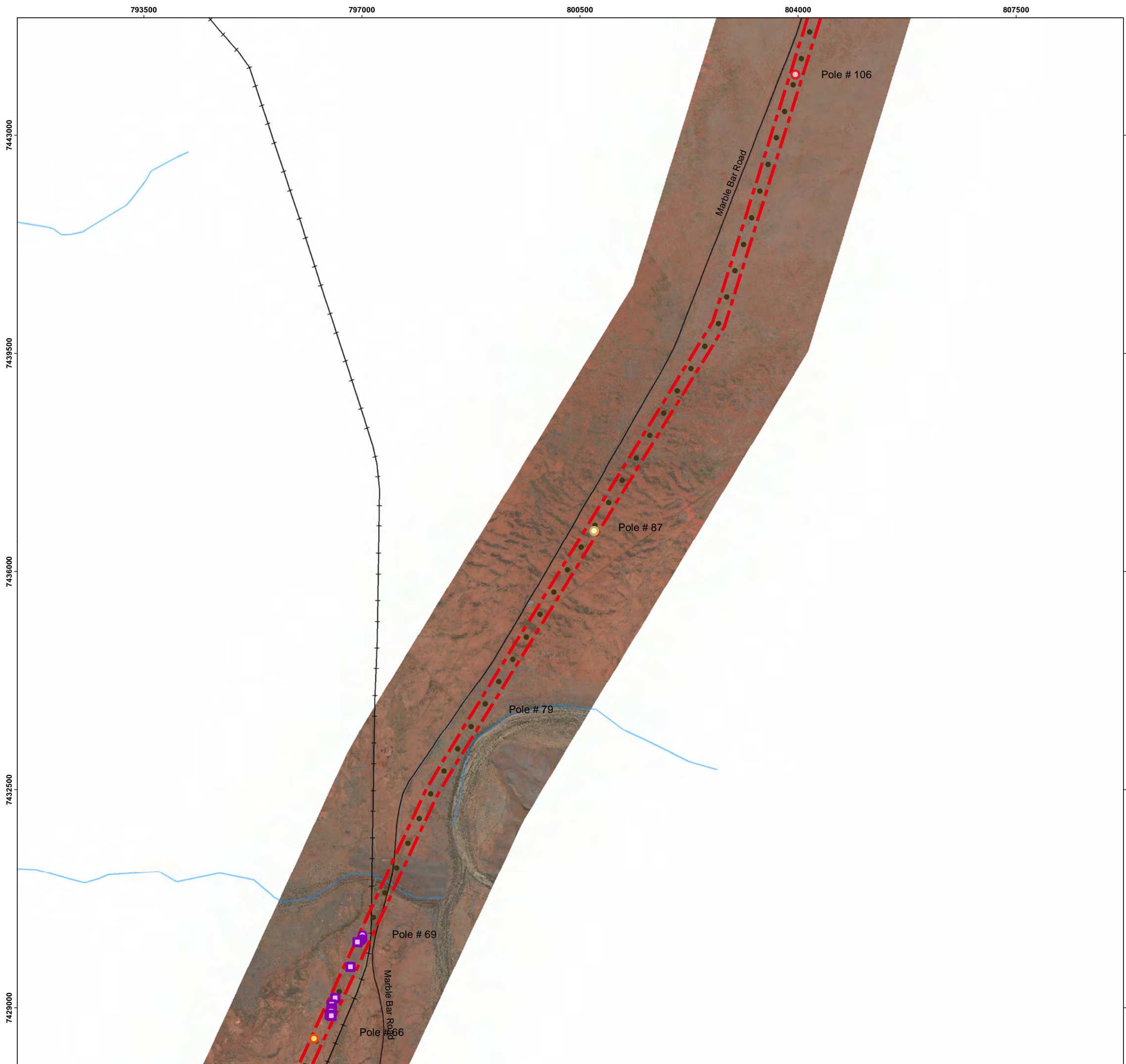


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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

CONSERVATION SIGNIFICANT FLORA
MAP 4b





LEGEND

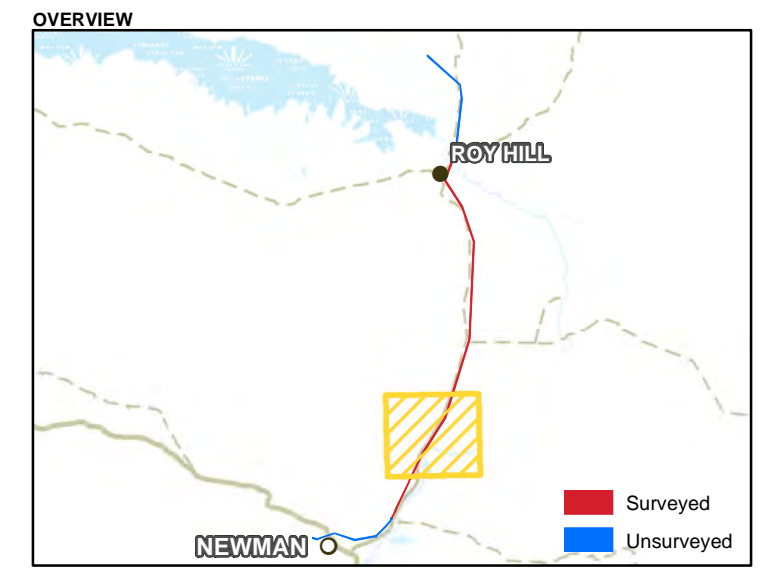
- Pole Locations

Conservation Significant Flora
Individual plants within 50 m

- P3 *Rhagodia* sp. *Hammersley*, 1 plant
- P3 *Themeda* sp. *Hammersley Station*, 10-50 plants
- P4 *Eremophila youngii* subsp. *lepidota*, less than 10 plants
- P4 *Eremophila youngii* subsp. *lepidota*, 10-50 plants
- P4 *Goodenia nuda*, less than 10 plants

Roads and Tracks

- Highway
- Road; sealed
- - Road; unsealed
- + Railway
- Drainage
- ▭ Study Area



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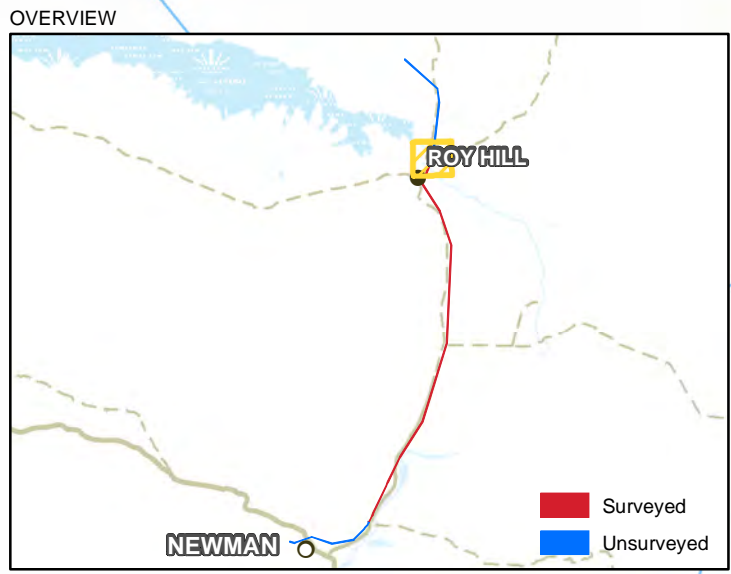
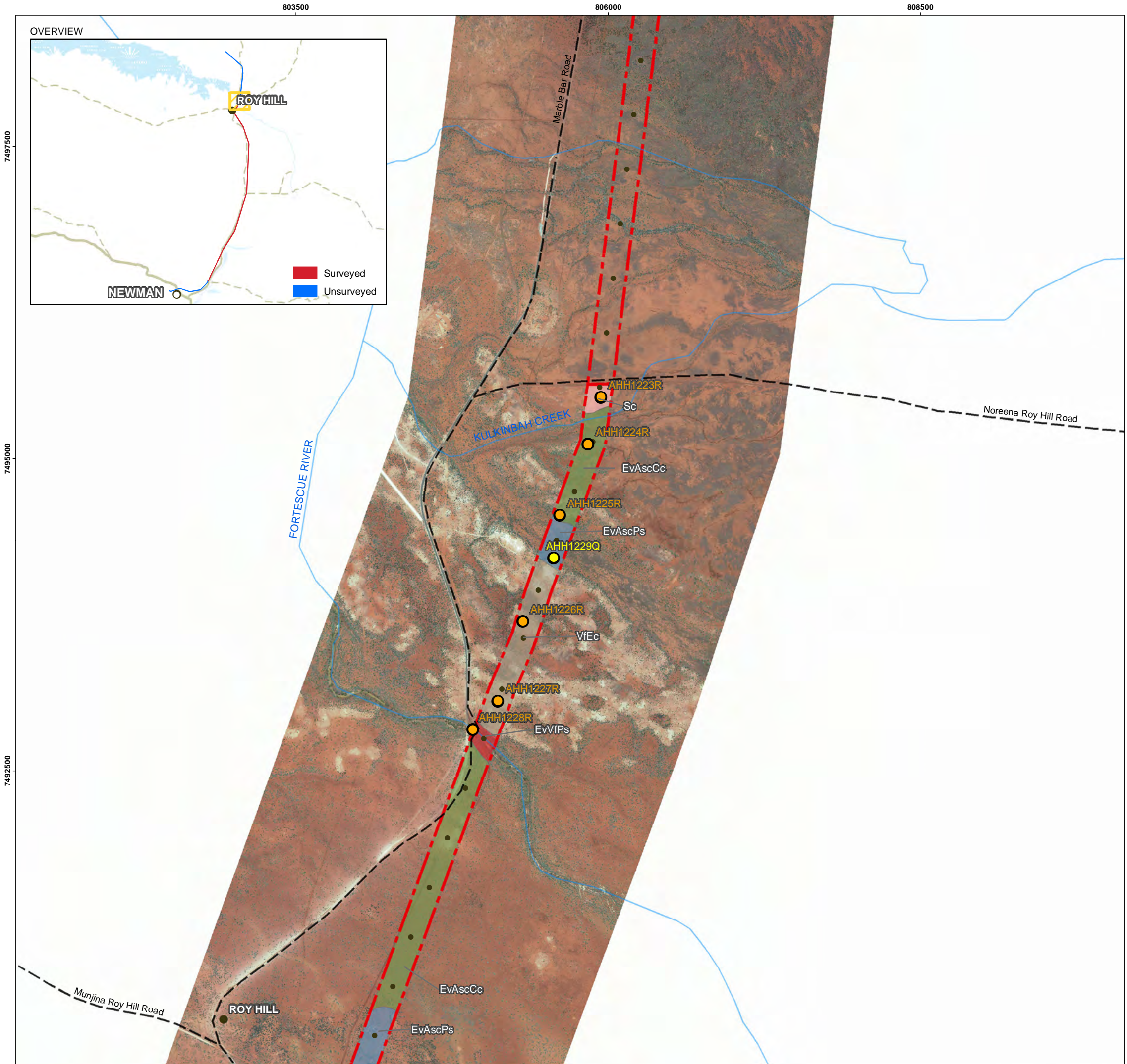
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DATE: 09-12 PROJECT NO: 2817-12

NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

CONSERVATION SIGNIFICANT FLORA
MAP 4c



Imagery Source: Alinta Energy (2012)



LEGEND

- Pole Locations
 - Quadrats
 - Relevés
- Roads and Tracks**
- Highway
 - Road; sealed
 - - - Road; unsealed
 - + - - Railway
- Vegetation Communities**
- AapAscTe - *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland
 - AapEfTe/AsyAc - Mulga grove: *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forrestii* subsp. *forrestii*, *A. tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequalis* mid-low open hummock/tussock grassland
Mulga intergrove: *A. synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland
 - AapEfTe/AsyAc/Tb - Mosaic of *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland/
Acacia synchronicia tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland and Tb
 - AbiTe - *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland
 - AbiTe/AbiTw - Mosaic of AbiTe and AbiTw
 - AbiTw - *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hilliana* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
 - AscTe - *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and *Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland
 - AsyTI - *Acacia synchronicia* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
 - CcAscCc - *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland
 - EvAscCc - *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and *Vachellia farnesiana* tall-mid sparse shrubland over *Cenchrus ciliaris*, *Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland
 - EvAscPs - *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland
 - EvVfPs - *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with *Vachellia farnesiana* mid scattered shrubs
 - Sc - *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland
 - Tb - *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
 - VfEc - *Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Enneapogon caeruleus*, *Cenchrus ciliaris* and *Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees
 - ⊠ N/A - Roadworks
 - ▭ Study Area

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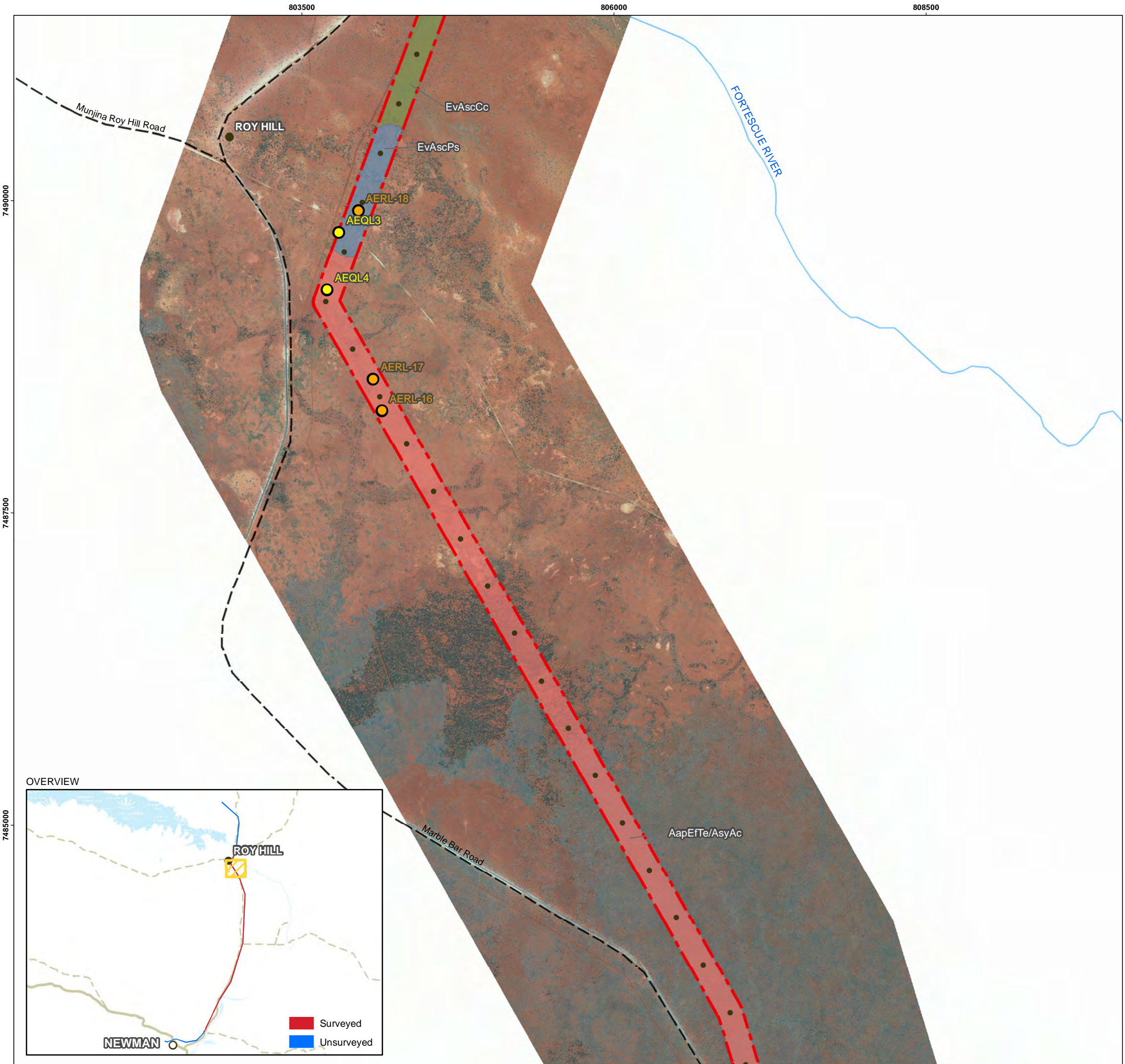


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DATE: 09-12 PROJECT NO: 2817-12

NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

VEGETATION TYPES
MAP 5a





LEGEND

- Pole Locations
 - Quadrats
 - Relevés
- Roads and Tracks**
- Highway
 - Road; sealed
 - - Road; unsealed
 - +— Railway
- Vegetation Communities**
- AapAscTe - *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronica* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland
 - AapEfTe/AsyAc - Mulga grove: *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forestii* subsp. *forestii*, *A. tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequiglumis* mid-low open hummock/tussock grassland
Mulga intergrove: *A. synchronica* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland
 - AapEfTe/AsyAc/Tb - Mosaic of *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronica* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland/
Acacia synchronica tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland and Tb
 - AbiTe - *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland
 - AbiTe/AbiTw - Mosaic of AbiTe and AbiTw
 - AbiTw - *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hilliana* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
 - AscTe - *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronica* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and *Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland
 - AsyTI - *Acacia synchronica* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
 - CcAscCc - *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland
 - EvAscCc - *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and *Vachellia farnesiana* tall-mid sparse shrubland over *Cenchrus ciliaris*, *Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland
 - EvAscPs - *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland
 - EVVIPs - *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with *Vachellia farnesiana* mid scattered shrubs
 - Sc - *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland
 - Tb - *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
 - ViEc - *Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Enneapogon caeruleus*, *Cenchrus ciliaris* and *Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees
 - N/A - Roadworks
 - Study Area



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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

VEGETATION TYPES
MAP 5b

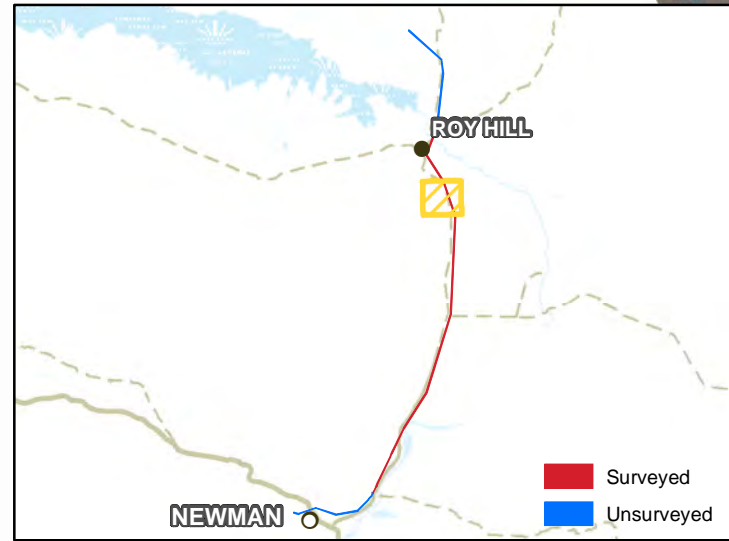


803500

806000

808500

OVERVIEW



7482500

7480000

7477500

Imagery Source: Alinta Energy (2012)

GDA 1994 MGA Zone 50

LEGEND

● Pole Locations

● Quadrats

● Relevés

Roads and Tracks

— Highway

— Road; sealed

- - - Road; unsealed

+ - - Railway

Vegetation Communities

- AapAscTe - *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronica* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland
- AapEffe/AsyAc - Mulga grove: *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forrestii* subsp. *forrestii*, *A. tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequiglumis* mid-low open hummock/tussock grassland
Mulga intergrove: *A. synchronica* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland
- AapEffe/AsyAc/Tb - Mosaic of *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronica* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland/*Acacia synchronica* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland and Tb
- AbiTe - *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland
- AbiTe/AbiTw - Mosaic of AbiTe and AbiTw
- AbiTw - *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hilliana* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
- AscTe - *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronica* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and *Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland
- AsyTI - *Acacia synchronica* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
- CcAscCc - *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland
- EvAscCc - *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and *Vachellia farnesiana* tall-mid sparse shrubland over *Cenchrus ciliaris*, *Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland
- EvAscPs - *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland
- EVVIPs - *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with *Vachellia farnesiana* mid scattered shrubs
- Sc - *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland
- Tb - *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
- VIEc - *Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Enneapogon caeruleus*, *Cenchrus ciliaris* and *Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees
- N/A - Roadworks
- Study Area

AapEffe/AsyAc

VIEc

AERL-9

Marble Bar Road

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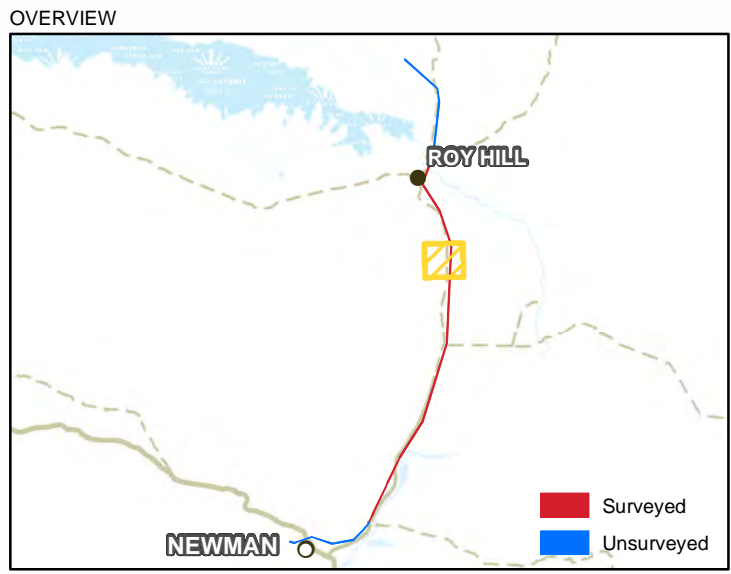


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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

VEGETATION TYPES
MAP 5c





LEGEND

- Pole Locations
 - Quadrats
 - Relevés
- Roads and Tracks**
- Highway
 - Road; sealed
 - - Road; unsealed
 - + Railway
- Vegetation Communities**
- AapAscTe - *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland
 - AapEfTe/AsyAc - Mulga grove: *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forrestii* subsp. *forrestii*, *A. tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequiglumis* mid-low open hummock/tussock grassland
Mulga intergrove: *A. synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland
 - AapEfTe/AsyAc/Tb - Mosaic of *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland/*Acacia synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland and Tb
 - AbiTe - *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland
 - AbiTe/AbiTw - Mosaic of AbiTe and AbiTw
 - AbiTw - *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hilliana* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
 - AscTe - *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and *Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland
 - AsyTI - *Acacia synchronicia* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
 - CcAscCc - *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland
 - EvAscCc - *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and *Vachellia farnesiana* tall-mid sparse shrubland over *Cenchrus ciliaris*, *Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland
 - EvAscPs - *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland
 - EVVIPs - *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with *Vachellia farnesiana* mid scattered shrubs
 - Sc - *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland
 - Tb - *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
 - VfEc - *Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Enneapogon caeruleus*, *Cenchrus ciliaris* and *Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees
 - N/A - Roadworks
 - Study Area

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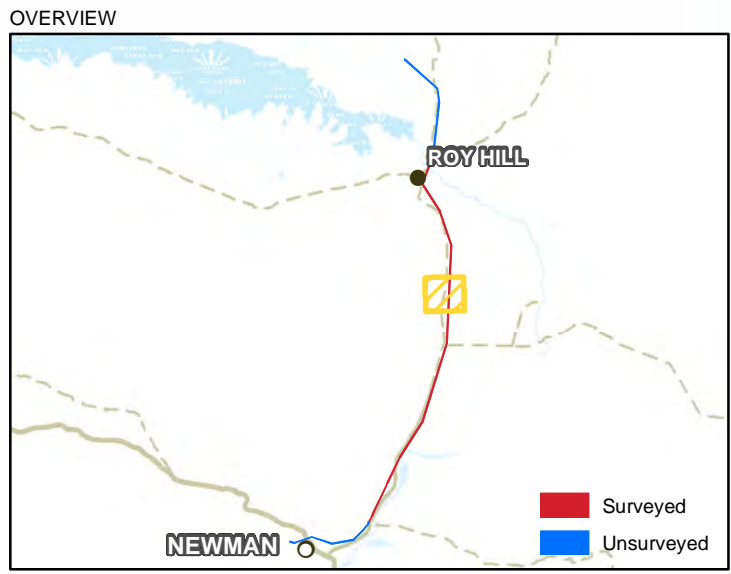


AUTHOR: RD CHECKED: JN
DATE: 09-12 PROJECT NO: 2817-12

NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

VEGETATION TYPES
MAP 5d





LEGEND

- Pole Locations
 - Quadrats
 - Relevés
- Roads and Tracks**
- Highway
 - Road; sealed
 - - - Road; unsealed
 - + - - Railway
- Vegetation Communities**
- AapAscTe - *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland
 - AapEffe/AsyAc - Mulga grove: *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forrestii* subsp. *forrestii*, *A. tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequiglumis* mid-low open hummock/tussock grassland
Mulga intergrove: *A. synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland
 - AapEffe/AsyAc/Tb - Mosaic of *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland/
Acacia synchronicia tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland and Tb
 - AbiTe - *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland
 - AbiTe/AbiTw - Mosaic of AbiTe and AbiTw
 - AbiTw - *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hilliana* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
 - AscTe - *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and *Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland
 - AsyTI - *Acacia synchronicia* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
 - CcAscCc - *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland
 - EvAscCc - *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and *Vachellia farnesiana* tall-mid sparse shrubland over *Cenchrus ciliaris*, *Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland
 - EvAscPs - *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland
 - EVVIPs - *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with *Vachellia farnesiana* mid scattered shrubs
 - Sc - *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland
 - Tb - *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
 - VIEc - *Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Enneapogon caeruleus*, *Cenchrus ciliaris* and *Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees
 - N/A - Roadworks
 - Study Area

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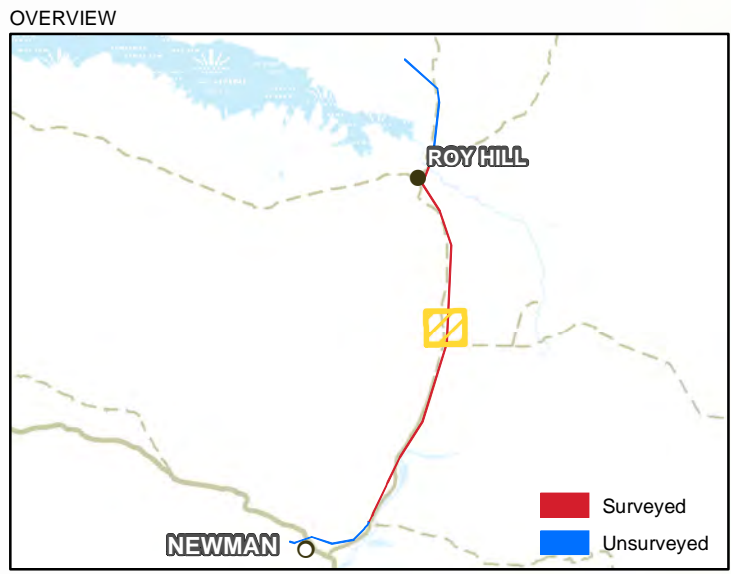
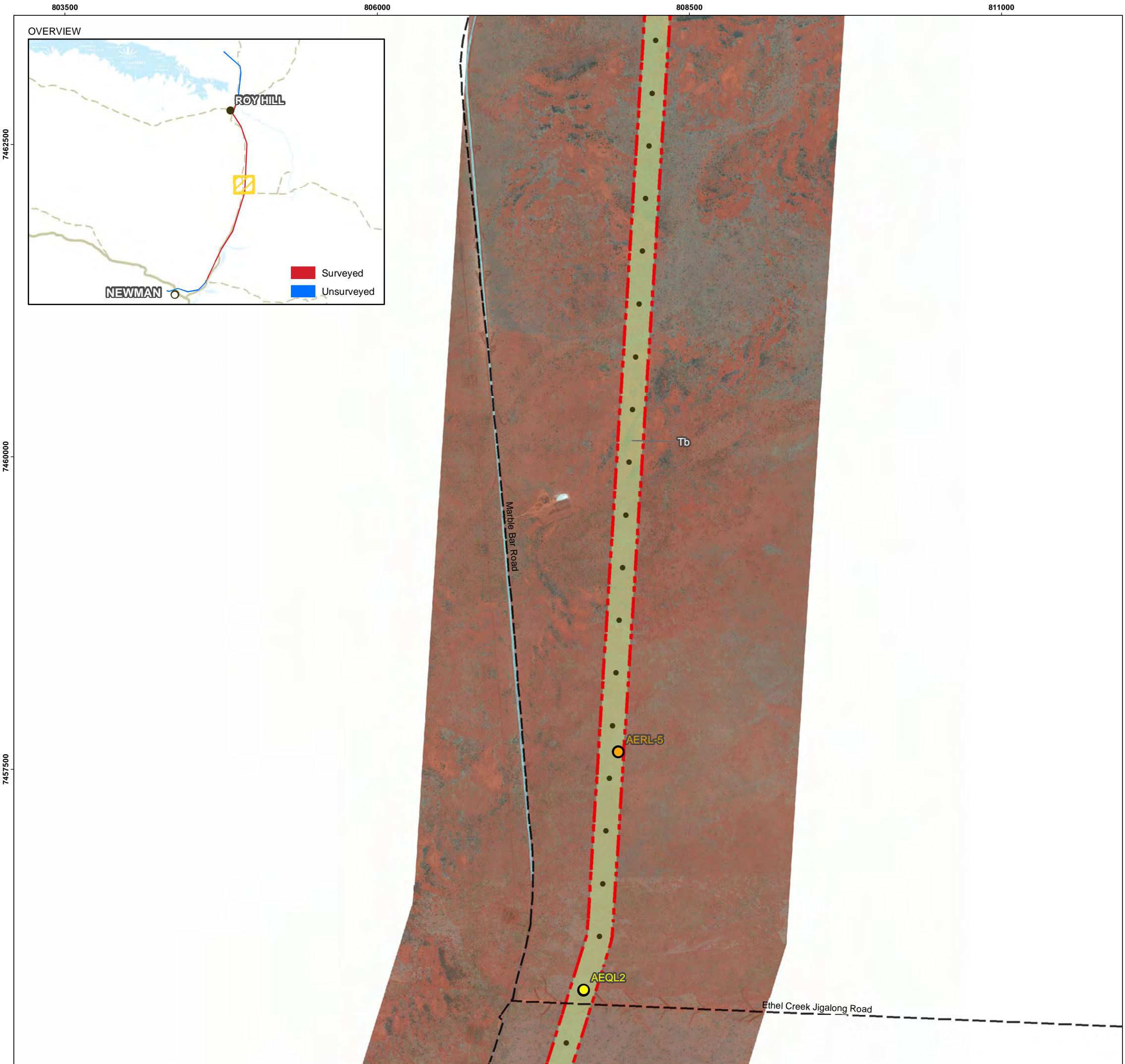


AUTHOR: RD CHECKED: JN
DATE: 09-12 PROJECT NO: 2817-12

NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

VEGETATION TYPES
MAP 5e





LEGEND

- Pole Locations
 - Quadrats
 - Relevés
- Roads and Tracks**
- Highway
 - Road; sealed
 - - Road; unsealed
 - + Railway
- Vegetation Communities**
- AapAscTe - *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland
 - AapEfTe/AsyAc - Mulga grove: *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forestii* subsp. *forestii*, *A. tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequiglumis* mid-low open hummock/tussock grassland
Mulga intergrove: *A. synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland
 - AapEfTe/AsyAc/Tb - Mosaic of *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland/*Acacia synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland and Tb
 - AbiTe - *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland
 - AbiTe/AbiTw - Mosaic of AbiTe and AbiTw
 - AbiTw - *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hillebrandii* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
 - AscTe - *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and *Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland
 - AsyTI - *Acacia synchronicia* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
 - CcAscCc - *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland
 - EvAscCc - *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and *Vachellia farnesiana* tall-mid sparse shrubland over *Cenchrus ciliaris*, *Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland
 - EvAscPs - *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland
 - EVVIPs - *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with *Vachellia farnesiana* mid scattered shrubs
 - Sc - *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland
 - Tb - *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
 - ViEc - *Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Enneapogon caerulscens*, *Cenchrus ciliaris* and *Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees
 - ⊠ N/A - Roadworks
 - ▭ Study Area

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AUTHOR: RD CHECKED: JN
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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

VEGETATION TYPES
MAP 5f

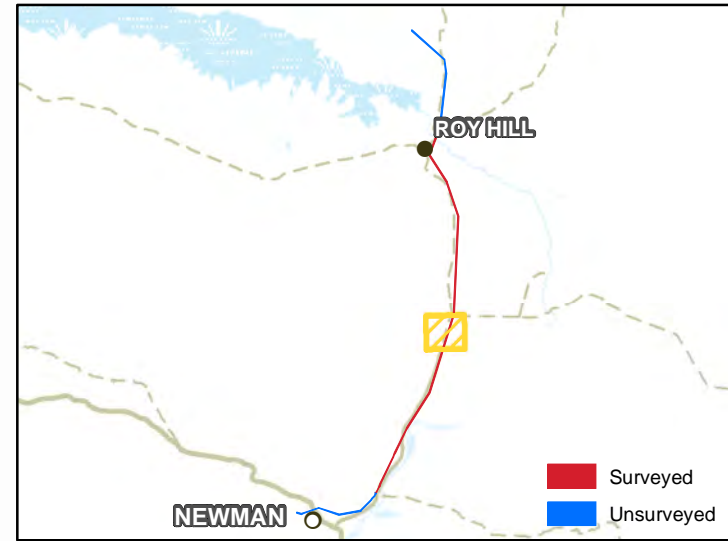


803500

806000

808500

OVERVIEW



7455000

7452500

7450000



LEGEND

● Pole Locations

● Quadrats

● Relevés

Roads and Tracks

— Highway

— Road; sealed

- - - Road; unsealed

+ + + Railway

Vegetation Communities

- AapAscTe - *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland
- AapEffe/AsyAc - Mulga grove: *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forrestii* subsp. *forrestii*, *A. tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequiglumis* mid-low open hummock/tussock grassland
Mulga intergrove: *A. synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland
- AapEffe/AsyAc/Tb - Mosaic of *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland/*Acacia synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland and Tb
- AbiTe - *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland
- AbiTe/AbiTw - Mosaic of AbiTe and AbiTw
- AbiTw - *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hillebrandii* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
- AscTe - *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and *Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland
- AsyTI - *Acacia synchronicia* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
- CcAscCc - *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland
- EvAscCc - *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and *Vachellia farnesiana* tall-mid sparse shrubland over *Cenchrus ciliaris*, *Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland
- EvAscPs - *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland
- EVVIPs - *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with *Vachellia farnesiana* mid scattered shrubs
- Sc - *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland
- Tb - *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
- ViEc - *Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Erneapogon caerulscens*, *Cenchrus ciliaris* and *Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees
- N/A - Roadworks
- Study Area

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AUTHOR: RD CHECKED: JN
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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

VEGETATION TYPES

MAP 5g

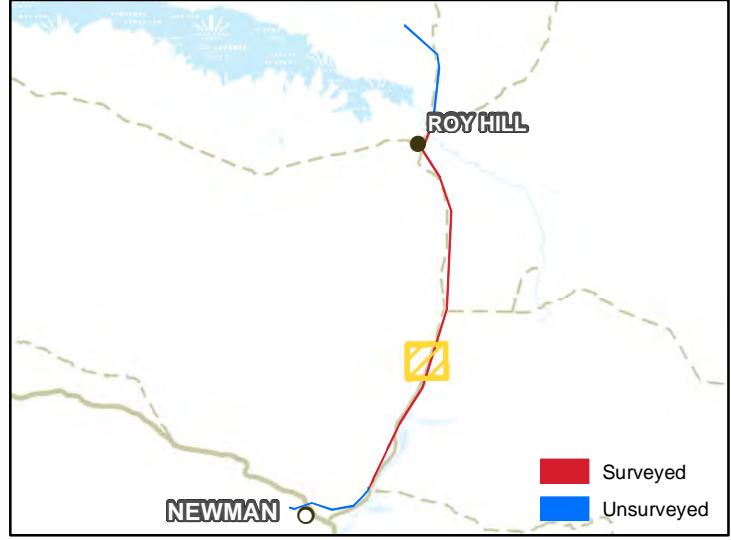


801000

803500

806000

OVERVIEW



7447500

7445000

7442500



LEGEND

- Pole Locations
 - Quadrats
 - Relevés
- Roads and Tracks**
- Highway
 - Road; sealed
 - - Road; unsealed
 - + - Railway
- Vegetation Communities**
- AapAscTe - *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland
 - AapEfTe/AsyAc - Mulga grove: *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forrestii* subsp. *forrestii*, *A. tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequiglumis* mid-low open hummock/tussock grassland
Mulga intergrove: *A. synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland
 - AapEfTe/AsyAc/Tb - Mosaic of *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland/*Acacia synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland and Tb
 - AbiTe - *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland
 - AbiTe/AbiTW - Mosaic of AbiTe and AbiTW
 - AbiTW - *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hilliana* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
 - AscTe - *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and *Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland
 - AsyTI - *Acacia synchronicia* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
 - CcAscCc - *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland
 - EvAscCc - *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and *Vachellia farnesiana* tall-mid sparse shrubland over *Cenchrus ciliaris*, *Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland
 - EvAscPs - *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland
 - EVVIPs - *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with *Vachellia farnesiana* mid scattered shrubs
 - Sc - *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland
 - Tb - *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
 - ViEc - *Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Enneapogon caeruleus*, *Cenchrus ciliaris* and *Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees
 - N/A - Roadworks
 - Study Area

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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

VEGETATION TYPES
MAP 5h



798500

801000

803500

7442500

7440000

7437500

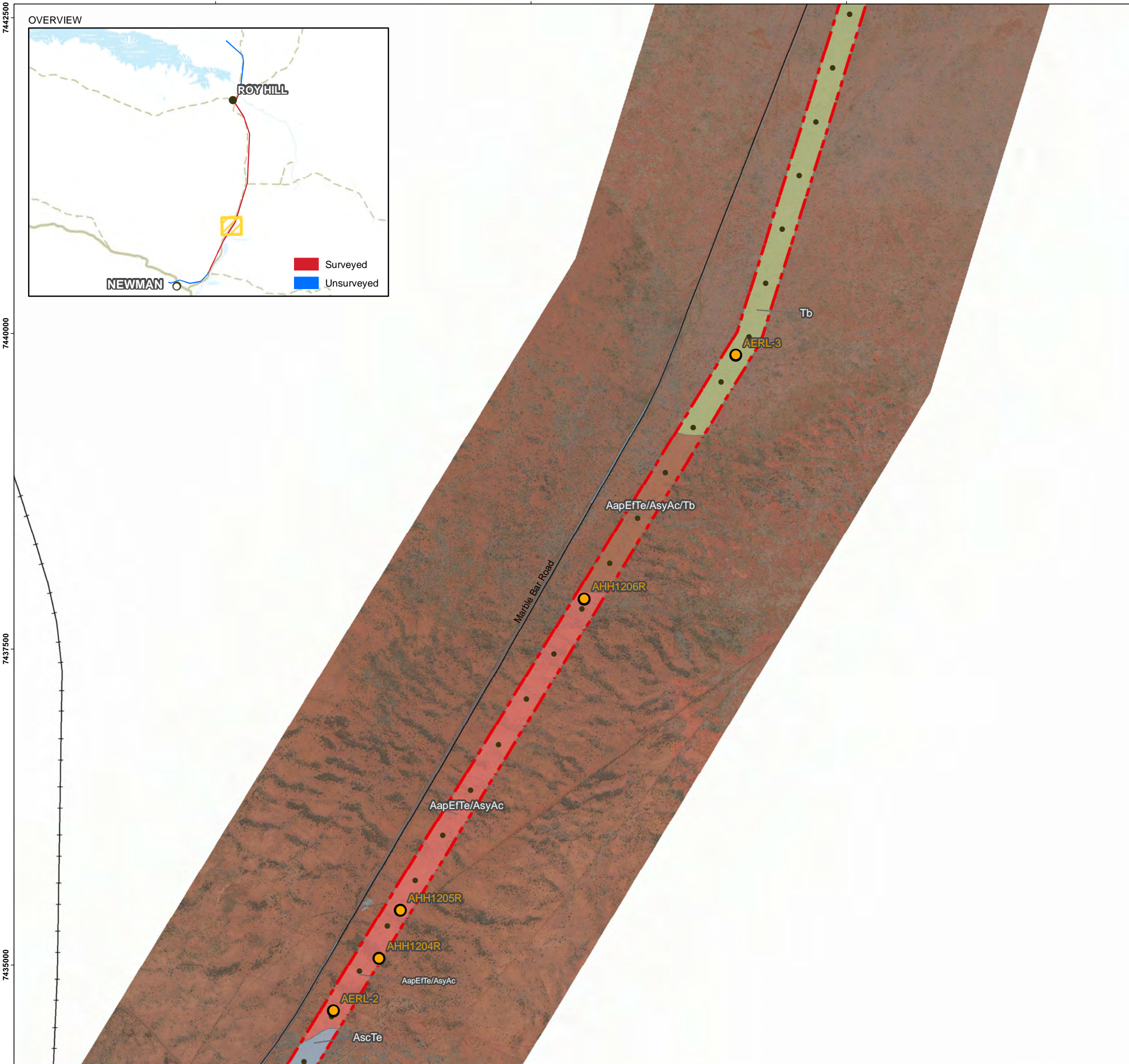
7435000



■ Surveyed
■ Unsurveyed

LEGEND

- Pole Locations
 - Quadrats
 - Relevés
- Roads and Tracks**
- Highway
 - Road; sealed
 - Road; unsealed
 - Railway
- Vegetation Communities**
- AapAscTe - *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronica* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland
 - AapEfTe/AsyAc - Mulga grove: *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forrestii* subsp. *forrestii*, *A. tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequiglumis* mid-low open hummock/tussock grassland
Mulga intergrove: *A. synchronica* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland
 - AapEfTe/AsyAc/Tb - Mosaic of *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronica* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland/*Acacia synchronica* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland and Tb
 - AbiTe - *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland
 - AbiTe/AbiTw - Mosaic of AbiTe and AbiTw
 - AbiTw - *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hilliana* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
 - AscTe - *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronica* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and *Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland
 - AsyTI - *Acacia synchronica* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
 - CcAscCc - *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland
 - EvAscCc - *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and *Vachellia farnesiana* tall-mid sparse shrubland over *Cenchrus ciliaris*, *Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland
 - EvAscPs - *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland
 - EVVIPs - *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with *Vachellia farnesiana* mid scattered shrubs
 - Sc - *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland
 - Tb - *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
 - ViEc - *Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Enneapogon caeruleus*, *Cenchrus ciliaris* and *Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees
 - N/A - Roadworks
 - Study Area



Imagery Source: Alinta Energy (2012)

GDA 1994 MGA Zone 50

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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS

CLIENT: ALINTA ENERGY

VEGETATION TYPES

MAP 5i

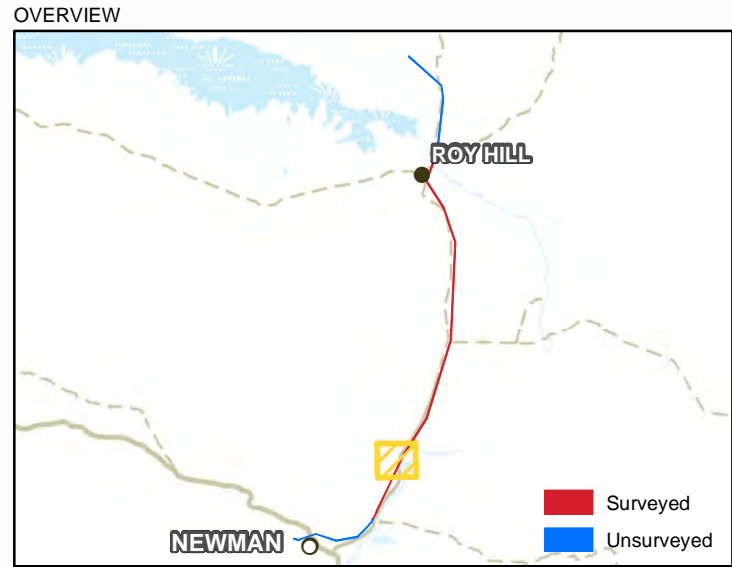


793500

796000

798500

801000

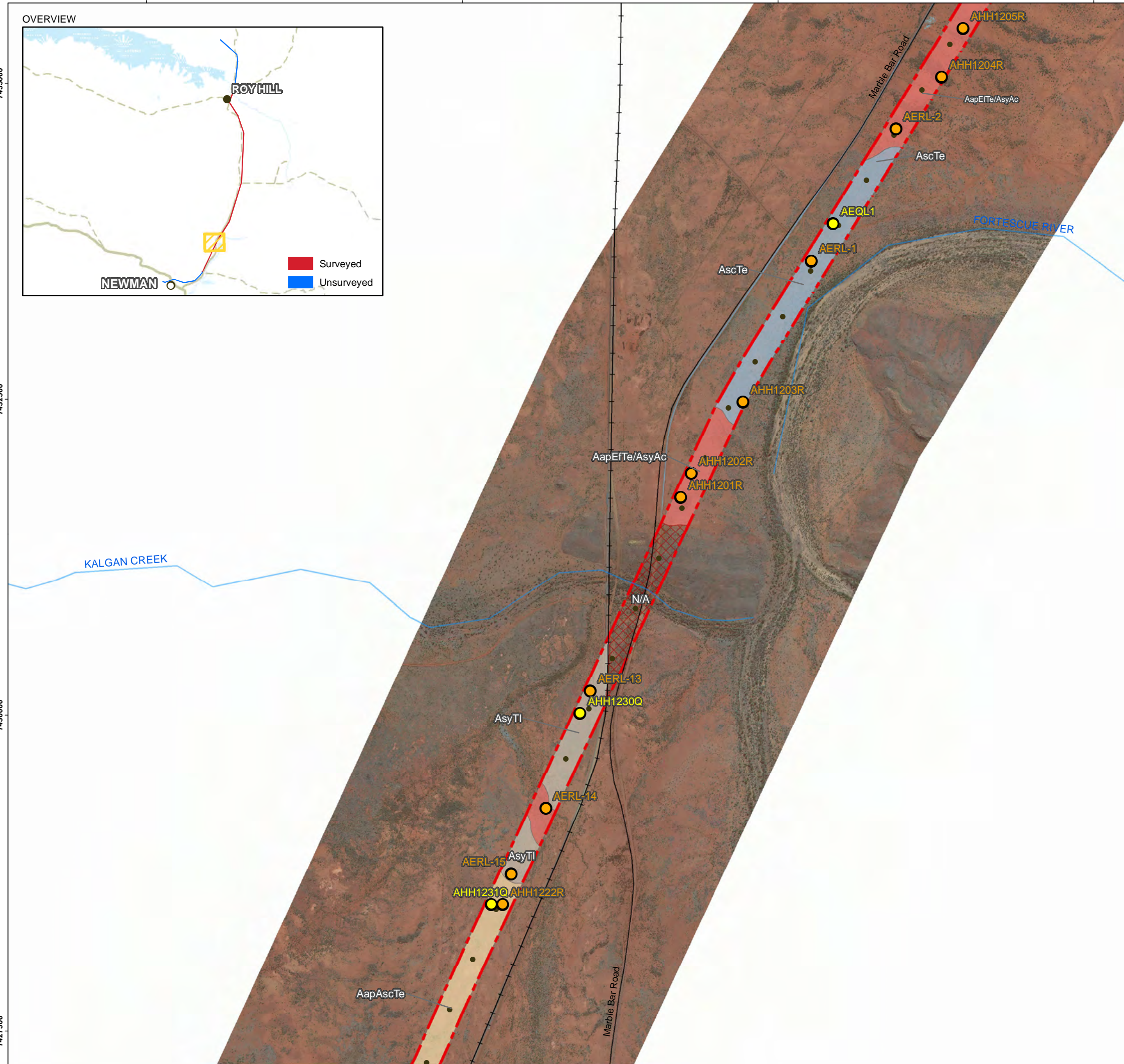


7435000

7432500

7430000

7427500



LEGEND

- Pole Locations
- Quadrats
- Relevés

Roads and Tracks

- Highway
- Road; sealed
- - - Road; unsealed
- +— Railway

Vegetation Communities

- AapAscTe - *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* mid open shrubland
- AapEfTe/AsyAc - Mulga grove: *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forrestii* subsp. *forrestii*, *A. tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequiglumis* mid-low open hummock/tussock grassland
Mulga intergrove: *A. synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland
- AapEfTe/AsyAc/Tb - Mosaic of *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland/*Acacia synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland and Tb
- AbiTe - *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland
- AbiTe/AbiTw - Mosaic of AbiTe and AbiTw
- AbiTw - *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hilliana* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
- AscTe - *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and *Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland
- AsyTI - *Acacia synchronicia* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
- CcAscCc - *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland
- EvAscCc - *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and *Vachellia farnesiana* tall-mid sparse shrubland over *Cenchrus ciliaris*, *Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland
- EvAscPs - *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland
- EVVIPs - *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with *Vachellia farnesiana* mid scattered shrubs
- Sc - *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland
- Tb - *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
- VIeC - *Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Enneapogon caeruleus*, *Cenchrus ciliaris* and *Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees
- N/A - Roadworks
- Study Area

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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

VEGETATION TYPES

MAP 5j

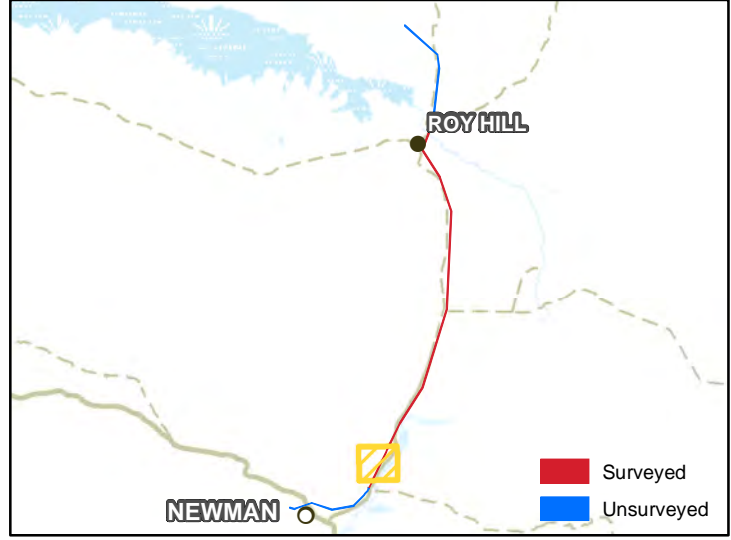


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793500

796000

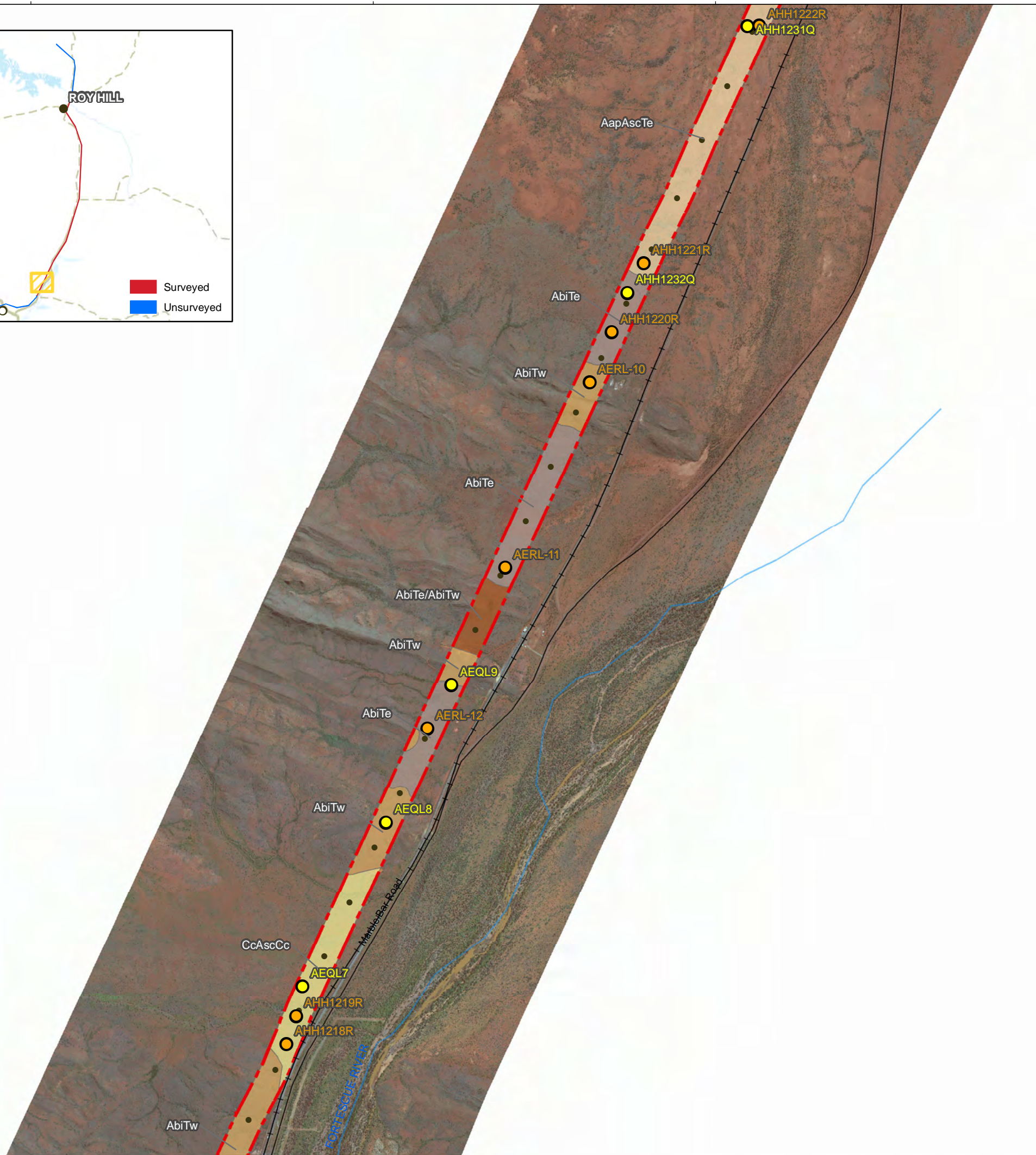
OVERVIEW



7427500

7425000

7422500



LEGEND

- Pole Locations
 - Quadrats
 - Relevés
- Roads and Tracks**
- Highway
 - Road; sealed
 - - Road; unsealed
 - + Railway
- Vegetation Communities**
- AapAscTe - *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland
 - AapEfTe/AsyAc - Mulga grove: *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forestii* subsp. *forestii*, *A. tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequiglumis* mid-low open hummock/tussock grassland
Mulga intergrove: *A. synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland
 - AapEfTe/AsyAc/Tb - Mosaic of *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland/
Acacia synchronicia tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland and Tb
 - AbiTe - *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland
 - AbiTe/AbiTW - Mosaic of AbiTe and AbiTW
 - AbiTW - *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hilliana* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
 - AscTe - *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and *Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland
 - AsyTI - *Acacia synchronicia* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
 - CcAscCc - *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland
 - EvAscCc - *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and *Vachellia farnesiana* tall-mid sparse shrubland over *Cenchrus ciliaris*, *Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland
 - EvAscPs - *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland
 - EVVIPs - *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with *Vachellia farnesiana* mid scattered shrubs
 - Sc - *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland
 - Tb - *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
 - VIc - *Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Enneapogon caeruleus*, *Cenchrus ciliaris* and *Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees
 - N/A - Roadworks
 - Study Area

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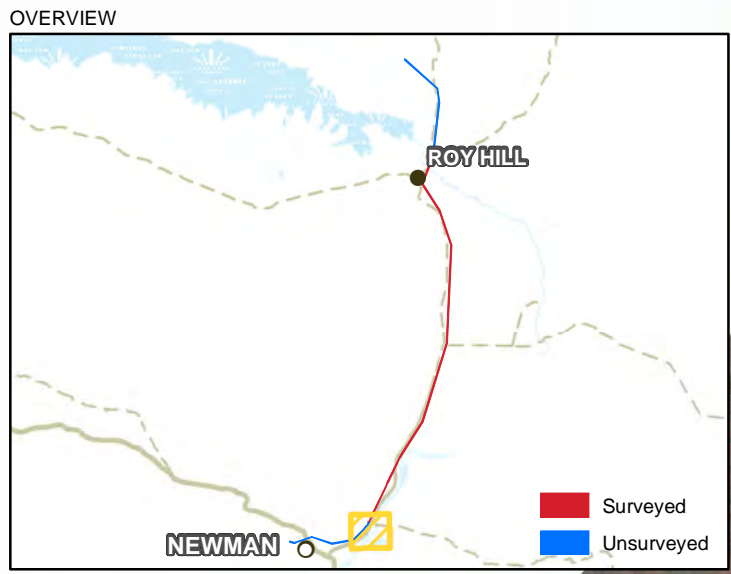
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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

VEGETATION TYPES
MAP 5k



788500 791000 793500 796000



7420000

7417500

7415000



LEGEND

- Pole Locations
 - Quadrats
 - Relevés
- Roads and Tracks**
- Highway
 - Road; sealed
 - - - Road; unsealed
 - +— Railway
- Vegetation Communities**
- AapAscTe - *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland
 - AapEfTe/AsyAc - Mulga grove: *Acacia aptaneura*, *A. pruinocarpa* and *A. paraneura* low woodland over *Eremophila forrestii* subsp. *forrestii*, *A. tetragonophylla* and *E. youngii* subsp. *lepidota* tall-mid sparse shrubland over *Triodia epactia*, *Aristida contorta* and *A. inaequiglumis* mid-low open hummock/tussock grassland
 - AapEfTe/AsyAc/Tb - Mosaic of *Acacia aptaneura* tall open shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia*, *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland/ *Acacia synchronicia* tall open/sparse shrubland over *Aristida contorta*, *Sclerolaena* spp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland
 - AbiTe - *Acacia bivenosa*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall-mid open shrubland over *Triodia epactia* and *T. wiseana* mid-low hummock grassland
 - AbiTe/AbiTw - Mosaic of AbiTe and AbiTw
 - AbiTw - *Acacia bivenosa* mid sparse shrubland over *Triodia wiseana*, *Acacia hilliana* and *T. epactia* low open hummock grassland/low open-sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
 - AscTe - *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall sparse shrubland over *Triodia epactia*, *Eragrostis eriopoda* and *Cenchrus ciliaris* tall hummock grassland/low sparse tussock grassland
 - AsyTI - *Acacia synchronicia* mid sparse shrubland over *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
 - CcAscCc - *Corymbia candida* subsp. *dipsodes* and *Eucalyptus victrix* low open woodland-isolated trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/mid open hummock grassland
 - EvAscCc - *Eucalyptus victrix*, *Acacia aptaneura* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and *Vachellia farnesiana* tall-mid sparse shrubland over *Cenchrus ciliaris*, *Malvastrum americanum* and *Salsola australis* low sparse tussock grassland/low sparse forbland
 - EvAscPs - *Eucalyptus victrix* and *Acacia aptaneura* low open-sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Vachellia farnesiana* and *A. tetragonophylla* mid sparse shrubland over mixed Poaceae spp. low open tussock grassland
 - EVVIPs - *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with *Vachellia farnesiana* mid scattered shrubs
 - Sc - *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland
 - Tb - *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland with *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
 - VIc - *Vachellia farnesiana* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland over *Enneapogon caerulescens*, *Cenchrus ciliaris* and *Aerva javanica* low scattered tussock grassland/low sparse forbland with *Acacia aptaneura* and *A. paraneura* low scattered trees
 - N/A - Roadworks
 - Study Area

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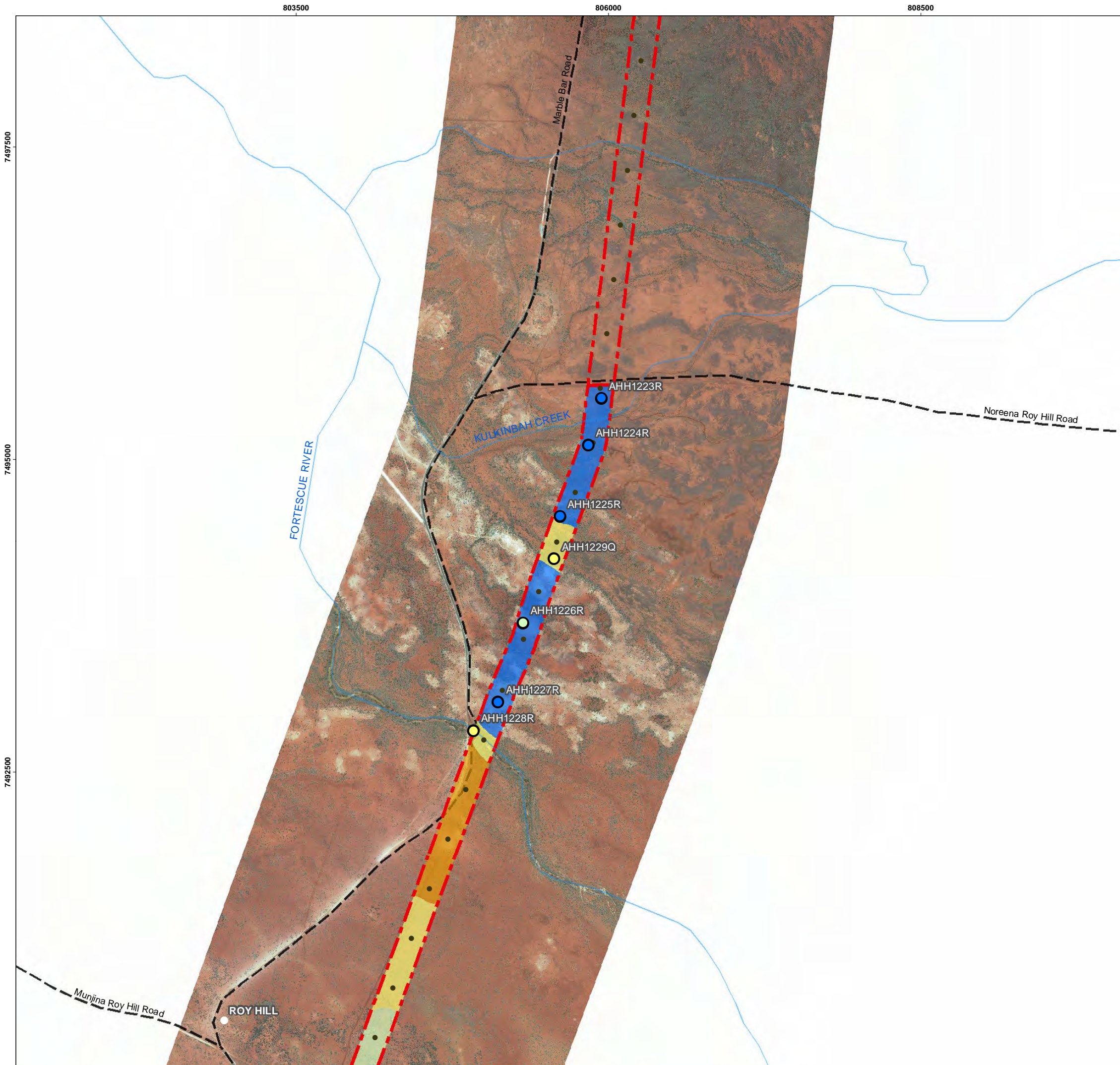


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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
CLIENT: ALINTA ENERGY

VEGETATION TYPES
MAP 51

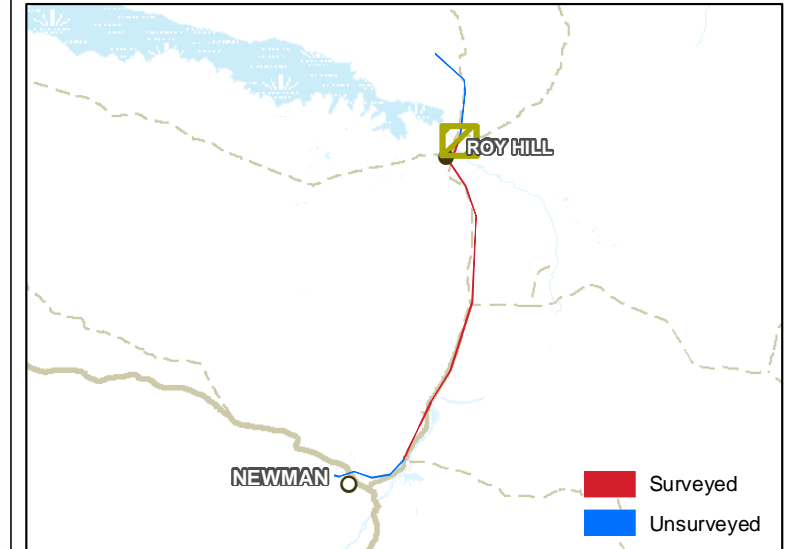




LEGEND

- Pole Locations
- Quadrat Relevé and Vegetation Condition**
- Trudgen (1991) Scale
 - Excellent
 - Very good
 - Good
 - Poor
 - Very poor
 - Degraded
- Roads and Tracks**
 - Highway
 - Road; sealed
 - - Road; unsealed
 - + Railway
 - Drainage
- Vegetation Condition**
- Trudgen (1991) Scale
 - Excellent
 - Very good
 - Good
 - Poor
 - Very poor
 - Completely degraded
 - ▨ N/A - Roadworks
 - ▩ Study Area

OVERVIEW



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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
 CLIENT: ALINTA ENERGY

VEGETATION CONDITION
MAP 6a

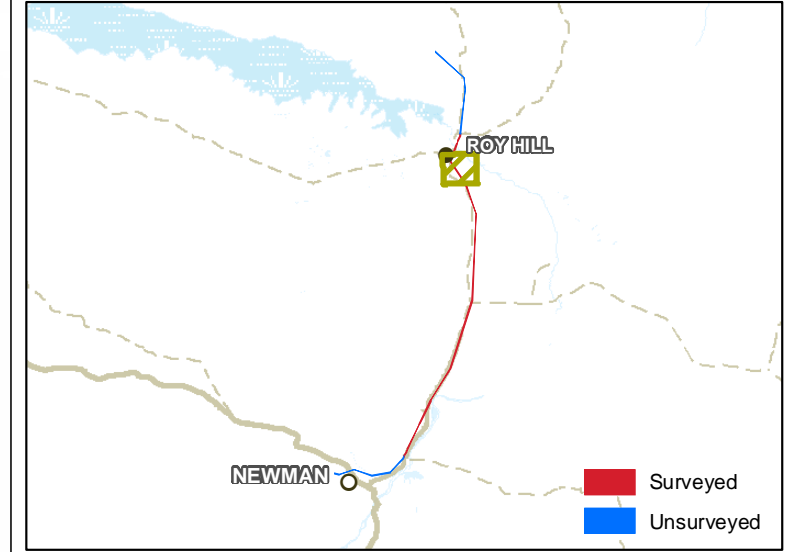





LEGEND

- Pole Locations
- Quadrat Relevé and Vegetation Condition**
- Trudgen (1991) Scale
- Excellent
- Very good
- Good
- Poor
- Very poor
- Degraded
- Roads and Tracks**
- Highway
- Road; sealed
- - Road; unsealed
- + Railway
- Drainage
- Vegetation Condition**
- Trudgen (1991) Scale
- Excellent
- Very good
- Good
- Poor
- Very poor
- Completely degraded
- N/A - Roadworks
- Study Area

OVERVIEW



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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
 CLIENT: ALINTA ENERGY

VEGETATION CONDITION
MAP 6b



803500

806000

808500

7482500

7480000

7477500



LEGEND

● Pole Locations

Quadrat Relevé and Vegetation Condition

Trudgen (1991) Scale

● Excellent

○ Very good

● Good

● Poor

● Very poor

● Degraded

Roads and Tracks

— Highway

— Road; sealed

- - Road; unsealed

+ Railway

— Drainage

Vegetation Condition

Trudgen (1991) Scale

■ Excellent

■ Very good

■ Good

■ Poor

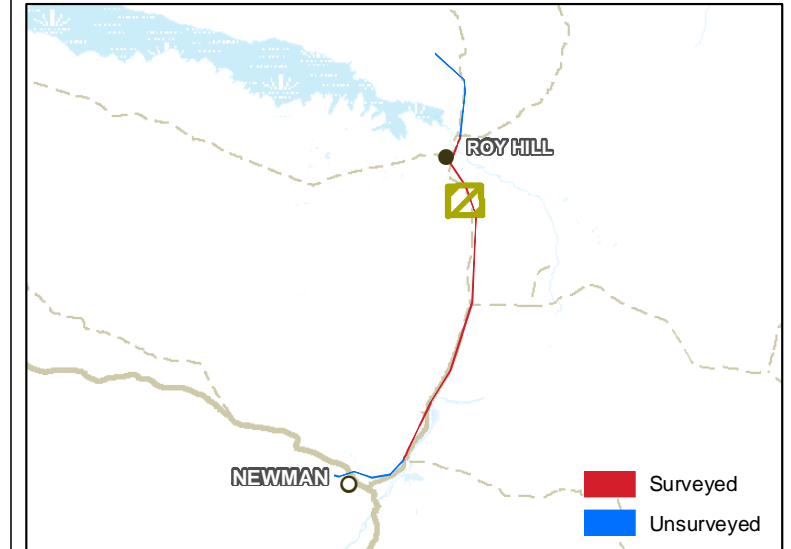
■ Very poor

■ Completely degraded

■ N/A - Roadworks

■ Study Area

OVERVIEW



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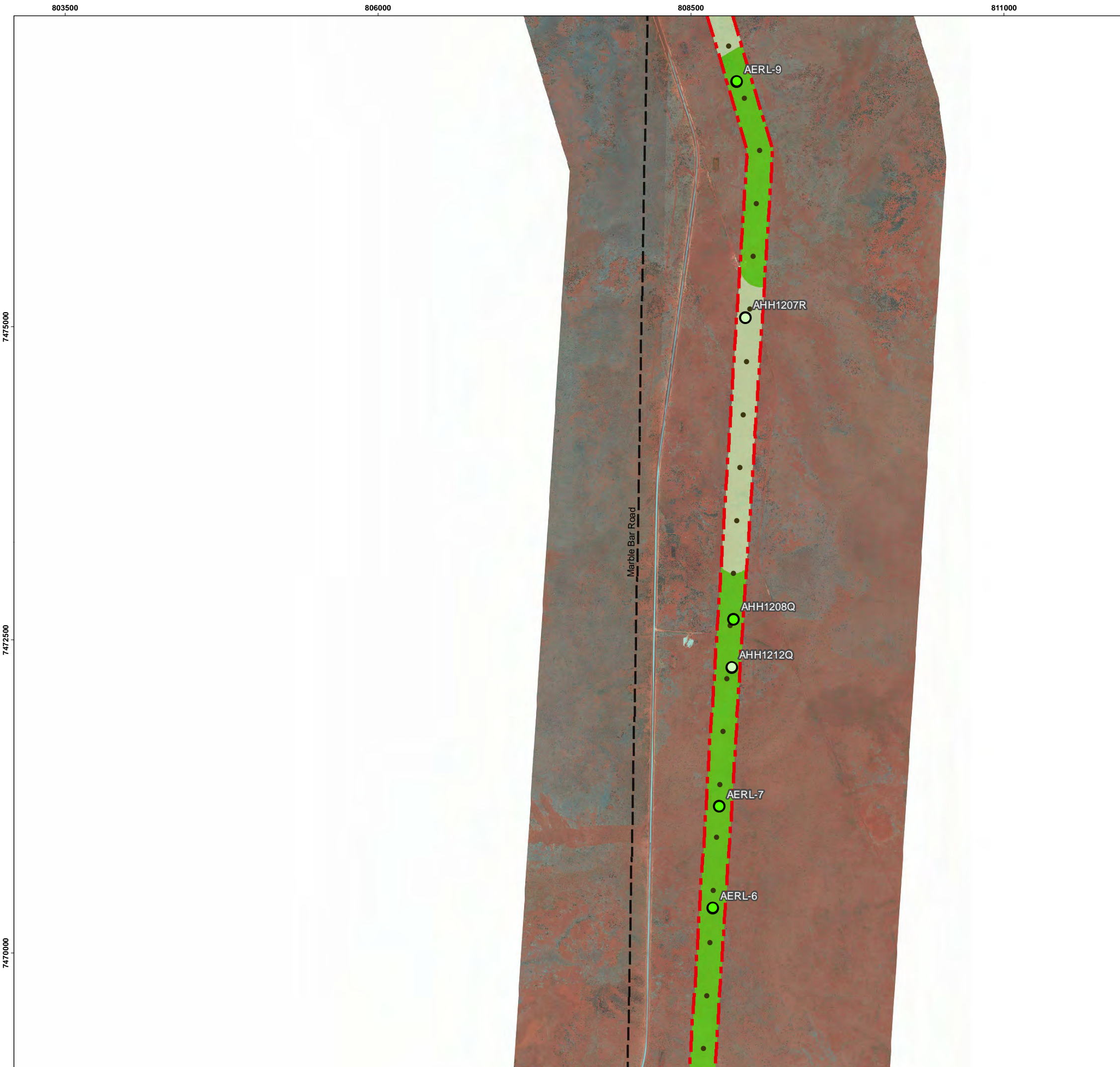
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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
 CLIENT: ALINTA ENERGY

VEGETATION CONDITION

MAP 6c

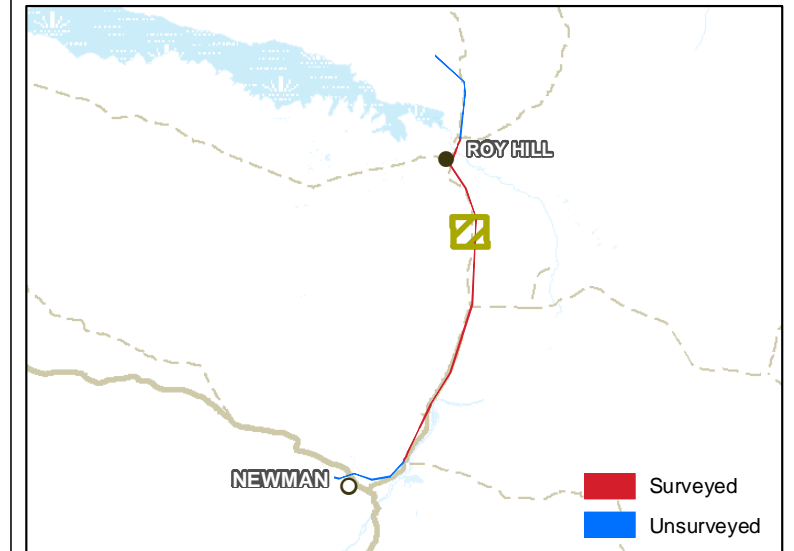




LEGEND

- Pole Locations
- Quadrat Relevé and Vegetation Condition**
- Trudgen (1991) Scale
- Excellent
- Very good
- Good
- Poor
- Very poor
- Degraded
- Roads and Tracks**
- Highway
- Road; sealed
- - Road; unsealed
- + Railway
- Drainage
- Vegetation Condition**
- Trudgen (1991) Scale
- Excellent
- Very good
- Good
- Poor
- Very poor
- Completely degraded
- N/A - Roadworks
- Study Area

OVERVIEW



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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
 CLIENT: ALINTA ENERGY

VEGETATION CONDITION
MAP 6d

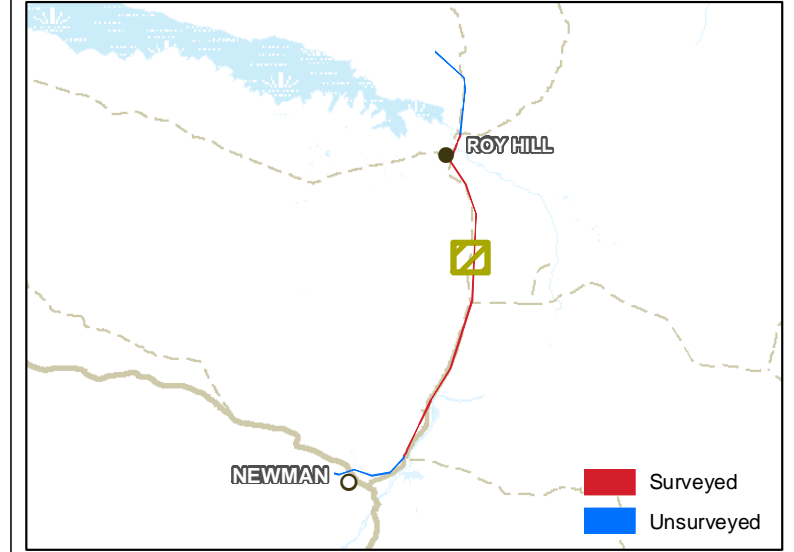





LEGEND

- Pole Locations
- Quadrat Relevé and Vegetation Condition**
- Trudgen (1991) Scale
- Excellent
- Very good
- Good
- Poor
- Very poor
- Degraded
- Roads and Tracks**
- Highway
- Road; sealed
- - Road; unsealed
- + Railway
- Drainage
- Vegetation Condition**
- Trudgen (1991) Scale
- Excellent
- Very good
- Good
- Poor
- Very poor
- Completely degraded
- N/A - Roadworks
- Study Area

OVERVIEW



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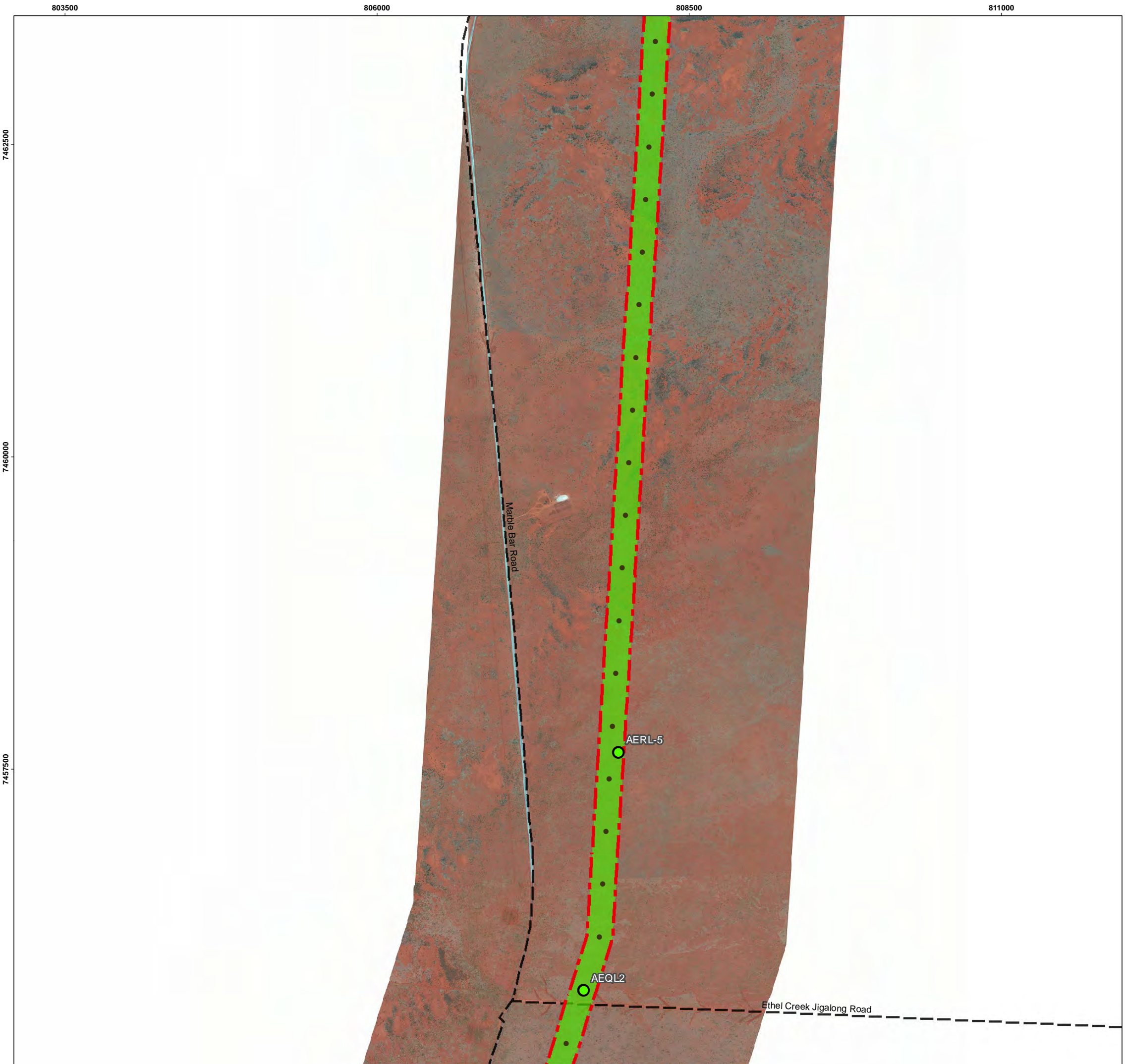


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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
 CLIENT: ALINTA ENERGY

VEGETATION CONDITION
MAP 6e





LEGEND

- Pole Locations
- Quadrat Relevé and Vegetation Condition**
- Trudgen (1991) Scale
- Excellent
- Very good
- Good
- Poor
- Very poor
- Degraded
- Roads and Tracks**
- Highway
- Road; sealed
- - Road; unsealed
- + Railway
- Drainage
- Vegetation Condition**
- Trudgen (1991) Scale
- Excellent
- Very good
- Good
- Poor
- Very poor
- Completely degraded
- N/A - Roadworks
- Study Area

OVERVIEW



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AUTHOR: RD CHECKED: JN
 DATE: 09-12 PROJECT NO: 2817-12

NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
 CLIENT: ALINTA ENERGY

VEGETATION CONDITION
MAP 6f



803500

806000

808500

7455000

7452500

7450000



LEGEND

● Pole Locations

Quadrat Relevé and Vegetation Condition

Trudgen (1991) Scale

● Excellent

○ Very good

● Good

○ Poor

○ Very poor

● Degraded

Roads and Tracks

— Highway

— Road; sealed

- - - Road; unsealed

+ - - Railway

— Drainage

Vegetation Condition

Trudgen (1991) Scale

■ Excellent

■ Very good

■ Good

■ Poor

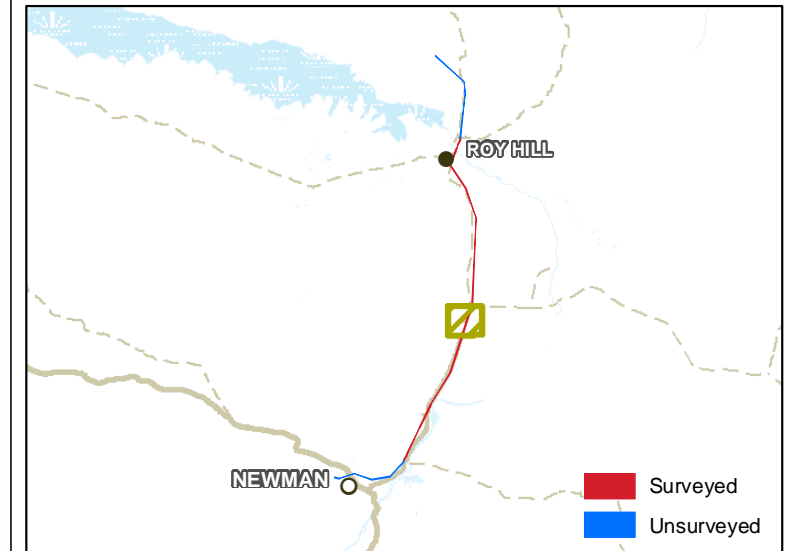
■ Very poor

■ Completely degraded

▨ N/A - Roadworks

▭ Study Area

OVERVIEW



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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
 CLIENT: ALINTA ENERGY

VEGETATION CONDITION

MAP 6g

SCALE 1:30,000 @ A3



801000

803500

806000

7447500

7445000

7442500



LEGEND

● Pole Locations

Quadrat Relevé and Vegetation Condition

Trudgen (1991) Scale

- Excellent
- Very good
- Good
- Poor
- Very poor
- Degraded

Roads and Tracks

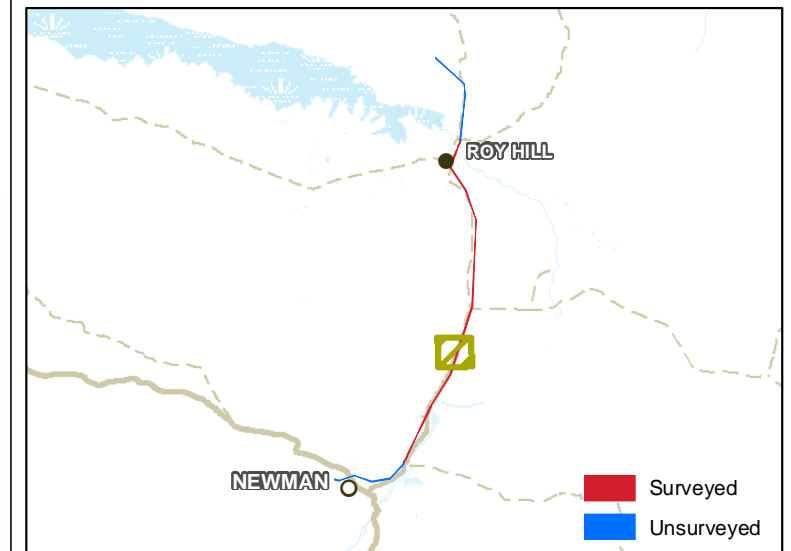
- Highway
- Road; sealed
- - Road; unsealed
- + Railway
- Drainage

Vegetation Condition

Trudgen (1991) Scale

- Excellent
- Very good
- Good
- Poor
- Very poor
- Completely degraded
- N/A - Roadworks
- Study Area

OVERVIEW



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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
 CLIENT: ALINTA ENERGY

VEGETATION CONDITION

MAP 6h



798500

801000

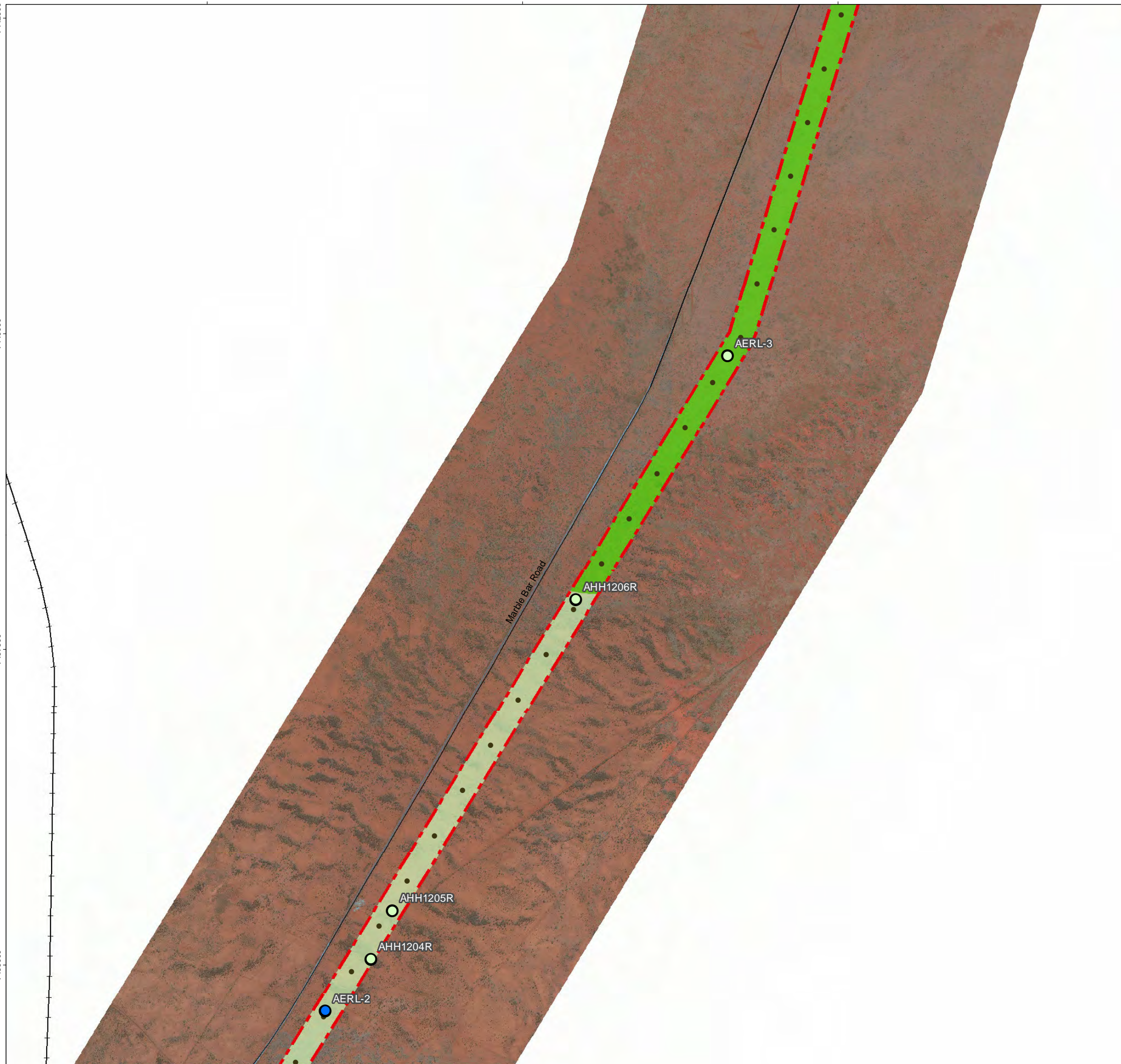
803500

7442500

7440000

7437500

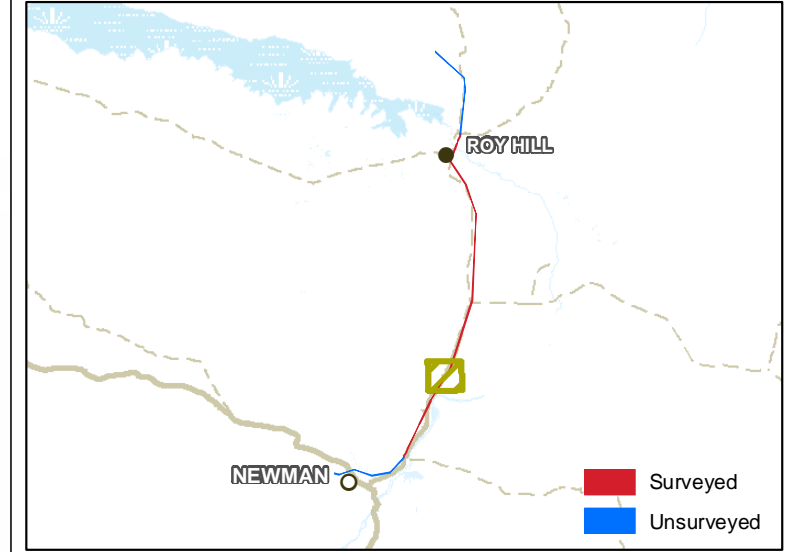
7435000



LEGEND

- Pole Locations
- Quadrat Relevé and Vegetation Condition**
- Trudgen (1991) Scale
- Excellent
- Very good
- Good
- Poor
- Very poor
- Degraded
- Roads and Tracks**
- Highway
- Road; sealed
- - Road; unsealed
- + Railway
- Drainage
- Vegetation Condition**
- Trudgen (1991) Scale
- Excellent
- Very good
- Good
- Poor
- Very poor
- Completely degraded
- N/A - Roadworks
- Study Area

OVERVIEW



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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
 CLIENT: ALINTA ENERGY

VEGETATION CONDITION
MAP 6i



793500

796000

798500

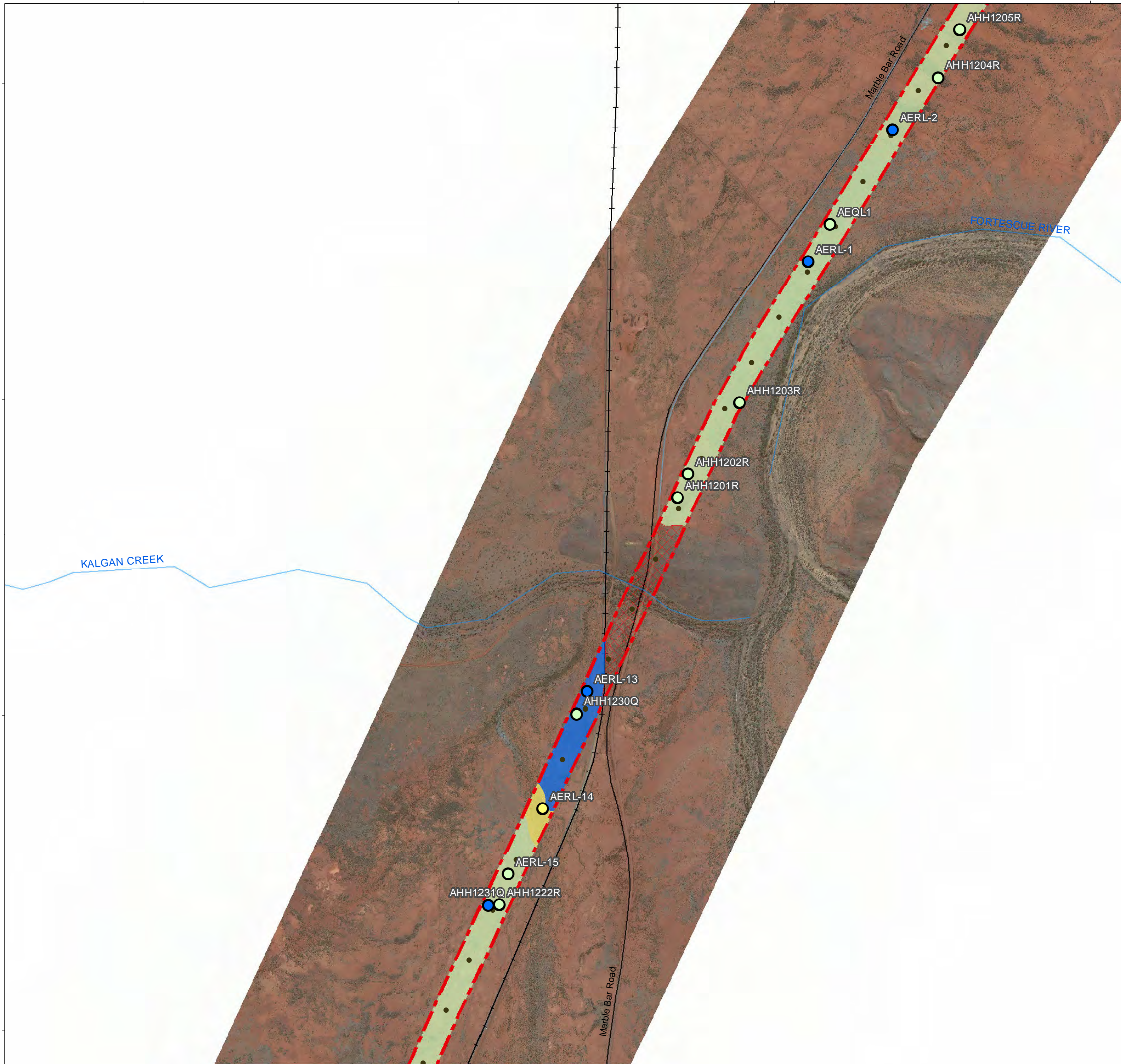
801000

7435000

7432500

7430000

7427500



LEGEND

● Pole Locations

Quadrat Relevé and Vegetation Condition

Trudgen (1991) Scale

● Excellent

○ Very good

● Good

○ Poor

● Very poor

● Degraded

Roads and Tracks

— Highway

— Road; sealed

- - - Road; unsealed

+ Railway

— Drainage

Vegetation Condition

Trudgen (1991) Scale

■ Excellent

■ Very good

■ Good

■ Poor

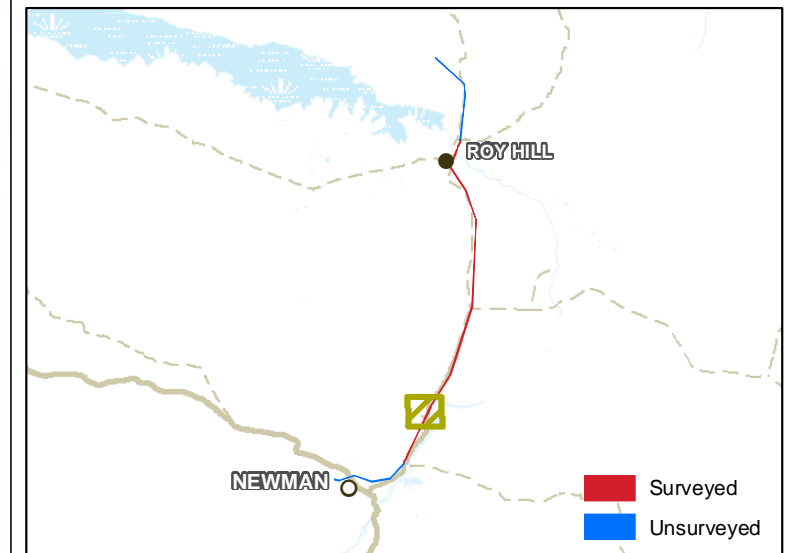
■ Very poor

■ Completely degraded

■ N/A - Roadworks

■ Study Area

OVERVIEW



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NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
 CLIENT: ALINTA ENERGY

VEGETATION CONDITION

MAP 6j



SCALE 1:30,000 @ A3

2 km

791000

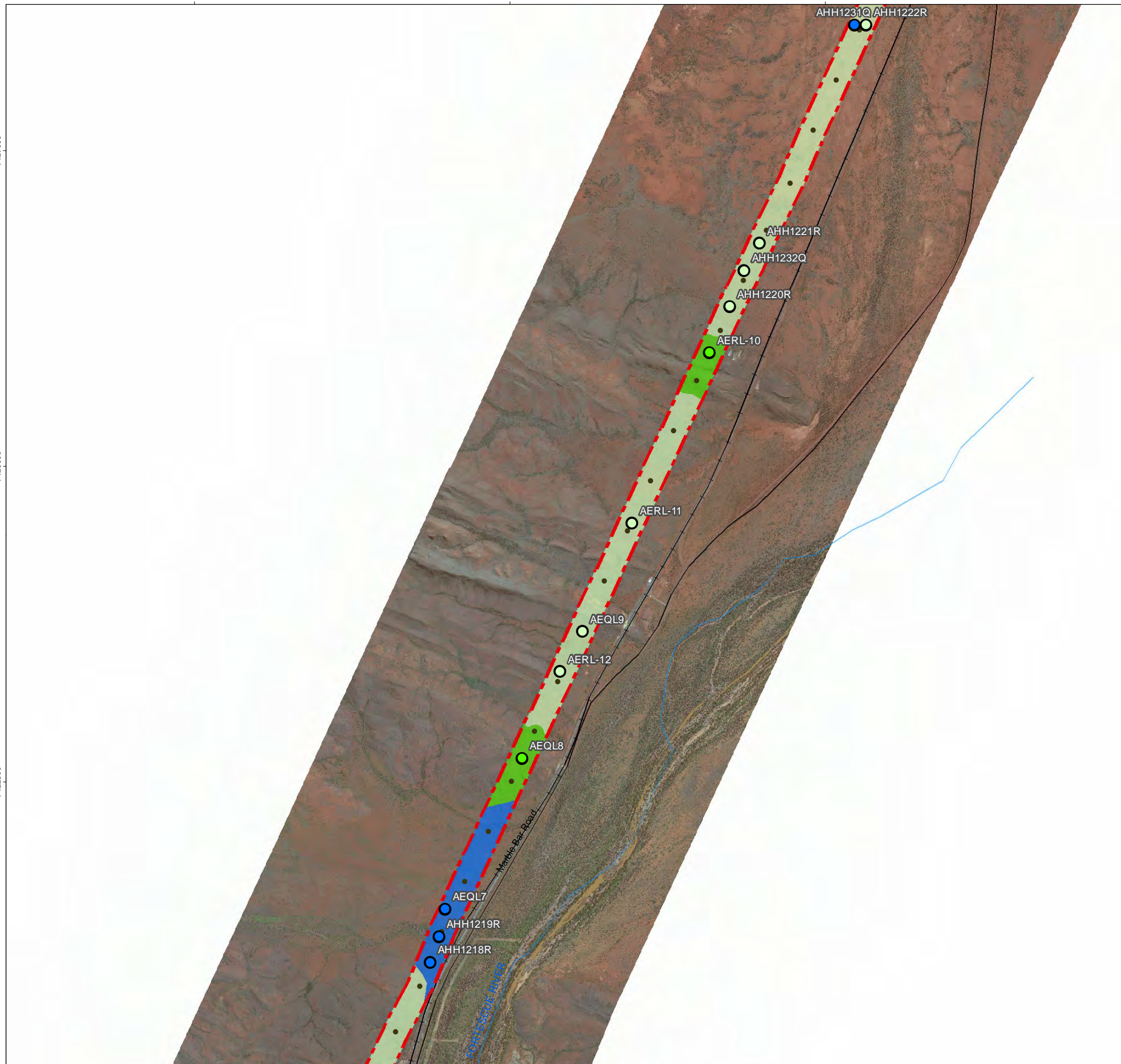
793500

796000

7427500

7425000

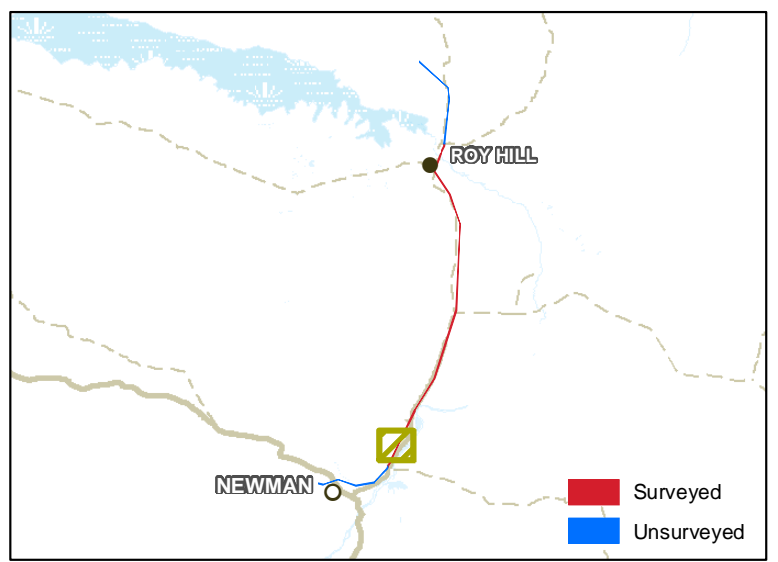
7422500



LEGEND

- Pole Locations
- Quadrat Relevé and Vegetation Condition**
- Trudgen (1991) Scale
- Excellent
- Very good
- Good
- Poor
- Very poor
- Degraded
- Roads and Tracks**
- Highway
- Road; sealed
- - Road; unsealed
- + Railway
- Drainage
- Vegetation Condition**
- Trudgen (1991) Scale
- Excellent
- Very good
- Good
- Poor
- Very poor
- Completely degraded
- N/A - Roadworks
- Study Area

OVERVIEW



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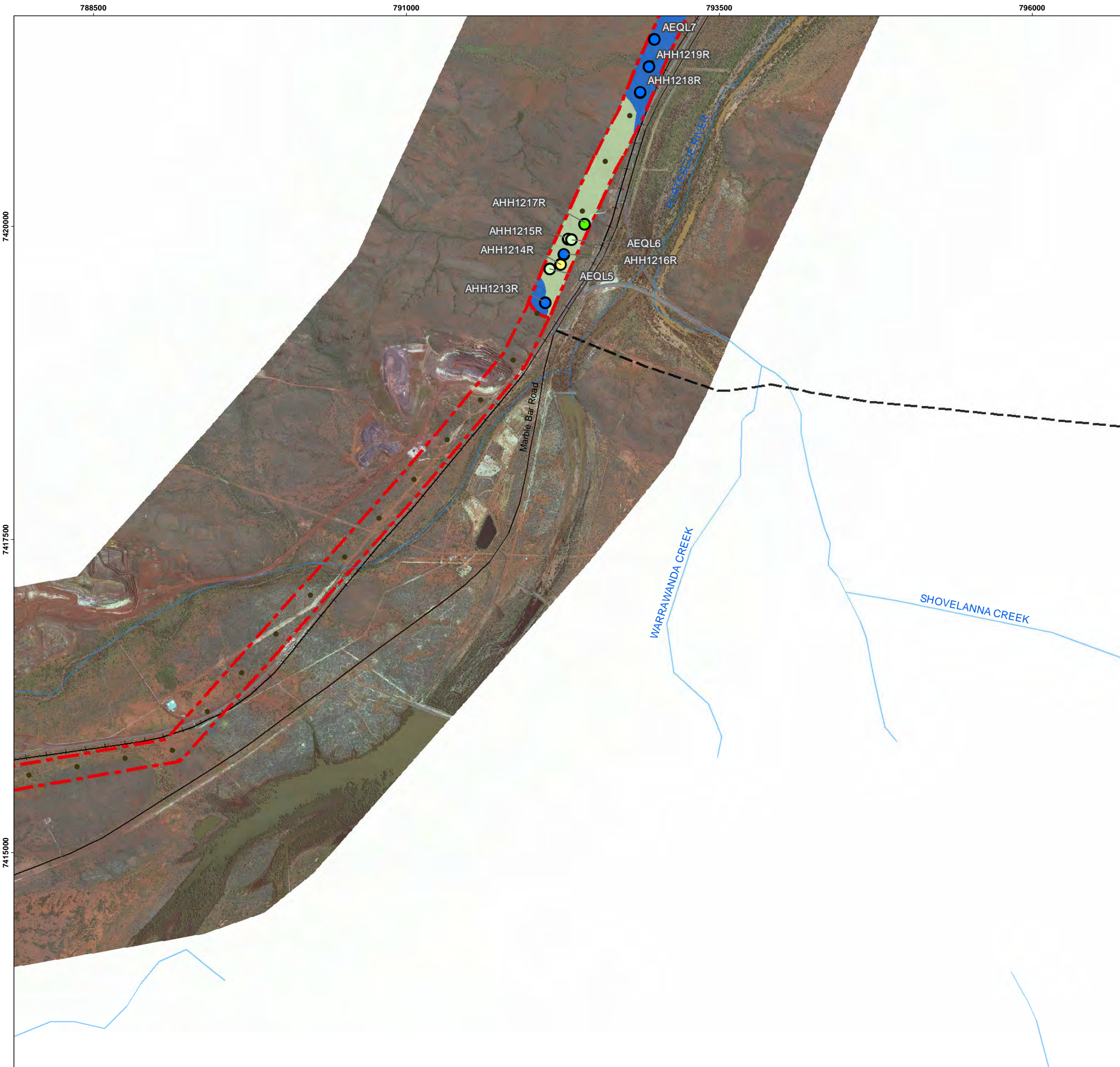


AUTHOR: RD CHECKED: JN
 DATE: 09-12 PROJECT NO: 2817-12

NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
 CLIENT: ALINTA ENERGY

VEGETATION CONDITION
MAP 6k

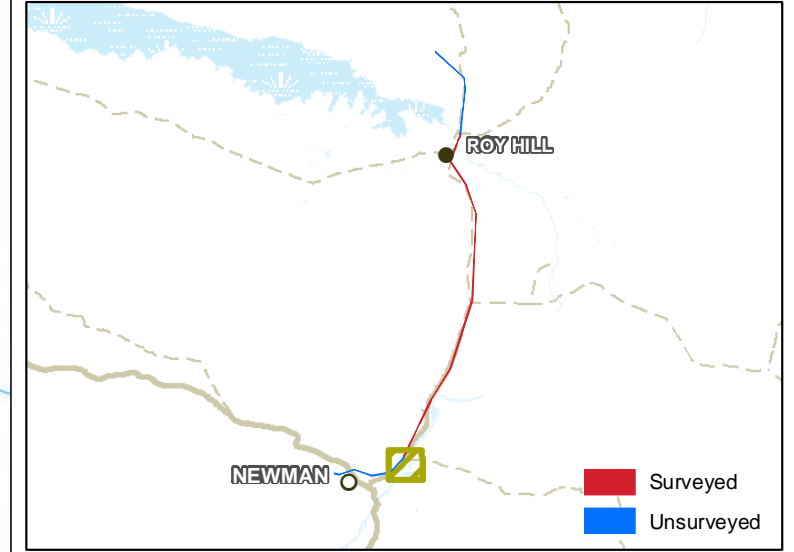





LEGEND

- Pole Locations
- Quadrat Relevé and Vegetation Condition**
- Trudgen (1991) Scale
- Excellent
- Very good
- Good
- Poor
- Very poor
- Degraded
- Roads and Tracks**
- Highway
- Road; sealed
- - - Road; unsealed
- + - - Railway
- Drainage
- Vegetation Condition**
- Trudgen (1991) Scale
- Excellent
- Very good
- Good
- Poor
- Very poor
- Completely degraded
- N/A - Roadworks
- Study Area

OVERVIEW



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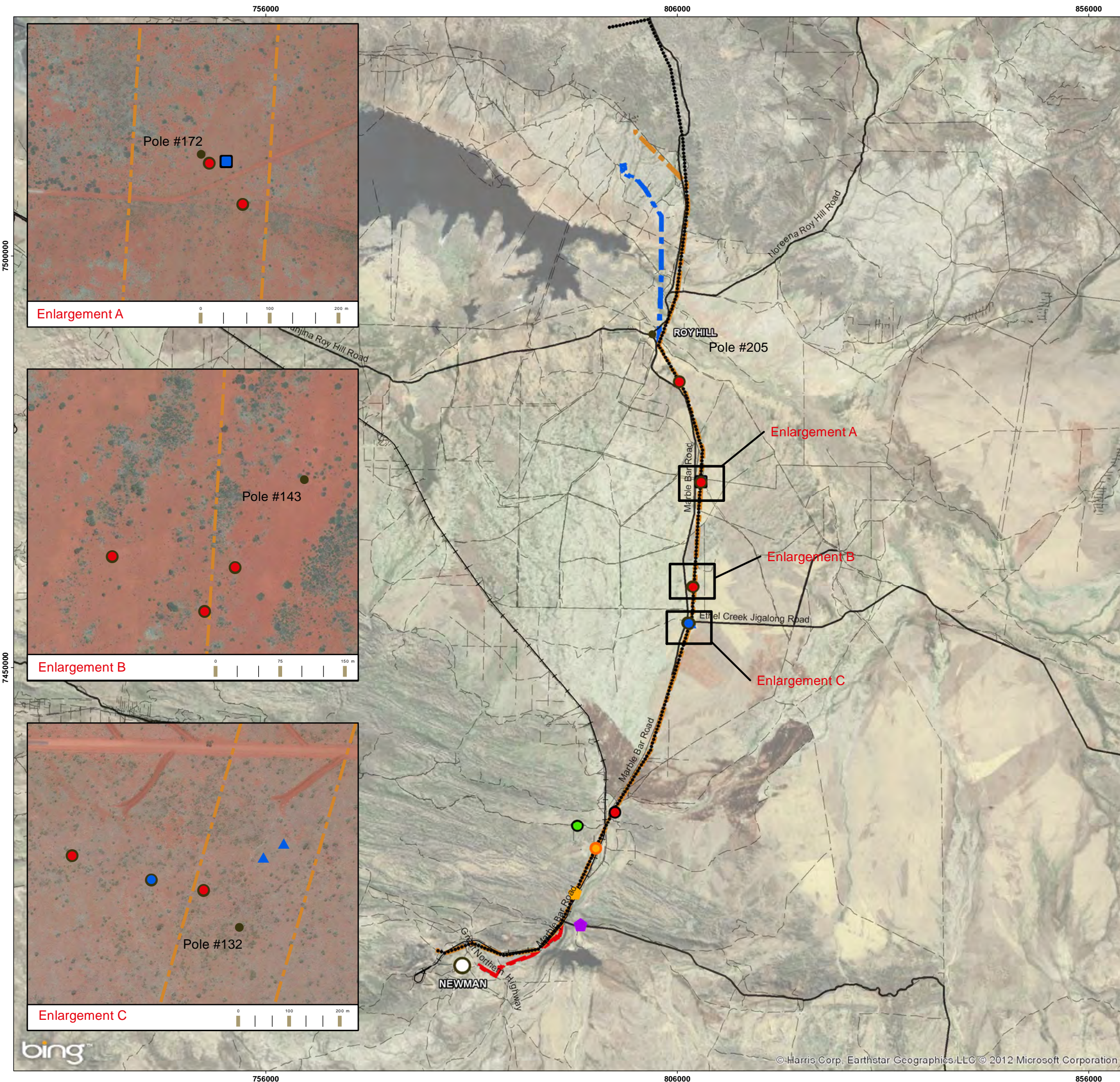


AUTHOR: RD CHECKED: JN
 DATE: 09-12 PROJECT NO: 2817-12

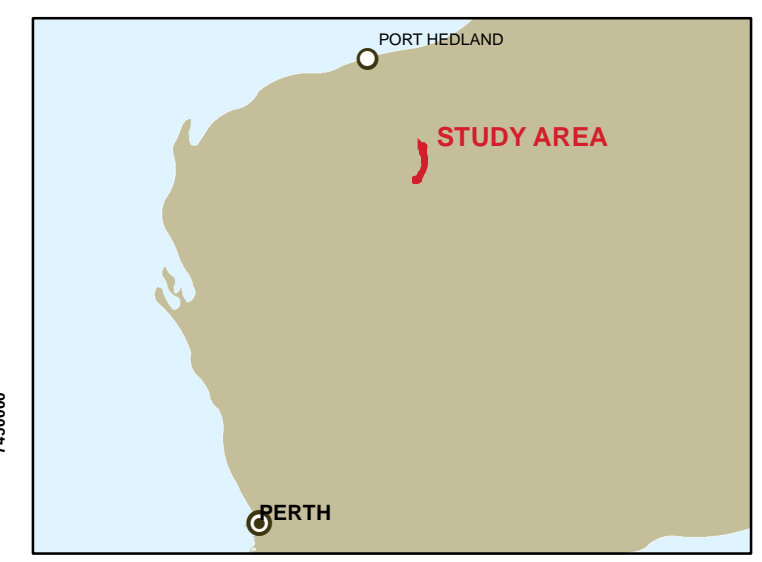
NEWMAN TO ROY HILL BIOLOGICAL SURVEYS
 CLIENT: ALINTA ENERGY

VEGETATION CONDITION
MAP 6I





- Legend**
- Original Study Area Todd Provided
 - Digitised Northern Area
 - Digitised Southern Area
 - Road
 - Tracks
 - Railway
 - Pole Locations
- Conservation Significant Fauna Locations**
- Mulgara Burrow
 - Mulgara Diggings
 - Bustard Tracks
 - Mulgara Tracks
 - Pebble-Mound Mouse Mound (Inactive)
 - Bush Stone Curlew Track
 - Rainbow Bee-eater
- Introduced Fauna Locations**
- Rabbit Scat



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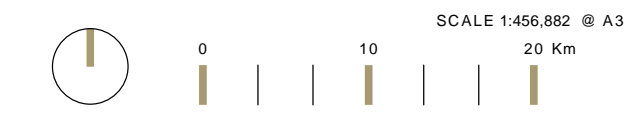


AUTHOR: CM
 DATE: 08-12
 PROJECT NO: 2817-12

Newman-Roy Hill Survey

FAUNA SURVEY LOCATIONS

MAP 7



7500000

7450000

7500000

7450000

756000

806000

856000

756000

806000

856000



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Appendix One: Definitions and Criteria

Table 17: EPBC Act categories for flora and fauna (Commonwealth of Australia 1999)

EPBC Act Category	Definition
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the wild	<p>A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time:</p> <ul style="list-style-type: none"> (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	<p>A native species is eligible to be included in the endangered category at a particular time if, at that time:</p> <ul style="list-style-type: none"> (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	<p>A native species is eligible to be included in the vulnerable category at a particular time if, at that time:</p> <ul style="list-style-type: none"> (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	<p>A native species is eligible to be included in the conservation dependent category at a particular time if, at that time:</p> <ul style="list-style-type: none"> (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: <ul style="list-style-type: none"> (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Table 18: DEC conservation codes for flora and fauna (DEC2011)

Conservation Codes for Western Australian Flora and Fauna
T: Schedule 1 under the <i>Wildlife Conservation Act 1950</i>
<ul style="list-style-type: none"> • Threatened Fauna (Fauna that is rare or is likely to become extinct) • Threatened Flora (Declared Rare Flora – Extant) <p>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.</p>
X: Schedule 2 under the <i>Wildlife Conservation Act 1950</i>
<ul style="list-style-type: none"> • Presumed Extinct Fauna • Presumed Extinct Flora (Declared Rare Flora – Extinct) <p>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.</p>
1A: Schedule 3 under the <i>Wildlife Conservation Act 1950</i>
<ul style="list-style-type: none"> • Birds protected under an international agreement <p>Birds that are subject to an agreement between governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction.</p>
S: Schedule 4 under the <i>Wildlife Conservation Act 1950</i>
<ul style="list-style-type: none"> • Other specially protected fauna <p>Fauna that is in need of special protection, otherwise than for the reasons mentioned in the above schedules.</p>
<p>Threatened fauna and flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List criteria.</p> <p>CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild.</p> <p>EN: Endangered – considered to be facing a very high risk of extinction in the wild.</p> <p>VU: Vulnerable – considered to be facing a high risk of extinction in the wild.</p>
<p>Taxa that have not yet been adequately surveyed to be listed under Schedule 1 or 2 are added to the Priority Flora and Priority Fauna Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna. Taxa that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These taxa require regular monitoring. Conservation Dependent species are placed in Priority 5.</p>
1: Priority One: Poorly-known taxa
<p>Taxa 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. Taxa 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.</p>
2: Priority Two: Poorly-known taxa
<p>Taxa 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. Taxa 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.</p>
3: Priority Three: Poorly-known taxa
<p>Taxa 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. Taxa 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.</p>

Conservation Codes for Western Australian Flora and Fauna

4: Priority Four: Rare, Near Threatened and other taxa in need of monitoring

(a) **Rare.** Taxa 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 taxa are usually represented on conservation lands.

(b) **Near Threatened.** Taxa 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) Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

5: Priority Five: Conservation Dependent taxa

Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxa becoming threatened within five years.

Table 19: DEC definitions and criteria for TECs and PECs (DEC 2010)

Criteria		Definition
Threatened Ecological Communities		
Presumed Destroyed (PD)	Totally	<p>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.</p> <p>An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B):</p> <p>A. Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or</p> <p>B. All occurrences recorded within the last 50 years have since been destroyed</p>
Critically (CR)	Endangered	<p>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.</p> <p>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. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):</p> <p>A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii):</p> <p>i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years);</p> <p>ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.</p> <p>B. Current distribution is limited, and one or more of the following apply (i, ii or iii):</p> <p>i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years);</p> <p>ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes;</p> <p>iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes.</p> <p>C. The ecological community exists only as highly modified occurrences that may be</p>

Criteria	Definition
	capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).
Endangered (EN)	<p>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.</p> <p>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. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C):</p> <p>A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii):</p> <ul style="list-style-type: none"> i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years); ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. <p>B) Current distribution is limited, and one or more of the following apply (i, ii or iii):</p> <ul style="list-style-type: none"> i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years); ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. <p>C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).</p>
Vulnerable (VU)	<p>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.</p> <p>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. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C):</p> <p>D) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.</p> <p>E) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.</p> <p>F) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.</p>
Priority Ecological Communities	
Priority One	<p><i>Poorly known ecological communities</i></p> <p>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</p>

Criteria	Definition
	from known threatening processes across their range.
Priority Two	<i>Poorly known ecological communities</i> 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.
Priority Three	<i>Poorly known ecological communities</i> <ol style="list-style-type: none"> 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 may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, 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.
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. <ol style="list-style-type: none"> i. Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. ii. Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. iii. Ecological communities that have been removed from the list of threatened communities during the past five years.
Priority Five	<i>Conservation Dependent Ecological Communities</i> 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.

Table 20: EPBC Act categories for TECs (DSEWPac 2009)

EPBC Act Category	Definition
Critically Endangered (CR)	An ecological community that is facing an extremely high risk of extinction in the wild in the immediate future.
Endangered (EN)	An ecological community that is not critically endangered, and is facing a very high risk of extinction in the wild in the new future.
Vulnerable (VU)	An ecological community that is not critically endangered or endangered, and is facing a high risk of extinction in the medium-term future.

Table 21: NVIS structural formation terminology (terrestrial vegetation) (NHT 2003)

		Cover Characteristics							
		Foliage cover *	70-100	30-70	10-30	<10	» 0 (scattered)	0-5 (clumped)	unknown
		Cover code	d	c	i	r	bi	bc	unknown
Growth Form	Height Ranges (m)	Structural Formation Classes							
tree, palm	<10,10-30,>30	closed forest	open forest	woodland	open woodland	isolated trees	isolated clumps of trees	trees	
tree mallee	<3, <10, 10-30	closed mallee forest	open mallee forest	mallee woodland	open mallee woodland	isolated mallee trees	isolated clumps of mallee trees	mallee trees	
shrub, cycad, grass-tree, tree-fern	<1,1-2,>2	closed shrubland	shrubland	open shrubland	sparse shrubland	isolated shrubs	isolated clumps of shrubs	shrubs	
mallee shrub	<3, <10, 10-30	closed mallee shrubland	mallee shrubland	open mallee shrubland	sparse mallee shrubland	isolated mallee shrubs	isolated clumps of mallee shrubs	mallee shrubs	
heath shrub	<1,1-2,>2	closed heathland	heathland	open heathland	sparse heathland	isolated heath shrubs	isolated clumps of heath shrubs	heath shrubs	
chenopod shrub	<1,1-2,>2	closed chenopod shrubland	chenopod shrubland	open chenopod shrubland	sparse chenopod shrubland	isolated chenopod shrubs	isolated clumps of chenopod shrubs	chenopod shrubs	
samphire shrub	<0.5,>0.5	closed samphire shrubland	samphire shrubland	open samphire shrubland	sparse samphire shrubland	isolated samphire shrubs	isolated clumps of samphire shrubs	samphire shrubs	
hummock grass	<2,>2	closed hummock grassland	hummock grassland	open hummock grassland	sparse hummock grassland	isolated hummock grasses	isolated clumps of hummock grasses	hummock grasses	
tussock grass	<0.5,>0.5	closed tussock grassland	tussock grassland	open tussock grassland	sparse tussock grassland	isolated tussock grasses	isolated clumps of tussock grasses	tussock grasses	
other grass	<0.5,>0.5	closed grassland	grassland	open grassland	sparse grassland	isolated grasses	isolated clumps of grasses	other grasses	
sedge	<0.5,>0.5	closed sedgeland	sedgeland	open sedgeland	sparse sedgeland	isolated sedges	isolated clumps of sedges	sedges	
rush	<0.5,>0.5	closed rushland	rushland	open rushland	sparse rushland	isolated rushes	isolated clumps of rushes	rushes	
herb	<0.5,>0.5	closed herbland	herbland	open herbland	sparse herbland	isolated herbs	isolated clumps of herrbs	herbs	
fern	<1,1-2,>2	closed fernland	fernland	open fernland	sparse fernland	isolated ferns	isolated clumps of ferns	ferns	
bryophyte	<0.5	closed bryophyte-land	bryophyte-land	open bryophyteland	sparse bryophyteland	isolated bryophytes	isolated clumps of bryophytes	bryophytes	
lichen	<0.5	closed lichenland	lichenland	open lichenland	sparse lichenland	isolated lichens	isolated clumps of lichens	lichens	
vine	<10,10-30,>30	closed vineland	vineland	open vineland	sparse vineland	isolated vines	isolated clumps of vines	vines	

Table 22: Vegetation Condition Scale for the Eremaean and Northern Botanical Provinces (adapted from Keighery (1994), included in EPA & DEC (2012))

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

Appendix Two: Flora Database Search Results

Table 23: DEC database, NatureMap and DSEWPaC search results, Threatened and Priority flora

Species	Habit	Flowering	Landform\Soil	Vegetation Type
T				
<i>Lepidium catapycnon</i>	Open, woody perennial, herb or shrub, 0.2-0.3 m high, stems zigzag	Oct	Skeletal soils, hillsides	<i>Triodia wiseana</i> hummock grassland. With <i>Acacia bivenosa</i> , <i>A. inaequilatera</i> , <i>A. pruinocarpa</i> , <i>A. pyrifolia</i> , <i>Triodia</i> sp. Shovelanna Hill.
<i>Thryptomene wittweri</i>	Spreading or rounded shrub, 0.5–1.5(–2.1) m high	Apr/Jul/ Aug	Skeletal red stony soils. Breakaways, stony creek beds	
P1				
<i>Aristida jerichoensis</i> var. <i>subspinulifera</i>	Compactly tufted perennial, grass-like or herb, 0.3-0.8 m high	-	Hardpan plains	Open <i>Acacia</i> woodland over <i>Triodia</i> and other grasses. <i>Acacia falcata</i> , <i>Triodia epactia</i> , <i>Eragrostis cumingii</i>
<i>Bothriochloa decipens</i> var. <i>cloncurrans</i>	Rhizomatous, perennial, herb (fern), 0.1-0.2 m high	-	Moist, sheltered sites in gorges and on cliff walls	-
<i>Brachyscome</i> sp. Wanna Munna Flats (S. van Leeuwen 4662)	Herb, 15 cm high. Flowers blue	-	Flat. Red brown clay	-
<i>Brunonia</i> sp. Long hairs (D.E. Symon 2440)	Erect herb, to 0.07 m high, with long spreading hairs on the leaves; spike to 0.3 m high	-	Along creeklines	-
<i>Calotis squamigera</i>	Procumbent annual, herb, to 0.21 m high	Jul	Pebbly loam	-
<i>Cochlospermum</i> sp. Pilbara (D. Brassington, E. Agar & J. Macknay LCH 31756) PN	-	-	-	-
<i>Eragrostis</i> sp. Mt Robinson (S. van Leeuwen 4109)	Tussock-forming perennial, grass-like or herb, to 0.3 m high	Sep	Red-brown skeletal soils, ironstone. Steep slopes, summits	
<i>Eremophila pilosa</i>	Shrub, ca 0.8 m high. Fl purple	Sep	Shallow depression in sandplain with loamy soil	Soft spinifex hummock grassland of <i>Triodia pungens</i> with an overstorey of this mallee
<i>Eremophila</i> sp. Hamersley Range (K. Walker KW 136) PN	Shrub to 2 m tall, rounded crowded canopy, Flowers white-cream-yellow-pink-purple	-	Hill crest, cliff top , gorge top	-
<i>Eremophila</i> sp. Snowy Mountain (S. van Leeuwen 3737)	-	-	-	-
<i>Eremophila</i> sp. West Angelas (S. van Leeuwen 4086)	-	-	-	-
<i>Eremophila spongiocarpa</i>	Compact, succulent-leaved shrub, to 1 m high	May/Sep	Weakly saline alluvial plain on margins of marsh	-
<i>Eucalyptus lucens</i>	Mallee, to 4.5 m high, bark smooth, white, sometimes slightly powdery; leaves glossy green	-	Ironstone rocky slopes and mountain tops, high in the landscape	-

Species	Habit	Flowering	Landform\Soil	Vegetation Type
<i>Genus</i> sp. Hamersley Range hilltops (S van Leeuwen 4345)	Rounded shrub, to 0.4 m high	Oct	Skeletal, brown gritty soil over ironstone. Hill summit	Growing in VOSM of <i>Eucalyptus leucophloia</i> and <i>E. gamophylla</i> over LSB of <i>Senna pruinosa</i> , <i>Acacia bivenosa</i> , <i>A. maitlandii</i> and <i>A. pyrifolia</i> over ODS of <i>A. marramamba</i> over MDHG of <i>Triodia</i> sp.
<i>Goodenia pallida</i>	Erect herb, to 0.5 m high	Aug	Red soils	Annual grassland, <i>Acacia</i> scrub-steppe
<i>Grevillea</i> sp. Turee (J. Bull & G. Hopkinson ONS JJ 01.01) PN	Low, single stemmed tree to 2 m	-	Steep scree slope, hill crest of low foothill below main range	<i>Acacia aneura</i> open woodland
<i>Gunniopsis</i> sp. Fortescue (M.E. Trudgen 11019)	-	-	-	-
<i>Helichrysum oligochaetum</i>	Erect annual, herb, to ca 0.25 m high. Fl. yellow	Aug to Nov	Red clay. Alluvial plains	<i>Eucalyptus camaldulensis</i> , <i>Gossypium</i> sp. etc.
<i>Hibiscus</i> sp. Mt Brockman (E. Thoma ET 1354) PN	Leafless except at apices of stems. Flowers purple with dark violet centres	-	Gorge	-
<i>Myriocephalus scalpellus</i>	Semi-erect herb, 0.03-0.08 m high	-	Clay	-
<i>Nicotiana heterantha</i>	Decumbent, short-lived annual or perennial, herb, to 0.5 m high, forming low, spreading colonies Fl. white-cream	Mar to Jun or Sep	Black clay. Seasonally wet flats	-
<i>Peplidium</i> sp. Fortescue Marsh (S. van Leeuwen 4865)	Herb to 4 cm tall and 30 cm across, in full to late flower			Growing in Low Heath of <i>Haloscargia</i> spp. (<i>H. indica</i> , <i>H. halocnemoides</i> , <i>H. auriculata</i>) and <i>Eremophila spongiocarpa</i>
<i>Sida</i> sp. Hamersley Range (K. Newbey 10692)	-	-	-	VOSM of <i>Eucalyptus gamophylla</i> and <i>E. xerothermica</i> with scattered emergent <i>E. leucophloia</i> over OLSB of <i>Acacia pyrifolia</i> (SVL 4375) and <i>Hakea lorea</i> over DHG of <i>Triodia</i> sp.
<i>Stemodia</i> sp. Battle Hill (A.L. Payne 1006)	Low shrub	-	Cracking clay. Floodplain	-
<i>Tecticornia globulifera</i>	Small spreading shrub to 0.3 m. Articles bright red	-	-	Samphire flats
<i>Tecticornia</i> sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063)	A low spreading shrub, 25 cm high, 50 cm across with articles varying in colour from a dull green to a purple red	-	Near man made channel. Gently undulating floodway. Red clayey sand	-
<i>Tetrateca fordiana</i>	Dwarf shrub, 0.3–0.4 m high	-	Shale pocket amongst ironstone	-
<i>Teucrium pilbaranum</i>	Rounded shrub, to 0.4 m high	May/Sep	Clay. Crab hole plain in a river floodplain, margin of calcrete table	<i>Chrysopogon fallax</i> tussock grassland, Open woodland of <i>Eucalyptus victrix</i> , with a tussock grass understorey of <i>Eriachne benthamii</i>
<i>Triodia triticoides</i>	Tussock-forming perennial, grass-like or herb, 0.45-2 m high	Jan to Mar or Jun to Jul	Rocky sandstone & limestone hillslopes	-
<i>Vittadinia</i> sp. Coondewanna Flats (s. van Leeuwen 4684)	Tall daisy to 1 m, open canopy, in late flower and dehiscing fruit, cream/white flowers.	May/Sep	Clay loam soils	<i>Acacia</i> thicket over mixed grassland. Species dominating in area include: <i>Acacia aneura</i> , <i>Eucalyptus ?xerothermica</i> , <i>Themeda ?triandra</i> .
P2				
<i>Adiantum capillus-veneris</i>	Rhizomatous, perennial, herb (fern), 0.1-0.2 m high	-	Moist, sheltered sites in gorges and on cliff walls	-

Species	Habit	Flowering	Landform\Soil	Vegetation Type
<i>Aristida lazaridis</i>	Tufted perennial, grass-like or herb, 0.4-1.5 m high	Apr	Sand or loam	-
<i>Calotis squamigera</i>	Densely tufted perennial, grass-like or herb (sedge), 2 m high	Nov	Perennial pools	-
<i>Cladium procerum</i>	Densely tufted perennial, grass-like or herb (sedge), 2 m high	Nov?	Perennial pools	With <i>Cyperus</i> and <i>Typha</i> and Date Palms
<i>Dicladantha glabra</i>	Spreading perennial, herb or shrub, to 0.6(-1) m high. Fl. white/white-blue	Apr or Aug-Oct	Alluvium , Along watercourses, near rock pools	-
<i>Eragrostis</i> sp. Mt Robinson (S.van Leeuwen 4109)	Low shrub 0.5 m tall with red or pinky flowers with long exerted stamens	May-Jul	Stony soil, slopes	-
<i>Eremophila forrestii</i> subsp. Pingandy (M.E. Trudgen 2662)	Subshrub to 50 cm tall, compact tight bush	-	Flat terrain, low in landscape, base of broad valley, stony gibber plain above shallow drainage line, red clay-loam	-
<i>Gompholobium karrijini</i>	Rounded shrub ca 40 cm high, 60 cm diameter	-	Hilltop with shaley ironstone substrate, red-brown gravelly loam	<i>Eucalyptus leucophloia</i> , <i>Senna</i> spp., <i>Triodia</i> spp.
<i>Hibiscus</i> sp. Gurinbiddy Range (M.E. Trudgen MET 15708) PN	Spindly upright shrub to 3 m tall	-	Near summit of hill, high in landscape, skeletal red-brown stony soil over massive ironstone of the Brockman Iron Formation	Growing in Very Open Shrub Mallee of <i>Eucalyptus kingsmillii</i> , <i>E. leucophloia</i> & <i>E. gamophylla</i> over Open Shrub of <i>Acacia aneura</i> , <i>A. rhodophloia</i> over Open Low Scrub of <i>Scaevola acacioides</i> , <i>Eremophila latrobei</i> over Mid-Dense Hummock Grass of <i>Triodia wiseana</i>
<i>Oxalis</i> sp. Pilbara (M.E. Trudgen 12725)	Creeping annual herb <0.3 m high. Flowers yellow	-	Gully. Brown-red loam, cobbles and pebbles	
<i>Paspalidium retiglume</i>	Tufted annual, grass-like or herb, 0.1-0.5 m high	Apr	Clay	-
<i>Pilbara trudgenii</i>	Gnarled, aromatic shrub, to 1 m high	Sep	Skeletal, red stony soil over ironstone. Hill summits, steep slopes, screes, cliff faces	<i>Eucalyptus kingsmillii</i>
<i>Scaevola</i> sp. Hamersley Range basalts (S. van Leeuwen 3675)	shrub, to 1 m high	Jul to Aug	Skeletal, brown gritty soil over basalt. Summits of hills, steep hills	<i>Acacia hamersleyensis</i> with emergent <i>Brachychiton gregorii</i>
<i>Sida</i> sp. Hamersley Range (K. Newbey 10692)	50 m high x 50 m wide.	-	Sandy plain, Plain with thin sheet of sand (light orange / brown) over compacted hardpan and limestone rock, Claypan of fine cracking clays. Basalt hills in the immediate distance.	<i>Triodia epactia</i> hummock grassland over * <i>Cenchrus ciliaris</i> very open tussock grassland, <i>Indigofera colutea</i> / <i>Vigna</i> sp Central / <i>Rhynchosia minima</i> low open shrubland. <i>Eucalyptus camaldulensis</i> and * <i>Cenchrus ciliaris</i> association.
P3				
<i>Acacia dawsoniana</i>	Spreading shrub, 0.3–1.5(–2) m high	Jul-Sep	Stony red loamy soils. Low rocky rises, along drainage lines	
<i>Acacia effusa</i>	Low, dense, spreading, somewhat viscid shrub, 0.3-1 m high, bark 'minni-ritchi'.	May to Aug	Stony red loam. Scree slopes of low ranges	Open Woodland of <i>Eucalyptus leucophloia</i> , over Open Low Shrub of <i>Acacia bivenosa</i> , <i>A. effusa</i> and Mid-dense Hummock Grass of <i>Triodia basedowii</i> and <i>Themeda triandra</i>
<i>Acacia glaucocoesia</i>	Dense, glabrous shrub or tree, 1.8-6 m high	Jul to Sep	Red loam, sandy loam, clay. Floodplains	Low shrubland
<i>Acacia subtiliformis</i>	Spindly, slender, erect shrub, to 3.5 m high	Jun	On rocky calcrete plateau	Tall open scrub to low shrubland over hummock grassland. <i>Eucalyptus leucophloia</i> , <i>Triodia</i> aff. <i>basedowii</i>
<i>Amaranthus centralis</i>	Single stemmed herb to 50 cm	-	River bank	With <i>Cenchrus ciliaris</i> under <i>Eucalyptus camaldulensis</i>

Species	Habit	Flowering	Landform\Soil	Vegetation Type
<i>Ampelopteris prolifera</i>	Rhizomatous, perennial, herb (fern), to 4 m high	-	Near water or in wet ground	-
<i>Astrebla lappacea</i>	Tufted perennial, grass-like or herb, 0.3-0.8 m high Fl. green/purple	Jun to Jul	Clay, loam	<i>Polymeria</i> sp. Hamersley (M.E. Trudgen 11353) herbland with <i>Astrebla pectinata</i> , <i>A. lappacea</i> open tussock grassland.
<i>Atriplex flabelliformis</i>	Monoecious, erect, rounded perennial, herb, to 0.35 m high	-	Clay loam, loam. Saline flats or marshes	Among succulents
<i>Calotis latiuscula</i>	Erect herb, to 0.5 m high	Jun-Oct	Sand, loam. Rocky hillsides, floodplains, rocky creeks or river beds	-
<i>Crotalaria smithiana</i>	Annual, herb, to 0.4 m high	Jun	Regeneration site on floodplain	-
<i>Dampiera anonyma</i> ms	Multistemmed perennial, herb, to 0.5(-1) m high	Jun-Sep	Skeletal red-brown to brown gravelly soil over banded ironstone, basalt, shale and jaspilite. Hill summits, upper slopes	-
<i>Dampiera metallorum</i>	Rounded, multistemmed perennial, herb, to 0.5 m high	Apr-Oct	Skeletal red-brown gravelly soils over banded ironstone. Steep slopes and summits	-
<i>Elatine macrocalyx</i>	Prostrate, glabrous, mat-forming annual, herb, sepals 2-3mm long, fruit indehiscent	May to Oct	Shallow sands over clay. Margins of playa lakes and clay pans	-
<i>Eragrostis crateriformis</i>	Annual, grass-like or herb, 0.17-0.42 m high	Jan-Jul	Clayey loam or clay. Creek banks, depressions	-
<i>Eragrostis surreyana</i>	Tufted annual herb 5-8 (-13) cm high	May-Sep	Drainage line, red-brown clay	-
<i>Eremophila forrestii</i> subsp. <i>viridis</i>	Much-branched shrub, ca 1 m high	Aug	Sandplain	-
<i>Eremophila magnifica</i> subsp. <i>velutina</i>	Shrub, 0.5-1.5 m high	Aug-Sep	Skeletal soils over ironstone. Summits	-
<i>Eremophila rigida</i>	Annual, grass-like or herb, 0.17-0.42 m high	May or Jul	Clayey loam or clay. Creek banks, depressions	Grassland with <i>Chrysopogon fallax</i> and <i>Triodia epactia</i>
<i>Euphorbia inappendiculata</i>	Spreading, procumbent herb, to 0.4 m high	Aug	Clay soils. Among broken rocky scree	Hummock grassland of <i>Triodia epactia</i> over Very Open Grassland of <i>Cenchrus ciliaris</i>
<i>Euphorbia stevenii</i>	Somewhat succulent perennial, herb, 0.1-0.5 m high	-	Clay, sandy soils	Tussock Grassland of <i>Aristida</i> sp. over Closed Bunch Grassland of <i>Iseilema</i> sp. over Herbs of <i>Operculina aequisejala</i> , <i>Striga</i> sp., <i>-Rhynchosia</i> sp. & <i>Vigna</i> sp.
<i>Fimbristylis sieberiana</i>	Shortly rhizomatous, tufted perennial, grass-like or herb (sedge), 0.25-0.6 m high	May-Jun	Mud, skeletal soil pockets. Pool edges, sandstone cliffs	-
<i>Geijera salicifolia</i>	Tree, 1.5-6 m high	Sep	Skeletal soils, stony soils. Massive rock scree, gorges	-
<i>Glycine falcata</i>	Mat-forming perennial, herb, to 0.2 m high. Fl. blue, purple	May-Jul	Floodplains. Black clayey sand. Along drainage depressions in crabhole plains on river	
<i>Goodenia lyrata</i>	Prostrate herb, with lyrate leaves	Aug	Red sandy loam. Near claypan	<i>Acacia aneura</i> low open woodland over <i>Eremophila margarethae</i> low open shrubland
<i>Goodenia</i> sp. East Pilbara (A.A. Mitchell PRP 727)	Open, erect annual or biennial, herb, to 0.2 m high Fl. yellow	-	Red-brown clay soil, calcrete pebbles. Low undulating plain, swampy plains.	<i>Melaleuca eleuterostachya</i> , <i>Acacia bivenosa</i> over <i>Triodia wiseana</i> , <i>Triodia angusta</i> . Associated Species: <i>Ptilotus exaltatus</i> var. <i>exaltatus</i> , <i>Enneapogon polyphyllus</i> , <i>Acacia pruinocarpa</i> , <i>Digitaria brownii</i>
<i>Gymnanthera cunninghamii</i>	Erect shrub 1-2 m high	Jan-Dec	Sandy soils	-

Species	Habit	Flowering	Landform\Soil	Vegetation Type
<i>Indigofera gilesii</i> subsp. <i>gilesii</i>	Shrub, to 1.5 m high	May/Aug	Pebbly loam amongst boulders & outcrops, hills	-
<i>Indigofera</i> sp. Bungaroo Creek (S. van Leeuwen 4301)	Erect shrub to 2.3 m high, red-pink flowers	Jul-Oct	Creeks and gorges	-
<i>Iotasperma sessilifolium</i>	Erect herb. Fl. pink.	-	Cracking clay, black loam. Edges of waterholes, plains	-
<i>Nicotiana umbratica</i>	Erect, short-lived annual or perennial, herb, 0.3-0.7 m high	Apr to Jun	Shallow soils. Rocky outcrops	-
<i>Oldenlandia</i> sp. Hamersley Station (A.A. Mitchell PRP 1479)	Spreading annual, herb, 0.05–0.1 m high	Mar.	Cracking clay, basalt. Gently undulating plain with large surface rocks, flat crabholed plain	-
<i>Olearia mucronata</i>	Densely branched, unpleasantly aromatic shrub, 0.6–1 m high. Fl. white, yellow	Aug-Jan	Schistose hills, along drainage channels	-
<i>Phyllanthus aridus</i>	Erect, much-branched shrub, to 0.25 m high. Fl. cream, green	May–Jun	Sandstone, gravel, red sand	-
<i>Polymeria distigma</i>	Prostrate trailing herb. Fl. pink	Apr to Jul	Sandy soils	-
<i>Ptilotus subspinescens</i>	Compact shrub, to 0.8 m high. Fl. pink, bases of screes	Sep–Oct	Gentle rocky slopes, screes and the bases of screes	-
<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794)	Erect shrub	-	Floodplain / lower slopes	-
<i>Rostellularia adscendens</i> var. <i>latifolia</i>	Herb or shrub, 0.1–0.3 m high	Apr-May	Ironstone soils. Near creeks, rocky hills	-
<i>Sida</i> sp. Barlee Range (S van Leeuwen 1642)	Spreading shrub, to 0.5 m high	Aug	Skeletal red soils pockets. Steep slope	-
<i>Solanum</i> sp. Hamersley clay (D. Halford Q 9280) PN	Low shrub 10 cm high and up to 20 cm across, suckering, fruit green, globose	-	Flat to slightly undulating plain. Red-brown clay (cracking in places) with ironstone rocks and pebbles scattered on surface	Tussock grassland
<i>Swainsona</i> sp. Hamersley Station (A.A. Mitchell 196)	Prostrate annual, herb, to 0.1 m high	-	Flat crabholed plain.	Open <i>Eremophila maculata</i> shrubland over moderately dense herbs. Tussock grassland of <i>Astrebla pectinata</i> .
<i>Tecticornia medusa</i>	Erect shrub 0.5 m high. Articles bright green	-	1.8 km from the shoreline. Flat floodplain. Red clayey sand	-
<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431)	Tussocky perennial, grass-like or herb, 0.9-1.8 m high	Aug	Red clay. Clay pan, grass plain	<i>Polymeria</i> sp. Hamersley (M.E. Trudgen 11353) herbland with <i>Chrysopogon fallax</i> , <i>Astrebla pectinata</i> , <i>Aristida latifolia</i> very open tussock grassland
<i>Triodia</i> sp. Mt. Ella (ME Trudgen 12739)	Perennial, grass-like or herb, 0.4 m high	-	Light orange-brown, pebbly loam. Amongst rocks & outcrops, gully slopes	-
<i>Triodia</i> sp. Robe River (M.E. Trudgen et al. MET 12367)	Perennial hummock grass to 0.6 m high	-	Rocky hills and mesas	-
<i>Whiteochloa capillipes</i>	Annual or perennial, grass-like or herb, 0.4-1 m high	Feb to Jun	Red-brown	<i>Astrebla</i> tussock grassland
P4				
<i>Acacia bromilowiana</i>	Tree or shrub, to 12 m high	Jul-Aug	Red skeletal stony loam, orange-brown pebbly, gravel loam, laterite, banded ironstone, basalt. Rocky hills, breakaways, scree slopes, gorges, creek beds	-

Species	Habit	Flowering	Landform\Soil	Vegetation Type
<i>Eremophila magnifica</i> subsp. <i>magnifica</i>	Shrub, 0.5-1.5 m high	Aug-Nov	Skeletal soils over ironstone. Rocky scree	-
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	Dense, spreading shrub, (0.2-)1-3 m high. Fl. purple-red-pink	Jan or Mar or Jun or Aug to Sep	Stony red sandy loam. Flats plains, floodplains, sometimes semi-saline, clay flats.	-
<i>Goodenia nuda</i>	Erect to ascending herb, to 0.5 m high Fl. yellow	Apr to Aug	Red--brown clay loam, ironstone.	<i>Acacia tumida</i> tall shrubland with mixed grass understorey including <i>Triodia epactia</i> .
<i>Rhynchosia bungarensis</i>	Compact, prostrate shrub, to 0.5 m high	-	Pebbly, coarse sand, banks of flow line	-

Appendix Three: EPBC Protected Matters Search Results



EPBC Act Protected Matters Report

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

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.environment.gov.au/epbc/assessmentsapprovals/index.html>

Report created: 04/07/12 11:37:40

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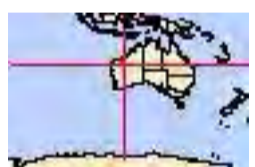
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Buffer: 10.0Km



Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see <http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html>

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None
Threatened Species:	8
Migratory Species:	8

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage/index.html>

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at <http://www.environment.gov>.

Commonwealth Lands:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	5
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

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

Place on the RNE:	2
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	6
Nationally Important Wetlands:	1

Details

Matters of National Environmental Significance

Threatened Species		[Resource Information]
Name	Status	Type of Presence
BIRDS		
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area
MAMMALS		
Dasycercus cristicauda Mulgara [328]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus hallucatus Northern Quoll [331]	Endangered	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat known to occur within area
Rhinonictoris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat likely to occur within area
PLANTS		
Pityrodia augustensis Mt Augustus Foxglove [4962]	Vulnerable	Species or species habitat likely to occur within area
REPTILES		
Liasis olivaceus barroni Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat may occur within area
Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Migratory Terrestrial Species		
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat likely to occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands

[[Resource Information](#)]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name

Commonwealth Land -
Defence - NEWMAN TRAINING DEPOT

Listed Marine Species

[[Resource Information](#)]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area

Extra Information

Places on the RNE

[[Resource Information](#)]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Fortescue Marshes	WA	Indicative Place
Indigenous		
Ethel Gorge Rockshelter Area	WA	Registered

Invasive Species

[[Resource Information](#)]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit,

Name	Status	Type of Presence
Mammals		
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Fortescue Marshes	WA

Coordinates

-23.38212 119.74832,-23.38065 119.74492,-23.37976 119.74244,-23.36738 119.71572,
-23.36517 119.71273,-23.36172 119.70807,-23.36091 119.7891,-23.35272 119.74973,
-23.34383 119.71288,-23.34255 119.7142,-23.34131 119.7153,-23.33967 119.71631,
-23.33871 119.71688,-23.33782 119.71776,-23.33748 119.71864,-23.32817 119.85177,
-23.32713 119.85269,-23.32405 119.85422,-23.32027 119.85487,-23.26749 119.881,
-23.26621 119.88179,-23.21302 119.90529,-23.14181 119.93877,-22.9987 119.9883,
-22.89604 119.9937,-22.84719 120.00279,-22.83948 120.00304,-22.76709 119.99808,
-22.71031 119.95628,-22.70818 119.95371,-22.66789 119.94888,-22.66654 119.94755,
-22.6654 119.94773,-22.66377 119.94735,-22.66264 119.9482,-22.58815 119.97472,
-22.52338 119.98487,-22.52213 119.98477,-22.47489 119.97511,-22.47489 119.97511,
-22.43553 119.92136,-22.43553 119.92136,-22.43333 119.91925,-22.43333 119.91925,
-22.39624 119.83365,-22.39624 119.83365,-22.39578 119.83511,-22.39578 119.83511,
-22.39576 119.83669,-22.39576 119.83669,-22.39576 119.83669,-22.38235 119.6464,
-22.37003 119.73047,-22.3698 119.61012,-22.36863 119.73515,-22.36779 119.73738,
-22.36579 119.60891,-22.36175 119.5197,-22.32314 119.4072

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

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

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

Acknowledgements

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

- [Department of Environment, Climate Change and Water, New South Wales](#)
- [Department of Sustainability and Environment, Victoria](#)
- [Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [Department of Environment and Natural Resources, South Australia](#)
- [Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [Environmental and Resource Management, Queensland](#)
- [Department of Environment and Conservation, Western Australia](#)
- [Department of the Environment, Climate Change, Energy and Water](#)
- [Birds Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [Museum Victoria](#)
- [Australian Museum](#)
- [SA Museum](#)
- [Queensland Museum](#)
- [Online Zoological Collections of Australian Museums](#)
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Atherton and Canberra](#)
- [University of New England](#)
- [Ocean Biogeographic Information System](#)
- [Australian Government, Department of Defence](#)
- [State Forests of NSW](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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

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Appendix Four: NatureMap Search Results and Fauna Inventory

Table 24: Vertebrate taxa known or potentially present in the Study Area

Based on EPBC Act Protected Matters Search Tool, NatureMap reports, and previous survey reports for eastern Pilbara. Pink shading: conservation significant species. Light brown shading: species known or likely to be present based on site and nearby records and available habitat. Records denote presence (+), number (individuals sighted or trapped, number of sites, or number of traces depending on detection method for species), percentage occurrence at sampling sites, or codes (initials for rare, scarce, uncommon, moderately common, common, very common). Sources of survey data:

% PIL quadrats: Microbats – McKenzie & Bullen (2009); Small terrestrial mammals – Gibson & McKenzie (2009); Frogs and reptiles – Doughty *et al.* (2011); Birds – Burbidge *et al.* (2010) (based on occurrence at 297 quadrats, except bats based on occurrence in 24 survey areas). All species recorded in quadrats of Roy Hill – Newman (RHN) cell by Doughty *et al.* (2011) are listed, even if no other records available.

DEC Threatened fauna database: Number of records listed in DEC report on search area (buffer not specified by DEC).

Nyidinghu (FMG Marillana mine area): Bamford & Tomlinson (2012) – number trapped or recorded in timed survey, '+' other sighting, 'e' expected based on database search and other data

Iron Valley (IOH Marillana mine area): Everard *et al.* (2012)

Hope Downs 4 Mining Area: Ninox (2009)

Cloudbreak: Davis *et al.* (2005) – '+' recorded in survey, 'e' expected based on database search and other data, 'x' considered regionally extinct

BHP Jimblebar: Outback Ecology (2009) – number recorded in 2008 survey, '+' recorded by other surveys in Study Area, 'e' expected based on nearby surveys and NatureMap search (40 km buffer)

FerrAus (east of Jimblebar): Phoenix (2011a; 2011b)

Roy Hill: Ecologia (2006) [Phoenix 2011 survey records in NatureMap, including *Melithreptus brevirostris* which is a likely error for *M. gularis*, report not available]

BCI Nullagine: Everard & Bamford (2009) - '+' recorded in survey, 'e' expected based on database search and other data

Cookes Ck, Nullagine: Ecoscape (2011a)

Abydos/Woodstock: How & Dell (2004), herpetofauna; How & Cooper (2002), small mammals – numbers trapped, '+' observational record

Notes: Extralimital species 'expected' but not recorded by previous surveys removed if inclusion not otherwise indicated.

Ctenophorus maculatus removed (one NatureMap record from Newman WGS84 50 785126 mE 7413049 mN on BHP Main Line, ID reported as 'certain'; this is nearly 500 km from the nearest other records of the species, and interpreted as either a misidentification or accidentally transported individual).

Ctenophorus scutulatus removed (NatureMap record from Mt Webber WGS84 50 740171 mE 7618625 mN, ID reported as 'certain'; the only other Pilbara records, in the Hamersley Ranges, are flagged on NatureMap as 'reported and under review').

Demansia shinei is not recorded on NatureMap or survey reports, but two atypical specimens are known from close to the east Pilbara (about 100 km SE of Newman in WGS84 51 ~255500 mE, 7356600 mN; and about 180 km NE of Roy Hill in 51 ~352300 mE, 7604300 mS) (Shea & Scanlon 2007)

Family	Species	Common Name	EPBC Act status	WC Act status	DEC status	DEC Threatened fauna database	EPBC Act PMIST	% PIL quadrats	NMap Newman +40km	NMap eastern Fortescue	NMap Roy Hill +40 km	Nyidinghu	Iron Valley	Hope Downs	Cloudbreak	BHP Jimblebar	FerrAus	Roy Hill	BCI Nullagine	Cookes Ck Nullagine	Abydos/W'stock	August 2012
FISH																						
Clupeidae	<i>Nematolosa erebi</i>	Bony Bream																	e			
Plotosidae	<i>Neosilurus hyrtli</i>	Hyrtl's Tandan										+							e			
Atherinidae	<i>Craterocephalus cuneiceps</i>	Murchison River Hardyhead																	e			
Melanotaeniidae	<i>Melanotaenia australis</i>	Western Rainbowfish										+				e			+			
Terapontidae	<i>Amniataba percoides</i>	Barred Grunter																	e			
	<i>Leiopotherapon unicolor</i>	Spangled Perch										e				e			e			
AMPHIBIANS																						
Hylidae	<i>Cyclorana maini</i>	Sheep Frog						6.4	+	+	+	31		+	e	+	e	e	+			73
	<i>Cyclorana platycephala</i>	Water-holding Frog						0.0		+	+	e		e	e	+	+	e	e	e		
	<i>Litoria rubella</i>	Little Red Tree Frog						2.0	+	+	+	1		e	+	5	+	+	e	e		48
Myobatrachidae	<i>Pseudophryne douglasi</i>	Gorge Toadlet						0.0	+			e			e	e	e		e			
	<i>Uperoleia glandulosa</i>	Glandular Toadlet						1.0		+	+				e				+			3
	<i>Uperoleia russelli</i>	Northwest Toadlet						-	+		+	e		e	e	1	+	e	e			124
Limnodynastidae	<i>Neobatrachus aquilonius</i>	Northern Burrowing Frog						4.0											+			
	<i>Neobatrachus "centralis"</i>	Desert Trilling Frog						-						e		+	e	e				
	<i>Neobatrachus kunapalari</i>	Kunapalari Frog						-	+							e	e					
	<i>Neobatrachus sutor</i>	Shoemaker Frog						-						e			e					+
	<i>Notaden nichollsi</i>	Desert Spadefoot						5.4			+			e	e	+	e	e	e			+
	<i>Platyplectrum ornatum</i>	Ornate Burrowing Frog						-														+
	<i>Platyplectrum spenceri</i>	Desert Burrowing Frog						1.0	+		+			e	e	+	+	e		e		103
MAMMALS																						
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Echidna							+	+	+	e	+	e	+	1	+	e	e	e	+	

Family	Species	Common Name	EPBC Act status	WC Act status	DEC status	DEC Threatened fauna database	EPBC Act PMST	% PIL quadrats	NMap Newman +40km	NMap eastern Fortescue	NMap Roy Hill +40 km	Nyidinghu	Iron Valley	Hope Downs	Cloudbreak	BHP Jimblebar	FerrAus	Roy Hill	BCI Nullagine	Cookes Ck Nullagine	Abydos/W'stock	August 2012	
Thylacomyidae	<i>Macrotis lagotis</i>	Greater Bilby	V U	S 1	VU		K				+	e	e	e	+		e	e	e	e	+		
Dasyuridae	<i>Dasyercus cristicauda</i>	Crest-tailed Mulgara	V U	S 1	VU		L					e	?		e		1		e	e	+	?	
	<i>Dasyercus blythi</i>	Brush-tailed Mulgara			P 4	2				+			+?				e			e	+	?	
	<i>Dasykaluta rosamondae</i>	Kaluta						39	+	+	+	1	e	+	+	2	+	e	+			51	
	<i>Dasyurus hallucatus</i>	Northern Quoll	E N	S 1	EN	2	L				+	e	e	e	e				e	+		11	
	<i>Ningau ridei</i>	Wongai Ningau												e				+	e				
	<i>Ningau timealeyi</i>	Pilbara Ningau							59	+	+	+	1	e	+	+	+	e	e	e	+		36
	<i>Planigale</i> sp. 1								50			?	e	e	?	?		?	+	?	+		0/1?
	<i>Planigale</i> sp. 2								11			?	e	e	?	?		?	+	?	+		1/0?
	<i>Pseudantechinus roryi</i>	Rory's Pseudantechinus							1.7	+			e	e	e			e					10
	<i>Pseudantechinus woolleyae</i>	Woolley's Pseudantechinus							5.4	+		+	+	e	e	e		e	e	e	e		2
	<i>Sminthopsis "crassicaudata"</i>	Fat-tailed Dunnart							-	+							2	+					
	<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart			P 4	2			2.7	+	+			e	e	e		e		e			e
	<i>Sminthopsis macroura</i>	Stripe-faced Dunnart							44	+	+	+	+	e	e	+	8	+	+	+	+		1
	<i>Sminthopsis ooldea</i>	Ooldea Dunnart							1.7	+					+			+	e				
	<i>Sminthopsis hirtipes</i>	Hairy-footed Dunnart							0.0				6										
<i>Sminthopsis youngsoni</i>	Lesser Hairy-footed Dunnart							11	+	+				e	e	1	+	e	e			1	
Notoryctidae	<i>Notoryctes caurinus</i>	Northern Marsupial Mole	E N	S 1			-																
Macropodidae	<i>Lagorchestes conspicillatus leichardti</i>	Spectacled Hare-wallaby			P 3							e			e	e	e		e			+	
	<i>Macropus robustus</i>	Euro, Biggada							+	+	+	+	+	+	+	7	+	+	+	+		+	
	<i>Macropus rufus</i>	Red Kangaroo, Marlu							+	+	+	+	+	+	+	16	+	+	+	e		c	
	<i>Petrogale I. lateralis</i>	Black-footed Rock-wallaby	V U	S 1		4	-		+					e		e	e						

Family	Species	Common Name	EPBC Act status	WC Act status	DEC status	DEC Threatened fauna database	EPBC Act PMST	% PIL quadrats	NMap Newman +40km	NMap eastern Fortescue	NMap Roy Hill +40 km	Nyidinghu	Iron Valley	Hope Downs	Cloudbreak	BHP Jimblebar	FerrAus	Roy Hill	BCI Nullagine	Cookes Ck Nullagine	Abydos/W' stock	August 2012
	<i>Petrogale rothschildi</i>	Rothschild's Rock-wallaby							+	+	+	e	e	e	e	e	e	e	e		+	
Phalangeridae	<i>Trichosurus vulpecula</i>	Brush-tailed Possum									+				x							
Pteropodidae	<i>Pteropus alecto</i>	Black Flying-fox													e				e			
	<i>Pteropus scapulatus</i>	Little Red Flying-fox																	e			
Megadermatidae	<i>Macroderma gigas</i>	Ghost Bat			P 4	3		87	+	+	+	e	e	e	e	+	?	e	e	e	+	
Hipposideridae	<i>Rhinonictis aurantia</i>	Pilbara Leaf-nosed Bat	V U	S 1	VU		L	71				e	e	e	e	+	e		e		+	
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat						100	+			+	+	+	+	+	+	e	e	+		
	<i>Taphozous georgianus</i>	Common Sheath-tail-bat						88	+		+	+	+	+	+	+	+	e	e	e	+	
	<i>Taphozous hilli</i>	Hill's Sheath-tail-bat						33	+			e	e	e	e		+	e	e			
Molossidae	<i>Chaerephon jobensis</i>	Northern Freetail-bat						100	+	+	+	+	+	+	+	e	+	+	+	+		
	<i>Mormopterus beccarii</i>	Beccari's Freetail-bat						100	+			e	e	e	e	+	+	e	e	+		
	<i>Mormopterus "sp. 3"</i>	Inland Freetail-bat						-							e				e			
	<i>Mormopterus "planiceps"</i>	Little Mastiff-bat						-						e				e				
	<i>Tadarida australis</i>	White-striped Freetail-bat						79		+	+	e	e	e	e	+	+	e	e	+	+	
Vespertilionidae	<i>Nyctophilus bifax daedalus</i>	Northwestern Long-eared Bat						29				e	e	e	e		e	+	e			
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat						96	+	+	+	+	e	e	+	+	+	+	e			
	<i>Nyctophilus "timoriensis"</i>	Greater long-eared Bat						-							e							
	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat						100	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat						4.2				e	e	+	e		e	e	e			
	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat						0.0						e	e		e	e	e			
	<i>Scotorepens greyii</i>	Little Broad-nosed Bat						100	+	+	+	+	+	+	+	+	+	+	e	+	+	
	<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat						100	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Muridae	<i>Leggadina</i>	Short-tailed Mouse			P 4	9		6.1		+	+	e	e	e	e				e		+	

Family	Species	Common Name	EPBC Act status	WC Act status	DEC status	DEC Threatened fauna database	EPBC Act PMST	% PIL quadrats	NMap Newman +40km	NMap eastern Fortescue	NMap Roy Hill +40 km	Nyidinghu	Iron Valley	Hope Downs	Cloudbreak	BHP Jimblebar	FerrAus	Roy Hill	BCI Nullagine	Cookes Ck Nullagine	Abydos/W' stock	August 2012	
	<i>lakedownensis</i>																						
	<i>Mus musculus</i>	House Mouse			l n t			26	+	+	+	e	e		+	1	+	+	+	e		118	
	<i>Notomys alexis</i>	Spinifex Hopping-mouse						3.0	+	+		e	e	e	e	+	2	e	e			e	
	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse			P 4	49		10	+	+	+	+	+	+	+	4	+	+	+	+		6	
	<i>Pseudomys delicatulus</i>	Delicate Mouse						6.4						+							+	4	
	<i>Pseudomys desertor</i>	Desert Mouse						27	+	+	+	+	e	+	+	+	+	+	+	+	+	+	
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse						42	+	+	+	2	e	+	e	5	+	+	e	e		99	
	<i>Zyomys argurus</i>	Common Rock-rat						4.7	+		+	+	e	+	+	3	+	e	+			67	
Leporidae	<i>Oryctolagus cuniculus</i>	Rabbit			l n t		L		+			e	e		e	+	+	e	e				+
Camelidae	<i>Camelus dromedaries</i>	Camel			l n t				+	+		e	e		+	+	+		e			+	
Bovidae	<i>Bos taurus</i>	European Cattle			l n t				+	+	+	+	e			+	+	+				+	+
	<i>Capra hircus</i>	Goat			l n t										e				e				
Equidae	<i>Equus asinus</i>	Donkey			l n t				+	+	+	e	e		+	1	+	+	e			+	
	<i>Equus caballus</i>	Horse			l n t					+	+	e	e		+	3	+	+	e				+
Canidae	<i>Canis lupus dingo</i>	Dingo			l n t				+	+	+	+	+	+	+	8	?	+	e	+	+	+	+
	<i>Vulpes vulpes</i>	Fox			l n t		M			+		e	e		e	e	+		e				
Felidae	<i>Felis catus</i>	Cat			l n t		L		+	+	+	+	+		+	3	+	+	+	+	+	+	+
REPTILES																							
Cheluidae	<i>Chelodina steindachneri</i>	Flat-shelled Turtle						0.0	+		+	e	e	e	+	+	e	e	e			+	
Agamidae	<i>Amphibolurus gilberti</i>	Gilbert's Dragon						0.0											+				
	<i>Amphibolurus longirostris</i>	Long-nosed Dragon						12	+	+	+	+	+	+	+	+	+	+	+	+	+	12	
	<i>Caimanops amphiboluroides</i>	Mulga Dragon						2.0				e	e	+		e	+	+					
	<i>Ctenophorus caudicinctus</i>	Ringtailed Dragon						63	+	+	+	3+	+	+	+	1	+	+	+	+	+	27	

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	<i>Ctenophorus isolepis</i>	Military Dragon						24	+	+	+	77	e	+	e	+	+	e	e		47	+
	<i>Ctenophorus nuchalis</i>	Central Netted Dragon						13	+	+	+	9+	e	+	e	4	+	e	e	e	29	?
	<i>Ctenophorus reticulatus</i>	Western Netted Dragon						10	+	+	+	e	e	+	e	+	+	e	+		+	?
	<i>Ctenophorus rubens</i>	Red Dragon						0.0													+	
	<i>Diporiphora valens</i>	Pilbara Two-lined Dragon						4.4				e	e	e		e		e		+		
	<i>Diporiphora winneckeii</i>	Canegrass Dragon						-							e		+		e		3	
	<i>Moloch horridus</i>	Thorny Devil						0.7									+					
	<i>Pogona minor</i>	Western Bearded Dragon						20	+	+	+	2+	e	+	e	+	+	+	+	e	9	
	<i>Tympanocryptis cephalus</i>	Pebble Dragon						1.0	+	+		e	e	e	e		e	e	e			
	<i>Tympanocryptis sp. nov.</i>							5.1														
	<i>Gehyra 'fenestra'</i>							9.8														
	<i>Gehyra pilbara</i>	Pilbara Dtella						3.7	+			e	e	e	e	e	e	e	+		67	
	<i>Gehyra punctata</i>	Spotted Dtella						26	+	+	+	e	+	+	e	2	+	+	e	+	58	
	<i>Gehyra purpurascens</i>	Purplish Dtella						29				4	+	e		+	+	e				
	<i>Gehyra variegata</i>	Common Dtella							+	+	+	13	+	+	+	13	+	+	+	+	23	
	<i>Hemidactylus frenatus</i>	Asian House Gecko				l n t		-											e			
	<i>Heteronotia binoei</i>	Bynoe's Prickly Gecko						42	+	+	+	11	+	+	+	1	+	+	+	+	15	
	<i>Heteronotia planiceps</i>	North-west Prickly Gecko						-	+													
	<i>Heteronotia spelea</i>	Desert Cave Gecko						1.0	+	+	+	e	+	e	+	+	e	e	e	+	1	
	<i>Nephrurus levis</i>	Smooth Knob-tailed Gecko						6.1						e	e		+	e	e		20	
	<i>Nephrurus laevisimus</i>	Pale Knob-tailed Gecko						0.3									e	e				
	<i>Nephrurus wheeleri cinctus</i>	Banded Knob-tailed Gecko						4.3	+	+	+	e	+	+	e		+	+	e			
	<i>Underwoodisaurus seorsus</i>	Pilbara Barking Gecko						0.0					e					e				

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Diplodactylidae	<i>Crenadactylus "ocellatus"</i>	Clawless Gecko						1.3				e	e	e	e		e	e	e		+		
	<i>Diplodactylus conspicillatus</i>	Fat-tailed Gecko						30	+	+	+	96	+	e	+	1	+	e	e	e	27		
	<i>Diplodactylus mitchelli</i>	Pilbara Stone Gecko						2.4	+	+				e			e						
	<i>Diplodactylus pulcher</i>	Fine-faced Gecko						1.3		+		e	e	+	e		+	e	e				
	<i>Diplodactylus savagei</i>	Yellow-spotted Pilbara Gecko						11	+	+	+	e	e	+	e	e	e	e	e	+	+	+	
	<i>Lucasium squarrosom</i>	Spotted Ground Gecko						-			+				e							+	
	<i>Lucasium stenodactylum</i>	Sand-plain Gecko						1.0	+	+	+	17	+	+	e	3	+	+	+	+	+	24	
	<i>Lucasium wombeyi</i>	Pilbara Ground Gecko						17	+	+	+	+	+	e		+	e	+	+	+	+	+	
	<i>Oedura marmorata</i>	Marbled Velvet Gecko						1.0	+	+	+	e	+	e	e	e	+	+	e	e		+	
	<i>Rhynchoedura ornata</i>	Beaked Gecko						13	+	+	+	27	+	+	e	+	+	+	e	e	+	12	
	<i>Strophurus assimilis (?)</i>	Goldfields Spiny-tail Gecko						-										+					
	<i>Strophurus ciliaris</i>	Northern Spiny-tail gecko						1.7							e			+					
	<i>Strophurus elderi</i>	Jewelled Gecko						13	+	+	+	5	e	e	e	+	+	e	+	e	e	6	
	<i>Strophurus jeanae</i>	Southern Phasmid Gecko						1.0				1	e	e	e	e	+		e			1	
	<i>Strophurus strophurus</i>	Western Spiny-tail Gecko						0.7								e				e			
	<i>Strophurus wellingtonae</i>	Western Shield Spiny-tail Gecko						11	+	+	+	3	e	+	e	+	+	+	+	+			
<i>Strophurus wilsoni</i>							0.3							e									
Pygopodidae	<i>Delma borea</i>							0.3						e	e				e				
	<i>Delma butleri</i>							0.3	+	+	+	e	e	e	e	e	e	e	+		+		
	<i>Delma desmosa</i>							0.7									+						
	<i>Delma elegans</i>							5.4	+	+	+	e	e	e	e	+	e	e	e		+		
	<i>Delma haroldi</i>							0.7	+	+		+	+	+	e	+	e	e	e				

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	<i>Delma nasuta</i>							5.7	+	+	+	e	e	+	e	+	+	+	+	e	e	
	<i>Delma pax</i>							8.1	+	+	+	+	e	+	e	2	+	+	+	+	+	5
	<i>Delma tincta</i>							5.1		+	+	e	e	+	e	1	+	+	e			1
	<i>Lialis burtonis</i>	Burton's Legless lizard						3.7	+	+	+	+	+	+	+	3	+	+	+	e		12
	<i>Pygopus nigriceps</i>	Hooded Scaly-foot						0.7	+	+		+	e	+	e	+	+	+	e			+
Scincidae	<i>Carlia munda</i>	Shaded-litter Rainbow Skink						25	+	+	+	1	e	+	+	+	+	+	+	+	+	9
	<i>Carlia triacantha</i>	Rainbow Skink						6.1	+	+	+	e	e	+	e	+	+	e	e			
	<i>Cryptoblepharus buchananii</i>							0.7	+		+	e	e	+			e					
	<i>Cryptoblepharus plagiocephalus</i>							1.0		+			e	?	+	e	e	e	e			9
	<i>Cryptoblepharus ustulatus</i>	Russet Snake-eyed Skink						0.0	+			e	+	+			e					+
	<i>Ctenotus ariadnae</i>							1.3	+			16	e	e		e	+	e	e			
	<i>Ctenotus atlas</i>	Southern Mallee Ctenotus						-		+												
	<i>Ctenotus brooksi</i>							0.3										e				
	<i>Ctenotus duricola</i>	Pilbara Ctenotus						32	+	+	+	17	e	+	e	2	+	+	e	e		28
	<i>Ctenotus grandis titan</i>	Titan Ctenotus						16	+		+	11	e	e	e	1	+	e	e	e		262
	<i>Ctenotus greeri</i>							-		+								e				
	<i>Ctenotus hanloni</i>	Nimble Ctenotus						5.4		+	+	59	e	e	e			+	e	e		
	<i>Ctenotus helenae</i> (and aff.)	Clay-soil Ctenotus						39	+	+	+	e	e	+	e	4	+	e	e	e		50
	<i>Ctenotus leonhardii</i>	Leonhard's Ctenotus						3.4	+	+	+	4	e	e	e	+	+	e	e			
	<i>Ctenotus nasutus</i>							1.0										e				
	<i>Ctenotus nigrilineatus</i>					P 1		0.0			+					e				e	e	2
<i>Ctenotus pantherinus</i>	Leopard Ctenotus						39	+	+	+	11	+	+	+	13	+	+	+	+			50

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	<i>Ctenotus piankai</i>							-				e		e	e		e	e	+				
	<i>Ctenotus quattuordecimlineatus</i>	Fourteen-lined Ctenotus						0.7								e	+	e					
	<i>Ctenotus robustus</i>	Robust Ctenotus						2.6														+	
	<i>Ctenotus rubicundus</i>	Ruddy Ctenotus						11	+			e	e	e	+		e	+	e			+	
	<i>Ctenotus rufescens</i>	Rufous Finesnout Ctenotus						0.7											e				
	<i>Ctenotus rutilans</i>	Rusty-shouldered Ctenotus						1.7	+			8	e	+		+	e	+					
	<i>Ctenotus saxatilis</i>	Rock Ctenotus						59	+	+	+	37	+	+	+	7	+	+	+	+	+	91	
	<i>Ctenotus schomburgkii</i>	Barred Wedge-snout Ctenotus						1.3	+			e	e	+	e		+	e	e			+	
	<i>Ctenotus serventyi</i>							4.7				e	e	e	e	e	e	e	e	e		5	
	<i>Ctenotus uber uber</i>	Spotted Ctenotus						6.4	+	+	+	e	e	e		1	+	e					
	<i>Ctenotus uber johnstonei</i> (aff.)	Balgo Spotted Ctenotus			P 2	3		-	+						e		e		e				
	<i>Cyclodomorphus melanops</i>	Spinifex Slender Bluetongue						18	+	+	+	1	+	+	+	+	+	+	+	+	+	1	?
	<i>Egernia cygnitos</i> (desc 2011)	West Pilbara Spiny-tail Skink						5.7															
	<i>Egernia depressa</i> (s.l.)	Southern Pygmy Spiny-tailed Skink							+		+	e	e	e	e	+	e	e	e	e	e	1	
	<i>Egernia formosa</i>	Goldfields Crevice-skink						0.0	+		+	e	e	e	e		e	e	e			11	
	<i>Egernia pilbarensis</i>							0.7			+	e			e				e				
	<i>Eremiascincus faciolutus</i>	Narrow-banded Sandswimmer						0.0				e	e				e	e	e				
	<i>Eremiascincus isolepis</i>							3.0							e								
	<i>Eremiascincus richardsonii</i>	Broad-banded Sandswimmer						1.3	+	+	+	2	e	e	e	+	+	+	+			1	
	<i>Lerista amicornum</i>							7.4		+	+	7	e	?			+						

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	<i>Lerista timida</i> (= 'rhodonoides')									+		2	e	?			+						
	<i>Lerista bipes</i> (& aff.)	Northwestern Sandslider						21	+			29	e		e	+	+	e	e			51	
	<i>Lerista clara</i>							7.1														+	
	<i>Lerista flammicauda</i> (= 'frost'i')	Pilbara Flame-tailed Slider						5.1		+	+			e			e	+					
	<i>Lerista ips</i>							0.7									e						
	<i>Lerista jacksoni</i>							8.1				1	e	?							+	+	
	<i>Lerista labialis</i>							1.0		+	+	1	e	e	e		e	e					
	<i>Lerista macropisthopus remota</i>				P 2	4		-	+						e		e		e				
	<i>Lerista muelleri</i>	Wood-mulch Slider						18	+	+	+	4	e	+	+	1	e	+	+	e		11	
	<i>Lerista neander</i>	Newman Slider						1.7	+			e	e	e		1	+	e					
	<i>Lerista verhmens</i>							11													e		
	<i>Lerista zietzi</i>	Blue-tailed Skink						2.0	+			e	+	+	e	+	e	e					
	<i>Liopholis inornata</i>	Desert Skink						-									+						
	<i>Liopholis kintorei</i>	Great Desert Skink	V U	S 1			-	-									e						
	<i>Liopholis striata</i>	Night Skink						1.0						e	e		+					27	
	<i>Menetia greyii</i>	Common Dwarf Skink						38	+	+	+	8	e	+	+	2	+	+	e			5	
	<i>Menetia surda</i>	Western Dwarf Skink						22	+	+	+	e	e	+	e			e	e	e			
	<i>Morethia ruficauda exquisita</i>	Fire-tailed Skink						40	+	+	+	e	+	+	+	+	+	+	+	+	+	4	
	<i>Notoscincus ornatus</i>	Ornate Soil-crevice Skink						11			+	e	e	e	e		+	e	e	+		2	
	<i>Proablepharus reginae</i>	Western Soil-crevice Skink						5.7		+	+	e	e	e	e		e	e	e	e		4	
	<i>Tiliqua multifasciata</i>	Central Blue-tongue						8.8	+	+		e	+	+	+	2	+	e	+	e		22	
Varanidae	<i>Varanus acanthurus</i>	Ridge-tailed Monitor						30	+	+	+	1	e	+	+	7	+	+	+	e		23	
	<i>Varanus brevicauda</i>	Short-tailed Pygmy						19	+		+	e	e	e	+		+	e	e			17	

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		Monitor																				
	<i>Varanus bushi</i>	Pilbara Mulga Monitor						0.0				e	e	+			e					
	<i>Varanus caudolineatus</i>	Stripe-tailed Monitor						5.7	+	+	+	e	e	e	+	3	+	+	e			
	<i>Varanus eremius</i>	Pygmy Desert Monitor						9.8				6	e	e	e	e	+	e	e	e	4	+
	<i>Varanus giganteus</i>	Perentie						0.0		+	+	e	e	e	e	+	+	e	+	e	1+	+
	<i>Varanus gilleni</i>	Pygmy Mulga Monitor						0.0						e	e		+	e	e			
	<i>Varanus gouldii</i>	Sand Monitor						0.7	+	+	+	2+	e	e	e	1	+	e	e		7+	?
	<i>Varanus panoptes</i>	Yellow-spotted Monitor						0.3	+	+	+	1+	e	e	+	+	+	+	+		+	?
	<i>Varanus pilbarensis</i>	Pilbara Rock Monitor						1.3	+		+	+	e	e		e	e	e	e	e	2	
	<i>Varanus tristis</i>	Black-tailed Monitor						0.7	+	+	+	1+	e	+	+	2	+	+	+	+	3	
Typhlopidae	<i>Ramphotyphlops ammodytes</i>							21	+	+	+	e	e	e	+	e	e	+	e	e	5	
	<i>Ramphotyphlops endoterus</i>							-									e					
	<i>Ramphotyphlops ganei</i>				P 1	12		1.7	+	+	+	e	e	e	e	e	e	e	e		+	
	<i>Ramphotyphlops grypus</i>							17	+	+	+	e	e	e	+	+	+	+	+	e	2	
	<i>Ramphotyphlops hamatus</i>							3.0	+	+	+	e	e	+		1	+	+		+		
	<i>Ramphotyphlops pilbarensis</i>							1.7			+				e				e	e	2	
	<i>Ramphotyphlops waitii</i>							1.0		+		e	e	e				e	e			
Pythonidae	<i>Antaresia perthensis</i>	Pygmy Python						1.0	+	+	+	1	e	e	e	+	+	e	e	e	1	
	<i>Antaresia stimsoni</i>	Stimson's Python						0.0	+	+	+	+	e	e	e	+	e	e	e	e	4	
	<i>Aspidites melanocephalus</i>	Black-headed Python						0.3	+		+	+	+	+	+	+	e	e	e	e	1	
	<i>Aspidites ramsayi</i>	Woma		S 4				0.0										e	e			
	<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	V U	S 1	VU	3	M	0.0	+		+	+	e	e	e	e	e	e	+		1	
Elapidae	<i>Acanthophis pyrrhus</i>	Desert Death Adder						0.0											e			

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	<i>Acanthophis wellsi</i>	Pilbara Death Adder						0.7	+	+	+	e	e	+	e		+	e	+	e	1+		
	<i>Brachyurophis approximans</i>	Pilbara Shovel-nosed Snake						2.0	+	+	+	+	e	e	e	+	e	+	e			1	
	<i>Demansia psammophis</i>	Yellow-faced Whipsnake						1.0	+	+	+	1	e	+	e	+	+	+	e	+		3	
	<i>Demansia rufescens</i>	Rufous Whipsnake						0.0	+			e	e	e		e	e	e	e				
	<i>Demansia shinei</i>	Shine's Whipsnake						-															
	<i>Furina ornata</i>	Moon Snake						0.3	+		+	e	e	e	e	e	+	+	+	e		1	
	<i>Parasuta monachus</i>	Monk Snake						0.0	+			2	e	+	e		e	e	e				
	<i>Pseudechis australis</i>	Mulga Snake						0.0	+	+	+	1	+	+	e	1	+	+	e	e		6+	
	<i>Pseudonaja modesta</i>	Ringed Brown Snake						1.3	+	+	+	e	e	e	e	+	+	e	e	e		1	
	<i>Pseudonaja mengdeni</i>	Gwardar						0.0	+	+	+	+	e	e	e	1	+	+	+	e		4	
	<i>Simoselaps anomalus</i>	Desert Banded Snake						1.3									e						
	<i>Simoselaps bertholdi</i>	Jan's Banded Snake						0.3									e						
	<i>Suta fasciata</i>	Rosen's Snake						0.0	+	+		e	+	e	e		e	e	e			+	
	<i>Suta punctata</i>	Spotted Snake						0.7	+	+	+		e	e	e	+	+	e	e	e		e	
	<i>Vermicella snelli</i>	Pilbara Bandy Bandy						0.3	+		+		e	+	e	e	e		e				
BIRDS																							
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu						11	+	+	+	+	+	e	+	+	+	+	+	+	+	+	+
Phasianidae	<i>Coturnix pectoralis</i>	Stubble Quail						1.6	+		+	e		e	e	e	e		e				
	<i>Coturnix ypsilophora</i>	Brown Quail						2.4	+		+	e	e	e	+	+	e	e	e	+			
Anseranatidae	<i>Anseranas semipalmata</i>	Magpie Goose						0.0	+							e	+						
Anatidae	<i>Dendrocygna eytoni</i>	Plumed Whistling Duck						0.3	+	+	+	e	e			e	e	e	e	e			
	<i>Dendrocygna arcuata</i>	Wandering Whistling Duck						0.0	+							e	e						
	<i>Stictonetta naevosa</i>	Freckled Duck						0.0	+							e	e						

Family	Species	Common Name	EPBC Act status	WC Act status	DEC status	DEC Threatened fauna database	EPBC Act PMST	% PIL quadrats	NMap Newman +40km	NMap eastern Fortescue	NMap Roy Hill +40 km	Nyidinghu	Iron Valley	Hope Downs	Cloudbreak	BHP Jimblebar	FerrAus	Roy Hill	BCI Nullagine	Cookes Ck Nullagine	Abydos/W'stock	August 2012
	<i>Cygnus atratus</i>	Black Swan						0.3	+			+		e	+	e	e	e	+		+	(+)
	<i>Tadorna tadornoides</i>	Australian Shelduck						0.0	+	+		+	e	e	+	+	e	e	e			
	<i>Chenonetta jubata</i>	Australian Wood Duck						0.0	+	+	+	e	e	e		+	e			e	+	
	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck						0.0	+					e	+	+	e	e	e		+	
	<i>Anas rhynchotis</i>	Australian Shoveler						0.0	+							e	e					
	<i>Anas gracilis</i>	Grey Teal						0.3	+	+	+	+	e	e	+	e	+	e	e		+	
	<i>Anas superciliosus</i>	Pacific Black Duck						0.7	+	+	+	e	e	e	+	e	+	e	e	e	+	
	<i>Aythya australis</i>	Hardhead						0.0	+	+	+	e	e	e		e	e	+		e	+	
Podicipedidae	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe						0.0	+	+	+	e	e	e		e	e	e		e	+	(+)
	<i>Poliiocephalus poliocephalus</i>	Hoary-headed Grebe						0.0	+		+	e	e	e		e	e			e		
	<i>Podiceps cristatus</i>	Great Crested Grebe						0.0	+							e	e					
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing						4.7	+	+	+	e	+	+	+	+	+	+	+	e	+	
	<i>Ocyphaps lophotes</i>	Crested Pigeon						49	+	+	+	13	+	+	+	38	+	+	+	+	+	+
	<i>Geophaps plumifera</i>	Spinifex Pigeon						32	+	+	+	+	+	+	e	8	+	+	+	+	+	
	<i>Geopelia cuneata</i>	Diamond Dove						57	+	+	+	23	+	+	+	+	+	+	+	+	+	c
	<i>Geopelia striata</i>	Peaceful Dove						9.8	+	+	+	e	e	e	e	+	e	+	+	+	+	
	<i>Geopelia humeralis</i>	Bar-shouldered Dove						0.0	+	+	+						e					
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth						3.0	+	+	+	e	e	e	+	+	+	+	e		+	
Eurostopodidae	<i>Eurostopodus argus</i>	Spotted Nightjar						7.1	+	+	+	+	+	+	+	+	+	+	+		+	
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owlet Nightjar						5.4	+	+	+	+	+	+	+	+	+	+	+	e	+	
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift	M	S 3			M	0.0				+	e	e	e	e	+	e	e			
Anhingidae	<i>Anhinga novaehollandiae</i>	Australian Darter						0.0				e	e	e		e	e	e				
Phalacrocoracidae	<i>Microcarbo</i>	Little Pied Cormorant						0.0				e	e	e		e	e	e				

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	<i>melanoleucos</i>																					
	<i>Phalacrocorax carbo</i>	Great Cormorant						0.0	+	+						e	e					(?)
	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant						0.0	+	+	+	e	e	e		+	+	+		e	+	(?)
	<i>Phalacrocorax varius</i>	Pied Cormorant						0.0	+							e	e					
Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican						0.0	+	+	+	+				e	+			e	+	
Ciconiidae	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork						0.0	+	+	+	e	e			e		e		+	+	
Ardeidae	<i>Ardea pacifica</i>	White-necked Heron						0.3	+	+	+	e	+	+	+	+	e	+	e	e	+	
	<i>Ardea modesta (=alba)</i>	Great Egret	M	S 3			M	0.0				+	e	e		e	e	+	e		+	
	<i>Ardea intermedia</i>	Intermediate Egret						0.0	+							e	e					
	<i>Ardea ibis</i>	Cattle Egret	M	S 3			M	0.0	+	+		e				e	e	e	e			
	<i>Egretta novaehollandiae</i>	White-faced Heron						0.0	+			+	e	+	+	+	e	e	+	+	+	
	<i>Egretta garzetta</i>	Little Egret						0.0				e	e			e	e	e				
	<i>Nycticorax caledonicus</i>	Nankeen Night-heron						0.3	+	+		e	e	e		e	e	e			+	+
Threskiornithidae	<i>Plegadis falcinellus</i>	Glossy Ibis						0.0	+							e	e					
	<i>Threskiornis molucca</i>	Australian White Ibis						0.7	+					e			e					
	<i>Threskiornis spinicollis</i>	Straw-necked Ibis						0.0	+	+	+	+	e	e	+		e	e	e	e	+	(+)
	<i>Platalea regia</i>	Royal Spoonbill						0.0	+	+		e	e			e	e	+				
	<i>Platalea flavipes</i>	Yellow-billed Spoonbill						0.0	+	+		e	e	e		e	e		e			
Accipitridae	<i>Elanus axillaris</i>	Black-shouldered Kite						3.4				e	e	e	e	+	e	+	e		+	
	<i>Lophoictinia isura</i>	Square-tailed Kite						0.0				e	e		e	e	e	e	e			
	<i>Hamirostra melanosternon</i>	Black-breasted Buzzard						0.7	+	+	+	1	+	+	e	1	+	e	e			+
	<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	M	S 3			-	0.7	+			e				e	e		e			
	<i>Haliastur sphenurus</i>	Whistling Kite						13	+	+	+	3	+	+	+	12	+	+	+	+	+	c
	<i>Milvus migrans</i>	Black Kite						0.7	+	+	+	3	e	e	+	2	+	e	e	e	+	

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	<i>Accipiter fasciatus</i>	Brown Goshawk						2.4	+	+	+	1	e	e	e	+	+	+	e		+	
	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk						1.6	+	+	+	2	e	e	+	e	+	+	e		+	
	<i>Circus assimilis</i>	Spotted Harrier						11	+	+	+	3	e	e	+	+	+	+	+		+	
	<i>Circus approximans</i>	Swamp Harrier						0.3	+				e	e	e	e	e		e			
	<i>Aquila audax</i>	Wedge-tailed Eagle						11	+	+	+	2	+	+	+	2	+	e	+	+	+	c
	<i>Hieraeetus morphnoides</i>	Little Eagle						3.0				+	+	+	+	1	+	+	+			+
Falconidae	<i>Falco cenchroides</i>	Australian Kestrel						26	+	+	+	1	+	+	+	1	+	+	+	+	+	c
	<i>Falco berigora</i>	Brown Falcon						28	+	+	+	+	+	+	+	16	+	+	+	+	+	+
	<i>Falco longipennis</i>	Australian Hobby						3.4	+	+	+	2	e	e	+	+	+	+	e		+	
	<i>Falco hypoleucos</i>	Grey Falcon			P 4	3		0.0		+	+	e	e	e	+		e	+	e			
	<i>Falco peregrinus</i>	Peregrine Falcon		S 4	S	9		0.3	+	+	+	+	e	+	+	e	+	+	e			
	<i>Falco subniger</i>	Black Falcon						0.0								e				e		
Rallidae	<i>Porphyrio porphyrio</i>	Purple Swanphen						0.0	+							+	e					
	<i>Gallirallus philippensis</i>	Buff-banded Rail						0.0	+	+	+	e	e			e	e	e				
	<i>Porzana pusilla</i>	Baillon's Crake						0.0	+							e	e					
	<i>Porzana tabuensis</i>	Spotless Crake						0.0	+			e		e		e	e					
	<i>Tribonyx ventralis</i>	Black-tailed Native Hen						0.0						e	+	+	e	e	e			
	<i>Fulica atra</i>	Eurasian Coot						0.0	+							e	e					+
Otididae	<i>Ardeotis australis</i>	Australian Bustard			P 4	68		21	+	+	+	+	+	+	+	1	+	+	+	+	+	c
Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew			P 4	7		2.4	+	+	+	e	e	e	e	1	+	+	+		+	+
Recurvirostridae	<i>Himantopus himantopus</i>	Black-winged Stilt						0.0	+		+	+	e	e		e	e		e	e	+	
	<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet						0.0	+			+		e		e	e		e			
	<i>Cladorhynchus leucocephalus</i>	Banded Stilt						0.0	+							e	e		e			
Charadriidae	<i>Charadrius ruficapillus</i>	Red-capped Plover						0.0				e		e		e	e		e			

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	<i>Charadrius veredus</i>	Oriental Plover	M	S 3			M	0.3				e					e		e			
	<i>Charadrius australis</i>	Inland Dotterel						0.0						e			e					
	<i>Elseyonis melanops</i>	Black-fronted Dotterel						1.3	+	+	+	+	e	e	+	+	e		+	+	+	
	<i>Erythrogonyx cinctus</i>	Red-kneed Dotterel						0.0				e	e	e	+		e	+	e	+	+	
	<i>Vanellus tricolor</i>	Banded Lapwing						0.0						e			e				+	
Turnicidae	<i>Turnix velox</i>	Little Button-quail						25	+	+	+	47	+	+	+	+	6	+	e		+	c
	<i>Actitis hypoleucos</i>	Common Sandpiper	M	S 3			-	0.0				e		e		e	e	e				
	<i>Tringa nebularia</i>	Common Greenshank	M	S 3			-	0.3	+			e		e		e	e				+	
	<i>Tringa stagnatilis</i>	Marsh Sandpiper	M	S 3			-	0.0	+			e				e	e					
	<i>Tringa glareola</i>	Wood Sandpiper	M	S 3			-	0.0	+							e	e	+			+	
Scolopacidae	<i>Calidris ruficollis</i>	Red-necked Stint	M	S 3			-	0.0				e		e		e	e		e			
	<i>Calidris subminuta</i>	Long-toed Stint	M	S 3			-	0.0						e		e	e					
	<i>Calidris melanotos</i>	Pectoral Sandpiper	M	S 3			-	0.0	+					e								
	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	M	S 3			-	0.0	+					e		e	e					
	<i>Calidris ferruginea</i>	Curlew Sandpiper	M	S 3			-	0.0	+							e	e					
Glareolidae	<i>Glareola maldivarum</i>	Oriental Pratincole	M	S 3			-	0.0				e										
	<i>Stiltia isabella</i>	Australian Pratincole						0.7	+	+	+	e			e	e	e		e			
	<i>Gelochelidon nilotica</i>	Gull-billed Tern						0.7				+				e	e					
Laridae	<i>Hydroprogne caspia</i> (= <i>Sterna caspia</i>)	Caspian Tern	M	S 3			-	0.0								e	e					
	<i>Chlidonias hybrida</i>	Whiskered Tern						0.0				+		e		e	e					
	<i>Chroicocephalus novaehollandiae</i>	Silver Gull						0.0	+					e		e	e					
Cacatuidae	<i>Calyptorhynchus banksii</i>	Red-tailed Black Cockatoo						0.0												+		
	<i>Eolophus roseicapillus</i>	Galah						47	+	+	+	72	+	+	+	+	+	+	+	+	+	+

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	<i>Cacatua sanguinea</i>	Little Corella						16	+	+	+	17	+	+	+	42	+	+	+	+	+	+
	<i>Nymphicus hollandicus</i>	Cockatiel						27	+	+	+	259	+	+	+	+	+	+	+	+	+	c
Psittacidae	<i>Polytelis alexandrae</i>	Princess Parrot	V U		P 4		M	0.0									e		e			
	<i>Barnardius zonarius</i>	Australian Ringneck						28	+	+	+	14	+	+	+	7	+	+	+	+	+	+
	<i>Psephotus varius</i>	Mulga Parrot						0.7				e		e		e	+	e				
	<i>Melopsittacus undulatus</i>	Budgerigar						53	+	+	+	1244	+	+	+	2	+	+	e	+	+	c
	<i>Neopsephotus bourkii</i>	Bourke's Parrot						1.3	+	+	+	e	e	e	+	+	+	e	e			
	<i>Neophema elegans</i>	Elegant Parrot						0.3				e		e					e			
	<i>Pezoporus occidentalis</i>	Night Parrot	E N	S 1	CR	1	L	0.0				e	e	e	+		e	e	e			
Cuculidae	<i>Centropus phasianinus</i>	Pheasant Coucal						0.7		+	+			e	e	+	e	e	e	+	+	
	<i>Chalcites osculans</i>	Black-eared Cuckoo						2.7	+			e	e	e	e	+	+	+	+			
	<i>Chalcites basalis</i>	Horsfield's Bronze-Cuckoo						23	+		+	2	+	+	+	+	+	+	e	e	+	
	<i>Cacomantis pallidus</i>	Pallid Cuckoo						24	+	+	+	6	+	+	+	+	+	+	+	+	+	
	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo						0.0								e						
Strigidae	<i>Ninox connivens</i>	Barking Owl						1.7	+			e	e	+	e	e	e	e	e	e		
	<i>Ninox novaeseelandiae</i>	Southern Boobook						4.4	+	+	+	+	+	+	+	2	+	+	+	+	+	
Tytonidae	<i>Tyto javanica</i>	Eastern Barn Owl						1.0	+	+	+	+	e	e	+	1	+	+	e			
Halcyonidae	<i>Dacelo leachii</i>	Blue-winged Kookaburra						9.8	+	+	+	e	e	+	+	+	+	+	+	+	+	
	<i>Todiramphus sanctus</i>	Sacred Kingfisher						8.1	+	+	+	e	e	+	e	+	e	e	+	+	+	?
	<i>Todiramphus pyrrhopygia</i>	Red-backed Kingfisher						15	+	+	+	2	+	+	+	1	+	+	+		+	?
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	M	S 3			M	35	+	+	+	14	+	+	+	12	3	+	+	+	+	(+)
Climacteridae	<i>Climacteris melanura</i>	Black-tailed Treecreeper						2.0	+	+		e		e	e	+	e	e	e	+		
Ptilonorhynchidae	<i>Ptilonorhynchus guttatus</i>	Western Bowerbird						10		+	+	+	e	+	e	+	+	e	e	e	+	
Maluridae	<i>Malurus splendens</i>	Splendid Fairy-wren						0.7	+			e		+		e	+					

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	<i>Malurus leucopterus</i>	White-winged Fairy-wren						28	+	+	+	19	+	+	+	2	+	+	e	e	+	+
	<i>Malurus lamberti</i>	Variiegated Fairy-wren						43	+	+	+	22	+	+	+	2	+	+	+	+	+	+
	<i>Stipiturus ruficeps</i>	Rufous-crowned Emu-wren						7.7				e	+	+	+	+	+	e	e		+	
	<i>Amytornis striatus whitei</i>	Striated Grasswren						8.8	+	+	+	e	e	+	e	4	+	+	+	+	+	
Acanthizidae	<i>Calamanthus campestris</i>	Rufous Fieldwren						0.0						e			e					
	<i>Pyrrholaemus brunneus</i>	Redthroat						4.0	+	+	+	e	e	+	e	e	e	e	e			
	<i>Smicronis brevirostris</i>	Weebill						25	+	+	+	17	+	+	+	2	+	+	+	+	+	+
	<i>Gerygone (fusca) fusca</i>	Western Gerygone						11		+	+	2	e	+	+	2	+	+	e	+	+	
	<i>Gerygone (fusca) mungi</i>	Desert Gerygone						-	+													
	<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill						4.7	+	+	+	e	e	e	+	+	+	+	e			
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill						13	+	+		6	e	+	+	+	+	+	e	e		
	<i>Acanthiza apicalis</i>	Broad-tailed (Inland) Thornbill						2.0	+	+	+	e	e	+		3	+	e				
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill						2.4	+	+	+	e	e	e		+	+	e		+		
	<i>Aphelocephala leucopsis</i>	Southern Whiteface						0.0	+					e	+	e	+	e	e			
	<i>Aphelocephala nigricincta</i>	Banded Whiteface						0.0		+					e			+				
Pardalotidae	<i>Pardalotus rubricatus</i>	Red-browed Pardalote						18	+	+	+	6	+	e	e	+	+	+	+	+	+	+
	<i>Pardalotus striatus</i>	Striated Pardalote						8.8	+	+	+	2	e	+	+	+	e	e	e	+	+	
Meliphagidae	<i>Certhionyx variegatus</i>	Pied Honeyeater						3.0	+	+	+	e	e	e	e	+	+	+	+		+	
	<i>Lichenostomus virescens</i>	Singing Honeyeater						78	+	+	+	50	+	+	+	10	+	+	+	+	+	+
	<i>Lichenostomus keartlandi</i>	Grey-headed Honeyeater						31	+	+	+	5	+	+	+	5	+	+	+	+	+	
	<i>Lichenostomus plumulus</i>	Grey-fronted Honeyeater						0.0						+	+	+	e	e	e	e	+	
	<i>Lichenostomus</i>	White-plumed						22	+	+	+	31	+	+	+	6	+	+	+	+		+

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	<i>penicillatus</i>	Honeyeater																				
	<i>Purnella albifrons</i>	White-fronted Honeyeater						0.3				e	e	e		+	e	e				
	<i>Manorina flavigula</i>	Yellow-throated Miner						52	+	+	+	+	+	+	+	25	+	+	+	+	+	+
	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater						27	+	+	+	+	e	+	+	+	+	+	+	+		+
	<i>Conopophila whitei</i>	Grey Honeyeater						0.3	+	+		e	e	e	e	e	+	e	e	+		
	<i>Sugomel niger</i>	Black Honeyeater						4.4	+	+		3	+	e	e	+	+	+	+			
	<i>Ephthianura tricolor</i>	Crimson Chat						11	+	+	+	17	+	e	e	+	+	+	e		+	
	<i>Ephthianura aurifrons</i>	Orange Chat						0.7	+	+	+	e	e	e	+		e		e			
	<i>Lichmera indistincta</i>	Brown Honeyeater						34	+	+	+	5	+	+	+	+	+	+	+	+	+	
	<i>Melithreptus gularis</i>	Black-chinned Honeyeater						4.4	+			e	e	+	+	+	e		e	+		
	<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater						0.0			+											
Pomatostomidae	<i>Pomatostomus temporalis</i>	Grey-crowned Babbler						22	+	+	+	17	e	+	+	4	+	+	+	+	+	
	<i>Pomatostomus superciliosus</i>	White-browed Babbler						2.4	+	+	+	e	e	+	+	+	+	+	e	+		
Eupetidae	<i>Cinclosoma castaneothorax</i>	Chestnut-breasted Quail-thrush						3.7		+	+	e	e	e	e	e	+	+	e	e		
	<i>Psophodes occidentalis</i>	Chiming Wedgebill						2.4	+	+		e	e	e	e	e	e	e	e			
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella						1.0		+	+	e	e	e	+		+	e	e			
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike						53	+	+	+	3	+	+	+	5	+	+	+	+	+	+
	<i>Coracina maxima</i>	Ground Cuckoo-shrike						2.4	+		+	e	e	+	+	+	+	+	e		+	
	<i>Lalage sueurii</i>	White-winged Triller						20	+	+	+	31	+	+	+	+	+	+	e		+	
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler						38	+	+	+	24	+	+	+	6	+	+	+	+	+	+
	<i>Colluricincla harmonica</i>	Grey Shrike-thrush						24	+	+	+	2	+	+	+	7	+	+	+	+	+	+

Family	Species	Common Name	EPBC Act status	WC Act status	DEC status	DEC Threatened fauna database	EPBC Act PMST	% PIL quadrats	NMap Newman +40km	NMap eastern Fortescue	NMap Roy Hill +40 km	Nyidinghu	Iron Valley	Hope Downs	Cloudbreak	BHP Jimblebar	FerrAus	Roy Hill	BCI Nullagine	Cookes Ck Nullagine	Abydos/W'stock	August 2012
	<i>Oreoica gutturalis</i>	Crested Bellbird						41	+	+	+	1	e	+	+	+	+	+	+	+		
	<i>Oreoica g. gutturalis</i>	Cr. Bellbird (southern)			P 4	2				+	+											
Artamidae	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow						0.0						e								
	<i>Artamus personatus</i>	Masked Woodswallow						19	+	+	+	80	+	+	e	3	+	+	e	+	+	
	<i>Artamus superciliosus</i>	White-browed Woodswallow						0.0	+			e				e	e	e				
	<i>Artamus cinereus</i>	Black-faced Woodswallow						64	+	+	+	96	+	+	+	7	+	+	+	+	+	
	<i>Artamus cyanopterus</i>	Dusky Woodswallow						0.0	+					e			e					
	<i>Artamus minor</i>	Little Woodswallow						6.7	+	+	+	e	+	+	e	+	+	+	e	e	+	c
	<i>Cracticus torquatus</i>	Grey Butcherbird						15	+	+	+	+	e	+	+	+	+	+	e		+	
	<i>Cracticus nigrogularis</i>	Pied Butcherbird						51	+	+	+	12	+	+	+	11	+	+	+	+	+	+
	<i>Cracticus tibicen</i>	Australian Magpie						14	+	+	+	+	+	+	+	13	+	+	+	+	+	
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail						4.7	+			e	+	+	+	e	e	+	e			
	<i>Rhipidura leucophrys</i>	Willie Wagtail						67	+	+	+	20	+	+	+	12	+	+	+	+	+	+
Corvidae	<i>Corvus coronoides</i>	Australian Raven						0.0		+	+					e	+					
	<i>Corvus bennetti</i>	Little Crow						11	+	+	+	1	e	+	+	+	e	+	+	+	+	+
	<i>Corvus orru</i>	Torresian Crow						45	+	+	+	7	+	+	+	8	+	+	+	+	+	+
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-Lark						25	+	+	+	14	+	+	+	4	+	+	+	+	+	+
Petroicidae	<i>Petroica goodenovii</i>	Red-capped Robin						5.1	+	+	+	1	e	+	+	3	+	+	e			
	<i>Melanodryas cucullata</i>	Hooded Robin						13		+	+	3	+	+	+	2	+	+	e	e		
Alaudidae	<i>Mirafra javanica horsfieldii</i>	Horsfield's (Singing) Bushlark						19	+	+	+	8	+	e	+	1	+	+	+		+	
Acrocephalidae	<i>Acrocephalus australis</i>	Australian Reed-warbler						0.3	+		+	e	e			+	e	e	+	e	+	
Megaluridae	<i>Megalurus gramineus</i>	Little Grassbird						0.0	+					e	e	e	e		e			
	<i>Cincloramphus mathewsi</i>	Rufous Songlark						7.4	+	+	+	e	+	e	e	+	+	+	e	e	+	

Family	Species	Common Name	EPBC Act status	WC Act status	DEC status	DEC Threatened fauna database	EPBC Act PMST	% PIL quadrats	NMap Newman +40km	NMap eastern Fortescue	NMap Roy Hill +40 km	Nyidinghu	Iron Valley	Hope Downs	Cloudbreak	BHP Jimblebar	FerrAus	Roy Hill	BCI Nullagine	Cookes Ck Nullagine	Abydos/W'stock	August 2012
	<i>Cincloramphus cruralis</i>	Brown Songlark						4.4	+	+	+	e	+	e	+	+	+	e	e	e	+	
	<i>Eremiornis carteri</i>	Spinifexbird						42	+	+	+	3	+	+	+	1	e	+	+	+	+	
Hirundinidae	<i>Cheramoeca leucosterna</i>	White-backed Swallow						0.7	+			e		e		4	+	e	e			
	<i>Hirundo neoxena</i>	Welcome Swallow						1.0	+			e	e	e	e	e	e	e	e			
	<i>Petrochelidon ariel</i>	Fairy Martin						13	+			+	e	e	+	e	e	e	e		+	
	<i>Petrochelidon nigricans</i>	Tree Martin						8.8				2	e	+	e	e	+	+	+	+	+	+
Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird						13	+	+	+	1	e	e	+	+	+	+	e		+	
Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch						82	+	+	+	367	+	+	+	25	+	+	+	+	+	c
	<i>Neochmia ruficauda subclarescens</i>	Star Finch (western)			P 4			0.3	+			e	e	e	+	e	e	+	+	e		
	<i>Emblema pictum</i>	Painted Finch						51	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit						23	+	+	+	+	e	+	+	1	+	+	+		+	

Appendix Five: Correspondence

From: [Van Leeuwen, Stephen](#)
To: [Lyn Atkins](#)
Cc: [Baker, Murray](#); [Corbellini, Michelle](#)
Subject: RE: Proposed Pilbara field survey for July
Date: Thursday, 14 June 2012 5:14:39 PM

Lyn

Given seasonal conditions and previous survey effort in close proximity to this road (e.g. Roy Hill borefield pipeline) I think a single session Level 2 type survey along the road verge would fulfil DEC requirements. If any new alignment or a re0alignment was to occur then we would need to reconsider this advice.

Cheers

Stephen

Dr Stephen van Leeuwen
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 Please consider the environment before printing this email

From: Lyn Atkins [mailto:LynA@ecoscape.com.au]
Sent: Thursday, 14 June 2012 1:53 PM
To: Van Leeuwen, Stephen
Subject: Proposed Pilbara field survey for July

Hi Stephen,

I'm wondering if you are available give advice in relation to a proposed field survey?

The proposal is for a single season Level 2 survey for an infrastructure corridor between Newman and Roy Hill, basically along the road. We've only just been given the go-ahead for the project so we won't be able to mobilise until July. No, it's not for a mining company.

What are the prospects of this being acceptable to the OEPA/DEC? I know it is not optimal (and certainly not within the 'season following rain'), but this year that part of the Pilbara has had decent rainfall. Having travelled along the road to Nullagine a number of times, I know a lot of the area is pretty heavily grazed and degraded (but better towards Newman than on the Fortescue floodplain).

Your advice would be appreciated.

Thanks,

Lyn

Lyn Atkins

Associate Environmental Scientist

Ecologist/Botanist

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Appendix Six: Floristic Quadrat Data

Site AEQL1

Described by LJA Date 4/08/2012 Type Q 50 m x 50 m

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 798937 mE 7433888 mN

Habitat Flat

Soil Red clay loam

Rock Type No exposed rock

Vegetation *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall sparse shrubland over *Triodia epactia* tall hummock grassland
 U+ ^*Acacia sclerosperma* subsp. *sclerosperma*, *A. synchronicia* ^shrub\4\r:G ^*Triodia epactia* ^hummock grass\1\r

Veg Condition Very good

Fire Age >5 years

Notes 2% leaf litter cover, <1 cm depth

65% bare ground

<1% weed cover

Disturbance type: grazing

Fire notes: no evidence of recent fire



Species list

Species list	Cover (%)	Height (m)
<i>Abutilon trudgenii</i>	<1	0.5
<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>	1	3.5
<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>	5	2-5
<i>Acacia synchronicia</i>	2	1.5-4.5
<i>Aristida contorta</i>	<1	0.3
<i>Boerhavia coccinea</i>	<1	0.1
<i>Bulbostylis barbata</i>	<1	0.4
* <i>Cenchrus ciliaris</i>	<1	0.4
<i>Cleome viscosa</i>	<1	0.6
<i>Enneapogon polyphyllus</i>	<1	0.4
<i>Eremophila forrestii</i> subsp. <i>forrestii</i>	<1	1.2
<i>Eriachne aristidea</i>	<1	0.3
<i>Euphorbia</i> sp.	<1	0.5
<i>Gomphrena affinis</i> subsp. <i>pilbarensis</i>	<1	
<i>Gomphrena cunninghamii</i>	<1	0.6
<i>Goodenia microptera</i>	<1	0.2
<i>Hibiscus burtonii</i>	<1	0.5
Indeterminant sp.	<1	0.3
<i>Indigofera colutea</i>	<1	0.1
<i>Polycarpaea corymbosa</i>	<1	0.8

<i>*Portulaca oleracea</i>	<1	
<i>Ptilotus astrolasius</i>	<1	1.8
<i>Ptilotus nobilis</i>	<1	0.5
<i>Ptilotus polystachyus</i>	<1	0.6
<i>Rhagodia eremaea</i>	<1	1
<i>Senna artemisioides</i> subsp. <i>oligophylla</i>	<1	1
<i>Senna artemisioides</i> subsp. <i>oligophylla</i> x <i>helmsii</i>	<1	
<i>Senna glutinosa</i> subsp. <i>pruinosa</i>	<1	1.5
<i>Senna notabilis</i>	<1	0.1
<i>Sida echinocarpa</i>	<1	0.3
<i>Sida echinocarpa</i>	<1	0.5
<i>Solanum lasiophyllum</i>	<1	0.6
<i>Sporobolus australasicus</i>	<1	0.4
<i>Stylobasium spathulatum</i>	<1	1.2
<i>Tribulus ?terrestris</i>	<1	0.1
<i>Tribulus macrocarpus</i>	<1	0.1
<i>Trichodesma zeylanicum</i> var. <i>zeylanicum</i>	<1	1.2
<i>Triodia epactia</i>	35	0.4

Site AEQL2

Described by LJA Date 5/08/2012 Type Q 50 m x 50 m
 Season A
 Location Alinta Energy Newman to Roy Hill
 MGA Zone 50 807654 mE 7455731 mN
 Habitat

Soil Red loamy sand
 Rock Type 0% outcropping, 0% loose rock cover
 Vegetation *Eucalyptus gamophylla* and *Acacia pachyacra* mid sparse mallee shrubland/tall sparse shrubland over *Triodia basedowii* and *Androcalva loxophylla* open tall hummock grassland/sparse low shrubland
 M+ ^*Eucalyptus gamophylla*, *Acacia pachyacra* \^tree mallee, shrub\6\r: ^*Triodia basedowii*, *Androcalva luteiflora*\^hummock grass, shrub\2\i

Veg Condition Excellent

Fire Age >10 years

Notes 1% leaf litter, <1 cm depth
 70% bare ground
 0% weeds
 Disturbance type: none
 Fire notes: no evidence of recent fire



Species list

Species list	Cover (%)	Height (m)
<i>Acacia adsurgens</i>	<1	4
<i>Acacia pachyacra</i>	1	5
<i>Androcalva loxophylla</i>	1	0.5
<i>Anthobolus leptomerioides</i>	<1	2
<i>Aristida contorta</i>	<1	0.2
<i>Aristida inaequiglumis</i>	<1	1
<i>Bonamia erecta</i>	<1	0.5
<i>Cassutha capillaris</i>	<1	creeper
<i>Dicrasyllis cordifolia</i>	<1	0.6
<i>Eriachne aristidea</i>	<1	0.3
<i>Eucalyptus gamophylla</i>	1	4
<i>Euphorbia</i> sp.	<1	0.3
Indeterminant sp.	<1	0.1
<i>Scaevola parvifolia</i> subsp. <i>parvifolia</i>	<1	0.2
<i>Senna notabilis</i>	<1	0.2
<i>Solanum centrale</i>	<1	0.4
<i>Solanum sturtianum</i>	<1	1
<i>Triodia basedowii</i>	25	0.6

Yakirra australiensis

<1

0.1

Site AEQL3

Described by LJA Date 8/08/2012 Type Q 50 m x 50 m

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 803797 mE 7489745 mN

Habitat Valley floor

Soil Red brown sandy clay loam

Rock Type Calcrete, <2% loose rock, 2-6 mm

Vegetation *Eucalyptus victrix* and *Acacia aptaneura* low open woodland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall open shrubland over *Eragrostis eriopoda*, *Salsola australis* and *Sporobolus australasicus* mid sparse grassland/sparse chenopod shrubland
 U+ ^*Eucalyptus victrix*,*Acacia aptaneura*\^tree\6\r:M ^*Acacia sclerosperma* subsp. *sclerosperma*, *A. synchronicia*\^shrub\4\j:G ^*Eragrostis eriopoda*,*Salsola australis*,*Sporobolus australasicus*\^tussock grass, chenopod shrub\2\i

Veg Condition Very good

Fire Age >5 years

Notes 2% leaf litter, <1 cm depth
 80% bare ground
 <1% weeds
 Disturbance type: Grazing
 Fire notes: No evidence of recent fire



Species list

Species list	Cover (%)	Height (m)
? <i>Enteropogon ramosus</i>	<1	0.6
? * <i>Malvastrum americanum</i>	<1	0.1
? <i>Melhania oblongifolia</i>	<1	0.3
<i>Abutilon otocarpum</i>	<1	0.5
<i>Acacia aptaneura</i>	1	7
<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>	10	3
<i>Acacia synchronicia</i>	10	4
<i>Acacia tetragonophylla</i>	2	4
<i>Amyema fitzgeraldii</i>	<1	
<i>Aristida contorta</i>	<1	0.3
<i>Atriplex codonocarpa</i>	<1	0.3
<i>Boerhavia coccinea</i>	<1	0.2
<i>Cleome viscosa</i>	<1	0.4
<i>Digitaria</i> sp.	<1	0.6
<i>Enchylaena tomentosa</i>	<1	0.8
<i>Enneapogon lindleyanus</i>	<1	0.2
<i>Enneapogon polyphyllus</i>	<1	0.4

<i>Eragrostis eriopoda</i>	5	0.3
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	1	3
<i>Eucalyptus victrix</i>	2	6
<i>Euphorbia</i> sp.	<1	0.2
<i>Gomphrena</i> sp.	<1	0.2
<i>Goodenia</i> sp.	<1	0.1
<i>Lepidium phlebopetalum</i>	<1	0.1
<i>Maireana tomentosa</i> subsp. <i>tomentosa</i>	<1	0.4
* <i>Malvastrum americanum</i>	<1	0.4
* <i>Portulaca oleracea</i>	<1	0.1
<i>Ptilotus nobilis</i>	<1	0.4
<i>Rhagodia eremaea</i>	<1	1.2
<i>Salsola australis</i>	2	0.5
<i>Sclerolaena cornishiana</i>	<1	0.3
<i>Sclerolaena costata</i>	<1	0.5
<i>Sclerolaena densiflora</i>	<1	0.4
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	<1	0.6
<i>Solanum lasiophyllum</i>	<1	0.4
<i>Sporobolus australasicus</i>	2	0.2
<i>Streptoglossa decurrens</i>	<1	0.1
<i>Stylobasium spathulatum</i>	<1	2
<i>Tribulus astrocarpus</i>	<1	0.1

Site AEQL4

Described by LJA Date 8/08/2012 Type Q 50 m x 50 m

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 803702 mE 7489288 mN

Habitat Plain

Soil Orange sand

Rock Type 0% outcropping, <2% loose rock, 2-6mm

Vegetation *Acacia synchronicia* and *Eremophila youngii* subsp. *lepidota* tall open shrubland over *Sclerolaena densiflora*, *Senna* sp. Meekatharra (E. Bailey 1-26) and *Salsola australis* mid sparse chenopod shrubland/sparse shrubland

M+ ^*Acacia synchronicia*, *Eremophila youngii* subsp. *lepidota*^shrub\4\i:G ^*Sclerolaena densiflora*, *Senna* sp. Meekatharra (E. Bailey 1-26), *Salsola australis*^chenopod shrub, shrub\2\r

Veg Condition Very good

Fire Age >10 years

Notes <1% leaf litter, <1 cm depth

90% bare ground

<1% weeds

Disturbance type: grazing

Fire notes: no evidence of fire

Intergrove



Species list

Species list	Cover (%)	Height (m)
? <i>Enteropogon ramosus</i>	<1	0.5
<i>Acacia aptaneura</i>	<1	2
<i>Acacia synchronicia</i>	10	4
<i>Aristida contorta</i>	<1	0.2
<i>Atriplex codonocarpa</i>	<1	0.3
<i>Boerhavia coccinea</i>	<1	0.3
<i>Brachyachne prostrata</i>	<1	0.1
<i>Dactyloctenium radulans</i>	<1	0.3
<i>Enchylaena tomentosa</i>	<1	1
<i>Eragrostis eriopoda</i>	<1	0.3
<i>Eremophila forrestii</i> subsp. <i>forrestii</i>	<1	0.8
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	2	2
<i>Lepidium phlebopetalum</i>	<1	0.3
<i>Maireana georgei</i>	<1	0.6
Poaceae sp.	<1	0.4
<i>Ptilotus nobilis</i>	<1	0.1
<i>Rhagodia eremaea</i>	<1	1

<i>Salsola australis</i>	2	0.5
<i>Sclerolaena cornishiana</i>	<1	0.3
<i>Sclerolaena costata</i>	<1	0.2
<i>Sclerolaena cuneata</i>	<1	0.5
<i>Sclerolaena densiflora</i>	2	0.3
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	2	0.5
<i>Solanum lasiophyllum</i>	<1	0.5
<i>Streptoglossa decurrens</i>	<1	0.4
<i>Trianthema triquetra</i>	<1	0.1

Site AEQL5

Described by LJA Date 9/08/2012 Type Q 50 m x 50 m

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 792143 mE 7419660 mN

Habitat Valley

Soil Red brown clay loam

Rock Type 0% outcropping, 0% loose rock, 6-20 mm

Vegetation *Acacia bivenosa* and *A. sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Triodia epactia* mid hummock grassland
M ^*Acacia bivenosa*, *A. sclerosperma* subsp. *sclerosperma* ^shrub\4\r:G ^*Triodia epactia* ^hummock grass\2\c

Veg Condition Very good

Fire Age >5 years

Notes 2% leaf litter, 1-2cm depth

65% bare ground

>1% weeds

Disturbance type: grazed, possibly some clearing (very old road)

Fire notes: no evidence of recent fire



Species list

Species list	Cover (%)	Height (m)
<i>Acacia bivenosa</i>	2	2.5
<i>Acacia dictyophleba</i>	<1	1.5
<i>Acacia inaequilatera</i>	<1	3.5
<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>	1	2.5
<i>Aristida contorta</i>	<1	0.2
<i>Aristida inaequiglumis</i>	<1	0.3
<i>Bulbostylis barbata</i>	<1	0.1
* <i>Cenchrus ciliaris</i>	<1	0.6
<i>Cleome viscosa</i>	<1	0.4
<i>Corymbia hamersleyana</i>	<1	0.5
<i>Cymbopogon ambiguus</i>	<1	0.8
<i>Dicrastylis cordifolia</i>	<1	0.6
<i>Dysphania rhadinostachya</i>	<1	0.2
<i>Enneapogon caeruleus</i>	<1	0.2
<i>Enneapogon</i> sp.	<1	0.3
<i>Eragrostis eriopoda</i>	<1	0.4
<i>Eremophila cuneifolia</i>	<1	0.6
<i>Eremophila platycalyx</i> subsp. <i>pardalota</i>	1	1.8
<i>Eucalyptus gamophylla</i>	<1	3.5
<i>Euphorbia australis</i>	<1	0.1

<i>Euphorbia boophthona</i>	<1	0.6
<i>Goodenia vilmoriniae</i>	<1	0.2
<i>Hakea lorea</i> subsp. <i>lorea</i>	<1	2
<i>Hibiscus burtonii</i>	<1	0.2
<i>Hybanthus aurantiacus</i>	<1	0.3
<i>Polycarpaea corymbosa</i>	<1	0.2
* <i>Portulaca oleracea</i>	<1	0.1
<i>Pterocaulon ? sphacelatum</i>	<1	0.2
<i>Ptilotus astrolasius</i>	<1	0.6
<i>Ptilotus calostachyus</i>	<1	0.5
<i>Ptilotus polystachyus</i>	<1	0.6
<i>Rhagodia eremaea</i>	<1	1.5
<i>Scaevola parvifolia</i> subsp. <i>pilbarae</i>	<1	0.3
<i>Sclerolaena densiflora</i>	<1	0.5
<i>Sclerolaena densiflora</i>	<1	0.3
<i>Sclerolaena eriacantha</i>	<1	0.2
<i>Senna artemisioides</i> subsp. <i>oligophylla x helmsii</i>	<1	0.6
<i>Senna glutinosa</i>	<1	1.5
<i>Senna glutinosa</i> subsp. <i>pruinosa</i>	<1	1.3
<i>Senna notabilis</i>	<1	0.3
<i>Sida ?sp.</i> Pilbara (A.A. Mitchell PRP 1543)	<1	0.1
<i>Solanum lasiophyllum</i>	<1	0.3
<i>Sporobolus australasicus</i>	<1	0.1
<i>Stylobasium spathulatum</i>	<1	1.5
<i>Trianthema triquetra</i>	<1	0.1
<i>Tribulus macrocarpus</i>	<1	0.1
<i>Trichodesma zeylanicum</i> var. <i>zeylanicum</i>	<1	1
<i>Triodia epactia</i>	35	0.6
<i>Yakirra australiensis</i>	<1	0.1

Site AEQL6

Described by LJA Date 9/08/2012 Type Q 50 m x 50 m

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 792320 mE 7419898 mN

Habitat Moderate to steep crest and slope, low rise

Soil Red brown clay loam

Rock Type 10-20% outcropping, 50-90% loose rock, 60-200 mm

Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* low open woodland over *Acacia hilliana* and *A. bivenosa* mid sparse shrubland over *Triodia wiseana* and *T. epactia* low hummock grassland
U+ ^*Eucalyptus leucophloia* subsp. *leucophloia*^tree\6\r:M ^*Acacia hilliana*, *A. bivenosa*^shrub\3\r:G ^*Triodia wiseana*, *T. epactia*^hummock grass\1\i

Veg Condition Very good

Fire Age >5 years

Notes <1% leaf litter, <1 cm depth

70% bare ground

<1% weeds

Disturbance type: none

Fire notes: very old fire scars



Species list

Species list	Cover (%)	Height (m)
<i>Acacia adoxa</i> var. <i>adoxo</i>	<1	0.5
<i>Acacia bivenosa</i>	2	2
<i>Acacia hilliana</i>	3	1
<i>Acacia inaequilatera</i>	<1	2
<i>Amphipogon sericeus</i>	<1	0.4
<i>Aristida inaequiglumis</i>	<1	0.3
<i>Bulbostylis barbata</i>	<1	0.4
<i>Calytrix carinata</i>	<1	0.8
* <i>Cenchrus ciliaris</i>	<1	0.6
<i>Corymbia hamersleyana</i>	<1	1
<i>Cymbopogon ambiguus</i>	<1	1
<i>Dysphania rhadinostachya</i>	<1	0.3
<i>Enneapogon polyphyllus</i>	<1	0.5
<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	<1	1.3
<i>Eremophila</i> sp.	<1	1.5
<i>Eriachne aristidea</i>	<1	0.3
<i>Eriachne ciliata</i>	<1	0.2
<i>Eriachne lanata</i>	<1	0.4
<i>Eriachne mucronata</i>	<1	0.4
<i>Eriachne pulchella</i> subsp. <i>dominii</i>	<1	0.2

<i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i>	2	6
<i>Fimbristylis simulans</i>	<1	0.3
<i>Gomphrena cunninghamii</i>	<1	0.1
<i>Goodenia ?triodiophila</i>	<1	0.4
<i>Goodenia muelleriana</i>	<1	0.4
<i>Goodenia stobbsiana</i>	<1	0.5
<i>Goodenia vilmorinae</i>	<1	0.3
<i>Hakea lorea</i> subsp. <i>lorea</i>	<1	2
<i>Maireana georgei</i>	<1	0.3
<i>Paraneurachne muelleri</i>	<1	0.4
<i>Polycarpaea holtzei</i>	<1	0.1
<i>Polycarpaea involucrata</i>	<1	0.2
<i>Ptilotus astrolasius</i>	<1	0.6
<i>Ptilotus calostachyus</i>	<1	0.8
<i>Ptilotus nobilis</i>	<1	0.2
<i>Ptilotus obovatus</i>	<1	0.5
<i>Ptilotus rotundifolius</i>	<1	0.6
<i>Schizachyrium fragile</i>	<1	0.4
<i>Senna artemisioides</i> subsp. <i>oligophylla</i>	<1	0.6
<i>Senna glutinosa</i> subsp. <i>glutinosa</i>	<1	1.4
<i>Senna glutinosa</i> subsp. <i>pruinosa</i>	<1	1.2
<i>Sida</i> sp. <i>Excedentifolia</i> (J.L. Egan 1925)	<1	0.3
<i>Solanum lasiophyllum</i>	<1	0.4
<i>Sporobolus australasicus</i>	<1	0.2
<i>Stackhousia intermedia</i>	<1	0.4
<i>Themeda triandra</i>	<1	0.6
<i>Trachymene oleracea</i> subsp. <i>oleracea</i>	<1	0.4
<i>Trianthema glossostigma</i>	<1	0.1
<i>Tribulus suberosus</i>	<1	0.6
<i>Triodia epactia</i>	2	1.3
<i>Triodia wiseana</i>	25	0.4
<i>Yakirra australiensis</i>	<1	0.1

Site AEQL7

Described by LJA Date 9/08/2012 Type Q 50*50 m

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 792983 mE 7421494 mN

Habitat Valley

Soil Red brown loamy sand

Rock Type 0% outcropping, <2% loose rock cover, 20-60 mm rock size

Vegetation *Corymbia candida* subsp. *dipsodes* and *Hakea lorea* subsp. *lorea* low scattered trees over *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over **Cenchrus ciliaris* and *Triodia epactia* mid open tussock grassland/open hummock grassland
 U+ ^*Corymbia candida* subsp. *dipsodes*, *Hakea lorea* subsp. *lorea* ^tree\6\bi:M ^*Acacia sclerosperma* subsp. *sclerosperma* ^shrub\4\r:G ^*Cenchrus ciliaris*, *Triodia epactia* ^tussock grass, hummock grass\2\i

Veg Condition Good

Fire Age >5years

Notes 1% leaf litter, <1 cm depth
 70% bare ground
 20% weeds
 Disturbance type: grazed
 Fire notes: no evidence of recent fire



Species list

Species list	Cover (%)	Height (m)
<i>Acacia aptaneura</i>	<1	2
<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>	3	2
<i>Acacia synchronicia</i>	<1	1.2
<i>Aristida contorta</i>	<1	0.2
<i>Aristida contorta</i>	<1	0.2
<i>Aristida inaequiglumis</i>	<1	0.5
<i>Boerhavia coccinea</i>	<1	0.1
<i>Bonamia erecta</i>	<1	0.4
<i>Bulbostylis barbata</i>	<1	0.1
* <i>Cenchrus ciliaris</i>	20	0.6
<i>Chrysocephalum pterochaetum</i>	<1	0.4
<i>Chrysopogon fallax</i>	<1	1.2
<i>Cleome viscosa</i>	<1	0.3
<i>Corchorus tridens</i>	<1	0.2
<i>Corymbia candida</i> subsp. <i>dipsodes</i>	1	6
<i>Cymbopogon ambiguus</i>	<1	1.2
<i>Duperreya commixta</i>	<1	climber
<i>Enneapogon polyphyllus</i>	<1	0.3
<i>Eragrostis eriopoda</i>	1	0.4

<i>Eremophila lanceolata</i>	<1	0.3
<i>Eriachne aristidea</i>	<1	0.3
<i>Euphorbia australis</i>	<1	0.1
<i>Euphorbia tannensis</i> subsp. <i>eremophila</i>	<1	0.5
<i>Evolvulus alsinoides</i> var. <i>villosicalyx</i>	<1	0.3
<i>Goodenia muelleriana</i>	<1	
<i>Goodenia prostrata</i>	<1	0.1
<i>Goodenia vilmoriniae</i>	<1	0.3
<i>Grevillea striata</i>	<1	5
<i>Hakea lorea</i> subsp. <i>lorea</i>	<1	4
<i>Hibiscus sturtii</i>	<1	0.3
<i>Hibiscus sturtii</i> var. <i>platyklamys</i>	<1	0.4
<i>Isotropis forrestii</i>	<1	0.4
<i>Mollugo molluginea</i>	<1	0.2
<i>Paraneurachne muelleri</i>	<1	0.3
<i>Paraneurachne muelleri</i>	<1	0.4
<i>Polycarpaea corymbosa</i>	<1	0.6
* <i>Portulaca oleracea</i>	<1	0.1
<i>Ptilotus astrolasius</i>	<1	0.8
<i>Ptilotus helipteroides</i>	<1	0.4
<i>Ptilotus nobilis</i>	<1	0.4
<i>Ptilotus obovatus</i>	<1	0.8
<i>Ptilotus polystachyus</i>	<1	0.4
<i>Rhagodia eremaea</i>	<1	1.2
<i>Rhynchosia minima</i>	<1	0.1
<i>Salsola australis</i>	<1	0.4
<i>Sclerolaena cornishiana</i>	<1	
<i>Senna artemisioides</i> subsp. <i>helmsii</i>	<1	0.5
<i>Senna glutinosa</i> subsp. <i>glutinosa</i>	<1	1.4
<i>Senna glutinosa</i> subsp. <i>pruinosa</i>	<1	0.6
<i>Sida echinocarpa</i>	<1	2
<i>Solanum lasiophyllum</i>	<1	0.6
<i>Sporobolus australasicus</i>	<1	0.3
<i>Streptoglossa</i> sp.	<1	0.4
<i>Stylobasium spathulatum</i>	<1	1.2
<i>Trianthema glossostigma</i>	<1	0.1
<i>Tribulus macrocarpus</i>	<1	0.1
<i>Trichodesma zeylanicum</i> var. <i>zeylanicum</i>	<1	0.6
<i>Triodia epactia</i>	10	0.8

Site AEQL8

Described by LJA Date 9/08/2012 Type Q 50*50 m

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 793594 mE 7422689 mN

Habitat Gentle north sloping hilltop of moderate sized hill

Soil Red brown clay loam

Rock Type Ironstone, <2% outcropping, >90% loose rock, 20-60 mm

Vegetation *Grevillea wickhamii* subsp. *hispidula* and *Acacia pruinocarpa* tall shrubland over *Triodia wiseana*, *Acacia hilliana* and *Triodia epactia* open hummock grassland/sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
 U ^*Eucalyptus leucophloia* subsp. *leucophloia* ^tree\6\bi:M+ ^*Grevillea wickhamii* subsp. *hispidula*, *Acacia pruinocarpa* ^shrub\4\r:G ^*Triodia wiseana*, *Acacia hilliana*, *Triodia epactia* ^hummock grass, shrub\2\i

Veg Condition Excellent

Fire Age >5 years

Notes <1% leaf litter, <1 cm depth

75% bare ground

<1% weeds

Disturbance type: none

Fire notes: no evidence of recent fire

Old Pebble Mound Mouse mound in quadrat



Species list

Species list	Cover (%)	Height (m)
<i>Acacia ?kempeana</i>	<1	0.8
<i>Acacia bivenosa</i>	1	2-5
<i>Acacia hilliana</i>	5	0.8
<i>Acacia pruinocarpa</i>	2	4
<i>Amphipogon sericeus</i>	<1	0.3
<i>Aristida inaequiglumis</i>	<1	0.3
<i>Bulbostylis barbata</i>	<1	0.3
* <i>Cenchrus ciliaris</i>	<1	0.3
<i>Corchorus lasiocarpus</i> subsp. <i>lasiocarpus</i>	<1	0.4
<i>Corymbia hamersleyana</i>	<1	2
<i>Cymbopogon ambiguus</i>	<1	0.6
<i>Enneapogon polyphyllus</i>	<1	0.3
<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	<1	
<i>Eremophila longifolia</i>	<1	1.2
<i>Eriachne aristidea</i>	<1	0.3
<i>Eriachne pulchella</i> subsp. <i>dominii</i>	<1	0.2

<i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i>	<1	7
<i>Euphorbia australis</i>	<1	0.1
<i>Gomphrena cunninghamii</i>	<1	0.2
<i>Goodenia ?triodiophila</i>	<1	0.3
<i>Goodenia ?triodiophila</i>	<1	0.4
<i>Goodenia stobbsiana</i>	<1	0.4
<i>Grevillea wickhamii</i>	<1	3
<i>Grevillea wickhamii</i> subsp. <i>hispidula</i>	2	4
<i>Hakea lorea</i> subsp. <i>lorea</i>	<1	3
<i>Hibiscus burtonii</i>	<1	0.3
<i>Paraneurachne muelleri</i>	<1	0.4
<i>Polycarpaea corymbosa</i>	<1	0.2
<i>Polycarpaea holtzei</i>	<1	0.1
<i>Polycarpaea involucrata</i>	<1	0.1
<i>Ptilotus astrolasius</i>	<1	0.6
<i>Ptilotus calostachyus</i>	<1	0.8
<i>Ptilotus helipteroides</i>	<1	0.3
<i>Ptilotus nobilis</i>	<1	0.3
<i>Ptilotus rotundifolius</i>	<1	0.6
<i>Salsola australis</i>	<1	0.4
<i>Schizachyrium fragile</i>	<1	0.2
<i>Senna glutinosa</i> subsp. <i>glutinosa</i>	<1	1.8
<i>Senna glutinosa</i> subsp. <i>pruinosa</i>	<1	1.2
<i>Solanum lasiophyllum</i>	<1	0.6
<i>Stackhousia intermedia</i>	<1	0.3
<i>Stenopetalum decipiens</i>	<1	0.4
<i>Trianthema glossostigma</i>	<1	0.1
<i>Tribulus suberosus</i>	<1	0.5
<i>Triodia epactia</i>	2	0.6
<i>Triodia wiseana</i>	20	0.4

Site AEQL9

Described by LJA Date 9/08/2012 Type Q 50*50 m

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 794072 mE 7423694 mN

Habitat Very gentle south facing lower slope/valley edge

Soil Red brown clay loam

Rock Type 0% outcropping, 20-50% loose rock, 20-60 mm ironstone

Vegetation *Acacia bivenosa* and *A. sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Triodia epactia*, *T. wiseana* and *Streptoglossa decurrens* mid hummock grassland/sparse forbland
M+ ^*Acacia bivenosa*, *A. sclerosperma* subsp. *sclerosperma*\^shrub\4\r:G ^*Triodia epactia*, *T. wiseana*, *Streptoglossa decurrens* \^hummock grass, herb\2\c

Veg Condition Very good

Fire Age >5 years

Notes 2% leaf litter, <1 cm depth

70% bare ground

<1% weeds

Disturbance type: grazed, possibly some soil disturbance

Fire notes: no evidence of recent fire

Quadrat has minor drainage line



Species list

Species list	Cover (%)	Height (m)
<i>Acacia adoxa</i> var. <i>adoxo</i>	<1	0.4
<i>Acacia ancistrocarpa</i>	<1	2
<i>Acacia bivenosa</i>	2	2.5
<i>Acacia hilliana</i>	1	0.8
<i>Acacia maitlandii</i>	<1	3
<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>	2	2.5
<i>Atriplex codonocarpa</i>	<1	0.3
<i>Atriplex semilunaris</i>	<1	0.6
<i>Brachyachne prostrata</i>	<1	0.1
<i>Calandrinia pumila</i>	<1	0.1
* <i>Cenchrus ciliaris</i>	1	0.4
<i>Chenopodiaceae</i> sp.	<1	0.4
<i>Chenopodiaceae</i> sp.	<1	0.1
<i>Chloris pumilio</i>	<1	0.5
<i>Corchorus</i> sp.	<1	0.5
<i>Dissocarpus paradoxus</i>	<1	0.6
<i>Enchylaena tomentosa</i>	<1	0.5
<i>Enneapogon polyphyllus</i>	<1	0.4
<i>Eragrostis cumingii</i>	<1	0.2

<i>Eragrostis dielsii</i>	<1	0.1
<i>Eragrostis eriopoda</i>	<1	0.4
<i>Eragrostis falcata</i>	<1	0.4
<i>Eragrostis setifolia</i>	<1	0.1
<i>Eriachne aristidea</i>	<1	0.3
<i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i>	<1	2
<i>Goodenia muelleriana</i>	<1	0.2
<i>Goodenia vilmoriniae</i>	<1	0.3
<i>Gossypium robinsonii</i>	<1	2
<i>Haloragis gossei</i> var. <i>gossei</i>	<1	0.4
<i>Hibiscus sturtii</i>	<1	0.3
<i>Isotropis atropurpurea</i>	<1	0.5
<i>Lepidium phlebopetalum</i>	<1	0.1
<i>Maireana tomentosa</i> subsp. <i>tomentosa</i>	<1	0.3
<i>Pluchea rubelliflora</i>	1	0.4
<i>Polycarpaea holtzei</i>	<1	0.1
<i>Ptilotus nobilis</i>	<1	0.4
<i>Salsola australis</i>	<1	0.5
<i>Sclerolaena costata</i>	1	0.4
<i>Senna notabilis</i>	<1	0.1
<i>Streptoglossa decurrens</i>	2	0.4
<i>Trianthema glossostigma</i>	<1	0.1
<i>Triodia epactia</i>	30	0.8
<i>Triodia wiseana</i>	2	0.4

Site AERL-1

Described by LJA Date 3/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 798765 mE 7433592 mN

Habitat Flat

Soil Red clay loam

Rock Type n/a

Vegetation *Acacia synchronicia* and *Acacia sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Triodia epactia*, **Cenchrus ciliaris* and *Eragrostis eriopoda* mid open hummock grassland/low sparse tussock grassland with *Corymbia hamersleyana* low scattered trees
U+ ^*Corymbia hamersleyana*^tree\6\bi;M ^*Acacia synchronicia*,*Acacia sclerosperma*^shrub\4\r;G
^*Triodia epactia*,*Cenchrus ciliaris*,*Eragrostis eriopoda*^hummock grass,tussock grass\2\i

Veg Condition Good

Fire Age > 5 years

Notes Disturbance: grazing
2% weed cover



Species list

Acacia sclerosperma subsp. *sclerosperma*

Acacia synchronicia

**Cenchrus ciliaris*

Corymbia hamersleyana

Eragrostis eriopoda

Triodia epactia

Site AERL-2

Described by LJA Date 3/08/2012 Type R

Season

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 799435 mE 7434636 mN

Habitat Flat

Soil Red clay loam

Rock Type n/a

Vegetation *Acacia aptaneura*, *A. paraneura* and *A. pruinocarpa* low woodland over *Acacia synchronicia*, *A. tetragonophylla* and *Senna glutinosa* subsp. *pruinosa* tall-mid sparse shrubland over *Aristida contorta*, *Ptilotus* sp. and *Aristida inaequiglumis* mid-low open tussock grassland/low sparse shrubland

Veg Condition Good

Fire Age >5 years

Notes Disturbance: heavily grazed, trampled

<1% weed cover

Ptilotus astrolasius also characteristic, along with many herbs

This is Mulga grove vegetation: intergrove is the same vegetation but with sparse/absent overstorey and midstratum



Species list

Acacia aptaneura

Acacia paraneura

Acacia pruinocarpa

Acacia synchronicia

Acacia tetragonophylla

Aristida contorta

Aristida inaequiglumis

Ptilotus sp.

Senna glutinosa subsp. *pruinosa*

Site AERL-3

Described by LJA Date 4/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 802623 mE 7439828 mN

Habitat Flat

Soil Red sandy loam

Rock Type Mixed rock type, <2% cover, no outcropping

Vegetation *Triodia basedowii*, ?*Glycine* sp. and *Bonamia erecta* mid open hummock grassland/low sparse shrubland with *Acacia pachyacra* tall scattered shrubs

Veg Condition Very good

Fire Age >5 years

Notes Disturbance: a few signs of grazing



Species list

?*Glycine* sp.

Acacia pachyacra

Bonamia erecta

Triodia basedowii

Site AERL-4
Described by LJA Date 4/08/2012 Type R
Season
Location Alinta Energy Newman to Roy Hill
MGA Zone 50 804410 mE 7445402 mN
Habitat Flat
Soil Red clay loam
Rock Type n/a
Vegetation *Triodia basedowii* low hummock grassland with *Corymbia deserticola* subsp. *deserticola* low scattered trees with *Acacia ancistrocarpa* and *Hakea chordophylla* tall-mid scattered shrubs
Veg Condition Excellent
Fire Age >5 years
Notes No evidence of disturbance
No weeds



Species list

Acacia ancistrocarpa
Corymbia deserticola subsp. *deserticola*
Hakea chordophylla
Triodia basedowii

Site AERL-5

Described by LJA Date 5/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 807933 mE 7457638 mN

Habitat Flat

Soil Red sandy loam

Rock Type n/a

Vegetation *Acacia ancistrocarpa*, *Acacia adsurgens* and *Eucalyptus gamophylla* sparse tall shrubland/scattered low mallee shrubs over *Triodia basedowii*, *Androcalva loxophylla* and *Paraneurachne muelleri* mid open hummock grassland/low sparse shrubland/low scattered tussock grassland with *Corymbia deserticola* subsp. *deserticola* low scattered trees

Veg Condition Excellent

Fire Age >5 years

Notes No disturbance evident
No weeds



Species list

Acacia adsurgens

Acacia ancistrocarpa

Androcalva loxophylla

Corymbia deserticola subsp. *deserticola*

Eucalyptus gamophylla

Paraneurachne muelleri

Triodia basedowii

Site AERL-6

Described by LJA Date 5/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 808674 mE 7470362 mN

Habitat Flat

Soil Red sandy clay-loam

Rock Type n/a

Vegetation *Acacia pachyacra* and *A. ancistrocarpa* mid sparse shrubland over *Triodia basedowii*, *Ptilotus astrolasius* and *Scaevola parviflora* subsp. *pilbarae* low open tussock grassland/low sparse shrubland

Veg Condition Excellent

Fire Age 3-5 years

Notes No disturbance evident
No weeds



Species list

Acacia ancistrocarpa
Acacia pachyacra
Ptilotus astrolasius
Scaevola parvifolia subsp. *pilbarae*
Triodia basedowii

Site AERL-7

Described by LJA Date 5/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 7471170 mE 7471170 mN

Habitat Flat

Soil Red sandy clay-loam

Rock Type n/a

Vegetation *Triodia basedowii*, *T. longiceps* and *Ptilotus astrolasius* low open hummock grassland/low sparse shrubland with *Acacia pachyacra* and *A. pruinocarpa* scattered mid shrubs

Veg Condition Excellent

Fire Age 3-5 years

Notes No disturbance evident

No weeds

Eremophila pilosa (P1) present



Species list

Acacia pachyacra

Acacia pruinocarpa

Eremophila pilosa

Ptilotus astrolasius

Triodia basedowii

Triodia longiceps

Site AERL-8

Described by LJA Date 6/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 808558 mE 7468433 mN

Habitat Flat

Soil Red loamy sand

Rock Type n/a

Vegetation *Triodia basedowii*, *T. longiceps* and *Ptilotus astrolasius* mid-low open hummock grassland/low sparse shrubland with *Acacia pachyacra* and *A. ancistrocarpa* tall scattered shrubs

Veg Condition Excellent

Fire Age >5 years

Notes No disturbance evident

Sparse *Eremophila pilosa* (P1)

Many other grass species characteristic including *Aristida* spp., *Paraneurachne muelleri*



Species list

Acacia ancistrocarpa

Acacia pachyacra

Eremophila pilosa

Ptilotus astrolasius

Triodia basedowii

Triodia longiceps

Site AERL-9

Described by LJA Date 6/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 808868 mE 7476963 mN

Habitat Flat

Soil Red loamy sand

Rock Type n/a

Vegetation *Triodia basedowii*, *Keraudrenia* sp. and *Isotropis atropurpurea* mid open hummock grassland/low sparse shrubland/low sparse tussock grassland with *Hakea lorea* subsp. *lorea* low scattered trees

Veg Condition Excellent

Fire Age <5 years

Notes No disturbance evident

No weeds

Codonocarpus cotinifolius nearby (indicates burnt within last 10 years)



Species list

Codonocarpus cotinifolius

Hakea lorea subsp. *lorea*

Isotropis atropurpurea

Keraudrenia sp.

Triodia basedowii

Site AERL-10

Described by LJA Date 7/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 795081 mE 7425902 mN

Habitat Lower slope of low hill, moderate slope, southerly aspect

Soil Red brown clay loam

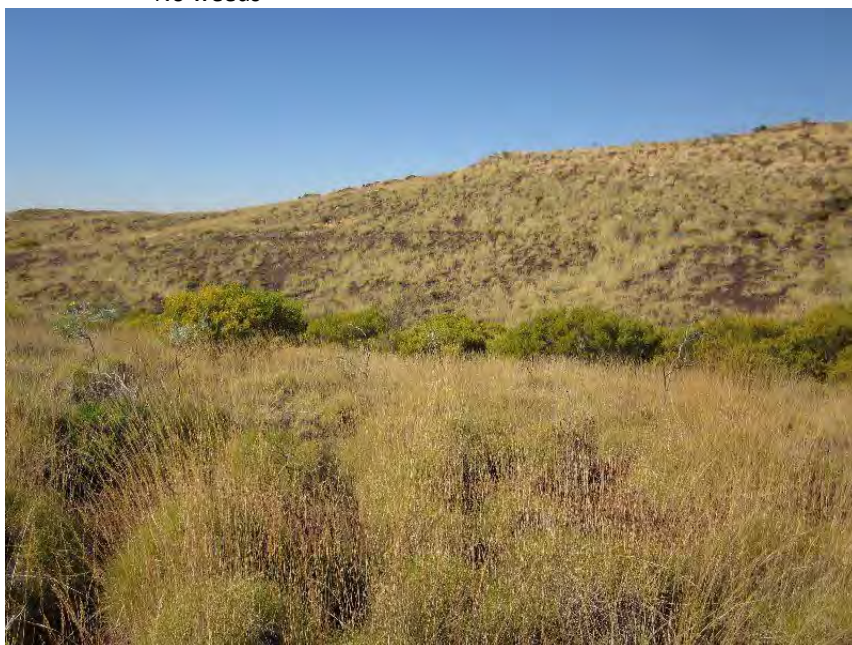
Rock Type Ironstone, >90% loose rock, 2-10% outcropping

Vegetation *Acacia bivenosa* tall sparse shrubland over *Triodia wiseana*, *Eremophila cuneifolia* and *Triodia epactia*
mid open hummock grassland/low sparse shrubland
M+ *Acacia bivenosa*^shrub\4\;G *Triodia wiseana*,*Eremophila cuneifolia*,*Triodia epactia*^hummock
grass,shrub\2\i

Veg Condition Excellent

Fire Age >5 years

Notes No disturbance evident
No weeds



Species list

Acacia bivenosa
Eremophila cuneifolia
Triodia epactia
Triodia wiseana

Site AERL-11

Described by LJA Date 7/08/2012 Type R

Season

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 794466 mE 7424550 mN

Habitat Raised plain (flat)

Soil Red brown clay loam

Rock Type n/a

Vegetation *Acacia bivenosa* and *A. ancistrocarpa* tall sparse shrubland over *Triodia epactia* and ?*Glycine* sp. low hummock grassland/low sparse shrubland with *Corymbia hamersleyana* low scattered trees
U+ ^*Corymbia hamersleyana* ^tree\6\bi;M ^*Acacia bivenosa*,*A. ancistrocarpa* ^shrub\4\r;G ^*Triodia epactia*,?*Glycine* sp. |^hummock grass,shrub\1|c

Veg Condition Very good

Fire Age >5 years

Notes Disturbance: grazed (cattle tracks)
<1% weed cover; scattered **Cenchrus ciliaris*



Species list

?*Glycine* sp.

Acacia ancistrocarpa

Acacia bivenosa

Corymbia hamersleyana

Triodia epactia

Site AERL-12

Described by LJA Date 7/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 793896 mE 7423376 mN

Habitat Raised plain (flat)

Soil Red loamy sand

Rock Type n/a

Vegetation *Acacia melleodora*, *A. ancistrocarpa* and *A. sclerosperma* subsp. *sclerosperma* tall sparse shrubland over *Triodia basedowii* and *T. epactia* mid-low hummock grassland with *Eucalyptus gamophylla* low scattered mallee shrubs
U ^ *Eucalyptus gamophylla* ^ mallee shrub \6\bi; M+ ^ *Acacia meliodora*, *A. ancistrocarpa*, *A. sclerosperma* subsp. *sclerosperma* ^ shrub \4\r; G ^ *Triodia basedowii*, *T. epactia* ^ hummock grass \2\c

Veg Condition Very good

Fire Age >5 years

Notes No disturbance noted
<1% weed cover



Species list

Acacia ancistrocarpa

Acacia melleodora

Acacia sclerosperma subsp. *sclerosperma*

Eucalyptus gamophylla

Triodia basedowii

Triodia epactia

Site AERL-13

Described by LJA Date 7/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 797015 mE 7430190 mN

Habitat Valley (flat)

Soil Red loamy sand

Rock Type n/a

Vegetation *Acacia synchronicia* and *Senna glutinosa* subsp. *luerssenii* x *pruinosa* tall sparse shrubland over *Triodia longiceps* and *Sporobolus australasicus* tall open hummock grassland/low sparse grassland with *Acacia aptaneura* low scattered trees

U ^*Acacia aptaneura*\^tree\6\bi;M+ ^*Acacia synchronicia*,*Senna glutinosa* subsp. *luerssenii* x *pruinosa*\^shrub\4\r;G ^*Triodia longiceps*,*Sporobolus australasicus*\^hummock grass,other grass\3\i

Veg Condition Good

Fire Age >5 years

Notes Disturbance: grazed (cattle tracks), road runoff erosion
2% weed cover



Species list

Acacia aptaneura

Acacia synchronicia

Senna glutinosa subsp. *luerssenii* x *pruinosa*

Sporobolus australasicus

Triodia longiceps

Site AERL-14

Described by LJA Date 7/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 796662 mE 7429260 mN

Habitat Valley (flat); minor drainage

Soil Red loamy sand

Rock Type n/a

Vegetation *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* tall sparse shrubland over **Cenchrus ciliaris*, *Salsola australis* and *Sclerolaena cornishiana* mid open tussock grassland/low sparse chenopod shrubland with *Acacia aptaneura* low scattered trees
U ^*Acacia aptaneura*\^tree\6\bi;M+ ^*Acacia sclerosperma* subsp. *sclerosperma*,*A. synchronicia*\^shrub\4\r;G ^*Cenchrus ciliaris*, *Salsola australis* and *Sclerolaena cornishiana*\^tussock grass,forb\2\i

Veg Condition Poor

Fire Age >5 years

Notes Disturbance: grazed
25% weed cover



Species list

Acacia aptaneura

Acacia sclerosperma subsp. *sclerosperma*

Acacia synchronicia

**Cenchrus ciliaris*

Salsola australis

Sclerolaena cornishiana

Site AERL-15

Described by LJA Date 7/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 796390 mE 7428743 mN

Habitat Valley (flat)

Soil Red brown clay loam

Rock Type Mixed (including quartz) loose rock, <2% cover

Vegetation *Aristida contorta*, *Senna* sp. Meekatharra (E. Bailey 1-26) and *Sclerolaena cornishiana* low sparse grassland/low sparse shrubland/low sparse chenopod shrubland with *Acacia aptaneura* low scattered trees with *A. bivenosa* tall scattered shrubs
U+ ^ *Acacia aptaneura* ^tree\7\r;M ^*A. bivenosa* ^shrub\4\r;G ^*Aristida contorta*,*Senna* sp. Meekatharra (E. Bailey 1-26),*Sclerolaena cornishiana* ^grass,shrub,forb\2\i

Veg Condition Very good

Fire Age >5 years

Notes Rabbit pooh



Species list

Acacia aptaneura

Acacia bivenosa

Aristida contorta

Sclerolaena cornishiana

Senna sp. Meekatharra (E. Bailey 1-26)

Site AERL-16

Described by LJA Date 8/08/2012 Type

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 804141 mE 7488320 mN

Habitat Plain

Soil Orange clayey sand

Rock Type Calcrete, <2% loose rock cover

Vegetation *Acacia synchronicia*, *Eremophila youngii* subsp. *lepidota* and *Acacia sclerosperma* subsp. *sclerosperma* tall open shrubland over *Senna* sp. Meekatharra (E. Bailey 1-26), *Eremophila forrestii* subsp. *forrestii* and *Sclerolaena* sp. low sparse shrubland/low sparse chenopod shrubland with *Acacia aptaneura* low scattered trees

U ^*Acacia aptaneura*\^shrub\6\bi ;M+ ^*Acacia synchronicia*,*Eremophila youngii* subsp. *lepidota*,*Acacia sclerosperma* subsp. *sclerosperma*\^shrub\4\r;G ^*Senna* sp. Meekatharra (E. Bailey 1-26),*Eremophila forrestii* subsp. *forrestii*,*Sclerolaena* sp.\^shurb\2\r

Veg Condition Good

Fire Age >5 years

Notes Disturbance: grazed

1% weed cover (**Cenchrus ciliaris*)

Vegetation has open patches.

Largely chenopod ground stratum. *Eremophila cuneifolia* is characteristic in some areas of this vegetation type.



Species list

Acacia aptaneura

Acacia sclerosperma subsp. *sclerosperma*

Acacia synchronicia

Eremophila forrestii subsp. *forrestii*

Eremophila youngii subsp. *lepidota*

Sclerolaena sp.

Senna sp. Meekatharra (E. Bailey 1-26)

Site AERL-17

Described by LJA Date 8/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 804070 mE 7488572 mN

Habitat Dune

Soil Red sand

Rock Type n/a

Vegetation *Acacia aptaneura*, *A. pruinocarpa* and *Hakea lorea* subsp. *lorea* low open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *A. synchronicia* and *Stylobasium spathulatum* tall-mid sparse shrubland over *Eragrostis eriopoda*, *Digitaria* sp. and *Senna* sp. Meekatharra (E. Bailey 1-26) low open tussock grassland/low sparse shrubland
U+ ^*Acacia aptaneura*,*A. pruinocarpa*,*Hakea lorea* subsp. *lorea*\^tree\6\r;M ^*Acacia sclerosperma* subsp. *sclerosperma*,*A. synchronicia*,*Stylobasium spathulatum*\^shrub\4\r;G ^ *Eragrostis eriopoda*,*Digitaria* sp.,*Senna* sp. Meekatharra (E. Bailey 1-26)\^tussock grass,srhub\1\i

Veg Condition Very good

Fire Age >5 years

Notes Disturbance: grazed
<1% weeds
Vegetation forms a mosaic with AERL-16



Species list

Acacia aptaneura
Acacia pruinocarpa
Acacia sclerosperma subsp. *sclerosperma*
Acacia synchronicia
Digitaria sp.
Eragrostis eriopoda
Hakea lorea subsp. *lorea*
Senna sp. Meekatharra (E. Bailey 1-26)
Stylobasium spathulatum

Site AERL-18

Described by LJA Date 8/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 803953 mE 7489919 mN

Habitat Floodplain

Soil Red brown clay loam

Rock Type n/a

Vegetation *Eucalyptus victrix* and *Acacia aptanera* low open woodland over *Acacia tetragonophylla* and **Vachellia farnesiana* tall-mid sparse shrubland over *Urochloa occidentalis* var. *occidentalis*, *Eragrostis xerophylla* and **Malvastrum americanum* mid tussock grassland/low sparse forband
U+ ^*Eucalyptus victrix*,*Acacia aptanera*\^tree\6\r;M ^*Acacia salicina*,*Alectryon oleifolius*,*Acacia stenophylla*\^shrub\4\r;G ^*Aristida ramosa*,*Astrebla squarrosa*,*Bothriochloa decipiens*\^tussock grass,forb\2\i

Veg Condition Good

Fire Age >10 years

Notes Disturbance: grazed

5% weed cover

Many grass species: some areas dominated by *Chrysopogon fallax*



Species list

Acacia aptanera

Acacia tetragonophylla

Eragrostis xerophila

Eucalyptus victrix

**Malvastrum americanum*

Urochloa occidentalis var. *occidentalis*

**Vachellia farnesiana*

Site AHH1201R

Described by HEH Date 3/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 797731 mE 7431722 mN

Habitat Flat

Soil Red brown sandy loam

Rock Type Ironstone, <2% loose rock cover

Vegetation *Acacia paraneura* low woodland over *Enneapogon polyphyllus*, *Eragrostis xerophylla* and *Aristida contorta* low tussock grassland

Veg Condition Very good

Fire Age >5 years

Notes Disturbance: cattle grazing, edge effects

0% weed cover

Other species include *Senna artemisioides* subsp. *helmsii*, *S. artemisioides* subsp. *oligophylla*, *Salsola australis* and *Sporobolus* sp.



Species list

Acacia paraneura

Aristida contorta

Enneapogon polyphyllus

Eragrostis xerophila

Site AHH1202R

Described by HEH Date 3/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 797814 mE 7431910 mN

Habitat Flat clay pan

Soil Red brown clay loam

Rock Type Ironstone, quartz and others, 50-90% loose rock cover

Vegetation *Aristida contorta* and *Sclerolaena lanicuspis* low sparse tussock grassland/low sparse chenopod shrubland

Veg Condition Very good

Fire Age >5 years

Notes Disturbance type: cattle
No weeds



Species list

Aristida contorta

Sclerolaena lanicuspis

Site AHH1203R

Described by HEH Date 3/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 798223 mE 7432476 mN

Habitat Flat

Soil Red brown loam

Rock Type Ironstone, >90% loose rock cover

Vegetation *Acacia aptaneura* and *A. synchronicia* low woodland over *Senna artemisioides* subsp. *oligophylla* and *Eremophila cuneifolia* mid sparse shrubland over *Triodia epactia* low open hummock grassland

Veg Condition Good-Very good

Fire Age >5 years

Notes Disturbance: cattle grazing
No weeds



Species list

Acacia aptaneura

Acacia synchronicia

Eremophila cuneifolia

Senna artemisioides subsp. *oligophylla*

Triodia epactia

Site AHH1204R

Described by HEH Date 3/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 799797 mE 7435048 mN

Habitat Flat

Soil Red brown clay loam

Rock Type n/a

Vegetation *Acacia macraneura* low closed forest over *Eremophila forrestii* subsp. *forrestii*, *E. latrobei* subsp. *filiformis* and *Acacia tetragonophylla* mid sparse shrubland over *Corchorus tridens*, *Aristida inaequiglumis* and Poaceae spp. low sparse shrubland/low sparse grassland

Veg Condition Good-Very good

Fire Age >5 years

Notes Disturbance: grazing

No weeds

Mulga grove



Species list

Acacia macraneura

Acacia tetragonophylla

Aristida inaequiglumis

Corchorus tridens

Eremophila forrestii subsp. *forrestii*

Eremophila latrobei subsp. *filiformis*

Poaceae sp.

Site AHH1205R

Described by HEH Date 3/08/2012 Type

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 799966 mE 7435431 mN

Habitat Flat

Soil Red brown clay loam

Rock Type n/a

Vegetation *Aristida contorta* and *Gomphrena* sp. low sparse grassland/low sparse forbland with *Acacia synchronicia* and *Salsola australis* tall-mid scattered shrubs

Veg Condition Good-Very good

Fire Age >5 years

Notes Disturbance: cattle grazing and tracks

No weeds

A lot of dead grasses

Senna artemisioides subsp. *helmsii* also common



Species list

Acacia synchronicia

Aristida contorta

Gomphrena sp.

Salsola australis

Site AHH1206R

Described by HEH Date 4/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 801423 mE 7437898 mN

Habitat Flat

Soil Red brown clay loam

Rock Type n/a

Vegetation *Acacia macraneura*, *A. pruinocarpa* and *A. ancistrocarpa* tall open shrubland over *Tridonia basedowii* low hummock grassland

Veg Condition Good-Very good

Fire Age

Notes Disturbance: cattle



Species list

Acacia ancistrocarpa

Acacia macraneura

Acacia pruinocarpa

Tridonia basedowii

Site AHH1207R

Described by HEH Date 5/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 808937 mE 7475078 mN

Habitat Flat, possibly slightly damp

Soil Red brown loam (silty?)

Rock Type n/a

Vegetation *Eucalyptus gamophylla* and *Acacia coriacea* subsp. *pendens* low sparse mallee shrubland/low open woodland over *Acacia ancistrocarpa* mid sparse shrubland over *Triodia basedowii* and *Paraneurachne muelleri* low open hummock grassland/low sparse tussock grassland

Veg Condition Very good

Fire Age >3 years

Notes Disturbance: cattle
No weeds



Species list

Acacia ancistrocarpa
Acacia coriacea subsp. *pendens*
Eucalyptus gamophylla
Paraneurachne muelleri
Triodia basedowii

Site AHH1208Q

Described by HEH Date 9/08/2012 Type Q
 Season A
 Location Alinta Energy Newman to Roy Hill
 MGA Zone 50 808841 mE 7472668 mN E S
 Habitat Flat
 Soil Red brown stony loam
 Rock Type No exposed rock
 Vegetation *Triodia basedowii* and *Bonamia erecta* low open hummock grassland/sparse shrubland with *Eucalyptus gamophylla* low scattered trees over *Acacia ancistrocarpa* mid scattered shrubs
 U ^*Eucalyptus gamophylla*\^tree\6\bi:M ^ *Acacia ancistrocarpa*\^shrub\3\bi:G+ ^*Triodia basedowii*,
Bonamia rosea\^hummock grass, shrub\1\i
 Veg Condition Excellent
 Fire Age >2 years
 Notes <1% leaf litter, <1 cm depth
 75% bare ground
 0% weeds
 Disturbance type: none
 Fire notes: regrowth of trees/shrubs, fire response species, blackened stags

No photo

Species list	Cover (%)	Height (m)
<i>Acacia ancistrocarpa</i>	<2	1.6
<i>Acacia melleodora</i>	<1	0.3
<i>Acacia pachyacra</i>	<1	0.2-1
<i>Acacia pruinocarpa</i>	<1	1.7
<i>Aristida inaequiglumis</i>	<1	0.2
<i>Aristida inaequiglumis</i>	<1	0.6
<i>Bonamia erecta</i>	2	0.2
<i>Bulbostylis barbata</i>	<1	0.1
<i>Corchorus</i> sp.	<1	
<i>Cymbopogon</i> sp.	<1	0.3
<i>Dicrastylis cordifolia</i>	<1	0.3
<i>Dodonaea coriacea</i>	<1	0.8
<i>Eremophila longifolia</i>	<1	0.7
<i>Eucalyptus gamophylla</i>	<2	3
<i>Euphorbia australis</i>	<1	0.15
<i>Hibiscus coatesii</i>	<1	0.2
<i>Paraneurachne muelleri</i>	<1	0.3
<i>Ptilotus astrolasius</i>	<1	0.3
<i>Ptilotus exaltatus</i>	<1	0.8
<i>Senna artemisioides</i> subsp. <i>oligophylla</i>	<1	0.1
<i>Senna notabilis</i>	<1	0.1
<i>Sida echinocarpa</i>	<1	
<i>Sporobolus australasicus</i>	<1	0.1
<i>Streptoglossa decurrens</i>	<1	1.6
<i>Tribulus</i> sp.	<1	prostrate
<i>Triodia basedowii</i>	20	0.3

Site AHH1209R

Described by HEH Date 6/08/2012 Type

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 808291 mE 7464044 mN

Habitat Flat

Soil Red brown clay loam

Rock Type n/a

Vegetation *Acacia pruinocarpa*, *A. ancistrocarpa* and *A. pachyacra* tall-mid sparse shrubland over *Triodia basedowii* open hummock grassland

Veg Condition Good-Very good

Fire Age >2 years

Notes Disturbance: grazing
**Portulaca oleracea* nearby



Species list

Acacia ancistrocarpa

Acacia pachyacra

Acacia pruinocarpa

Site AHH1210R

Described by HEH Date 6/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 808365 mE 7465994 mN

Habitat Flat

Soil Red brown clay loam

Rock Type n/a

Vegetation *Acacia ancistrocarpa* mid sparse shrubland over *Triodia basedowii* low hummock grassland with *Corymbia deserticola* subsp. *deserticola* low scattered trees

Veg Condition Very good

Fire Age >5 years

Notes Disturbance: cattle

No weeds

Shrubs get sparser and dominant species change in this vegetation type



Species list

Acacia ancistrocarpa

Corymbia deserticola subsp. *deserticola*

Triodia basedowii

Site AHH1211R

Described by HEH Date 6/08/2012 Type R
Season A
Location Alinta Energy Newman to Roy Hill
MGA Zone 50 808447 mE 7466386 mN
Habitat Flat
Soil Red brown clay loam
Rock Type Mixed including ironstone and quartz; 20-50% loose rock cover
Vegetation *Triodia longiceps* low hummock grassland
Veg Condition Very good
Fire Age >3 years
Notes Disturbance: ?cattle
No weeds



Species list

Triodia longiceps

Site AHH1212Q

Described by HEH Date 6/08/2012 Type Q 50*50 m

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 808826 mE 7472284 mN

Habitat Flat

Soil Red brown clay loam

Rock Type 0% outcropping, 0% loose rock

Vegetation *Acacia paraneura* and *A. aptaneura* low woodland over *Triodia basedowii*, *Triodia epactia* and *Aristida contorta* low open hummock grassland/sparse tussock grassland
U+ ^Mulga *paraneura*, *Mulga aptaneura* \^tree\6\i:G ^*Triodia basedowii*, ^*Triodia epactia*, *Aristida contorta*\^hummock grass, tussock grass\1\i

Veg Condition Very good

Fire Age >2 years

Notes <1% leaf litter, <1 cm depth

<1% weeds

Disturbance type: grazing/trampling, weeds

Fire notes: burnt stags, lots of small Mulga, fire response species



Species list

Species list	Cover (%)	Height (m)
? <i>Stackhousia</i> sp.	<1	0.15
<i>Abutilon otocarpum</i>	<1	0.2
<i>Acacia ancistrocarpa</i>	<1	1.5
<i>Acacia aptaneura</i>	2	5-6
<i>Acacia pachyacra</i>	<1	1.5
<i>Acacia paraneura</i>	8	5-6
<i>Acacia synchronicia</i>	<1	0.5
<i>Aristida contorta</i>	5	0.2-0.3
<i>Aristida inaequiglumis</i>	<1	0.3
<i>Bonamia erecta</i>	<1	0.3
<i>Cleome viscosa</i>	<1	0.5
<i>Corchorus ?sidoides</i>	<1	0.8
<i>Cymbopogon procerus</i>	<1	0.3
<i>Dysphania</i> sp.	<1	<0.05
<i>Eremophila cuneifolia</i>	<1	0.3
<i>Eremophila forrestii</i>	<1	1.2
<i>Eremophila longifolia</i>	<1	1
<i>Maireana planifolia</i>	<1	0.35
Poaceae sp.	<1	<0.05
<i>Polycarpaea corymbosa</i>	<1	0.1
* <i>Portulaca oleracea</i>	<1	prostrate

<i>Ptilotus astrolasius</i>	<1	0.4
<i>Ptilotus exaltatus</i>	<1	1.1
<i>Salsola australis</i>	<1	0.2
<i>Sclerolaena cornishiana</i>	<1	0.4
<i>Senna artemisioides</i> subsp. <i>helmsii</i>	<1	0.5
<i>Senna artemisioides</i> subsp. <i>oligophylla</i>	<1	0.4
<i>Senna glutinosa</i> subsp. <i>glutinosa</i> x <i>luerssenii</i>	<1	1.6
<i>Senna notabilis</i>	<1	0.15
<i>Sida arenicola</i>	<1	1
<i>Sida echinocarpa</i>	<1	0.7
<i>Solanum lasiophyllum</i>	<1	1
<i>Solanum sturtianum</i>	<1	1.5
<i>Sporobolus australasicus</i>	<1	0.05
<i>Triodia basedowii</i>	10	0.3
<i>Triodia epactia</i>	10	0.4

Site AHH1213R

Described by HEH Date 7/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 792111 mE 7419391 mN

Habitat Lower slope of rolling hills, very gentle slope with easterly aspect

Soil Red brown loam

Rock Type Ironstone, >90% loose rock

Vegetation *Acacia bivenosa*, *A. sibirica* and *A. sclerosperma* subsp. *sclerosperma* mid sparse shrubland over *Triodia basedowii* and *Triodia epactia* low open hummock grassland with *Eucalyptus gamophylla* scattered mallee shrubs

Veg Condition Poor-Good

Fire Age

Notes Disturbance: weeds, modified landscape, cattle
2% weed cover



Species list

Acacia bivenosa

Acacia sclerosperma subsp. *sclerosperma*

Acacia sibirica

Eucalyptus gamophylla

Triodia basedowii

Triodia epactia

Site AHH1214R

Described by HEH Date 7/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 792232 mE 7419698 mN

Habitat Lower slope of rolling hills, very gentle slope with north-easterly aspect

Soil Red brown clay loam

Rock Type

Vegetation *Acacia monticola* and *A. aptaneura* tall sparse shrubland over *Acacia bivenosa* and *Petalostylis labicheoides* mid sparse shrubland over *Triodia epactia* and *Paraneurachne muelleri* low sparse hummock grassland/low sparse tussock grassland

Veg Condition

Fire Age >5 years

Notes Disturbance: weeds (**Cenchrus ciliaris*)

<2% weed cover

Cymbopogon sp. also common



Species list

Acacia aptaneura

Acacia bivenosa

Acacia monticola

Paraneurachne muelleri

Petalostylis labicheoides

Triodia epactia

Site AHH1215R

Described by HEH Date 7/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 792260 mE 7419782 mN

Habitat Minor drainage depression

Soil Red brown clay loam

Rock Type n/a

Vegetation *Acacia ancistrocarpa* and *A. bivenosa* tall shrubland over **Cenchrus ciliaris* and *Triodia epactia* mid open tussock grassland/mid open hummock grassland

Veg Condition Poor-good

Fire Age >5 years

Notes Disturbance: weeds
25% weed cover



Species list

Acacia ancistrocarpa

Acacia bivenosa

**Cenchrus ciliaris*

Triodia epactia

Site AHH1216R

Described by HEH Date 7/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 792294 mE 7419902 mN

Habitat Mid slope of rolling hills, gentle-very gentle slope of various aspects

Soil Red brown loam

Rock Type Ironstone, >90% loose rock cover, <2% outcropping

Vegetation *Triodia basedowii* and *Acacia hilliana* low hummock grassland/low sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees over *Acacia bivenosa* mid scattered shrubs

Veg Condition Very good

Fire Age >3 years

Notes Disturbance: cattle



Species list

Acacia bivenosa

Acacia hilliana

Eucalyptus leucophloia subsp. *leucophloia*

Triodia basedowii

Site AHH1217R

Described by HEH Date 7/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 792423 mE 7420020 mN

Habitat Crest of ridge

Soil Red brown loam

Rock Type Ironstone, 50-90% loose rock, 20-50% outcropping

Vegetation *Triodia epactia* low hummock grassland with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees

Veg Condition Excellent

Fire Age >5 years

Notes No disturbance
No weeds



Species list

Eucalyptus leucophloia subsp. *leucophloia*

Triodia epactia

Site AHH1218R

Described by HEH Date 7/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 792867 mE 7421072 mN

Habitat Flat valley floor, open drainage

Soil Red brown silty loam

Rock Type n/a

Vegetation *Acacia sclerosperma* subsp. *sclerosperma* and *A. pachyacra* tall sparse shrubland over **Cenchrus ciliaris* and *Triodia epactia* mid tussock grassland/open hummock grassland with *Corymbia candida* subsp. *dipsodes* isolated clumps of trees

Veg Condition Poor-Good

Fire Age >5 years

Notes Disturbance: cattle
45% weed cover



Species list

Acacia pachyacra

Acacia sclerosperma subsp. *sclerosperma*

**Cenchrus ciliaris*

Corymbia candida subsp. *dipsodes*

Triodia epactia

Site AHH1219R

Described by HEH **Date** 7/08/2012 **Type** R
Season A
Location Alinta Energy Newman to Roy Hill
MGA Zone 50 792937 mE 7421278 mN
Habitat Incised drainage
Soil Stony loam
Rock Type Alluvial rocks, >90% loose rock cover
Vegetation *Eucalyptus victrix* mid woodland over *Acacia citrinoviridis* tall sparse shrubland over **Cenchrus ciliaris*,
Themeda triandra and *Tephrosia rosea* var. *glabrior* mid tussock grassland/low sparse shrubland

Veg Condition Poor-Good

Fire Age >5 years

Notes Disturbance: weeds, cattle
25% weed cover



Species list

Acacia citrinoviridis
**Cenchrus ciliaris*
Eucalyptus victrix
Tephrosia rosea var. *glabrior*
Themeda triandra

Site AHH1220R

Described by HEH Date 7/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 795242 mE 7426268 mN

Habitat Flat

Soil Red loam

Rock Type n/a

Vegetation *Triodia epactia*, *Ptilotus astrolasius* and *Paraneurachne muelleri* low open hummock grassland/low open shrubland/low sparse tussock grassland with *Acacia trudgeniana* tall scattered shrubs over *Petalostylis labicheoides* mid scattered shrubs

Veg Condition Very good

Fire Age <5 years

Notes Disturbance: horses, human disturbance
No weeds



Species list

Acacia trudgeniana

Paraneurachne muelleri

Petalostylis labicheoides

Ptilotus astrolasius

Triodia epactia

Site AHH1221R

Described by HEH Date 7/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 795475 mE 7426770 mN

Habitat Flat

Soil Red brown loam

Rock Type Ironstone, 2-10% loose rock cover

Vegetation *Acacia ?aptaneura* sparse shrubland over *Acacia sclerosperma* subsp. *sclerosperma* and *A. synchronicia* sparse mid shrubland over *Triodia epactia* and *Aristida contorta* low open hummock grassland/low sparse grassland

Veg Condition Very good

Fire Age >2 years

Notes Disturbance: horses
<1% weed cover (**Portulaca oleracea*)



Species list

Acacia ?aptaneura

Acacia sclerosperma subsp. *sclerosperma*

Acacia synchronicia

Aristida contorta

Triodia epactia

Site AHH1222R

Described by HEH Date 7/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 796320 mE 7428502 mN

Habitat Flat

Soil Red brown loam

Rock Type n/a

Vegetation *Eremophila cuneifolia* and *Senna* sp. Meekatharra (E. Bailey 1-26) low sparse shrubland with *Acacia ?aptaneura* tall scattered shrubs with *Acacia sclerosperma* subsp. *sclerosperma* mid scattered shrubs

Veg Condition Very good

Fire Age >2 years

Notes Disturbance: horses and cattle
No weeds



Species list

Acacia ?aptaneura

Acacia sclerosperma subsp. *sclerosperma*

Eremophila cuneifolia

Senna sp. Meekatharra (E. Bailey 1-26)

Site AHH1223R

Described by HEH Date 8/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 805942 mE 7495492 mN

Habitat Flat, claypan

Soil Red brown clay loam

Rock Type Ironstone, 2-10% loose rock cover

Vegetation *Sclerolaena cornishiana* and *S. bicornis* var. *bicornis* low sparse chenopod shrubland

Veg Condition Poor-Good

Fire Age >5 years

Notes Disturbance: grazing

No weeds



Species list

Sclerolaena bicornis var. *bicornis*

Sclerolaena cornishiana

Site AHH1224R

Described by HEH Date 8/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 805839 mE 7495116 mN

Habitat Flat

Soil Red brown clay loam

Rock Type Unknown, <2% loose rock cover

Vegetation *Eucalyptus victrix* and *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma* and **Vachellia farnesiana* tall-mid open shrubland over **Cenchrus ciliaris* and *Salsola australis* mid sparse tussock grassland/low chenopod shrubland

Veg Condition Poor-Good

Fire Age >5 years

Notes Disturbance: grazing, weeds
>5% weed cover (**Malvastrum americanum*, **Vachellia farnesiana*, **Cenchrus ciliaris*)
Rhagodia sp. Hamersley (P3) present



Species list

Acacia sclerosperma subsp. *sclerosperma*
**Cenchrus ciliaris*
Eucalyptus victrix
Rhagodia sp. Hamersley (M. Trudgen 17794)
Salsola australis
**Vachellia farnesiana*

Site AHH1225R

Described by HEH Date 8/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 805613 mE 7494545 mN

Habitat Flat

Soil Red brown clay loam

Rock Type Unknown, <2% loose rock cover

Vegetation *Eucalyptus victrix*, *Acacia aptaneura*, *Atalaya hemiglauca* open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Eremophila youngii* subsp. *lepidota* and *A. synchronicia* tall-mid sparse shrubland over **Cenchrus ciliaris* and **Malvastrum americanum* low sparse tussock grassland/low sparse forbland

Veg Condition Poor-Good

Fire Age >5 years

Notes Disturbance: weeds, cattle etc including dam area with infrastructure around it
>3% weed cover



Species list

Acacia aptaneura

Acacia sclerosperma subsp. *sclerosperma*

Acacia synchronicia

Atalaya hemiglauca

**Cenchrus ciliaris*

Eremophila youngii subsp. *lepidota*

Eucalyptus victrix

**Malvastrum americanum*

Site AHH1226R

Described by HEH Date 8/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 805318 mE 7493694 mN

Habitat Slightly raised flat

Soil Red brown clay loam

Rock Type Calcrete, 20-50% loose rock cover, <2% outcropping

Vegetation *Senna glutinosa* subsp. *luerssenii* x *pruinosa* mid sparse shrubland with *Acacia aptaneura* low scattered trees over *Enneapogon caeruleus* scattered tussock grasses

Veg Condition Good-Very good

Fire Age >2 years

Notes Disturbance: weeds, cattle
<2% weed cover (**Aerva javanica*)



Species list

Acacia aptaneura

**Aerva javanica*

Enneapogon caeruleus

Senna glutinosa subsp. *luerssenii* x *pruinosa*

Site AHH1227R

Described by HEH Date 8/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 805118 mE 7493060 mN

Habitat Undulating hills, gentle slope of various aspects

Soil Light brown loam

Rock Type Calcrete, >90% loose rock cover, <2% outcropping

Vegetation **Cenchrus ciliaris* and **Aerva javanica* low sparse tussock grassland/low sparse forbland with *Acacia paraneura* low scattered trees over **Vachellia farnesiana* mid scattered shrubs

Veg Condition Poor-Good

Fire Age >5 years

Notes Disturbance: weeds, Telstra line poles
>10% weed cover



Species list

Acacia paraneura

**Cenchrus ciliaris*

**Vachellia farnesiana*

Site AHH1228R

Described by HEH Date 8/08/2012 Type R

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 804918 mE 7492830 mN

Habitat Incised creek

Soil Red brown loam

Rock Type n/a

Vegetation *Eucalyptus victrix*, *E. camaldulensis* subsp. *refulgens* and *Atalaya hemiglauca* mid open forest over Poaceae sp. mid open tussock grassland with **Vachellia farnesiana* mid scattered shrubs

Veg Condition Poor

Fire Age >5 years

Notes Disturbance: weeds, cattle, horses
>25% weed cover



Species list

Atalaya hemiglauca

Eucalyptus camaldulensis subsp. *refulgens*

Eucalyptus victrix

Poaceae sp.

**Vachellia farnesiana*

Site AHH1229Q

Described by HEH Date 8/08/2012 Type Q 50 m x 50 m

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 805564 mE 7494206 mN

Habitat Very gentle lower slope of undulating landscape

Soil Red brown clay loam

Rock Type Calcrete, <2% loose rock, 6-20 mm

Vegetation *Eucalyptus victrix* and *Acacia aptaneura* low sparse woodland over *Acacia sclerosperma* subsp. *sclerosperma* mid sparse shrubland over **Cenchrus ciliaris* and *Sporobolus australasicus* low sparse tussock grassland
 U+ ^*Eucalyptus victrix*, *Acacia aptaneura*\^tree\6\r:M ^*Acacia sclerosperma*\^shrub\3\rG ^*Cenchrus ciliaris*, *Sporobolus australasicus*\^tussock grass\1\r

Veg Condition Poor

Fire Age >5 years

Notes 10% leaf litter, <1-5 cm depth

88% bare ground

>3% weeds

Disturbance type: cattle

Fire notes: no evidence of recent fire



Species list

Species list	Cover (%)	Height (m)
<i>Abutilon ?fraseri</i>	<1	0.4
<i>Acacia aptaneura</i>	2	5.6
<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>	8	1.5-2
<i>Acacia tetragonophylla</i>	<1	0.2
<i>*Aerva javanica</i>	<1	1.4
<i>Alysicarpus muelleri</i>	<1	1.2
<i>Atalaya hemiglauca</i>	<1	1.2-1.7
<i>*Bidens bipinnata</i>	<1	0.1
<i>Boerhavia</i> sp.	<1	semi prostrate
<i>Capparis lasiantha</i>	<1	0.4
<i>Capparis umbonata</i>	<2	1.2-2.2
<i>*Cenchrus ciliaris</i>	3	0.15-0.3
<i>Dicladantha forrestii</i>	<1	0.2
<i>Eragrostis falcata</i>	<1	0.2
<i>Eucalyptus victrix</i>	7	7
<i>Evolvulus alsinoides</i> var. <i>villosicalyx</i>	<1	0.1
<i>Gomphrena affinis</i> subsp. <i>pilbarensis</i>	<1	1
<i>Grevillea striata</i>	<1	0.15

<i>Grevillea striata</i>	<1	1.5
* <i>Heliotropium europaeum</i>	<1	0.1
Malvaceae sp.	<1	
* <i>Malvastrum americanum</i>	2	0.1
<i>Ptilotus exaltatus</i>	<1	0.1
<i>Ptilotus</i> sp.	<1	0.8
<i>Salsola australis</i>	<1	2
<i>Scaevola spinescens</i>	<1	0.8
<i>Sclerolaena cornishiana</i>	<1	0.2
<i>Sclerolaena costata</i>	<1	0.15
<i>Senna artemisioides</i> subsp. <i>oligophylla</i>	<1	1
<i>Sporobolus australasicus</i>	<2	0.7
* <i>Vachellia farnesiana</i>	<1	<0.05

Site AHH1230Q

Described by HEH Date 9/08/2012 Type Q 50*50 m

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 796933 mE 7430012 mN

Habitat Flat

Soil Red brown stony silty loam

Rock Type Mixed rock, <2% rock, 20-60 mm

Vegetation *Acacia synchronicia* mid sparse shrubland over *Triodia longiceps* and *Eremophila cuneifolia* mid sparse hummock grassland/low sparse shrubland
U+ ^*Acacia synchronicia* ^shrub\3\r:G ^*Triodia longiceps*, *Eremophila cuneifolia* ^hummock grass, shrub\2\r

Veg Condition Good-Very good

Fire Age >5 years

Notes <1% leaf litter, <1 cm depth

92% bare ground

0% weeds

Disturbance type: bare areas though appears natural, cattle tracks

Fire notes: no evidence of recent fire



Species list

Species list	Cover (%)	Height (m)
<i>Abutilon otocarpum</i>	<1	0.1
<i>Acacia synchronicia</i>	5	1.5-2.5
<i>Aristida contorta</i>	<1	0.2
<i>Brachyachne prostrata</i>	<1	prostrate
<i>Calandrinia ?pumila</i>	<1	0.05
<i>Dysphania rhadinostachya</i>	<1	0.15
<i>Eragrostis dielsii</i>	<1	0.15
<i>Eragrostis falcata</i>	<1	0.15
<i>Eremophila cuneifolia</i>	2	0.5
<i>Fimbristylis</i> sp.	<1	0.3
<i>Gomphrena affinis</i> subsp. <i>pilbarensis</i>	<1	0.2
<i>Hibiscus sturtii</i>	<1	0.2
<i>Lepidium phlebopetalum</i>	<1	0.1
<i>Maireana georgei</i>	<1	0.15
<i>Maireana melanocoma</i>	<1	0.3
<i>Maireana melanocoma</i>	<1	0.2
<i>Polycarpaea corymbosa</i>	<1	0.1
<i>Portulaca</i> sp.	<1	0.15
<i>Ptilotus exaltatus</i>	<1	0.3
<i>Ptilotus helipteroides</i>	<1	0.25

<i>Sclerolaena beagleholei</i>	<1	0.2
<i>Sclerolaena densiflora</i>	<1	0.2
<i>Sclerolaena densiflora</i>	<1	0.4
<i>Sclerolaena eriacantha</i>	<1	0.2
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	<1	1
<i>Sida</i> sp.	<1	0.15
<i>Solanum lasiophyllum</i>	<1	0.2
<i>Sporobolus australasicus</i>	<1	0.1
<i>Streptoglossa bubakii</i>	<1	0.15
<i>Streptoglossa liatroides</i>	<1	0.2
<i>Triodia longiceps</i>	5	1

Site AHH1231Q

Described by HEH Date 9/08/2012 Type Q 50 m x 50 m

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 796232 mE 7428502 mN

Habitat Flat

Soil Red brown stony loam with 'crunchy' top layer

Rock Type Ironstone, quartz and other rock, >90% loose rock, 2-6 mm

Vegetation *Acacia aptaneura* tall open shrubland over *Eremophila cuneifolia* and *Ptilotus nobilis* var. *nobilis* mid open shrubland
M+ ^*Acacia aptaneura*^\shub\4\iG ^*Eremophila cuneifolia*, *Ptilotus nobilis* var. *nobilis*^\shrub\2\i

Veg Condition Good

Fire Age <6 years

Notes 2% leaf litter, <1-5 cm depth

85% bare ground

<2% weeds

Disturbance type: cattle, horses, weeds

Fire notes: lots of burnt stags, regrowth, fire response species



Species list

Species list	Cover (%)	Height (m)
<i>Acacia aptaneura</i>	12	2-4.5
<i>Acacia synchronicia</i>	1	3
<i>Aristida contorta</i>	1	0.15
<i>Calandrinia ?pumila</i>	<1	0.05
* <i>Cenchrus ciliaris</i>	<1	0.8
<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	<1	0.15
<i>Enneapogon polyphyllus</i>	<1	0.1
<i>Eragrostis falcata</i>	<1	0.1
<i>Eremophila cuneifolia</i>	8	0.5-0.9
<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	<1	0.8
<i>Eremophila</i> sp.	<1	1.4
<i>Eriachne pulchella</i> subsp. <i>dominii</i>	<1	0.1
<i>Evolvulus alsinoides</i> var. <i>villosicalyx</i>	<1	0.15
<i>Gomphrena affinis</i> subsp. <i>pilbarensis</i>	<1	0.2
<i>Gomphrena cunninghamii</i>	<1	0.1
<i>Goodenia prostrata</i>	<1	prostrate
<i>Grevillea striata</i>	<1	1.7
<i>Lepidium phlebopetalum</i>	<1	0.1
<i>Maireana planifolia</i>	<1	0.3
<i>Polycarpaea corymbosa</i>	<1	0.1
<i>Pterocaulon</i> sp.	<1	0.05

<i>Ptilotus nobilis</i> var. <i>nobilis</i>	2	0.2-0.5
<i>Rhagodia eremaea</i>	<1	0.7
<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794)	<1	0.6
<i>Salsola australis</i>	<1	0.5
<i>Sclerolaena bicornis</i> var. <i>bicornis</i>	<1	0.3
<i>Sclerolaena densiflora</i>	<1	0.2
<i>Senna glutinosa</i> subsp. <i>luersenii</i> x <i>pruinosa</i>	<1	0.5-1.2
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	<1	1.1
<i>Sida echinocarpa</i>	<1	0.4
<i>Sida</i> sp.	<1	0.7
<i>Solanum lasiophyllum</i>	<1	0.3
<i>Streptoglossa bubakii</i>	<1	0.6
<i>Trianthema</i> sp.	<1	prostrate

Site AHH1232Q

Described by HEH Date 9/08/2012 Type Q 50 m x 50 m

Season A

Location Alinta Energy Newman to Roy Hill

MGA Zone 50 795355 mE 7426554 mN

Habitat Flat

Soil Red brown stony loam

Rock Type No exposed rock

Vegetation *Acacia sclerosperma* subsp. *sclerosperma*, *A. synchronicia* and *Stylobasium spathulatum* mid open shrubland over *Triodia epactia* mid open hummock grassland
M+ ^*Acacia sclerosperma* subsp. *sclerosperma*, *A. synchronicia*, *Stylobasium spathulatum*^\^shrub\3\iG
^*Triodia epactia*^\^hummock grass\2\i

Veg Condition Good-Very good

Fire Age >5 years

Notes 3% leaf litter, <1-1 cm depth
75% bare ground
<2% weeds
Disturbance type: cattle, horses, weeds
Fire notes: no evidence of recent fire



Species list

Species list	Cover (%)	Height (m)
<i>Acacia ancistrocarpa</i>	1	2-2.5
<i>Acacia bivenosa</i>	<1	2.5
<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>	10	1.7-2.2
<i>Acacia synchronicia</i>	2	1.5-2
<i>Aristida contorta</i>	<1	0.1
* <i>Cenchrus ciliaris</i>	1	0.4
<i>Cleome viscosa</i>	<1	0.3
<i>Cymbopogon</i> sp.	<1	0.2
<i>Duperreya commixta</i>	<1	climber
<i>Dysphania</i> sp.	<1	0.1
<i>Eragrostis eriopoda</i>	<1	0.4
<i>Euphorbia australis</i>	<1	0.1
<i>Euphorbia australis</i>	<1	0.15
<i>Euphorbia tannensis</i> subsp. <i>eremophila</i>	<1	0.4
<i>Gomphrena affinis</i> subsp. <i>pilbarensis</i>	<1	0.2
<i>Goodenia prostrata</i>	<1	prostrate
<i>Goodenia prostrata</i>	<1	prostrate
<i>Heliotropium europaeum</i>	<1	0.05
<i>Hibiscus burtonii</i>	<1	0.4
<i>Indigofera monophylla</i>	<1	0.2

<i>Maireana planifolia</i>	<1	1.3
<i>Petalostylis labicheoides</i>	<1	1.6
<i>Polycarpaea corymbosa</i>	<1	0.1
<i>Pterocaulon</i> sp.	<1	<0.05
<i>Ptilotus astrolasius</i>	<1	0.3
<i>Ptilotus obovatus</i>	<1	0.8
<i>Ptilotus</i> sp.	<1	0.2
<i>Senna artemisioides</i> subsp. <i>oligophylla</i> x <i>helmsii</i>	<1	0.9
<i>Senna glutinosa</i> subsp. <i>luersenii</i> x <i>pruinosa</i>	<1	1.2
<i>Senna notabilis</i>	<1	0.1
<i>Sida echinocarpa</i>	<1	0.4
<i>Sida echinocarpa</i>	<1	0.4
<i>Solanum lasiophyllum</i>	<1	0.7
<i>Streptoglossa bubakii</i>	<1	1
<i>Stylobasium spathulatum</i>	5	1.8
<i>Tribulus</i> sp.	<1	prostrate
<i>Trichodesma zeylanicum</i> var. <i>zeylanicum</i>	<1	1
<i>Triodia epactia</i>	20	0.5-0.6

Appendix Seven: Flora Inventory

Table 25: Flora Inventory

FCode	Family	Cons Code	Introduced	Species
29	Pteridaceae			<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>
80	Lauraceae			<i>Cassytha capillaris</i>
156	Cyperaceae			<i>Bulbostylis barbata</i>
				<i>Fimbristylis simulans</i>
				<i>Fimbristylis</i> sp.
163	Poaceae			<i>Amphipogon sericeus</i>
				<i>Aristida contorta</i>
				<i>Aristida inaequiglumis</i>
				<i>Brachyachne prostrata</i>
			*	<i>Cenchrus ciliaris</i>
				<i>Chloris pumilio</i>
				<i>Chrysopogon fallax</i>
				<i>Cymbopogon ambiguus</i>
				<i>Cymbopogon procerus</i>
				<i>Cymbopogon</i> sp.
				<i>Dactyloctenium radulans</i>
				<i>Digitaria</i> sp.
				<i>Enneapogon caeruleus</i>
				<i>Enneapogon lindleyanus</i>
				<i>Enneapogon polyphyllus</i>
				<i>Enneapogon</i> sp.
				? <i>Enteropogon ramosus</i>
				<i>Eragrostis cumingii</i>
				<i>Eragrostis dielsii</i>
				<i>Eragrostis eriopoda</i>
				<i>Eragrostis falcata</i>
				<i>Eragrostis setifolia</i>
				<i>Eragrostis xerophila</i>
				<i>Eriachne aristidea</i>
				<i>Eriachne ciliata</i>
				<i>Eriachne lanata</i>
				<i>Eriachne mucronata</i>
				<i>Eriachne pulchella</i> subsp. <i>dominii</i>
				<i>Eulalia aurea</i>
				<i>Paraneurachne muelleri</i>
				Poaceae sp.
				<i>Schizachyrium fragile</i>
				<i>Sporobolus australasicus</i>

FCode	Family	Cons Code	Introduced	Species
		P3		<i>Themeda sp. Hamersley Station (M.E. Trudgen 11431)</i>
				<i>Themeda triandra</i>
				<i>Triodia basedowii</i>
				<i>Triodia epactia</i>
				<i>Triodia longiceps</i>
				<i>Triodia wiseana</i>
				<i>Urochloa occidentalis var. occidentalis</i>
				<i>Yakirra australiensis</i>
175	Proteaceae			<i>Grevillea juncifolia subsp. juncifolia</i>
				<i>Grevillea striata</i>
				<i>Grevillea wickhamii</i>
				<i>Grevillea wickhamii subsp. hispidula</i>
				<i>Hakea chordophylla</i>
				<i>Hakea lorea subsp. lorea</i>
196	Haloragaceae			<i>Haloragis gossei var. gossei</i>
				<i>Haloragis sp.</i>
199	Zygophyllaceae		*?	<i>Tribulus ?terrestris</i>
				<i>Tribulus astrocarpus</i>
				<i>Tribulus macrocarpus</i>
				<i>Tribulus sp.</i>
				<i>Tribulus suberosus</i>
201	Fabaceae			<i>Acacia ?aptaneura</i>
				<i>Acacia ?kempeana</i>
				<i>Acacia adoxa var. adoxa</i>
				<i>Acacia adsurgens</i>
				<i>Acacia ancistrocarpa</i>
				<i>Acacia aptaneura</i>
				<i>Acacia bivenosa</i>
				<i>Acacia citrinoviridis</i>
				<i>Acacia coriacea subsp. pendens</i>
				<i>Acacia dictyophleba</i>
				<i>Acacia hilliana</i>
				<i>Acacia inaequilatera</i>
				<i>Acacia macraneura</i>
				<i>Acacia maitlandii</i>
				<i>Acacia melleodora</i>
				<i>Acacia monticola</i>
				<i>Acacia orthocarpa</i>
				<i>Acacia pachyacra</i>
				<i>Acacia paraneura</i>
				<i>Acacia pruinocarpa</i>
				<i>Acacia rhodophloia</i>

FCode	Family	Cons Code	Introduced	Species
				<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>
				<i>Acacia sibirica</i>
				<i>Acacia synchronicia</i>
				<i>Acacia tetragonophylla</i>
				<i>Acacia trudgeniana</i>
				<i>Acacia wanyu</i>
				<i>Alysicarpus muelleri</i>
				? <i>Glycine</i> sp.
				<i>Indigofera colutea</i>
				<i>Indigofera monophylla</i>
				<i>Isotropis atropurpurea</i>
				<i>Isotropis forrestii</i>
				<i>Petalostylis cassioides</i>
				<i>Petalostylis labicheoides</i>
				<i>Rhynchosia minima</i>
				<i>Senna artemisioides</i> subsp. <i>helmsii</i>
				<i>Senna artemisioides</i> subsp. <i>oligophylla</i>
				<i>Senna artemisioides</i> subsp. <i>oligophylla</i> x <i>helmsii</i>
				<i>Senna glutinosa</i>
				<i>Senna glutinosa</i> subsp. <i>glutinosa</i>
				<i>Senna glutinosa</i> subsp. <i>glutinosa</i> x <i>luerssenii</i>
				<i>Senna glutinosa</i> subsp. <i>luerssenii</i> x <i>pruinosa</i>
				<i>Senna glutinosa</i> subsp. <i>pruinosa</i>
				<i>Senna notabilis</i>
				<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)
				<i>Tephrosia rosea</i> var. <i>glabrior</i>
			*	<i>Vachellia farnesiana</i>
202	Surianaceae			<i>Stylobasium spathulatum</i>
229	Celastraceae			<i>Stackhousia intermedia</i>
				? <i>Stackhousia</i> sp.
409	Rubiaceae			<i>Psyrdrax latifolia</i>
415	Boraginaceae		*	<i>Heliotropium europaeum</i>
				<i>Trichodesma zeylanicum</i> var. <i>zeylanicum</i>
416	Convolvulaceae			<i>Bonamia erecta</i>
				<i>Duperreya commixta</i>
				<i>Evolvulus alsinoides</i> var. <i>villosicalyx</i>
				<i>Ipomoea calobra</i>
417	Solanaceae			<i>Solanum centrale</i>
				<i>Solanum lasiophyllum</i>
				<i>Solanum sturtianum</i>
428	Scrophulariaceae			<i>Eremophila cuneifolia</i>
				<i>Eremophila forrestii</i>
				<i>Eremophila forrestii</i> subsp. <i>forrestii</i>

FCode	Family	Cons Code	Introduced	Species
				<i>Eremophila fraseri</i> subsp. <i>fraseri</i>
				<i>Eremophila lanceolata</i>
				<i>Eremophila latrobei</i> subsp. <i>filiformis</i>
				<i>Eremophila latrobei</i> subsp. <i>latrobei</i>
				<i>Eremophila longifolia</i>
				<i>Eremophila maculata</i> subsp. <i>brevifolia</i>
		P1		<i>Eremophila pilosa</i>
				<i>Eremophila platycalyx</i> subsp. <i>pardalota</i>
				<i>Eremophila</i> sp.
		P4		<i>Eremophila youngii</i> subsp. <i>lepidota</i>
432	Lamiaceae			<i>Clerodendrum floribundum</i> var. <i>angustifolium</i>
				<i>Dicrastylis cordifolia</i>
				<i>Newcastelia hexarrhena</i>
437	Acanthaceae			<i>Dicladanthera forrestii</i>
458	Goodeniaceae			<i>Brunonia australis</i>
				<i>Dampiera candidans</i>
				<i>Goodenia ?nuda</i>
				<i>Goodenia ?triodiophila</i>
				<i>Goodenia lamprosperma</i>
				<i>Goodenia microptera</i>
				<i>Goodenia muelleriana</i>
				<i>Goodenia prostrata</i>
				<i>Goodenia</i> sp.
				<i>Goodenia stobbsiana</i>
				<i>Goodenia vilmoriniae</i>
				<i>Scaevola parvifolia</i> subsp. <i>pilbarae</i>
				<i>Scaevola spinescens</i>
460	Asteraceae		*	<i>Bidens bipinnata</i>
				<i>Chrysocephalum gilesii</i>
				<i>Chrysocephalum pterochaetum</i>
				<i>Pluchea rubelliflora</i>
				<i>Pterocaulon ? sphacelatum</i>
				<i>Pterocaulon</i> sp.
				<i>Streptoglossa bubakii</i>
				<i>Streptoglossa decurrens</i>
				<i>Streptoglossa liatroides</i>
				<i>Streptoglossa</i> sp.
472	Araliaceae			<i>Trachymene oleracea</i> subsp. <i>oleracea</i>
	INDETERMINANT			Indeterminant sp.
242	Euphorbiaceae			<i>Euphorbia australis</i>
				<i>Euphorbia boophthona</i>
				<i>Euphorbia</i> sp.
				<i>Euphorbia tannensis</i> subsp. <i>eremophila</i>

FCode	Family	Cons Code	Introduced	Species
261	Violaceae			<i>Hybanthus aurantiacus</i>
281	Myrtaceae			<i>Calytrix carinata</i>
				<i>Corymbia candida</i> subsp. <i>dipsodes</i>
				<i>Corymbia deserticola</i> subsp. <i>deserticola</i>
				<i>Corymbia hamersleyana</i>
				<i>Eucalyptus camaldulensis</i> subsp. <i>refulgens</i>
				<i>Eucalyptus gamophylla</i>
				<i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i>
				<i>Eucalyptus victrix</i>
299	Sapindaceae			<i>Atalaya hemiglauca</i>
				<i>Diplopeltis stuartii</i> var. <i>stuartii</i>
				<i>Dodonaea coriacea</i>
				<i>Dodonaea pachyneura</i>
309	Malvaceae			<i>Abutilon ?fraseri</i>
				<i>Abutilon otocarpum</i>
				<i>Abutilon trudgenii</i>
				<i>Androcalva loxophylla</i>
				<i>Corchorus ?sidoides</i>
				<i>Corchorus lasiocarpus</i> subsp. <i>lasiocarpus</i>
				<i>Corchorus</i> sp.
				<i>Corchorus tridens</i>
				<i>Gossypium robinsonii</i>
				<i>Hibiscus burtonii</i>
				<i>Hibiscus coatesii</i>
				<i>Hibiscus sturtii</i>
				<i>Hibiscus sturtii</i> var. <i>platychlmys</i>
				<i>Keraudrenia</i> sp.
				<i>Keraudrenia velutina</i> subsp. <i>elliptica</i>
				<i>Malvaceae</i> sp.
			*	<i>Malvastrum americanum</i>
			?*	? <i>Malvastrum americanum</i>
				? <i>Melhania oblongifolia</i>
				<i>Sida</i> ?sp. Pilbara (A.A. Mitchell PRP 1543)
				<i>Sida arenicola</i>
				<i>Sida echinocarpa</i>
				<i>Sida</i> sp.
				<i>Sida</i> sp. <i>Excedentifolia</i> (J.L. Egan 1925)
328	Gyrostemonaceae			<i>Codonocarpus cotinifolius</i>
330	Capparaceae			<i>Capparis lasiantha</i>
				<i>Capparis spinosa</i>
				<i>Capparis umbonata</i>
331	Cleomaceae			<i>Cleome viscosa</i>
332	Brassicaceae			<i>Lepidium phlebopetalum</i>

FCode	Family	Cons Code	Introduced	Species
				<i>Stenopetalum decipiens</i>
338	Santalaceae			<i>Anthobolus leptomerioides</i>
339	Loranthaceae			<i>Amyema fitzgeraldii</i>
355	Caryophyllaceae			<i>Polycarpaea corymbosa</i>
				<i>Polycarpaea holtzei</i>
				<i>Polycarpaea involucrata</i>
357	Amaranthaceae		*	<i>Aerva javanica</i>
				<i>Gomphrena affinis</i> subsp. <i>pilbarensis</i>
				<i>Gomphrena cunninghamii</i>
				<i>Gomphrena</i> sp.
				<i>Ptilotus astrolasius</i>
				<i>Ptilotus calostachyus</i>
				<i>Ptilotus exaltatus</i>
				<i>Ptilotus fusiformis</i>
				<i>Ptilotus helipteroides</i>
				<i>Ptilotus nobilis</i> var. <i>nobilis</i>
				<i>Ptilotus obovatus</i>
				<i>Ptilotus polystachyus</i>
				<i>Ptilotus rotundifolius</i>
				<i>Ptilotus schwartzii</i> var. <i>schwartzii</i>
				<i>Ptilotus</i> sp.
358	Chenopodiaceae			<i>Atriplex codonocarpa</i>
				<i>Atriplex semilunaris</i>
				Chenopodiaceae sp.
				<i>Dissocarpus paradoxus</i>
				<i>Dysphania kalpari</i>
				<i>Dysphania rhadinostachya</i>
				<i>Dysphania</i> sp.
				<i>Enchylaena tomentosa</i>
				<i>Maireana georgei</i>
				<i>Maireana melanocoma</i>
				<i>Maireana planifolia</i>
				<i>Maireana tomentosa</i> subsp. <i>tomentosa</i>
				<i>Rhagodia eremaea</i>
				<i>Rhagodia</i> sp.
		P3		<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794)
				<i>Salsola australis</i>
				<i>Sclerolaena beaugleholei</i>
				<i>Sclerolaena bicornis</i> var. <i>bicornis</i>
				<i>Sclerolaena cornishiana</i>
				<i>Sclerolaena costata</i>
				<i>Sclerolaena cuneata</i>
				<i>Sclerolaena densiflora</i>

FCode	Family	Cons Code	Introduced	Species
				<i>Sclerolaena eriacantha</i>
				<i>Sclerolaena lanicuspis</i>
				<i>Sclerolaena</i> sp.
364	Aizoaceae			<i>Trianthema glossostigma</i>
				<i>Trianthema</i> sp.
				<i>Trianthema triquetra</i>
367	Nyctaginaceae			<i>Boerhavia coccinea</i>
				<i>Boerhavia</i> sp.
368	Molluginaceae			<i>Mollugo molluginae</i>
374	Portulacaceae			<i>Caladrinia ?pumila</i>
			*	<i>Portulaca oleracea</i>
				<i>Portulaca</i> sp.

Appendix Eight: Threatened and Priority Flora Report Forms

Threatened and Priority Flora Report Form

Version 1.1 February 2012

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DEC website at <http://www.dec.wa.gov.au/content/view/5388/2237/>

TAXON: <u>Eremophila youngii subsp. lepidota</u>		TPFL Pop. No.: _____
OBSERVATION DATE: <u>05/08/2012</u>	CONSERVATION STATUS: <u>P4</u>	New population <input checked="" type="checkbox"/> Y
OBSERVER/S: <u>Lyn Atkins</u>		PHONE: <u>9430 8955</u>
ROLE: <u>Botanist</u>	ORGANISATION: <u>Ecoscape</u>	

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place): <u>North of Newman, east of the railway that runs parallel to Newman Marble Bar Road, just south of Kalgan Creek</u>		
Reserve No.: _____		
DEC DISTRICT: _____	LGA: _____	Land manager present: <input type="checkbox"/>
DATUM:	COORDINATES: (If UTM coords provided, Zone is also required) DecDegrees <input type="checkbox"/> DegMinSec <input type="checkbox"/> UTM's <input type="checkbox"/>	METHOD USED:
GDA94 / MGA94 <input checked="" type="checkbox"/>	Lat / Northing: <u>7428870</u>	GPS <input checked="" type="checkbox"/> Differential GPS <input type="checkbox"/> Map <input type="checkbox"/>
AGD84 / AMG84 <input type="checkbox"/>	Long / Easting: <u>796512</u>	No. satellites: _____ Map used: _____
WGS84 <input type="checkbox"/>	ZONE: <u>50</u>	Boundary polygon captured: <input type="checkbox"/> Map scale: _____
Unknown <input type="checkbox"/>		
LAND TENURE:		
Nature reserve <input type="checkbox"/>	Timber reserve <input type="checkbox"/>	Private property <input type="checkbox"/>
National park <input type="checkbox"/>	State forest <input type="checkbox"/>	Pastoral lease <input checked="" type="checkbox"/> x
Conservation park <input type="checkbox"/>	Water reserve <input type="checkbox"/>	UCL <input type="checkbox"/> SLK/Pole _____ to _____
		Rail reserve <input type="checkbox"/> MRWA road reserve <input type="checkbox"/> Shire road reserve <input type="checkbox"/> Other Crown reserve <input type="checkbox"/>
		Specify other: _____

AREA ASSESSMENT: Edge survey <input type="checkbox"/> Partial survey <input checked="" type="checkbox"/> Full survey <input type="checkbox"/>	Area observed (m ²): _____															
EFFORT: Time spent surveying (minutes): _____	No. of minutes spent / 100 m ² : _____															
POP'N COUNT ACCURACY: Actual <input type="checkbox"/> Extrapolation <input type="checkbox"/> Estimate <input type="checkbox"/>	Count method: _____ (Refer to field manual for list)															
WHAT COUNTED: Plants <input type="checkbox"/> Clumps <input type="checkbox"/> Clonal stems <input type="checkbox"/>																
TOTAL POP'N STRUCTURE:																
	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Mature:</th> <th>Juveniles:</th> <th>Seedlings:</th> <th>Totals:</th> </tr> </thead> <tbody> <tr> <td>Alive</td> <td><u>10-50</u></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Dead</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Mature:	Juveniles:	Seedlings:	Totals:	Alive	<u>10-50</u>				Dead				
	Mature:	Juveniles:	Seedlings:	Totals:												
Alive	<u>10-50</u>															
Dead																
	Area of pop (m ²): _____															
	Note: Pls record count as numbers (not percentages) for database.															
QUADRATS PRESENT:	No. _____ Size _____ Data attached <input type="checkbox"/> Total area of quadrats (m ²): <u>2500</u>															
Summary Quad. Totals: Alive																
REPRODUCTIVE STATE:																
Clonal <input type="checkbox"/> Vegetative <input type="checkbox"/> Flowerbud <input checked="" type="checkbox"/> Flower <input type="checkbox"/>																
Immature fruit <input type="checkbox"/> Fruit <input checked="" type="checkbox"/> Dehisced fruit <input type="checkbox"/> Percentage in flower: _____ %																

CONDITION OF PLANTS: Healthy Moderate Poor Senescent

COMMENT: _____

THREATS - type, agent and supporting information:	Current impact (N-E)	Potential Impact (L-E)	Potential Threat Onset (S-L)
Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. Specify agent where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)			
• Infrastructure	<u>N</u>	<u>L</u>	<u>M</u>
•			
• Mining (unlikely to be in a resource area)	<u>N</u>	<u>L</u>	<u>L</u>

Please return completed form to **Species And Communities Branch DEC**,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983

RECORDS: Please forward to **Flora Administrative Officer**, Species and Communities Branch.

Record entered by: _____ Sheet No.: _____ Record Entered in Database

Threatened and Priority Flora Report Form

Version 1.1 February 2012

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DEC website at <http://www.dec.wa.gov.au/content/view/5388/2237/>

TAXON: <u>Eremophila youngii subsp. lepidota</u>	TPFL Pop. No.: _____
OBSERVATION DATE: <u>07/08/2012</u>	CONSERVATION STATUS: <u>P1</u> New population <u>N</u>
OBSERVER/S: <u>Hayley Hughes</u>	PHONE: <u>9430 8955</u>
ROLE: <u>Botanist</u>	ORGANISATION: <u>Ecoscape</u>

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):
North of Newman, east of and close to Newman Marble Bar Road.

DEC DISTRICT: _____		LGA: _____	Reserve No.: _____
		Land manager present: <input type="checkbox"/>	
DATUM:	COORDINATES: (If UTM coords provided, Zone is also required)	METHOD USED:	
GDA94 / MGA94 <input type="checkbox"/>	DecDegrees <input type="checkbox"/> DegMinSec <input type="checkbox"/> UTM's <input type="checkbox"/>	GPS <input type="checkbox"/>	Differential GPS <input type="checkbox"/> Map <input type="checkbox"/>
AGD84 / AMG84 <input type="checkbox"/>	Lat / Northing: <u>7426147.830</u>	No. satellites: _____	Map used: _____
WGS84 <input type="checkbox"/>	Long / Easting: <u>795189.570</u>	Boundary polygon captured: <input type="checkbox"/>	Map scale: _____
Unknown <input type="checkbox"/>	ZONE: <u>50</u>		
LAND TENURE:			
Nature reserve <input type="checkbox"/>	Timber reserve <input type="checkbox"/>	Private property <input type="checkbox"/>	Rail reserve <input type="checkbox"/> Shire road reserve <input type="checkbox"/>
National park <input type="checkbox"/>	State forest <input type="checkbox"/>	Pastoral lease x	MRWA road reserve <input type="checkbox"/> Other Crown reserve <input type="checkbox"/>
Conservation park <input type="checkbox"/>	Water reserve <input type="checkbox"/>	UCL <input type="checkbox"/> SLK/Pole _____ to _____	Specify other: _____

AREA ASSESSMENT: Edge survey Partial survey x Full survey Area observed (m²): _____

EFFORT: Time spent surveying (minutes): _____ No. of minutes spent / 100 m²: _____

POP'N COUNT ACCURACY: Actual Extrapolation Estimate Count method: _____
(Refer to field manual for list)

WHAT COUNTED: Plants Clumps Clonal stems

TOTAL POP'N STRUCTURE:	Mature:	Juveniles:	Seedlings:	Totals:	Area of pop (m ²): _____ <small>Note: Pls record count as numbers (not percentages) for database.</small>
	Alive				
	Dead				

QUADRATS PRESENT: No. _____ Size _____ Data attached Total area of quadrats (m²): _____

Summary Quad. Totals: Alive _____

REPRODUCTIVE STATE: Clonal Vegetative Flowerbud x Flower x
Immature fruit Fruit Dehisced fruit Percentage in flower: _____ %

CONDITION OF PLANTS: Healthy x Moderate Poor Senescent

COMMENT: _____

THREATS - type, agent and supporting information:	Current impact (N-E)	Potential Impact (L-E)	Potential Threat Onset (S-L)
Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. Specify agent where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)			
• Infrastructure	<u>N</u>	<u>L</u>	<u>M</u>
• Road widening	<u>N</u>	<u>L</u>	<u>L</u>
• Mining (unlikely to be in a resource area)	<u>N</u>	<u>L</u>	<u>L</u>

Please return completed form to **Species And Communities Branch DEC**,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983

RECORDS: Please forward to **Flora Administrative Officer**, Species and Communities Branch.

Record entered by: _____ Sheet No.: _____ Record Entered in Database

Threatened and Priority Flora Report Form

Version 1.1 February 2012

HABITAT INFORMATION:

LANDFORM:	ROCK TYPE:	LOOSE ROCK:	SOIL TYPE:	SOIL COLOUR:	DRAINAGE:
Crest <input type="checkbox"/>	Granite <input type="checkbox"/>	(on soil surface; eg gravel, quartz fields)	Sand x	Red x	Well drained x
Hill <input type="checkbox"/>	Dolerite <input type="checkbox"/>		Sandy loam <input type="checkbox"/>	Brown <input type="checkbox"/>	Seasonally inundated <input type="checkbox"/>
Ridge <input type="checkbox"/>	Laterite <input type="checkbox"/>	0-10% <input type="checkbox"/>	Loam <input type="checkbox"/>	Yellow <input type="checkbox"/>	Permanently inundated <input type="checkbox"/>
Outcrop <input type="checkbox"/>	Ironstone <input type="checkbox"/>	10-30% <input type="checkbox"/>	Clay loam <input type="checkbox"/>	White <input type="checkbox"/>	Tidal <input type="checkbox"/>
Slope <input type="checkbox"/>	Limestone <input type="checkbox"/>	30-50% <input type="checkbox"/>	Light clay <input type="checkbox"/>	Grey <input type="checkbox"/>	
Flat x	Quartz <input type="checkbox"/>	50-100% <input type="checkbox"/>	Peat <input type="checkbox"/>	Black <input type="checkbox"/>	
Open depression <input type="checkbox"/>	Specify other: _____		Specify other: _____	Specify other: _____	
Drainage line <input type="checkbox"/>					
Closed depression <input type="checkbox"/>					
Wetland <input type="checkbox"/>					
CONDITION OF SOIL:	Dry <input type="checkbox"/>	Moist <input type="checkbox"/>	Waterlogged <input type="checkbox"/>	Inundated <input type="checkbox"/>	

VEGETATION CLASSIFICATION*:

Eg: 1. Banksia woodland (B. attenuata, B. ilicifolia);
2. Open shrubland (Hibbertia sp., Acacia spp.);
3. Isolated clumps of sedges (Mesomelaena tetragona)

1. *Acacia synchronicia* mid sparse shrubland
2. *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
3. _____
4. _____

ASSOCIATED SPECIES:

Other (non-dominant) spp

Acacia aptaneura, *Eragrostis dielsii*, *E. falcata*, *Sporobolus australasicus* and *Chenopodiaceae* species. The *Sclerolaena* species include *S. beagleholei*, *S. densiflora* and *S. ericantha*.

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine Excellent x Very good Good Degraded Completely degraded

COMMENT:

FIRE HISTORY: Last Fire: Season/Month: _____ Year: _____ Fire Intensity: High Medium Low No signs of fire

FENCING: Not required Present Replace / repair Required Length req'd: _____

ROADSIDE MARKERS: Not required Present Replace / reposition Required Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

DRF PERMIT/ LICENCE No: Note if only observing plants (i.e. no specimens or plant material is taken) then no permit/licence is required. For further information on permit and licensing requirements see the Threatened Flora and Wildlife Licensing pages on DEC's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: OPHH12 WA Herb. Regional Herb. District Herb. Other: _____

ATTACHED: Map Mudmap Photo GIS data Field notes Other: _____

COPY SENT TO: Regional Office District Office Other: _____

Submitter of Record: L Atkins Role: Environmental Scientist Signed: _____ Date: 16/11/12

Please return completed form to **Species And Communities Branch DEC**,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983

RECORDS: Please forward to **Flora Administrative Officer**, Species and Communities Branch.

Record entered by: _____ Sheet No.: _____ Record Entered in Database

Threatened and Priority Flora Report Form

Version 1.1 February 2012

HABITAT INFORMATION:

LANDFORM:	ROCK TYPE:	LOOSE ROCK:	SOIL TYPE:	SOIL COLOUR:	DRAINAGE:
Crest <input type="checkbox"/>	Granite <input type="checkbox"/>	(on soil surface; eg gravel, quartz fields)	Sand x	Red x	Well drained x
Hill <input type="checkbox"/>	Dolerite <input type="checkbox"/>		Sandy loam <input type="checkbox"/>	Brown <input type="checkbox"/>	Seasonally inundated <input type="checkbox"/>
Ridge <input type="checkbox"/>	Laterite <input type="checkbox"/>	0-10% <input type="checkbox"/>	Loam <input type="checkbox"/>	Yellow <input type="checkbox"/>	Permanently inundated <input type="checkbox"/>
Outcrop <input type="checkbox"/>	Ironstone <input type="checkbox"/>	10-30% <input type="checkbox"/>	Clay loam <input type="checkbox"/>	White <input type="checkbox"/>	Tidal <input type="checkbox"/>
Slope <input type="checkbox"/>	Limestone <input type="checkbox"/>	30-50% <input type="checkbox"/>	Light clay <input type="checkbox"/>	Grey <input type="checkbox"/>	
Flat x	Quartz <input type="checkbox"/>	50-100% <input type="checkbox"/>	Peat <input type="checkbox"/>	Black <input type="checkbox"/>	
Open depression <input type="checkbox"/>	Specify other: _____		Specify other: _____	Specify other: _____	
Drainage line <input type="checkbox"/>					
Closed depression <input type="checkbox"/>					
Wetland <input type="checkbox"/>					
CONDITION OF SOIL:	Dry <input type="checkbox"/>	Moist <input type="checkbox"/>	Waterlogged <input type="checkbox"/>	Inundated <input type="checkbox"/>	

VEGETATION CLASSIFICATION*:

Eg: 1. Banksia woodland (B. attenuata, B. ilicifolia);
2. Open shrubland (Hibbertia sp., Acacia spp.);
3. Isolated clumps of sedges (Mesomelaena tetragona)

1. *Acacia synchronicia* mid sparse shrubland over
2. *Triodia longiceps*, *Aristida contorta* and *Sclerolaena* spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland
- 3.
- 4.

ASSOCIATED SPECIES:

Acacia aptaneura, *Eragrostis dielsii*, *E. falcata*, *Sporobolus australasicus* and *Chenopodiaceae* species. The *Sclerolaena* species include *S. beaugleholei*, *S. densiflora* and *S. ericantha*.

Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine Excellent x Very good Good Degraded Completely degraded

COMMENT: Semi-saline alluvial soil

FIRE HISTORY: Last Fire: Season/Month: _____ Year: _____ Fire Intensity: High Medium Low No signs of fire

FENCING: Not required Present Replace / repair Required Length req'd: _____

ROADSIDE MARKERS: Not required Present Replace / reposition Required Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

DRF PERMIT/ LICENCE No: Note if only observing plants (i.e. no specimens or plant material is taken) then no permit/licence is required. For further information on permit and licencing requirements see the Threatened Flora and Wildlife Licensing pages on DEC's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: LA V20 WA Herb. Regional Herb. District Herb. Other: _____

ATTACHED: Map Mudmap Photo GIS data Field notes Other: _____

COPY SENT TO: Regional Office District Office Other: _____

Submitter of Record: L Atkins Role: Environmental Scientist Signed: _____ Date: 16/11/12

Please return completed form to **Species And Communities Branch DEC**,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983

RECORDS: Please forward to **Flora Administrative Officer**, Species and Communities Branch.

Record entered by: _____ Sheet No.: _____ Record Entered in Database

Threatened and Priority Flora Report Form

Version 1.1 February 2012

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DEC website at <http://www.dec.wa.gov.au/content/view/5388/2237/>

TAXON: <u>Eremophila pilosa</u>	TPFL Pop. No.: _____
OBSERVATION DATE: <u>05/08/2012</u>	CONSERVATION STATUS: <u>P1</u> New population <input type="checkbox"/>
OBSERVER/S: <u>Lyn Atkins</u>	PHONE: <u>9430 8955</u>
ROLE: <u>Botanist</u>	ORGANISATION: <u>Ecoscape</u>

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):
North of Newman, east of and close to Newman Marble Bar Road. Population of this species extends approximately from approximately 60 km north of Newman, to about 8.5 km further north.

DEC DISTRICT: _____		LGA: _____	Land manager present: <input type="checkbox"/>
DATUM:	COORDINATES: (If UTM coords provided, Zone is also required)	METHOD USED:	
GDA94 / MGA94 <input type="checkbox"/>	DecDegrees <input type="checkbox"/> DegMinSec <input type="checkbox"/> UTM's <input type="checkbox"/>	GPS x	Differential GPS <input type="checkbox"/> Map <input type="checkbox"/>
AGD84 / AMG84 <input type="checkbox"/>	Lat / Northing: <u>7471170</u>	No. satellites: _____	Map used: _____
WGS84 <input type="checkbox"/>	Long / Easting: <u>7471170</u>	Boundary polygon captured: <input type="checkbox"/>	Map scale: _____
Unknown <input type="checkbox"/>	ZONE: <u>50</u>		
LAND TENURE:			
Nature reserve <input type="checkbox"/>	Timber reserve <input type="checkbox"/>	Private property <input type="checkbox"/>	Rail reserve <input type="checkbox"/> Shire road reserve <input type="checkbox"/>
National park <input type="checkbox"/>	State forest <input type="checkbox"/>	Pastoral lease x	MRWA road reserve <input type="checkbox"/> Other Crown reserve <input type="checkbox"/>
Conservation park <input type="checkbox"/>	Water reserve <input type="checkbox"/>	UCL <input type="checkbox"/> SLK/Pole _____ to _____	Specify other: _____

AREA ASSESSMENT: Edge survey <input type="checkbox"/> Partial survey <input type="checkbox"/> Full survey x	Area observed (m ²): <u>2500</u>															
EFFORT: Time spent surveying (minutes): _____	No. of minutes spent / 100 m ² : _____															
POP'N COUNT ACCURACY: Actual <input type="checkbox"/> Extrapolation <input type="checkbox"/> Estimate x	Count method: _____ (Refer to field manual for list)															
WHAT COUNTED: Plants <input type="checkbox"/> Clumps <input type="checkbox"/> Clonal stems <input type="checkbox"/>																
TOTAL POP'N STRUCTURE:																
	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Mature:</th> <th>Juveniles:</th> <th>Seedlings:</th> <th>Totals:</th> </tr> </thead> <tbody> <tr> <td>Alive</td> <td><10</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Dead</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Mature:	Juveniles:	Seedlings:	Totals:	Alive	<10				Dead				
	Mature:	Juveniles:	Seedlings:	Totals:												
Alive	<10															
Dead																
QUADRATS PRESENT: No. <u>y</u> Size <u>50 m x 50 m</u> Data attached <input type="checkbox"/>	Total area of quadrats (m ²): <u>2500</u>															
Summary Quad. Totals: Alive																
REPRODUCTIVE STATE: Clonal <input type="checkbox"/> Vegetative <input type="checkbox"/> Flowerbud x	Flower x															
Immature fruit <input type="checkbox"/> Fruit <input type="checkbox"/> Dehisced fruit <input type="checkbox"/>	Percentage in flower: _____ %															

CONDITION OF PLANTS: Healthy x Moderate Poor Senescent

COMMENT: _____

THREATS - type, agent and supporting information:	Current impact (N-E)	Potential Impact (L-E)	Potential Threat Onset (S-L)
Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. Specify agent where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)			
• Infrastructure	<u>N</u>	<u>L</u>	<u>M</u>
• Road widening	<u>N</u>	<u>L</u>	<u>L</u>
• Mining (unlikely to be in a resource area)	<u>N</u>	<u>L</u>	<u>L</u>

Please return completed form to **Species And Communities Branch DEC**,
 Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983

RECORDS: Please forward to **Flora Administrative Officer**, Species and Communities Branch.

Record entered by: _____ Sheet No.: _____ Record Entered in Database

Threatened and Priority Flora Report Form

Version 1.1 February 2012

HABITAT INFORMATION:

LANDFORM:	ROCK TYPE:	LOOSE ROCK:	SOIL TYPE:	SOIL COLOUR:	DRAINAGE:
Crest <input type="checkbox"/>	Granite <input type="checkbox"/>	(on soil surface; eg gravel, quartz fields)	Sand x	Red x	Well drained x
Hill <input type="checkbox"/>	Dolerite <input type="checkbox"/>		Sandy loam <input type="checkbox"/>	Brown <input type="checkbox"/>	Seasonally inundated <input type="checkbox"/>
Ridge <input type="checkbox"/>	Laterite <input type="checkbox"/>	0-10% <input type="checkbox"/>	Loam <input type="checkbox"/>	Yellow <input type="checkbox"/>	Permanently inundated <input type="checkbox"/>
Outcrop <input type="checkbox"/>	Ironstone <input type="checkbox"/>	10-30% <input type="checkbox"/>	Clay loam <input type="checkbox"/>	White <input type="checkbox"/>	Tidal <input type="checkbox"/>
Slope <input type="checkbox"/>	Limestone <input type="checkbox"/>	30-50% <input type="checkbox"/>	Light clay <input type="checkbox"/>	Grey <input type="checkbox"/>	
Flat x	Quartz <input type="checkbox"/>	50-100% <input type="checkbox"/>	Peat <input type="checkbox"/>	Black <input type="checkbox"/>	
Open depression <input type="checkbox"/>	Specify other: _____		Specify other: _____	Specify other: _____	
Drainage line <input type="checkbox"/>					
Closed depression <input type="checkbox"/>					
Wetland <input type="checkbox"/>					
	Specific Landform Element: (Refer to field manual for additional values)				
CONDITION OF SOIL:	Dry <input type="checkbox"/>	Moist <input type="checkbox"/>	Waterlogged <input type="checkbox"/>	Inundated <input type="checkbox"/>	

VEGETATION CLASSIFICATION*:

Eg: 1. Banksia woodland (B. attenuata, B. ilicifolia);
2. Open shrubland (Hibbertia sp., Acacia spp.);
3. Isolated clumps of sedges (Mesomelaena tetragona)

1. *Acacia pachyacra* and *A. pruincarpa* scattered mid shrubs
2. *Triodia basedowii*, *T. longiceps* and *Ptilotus astrolasius* low open hummock grassland/low sparse shrubland
3. _____
4. _____

ASSOCIATED SPECIES:

Other (non-dominant) spp _____

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine Excellent x Very good Good Degraded Completely degraded

COMMENT:

FIRE HISTORY: Last Fire: Season/Month: _____ Year: _____ Fire Intensity: High Medium Low No signs of fire

FENCING: Not required Present Replace / repair Required Length req'd: _____

ROADSIDE MARKERS: Not required Present Replace / reposition Required Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.) _____

DRF PERMIT/ LICENCE No: Note if only observing plants (i.e. no specimens or plant material is taken) then no permit/licence is required. For further information on permit and licencing requirements see the Threatened Flora and Wildlife Licensing pages on DEC's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: AERL7-1 _____ WA Herb. Regional Herb. District Herb. Other: _____

ATTACHED: Map Mudmap Photo GIS data Field notes Other: _____

COPY SENT TO: Regional Office District Office Other: _____

Submitter of Record: L Atkins Role: Environmental Scientist Signed: _____ Date: 16/11/12

Please return completed form to **Species And Communities Branch DEC,**

Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by: _____ Sheet No.: _____ Record Entered in Database

Threatened and Priority Flora Report Form

Version 1.1 February 2012

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DEC website at <http://www.dec.wa.gov.au/content/view/5388/2237/>

TAXON: <u>Eremophila pilosa</u>	TPFL Pop. No.: _____
OBSERVATION DATE: <u>05/08/2012</u>	CONSERVATION STATUS: <u>P1</u> New population <input type="checkbox"/>
OBSERVER/S: <u>Lyn Atkins</u>	PHONE: <u>9430 8955</u>
ROLE: <u>Botanist</u>	ORGANISATION: <u>Ecoscape</u>

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):
North of Newman, east of and close to Newman Marble Bar Road. Population of this species extends approximately from approximately 60 km north of Newman, to about 8.5 km further north.

DEC DISTRICT: _____		LGA: _____	Land manager present: <input type="checkbox"/>
DATUM:	COORDINATES: (If UTM coords provided, Zone is also required)	METHOD USED:	
GDA94 / MGA94 <input checked="" type="checkbox"/>	DecDegrees <input type="checkbox"/> DegMinSec <input type="checkbox"/> UTM <input type="checkbox"/>	GPS <input checked="" type="checkbox"/>	Differential GPS <input type="checkbox"/> Map <input type="checkbox"/>
AGD84 / AMG84 <input type="checkbox"/>	Lat / Northing: <u>7470146.548</u>	No. satellites: _____	Map used: _____
WGS84 <input type="checkbox"/>	Long / Easting: <u>808615.548</u>	Boundary polygon captured: <input type="checkbox"/>	Map scale: _____
Unknown <input type="checkbox"/>	ZONE: _____		
LAND TENURE:			
Nature reserve <input type="checkbox"/>	Timber reserve <input type="checkbox"/>	Private property <input type="checkbox"/>	Rail reserve <input type="checkbox"/> Shire road reserve <input type="checkbox"/>
National park <input type="checkbox"/>	State forest <input type="checkbox"/>	Pastoral lease <input checked="" type="checkbox"/>	MRWA road reserve <input type="checkbox"/> Other Crown reserve <input type="checkbox"/>
Conservation park <input type="checkbox"/>	Water reserve <input type="checkbox"/>	UCL <input type="checkbox"/> SLK/Pole _____ to _____	Specify other: _____

AREA ASSESSMENT: Edge survey <input type="checkbox"/> Partial survey <input checked="" type="checkbox"/> Full survey <input type="checkbox"/>	Area observed (m ²): <u>8.5 km x 100 m</u>															
EFFORT: Time spent surveying (minutes): _____	No. of minutes spent / 100 m ² : _____															
POP'N COUNT ACCURACY: Actual <input type="checkbox"/> Extrapolation <input type="checkbox"/> Estimate <input checked="" type="checkbox"/>	Count method: _____ (Refer to field manual for list)															
WHAT COUNTED: Plants <input type="checkbox"/> Clumps <input type="checkbox"/> Clonal stems <input type="checkbox"/>																
TOTAL POP'N STRUCTURE:																
	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Mature:</th> <th>Juveniles:</th> <th>Seedlings:</th> <th>Totals:</th> </tr> </thead> <tbody> <tr> <td>Alive</td> <td><10 (within sight)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Dead</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Mature:	Juveniles:	Seedlings:	Totals:	Alive	<10 (within sight)				Dead				
	Mature:	Juveniles:	Seedlings:	Totals:												
Alive	<10 (within sight)															
Dead																
QUADRATS PRESENT:	No. _____ Size _____ Data attached <input type="checkbox"/> Total area of quadrats (m ²): <u>2500</u>															
Summary Quad. Totals: Alive																
REPRODUCTIVE STATE:	Clonal <input type="checkbox"/> Vegetative <input type="checkbox"/> Flowerbud <input checked="" type="checkbox"/> Flower <input type="checkbox"/> Immature fruit <input type="checkbox"/> Fruit <input type="checkbox"/> Dehisced fruit <input type="checkbox"/> Percentage in flower: _____ %															

CONDITION OF PLANTS: Healthy Moderate Poor Senescent

COMMENT: Plants were scattered at varying densities

THREATS - type, agent and supporting information:	Current impact (N-E)	Potential Impact (L-E)	Potential Threat Onset (S-L)
Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. Specify agent where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)			
• Infrastructure	<u>N</u>	<u>L</u>	<u>M</u>
• Road widening	<u>N</u>	<u>L</u>	<u>L</u>
• Mining (unlikely to be in a resource area)	<u>N</u>	<u>L</u>	<u>L</u>

Please return completed form to **Species And Communities Branch DEC**,
 Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983

RECORDS: Please forward to **Flora Administrative Officer**, Species and Communities Branch.

Record entered by: _____ Sheet No.: _____ Record Entered in Database

Threatened and Priority Flora Report Form

Version 1.1 February 2012

HABITAT INFORMATION:

LANDFORM:	ROCK TYPE:	LOOSE ROCK:	SOIL TYPE:	SOIL COLOUR:	DRAINAGE:
Crest <input type="checkbox"/>	Granite <input type="checkbox"/>	(on soil surface; eg gravel, quartz fields)	Sand x	Red x	Well drained x
Hill <input type="checkbox"/>	Dolerite <input type="checkbox"/>		Sandy loam <input type="checkbox"/>	Brown <input type="checkbox"/>	Seasonally inundated <input type="checkbox"/>
Ridge <input type="checkbox"/>	Laterite <input type="checkbox"/>	0-10% <input type="checkbox"/>	Loam <input type="checkbox"/>	Yellow <input type="checkbox"/>	Permanently inundated <input type="checkbox"/>
Outcrop <input type="checkbox"/>	Ironstone <input type="checkbox"/>	10-30% <input type="checkbox"/>	Clay loam <input type="checkbox"/>	White <input type="checkbox"/>	Tidal <input type="checkbox"/>
Slope <input type="checkbox"/>	Limestone <input type="checkbox"/>	30-50% <input type="checkbox"/>	Light clay <input type="checkbox"/>	Grey <input type="checkbox"/>	
Flat x	Quartz <input type="checkbox"/>	50-100% <input type="checkbox"/>	Peat <input type="checkbox"/>	Black <input type="checkbox"/>	
Open depression <input type="checkbox"/>	Specify other: _____		Specify other: _____	Specify other: _____	
Drainage line <input type="checkbox"/>					
Closed depression <input type="checkbox"/>					
Wetland <input type="checkbox"/>					
CONDITION OF SOIL:	Dry <input type="checkbox"/>	Moist <input type="checkbox"/>	Waterlogged <input type="checkbox"/>	Inundated <input type="checkbox"/>	

VEGETATION CLASSIFICATION*:

Eg: 1. Banksia woodland (B. attenuata, B. ilicifolia);
2. Open shrubland (Hibbertia sp., Acacia spp.);
3. Isolated clumps of sedges (Mesomelaena tetragona)

1. *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
2. *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland
3. _____
4. _____

ASSOCIATED SPECIES:

Other (non-dominant) spp

Aristida contorta, *Aristida inaequilatera*, *Bonamia erecta*, *Ptilotus asterolasius* and *Senna notabilis*. The mid stratum, and occasionally upper stratum, emergent species were very variable and included several *Acacia* species (including *A. aptaneura* and *A. paraneura*), *Corymbia deserticola* subsp. *deserticola*, *Eucalyptus gamophylla* and *Grevillea* species.

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine Excellent x Very good Good Degraded Completely degraded

COMMENT:

FIRE HISTORY: Last Fire: Season/Month: _____ Year: _____ Fire Intensity: High Medium Low No signs of fire

FENCING: Not required Present Replace / repair Required Length req'd: _____

ROADSIDE MARKERS: Not required Present Replace / reposition Required Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

DRF PERMIT/ LICENCE No:

Note if only observing plants (i.e. no specimens or plant material is taken) then no permit/licence is required. For further information on permit and licensing requirements see the Threatened Flora and Wildlife Licensing pages on DEC's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: LA V11 WA Herb. Regional Herb. District Herb. Other: _____

ATTACHED: Map Mudmap Photo GIS data Field notes Other: _____

COPY SENT TO: Regional Office District Office Other: _____

Submitter of Record: L Atkins Role: Environmental Scientist Signed: _____ Date: 16/11/12

Please return completed form to **Species And Communities Branch DEC,**

Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by: _____ Sheet No.: _____ Record Entered in Database

Threatened and Priority Flora Report Form

Version 1.1 February 2012

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DEC website at <http://www.dec.wa.gov.au/content/view/5388/2237/>

TAXON: <u>Themeda sp. Hamersley Station (M.E. Trudgen 11431)</u>	TPFL Pop. No.: _____
OBSERVATION DATE: <u>04/08/2012</u>	CONSERVATION STATUS: <u>P3</u> New population <input checked="" type="checkbox"/> Y
OBSERVER/S: <u>Hayley Hughes</u>	PHONE: <u>9430 8955</u>
ROLE: <u>Botanist</u>	ORGANISATION: <u>Ecoscape</u>

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):
North of Newman, east of and close to Newman Marble Bar Road.

DEC DISTRICT: _____		LGA: _____	Land manager present: <input type="checkbox"/>
DATUM:	COORDINATES: (If UTM coords provided, Zone is also required)	METHOD USED:	
GDA94 / MGA94 <input checked="" type="checkbox"/>	DecDegrees <input type="checkbox"/> DegMinSec <input type="checkbox"/> UTM <input type="checkbox"/>	GPS <input checked="" type="checkbox"/>	Differential GPS <input type="checkbox"/> Map <input type="checkbox"/>
AGD84 / AMG84 <input type="checkbox"/>	Lat / Northing: <u>7436650</u>	No. satellites: _____	Map used: _____
WGS84 <input type="checkbox"/>	Long / Easting: <u>800731</u>	Boundary polygon captured: <input type="checkbox"/>	Map scale: _____
Unknown <input type="checkbox"/>	ZONE: <u>50</u>		
LAND TENURE:			
Nature reserve <input type="checkbox"/>	Timber reserve <input type="checkbox"/>	Private property <input type="checkbox"/>	Rail reserve <input type="checkbox"/>
National park <input type="checkbox"/>	State forest <input type="checkbox"/>	Pastoral lease <input checked="" type="checkbox"/>	MRWA road reserve <input type="checkbox"/>
Conservation park <input type="checkbox"/>	Water reserve <input type="checkbox"/>	UCL <input type="checkbox"/>	SLK/Pole _____ to _____
		Shire road reserve <input type="checkbox"/>	
		Other Crown reserve <input type="checkbox"/>	
		Specify other: _____	

AREA ASSESSMENT: Edge survey Partial survey Full survey Area observed (m²): _____

EFFORT: Time spent surveying (minutes): _____ No. of minutes spent / 100 m²: _____

POP'N COUNT ACCURACY: Actual Extrapolation Estimate Count method: _____
(Refer to field manual for list)

WHAT COUNTED: Plants Clumps Clonal stems

TOTAL POP'N STRUCTURE:	Mature:	Juveniles:	Seedlings:	Totals:	Area of pop (m ²): _____ Note: Pls record count as numbers (not percentages) for database.
Alive	<u>10-50</u>				
Dead					

QUADRATS PRESENT: No. _____ Size _____ Data attached Total area of quadrats (m²): 2500

Summary Quad. Totals: Alive _____

REPRODUCTIVE STATE: Clonal Vegetative Flowerbud Flower
Immature fruit Fruit Dehisced fruit Percentage in flower: _____ %

CONDITION OF PLANTS: Healthy Moderate Poor Senescent

COMMENT: Only clump observed in approximately 70 km linear survey

THREATS - type, agent and supporting information:	Current impact (N-E)	Potential Impact (L-E)	Potential Threat Onset (S-L)
Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. Specify agent where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)			
• Infrastructure	<u>N</u>	<u>L</u>	<u>M</u>
• Road widening	<u>N</u>	<u>L</u>	<u>L</u>
• Mining (unlikely to be in a resource area)	<u>N</u>	<u>L</u>	<u>L</u>

Please return completed form to **Species And Communities Branch DEC**,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983

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Threatened and Priority Flora Report Form

Version 1.1 February 2012

HABITAT INFORMATION:

LANDFORM:	ROCK TYPE:	LOOSE ROCK:	SOIL TYPE:	SOIL COLOUR:	DRAINAGE:
Crest <input type="checkbox"/>	Granite <input type="checkbox"/>	(on soil surface; eg gravel, quartz fields)	Sand x	Red x	Well drained x
Hill <input type="checkbox"/>	Dolerite <input type="checkbox"/>		Sandy loam <input type="checkbox"/>	Brown <input type="checkbox"/>	Seasonally inundated <input type="checkbox"/>
Ridge <input type="checkbox"/>	Laterite <input type="checkbox"/>	0-10% <input type="checkbox"/>	Loam <input type="checkbox"/>	Yellow <input type="checkbox"/>	Permanently inundated <input type="checkbox"/>
Outcrop <input type="checkbox"/>	Ironstone <input type="checkbox"/>	10-30% <input type="checkbox"/>	Clay loam <input type="checkbox"/>	White <input type="checkbox"/>	Tidal <input type="checkbox"/>
Slope <input type="checkbox"/>	Limestone <input type="checkbox"/>	30-50% <input type="checkbox"/>	Light clay <input type="checkbox"/>	Grey <input type="checkbox"/>	
Flat x	Quartz <input type="checkbox"/>	50-100% <input type="checkbox"/>	Peat <input type="checkbox"/>	Black <input type="checkbox"/>	
Open depression <input type="checkbox"/>	Specify other: _____		Specify other: _____	Specify other: _____	
Drainage line <input type="checkbox"/>					
Closed depression <input type="checkbox"/>					
Wetland <input type="checkbox"/>					
CONDITION OF SOIL:	Dry <input type="checkbox"/>	Moist <input type="checkbox"/>	Waterlogged <input type="checkbox"/>	Inundated <input type="checkbox"/>	

VEGETATION CLASSIFICATION*:

Eg: 1. Banksia woodland (B. attenuata, B. ilicifolia);
2. Open shrubland (Hibbertia sp., Acacia spp.);
3. Isolated clumps of sedges (Mesomelaena tetragona)

1. *Acacia ancistrocarpa* and *A. pachyacra* tall-mid scattered shrubs
2. *Triodia basedowii*, *T. longiceps* and *Paraneurachne muelleri* mid-low open hummock grassland/low sparse tussock grassland
3. _____
4. _____

ASSOCIATED SPECIES:

Other (non-dominant) spp

Aristida contorta, *Aristida inaequilatera*, *Bonamia erecta*, *Ptilotus asterolasius* and *Senna notabilis*.
The mid stratum, and occasionally upper stratum, emergent species were very variable and included several *Acacia* species (including *A. aptaneura* and *A. paraneura*), *Corymbia deserticola* subsp. *deserticola*, *Eucalyptus gamophylla* and *Grevillea* species.

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SPECIMEN: Collectors No: OPHH03 WA Herb. Regional Herb. District Herb. Other: _____

ATTACHED: Map Mudmap Photo GIS data Field notes Other: _____

COPY SENT TO: Regional Office District Office Other: _____

Submitter of Record: L Atkins Role: Environmental Scientist Signed: _____ Date: 16/11/12

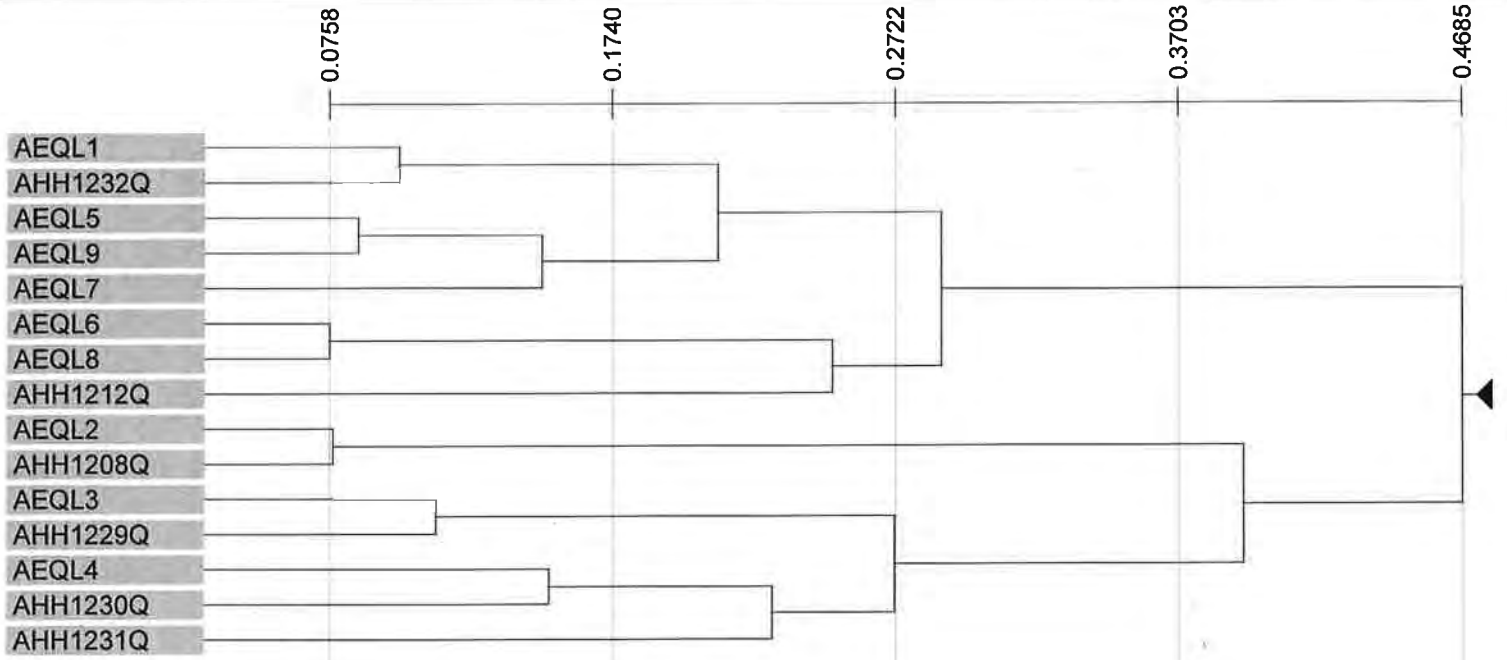
Please return completed form to **Species And Communities Branch DEC**,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983

RECORDS: Please forward to **Flora Administrative Officer**, Species and Communities Branch.

Record entered by: _____ Sheet No.: _____ Record Entered in Database

Appendix Nine: Floristic Analysis Dendrogram

Column Fusion Dendrogram



Appendix Ten: Conservation Significant Flora Risk Assessment

Table 26: Conservation Significant Flora Risk Assessment

Species	Cons Code	Soil	Landform	Vegetation	Soil Type Present	Landform Present	Associated Vegetation Present	Known from Nearby	Likelihood of Occurring in the study area
<i>Lepidium catapycnon</i>	T	Skeletal soils	Hillsides	<i>Eucalyptus leucophloia</i> , <i>Acacia bivenosa</i> , <i>A. inaequilatera</i> , <i>A. pruinocarpa</i> , <i>Triodia</i> spp.	Y	N	Y	Y	Possible
<i>Thryptomene wittweri</i>	T	Skeletal red stony soils	Breakaways, stony creek beds	<i>Eucalyptus kingsmillii</i>	Y	N	N	N	Almost none
<i>Aristida jerichoensis</i> var. <i>subspinulifera</i>	P1	Hardpan	Plain	Mulga, <i>Acacia falcata</i> , <i>Triodia epactia</i> , <i>Eragrostis cumingii</i>	N	Y	Y	Y	Possible
<i>Bothriochloa decipiens</i> var. <i>cloncurrrensensis</i>	P1	Clay, loam	Damp depression; clay plain	Mulga, <i>Eucalyptus camaldulensis</i>	Y	Y	Y	N	Unlikely
<i>Brachyscome</i> sp. Wanna Munna Flats (S. van Leeuwen 4662)	P1	Red brown clay	Flat	Mulga, grasses	Y	Y	Y	Y	Almost certain
<i>Brunonia</i> sp. Long hairs (D.E. Symon 2440)	P1		Creeklines		U	Y	U	Y	Possible
<i>Calotis squamigera</i>	P1	Pebbly loam	Plain	Mulga, <i>Acacia xiphophylla</i>	N	Y	Y	Y	Possible
<i>Cochlospermum</i> sp. Pilbara (D. Brassington, E. Agar & J. Macknay LCH 31756) PN	P1	Granite	Hill		N	Y	U	N	Unlikely
<i>Eragrostis</i> sp. Mt Robinson (S. van Leeuwen 4109)	P1	Red-brown skeletal soils, ironstone	Steep slopes, summits	<i>Eucalyptus kingsmillii</i>	Y	N	N	U	Unlikely
<i>Eremophila pilosa</i>	P1	Loamy soil	Depression in sandplain	<i>Triodia pungens</i>	Y	Y	Y	Y	Recorded
<i>Eremophila</i> sp. Hamersley Range (K. Walker KW 136) PN	P1		Hill crest, cliff top, gorge top	Mulga	Y	N	N	Y	Possible
<i>Eremophila</i> sp. Snowy Mountain (S. van. Leeuwen 3737)	P1	Ironstone	High hills, summits	<i>Eucalyptus leucophloia</i>	Y	N	Y	N	Unlikely
<i>Eremophila</i> sp. West Angelas (S. van Leeuwen 4086)	P1	Banded ironstone	High hills, summits	<i>Eucalyptus kingsmillii</i> , Mulga	N	N	N	Y	Almost none

Species	Cons Code	Soil	Landform	Vegetation	Soil Type Present	Landform Present	Associated Vegetation Present	Known from Nearby	Likelihood of Occurring in the study area
<i>Eremophila spongiocarpa</i>	P1	Weakly saline alluvium	Alluvial plain on margins of marsh	Samphire	N	N	N	Y	Unlikely
<i>Eucalyptus lucens</i>	P1	Ironstone rocks	Rocky slopes and mountain tops, high in the landscape	<i>Eucalyptus kingsmillii</i>	Y	N	N	N	Unlikely
Genus sp. Hamersley Range hilltops (S van Leeuwen 4345)	P1	Skeletal, brown gritty soil over ironstone	Hill summit	<i>Eucalyptus leucophloia</i> , <i>Triodia</i> spp.	Y	Y	Y	N	Unlikely
<i>Goodenia pallida</i>	P1	Red soil		Annual grassland, <i>Acacia</i> scrub-steppe	N	U	U	N	Almost none
<i>Grevillea</i> sp. Turee (J. Bull & G. Hopkinson ONS JJ 01.01) PN	P1		Steep scree slope, hillcrest of low foothill	<i>Acacia aneura</i> open woodland	U	N	Y	N	Unlikely
<i>Gunniopsis</i> sp. Fortescue (M.E. Trudgen 11019)	P1				U	U	U	N	None (rare)
<i>Helichrysum oligochaetum</i>	P1	Red clay	Alluvial plains	<i>Eucalyptus camaldulensis</i> , <i>Gossypium</i> sp. etc.	Y	Y	Y	Y	Almost certain
<i>Hibiscus</i> sp. Mt Brockman (E. Thoma ET 1354) PN	P1		Gorges		N	N	U	N	Almost none
<i>Myriocephalus scalpellus</i>	P1	Clay			Y	Y	U	Y	Possible
<i>Nicotiana heterantha</i>	P1	Black clay	Seasonally wet flats	<i>Eucalyptus victrix</i> , <i>Melaleuca</i> spp., samphire	N	Y	N	Y	Possible
<i>Peplidium</i> sp. Fortescue Marsh (S. van Leeuwen 4865)	P1			<i>Halosarcia indica</i> , <i>H. halocnemoides</i> , <i>H. auriculata</i> , <i>Eremophila spongiocarpa</i>	N	N	N	Y	Almost none
<i>Sida</i> sp. Hamersley Range (K. Newbey 10692)	P1	Skeletal ironstone soil;	Hilltops, cliffs, scree	<i>Eucalyptus leucophloia</i> , <i>Eucalyptus gamophylla</i>	Y	N	Y	N	Unlikely
<i>Stemodia</i> sp. Battle Hill (A.L. Payne 1006)	P1	Cracking clay	Floodplains	<i>Eriachne</i> , <i>Eragrostis</i> spp.	N	Y	Y	Y	Possible
<i>Tecticornia globulifera</i>	P1		Samphire flats	Samphire	N	N	N	N	None (rare)
<i>Tecticornia</i> sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063)	P1	Red clayey sands	Floodway	Samphire	N	Y	N	Y	Possible
<i>Tetrateca fordiana</i> ms	P1	Shale pocket amongst ironstone	Midslope	<i>Eucalyptus kingsmillii</i>	Y	N	N	N	Almost none

Species	Cons Code	Soil	Landform	Vegetation	Soil Type Present	Landform Present	Associated Vegetation Present	Known from Nearby	Likelihood of Occurring in the study area
<i>Teucrium pilbaranum</i>	P1	Clay	Crab hole plain in a river floodplain, margin of calcrete table	<i>Eucalyptus camaldulensis</i> , <i>Eucalyptus victrix</i> , <i>Chrysopogon fallax</i>	Y	Y	Y	N	Almost none
<i>Triodia triticoides</i>	P1	Red sandstone, limestone	Hillslopes		N	N	N	N	None (rare)
<i>Vittadinia</i> sp. Coondewanna Flats (S. van Leeuwen 4684)	P1	Clay loam soils	Plain	Mulga	Y	Y	Y	N	Unlikely
<i>Adiantum capillus-veneris</i>	P2	Rocky	Moist, sheltered sites in gorges and on cliff walls	Unknown	Y	N	N	N	None (Rare)
<i>Aristida lazaridis</i>	P2	Sand, loam	Crest	<i>Eucalyptus leucophloia</i>	Y	N	Y	Y	Possible
<i>Cladium procerum</i>	P2	Loam, gravel	Perennial pools	Unknown	Y	N	U	N	Almost none
<i>Dicladantha glabra</i>	P2	Alluvium	Watercourses, near rock pools		Y	N	U	N	Almost none
<i>Eremophila forrestii</i> subsp. Pingandy (M.E. Trudgen 2662)	P2	Stony soil	Slopes, low in landscape	Mulga	Y	Y	Y	N	Unlikely
<i>Gompholobium karijini</i>	P2	Shale, red brown gravelly loam	Hilltop		Y	Y	Y	N	Unlikely
<i>Hibiscus</i> sp. Gurinbiddy Range (M.E. Trudgen MET 15708) PN	P2	Skeletal red brown stony soil over massive ironstone	Hilltops, high in landscape	<i>Eucalyptus kingsmillii</i>	Y	N	N	Y	Unlikely
<i>Isotropis parviflora</i>	P2		Valley slope of ironstone plateau	<i>Corymbia hamersleyana</i> , <i>Triodia basedowii</i>	U	N	Y	Y	Possible
<i>Oxalis</i> sp. Pilbara (M.E. Trudgen 12725)	P2	Red-brown pebbly/rocky loam amongst boulders	Gullies	<i>Acacia</i> spp, <i>Eucalyptus leucophloia</i>	Y	N	Y	N	Unlikely
<i>Paspalidium retiglume</i>	P2	Clay; cracking	Plain	Grassland/herbland	Y	Y	Y	N	Unlikely
<i>Pilbara trudgenii</i>	P2	Skeletal, red stony soil over ironstone	Hill summits, steep slopes, screes, cliff faces	<i>Eucalyptus kingsmillii</i>	Y	N	N	N	Almost none
<i>Scaevola</i> sp. Hamersley Range basalts (S. van Leeuwen 3675)	P2	Skeletal, brown gritty soil over basalt	Summits of hills, steep hills	<i>Eucalyptus kingsmillii</i>	Y	N	N	N	Almost none
<i>Spartothamnella puberula</i>	P2	Rocky loam, sandy or skeletal soils, clay	Gorge, gully	<i>Acacia</i> spp.	Y	N	N	N	Almost none

Species	Cons Code	Soil	Landform	Vegetation	Soil Type Present	Landform Present	Associated Vegetation Present	Known from Nearby	Likelihood of Occurring in the study area
<i>Acacia dawweana</i>	P3	Stony red loamy soils	Low rocky rises, along drainage lines	<i>Acacia</i> spp, <i>Eucalyptus</i> spp.	Y	Y	Y	N	Unlikely
<i>Acacia effusa</i>	P3	Red stony loam	Scree, low ranges	<i>Eucalyptus leucophloia</i> , <i>Acacia bivenosa</i> , <i>Triodia basedowii</i> , <i>Themeda triandra</i>	Y	N	Y	N	Almost none
<i>Acacia glaucocaesia</i>	P3	Red loam, sandy loam, clay	Floodplain	<i>Eucalyptus camaldulensis</i>	Y	Y	Y	N	Unlikely
<i>Acacia subtiliformis</i>	P3	Rocky calcrete plateau	Plateau	<i>Triodia</i> spp.	Y	N	Y	Y	Possible
<i>Amaranthus centralis</i>	P3		River banks	<i>Eucalyptus camaldulensis</i> , * <i>Cenchrus ciliaris</i> , Mulga, grasses	Y	Y	Y	Y	Almost certain
<i>Ampelopteris proliferata</i>	P3	Wet	Near water	<i>Eucalyptus victrix</i> , <i>Eucalyptus camaldulensis</i>	Y	Y	Y	N	Unlikely
<i>Astrelba lappacea</i>	P3	Clay, loam	Plain	<i>Astrelba</i> spp., Mulga, <i>Acacia xiphophylla</i>	Y	Y	N	N	Almost none
<i>Atriplex flabelliformis</i>	P3	Clay loam, loam, saline	Saline flats, marshes	Samphire	Y	N	N	N	Almost none
<i>Calotis latiuscula</i>	P3	Sand, loam	Plain	Mulga	Y	Y	Y	N	Unlikely
<i>Crotalaria smithiana</i>	P3		Floodplain	Mulga, <i>Astrelba</i> spp., <i>Aristida contorta</i>	U	Y	Y	Y	Possible
<i>Dampiera anonyma</i> ms	P3	Skeletal red-brown to brown gravelly soil over banded ironstone, basalt, shale and jaspilite	Hill summits, upper slopes	<i>Eucalyptus kingsmillii</i> , <i>Acacia hamersleyana</i>	N	N	N	N	None (Rare)
<i>Dampiera metallorum</i>	P3	Skeletal red-brown gravelly soils over banded ironstone	Steep slopes and summits	<i>Eucalyptus kingsmillii</i>	Y	N	N	N	None (Rare)
<i>Elatine macrocalyx</i>	P3	Shallow sand over clay	Edge of playa lakes, clay pans	<i>Eucalyptus victrix</i>	Y	N	Y	N	Almost none
<i>Eragrostis crateriformis</i>	P3	Clayey loam or clay	Creek banks, depressions	<i>Triodia epactia</i> , <i>Eucalyptus victrix</i>	Y	Y	Y	N	Unlikely
<i>Eragrostis surreyana</i>	P3	Red-brown clay	Drainage line	<i>Eucalyptus victrix</i> , <i>Eucalyptus camaldulensis</i> , <i>Cyperus vaginatus</i>	N	N	N	N	None (Rare)
<i>Eremophila forrestii</i> subsp. <i>viridis</i>	P3	Unknown	Sandplain	Unknown	U	Y	U	N	Almost none

Species	Cons Code	Soil	Landform	Vegetation	Soil Type Present	Landform Present	Associated Vegetation Present	Known from Nearby	Likelihood of Occurring in the study area
<i>Eremophila magnifica</i> subsp. <i>velutina</i>	P3	Skeletal soils over ironstone	Summits	<i>Eucalyptus kingsmillii</i>	Y	N	N	Y	Possible
<i>Eremophila rigida</i>	P3	Clayey loam, clay	Creek depressions beds,	Mulga	Y	Y	Y	Y	Almost certain
<i>Euphorbia inappendiculata</i>	P3	Clay	Rock screes	<i>Triodia epactia</i> , <i>Acacia xiphophylla</i>	Y	N	Y	N	Almost none
<i>Euphorbia stevenii</i>	P3	Clay, sand	Slope, plain	<i>Aristida</i> sp.	Y	Y	Y	N	Unlikely
<i>Fimbristylis sieberiana</i>	P3	Mud, skeletal soil pockets	Pool edges, sandstone cliffs	<i>Cyperus vaginatus</i>	N	N	Y	N	Unlikely
<i>Geijera salicifolia</i>	P3	Skeletal soils, stony soils	Massive rock scree, gorges	Mulga	N	N	Y	N	None (Rare)
<i>Glycine falcata</i>	P3	Black clayey sand	Floodplains; depressions in crabhole plains on river	Grassland; <i>Eriachne</i> spp.	N	Y	Y	N	Almost none
<i>Goodenia lyrata</i>	P3	Red sandy loam	Claypan	Mulga	Y	Y	Y	N	Unlikely
<i>Gymnanthera cunninghamii</i>	P3	Sand, calcrete, clay loam	Drainage line	<i>Eucalyptus camaldulensis</i> , <i>Eucalyptus victrix</i> , <i>Acacia citrinoviridis</i>	Y	Y	Y	Y	Almost certain
<i>Indigofera gilesii</i> subsp. <i>gilesii</i>	P3	Pebbly loam amongst boulders & outcrops	Hills	<i>Eucalyptus leucophloia</i> , <i>Corymbia hamersleyana</i> , <i>Corymbia ferriticola</i>	Y	Y	Y	Y	Almost certain
<i>Indigofera</i> sp. Bungaroo Creek (S. van Leeuwen 4301)	P3	Alluvium, skeletal ironstone	Creeks and gorges	Not given	Y	N	N	N	Almost none
<i>Iotasperma sessilifolium</i>	P3	Cracking clay, black loam	Edges of waterholes, plains	Grassland, <i>Eriachne</i> spp., <i>Astrebla</i> spp., <i>Eucalyptus victrix</i>	Y	Y	Y	Y	Almost certain
<i>Nicotiana umbratica</i>	P3	Shallow	Rocky outcrops		Y	N	U	N	Almost none
<i>Oldenlandia</i> sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3	Cracking clay, basalt	Gently undulating plain with large surface rocks, flat crabholed plain	<i>Astrebla</i> grassland; Mulga	N	Y	Y	N	Almost none
<i>Olearia mucronata</i>	P3	Schist	Schistose hills, along drainage channels	Mulga; grassland	N	N	Y	N	Almost none
<i>Phyllanthus aridus</i>	P3	Sandstone, gravel, red sand	Sandplain, hills	Coastal	N	N	N	N	None (Rare)

Species	Cons Code	Soil	Landform	Vegetation	Soil Type Present	Landform Present	Associated Vegetation Present	Known from Nearby	Likelihood of Occurring in the study area
<i>Polymeria distigma</i>	P3	Sand, clay	Coastal plain	<i>Acacia</i> spp., grasses	Y	N	N	N	Almost none
<i>Ptilotus subspinescens</i>	P3	Rocky	Gentle rocky slopes, screes and the bases of screes	Unknown	Y	N	U	N	Almost none
<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794)	P3	Clay loam, sand loam, colluvium	Floodplain / lower slopes	Mulga; <i>Triodia</i> grassland	Y	Y	Y	Y	Recorded
<i>Rostellularia adscendens</i> var. <i>latifolia</i>	P3	Ironstone soils	Near creeks, rocky hills	Mulga; <i>Eucalyptus kingsmillii</i>	Y	Y	N	N	Almost none
<i>Sida</i> sp. Barlee Range (S van Leeuwen 1642)	P3	Skeletal red soils pockets	Steep slope	<i>Ficus brachypoda</i> , <i>Corymbia ferritcola</i> , <i>Eucalyptus victrix</i> , <i>Eucalyptus kingsmillii</i>	Y	N	N	N	Almost none
<i>Solanum</i> sp. Hamersley clay (D. Halford Q.9280) PN	P3	Red brown clay, cracking clay, scattered ironstone	Flat to slightly undulating plain	Tussock grasslands	Y	Y	Y	N	Unlikely
<i>Swainsona</i> sp. Hamersley Station (A.A. Mitchell 196)	P3	Clay loam (cracking)	Flat crabholed plain	<i>Astrelba</i> grassland; Mulga	Y	Y	Y	N	Unlikely
<i>Tecticornia medusa</i>	P3	Red clayey sands	Floodplain	Samphire	Y	Y	N	Y	Possible
<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431)	P3	Red clay	Clay pan, grass plain		Y	Y	Y	Y	Recorded
<i>Triodia</i> sp. Mt. Ella (ME Trudgen 12739)	P3	Light orange-brown, pebbly loam. Amongst rocks & outcrops, gully slopes	Hilltops, gorges, gullies	<i>Eucalyptus leucophloia</i> , <i>Corymbia ferritcola</i> , Mulga	N	Y	N	N	Unlikely
<i>Triodia</i> sp. Robe River (M.E. Trudgen et al. MET 12367)	P3	Banded ironstone, Robe pisolite	Rocky hills and mesas	<i>Eucalyptus leucophloia</i> , <i>Acacia pruinocarpa</i> , <i>Acacia bivenosa</i> , <i>Acacia inaequilatera</i>	N	N	Y	N	Almost none
<i>Whiteochloa capillipes</i>	P3	Sand	Sandplain	<i>Astrelba</i> tussock grassland	Y	Y	N	N	Unlikely
<i>Acacia bromilowiana</i>	P4	Red skeletal stony loam, orange-brown pebbly, gravel loam, laterite, banded ironstone, basalt	Rocky hills, breakaways, scree slopes, gorges, creek beds	<i>Eucalyptus leucophloia</i> , <i>Eucalyptus kingsmillii</i> , <i>Corymbia ferritcola</i> , <i>Acacia hamersleyensis</i>	N	N	Y	Y	Unlikely

Species	Cons Code	Soil	Landform	Vegetation	Soil Type Present	Landform Present	Associated Vegetation Present	Known from Nearby	Likelihood of Occurring in the study area
<i>Eremophila magnifica</i> subsp. <i>magnifica</i>	P4	Skeletal soils over ironstone	Rocky screes	<i>Corymbia hamersleyana</i> , <i>Eucalyptus leucophloia</i> , <i>Eucalyptus kingsmillii</i>	Y	N	Y	Y	Possible
<i>Eremophila youngii</i> subsp. <i>lepidota</i>		Stony red sandy loam	Flats, plains, semi-saline areas, clay flats	Mulga, <i>Acacia xiphophylla</i> , Samphire	Y	Y	Y	Y	Recorded
<i>Goodenia nuda</i>	P4	Alluvium, loam, clay (various)	Adjacent to drainage, floodplain, hills	Various	Y	Y	Y	Y	?Recorded
<i>Rhynchosia bungarensis</i>	P4	Pebbly, coarse sand	Banks of flow line	Various	Y	Y	Y	N	Unlikley

Table 27: Vegetation conservation risk assessment

Code	Vegetation Type	Small extent within study area	Restricted landform*	Riparian/GDE	Mulga	Supports PF/new spp.	Vulnerable to disturbance	Significant ephemeral species component	TEC/PEC	Risk
		Value 1=1-5% 2=<1%	1= not confined 2 = confined	1	1=non-growing 2=SFDV	1=P3,P4 2=P1,P2, multiple P3,P4, new spp.	1	1	1=PEC (or similar to) 2=TEC	
AapAscTe	<i>Acacia aptaneura</i> tall open shrubland over <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> and <i>A. synchronica</i> sparse mid shrubland over <i>Triodia epactia</i> , <i>Eremophila cuneifolia</i> and <i>Ptilotus nobilis</i> var. <i>nobilis</i> mid open shrubland	1			1	1	1			4

Code	Vegetation Type	Small extent within study area	Restricted landform*	Riparian/GDE	Mulga	Supports PF/new spp.	Vulnerable to disturbance	Significant ephemeral species component	TEC/PEC	Risk
AapEfTe/AsyAc	<p>Mulga grove: <i>Acacia aptaneura</i>, <i>A. pruinocarpa</i> and <i>A. paraneura</i> low woodland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i>, <i>Acacia tetragonophylla</i> and <i>E. youngii</i> subsp. <i>lepidota</i> tall-mid sparse shrubland over <i>Triodia epactia</i>, <i>Aristida contorta</i> and <i>A. inaequiglumis</i> mid- low open hummock grassland/mid-low open tussock grassland</p> <p>Mulga intergrove: <i>Acacia synchronicia</i> tall open/sparse shrubland over <i>Aristida contorta</i>, <i>Sclerolaena</i> spp. and <i>Senna</i> sp. Meekatharra (E. Bailey 1-26) low sparse grassland/low sparse chenopod shrubland/low sparse shrubland</p>									
					2	2	1	1		6
AbiTe	<p><i>Acacia bivenosa</i>, <i>A. ancistrocarpa</i> and <i>A. sclerosperma</i> subsp. <i>sclerosperma</i> tall-mid open shrubland over <i>Triodia epactia</i> and <i>T. wiseana</i> mid-low hummock grassland</p>	1					1			2

Code	Vegetation Type	Small extent within study area	Restricted landform*	Riparian/GDE	Mulga	Supports PF/new spp.	Vulnerable to disturbance	Significant ephemeral species component	TEC/PEC	Risk
AbiTw	<i>Acacia bivenosa</i> mid sparse shrubland over <i>Triodia wiseana</i> , <i>Acacia hilliana</i> and <i>T. epactia</i> low open hummock grassland/low open-sparse shrubland with <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> low scattered trees	1								1
AscTe	<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> and <i>A. synchronicia</i> tall sparse shrubland over <i>Triodia epactia</i> , <i>Eragrostis eriopoda</i> and * <i>Cenchrus ciliaris</i> tall hummock grassland/low sparse tussock grassland	1								1
AsyTl	<i>Acacia synchronicia</i> mid sparse shrubland over <i>Triodia longiceps</i> , <i>Aristida contorta</i> and <i>Sclerolaena</i> spp. tall open-sparse hummock grassland/low sparse grassland/low sparse chenopod shrubland	1				1				2
CcAscCc	<i>Corymbia candida</i> subsp. <i>dipsodes</i> and <i>Eucalyptus victrix</i> low open woodland-isolated trees over <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> tall sparse shrubland over * <i>Cenchrus ciliaris</i> and <i>Triodia epactia</i> mid tussock grassland/mid open hummock grassland	1		2			1			4

Code	Vegetation Type	Small extent within study area	Restricted landform*	Riparian/GDE	Mulga	Supports PF/new spp.	Vulnerable to disturbance	Significant ephemeral species component	TEC/PEC	Risk
EvAscCc	<i>Eucalyptus victrix</i> , <i>Acacia aptaneura</i> and <i>Atalaya hemiglauca</i> open woodland over <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> , <i>Eremophila youngii</i> subsp. <i>lepidota</i> and * <i>Vachellia farnesiana</i> tall-mid sparse shrubland over * <i>Cenchrus ciliaris</i> , * <i>Malvastrum americanum</i> and <i>Salsola australis</i> low sparse tussock grassland/low sparse forbland	1		2		2				5
EvAscPs	<i>Eucalyptus victrix</i> and <i>Acacia aptaneura</i> low open-sparse woodland over <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> , * <i>Vachellia farnesiana</i> and <i>A. tetragonophylla</i> mid sparse shrubland over mixed Poaceae spp. low open tussock grassland	1		2		1	1			5
EvVfPs	<i>Eucalyptus victrix</i> , <i>E. camaldulensis</i> subsp. <i>refulgens</i> and <i>Atalaya hemiglauca</i> mid open forest over Poaceae sp. mid open tussock grassland with * <i>Vachellia farnesiana</i> mid scattered shrubs	2	1	2			1			6
Sc	<i>Sclerolaena cornishiana</i> and <i>S. bicornis</i> var. <i>bicornis</i> low sparse chenopod shrubland	2	1					1		4

Code	Vegetation Type	Small extent within study area	Restricted landform*	Riparian/GDE	Mulga	Supports PF/new spp.	Vulnerable to disturbance	Significant ephemeral species component	TEC/PEC	Risk
Tb	<i>Triodia basedowii</i> , <i>T. longiceps</i> and <i>Paraneurachne muelleri</i> mid-low open hummock grassland/low sparse tussock grassland with <i>Acacia ancistrocarpa</i> and <i>A. pachyacra</i> tall-mid scattered shrubs					2				2
VfEc	* <i>Vachellia farnesiana</i> and <i>Senna glutinosa</i> subsp. <i>luerssenii</i> x <i>pruinosa</i> mid sparse shrubland over <i>Enneapogon caerulscens</i> , * <i>Cenchrus ciliaris</i> and * <i>Aerva javanica</i> low scattered tussock grassland/low sparse forbland with <i>Acacia aptaneura</i> and <i>A. paraneura</i> low scattered trees		1			2				3

Appendix Eleven: Vegetation Significance Review Summary

Table 28: Reports reviewed for vegetation significance and summary of findings relevant to the Study Area

Author/Year Reference	Report Title	Summary of report findings of relevance to the study area
Environmental Protection Authority (2012a)	<i>Cloudbreak Life of Mine Project. Report and Recommendations of the Environmental Protection Authority. Report 1429</i>	The EPA considers saltmarsh, Mulga and creekline (groundwater dependent) vegetation to be significant
Environmental Protection Authority (2012b)	<i>FerrAus Pilbara Project. Report and Recommendations of the Environmental Protection Authority. Report 1449</i>	The EPA considers impacts on vegetation consisting of the partly groundwater dependent <i>Eucalyptus camaldulensis</i> and <i>E. victrix</i> , and nearby Fortescue Marsh may be significant (but can be managed)
Environmental Protection Authority (2012c)	<i>Yandicoogina Iron Ore Project – expansion to include Junction south West and Oxbow Depostis. Report and Recommendations of the Environmental Protection Authority. Report 1448</i>	Riparian vegetation is considered significant
Fortescue Metals Group (2011)	<i>Significant Flora, Vegetation, Fauna and Fauna Habitats of the Special Rail Licence</i>	This report summarized the findings of a number of biological surveys in the Pilbara. Mulga vegetation types were considered to have high conservation significance.
Mattiske Consulting Pty Ltd (2011a)	<i>Flora and Vegetation Survey of Roy Hill Infrastructure Railway– Bonney Downs Alignment</i>	11 vegetation communities were identified; none were TECs or PECs. Many of the vegetation communities were similar to those identified from the Alinta Study Area.
Mattiske Consulting Pty Ltd (2011b)	<i>Review of Flora and Vegetation Along Weeli Wolli, Mindy Mindy and Coondiner Creeklines</i>	Mainly and flora and vegetation monitoring report. No vegetation significance was discussed.
Coffey Environments (2010a)	<i>Flora and Vegetation Assessment, Solomon Project and Investigator</i>	Mulga vegetation was considered to have regional significance due to its vulnerability to changes in surface drainage.
Coffey Environments (2010b)	<i>Flora and Vegetation Assessment, Solomon Rail Project Volume 1</i>	No vegetation types were listed as having significance
Ecologia Environment (2009)	Brockman Resources Limited Marillana (E47/1408) Vegetation and Flora Report Version 5	Vegetation of the Fortescue Land system was considered to have conservation significance
ENVIRON Australia Pty Ltd (2009)	<i>Roy Hill 1 Iron Ore Mining Project: Stage 2. Environmental</i>	Identifies groups of vegetation communities from the Stage 2 area; five <i>Triodia</i> sp. hummock grasslands (dominated by various species: <i>T. brizoides</i> , <i>T. sp.</i> Shovelanna Hill, <i>T. longiceps</i> , <i>T.</i>

Author/Year Reference	Report Title	Summary of report findings of relevance to the study area
	<i>Referral</i>	<i>basedowii</i> , <i>T. epactia</i>); five riparian associations, all dominated by <i>Eucalyptus victrix</i> ; five <i>Acacia aneura</i> low woodlands and shrublands; two miscellaneous shrublands dominated by <i>Acacia rhodophloia</i> or <i>A. synchronicia</i> . None were considered of significance. Identifies groups of vegetation communities from the 'remote borefield area': seven woodlands dominated by <i>Acacia aneura</i> , <i>Acacia pruinocarpa</i> or <i>Corymbia aspera</i> ; three shrublands dominated by <i>A. aneura</i> ; one grassland. None were considered significant. Many of these vegetation types were also recorded from the Alinta Study Area.
Environmental Protection Authority (2009b)	<i>Roy Hill 1 Iron Ore Mining Project Stage 1. Report and Recommendations of the Environmental Protection Authority. Report 1342</i>	No vegetation of significance was identified (ie all vegetation was considered common and represented outside the relevant area), however it was identified as being adjacent to the Fortescue Saltmarsh area. Phreatophytic vegetation was listed as being impacted. Listed vegetation was dominated by <i>Eucalyptus camaldulensis</i> / <i>E. victrix</i> or <i>E. victrix</i> . Mulga (<i>Acacia aneura</i>) was as potentially being impacted by changes to surface water flows, however no impacts were anticipated.
Environmental Protection Authority (2009c)	<i>Roy Hill 1 Iron Ore Mining Project Stage 2. Report and Recommendations of the Environmental Protection Authority. Report 1345</i>	Vegetation of key interest was identified as being phreatophytic (groundwater dependent) Samphire, <i>Eucalyptus camaldulensis</i> , <i>Melaleuca argentea</i> or <i>E. victrix</i> dominated, or vegetation impacted by changes to surface hydrology, including Mulga and marsh communities.
Mattiske Consulting Pty Ltd (2009)	<i>Flora and Vegetation on the Creeklines (Coondiner, Kalgan, Mindy Mindy and Unnamed) Associated with Hope Downs 4</i>	The most significant vegetation type supported Priority listed flora
Astron Environmental Services (2008)	Nullagine Project Flora and Vegetation Survey	Grasslands and herblands on cracking clay and Mulga woodlands were considered of local significance
Biota Environmental Sciences (2008)	Marandoo Mine Phase 2 Project Vegetation and Flora Survey	Mulga vegetation types and vegetation on calcrete (as well as other vegetation types not similar to the Alinta Study Area) were considered to have conservation significance
Ecologia Environment (2008)	<i>BHP Billiton Iron Ore Rapid Growth Project 5 (RGP5) Chichester Deviation Vegetation and Flora Report (Version 3)</i>	<i>Astrebla pectinata</i> tussock grassland and <i>Acacia xiphophylla</i> scrubland on cracking clays, were considered to be of high local conservation significance. <i>Acacia ayersiana</i> and <i>A. aneura</i> low open forest were considered of moderate regional conservation significance.
Mattiske Consulting Pty Ltd (2008a)	<i>Condition and Composition of Flora and Vegetation Along Creek Systems Near Discharge Points Marandoo, Phase 2</i>	Monitoring report: no vegetation significance was included in the report. Of interest is that <i>Eucalyptus victrix</i> and <i>Acacia citrinoviridis</i> were both included in the monitoring of vegetation health along creeklines, although no other references consider <i>A. citrinoviridis</i> to be phreatophytic, groundwater dependent or dependent on surface water flows.
Mattiske Consulting (2008b)	<i>Flora and Vegetation on the Hope Downs 4 Mine and Village/Camp Area</i>	Mulga and Mulga-Spinifex communities, calcrete (characterised by <i>Eucalyptus socialis</i>) and creekline communities are considered to have conservation significance as they support populations of PF
Coffey Environments Pty	<i>Supplementary Vegetation and Flora</i>	Vegetation types considered of high conservation significance and occurring towards the

Author/Year Reference	Report Title	Summary of report findings of relevance to the study area
Ltd (2007)	<i>Surveys of the Port Hedland to Cloudbreak Rail Corridor and Associated Borrow Pits and Infrastructure. Volume 1: Main Report and Figures</i>	south-eastern portion of the relevant Study Area (ie those closest to the Alinta Study Area) were: <ul style="list-style-type: none"> • AayS1 <i>Acacia ayersiana</i>, <i>Acacia pruinocarpa</i> and <i>Acacia aneura</i> Tall Open Scrub over a Mid Dense Hummock Grassland of <i>Triodia epactia</i> and <i>Aristida contorta</i> • ChaW2 <i>Corymbia hamersleyana</i> Low Open Woodland over Mixed Open to Mid Dense Hummock Grassland • TanTepHG1 <i>Triodia angusta</i> and <i>Triodia epactia</i> Hummock Grassland. No reasons were given for why these were considered of significance.
Environmental Protection Authority (2005)	<i>Pilbara Iron Ore & Infrastructure Project: East-West Railway and Mine Sites (Stage B). Report and Recommendations of the Environmental Protection Authority. Bulletin 1202</i>	80 broad vegetation types were identified, with vegetation of key interest being phreatophytic (<i>Eucalyptus camaldulensis</i> , <i>Melaleuca argentea</i> or <i>E. victrix</i> dominated).
Mattiske Consulting (2005)	<i>Flora and Vegetation on the Cloudbreak and White Knight Leases</i>	Mulga communities are considered to be of local significance due to having Priority Flora species and being on the northern edge of their extent
Biota Environmental Sciences (2004a)	<i>Vegetation and Flora Survey of the Proposed FMG Stage A Rail Corridor</i>	Within the Hamersley biogeographic subregion, only Mulga groves were considered of high conservation significance. Within the Fortescue Valley biogeographic region, the Fortescue Marsh and surrounds, Muga and <i>Eucalyptus victrix</i> were considered significant.
Biota Environmental Sciences (2004b)	Vegetation and Flora Survey of the Proposed FMG Stage B Rail Corridor and Mines Areas	Only Mulga vegetation was considered to have conservation significance
Van Vreeswyk <i>et al.</i> (2004)	'Vegetation' in Technical Bulletin 92 - An inventory and condition survey of the Pilbara region, Western Australia	The only vegetation considered of significance is now listed as either TEC or PECs
Trudgen & Casson (1998)	<i>Flora and Vegetation Surveys of Orebody A and Orebody B in the West Angelas Hill Area, an Area Surrounding Them, and of Rail Route Options Considered to Link Them to the Existing Robe River Iron Associates Rail Line</i>	A number of vegetation types identified from the Study Area were considered to have conservation significance, including: <ul style="list-style-type: none"> • some riparian vegetation • vegetation associated with seeps • some grasslands on clay soils (including vegetation that is now considered a TEC and PEC) • some Mulga vegetation types.

Appendix Twelve: Fauna Species Profiles

PROFILES OF POTENTIALLY OCCURRING CONSERVATION SIGNIFICANT FAUNA

Mammals

Dasyurus hallucatus (Northern Quoll)

Conservation status

EPBC Act EN, WC Act S1, DEC EN

Distribution and Preferred 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 north Kimberley in Western Australia and a few discrete populations across the Northern Territory and eastern Queensland (Braithwaite & Griffiths 1994). Pilbara populations are considered to be already fragmented and to have been in decline since the mid-1980s, with the precise causes unknown (Threatened Species Scientific Committee 2005). Northern Quolls are most common on dissected rocky escarpments, but are also found in eucalypt forest and woodland (Oakwood 2008). Potential denning / shelter habitat (considered critical for quoll survival) includes rocky gorges, gullies, major creeklines and escarpments associated with *Corymbia* woodland, boulder fields, termite mounds, and small caves. Foraging or dispersal habitat is considered to include any areas of predominantly native vegetation up to 2 km from denning habitat (DSEWPaC 2012c).

Biota (2009) made a very useful compilation of Northern Quoll distribution records and trapping results across the Pilbara, which were mapped and related to Land Systems (Van Vreeswyk *et al.* 2004), but their discussion does not fully account for unequal distribution of area and trapping effort. While Biota (2009; table 4.1) ranked land systems based on the raw number of Northern Quoll records (regarding those with 8 or more as containing 'core habitat'), they are ranked here (**Table 29**) based on the number of records in proportion to area.

Table 29. Ranking of Land Systems by number of Northern Quoll records (if >3) in proportion to land area (Land Systems intersected by Study Area shown in bold)

Land System	Area (ha) (Van Vreeswyk <i>et al.</i> 2004)	NQ records (Biota 2009)	NQ records per 10,000 km ²
Robe	865	31	358
Horseflat	1,261	7	56
Wona	1,815	10	55
Calcrete	1,444	5	35
Macroy	13,095	38	29
Rocklea	22,993	49	21
River	4,088	8	20
Capricorn	5,296	10	19
McKay	4,202	5	12

Land System	Area (ha) (Van Vreeswyk <i>et al.</i> 2004)	NQ records (Biota 2009)	NQ records per 10,000 km ²
Boolgeeda	7,748	5	6.5
Newman	14,580	7	4.8

Ecology

Northern Quolls are nocturnal and opportunistic omnivores feeding primarily on large insects, small vertebrates and soft fruits. They are both arboreal and terrestrial and use a variety of den sites including rock crevices, tree hollows, logs, termite mounds, house roofs and goanna burrows (Oakwood 2008). Breeding tends to occur near creeklines, where individuals go to drink when water is available. Body size, home range size and survival rate vary between rocky and savannah habitats, but Pilbara populations have not been well studied. The short generations, large litter sizes and large home ranges of this species mean that population density and occupancy of habitat may fluctuate greatly between years, and sites that are occupied only occasionally may still be critical for long-term survival in the region.

Likelihood of Occurrence

Potentially suitable denning and foraging habitat occurs where the Fortescue River cuts through the Ophthalmia Range, where ironstone ridges with caves and crevices occur in proximity to riparian woodland and pools or flowing creeks; cavities suitable for denning also occur where calcrete layers (former channels, now ridges) are undercut by weathering (**Plate 33**, **Plate 34**). However, most of the habitat types comprising the Study Area are not suitable for this species (compare **Table 3** and **Table 29**); there are only two NatureMap records (DEC 2012b) to the south or east of the Study Area (in 2010 and 2011), separated by nearly 200 km from the more continuous area of distribution to the north and west, indicating occasional long-distance dispersals but no evidence for self-sustaining resident populations in the area.

Potential Impacts

No impact to existing populations is likely to occur due to the proposed clearing. The possibility of intermittent use or future recolonisation means that disturbance to critical habitat should be avoided.

***Macrotis lagotis* (Greater Bilby)**

Conservation status

EPBC Act VU, WC Act S1, DEC VU

Distribution and Preferred habitat

Once very widespread, the Bilby (*Macrotis lagotis*, Thylacomyidae) is now rare and scattered, confined to northern and mostly inland locations, particularly sandy deserts (patchily distributed through the Tanami Desert in the Northern Territory, west to Broome and south to Warburton in Western Australia). It occupies a variety of habitats, including cracking clays, desert sandplains, and dune fields with hummock grassland and *Acacia* shrubland (Van Dyck & Strahan 2008).

Ecology

The Bilby is terrestrial, nocturnal and omnivorous, constructing an extensive burrow where it remains during the day, emerging at night to dig for insects, very small vertebrates, seeds, fruit and fungi. The burrow provides refuge from fires and many of its food plants are promoted by disturbance, so Bilbies are able to occupy recently burnt areas and have been considered 'dependent on fire' (Friend *et al.* 2011). Lavery & Kirkpatrick (1997) suggest that very small populations may leave traces that incorrectly suggest much larger numbers and healthier populations than is actually the case.

Likelihood of Occurrence

There are two records near the eastern end of the Fortescue Valley, one based on a WAM specimen some decades ago but the other only 'moderately certain' (DEC 2012b). Apparently suitable habitat for Bilby is widespread in the Study Area (e.g. Turee and Jamindie LS in the northern part, as well as Fan and Divide) but no evidence of burrows, digs or scats observed during the survey could be positively associated with this species. It is likely that this species is now locally extinct.

Potential Impacts

No impact on this species is likely due to its absence.

***Dasyercus cristicauda* (Crest-tailed Mulgara)**

Conservation status

EPBC Act VU, WC Act S1, DEC VU

***Dasyercus blythi* (Brush-tailed Mulgara)**

Conservation status

DEC P4

Two species of Mulgara (Dasyuridae) have only recently been consistently distinguished by Woolley (Woolley 2005), and the actual distribution and conservation status of each remain uncertain. The current EPBC Act listing is based on the *Action Plan for Australian Marsupials and Monotremes* (Maxwell *et al.* 1996) and does not reflect current taxonomic understanding. The species are distinguished by distribution of long, dark, stiff hairs on the tail, number of upper premolars, and number of teats in the pouch: *D. cristicauda* with dorsally crested tail, small P³ [third upper premolar] present, and 8 teats, vs. *D. blythi* non-crested, only two upper premolars, and 6 teats (Woolley 2005). DSEWPaC's current position (eg DSEWPaC 2010) is that where specimens of *Dasyercus* have not been positively assigned to species based on diagnostic characters, as a precautionary measure they are assumed to represent *D. cristicauda* due to its higher level of statutory protection.

Distribution and Preferred habitat

Both Mulgara species have a wide geographic range in the arid zone of Australia, and broadly overlapping distributions, typically occurring in mature spinifex grasslands on sandy substrates (including sandy loam). Within the Pilbara, there are many records of Mulgara in the Chichester IBRA subregion and eastern Fortescue valley, but very few in the Hamersley subregion, where rocky substrates predominate. There were no confirmed records of *D. cristicauda* in WA after 1931 (Ric How [WAM] via David Pearson [DEC] pers comm 2012), until recently when a specimen trapped east of Newman was positively identified by genetic testing (Phoenix 2011b). Evidence from areas of

sympatry outside the Pilbara indicates habitat differences between the two species, with *D. cristicauda* occurring on sandhills and sandridges, *D. blythi* mostly on sandplains and gibber plains (Pavey et al. 2011; Woolley 2005). This pattern is likely also to apply to Pilbara populations.

Ecology

Both Mulgara species are primarily nocturnal, carnivorous marsupials, feeding mainly on invertebrates, along with some reptiles and small mammals. The Crest-tailed Mulgara is somewhat larger: females up to 80 g and males up to 140 g, vs 60 and 75 g respectively in Brush-tailed Mulgara (Pavey et al. 2011). They construct and occupy burrow systems with two or more entrances, usually at the edge of spinifex hummocks (Thompson & Thompson 2007; Woolley 1990).

Likelihood of Occurrence

There are two 2009 records of *D. blythi* on NatureMap about 20 km west of the Study Area on the Fortescue Valley floor (DEC 2012b). The Study Area intersects extensive sandplain or sandy loam habitat with spinifex or tussock grass, which may be suitable for *D. blythi* or both species. The species therefore potentially occurs as a resident in one or more of these habitat types. Likely presence was confirmed by observation of burrows typical of Mulgara at several locations, including clusters of several burrows under or between Spinifex hummocks, with fresh digging evident. Tracks consistent with Mulgara were also observed.

Potential Impacts

Any impact is expected to be relatively minor because of the sparse and patchy distribution of the species in widespread and abundant habitat, and the relatively small and discontinuous areas of disturbance associated with the proposed activity.

***Sminthopsis longicaudata* (Long-tailed Dunnart)**

Conservation status

DEC P4

Distribution and Preferred habitat

This species of Dasyuridae is rare and patchily distributed in rocky areas of central Western Australia (Pilbara, Murchinson, Northeastern Goldfields, Ashburton, and Gibson Desert regions) and a few sites in central southern Northern Territory, but at times it can be locally common. It is found in rocky scree and plateau areas, generally with little vegetation or of spinifex hummock grassland, shrubs, and open woodland (Burbidge *et al.* 2008).

Ecology

This species is nocturnal, and its diet includes a variety of invertebrates. Females in captivity give birth to up to five young between the months of October and December (Pavey 2006).

Likelihood of Occurrence

There are records of this species from rocky areas near Newman and Roy Hill (DEC 2012b) so it is likely to occur as a resident or irruptive visitor near the northern and southern parts of the Study Area.

Potential Impacts

There appear to be no major threats to this species. In the range within central Australia this species is affected by the spread of exotic buffel grass, which increases frequency and intensity of fires. This is also likely to be an issue in some areas in Western Australia (IUCN 2011). Localised clearing does not represent a threat and negligible or no impact is likely to occur.

***Planigale* sp. 1 and sp. 2 (Pilbara Planigales)**

Conservation status

None recognised, but should be treated as equivalent to DEC Priority species as they are undescribed and poorly known (without taxonomy, no information can be reliably associated with species).

Distribution and Preferred habitat

Planigales are carnivorous marsupials (Dasyuridae) and the smallest terrestrial mammals in Australia. It has long been recognized that *Planigale* is represented by two species in the Pilbara, but they have often been conflated with *P. ingrami* and *P. maculata* (Biota 2005a; Blacket et al. 2000; Dunlop & Sawle 1983; Gibson & McKenzie 2009). Gibson and McKenzie (2009) considered both of these species to be endemic to the Pilbara, and confirmed that they have distinct habitat preferences, with *Planigale* sp. 1 associated with rugged substrates dominated by exposed bedrock, and *Planigale* sp. 2 appearing to prefer clay substrates and avoid massive rocky habitats.

Ecology

Planigales are very small marsupial insectivore/carnivores with more or less flattened heads and splayed hindlimbs, which enable them to shelter and forage in narrow soil cracks and rock crevices, but they are also active on the surface at night and sometimes early morning (Van Dyck & Strahan 2008).

Likelihood of Occurrence

Both species are very likely to be resident in the Study Area where suitable habitats occur (rocky outcrops and cracking clay soils respectively).

Potential Impacts

Any impact is likely to be very minor, as the effected area represents a very small proportion of extensive habitats for both species in the region.

***Notoryctes caurinus* (Kakarratul, Northern Marsupial Mole)**

Conservation status

EPBC Act EN, WC Act S1, DEC EN

Distribution and Preferred habitat

The two species of Marsupial Moles (Notoryctidae) are most often recorded in sandy dune habitats supporting various acacias and other shrubs, and often but not always in association with spinifex (Benshemesh 2004; Benshemesh & Johnson 2003; DSEWPac 2012c; IUCN 2007; Pearson & Turner 2000). *N. caurinus* appears to be restricted to northern WA, while *N. typhlops* occurs in south-eastern WA, southern NT and northern SA; there is an area of overlap and apparent sympatry around Warburton and the Gibson Desert (Benshemesh & Aplin 2008).

Ecology

Recent investigations have found that marsupial moles tunnel, rather than 'swim' through sand as previously thought, and back fill as they move along (Benshemesh 2004). Northern and southern marsupial moles, *Notoryctes caurinus* and *N. typhlops*, leave very different tracks on the surface, making them easy to differentiate. The southern marsupial mole leaves a distinctive sinuous tail-mark in the sand, whereas the northern marsupial mole shows no obvious tail-marks and leaves marks resembling a miniature turtle hauling itself over the sand (Benshemesh & Aplin 2008). Detected either by tracks or when active on or just under the surface (which occurs most often just after heavy rain), but otherwise leaves few detectible traces and is very rarely trapped. A survey methodology has been developed involving the digging of a steep and smooth sided trench to detect tunnels. Trenches are normally dug at three levels on a dune: near the crest, mid slope, and base (Benshemesh 2004; Benshemesh 2005).

Remains of marsupial moles are found frequently in the scats of introduced foxes, and to a lesser extent those of dingos and feral cats, but it is not clear to what extent these predators limit their populations or distribution. Other possible threats include changed fire regimes, and trampling and habitat changes due to introduced cattle and camels, which potentially affect moles by modifying availability of invertebrate prey.

Likelihood of Occurrence

The nearest record of *N. caurinus* is approximately 150 km east of the Study Area (DEC 2012b), but the possibility of occurrence is considered here due to the cryptic nature of the species, and the low overall number of fauna records in the potentially suitable sandplain habitat intersected by the Study Area (Divide LS). However, all the areas of sandy habitat intersected by the powerline corridor are relatively flat and well vegetated, without dunes, so presence of *Notoryctes* is considered unlikely.

Potential Impacts

No impact to any population is likely to occur.

***Lagorchestes conspicillatus leichardti* (Spectacled Hare-wallaby - mainland)**

Conservation status

DEC P3

Distribution and Preferred habitat

The Spectacled Hare Wallaby (Macropodidae) has declined dramatically in WA; it is now extremely rare and reduced to a few isolated populations in the Pilbara and Kimberley regions (Wildlife Australia 1996). It occupies a wide variety of habitat types including: open forests, open woodland, tall shrublands, tussock grasslands and hummock grasslands. In the drier southern parts of its range it commonly occupies spinifex (*Triodia* or *Plectrachne* spp.) sandplains interspersed with low shrubs and a diversity of either soft grasses, sedges or forb species.

Ecology

This small nocturnal macropod shelters by day under grass tussocks or shrubs, and feeds on grass, herbs, seeds, and browse (shrub foliage). Threats probably include introduced predators (foxes in southern parts of the range, and possibly cats), and impacts on food resources and habitat from the

pastoral industry (particularly sheep, which are now relatively unimportant in the Pilbara) and changes in fire regimes (Ingleby 1991; Ingleby & Westoby 1992; Wildlife Australia 1996).

Likelihood of Occurrence

Extant remnant populations have been reported near Jimblebar (about 45 km east of Newman) and to the north-west of Nullagine (Ingleby 1991; Ingleby & Westoby 1992), but no other records in the vicinity (DEC 2012b), and it is unlikely that any still occurs closer to the Study Area.

Potential Impacts

No impact is likely, as the species is considered to be locally extinct.

***Petrogale lateralis lateralis* (Black-flanked Rock-wallaby)**

Conservation status

EPBC Act VU, WC Act S1, DEC VU

Distribution and Preferred habitat

The Black-flanked (or Black-footed) Rock-wallaby (Macropodidae) has declined greatly due to foxes and other threats, and only scattered, small and insecure populations remain in the Pilbara, mostly near the coast (Barrow Island, Cape Range, Ningaloo Station, Fortescue River Roadhouse [near Roebourne]); populations also exist far inland (Calvert Range) and further south in the Murchison and Wheatbelt (Pearson & Kinnear 1997). Habitat depends on availability of suitable refuge (cliff, rock-pile, talus or escarpment) close to sufficient vegetation to provide food. The Pilbara craton is otherwise occupied by the regional endemic *P. rothschildi* (not conservation listed).

Ecology

Diet is generalized, including forbs, browse, and minor amounts of grass, fruit, seeds, flowers and insect larvae (Van Dyck & Strahan 2008).

Likelihood of Occurrence

There are records from 1975 about 20 km north of Newman (DEC 2012b), but remnant populations are not known to occur in the eastern Pilbara (Pearson & Kinnear 1997), and this species is considered to be locally extinct.

Potential Impacts

No impact is likely due to absence of the species.

***Rhinonictoris aurantia* (Pilbara Leaf-nosed Bat)**

Conservation status

EPBC Act VU, WC Act S1, DEC VU

Distribution and Preferred habitat

The Pilbara Leaf-nosed Bat is an isolated population of a species (Orange Leaf-nosed Bat or Orange Horseshoe Bat, Hipposideridae) that also occurs from the Kimberley to north-west Queensland. It appears to be divided into three discrete subpopulations (eastern Pilbara mines and granite, Hamersley Range, Upper Gascoyne), separated by relatively flat areas that impede gene flow such as the Fortescue and Ashburton valley. Many records of the species in the region are of bats in flight or roadkills, so the number of distinct roosts is not known.

Because of its poor ability to thermoregulate and retain water, the Pilbara Leaf-nosed Bat is normally restricted to caves and mine adits (horizontal shafts) with stable, warm and humid microclimates (Van Dyck & Strahan 2008). Temporary roosts such as crevices and tree hollows could be used in warm and humid conditions, allowing greater dispersal during the wet season. The roosting site is often at depth in mines; in small crevices within caves, usually those ascending between sedimentary rock layers; and with associated groundwater seeps, e.g. at Barlee Range (Armstrong 2001). Simple vertical shafts are not used and shallow caves beneath mesa bluffs are also unlikely roost sites. Foraging in the Pilbara has been observed in the following habitats: *Triodia* hummock grasslands covering low rolling hills and shallow gullies, with scattered *Eucalyptus camaldulensis* along the creeks (e.g. near Marble Bar, Bamboo Creek, Lalla Rookh and Copper Hills); over small watercourses amongst granite boulder terrain and around nearby koppies; over pools and low shrubs in ironstone gorges; and above low shrubs and around pools in gravelly watercourses with *Melaleuca leucodendron*, such as in Barlee Range Nature Reserve (Armstrong 2001; Churchill et al. 1988).

Ecology

Typically, the Pilbara Leaf-nosed Bat flies low in the open spaces in watercourses and gorges, and over *Triodia* grassland, sometimes within centimetres of the ground, but up to 2–3 m in height. It feeds mainly on moths, but also beetles, bugs, wasps and ants. Feeding is mainly close to roost sites, the bat returning to the roost several times during the night between feeding flights. This species is very sensitive to even slight human disturbances. If subject to continual human interference it may completely abandon a roost. It often shares roosts with the Ghost Bat, *Macroderma gigas*, Finlayson's Cave Bat, *Vespadelus finlaysoni*, Common Sheath-tailed Bat, *Taphozous georgianus*, and possibly Hill's Sheath-tailed Bat, *Taphozous hilli*, in some parts of its range. Any management strategy that benefits the Pilbara Leaf-nosed Bat is also likely to benefit these species (Armstrong 2001; Churchill et al. 1988; DSEWPac 2012c).

Likelihood of Occurrence

There are records to the north and west of the Study Area (DEC 2012b) but none to the south or east, so it lies outside the known range; none have been recorded in the well-surveyed areas around Newman, Roy Hill, or Cloudbreak. It is questionable whether suitable roosting sites occur in the Ophthalmia or southern Chichester Range, and there are no records of the species within 60 km of Newman or within 80 km of the northern part of the Study Area. No indication of deep horizontal caves providing suitable roosts was observed in this survey. It is therefore unlikely that the species occurs either as a resident, or temporarily during wet-season dispersal.

Potential Impacts

No impact is likely to occur to this species.

***Macroderma gigas* (Ghost Bat)**

Conservation status

DEC P4

Distribution and Preferred habitat

Regional populations of Australia's only carnivorous bat (Megadermatidae) are centred on maternity roosts that are genetically isolated from each other, and only 10 such sites are known to exist (Worthington-Wilmer *et al.* 1994). Populations are known to disperse in the non-breeding (dry) season (Toop 1979; Toop 1985). The persisting arid zone regional population in the Pilbara is also geographically isolated, being separated from extant northern Australian populations and the historical central Australian populations by extensive sandy deserts (Richards & Hand 1995). Roosts occur in caves, mines, and rock clefts, and most of the distribution is in the arid zone but the species also occurs in mesic environments including rainforest. Its range appears to have contracted into northern Australia in relatively recent times, especially in Central Australia (Churchill & Helman 1990).

Ecology

Forages by gleaning (picking prey items from surfaces), eating large insects, frogs, lizards, small birds and mammals. Tidemann *et al.* (1985) reported Ghost Bats in the Northern Territory foraged, on average, 1.9km from their day roost, with a mean foraging area of 61 ha. This species detects prey using eyes and ears rather than using echolocation, and changes vantage points about every 15 minutes during foraging periods, with a mean distance of 360 m between them. It is an obligate troglodyte, and survival is critically dependent on finding natural roosts in caves, crevices, deep overhangs, and artificial roosts such as abandoned mine adits (Hall *et al.* 1997). Threats include disturbance and loss of roosting sites due to mining, tourism and internal dereliction of mines through aging of timber supports (Hall *et al.* 1997). In recent times population declines could be attributable to competition for prey with foxes, feral cats, and prey lost through habitat modification by fire and livestock (Environment Australia 1999).

Likelihood of Occurrence

This species has been recorded in hilly habitat near the northern and southern parts of the Study Area where suitable roost caves are likely to occur, and also (further west) on the Fortescue Valley floor (DEC 2012b), where presence would be more intermittent (foraging and dispersing individuals).

Potential Impacts

Minor impact may occur through clearing (reduction of foraging area), particularly in the southern section where the Fortescue River intersects the Ophthalmia Range. Electrocutation on powerlines is a frequent source of mortality for Pteropodid fruit bats, but this does not seem to be a known hazard for the Ghost Bat despite its comparably large size.

Short-tailed Mouse, Lakeland Downs Mouse (*Leggadina lakedownensis*)

Conservation status

DEC P4

Distribution and Preferred habitat

This native rodent (Muridae) is a nocturnal species found in areas of open tussock and hummock grassland, acacia shrubland, and savanna woodland, on alluvial clay or sandy soils. The population is

rare and scattered on the mainland with large annual fluctuations that may not correlate with environmental fluctuations or seasonality (Moro & Kutt 2008).

Ecology

Females give birth to two litters annually. Litters contain up to four young and the gestation period lasts about 30 days. No major or general threats have been identified (IUCN 2011).

Likelihood of Occurrence

There are *NatureMap* (DEC 2012b) records of this species along the southern edge of the Chichester Range adjacent to the northern part of the Study Area, so it is likely to occur as a resident or irruptive visitor, especially along drainage lines where clay and sandy soils with *Acacia* shrubland represent suitable habitat.

Potential Impacts

Given the patchy and fluctuating population, any impact would be very difficult to measure but some may occur due to clearing. Any impact would be minor in proportion to the area affected, as suitable habitat is extensive in the region.

***Pseudomys chapmani* (Western Pebble-mound Mouse)**

Conservation status

DEC P4

Distribution and Preferred habitat

This native rodent (Muridae) occurs across the central and southern Pilbara and into smaller ranges of the Little Sandy Desert, although it was formerly more widespread (IUCN 2011). Abandoned mounds found in the Gascoyne and Murchison districts indicate a recent decline in distribution, most likely due to fox and feral cat predation. The species does however appear secure in its remaining range (Start 2008). The preferred habitat is gentle slopes of rocky ranges sparsely vegetated by *Triodia* grasses, *Senna*, *Acacia* and *Ptilotus* species.

Ecology

Animals live in small family groups in burrows below mounds of pebbles. Each mouse utilises and maintains several mounds, and active mounds are identifiable by structural features and absence of vegetation, but remain recognisable for some time once abandoned (Anstee 1996). Females can produce several litters of four young annually. There appear to be no major threats to this species. The reasons for its elimination from the southern portion of its range are unclear, but may have been related to predation by feral cats and foxes. Mining may be a localized threat (Anstee et al. 1997), but this would not significantly affect the overall population size (IUCN 2011). Diet has not been reported, but likely to be mainly seeds, with some leaves and invertebrates.

Likelihood of Occurrence

Suitable habitat occurs on slopes and hilltops in and adjacent to the Newman LS in the southern part of the Study Area; these areas were mostly not accessed during the fauna reconnaissance survey, but an inactive mound was located by the Flora team. The species is considered likely to be a resident in

the Ophthalmia Range, and may also occur where stony mantles occur in the northern part of the Study Area (e.g. Jamindie and Turee Land Systems) depending on the final alignment.

Potential Impacts

Any impacts of the proposed clearing are unlikely to be significant for this species due to the low density of populations and extensive known distribution of habitat across the region. Local impacts may be further reduced by surveying clearing locations in suitable habitat (slopes or ridgetops) for active mounds, and trapping/translocation of resident individuals immediately prior to clearing.

Reptiles

***Liasis olivaceus barroni* (Pilbara Olive Python)**

Conservation status

EPBC Act VU, WC Act S1, DEC VU

Distribution and Preferred habitat

The Pilbara subspecies of the Olive Python (Pythonidae) only occurs in the ranges of the Pilbara region of Western Australia, and islands of the Dampier Archipelago. It inhabits watercourses and areas of permanent water in rocky gorges and gullies (Pearson 2003). The Pilbara subspecies was reported from nine localities when first described (Smith 1981) and listed as threatened in WA soon afterward, but many more locality records have accumulated subsequently (Pearson 1993) and it has been considered “Not threatened, or likely to be. Shouldn’t be on list, common and widespread” (Kendrick 2002). The species is considered stable and in sizable numbers at some known sites (Pearson 2003).

Ecology

This large constricting snake is an adept swimmer, often hunting in water, feeding on a variety of vertebrates including rock wallabies, fruit bats, ducks, and pigeons. Individuals may be sedentary (with a discrete home range associated with water) for most of the year, but can move several kilometres through rocky hills in some seasons, e.g. during June and July males may travel long distances to locate females for breeding (Pearson 2003; Wilson & Swan 2008)). 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 (Department of Environment Water Heritage and the Arts 2008). In late winter or early spring males will travel large distances to find and mate with females.

They are mostly found close to permanent waterholes, not because they need to drink frequently but because their prey does. They are most often seen at night and are generally found around rocky areas, rocky outcrops and cliffs, but they also shelter in logs, flood debris, caves, tree hollows and thick vegetation. Juvenile Olive Pythons feed on small reptiles and (probably) frogs as well as small mammals, shifting to birds and medium-sized mammals (e.g. quolls, rock-wallabies) as adults, which may grow to at least 4 m.

Likelihood of Occurrence

There are numerous NatureMap records of the Pilbara Olive Python from the Hamersley Range, but few in the less rugged Chichesters and none on the broad part of the Fortescue Valley floor (DEC 2012b). It occurs close to Newman in the Ophthalmia Range (e.g. Kalgan Pool), but appears to be at the limit of its distribution as there are no records either south of the range, or east of the Fortescue River. Thus, the entire Study Area may lie outside the current distribution of the species and it is unlikely to be resident.

Potential Impacts

The main threats to this subspecies come from predation from feral cats and foxes, particularly of juveniles, loss of suitable prey species (e.g. due to Fox in coastal areas), and accidental or deliberate killing of individual snakes by people (Pearson 2003). Mortality may occur during clearing in the Ophthalmia Range section of the Study Area, but this would not represent a significant impact to a population because the area is marginal habitat if the species occurs at all.

***Ramphotyphlops ganei* (Pilbara Blindsnake)**

Conservation status

DEC P1

Distribution and Preferred habitat

This species of Blindsnake (Typhlopidae) occurs at widely scattered sites in the Pilbara, including the eastern and western Hamersley, Fortescue valley, and Chichester range (Aplin 1998; DEC 2012b). It appears to be associated with moist areas such as gorges, gullies and floodplains, though there is a record from sandy soil with spinifex (WAM record cited by Ecologia 2010).

Ecology

Like most other typhlopids it presumably feeds on eggs, larvae and pupae of ants, and individuals are likely to mostly inhabit the topsoil, termitaria and ant nests (Greer 1997; Webb & Shine 1993). Typhlopids emerge only at night and follow chemical trails to locate food sources and mates, and are most often seen active or trapped in warm, humid conditions.

Likelihood of Occurrence

This species has been recorded near the northern and southern part of the Study Area and on the Fortescue Valley floor (DEC 2012b). The most suitable habitat (rocky gorges) occurs where the Fortescue River cuts through the Ophthalmia Range, but it may also be present in any other habitats intersected by the corridor.

Potential Impacts

Impact would be very difficult to quantify because of the low detectability of the species, but it is likely to be minor because it is broadly distributed within the Pilbara.

***Ctenotus nigrilineatus* (Pinstriped Finesnout Ctenotus)**

Conservation status

DEC P1

Distribution and Preferred habitat

This boldly patterned skink is recorded from few locations, ranging from Abydos/Woodstock to Nullagine in the Chichester subregion (DEC 2012b). Originally described from one isolated granite rockpile near Woodstock, Abydos Plain (How & Dell 2004; Storr 1990), the only other reported habitat data are for an uncertain sighting in *Acacia adsurgens* (Wattle) shrubland over *Triodia epactia* hummock grassland (DEC 2012b).

Ecology

Associated with hummock grass habitats, and with multiple specimen records from each of few localities indicating patchy local abundance. Like most other *Ctenotus* species, this is an active diurnal terrestrial lizard and probably a generalist invertebrate feeder; some dietary specialization on different invertebrate groups occurs within the genus (Goodyear & Pianka 2011).

Likelihood of Occurrence

The Study Area is outside the known area of distribution, so presence is not predicted. However, given the sparse locality records relative to the total distribution, further range extensions are considered likely, and extensive hummock grass habitat occurs in the Study Area so it may occur.

Potential Impacts

Due to the paucity of information regarding this species little is known about potential threats. The proposed vegetation clearing will impact any local populations that may be present, but is unlikely to significantly impact regional populations.

***Ctenotus* aff. *uber johnstonei* (Balgo Spotted Ctenotus)**

Conservation status

Ctenotus uber johnstonei is a **DEC P2** taxon known definitively from the south-east Kimberley, that differs from the nominate subspecies in presence of a distinct dark vertebral stripe and contact between nasal scales (DEC 2012b; Wilson & Swan 2008). The taxonomic and conservation status of similar specimens from the Pilbara remains obscure. Doughty *et al.* (2011) do not list or discuss this form as part of the Pilbara herpetofauna, but record *C. u. uber* from 19 of 273 quadrats throughout the bioregion. It is assumed here that Pilbara records represent a taxon potentially distinct from both named subspecies, but of equivalent conservation significance to *C. uber johnstonei* (P2).

Distribution and Preferred habitat

Ctenotus uber (all subspecies) occurs mainly on hard reddish soils, including rocky hills and floodplains. *C. uber johnstonei* occurs in an area of chenopod shrubland at the base of a sandstone hill near Balgo in the Kimberley. Biota (2005b) report Pilbara specimens from several distinct habitats (*Triodia* on a dolerite hillslope, snakewood *Acacia xiphophylla* over chenopods, and snakewood over *Sclerolaena cuneata* herbland), both north and south of the Fortescue Marsh. It is also recorded from the western Hamersley Range (Wilson & Swan 2008).

Ecology

Like most other *Ctenotus* species, this is an active diurnal terrestrial lizard and probably a generalist invertebrate feeder; some dietary specialization on different invertebrate groups occurs within the genus (Goodyear & Pianka 2011).

Likelihood of Occurrence

Recorded from about 30 km east of Newman, and also further west on the Fortescue Valley floor (DEC 2012b). Based on association with chenopods, *Triodia* and/or *Acacia* shrubland and occurrence north and south of Fortescue Marsh, this taxon could be expected to occur in almost any habitat type within the Study Area.

Potential Impacts

Any impact is likely to be minor because this lizard is widely but sparsely distributed through the Pilbara.

***Lerista macropisthopus remota* (Robust Lerista)**

Conservation status

DEC P2

Distribution and Preferred habitat

Populations of this widespread burrowing skink in the south-east Pilbara are recognised as a subspecies, originally described from one locality northeast of Jiggalong on the edge of the Little Sandy Desert (Storr 1991), but now also recorded as occurring at Newman and up to 150 km to the south-east (DEC 2012b). All forms of the species typically shelter in loose soil under leaf litter at bases of shrubs, usually *Acacia* (Wilson & Swan 2008). Habitat records for *L. m. remota* on NatureMap (DEC 2012b) include *Acacia* woodland, mallee, or *Corymbia* over tussock grass or *Triodia*, and some on rock outcrops.

Ecology

This species is moderately specialised as a sand-swimmer, and usually found sheltering under relatively deep layers of litter (Kendrick 1991). In a study on Shark Bay specimens (*L. m. fusciceps*), it was found to feed predominantly on soft-bodied subterranean insect larvae, but also other invertebrates. Preferred body temperature is similar to other *Lerista* species at about 32° C. Rarely active on the surface, and most active in the substrate between 1600 and 2000 hrs (Pough *et al.* 1997).

Likelihood of Occurrence

Present at Newman (DEC 2012b), and likely to occur in *Acacia* shrubland habitats in the southern part of the Study Area.

Potential Impacts

Minor local impact may occur due to clearing, but is unlikely to be significant for the regional population.

Birds

***Apus pacificus* (Fork-tailed Swift)**

Conservation status

EPBC Act Migratory, WC Act S3

Distribution and Preferred habitat

In Australia they mostly occur over dry and open inland plains, but also over a wide variety of land and marine habitats. 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 & Storr 1998). Some birds have been sighted in Western Australia arriving from Indonesia between October–November. Flocks have been recorded near Broome on southward passage across the continent. In north and north-west Western Australia, most birds have departed by the end of April.

Ecology

A non-breeding visitor to all states and territories of Australia, this swift (Apodidae) feeds on flying insects and is almost exclusively aerial in habits, flying from less than 1 m to at least 300 m above ground and probably much higher (Simpson & Day 2004). Fork-tailed Swifts are nomadic and typically respond to broad-scale weather pattern changes. They are attracted to thunderstorms and cyclonic disturbances where they can be seen in flocks hawking insects from the storm fronts with numbers ranging from a few individuals to flocks of up to 2,000 birds.

Likelihood of Occurrence

Fork-tailed Swifts were not observed on this survey. There are numerous records from adjoining regions except to the south-east (DEC 2012b). The species is likely to seasonally visit the area to forage.

Potential Impacts

There are no significant threats to the Fork-tailed Swift in Australia (DSEWPac 2012c). As migratory visitors to the project area, negligible or no impact is anticipated to this species due to its highly nomadic lifestyle.

***Ardea modesta* (Eastern Great Egret)**

Conservation status

EPBC Act Migratory, WC Act S3

Distribution and Preferred habitat

Eastern Great Egrets (Ardeidae; listed by DEC as *Ardea alba* or *A. alba modesta*) are widespread in Australia, occurring in a wide range of wetland habitats and breeding (November to April, depending on rainfall) in colonies in wooded and shrubby swamps.

Ecology

They feed on a wide range of invertebrates and small vertebrates including birds, reptiles and small mammals. The species undertakes some regular seasonal movements, mostly to and from breeding colonies, and towards the coast in the dry season. Regional differences in reporting rates suggest that individuals migrate north to winter in tropical northern Australia, consistent with changes in the availability of suitable wetland habitat. Regular migration to locations outside of Australia is suspected but not confirmed. Threats include loss and/or degradation of foraging and especially breeding habitat through alteration of water flows, drainage and/or clearing of wetlands for

development, frequent burning of wetland vegetation used as nest sites, salinisation, and invasion by exotic plants or fishes (DSEWPaC 2012c).

Likelihood of Occurrence

There are few records of Great Egret in the Pilbara, including one near Cloudbreak but otherwise far north or west of the Study Area (DEC 2012b); it was not recorded during this survey, and no suitable wetland habitat was present in the Study Area. However, it is likely to visit the Study Area when surface water is present on and adjacent to Fortescue River after sufficient rainfall.

Potential Impacts

Impact on this species may occur through reduction of wet-season foraging area, but this is unlikely to be significant at the population level because of the large area of similar habitats available in the region.

***Ardea ibis* (Cattle Egret)**

Conservation status

EPBC Act Migratory, WC Act S3

Distribution and Preferred habitat

The Cattle Egret (Ardeidae) is a relatively recent colonist of Australia (from 1948) from Asia, and occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. The main areas of distribution are from Wyndham (WA) to Arnhem Land (NT), and in south-eastern Australia, but there are scattered records in other areas; it remains extremely rare in arid and semi-arid regions (DSEWPaC 2012c). It uses predominately shallow, open and fresh wetlands including poorly drained pastures and swamps with tall grass, abundant aquatic flora and emergent vegetation. It has been recorded on earthen dam walls and ploughed fields, and is commonly associated with the habitats of farm animals (particularly cattle, but also pigs, sheep, horses and deer) but avoids low grass pastures.

Ecology

The Cattle Egret feeds mostly on grasshoppers during the breeding season. It is, however, known to consume other insects including cicadas, centipedes, spiders, cattle ticks, frogs (including cane toads), lizards (particularly skinks) and small mammals (Marchant & Higgins 1990). The Cattle Egret is known to follow earth-moving machinery and has been located at rubbish tips. Breeds in colonies in wooded swamps such as mangrove forests (e.g. the lower Adelaide River, Northern Territory), Melaleuca swamps (e.g. Shortland, NSW) and the eucalypt/lignum swamps of the Murray-Darling Basin. They may breed in artificial situations or close to urban areas; generally the nesting trees are inundated except where breeding on small islands. Nests are sited usually in middle to upper branches (Marchant & Higgins 1990).

In Australia exotic species, especially Feral Cats (*Felis catus*), is a major threat for many native birds. Cats are distributed across the entire country (including islands off the mainland). Due to their agility, climbing ability and stealthy characteristics they are able to seek prey in a diverse range of habitats. The Cattle Egret roosts both in trees and on the ground in vegetation, making it particularly susceptible to predation by cats.

Likelihood of Occurrence

There are few sightings of this species in the Pilbara and no breeding has been reported, but it has been recorded on Fortescue Marsh and at Ophthalmia Dam near Newman (DEC 2012b), so may be expected to occur in the Study Area when conditions are suitable after rainfall.

Potential Impacts

Any impact will very minor or negligible due to the infrequent regional occurrence of this highly mobile species.

***Haliaeetus leucogaster* (White-bellied Sea-eagle)**

Conservation status

EPBC Act Migratory, WC Act S3

Distribution and Preferred habitat

A large raptor (Accipitridae) distributed mainly along coastlines, offshore islands and large inland waterways, with breeding only in limited areas of its range; it also occurs around freshwater swamps, lakes, reservoirs etc. It is common and widespread in much of southern Asia, but has declined in some areas including Australia.

Ecology

Feeds on a wide variety of fish, crustaceans, turtles, waterbirds, and terrestrial vertebrates including carrion. Breeding occurs in tall open forest or woodland. The main threats are loss of habitat due to land development, and the disturbance of nesting pairs by human activity (DSEWPaC 2012c).

Likelihood of Occurrence

Sea-eagles are recorded along the lower Fortescue River, but there is only one record on the marsh near Cloudbreak, and two at Ophthalmia Dam near Newman (DEC 2012b). They are likely to be occasional visitors to the central and southern part of the Study Area, but there is no evidence of a resident population and no breeding activity is likely.

Potential Impacts

Any impact on this species is likely to be very minor due to the low number of individuals potentially affected, and the fact they can readily move to unaffected areas.

***Falco hypoleucos* (Grey Falcon)**

Conservation status

DEC P4

Distribution and Preferred habitat

Grey Falcons are a rare, nomadic species sparsely distributed across much of arid and semi-arid Australia; sightings are very uncommon, but coastal sightings may occur in drought years. Occurs in a wide variety of arid habitats including open woodlands and open acacia shrubland, hummock and tussock grasslands, low shrublands and may also be seen around swamps and waterholes that attract prey (Ehmann & Watson 2008). 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 & Storr 1998), i.e. the

latitude of Shark Bay and the SA-NT border. The distribution of the Grey Falcon is centred on inland drainage systems. It prefers areas of timbered lowland plains, particularly *Acacia* shrublands that are crossed by tree-lined watercourses. However, it may also frequent other grassland and woodland habitats (IUCN 2011).

Ecology

Grey falcons feed on a wide variety of birds, but most often on ground-feeding parrots and pigeons, as well as some snakes, lizards, and grasshoppers. They use the nests of crows, kites or eagles, most often placed in upper branches of emergent eucalypts, often on a tree-lined watercourse, and eggs are laid between July and October (Ehmann & Watson 2008; Olsen & Olsen 1986).

Likelihood of Occurrence

The Grey Falcon was not recorded during the field survey. However, there are NatureMap records in the vicinity (DEC 2012b) and the *Acacia* shrublands and tree-lined creeklines would provide suitable habitat for this species in which it may occur.

Potential Impacts

The limited extent of proposed clearing is highly unlikely to significantly impact foraging habitat, so the only potential impact on this species would be through disturbance of nesting habitat, i.e. large trees near watercourses, which may occur where the corridor crosses the Fortescue River.

***Falco peregrinus* (Peregrine Falcon)**

Conservation status

WC Act S4

The Bonn Convention defines as Migratory, “any species or lower taxon..., a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries.” The EPBC Act (1999) includes as Migratory all taxa listed in Appendix II of the Bonn Convention, including “All species in the family Falconidae for which Australia is a Range State” (Department of the Environment and Heritage 2001). However, these criteria are now applied at the level of subspecies or population; the two subspecies of *F. peregrinus* that occur in Australia (out of 19 worldwide) do not regularly cross borders, and the EPBC Act is not applied to them (Debus 2009). Thus, this species is not listed on recent PMST results, although it would have been in previous years (up to about 2009).

Distribution and Preferred habitat

This species (Falconidae) is uncommon but wide-ranging throughout Australia, preferring areas with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land. Ledges, cliff faces, large tree hollows and spouts, or abandoned nests of other raptors are used for nesting.

Ecology

Feeds almost exclusively on birds (including pigeons, parrots and passerines) which are captured in flight, but rarely takes mammals (e.g. possums, rabbits) (Olsen *et al.* 2008).

Likelihood of Occurrence

Individual Peregrine Falcons are occasionally sighted throughout the region (DEC 2012b) and would certainly use the Study Area at least for foraging. Cliffs suitable for nesting do not occur in the Study Area, but large trees along watercourses that may contain hollows, or stick-nests of other raptor species (e.g. Australian Kestrel, Wedge-tailed Eagle) are likely to provide suitable nesting sites.

Potential Impacts

Impacts on adult individuals or foraging habitat are not likely to be significant, but destruction of tree hollows or existing nests of other birds could affect value of the habitat for breeding, especially if any are in use by this species. Impact is likely to be minor due to low density of population and ability to relocate to unaffected areas.

***Ardeotis australis* (Australian Bustard)**

Conservation status

DEC P4

Distribution and Preferred habitat

The Australian Bustard (Otididae) typically occurs in open country, preferring grasslands, low shrublands, grassy woodlands and other structurally similar but artificial habitats such as croplands and airfields. There has been a large historical decline in abundance, particularly south of the tropics, but to a smaller extent across northern Australia where it remains moderately common (Garnett & Crowley 2000).

Ecology

Bustards (Otididae) are large, nomadic, partly nocturnal birds with an omnivorous diet comprising seeds, fruit, vegetation, invertebrates and small vertebrates. Numbers of Australian Bustard present in any particular area fluctuate with the availability of food with seasons and following irregular rainfall, and variation between regions in timing and duration of residence and breeding activity has been documented; In the Pilbara, breeding may occur at any time of year but mostly in May – September (Ziembicki & Woinarski 2012). Decline is attributed to hunting, degradation of grassland habitat by sheep and rabbits, predation by foxes and cats, and thickening of vegetation due to overgrazing or lack of fire (Garnett & Crowley 2000; Schodde & Tidemann 1986). As ground nesters, they are particularly vulnerable to fire in the nesting season, and readily desert nests in response to disturbance by humans, sheep or cattle (Garnett & Crowley 2000).

Likelihood of Occurrence

Two individuals of this species were seen at the northern edge of the Ophthalmia Range, and fresh tracks were observed at numerous sites further north in the River, Fan and Divide Land Systems (eucalypt woodland, acacia shrubland, and hummock grassland). Bustards are likely to utilise most of the Study Area including areas close to Newman, where it has been recorded recently (DEC 2012b). No evidence of juveniles, nests or eggs was observed during the survey.

Potential Impacts

Any impact on extent of foraging habitat is likely to be negligible, due to the ability of these birds to move to large areas of similar habitat in the region. Clearing has the potential to be more disruptive if it coincides with breeding activity.

***Burhinus grallarius* (Bush Stone-curlew)**

Conservation status

DEC P4

Distribution and Preferred habitat

While this bird, also known as the Bush Thick-knee (Burhinidae) is found in all mainland states, it is sparsely distributed and continues to decline. Historically the species was widely distributed throughout much of Western Australia but is now considered rare, with an estimated population of 15,000 individuals (Garnett & Crowley 2000). It prefers grassy woodlands with low, sparse grassy or herb understorey.

Ecology

The species is insectivorous, preying primarily upon beetles, although they will also eat seeds and shoots, frogs, lizards and snakes (Marchant & Higgins 1993). Activity is mainly nocturnal, especially on moonlit nights (NSW National Parks and Wildlife Service 1999). Breeding takes place mainly from August to January, but at any time of year depending on local conditions. They are usually seen in pairs, but sometimes form flocks. Branches on the ground are essential for the bird's camouflage, and it is unlikely to attempt nesting without it (Department of Sustainability and Environment (Victoria) 2005). Since Bush Stone-curlews are a ground dwelling and non-migratory species they are quite susceptible to local disturbances by humans and to predation by cats and foxes (Frith 1976; Johnstone & Storr 1998). They are most common where land disturbance is minimal and generally become rare or extinct around human settlements (Johnstone & Storr 1998).

Likelihood of Occurrence

This species is widespread in the Pilbara and may occur in any part of the Study Area, although there is only one record in the immediate vicinity (DEC 2012b). During the survey, tracks consistent with this species were observed on the road to Kalgan Pool west of the Study Area (Washplain/River Land Systems) and it is likely to be resident in similar woodland habitats intersected by the corridor.

Potential Impacts

Adult birds are able to move away from disturbance, but clearing of vegetation, especially logs and branches on the ground, could potentially disrupt breeding.

***Charadrius veredus* (Oriental Plover)**

Conservation status

EPBC Act Migratory, WC Act S3

Distribution and Preferred habitat

The Oriental Plover (Charadriidae) breeds in Mongolia and adjacent parts of Manchuria and Siberia, and spends the non-breeding season (September to March) in northern Australia, in both coastal and inland areas. Most records are along the north-western coast, between Exmouth Gulf and Derby in

Western Australia. Immediately after arriving, Oriental Plovers spend a few weeks in coastal habitats before dispersing further inland to flat, open, semi-arid or arid grasslands, particularly locations with short, sparse grass interspersed with hard, bare ground, such as claypans, dry paddocks, lawns, cattle camps, or recently burnt grasslands. Saltmarsh and mudflats are also used for feeding and roosting.

Ecology

Diet poorly known, but includes various insects. Often feeds in mixed flocks with other waterbirds, and sometimes at night. This species is not considered globally threatened (DSEWPaC 2012c).

Likelihood of Occurrence

Not recorded in these or previous surveys of the Study Area, but there is one record from 1981 just south of Newman (DEC 2012b). Unlikely to occur regularly in any part of the Study Area, but may utilise parts of open grassland habitats when grass is short, e.g. after fire.

Potential Impacts

Any impact is likely to be negligible due to the low frequency of occurrence in the area and ability to relocate to unaffected areas.

***Actitis hypoleucos* (Common Sandpiper)**

***Tringa nebularia* (Common Greenshank)**

***Tringa stagnatilis* (Marsh Sandpiper)**

***Tringa glareola* (Wood Sandpiper)**

***Calidris ruficollis* (Red-necked Stint)**

***Calidris subminuta* (Long-toed Stint)**

***Calidris melanotos* (Pectoral Sandpiper)**

***Calidris acuminata* (Sharp-tailed Sandpiper)**

***Calidris ferruginea* (Curlew Sandpiper)**

Conservation status

EPBC Act Migratory, WC Act S3

Distribution and Preferred habitat

Each of these Wader or Shorebird species (Scolopacidae) breeds in the northern hemisphere (mostly Siberia) and migrates along the East Asian - Australasian Flyway (DSEWPaC 2012c). Each of them has a broad distribution on the north, west and south coasts of WA (beaches, saltmarshes etc), but is also recorded from inland localities (ephemeral or permanent natural and artificial wetlands such as dams, floodplains, salt lakes etc) including Ophthalmia Dam and/or the town of Newman.

Ecology

Most members of this family feed on small invertebrates picked out of mud or soil by pecking or probing, but some catch small fish in shallow water.

Likelihood of Occurrence

No species of Scolopacidae is predicted to occur by the PMST (**Table 7**), despite actual records within a few km of the Study Area (DEC 2012b). Presence of any of these species in areas to be affected by

clearing will be intermittent, and confined to temporary wetlands (most likely in River, Coolibah or Narbung Land Systems).

Potential Impacts

Negligible or no impact is likely to occur to these species.

***Pezoporus occidentalis* (Night Parrot)**

Conservation status

EPBC Act EN [and Migratory], WC Act S1, DEC EN

Listed as Migratory under the EPBC Act (DEH 2001); DSEWPaC (2012c) indicates that this is a consequence of listing under JAMBA ([1981] ATS 6). However, the Night Parrot is not listed in the Annex (Migratory species as defined under Article 1, as amended) but in the separate 'Official List of Australian Endangered Birds' (Department of Foreign Affairs 1995). DSEWPaC is aware of this inconsistency and modification of the listing has been proposed (P O'Neill 2012, pers comm).

Distribution and Preferred habitat

Night Parrots (Psittacidae) have been reported from all mainland states (Higgins 1999), but the few recent records come from southwestern Queensland and the eastern Pilbara. This species is most frequently associated with *Triodia* hummock grass and chenopod shrubs (samphire, saltbush etc), particularly where these occur together as a mosaic or along a boundary (ecotone). Suitability of habitat is thought to depend on particular stages of regeneration after fire, so that patch burning and low stocking rates may be important for persistence (Garnett et al. 1993).

Ecology

Nocturnal or crepuscular, reported drinking shortly after nightfall and then dispersing to forage. Sightings during the day are of birds flushed from cover by stock, dogs or fire; utilisation of diurnal retreats is not well documented but they may include caves, or burrows of other vertebrates, in addition to Spinifex clumps and dense samphire (Biota 2005b; FMG 2005). Evidence suggests the species is either nomadic, or with very large individual home range (Boles *et al.* 1994), rather than 'migratory' (as incorrectly implied by EPBC listing). Like other seed-eating birds (e.g. most other parrots, pigeons and finches) it is likely to drink frequently, and thus be dependent on water sources which are often temporary. Threats are considered to include predation by foxes and feral cats, modification of vegetation by introduced herbivores (stock and feral), loss or degradation of watering points, and altered fire regimes (Blyth et al. 1996).

Likelihood of Occurrence

There is a recent sighting of Night Parrots, considered reliable, at Mingarwirriewirrie (Minga) Well (FMG 2005), and a less positive record at Moojarri Well (Biota 2005b), both sites located in open mulga woodland near the northern margin of Fortescue Marsh. The species is therefore considered likely to occur at least as an irregular visitor in the Study Area, and to utilise mulga woodland (visiting permanent and temporary pools for drinking) as well as feeding in chenopod shrubland and Spinifex grassland. Potential Night Parrot habitat thus includes all parts of the Study Area north of the Ophthalmia Range.

Potential Impacts

Likelihood and magnitude of impact are very difficult to assess due to the lack of adequate biological data and survey methods for this rare and cryptic species. Strategies to avoid or limit impacts to the Night Parrot in the Fortescue Marsh area have previously been developed by FMG (2005) in connection with the Cloudbreak Mine development. Any impact is likely to be minor, in proportion to the area affected relative to the extent of suitable habitat in the region.

***Polytelis alexandrae* (Princess Parrot)**

Conservation status

EPBC Act VU, DEC P4

Distribution and Preferred habitat

This parrot (Psittacidae) is restricted to arid regions of Western Australia, southern NT and north-western South Australia, all records being far inland except where the Great Sandy Desert reaches the coast south of Broome. Distribution is sparse and sightings rare except in the Great Sandy, Gibson, Tanami and Great Victoria Deserts, and central ranges; the Great Sandy Desert is considered to be the 'core range'. Habitats include sand dunes and flats with open savannah woodlands (scattered stands of *Eucalyptus gongylocarpa*, *E. chippendalei* and mallee species, *Casuarina* or *Allocasuarina*) over *Acacia*, *Cassia*, *Eremophila*, *Grevillea*, *Hakea* and *Senna* shrublands, over *Triodia* hummock grassland. It has been recorded in the far east of the Pilbara region (single 1981 record from Bird Atlas), with few other records within hundreds of kilometres (DEC 2012b).

Ecology

The Princess Parrot feeds on seeds of grasses and shrubs, and some flowers, nectar and leaves. Birds may live up to 30 years, but commence breeding in their first or second year. Nests in hollows of *Eucalyptus* close to watercourses, or occasionally in *Allocasuarina* away from water, breeding between September and January or opportunistically after rains. There are reports of up to 10 pairs nesting in a single tree. Movements are poorly known, but described as nomadic, irruptive, or both. Active, noisy and conspicuous in the morning and evening, but difficult to observe in the middle of the day. No threatening processes have been demonstrated, but populations may have been impacted by changes in vegetation due to grazing, altered fire regimes, and competition from more water-dependent species following provision of artificial water sources. Other possible threats are Psittacine Beak and Feather Disease (symptoms of which have been observed in the wild), and poaching of eggs or young (known to occur, but unlikely to be important because of the large captive-bred population and low demand for wild-caught birds) (DSEWPac 2012c).

Likelihood of Occurrence

This species has rarely been recorded in the Pilbara and is considered to be an occasional vagrant, with no resident population or regular use of resources in the region.

Potential Impacts

No impact is likely to this species.

***Merops ornatus* (Rainbow Bee-eater)**

Conservation status

EPBC Act Migratory, WC Act S3

Distribution and Preferred habitat

The Rainbow Bee-eater is widespread throughout most of Australia, and does not depend on any particular habitat or vegetation type for feeding or breeding. They are scarce to common throughout much of Western Australia except for the arid interior, preferring lightly wooded, sandy country near water (DSEWPaC 2012c).

Ecology

Bee-eaters feed mainly on insects taken in flight (hawking), but also take prey from the ground and foliage (gleaning). Populations in southern Australia are migratory, wintering in Indonesia and New Guinea, moving south over summer and breeding in Australia, but the species is resident and present year-round in parts of northern Australia including the Pilbara (DSEWPaC 2012c). Nesting occurs in burrows dug in flat or slightly sloping ground, sandy banks or cuttings, and often at the margins of roads or tracks; breeding is often colonial and cooperative (Boland 2004).

Likelihood of Occurrence

Rainbow Bee-eaters are commonly sighted throughout the region (DEC 2012b), were recorded at Ophthalmia Dam during the survey, and are presumed to be resident; suitable conditions for breeding may exist along banks of drainage lines.

Potential Impacts

Disturbance to areas utilised by the Rainbow Bee-eater, such as sand banks of creeks and drainage lines used to burrow to create nesting chambers between September and February, may have some impact on the breeding success of this species. However, historical disturbance does not represent a major issue to this species and it is common in cleared and semi-cleared habitats (DSEWPaC 2012c). No significant impact is likely.

***Oreoica gutturalis gutturalis* (Crested Bellbird [southern])**

Conservation status

DEC P4

Distribution and Preferred habitat

This single species of *Oreoica* (Pachycephalidae) occurs over most of the continent, excluding only the wet areas (in the southwest, southeast, and most of the eastern and northern coast). Northern and southern subspecies are distinguished on size, tail/wing ratio and coloration details (Schodde & Mason 1999), but there is a broad zone of intergradation between them (clinal variation or introgression). The minority of records in NatureMap that are identified to subspecies indicate broad overlap in the western third of WA, with a few records of the 'southern' form deep within the range of *O. gutturalis pallescens*, including some in the eastern Pilbara (DEC 2012b). Crested Bellbirds mainly inhabit tall dry acacia shrublands or thickets, low eucalypt woodlands, including open mallee, with a shrub layer or understorey, or among spinifex, chenopods and sometimes heathland growing

on treeless plains or sand-dunes. They usually occur near the ground or in the dense vegetation of the shrub layer of various acacias, *Eremophila*, *Dodonaea*, *Thryptomene*, *Grevillea* or chenopods.

Ecology

Usually solitary (sometimes pairs or small parties), mostly forage on the ground, among grass, stones or leaf-litter, and less often in low shrubs, but may sing from trees. Feeds on a variety of insects and seeds. No distinct breeding season; 2-4 eggs in a cup-shaped nest usually 'decorated' with live, immobilised hairy caterpillars around the rim. Declines and local extinctions at the periphery of the species range are mostly attributable to extensive clearing, and particularly fragmentation of woodland habitat, with isolated areas of apparently suitable habitat as large as 5000 ha now unoccupied. The southern form was listed as 'Near Threatened a' in the 2000 Action Plan for Australian Birds, but revised to 'Least Concern' in 2010 (Garnett et al. 2011; Garnett & Crowley 2000).

Likelihood of Occurrence

Crested Bellbirds are likely to occur in shrub, woodland and Spinifex habitats (essentially, all habitat types) throughout the Study Area, but are inferred to be sparsely distributed as none were heard during the survey. The Pilbara population as a whole is part of the northern subspecies *O. gutturalis pallescens*, but since the subspecies are considered to intergrade rather than remaining distinct in sympatry, some individuals within the normal range of variation would be expected to resemble typical southern specimens in colour or measurements. It is inferred here that such normal variation accounts for the records of '*O. g. gutturalis*' listed in the DEC databases, and that the P4 southern subspecies is absent.

Potential Impacts

No impact will occur to the conservation listed subspecies because it is absent from the Study Area. In any case, the proposed clearing will not lead to fragmentation of habitat, and impact to the species will therefore be limited to disturbance of the actual cleared area.

***Neochmia ruficauda subclarescens* (Star Finch [western])**

Conservation status

DEC P4

This subspecies is listed as Least Concern (Garnett *et al.* 2011), but conservation categories may not provide sufficient information about actual status. The Cape York subspecies (*N. r. clarescens*) is Near Threatened, but is not listed by federal or state statutes as it has been recognized as a separate subspecies for only a few years; some Pilbara survey records are identified as that form, in error. The southern or eastern subspecies *N. r. ruficauda* is listed under the EPBC Act as EN, but Garnett *et al.* (2011) consider it Critically Endangered, possibly extinct.

Distribution and Preferred habitat

Star Finches (Estrildidae) live in reedbeds, grasslands and eucalypt woodland close to water. The western subspecies has three sub-populations: 1. Shark Bay to Pilbara, 2. Fitzroy River valley, West Kimberley, and 3. Gibb River to Gulf of Carpentaria.

Ecology

A seed-eater like most other 'finches'; reported to feed on seeds of sedges (*Cyperus* sp.) and Buffel Grass (*Cenchrus ciliaris*), but also insects during the breeding season. Birds tend to be resident in large flocks close to permanent waterways during the dry season, and disperse to breed during the wet season. The main threat is thought to be overgrazing of grasslands near water; the species may also require mosaic burning to maintain food supply.

Likelihood of Occurrence

There are scattered records of this species through most parts of the Pilbara (DEC 2012b), including Ophthalmia Dam and other sites in the Ophthalmia Range, but not on the floor of the eastern Fortescue Valley. It was not recorded in this survey, but is likely to occur in the Study Area where suitable habitat occurs, adjacent to the Fortescue River where it cuts through the Range. Wet season surveys would be required to determine whether breeding sites occur.

Potential Impacts

Any impact is likely to be restricted to wet season breeding habitat, when the birds are dispersed from colonies and thus able to relocate to avoid disturbance, so considered minor.