With Biota Environmental Sciences

Austeel Pty Ltd

# Austeel Biological Survey Phase I

ES974691A100

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**Austeel Pty Ltd** 

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CALM

### ES974691A100

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# **Austeel Biological Survey Phase I**

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### **1.0 Executive Summary**

Austeel Pty Ltd (Austeel) intends to develop a project for the production of Direct Reduced Iron/Hot Briquetted Iron (DRI/HBI) at Cape Preston, 80 km south-west of Karratha in Western Australia. This report documents the results of a biological survey of the project area conducted in April 2000.

### **Terrestrial Vegetation**

Sixty four terrestrial vegetation units were described for the study area from nine Land Systems (LS). The rank of these units varied from plant community to vegetation association. The Rocklea, Newman, Paraburdoo and Horseflats LS cover much of the survey area and 14, 13, 10 and five vegetation units were described for these respectively. The general vegetation of the low hills of the Rocklea and Newman LS comprised various *Acacia* shrublands over *Triodia wiseana* hummock grasslands, sometimes with *Corymbia* (Bloodwoods) as a tree layer and *Triodia pungens* replacing *T. wiseana* in larger flowlines. Areas of *Triodia angusta* hummock grassland occurred on plains within the Rocklea LS, and small patches of *Acacia xiphophylla* (Snakewood) shrublands were also recorded. Rockpiles occurred within both of these LS and typically featured shrublands of *Acacia coriacea* and *Ficus platypoda* over spinifex (*Triodia wiseana*), tussock grasses (particularly *Cymbopogon ambiguus*) and/or lianes (*Canavalia rosea, Operculina aequisepala* and *Trichosanthes cucumerina*).

The Paraburdoo LS was dominated by Snakewood shrublands over spinifex (*Triodia wiseana*) or tussock grasses (*Eragrostis xerophila*), interspersed with herblands on clay. Creeklines within this LS generally supported *Eucalyptus victrix* woodlands over *Acacia coriacea* shrublands, and were frequently invaded by \**Cenchrus ciliaris* (Buffel Grass).

The heavy clay soils of the Horseflats LS were dominated by grasslands of *Eragrostis xerophila*, with patches of *Eriachne benthamii* grassland and *Sida* aff. *fibulifera* low shrublands.

The coastal fringe of the survey area comprised the Littoral LS, which consisted of areas of mangal on the seaward fringe, samphire shrublands on mudflats, *Acacia coriacea* shrublands over spinifex or tussock grasses on coastal dunes and *Triodia angusta* hummock grasslands on broad sandy plains.

The Yamerina LS was dominated by a mosaic of *Triodia angusta* hummock grassland with patches of open herblands and scattered shrubs of Mesquite.

The River LS comprised woodlands of *Eucalyptus victrix* and/or *E. camaldulensis* over shrublands of *Melaleuca glomerata* or *Acacia coriacea* over patches of sedges or tussock grasslands of \**Cenchrus ciliaris*. One stand of *Melaleuca argentea* (Cadjeput) was recorded. This LS had some severe infestations of Mesquite.

The Macroy LS was dominated by *Acacia* shrublands over *Triodia wiseana* hummock grasslands. Two rockpile vegetation types were identified within this LS, one of which (a *Fimbristylis dichotoma* low sedgeland) was distinctly different from the general vegetation associated with this habitat.

A single vegetation type was recorded from the Boolgeeda LS, comprising a Snakewood shrubland over *Triodia epactia* hummock grassland.

Overall, the vegetation of the study area was considered to have conservation value, reflecting the diversity of the vegetation units described and the frequently

good condition of vegetation (other than along creeklines, floodplains and on dune sands, which often had high weed invasion). The conservation value of the following vegetation was considered particularly important:

- Coastal dune vegetation (small representation in area; high species richness of one vegetation unit; susceptible to erosion and weed invasion following physical disturbance;);
- Riverine vegetation (high species richness; habitat-specific flora, including Priority species; susceptible to weed invasion);
- Rockpile vegetation (very limited representation in area; variable composition; habitat-restricted flora);
- Minor creeklines (small representation in area; relatively species rich; habitatspecific flora, including Priority species; susceptible to weed invasion).

### Mangroves

Twelve mangrove units were identified. These were principally stands of variable cover dominated by *Avicennia marina* and/or *Rhizophora stylosa*. Other units included shrublands of *Aegiceras corniculatum* or *Ceriops tagal*. The mangrove assemblages were generally in very good to excellent condition and are considered to have high conservation significance.

### Flora

A total of 426 taxa of vascular flora was recorded from the survey area, belonging to 190 genera from 64 plant families. Six of these taxa were mangroves. While nonvascular flora and fungi were not specifically sampled, one green alga and two fungi were also recorded. The relatively high species richness of the flora reflects the large size of the project area, the presence of a wide variety of habitats and the opportune collecting season.

No Declared Rare Flora were recorded from the survey area, however six Priority flora were recorded:

- the Priority 1 species Goodenia omearana ms.;
- the Priority 3 species Abutilon trudgenii ms., Eriachne tenuiculmis, Hibiscus brachysiphonius, Phyllanthus aridus and Sida sp. Wittenoom (WR Barker 1962).

A number of other flora of conservation interest were also identified:

- *Tephrosia* aff. *clementii* (1) (M1/M2): an apparently newly discovered species which may be more restricted in distribution than other taxa in the *T*. aff. *clementii* group; given current knowledge should be considered poorly collected and uncommon;
- *Tephrosia* aff. *clementii* (2) (M35-14): an undescribed species; poorly collected and uncommon, but known from the Burrup Peninsula;
- *Hibiscus* aff. *platychlamys* (M9-15): an undescribed species; restricted in distribution and moderately poorly collected;
- *Hibiscus* aff. *platychlamys* (M35-11): an undescribed species; very poorly collected and possibly uncommon and/or restricted in distribution;
- Other Malvaceae: various undescribed taxa, particularly of Abutilon and with

affinities to *Sida fibulifera;* likely to be poorly collected rather than restricted or rare;

- Tephrosia aff. supina (M.E. Trudgen 12,357): an undescribed species; common on the coast, less common inland, and not of particular concern for conservation;
- Urochloa sp. "glabrous apices": an undescribed species; very poorly collected;
- Senna sp. Karajini (ME Trudgen 10,392): range extension to the coast;
- Boerhavia paludosa: poorly collected but not uncommon; and
- Mukia sp. D (Flora of Australia): poorly collected but not uncommon.

Twelve introduced flora species were recorded. One of these, Mesquite (a hybrid of *\*Prosopis pallida*) is a Declared Plant (noxious weed). Severe infestations of this species occurred around in and around tributaries of the Fortescue River System, however it was largely absent from the low hills comprising the ore bodies, presumably because these habitats are too harsh. Another significant weed was Buffel Grass (*\*Cenchrus ciliaris*), which was introduced as a fodder species by pastoralists. This aggressive grass displaces native species in suitable habitats, particularly creeks, floodplains and calcareous coastal sands.

### Fauna

The survey recorded a combined total of 179 vertebrate species comprising 17 native mammals, five species of introduced mammal, 96 species of bird, 58 species of reptile (including evidence of nesting by at least one marine turtle species) and three amphibians. The following table summarises the number of species recorded in each of the identified fauna habitats.

Ten fauna habitats were identified in the project area based on repeated units combining both vegetation type and landform. Where possible the habitats have been related to the Land System classification developed by AgWest, thereby providing an appreciation of their wider distribution in the region.

Habitats	Avifauna	Mammals	Herpetofauna	Total
Beach	12	1	1	14
Mangroves	30	2	3	35
Coastal Sand Dunes	14	4	8*	25
Samphire	14	1	9	24
Stony Plain	12	4	7	23
Low Stony Hill	13	5	19	37
Rocky Hills and Outcrops	12	2	15	29
Cracking Clays	24	7	20	51
Creeklines	53	9	22	84
Sandplain	t	t	t	†
Total	96	22	61*	

#### Species richness for each habitat type.

\*Note that records of nesting by at least one sea turtle species within the coastal dunes habitat have been included in this tally.

† Identified towards the latter stages of the field survey, this habitat was not surveyed.

#### Fauna of Conservation Significance

A search of CALM's database of threatened fauna species recorded from or potentially occurring in the area yielded the following nine species:

Schedule Fauna

A single Schedule listed species was identified as potentially occurring in the project area. The Peregrine Falcon *Falco peregrinus* (Schedule 4) was not recorded during the current survey although it is likely that this species would occur within the creekline vegetation.

#### Priority Species

Several Priority listed species may occur in the project area. The field survey was not conducted at an opportune time for recording migratory waders such as the Priority 3 Asian Dowitcher Limnodromus semipalmatus. The Water Rat Hydromys chrysogaster (Priority 4) inhabits marine waters along the Pilbara coast. The Grey Falcon Falco hypoleucos (Priority 4) was not recorded from the project area and is mostly known from the coastal plain between the de Grey and Ashburton Rivers. The Square-tailed Kite Lophoictinia isura (Priority 4) was not recorded from the project area and is most likely to only be transient in the Pilbara region. A single Bush Stonecurlew Burhinus grallarius (Priority 4) was seen on the access track whilst spotlighting and two additional birds were recorded from the North West Coastal Highway adjacent to the Fortescue Roadhouse. Three Beach Stonecurlew Esacus neglectus (Priority 4) were recorded from the beach on the western side of Cape Preston. The Eastern Curlew Numenius madagascariensis (Priority 4) was recorded from mudflats adjacent to the mangroves at the base of Cape Preston. The White-shafted Tern (Little Tern) Sterna (albifrons) sinensis (Priority 4) was not recorded during the current survey. Its preferred habitat comprises sheltered seas, estuaries and mangrove creeks.

#### • This survey

The field survey did not record any Schedule listed fauna species. However seven Priority listed fauna taxa were recorded; the Little Western Freetail Bat *Mormopterus loriae cobourgensis*, Western Pebble-mound Mouse *Pseudomys chapmani*, Lakeland Downs Mouse *Leggadina lakedownensis*, Bush Stonecurlew *Burhinus grallarius*, Beach Stonecurlew *Esacus neglectus*, Eastern Curlew *Numenius madagascariensis* and Green Turtle *Chelonia mydas*. (As described previously, the Green Turtle is also included on the Threatened Species list of the *EPBC* Act). In addition, one undescribed species of rodent (*Pseudomys* sp. "hamersley") and two undescribed skinks (*Ctenotus* aff. *robustus* and *Ctenotus* sp. nov.) of possible conservation significance were recorded.

### **Fauna Habitats**

None of the habitat types present in the project area appear to be unique to the locality or regionally significant on this basis. Several habitat types are, however, significant on a local scale and support species which are or may be of regional significance. These habitat units include:

- several of the broader beaches (given evidence of nesting by sea turtles);
- mudflats (although these do not appear regionally significant, they may be utilised by resident waders, or by migratory waders as a stop-over point)
- the linear sand dunes on the western margin of Cape Preston;
- the small area of red sandplain habitat on Cape Preston;
- mangroves (an important habitat for the bats *Nyctophilus arnhemensis* and *Mormopterus loriae cobourgiana* and a suite of bird species);
- cracking clay habitat units (given the presence of *Leggadina lakedownensis*, *Ctenotus* aff. *robustus* and *Ctenotus* sp. nov. in this habitat); and
- major drainage lines (the most species rich fauna habitat unit in the project area).

### 2.0 Introduction

### 2.1 Background

Austeel Pty Ltd (Austeel) intends to develop a project for the production of up to 4.7 million tonnes per annum of Direct Reduced Iron/Hot Briquetted Iron (DRI/HBI) at Cape Preston, 80 km south-west of Karratha in Western Australia. The project will use part of the estimated 4 billion tonne Fortescue magnetite ore resource over which the mining rights are held by Mineralogy Pty Ltd (Mineralogy).

The project includes development of an open-cut pit, waste dumps, tailings dams, product stockpiles and additional infrastructure including access roads, haul roads, construction camps, village, power station, power distribution network and desalinated water plant. The finished products will be conveyed to Cape Preston for shipping via a load-out facility which will be constructed off Preston Island. A detailed description of the project is available in the Public Environmental Review (Halpern Glick Maunsell, 2000a).

### 2.2 Limitations of the Survey

The most obvious limitation of the survey was the limited amount of sampling conducted. The terrestrial vegetation survey was restricted to a two week field survey by two botanists. Sampling was concentrated on areas that were known to be proposed for disturbance (particularly the three ore bodies), however details of much of the infrastructure location were not known at the time of survey. Large portions of the project area could only be assessed in a very cursory fashion. The fauna survey was conducted over a similar timeframe by two teams of two zoologists, while mangroves were assessed by a biologist over the same period. Heavy rains prior to the field survey caused some delays and made access to certain areas difficult.

In addition, sampling was conducted in only one season (albeit at an optimal time for observation of ephemeral flora species). Further sampling, particularly after rain in mid-year, would undoubtedly add a significant number of species to the flora lists. Seasonal sampling would also increase the number of fauna species recorded.

With respect to the flora, only vascular species were systematically recorded although notes were made regarding algae and fungi where these were observed. The flora species list generated from the current study is therefore unlikely to be representative of the entire floristic community, and should be taken only as an indication of the species present. Invertebrate fauna were not specifically targeted, but were collected from pit traps set at the fauna trapping sites. These specimens were then lodged with the WA Museum.

Assessment of the conservation significance of the vegetation types in the project area is difficult due to the lack of regional mapping of the vegetation at a similar scale to that provided for the project area in this document.

The only vegetation mapping of the Fortescue Botanical District as a whole (equivalent to the Pilbara Interim Biogeographic Region) is the 1: 1,000,000 scale mapping by Beard (1975) for the Pilbara. While useful in conjunction with more detailed surveys, Beard's mapping is not sufficiently detailed to be an appropriate basis for the assessment of conservation value for vegetation due to the scale of the mapping and the consequent low intensity of ground truthing. The broad level at which Beard defined his units was necessary for his mapping to be practical, which also necessarily meant that much of the variation in the vegetation was ignored.

The distribution of vegetation types is strongly related to geology and topography and as these are major attributes on which land systems are defined, land system mapping can be used to predict the likely distribution of vegetation types. Land System mapping from 1:50,000 scale aerial photography is available for the region including the project area (AgWest, in prep.), however the description of the vegetation of the land systems and land units is still being prepared. This limits the use of this mapping in assessment of the conservation value of vegetation of the project area at this stage.

A further limitation on the ability to provide a detailed assessment of the conservation value of the vegetation of the project area is the lack of a database of vegetation site data which would allow assessment of the floristic variation of the vegetation compared to other areas.

### 2.3 Biological Context

### 2.3.1 IBRA Bioregion

The Interim Biogeographic Regionalisation for Australia (IBRA) recognises 85 bioregions. The Pilbara Bioregion has four main components; the Hamersley and Chichester Ranges, Fortescue Plains and Roebourne Plains, of which the study area is a part. The Pilbara Bioregion is listed as a high priority for funding for land purchase under the National Reserves System Co-operative Program due to the limited representation of the area in conservation reserves.

### 2.3.2 Land Systems

The study area lies within a region for which the Land Systems have been mapped by AgWest staff, as part of the rangeland assessment programme (AgWest, in prep.). Digital data was obtained from the current custodian, the Department of Land Administration.

The survey area includes portions of nine land systems:

Ι.	Littoral	Bare coastal mudflats flanked by mangroves and samphire flats; minor sandy islands, narrow sandy plains, coastal dunes and beaches; occurred along the coast in the northern section of the project area:
II.	Horseflats	Extensive, weakly gilgaied clay plains with tussock grasslands; prominent in the southern portion of the survey
III.	Newman	Rugged jaspilite plateaux and ridges with hard spinifex grasslands; comprised the three ore bodies (Northern, Central and Southern OB):
IV.	Rocklea	Rugged basalt hills and plateau remnants with hard spinifex grasslands; prominent in the northern portion of the survey area, particularly on Cape Preston:
V.	Paraburdoo	Stony plains derived from basalt, supporting snakewood shrublands and spinifex grasslands; occurred around hills of the Newman and Rocklea LS:
VI.	Macroy	Stony plains with hard and soft spinifex hummock grasslands; occurred along the eastern end of the access road;
VII.	Boolgeeda	Stony lower slopes and plains found below hill systems, supporting hard spinifex grasslands; occurred as a single patch west of the Southern OB;
VIII.	River	Active floodplains and terraces flanking major rivers and creeks, supporting riverine woodlands and tussock and hummock grasslands; associated with the Fortescue River system:
IX.	Yamerina	Floodplains and deltaic deposits supporting tussock grasslands with chenopod low shrubs and soft spinifex grasslands; occurred west of the Northern OB.



The section of the survey area south of Preston Creek adjoins a section of the Cheerawarra Land System. This is described as comprising sandy coastal plains and saline scalds supporting soft spinifex and buffel grass grasslands.

Table 2.1 presents the distribution of the nine Land Systems within the project area and in the greater surrounding region (encompassed by mapping of the Pilbara, and of the Roebourne Plains and surrounds). Distribution of the Land Systems within the study area is shown in Figure 2.1.

Land System	Amount in survey	Amount in region*		
-	area (ha)	(ha)		
Littoral	1648.80	81,471.75		
Horseflats	2748.83	135,865.16		
Newman	3760.09	202,494.43		
Rocklea	5023.89	461,075.52		
Paraburdoo	4207.39	22,691.88		
Macroy	463.23	11,624.95		
Boolgeeda	379.76	74,994.92		
River	741.32	47,983.25		
Yamerina	1907.33	26,282.57		

# Table 2.1:Extent of Land Systems within the survey area and in the<br/>surrounding region.

\* Based on Land System mapping for the Pilbara (AgWest, in prep.) and Roebourne Plains and surrounds (Payne & Tille, 1992).

### 2.3.3 Vegetation Mapping of Beard

Beard's (1975) 1:1,000,000 scale mapping of the Pilbara region identified the following broad terrestrial vegetation types as occurring in the Cape Preston area:

- t<sub>1</sub>Hi *Triodia pungens* steppe (hummock grassland), primarily on Cape Preston itself;
- a<sub>2</sub>Sr,t<sub>1</sub>Hi Shrub-steppe of Acacia pyrifolia over Triodia pungens;
- xGc/t<sub>1</sub>Hi Mosaics of grass savanna with spinifex *Triodia pungens*.

Mangroves and tidal mudflats were also mapped along the coastal portions of Cape Preston.

As previously described, Beard's mapping is at a broad scale which necessarily requires amalgamation of minor vegetation types and a bias towards large and commonly distributed units. In addition, due to limited sampling, Beard's units often contain inaccuracies. For example, the current field survey found that the majority of the Cape Preston area actually comprised hills and stony plains which were dominated by hummock grasslands of either *Triodia wiseana* or *T. angusta*. *T. pungens* was largely restricted to drainage areas, portions of clayey plains and sections of dunes (see Section 4).

### 2.3.4 Previous Surveys of the Project Area

Like most of the Pilbara region, the area surrounding and including the study area is poorly known. It appears that the rangeland assessment conducted by AgWest (in prep.) represents the only survey of the terrestrial vegetation or flora of the Cape Preston area. While the results of this assessment could not be obtained prior to preparation of this report, it is likely that only limited sampling, if any, would have been conducted within the project area. Some sampling has been conducted on various islands in the Karratha area and assessments of the mangrove communities of the Pilbara have also been conducted. No previous fauna trapping has been carried out in the area.

### 3.0 Methodology

The methodology associated with the terrestrial flora and fauna survey is described in the following sections. Methods used to assess mangroves in the area are described under Section 6.

### 3.1 Terrestrial Vegetation and Flora

### 3.1.1 Field Survey

The field survey was conducted by two botanists (Malcolm Trudgen and Michi Maier) and an assistant between the 15<sup>th</sup> and 28<sup>th</sup> of April 2000. A total of 121 detailed vegetation and flora sites was recorded. The distribution of these sites in the survey area is given in Table 3.1, while the data recorded is presented in Appendix A.

### Table 3.1: Distribution of flora survey sites within the project area.

General Area	Number of Sites		
Cape Preston	17		
Northern Ore Body	9		
Central Ore Body	12		
Southern Ore Body	19		
Transport Corridor to Cape Preston	31		
Access Road to Highway	17		
Flats and creeklines surrounding ore bodies	16		

The locations of the detailed recording sites were chosen to represent the major vegetation types occurring within the survey area. Due to time limitations, sites were concentrated on areas which were known to be proposed for disturbance (primarily the Northern, Central and Southern Ore Bodies, since infrastructure locations were not known at the time).

At each recording site, flora and vegetation were assessed within quadrats. A quadrat size of 50 m by 50 m was selected for the recording sites, as this size gives a good sample of flora presence. It also gives a good indication of the shrub and grass layer vegetation structure for most vegetation types in the Pilbara that occur in 'uniform' habitats (eg. plains and hillslopes) where vegetation stands of greater than this size occur. In other habitats (eg. narrow creeklines, or where stands would not accommodate a 50 x 50 m quadrat), alternative sample design was used. In some cases the shape of a quadrat had to be adjusted, in which case an equivalent area was sampled. In narrow creeklines, a transect the width of the creekline vegetation was sampled. The length of these transects (usually 100 m) was chosen to give a comparable flora list to those recorded from the 50 x 50 m quadrats. Where the stand was less than 100 m long, shorter transects were recorded.

Each of the sites was permanently pegged, with two diagonally opposite corners marked using fibreglass stakes.

The following parameters were recorded for each quadrat:

•	Location	Recorded at each permanent stake using a hand-held Global Positioning System (GPS) to an accuracy usually within 10 m;

Vegetation Type Broad description based on dominant species and strata after Specht (1970);

- Landform;
  - Substrate General soil type and description of stony surface mantle;
- Leaf / Wood Litter Percent cover; depth of leaf litter where appropriate;
- Disturbance Details Evidence of grazing, mining exploration activities, weed invasion, frequent fires etc. Note that fire effects are only considered as a negative impact if they are caused by repeated burning (eg. conducted for pastoral purposes). Fire is a natural and frequent process in the Pilbara to which the vegetation has adapted, and to class areas as being in poor condition simply because they have been recently burnt is misleading; and
- Percent Foliar Cover Cover was visually estimated for each species and for each of the dominant strata (based on life form and height). Strata used were as follows:
  - Trees >5 m tall
  - Trees <5 m tall
  - Shrubs >2 m tall
  - Shrubs 1-2 m tall
  - Shrubs 0.5-1 m tall
  - Shrubs <0.5 m tall</li>
  - Spinifex
  - Other grasses
  - Herbs
  - Sedges
  - Mistletoes

Estimates of cover were made as percentages. Where this was too difficult, cover was recorded within the following classes:

- 0-2 % (very sparse)
- 2-10 % (sparse)
- 10-30 % (open)
- 30-50 % or 50-70 % (moderately dense)
- 70-100 % (dense)

Colour photographs of the vegetation at most sites were taken using either a 35 mm camera or a digital camera.

Additional foot traverses were conducted to ground truth the boundaries of vegetation types and to allow assessment of areas that were inaccessible by vehicle. Opportunistic flora collections were made on these traverses to supplement the list of species recorded from the flora survey sites. Particular attention was paid to searching habitats (eg. creeklines) likely to support flora species with sporadic distributions.

### 3.1.2 Flora Identification, Data Entry and Analysis

Common species which were well known to the survey botanists were identified in the field. Specimens were collected of all other species, and were identified by keying out, reference to appropriate publications, use of reference collections and comparison to the collections held at the Western Australian Herbarium (WAHerb). Each specimen collected was assigned a unique number to facilitate tracking of data. Specimens will be lodged with WAHerb and the Karratha Herbarium for all species for which suitable material is available.

All raw site data was entered into an Access database using forms developed by Mr. Ted Griffin and supplied by Mr. Malcolm Trudgen. This raw data was corrected as necessary after specimens were identified. A matrix of the cover of each perennial species at each site was generated. This was used to run a TWINSPAN divisive classification in order to examine the relationships between the detailed vegetation survey sites. TWINSPAN computes successive ordinations to allow dichotomisation of sites, and in addition computes 'indicator species' (species which are strongly linked to particular communities and are diagnostic of each division in the classification) (Hill, 1979).

Only perennial species were used for the analysis. Where a range of foliar cover was presented (eg. 10-20%), the approximate midpoint of the range was selected for the analysis. The matrix used for the analysis is included as Appendix C. The qualitative results of TWINSPAN were used to refine the vegetation types identified in the field and to identify indicator species.

The vegetation type boundaries were then mapped, using 1:25,000 scale colour aerial photography enlarged to 1:5,000. Locations of survey sites, threatened flora populations and weeds were specifically indicated. An arbitrary coding system was used for the vegetation types, incorporating:

- the initial letter of the Land System (eg. RO for Rocklea);
- a lower case letter designating the broad habitat / vegetation type: beaches
   (b), mangals (m), mudflats (s), dunes (d), plains (p) (divided into grasslands
   (pg) and shrublands (ps) for the Horseflats LS), creeks and flowlines (c), hills
   and ridges (h), rockpiles (r), Snakewood shrublands (x), floodplains (f);
- a number (and letter where necessary) to further separate vegetation types within each habitat.

Several of the vegetation units were either too small to represent at the scale of mapping, or too variable to map individually based on the level of investigation which was possible during the field survey. These latter units were mapped as mosaics.

It is intended that the Austeel data will eventually be utilised in a combined PATN analysis when data from the recent Burrup Peninsula Study becomes available. This will assist in determination of the regional significance of vegetation of the survey area.

### 3.2 Fauna

### 3.2.1 Survey Timing

The main field component of the fauna survey was conducted between the 14<sup>th</sup> and 28<sup>th</sup> of April 2000. Roy Teale was the principal zoologist, while Kyle Armstrong carried out bat survey work.

An additional day (8<sup>th</sup> May 2000) was spent investigating potential sightings of Black and White Fairy-wrens on Cape Preston in conjunction with staff of the Western Australian Museum and CALM Karratha.

### 3.2.2 Fauna Habitats

Aerial photography of the project area was reviewed prior to the field survey to provisionally identify fauna habitats and to locate potential fauna trapping sites. This was followed by a short reconnaissance of the study site to confirm broad habitat types and evaluate the accessibility of proposed trapping grids.

Ten fauna habitats were identified based on repeated units combining both vegetation type and landform. The fauna habitats identified were defined on the basis of the requirements of a broad range of vertebrate species (avifauna, mammals and herpetofauna) responding to different elements of their environment. They represent a compromise between the vegetation descriptions reported for this survey (which are distinguished at a finer level) and the Land System mapping (in which the mapped systems represent a number of different habitat types). The ideal habitat delineation seems to be at the Land Unit level. These are identified as occurring within each Land System, however they are not specifically mapped but are rather described (AgWest, in prep.).

An account of each of the habitat units in the survey area is provided in the following. Where possible the habitats have been related to the Land System

classification developed by AgWest, thereby providing an appreciation of their wider distribution in the region.

Beach

This habitat encompassed the tidal flats left by the receding tide and extended to the first set of vegetated dunes. It also included rocky headlands. The beach, coastal dunes, mangrove and samphire habitats were all part of the Littoral Land System (LS). Vegetation type Lb encompassed this habitat (see Section 4.1).

No trapping was conducted within this habitat type, however numerous avifauna transects were carried out.

Coastal Dunes

The coastal dunes habitat occurred predominantly along the western side of Cape Preston. It comprised vegetation types Ld1, Ld2 and Ld3.

One trapping grid (Site 9) was established in this habitat. Pale brown, deep sands predominated. The pit-line was positioned such that it crossed both a swale and a crest of a low dune.

Mangroves (Mangals)

This habitat occurred on the margins of the tidal creeks and along some of the coastline (Figure 6.1). It was most intensively surveyed on the tidal creek at the southern boundary of Cape Preston. This unnamed creek is referred to as Preston Creek in this document.

Although no trapping occurred in this habitat, systematic avifauna censusing and opportunistic searching were carried out. In addition, the mangroves were targeted for bat sampling through trapping and the recording of ultrasonic calls.

Samphire

This habitat encompassed vegetation types Ls1 and Ls2. It typically occurred on the margins of mudflats, tidal creeks and low-lying saline areas. It was found largely in the northern portion of the project area, particularly on Cape Preston.

A single trapping grid (Site 8) was established in this habitat type.

Creeklines

This habitat consisted of various vegetation types, principally Rc1, Rc2, Rc3, Rc4 and Rf1, but also a number of minor creeklines including Hc1, Nc1-4, ROc1-5 and Pc1-4 (see Section 4.1, Appendix B). It occurred primarily in the River Land System (LS) and also within the Paraburdoo LS.

Two grids were established in this habitat (Sites 6 and 10). The grids were located on the banks of Edward Creek close to the ecotone. The vegetation typically comprised scattered trees and tall shrubs over grasslands of Buffel grass *\*Cenchrus ciliaris.* Soil was typically a thin layer of loam over compact gravels or deep red loams.

Cracking Clays

Two trapping grids (Sites 1 and 2) were established in this habitat type. Although the two sites were somewhat similar, Site 1 was lower in the landscape than Site 2. Pit traps at Site 2 were positioned in the small raised stony islands that occur as a mosaic throughout much of the cracking clays.

This habitat encompassed vegetation types Px1-3, Hpg1-3, Hps1 and Hc1. It was generally associated with the Paraburdoo and Horseflats Land Systems.

Stony Plains

A single trapping grid was located in this habitat type at Site 5. The area was extremely uniform and correlated with vegetation type Pp2. It was most strongly associated with the Paraburdoo Land System.

Low Stony Hills

Two trapping grids were established in this habitat type at Sites 3 and 7. At Site 3 the pit-line was positioned on the face of the hill perpendicular to the contour lines. At Site 7 the pits followed a minor drainage feature. This habitat was associated with vegetation associations Nh1-5 and ROh1a-2b and occurred generally over the Newman and Rocklea Land Systems.

Rocky Hills and Outcrops

Occurred as outcroppings on the proposed ore bodies and as rock piles and rock faces at the northern end of the project area. A single trapping grid (Site 4) was established in this habitat. This habitat would encompass vegetation types Nr1-4 and ROr1-3, and occurred principally in the Newman and Rocklea Land Systems, with small occurrences in the Macroy LS.

Sandplain

Identified towards the latter stages of the field survey, this habitat was not surveyed. It occupied a relatively small area of Littoral LS on Cape Preston, corresponding to vegetation type Ld4.

#### 3.2.2 Fauna Sampling

The fauna sampling for this survey was conducted under the "Licence To Take Fauna For Scientific Purposes" No. SF003099 and "Permit for Research/Educational Excursion in CALM Estate" No. NE002410, both issued to RJ Teale.

Fauna survey sites were selected so that they:

- sampled a representative set of the fauna habitats/community types identified within the project area;
- sampled across the geographic extent of the project area, with some emphasis on proposed impact areas; and
- investigated areas of particular conservation significance.

Preston Island itself was not trapped during the survey for a number of reasons, including its small size, inclement ocean conditions and CALM's advice that it was probably unlikely to support any regionally significant fauna.

For each fauna survey site, spatial coordinates were obtained using a hand-held GPS (Australian Geod '84 datum), typically to an accuracy of less than 10 m. A number of parameters were recorded including the broad soil type, dominant vegetation type, landform and level of disturbance (see Section 3.1).

The fauna survey comprised both systematic and non-systematic approaches. The majority of the systematic trapping grids were established over the first three days of the survey period. Grids were either shut down after nine nights (Sites 1, 2 and 3), eight nights (Sites 4, 5, 6 and 7), seven nights (Site 8) or five nights (Sites 9 and 10) (Table 3.2). Non-systematic information was recorded throughout the period.

#### Systematic Censusing

The central component of the systematic censusing consisted of a number of intensive trapping grids, each located within a defined habitat. Each trapping grid consisted of a row of 10 pitfall traps, spaced at 10m intervals and connected with a single length of flywire, and 20 Elliott box traps arranged in two lines of 10 traps.

Elliott traps were generally spaced 10 m apart, however the spacing at each site varied according to the distribution of microhabitats. Traps were baited with a mixture of rolled oats and peanut butter, and each site and trap was assigned a unique reference number.

Traps were checked daily, with vertebrates identified at the point of capture and released. Voucher specimens of each species were lodged with the Museum of Western Australia for confirmation of field identifications (Appendix F).

Site	Location	Date	Date	Nights	#	# Pit	Elliott	Pit	Total effort
#	(AMG)	Set-up	Closed	Open	Elliott	Traps	Trap	Trap	(trap
					Traps		Effort	Effort	nights)
1	415558	16/04/00	25/04/00	9	20	10	180	90	270
	7672784								
2	416041	16/04/00	25/04/00	9	20	10	180	90	270
	7675944								
3	416400	16/04/00	25/04/00	9	20	10	180	90	270
	7675829								
4	418570	17/04/00	25/04/00	8	20	10	160	80	240
	7688117								
5	416902	17/04/00	25/04/00	8	20	10	160	80	240
	7684481								
6	412489	17/04/00	25/04/00	8	20	10	160	80	240
	7681207								
7	411602	17/04/00	25/04/00	8	20	10	160	80	240
	7670335								
8	416012	18/04/00	25/04/00	7	20	10	140	70	210
	7687449								
9	416253	20/04/00	25/04/00	5	20	10	100	50	150
	7690565								
10	409817	20/04/00	25/04/00	5	20	10	100	50	150
	7666269								
							1520	760	2280

Table 3.2: Trapping grid location and trap effort.

#### **Avifauna Sampling**

Avifauna censusing was undertaken during the field survey in conjunction with clearing of traps and opportunistic searches for ground vertebrates. A total of 40 censuses was conducted across 25 sites.

#### Bat Sampling

Three general bat habitats were surveyed in the study area: mangal; over the open water of large rivers; and within wooded watercourses. Specific locations sampled within these habitats included areas of mangal south of Mt. Preston, the ford of Du Boulay Creek, Fauna Site 6 and Fauna Site 10 (Figure 6.1 and Appendix B).

Bat fauna were surveyed by trapping with mist nets and a harp trap (Austbat, Lower Plenty, Victoria). Within the mangal, a harp trap was placed in a narrow channel between two stands of *Avicennia* over two nights. A mist net arrangement was placed against a stand of *Rhizophora* in the main channel over two nights. A second mist net arrangement was placed within a stand of *Avicennia* for one night. These positions correspond to the foraging habitats of Kimberley mangrove bats (beside the stand but against the surfaces, beside the stand in the open, and within the stand; McKenzie & Rolfe, 1986). Trapping was conducted at low tide only. Harp trapping and mist netting were conducted over water within the wooded watercourses at Fauna Sites 6 and 10 for one night each.

In addition, bat species can be distinguished from each other using the characteristics of their echolocation calls. These calls are used by the bat primarily to locate prey and avoid obstacles. This method of identification relies on the comparison of the sample call sequence with a known reference call and in this survey was used as a supplement to trapping.

Bat echolocation calls were recorded within the mangal south of Mt. Preston, and over the open water of Du Boulay Creek at the ford (for part of one night). Calls were also recorded of species foraging above the Fortescue River at the Fortescue River Bridge. Calls were recorded with an electronic device which is able to detect and transform ultrasonic bat echolocation calls (Anabat II Bat detector, Titley Electronics, Ballina, NSW). The transformed calls were stored on TDK Ferrous D90 IEC1/Type 1 audio cassettes using a Sony Professional Walkman WM-6DC. A comprehensive library of reference calls has not been published for Western Australia, however some identification was aided by call characteristics of Carnarvon Basin bat species published in McKenzie and Muir (in press). Calls were characterised in terms of three characters by zero crossing analysis (ZCA) using an Anabat V ZCA Interface Module and with Anabat 5.2B and Analook 2.0 software (Titley Electronics):  $F_{min}$  is the frequency of the shallowest section of the frequency sweep near the end of the frequency modulated call,  $F_{max}$  is the highest detected frequency and DUR is the duration of each pulse. Only consistently shaped, regularly spaced sequences of pulses with a clean, well defined low frequency component were included. Furthermore, only search mode calls were considered for analysis. All calls were calibrated with a tone of 40 kHz and divided down by a factor of 16. The discriminant scatterplot generated by McKenzie and Muir (in press) was used to identify echolocation sequences recorded during night traverses of the study area.

### Non-systematic Censusing

A range of non-systematic fauna survey activities was undertaken by the survey team to groundtruth the remainder of the study area and provide a general coverage of the survey area. These included:

- searching of microhabitats for reptile, frog and small mammal species: approximately two to three person hours were spent within each habitat on this activity;
- habitat specific searches for Threatened fauna species;
- opportunistic sightings and records;
- identification of road kills and animal remains;
- identification and recording of secondary signs including tracks, scats and diggings; and
- fauna habitat type assessment.

### 3.2.3 Taxonomy

The taxonomy and nomenclature used in this report are based on the following references.

Reptiles:Storr et al. (1990, 1999), Cogger (1996).Birds:Johnstone (2000)\*.Frogs:Tyler et al. (2000).Mammals:How et al. (in press).\*Entered using MAX (CALM, 2000) with original files kindly provided by Dr. Alan Burbidge.

Where a discrepancy exists between references, taxonomy follows that used by the Western Australian Museum.

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### 4.0 Terrestrial Flora and Vegetation

### 4.1 Vegetation of the Project Area

### 4.1.1 Vegetation Diversity Recorded

Sixty four vegetation types were defined for the survey area, including a wide range of structural and floristic variants. These included tussock grasslands dominated by *Eragrostis* on plains; annual herblands on cracking clays; hummock grasslands of *Triodia* species on slopes and crests; *Acacia* shrublands over hummock grasslands on slopes and crests; tall shrublands of *Acacia* species in creeklines; low open woodlands of *Corymbia* over *Acacia* shrublands in flowlines on slopes; and open forests of *Eucalyptus camaldulensis* and/or *E. victrix* over tall shrublands of *Acacia coriacea* or *Melaleuca glomerata* on river banks and beds.

Maps of the distribution of these vegetation types are presented in Appendix B. A description of each vegetation type is given below, grouped under the Land System in which they predominantly occurred.

### 4.1.2 Littoral Land System

The Littoral (L) LS supported a range of vegetation, including mangals along the coastal fringe, samphires on saline mudflats, low shrublands on sandy plains and shrublands of *Acacia coriacea* and/or *A. bivenosa* over spinifex or tussock grasses on coastal dunes. A feature of the vegetation of the Littoral LS was the frequent presence of salt-tolerant species.

### Lb Beaches

Narrow beaches occurred primarily along the western margin of Cape Preston. These consisted principally of bare sand, with very occasional individuals of *Spinifex longifolius* and herbs. The beaches were in excellent condition, with no obvious signs of disturbance.

### Lm Mangals

Belts of mangroves occurred in the intertidal zone, particularly around tidal creeks such as Preston Creek. Six species of mangroves were recorded from the project area, with *Avicennia marina* being the most common. Twelve mangal assemblages were identified. These are described separately in Section 6.

### Ls1 Halosarcia spp. scattered low shrubs

Broad areas of tidal mudflat with only scattered low samphires occurred in the northern section of the project area. Species present included the samphires *Halosarcia halocnemoides* subsp. *tenuis* and *H. indica* subsp. *leiostachya.* This vegetation was in excellent condition, with no obvious signs of disturbance.

### Ls2 *Halosarcia halocnemoides* subsp. *tenuis* low open shrubland to low open heath

Areas of samphire occurred in the northern section of the study area on mudflats fringing the coast and tidal inlets. These consisted of an open to moderately dense low shrubland (typically ~30 cm tall) dominated by salt tolerant plants, principally samphires. The dominant species was *Halosarcia halocnemoides* subsp. *tenuis,* which occurred with lesser amounts of *Frankenia ambita, Halosarcia indica* subsp. *leiostachya, Hemichroa diandra, Muellerolimon salicorniaceum, Neobassia astrocarpa* and *Trianthema turgidifolia.* Occasional seedlings of the mangrove species *Avicennia marina* were also recorded. A small number of grasses was noted, with species of *Eragrostis* and *Sporobolus virginicus* providing a very sparse cover towards the landward edge of this vegetation type. Herbs were occasional only but included *Dysphania plantaginella*. This vegetation was generally in very good to excellent condition, with few obvious signs of disturbance. (Sites M036 & M074).

# Ld1 *Acacia bivenosa* low open shrubland over *Spinifex longifolius* grassland

This vegetation type occurred in a narrow band (~20m wide) along the seaward margin of the frontal dunes on Cape Preston. It was sampled only at Site M068, which comprised very undulating (2-3 m tall) dunes of coarse brown sand. This vegetation was characterised by a moderate height (to 1 m) shrubland dominated by a scattered to open cover of *Acacia bivenosa*, with occasional *Acacia coriacea* subsp. *coriacea*, \**Aerva javanica* and *Rhagodia preissii* subsp. *obovata*, over a moderately dense grassland of Beach spinifex *Spinifex longifolius*, with occasional \**Cenchrus ciliaris*. Scattered herbs included *Euphorbia tannensis* subsp. *eremophila*, *Salsola tragus* and *Tribulus occidentalis*. This vegetation was in very good condition, with only occasional weeds recorded. (Site M068).

### Ld2 Acacia coriacea, A. bivenosa open shrubland to shrubland over scattered grasses

This vegetation type occurred on the coarse brown sands of the gently undulating dunes which border Cape Preston. It consisted of an open to sparse tall shrubland that was dominated by *Acacia coriacea* subsp. *coriacea*, with lesser amounts of *A. bivenosa*. Occasional other shrubs included *Rhagodia preissii* subsp. *obovata*, *Scaevola spinescens* and *Threlkeldia diffusa*. The grass cover ranged from a scattered to sometimes open cover of *\*Cenchrus ciliaris*, with occasional other species such as *Enneapogon caerulescens* and *Triraphis mollis*. Very sparse herbs included *Amaranthus pallidiflorus*, *Cleome viscosa*, *Euphorbia schultzii*, *E. tannensis* subsp. *eremophila*, *Ptilotus exaltatus*, *Salsola tragus* and *Tribulus occidentalis*. This vegetation type ranged from very good to good condition, with invasion by Buffel grass the major factor reducing condition. (Sites M070 & M072).

# Ld3 *Acacia coriacea, A. bivenosa* open shrubland over *Triodia epactia* curly spinifex grassland

Areas of backing dunes supported an open tall shrubland of *Acacia coriacea* subsp. *coriacea*, with lesser amounts of *Acacia bivenosa* and *Rhagodia preissii* subsp. *obovata*, over a curly spinifex (ie. not hummock forming) grassland of *Triodia epactia*. Other tall shrubs recorded included *Adriana tomentosa* and *Santalum lanceolatum*, while occasional low shrubs included \**Aerva javanica*, *Corchorus walcottii*, *Melhania oblongifolia*, *Sida* aff. *fibulifera* (M100.22) and *Threlkeldia diffusa*. Grasses other than spinifex were dominated by scattered patches of *Eragrostis eriopoda*, with occasional \**Cenchrus ciliaris* and *Triraphis mollis*. The very sparse herb stratum included *Amaranthus pallidiflorus*, *Cleome viscosa*, *Cuscuta victoriana*, *Euphorbia* species, *Salsola tragus* and *Swainsona formosa*. This vegetation was in very good condition, with only scattered weeds recorded. (Site M100).

### Ld4 Acacia coriacea scattered shrubs over mixed low shrubland and Triodia pungens, \*Cenchrus ciliaris curly spinifex / tussock grassland

This vegetation occurred on a low, narrow dune and on a broad sandbank in the southwestern portion of Cape Preston. The sandbank at Site M069 was larger and supported a broader range of species given its location between more intact and more variable vegetation. The vegetation consisted of very scattered tall shrubs of *Acacia coriacea* subsp. *coriacea* over sparse to occasional low shrubs of species such as *Adriana tomentosa, Atriplex bunburyana, Corchorus walcottii, Indigofera trita, Melhania oblongifolia, Solanum lasiophyllum, Trianthema turgidifolia* and Waltheria indica. The open to moderately dense curly spinifex grassland of *Triodia pungens* showed some invasion by \**Cenchrus ciliaris*. Scattered other grasses included *Aristida holathera, Eragrostis cumingii, E. eriopoda, Eriachne mucronata* and *Panicum decompositum,* while very occasional sedges included *Bulbostylis barbata* and *Cyperus bulbosus*. Very sparse herbs included *Cleome viscosa, Indigofera colutea, Portulaca pilosa, Pterocaulon sphacelatum* and *Rhynchosia* cf. *minima.* This vegetation type was rated as being in very good (Site M069) to good condition (M063) depending on the extent of invasion by Buffel grass. (Sites M063 & M069).

#### Ld5 Saline low shrubland

This vegetation type was recorded within a single saline swale located between dunes on Cape Preston. The substrate consisted of pale brown, fine silty sand, with a blue-green algal surface crust in places. The vegetation consisted of a low shrubland (to ~30 cm tall) dominated by salt tolerant species, principally *Dissocarpus paradoxus* and *Frankenia pauciflora*, with lesser amounts of *Halosarcia indica* subsp. *leiostachya, Hemichroa diandra, Lawrencia viridigrisea* and *Neobassia astrocarpa*. Grasses contributed a very sparse cover. The dominant species was *Eragrostis falcata,* while very small amounts of *\*Cenchrus ciliaris, Dactyloctenium radulans, Xerochloa imberbis* and the spinifex *Triodia angusta* were also recorded. Occasional herbs present included *Dysphania rhadinostachya, Euphorbia coghlanii, Portulaca pilosa* and *Swainsona kingii*. This vegetation was in very good condition. (Site M061).

#### Lp1 *Triodia angusta* hummock grassland on sandy plain

This vegetation type occurred over a plain of pale brown silty loam on the lower section of Cape Preston. It consisted of a moderately dense hummock grassland of *Triodia angusta*, with considerable invasion by Buffel grass \**Cenchrus ciliaris*. Occasional other grasses included *Eragrostis falcata* and *Panicum decompositum*. Scattered low shrubs included *Indigofera trita*, *Melhania oblongifolia*, *Neobassia astrocarpa* and *Trianthema turgidifolia*. Occasional herbs included *Portulaca oleracea* and *Trianthema triquetra*. This vegetation was considered to only be in moderate condition, given the extent of invasion by Buffel grass. (Site M065).

### 4.1.3 Horseflats Land System

The following vegetation types occurred on clayey plains within the Horseflats Land System (H). The grasslands and low shrublands typically occurred as a mosaic (Hp), hence some sites contained portions of more than one vegetation type.

#### Hpg1 Eragrostis xerophila open tussock grassland

Broad areas of red-brown cracking clay plain supported *Eragrostis xerophila* tussock grassland. These were characterised by an open grassland which was strongly dominated by *E. xerophila*, with occasional other grasses such as *Dichanthium sericeum* subsp. *humilius* and *Xerochloa imberbis*. Scattered herbs included *Corchorus tridens*, *Lotus australis, Phyllanthus maderaspatensis* var. *angustifolius, Rhynchosia* cf. *minima* and *Stemodia kingii*. The cracking clays largely preclude growth of larger shrub species, however occasional small shrubs were recorded including *Indigofera trita, Neptunia dimorphantha* and forms of *Sida* aff. *fibulifera*. This vegetation type was generally in very good condition, despite being subject to grazing. The cracking clay substrate prevents substantial invasion by Buffel grass *\*Cenchrus ciliaris,* which is a pervasive weed on sandier soils within the survey area. (Sites M002A, M021 & M105; portions of Sites M001 & M027).

#### Hpg2 Eriachne benthamii tussock grassland

Localised wetter areas within the clay plains supported *Eriachne benthamii* tussock grasslands. The *Eriachne benthamii* grasslands were typically more dense than the *Eragrostis xerophila* grasslands. Apart from the obvious difference in the dominant grass species, the two grasslands supported quite similar species' mixes. However, a number of species which are typical of wet areas were only recorded from the *E. benthamii* grasslands, including *Cyperus iria, C. squarrosus* and *Marsilea hirsuta*. Like the previous vegetation type, the *E. benthamii* grasslands were generally in very good condition, with little invasion by Buffel grass (\**Cenchrus ciliaris*) and no obvious grazing effects. (Portions of Sites M001 & M027).

#### Hpg3 Xerochloa imberbis grassland

Small patches of grassland dominated by *Xerochloa imberbis* were recorded on clay plains within the survey area. These occurred principally within the Horseflats and Paraburdoo LS, but were only specifically sampled within the Rocklea LS at Site M102 on Cape Preston. The vegetation at this site was characterised by a moderately dense, very low (~10cm tall) grassland of *X. imberbis*, with very occasional individuals of \*Cenchrus ciliaris. The very sparse cover of herbs was dominated by *Ptilotus murrayi* var. *murrayi*, other species present included *Portulaca oleracea*, *P. pilosa*, *Rhynchosia* cf. *minima* and *Trianthema triquetra*. Very occasional low shrubs were recorded, including species typical of clay plains (eg. *Neptunia dimorphantha* and *Sida* aff. *fibulifera* 'var. L') and species characteristic of saline soils (*Atriplex bunburyana* and *Trianthema turgidifolia*). This vegetation type was in very good condition, with occasional weeds representing the primary disturbance. (Site M102).

#### Hps1 Sida aff. fibulifera low shrubland over very open herbland

Patches of low shrubland were observed within the clayey plains in the survey area. These were dominated by *Sida* aff. *fibulifera* (M85.15), with occasional individuals of *Neptunia dimorphantha*. Scattered grasses included *Aristida contorta*, \**Cenchrus ciliaris*, *Dichanthium sericeum* subsp. *humilius*, *Enneapogon caerulescens* and *Sporobolus australasicus*. *Streptoglossa liatroides* was the most abundant herb species; others present were *Phyllanthus maderaspatensis* 

abundant herb species; others present were *Phyllanthus maderaspatensis* var. *angustifolius, Rhynchosia* cf. *minima* and *Sclerolaena costata*. This vegetation type was in very good condition, with occasional weeds representing the primary disturbance. (Site M002B).

### Hc1 Acacia sclerosperma high shrubland over Chrysopogon fallax tussock grassland

This vegetation was recorded within a single flowline in the Horseflats LS. It had a high shrubland layer dominated by Acacia sclerosperma, with lesser amounts of Acacia coriacea subsp. pendens, over a dense grassland dominated by Chrysopogon fallax with small amounts of \*Cenchrus ciliaris, \*C. setigerus, Eriachne benthamii, Themeda triandra and the spinifex Triodia epactia. Other tall shrubs recorded included Acacia farnesiana, A. inaequilatera, A. xiphophylla, Capparis spinosa var. nummularia and Eremophila longifolia. Scattered low shrubs were dominated by Indigastrum parviflorum, and included Solanum diversiflorum, S. horridum, S. lasiophyllum and Triumfetta clementii. A variety of herbs was recorded, including Alysicarpus rugosus, Crotalaria medicaginea, Euphorbia species, Ipomoea muelleri, \*Malvastrum americanum. Phyllanthus maderaspatensis var. angustifolius. Pterocaulon sphacelatum, Rhynchosia cf. minima, Rostellularia adscendens var. *clementii* and *Vigna lanceolata* var. *lanceolata*. This vegetation type was in very good condition, with a small amount of weed invasion representing the main disturbance. (Site M022).

#### 4.1.4 Newman Land System

The three ore bodies and occasional other hills were dominated by hummock

grasslands of the Newman (N) LS. These were separated on the basis of differing overstorey layers, which ranged from virtually absent to an open shrubland dominated by some combination of *Acacia* and/or *Senna* species. These grasslands were difficult to map separately as they tended to occur as a mosaic, and also because the different units had a similar photo pattern.

#### Nh1 Triodia wiseana hummock grassland

Areas of hillslopes with very shallow soil in both the Newman and Rocklea LS supported a moderately dense hummock grassland of *Triodia wiseana* with negligible overstorey. Very occasional low shrubs included *Solanum horridum*, *S. lasiophyllum*, *Tephrosia supina* and *Triumfetta clementii*. *Paspalidium clementii* was the only regularly recorded grass species (other than spinifex), while very scattered sedges included *Bulbostylis barbata* and *Fimbristylis dichotoma*. The very sparse herb stratum included *Crotalaria medicaginea*, *Evolvulus alsinoides* var. *villosicalyx*, *Gomphrena cunninghamii*, *Trachymene oleracea* and *Trichodesma zeylanicum*. This vegetation ranged from very good to excellent condition, with very few weeds recorded. Buffel grass \**Cenchrus ciliaris* was conspicuously absent. (Sites M081, M120 & M120A (burnt)).

### Nh2 Acacia bivenosa, A ancistrocarpa open shrubland over Triodia wiseana hummock grassland

Hillslopes within the Newman LS supported an open shrubland dominated by Acacia bivenosa, with lesser amounts of Acacia ancistrocarpa, over a moderately dense hummock grassland of *Triodia wiseana*. Other tall shrubs frequently recorded included Acacia coriacea subsp. *coriacea*, *A*. *pyrifolia* and *Senna glutinosa* subsp. *pruinosa*. Scattered low shrubs included *Corchorus laniflorus*, *Indigofera monophylla*, *Solanum lasiophyllum* and *Triumfetta clementii*. Grasses such as *Cymbopogon ambiguus*, *Digitaria brownii* and *Paspalidium clementii* provided a very sparse cover, while scattered herbs included *\*Bidens bipinnata*, *Bonamia media* var. *villosa*, *Cassytha capillaris*, *Evolvulus alsinoides* var. *villosicalyx*, *Hybanthus aurantiacus*, *Polygala* aff. *isingii*, *Ptilotus aervoides*, *Trachymene oleracea* and *Trichodesma zeylanicum*. This vegetation type was generally in very good to excellent condition, with few obvious signs of disturbance. (Sites M010, M016, M020, M046, M052 & M112).

# Nh3 *Acacia bivenosa* open shrubland over *Triodia wiseana* hummock grassland

This vegetation type was similar to the previous, differing primarily in the general lack of *Acacia ancistrocarpa* and *A. pyrifolia* in the tall shrub stratum. Other notable differences included the absence of *Hybanthus aurantiacus* and *Ptilotus aervoides* and the presence of *Tephrosia supina* within this vegetation. The differences in species composition would appear to indicate a lower water availability in this (Nh3) vegetation type. This vegetation was mostly in very good condition, with few signs of disturbance apart from occasional weeds. Mesquite *\*Prosopis pallida* hybrid seedlings were recorded at some of the sites within this vegetation type, but did not appear to survive to maturity. (Sites M014, M048, M050, M058, M064, M097 & M116).

# Nh4 Senna glutinosa subsp. pruinosa scattered shrubs over Triodia wiseana hummock grassland

Some areas of stony hills supported very sparse moderate height shrublands of *Senna glutinosa* subsp. *pruinosa* over hummock grasslands of *Triodia wiseana*. Few other tall shrubs were noted, and *Acacia inaequilatera* was the only species recorded as mature plants from more than one site (seedlings of Mesquite \**Prosopis pallida* hybrid occurred at three sites). Scattered low shrubs included *Corchorus laniflorus, Indigastrum parviflorum, Indigofera monophylla, Tephrosia supina* and *Triumfetta clementii.* Scattered individuals of the herbs *Bonamia media* var. *villosa, Polygala* aff. *isingii, Trachymene oleracea* and *Trichodesma*  *zeylanicum* were recorded. Apart from spinifex, no grass species occurred at more than one site. (Sites M056, M060, M104 & M118).

### Nh5 *Acacia arida* low open shrubland over *Triodia wiseana* hummock grassland

Ridge crests on the Central OB supported a low shrubland (to ~1m tall) dominated by *Acacia arida* over a hummock grassland of *Triodia wiseana*. Other low shrubs recorded included *Corchorus laniflorus* and *Sida ?cardiophylla* (juvenile), while scattered taller shrubs included *Acacia bivenosa, A. pyrifolia, Senna glutinosa* subsp. *glutinosa* and subsp. *pruinosa*, and *Sida clementii*. The very sparse cover of grasses typically included *Cymbopogon ambiguus*, while the very sparse herb stratum included *Bonamia media* var. *villosa, Cassytha capillaris, Euphorbia boophthona, Gomphrena cunninghamii, Trachymene oleracea* and *Trichodesma zeylanicum*. This vegetation type was typically in very good to excellent condition, with few signs of disturbance. (Sites M011 (burnt) & M018).

A number of distinct vegetation types associated with minor flowlines within the Newman LS were observed, however these were impossible to map separately due to their extreme variability.

#### Nc1 Corymbia hamersleyana scattered low trees over Acacia ancistrocarpa, A. tumida, Petalostylis labicheoides open scrub over Triodia pungens hummock grassland

Narrow flowlines within the rocky hills of the Newman LS often supported scattered low trees of Corymbia hamersleyana over a tall shrubland which was dominated by a mixture of Acacia ancistrocarpa, A. tumida and Petalostylis labicheoides, usually with lesser amounts of Acacia bivenosa. Low shrubs generally provided a sparse cover and were dominated by Indigofera monophylla. Other species recorded included Abutilon lepidum, Corchorus laniflorus, Isotropis atropurpurea, Solanum gabrielae, S. lasiophyllum, Triumfetta clementii and Waltheria indica. Soft spinifex Triodia pungens provided an open cover, usually with some Triodia wiseana from the surrounding hummock grasslands. Other grasses recorded included Digitaria brownii. Eriachne mucronata and Paspalidium clementii. A large variety of herbs was recorded, including \*Bidens bipinnata, Goodenia stobbsiana, Hybanthus aurantiacus, \*Malvastrum americanum, Pterocaulon sphacelatum and Trichodesma zeylanicum. The lianes Cassytha capillaris and Porana commixta were also often present. This vegetation type was generally in very good condition, with minor weed invasion being the primary disturbance noted. (Sites M019 (burnt), M095, M107 & M114).

# Nc2 Acacia monticola dominated open scrub over Triodia wiseana hummock grassland

Other sections of narrow flowlines supported a tall shrubland dominated by Acacia monticola, usually with lesser amounts of Acacia ancistrocarpa, A. bivenosa, A. coriacea subsp. pendens, A. pyrifolia, and sometimes with significant amounts of Petalostylis labicheoides. The cover of low trees of Corymbia hamersleyana ranged from negligible to open. The sparse cover of low shrubs was again dominated by Indigofera monophylla, and also included Corchorus laniflorus, Solanum horridum and Triumfetta clementii. The moderately dense spinifex layer was dominated by Triodia wiseana, with small amounts of T. epactia. Other grasses noted included Cymbopogon ambiguus and Digitaria brownii. A variety of herbs was recorded, including \*Bidens bipinnata, Bonamia media var. villosa, Hybanthus aurantiacus, Evolvulus alsinoides, Trachymene oleracea and Trichodesma zeylanicum. The lianes Cassytha capillaris and Porana commixta were also recorded. This vegetation type was generally in very good condition, with minor weed invasion. (Sites M009 (burnt), M015, M017, M055 & M057).

# Nc3 *Acacia coriacea* high shrubland over *Triodia wiseana* hummock grassland

Some minor flowlines on the Northern OB and on Cape Preston supported sparse to open tall shrublands dominated by *Acacia coriacea* subsp. *pendens*, frequently over *A. bivenosa*. Other tall shrubs recorded included *Acacia elachantha*, *A. pyrifolia*, *A. tumida* and *Scaevola spinescens*. The sparse cover of low shrubs included *Achyranthes aspera*, *Indigofera monophylla*, *Melhania oblongifolia*, *Solanum lasiophyllum* and *Triumfetta clementii*. The cover of spinifex *Triodia wiseana* ranged from sparse to moderately dense. The sparse cover of other grasses included \**Cenchrus ciliaris*, *Cymbopogon ambiguus*, *C. obtectus* and *Paspalidium clementii*. The very sparse cover of herbs included *Alternanthera nana*, *Bonamia media*, *Evolvulus* species, *Hybanthus aurantiacus*, \**Malvastrum americanum*, *Phyllanthus maderaspatensis* var. *angustifolius*, *Portulaca pilosa*, *Trachymene oleracea* and *Trichodesma zeylanicum*. This vegetation type was generally in very good condition, with only minor invasion by weeds. (Sites M047, M049 & M071).

### Nc4 Acacia coriacea high shrubland over Eriachne benthamii, \*Cenchrus ciliaris tussock grassland

Located between a ridge of Newman LS and a plain of Yamerina LS, this flowline supported a tall shrubland of Acacia coriacea subsp. pendens, with occasional individuals of Acacia bivenosa, A. elachantha, A. farnesiana and Ehretia saligna. Scattered low shrubs included Achyranthes aspera, Indigofera species, \*Melochia pyramidata, Sida aff. fibulifera (MET Site 1346), Sida rohlenae, Solanum lasiophyllum and *Triumfetta clementii.* The moderately dense cover of tussock grasses was dominated by Eriachne benthamii, with lesser amounts of \*Cenchrus ciliaris. A variety of other grasses was recorded including Bothriochloa ewartiana, Chrysopogon fallax and Eragrostis species. Very occasional spinifex hummocks were recorded, particularly of Triodia angusta. Scattered sedges included Bulbostylis barbata, Cyperus iria and Fimbristylis depauperata. The sparse but diverse array of herbs included \*Bidens bipinnata, Corchorus tridens, Evolvulus alsinoides, Hybanthus aurantiacus, Ipomoea muelleri, \*Malvastrum americanum, Marsilea hirsuta, Phyllanthus maderaspatensis var. angustifolius and Rostellularia adscendens var. clementii. This vegetation type was in good condition, with invasion by Buffel grass representing the major disturbance. (Site M045).

#### **Rockpiles of the Newman LS**

The majority of rockpiles within the survey area occurred on the Newman or Rocklea LS and supported some combination of the tall shrubs *Acacia coriacea* and *Ficus* species over an understorey of grasses (particularly *Cymbopogon ambiguus*), spinifex and/or lianes (particularly *Canavalia rosea, Operculina aequisepala, Tinospora smilacina* and *Trichosanthes cucumerina*). The notable exception was the low sedgeland at Site M075 within the Macroy LS.

Nr1 Acacia coriacea, Ficus platypoda high open shrubland over Cymbopogon ambiguus open tussock grassland and Operculina aequisepala, Trichosanthes cucumerina lianes This vegetation was similar to ROr1, but occurred on rockpiles composed of smaller boulders, with more soil present in between. This substrate supported a number of species that were not common within ROr1, while other species (eg. Canavalia rosea) which were prominent on the larger boulder piles were absent. This vegetation consisted of a sparse tall shrubland dominated by Acacia coriacea subsp. coriacea, with lesser amounts of Ficus platypoda, over sparse lianes dominated by Operculina aequisepala and Trichosanthes cucumerina. Scattered low shrubs typically included Achyranthes aspera, Solanum gabrielae and Triumfetta clementii, while Tephrosia aff. densa contributed a sparse cover at Site M053. The sparse cover of grasses was generally dominated by *Cymbopogon ambiguus* and also included small amounts of *\*Cenchrus ciliaris* and *Paspalidium clementii*. The very sparse cover of herbs included a variety of species such as *Alysicarpus rugosus*, *\*Bidens bipinnata, Boerhavia burbidgeana, Cleome viscosa, Gomphrena cunninghamii, Portulaca oleracea, Nicotiana benthamiana, Rhynchosia* cf. *minima, Trachymene oleracea* and *Trichodesma zeylanicum*. This vegetation was in very good condition, with only minor invasion by weeds. (Sites M051 & M053).

Nr2 *Ficus platypoda, Acacia coriacea, Ehretia saligna* high open shrubland over *Triodia wiseana* open hummock grassland and scattered lianes

This vegetation type was recorded from boulder outcrops on the Southern Ore Body. It featured a sparse tall shrubland dominated by Ficus platypoda var. minor, with lesser amounts of Acacia coriacea subsp. coriacea and Ehretia saligna. Other species recorded included Acacia tumida, Alectryon oleifolius, Capparis spinosa var. nummularia, Eremophila longifolia and very occasional Mesquite \*Prosopis pallida hybrid. Low shrubs were uncommon but included Enchylaena tomentosa, Senna notabilis and Solanum gabrielae. Grasses were typically sparse and dominated by small amounts of Triodia wiseana, although there was a variable degree of invasion by \*Cenchrus ciliaris. The very sparse herb stratum included Amaranthus mitchellii, \*Bidens bipinnata, Boerhavia species, Cleome viscosa, Gomphrena cunninghamii, Leptopus decaisnei, Nicotiana benthamiana, Polycarpaea longiflora (pale form) and Trachymene oleracea. Lianes were scattered across the outcrops and included Operculina aequisepala, Tinospora smilacina and Trichosanthes cucumerina. This vegetation type varied from good to very good condition depending on the level of invasion by weeds. (Sites M109 & M111).

Nr3 Acacia coriacea scattered tall shrubs over \*Cenchrus ciliaris, Cymbopogon ambiguus open tussock grassland

Site M062 sampled a very small rockpile (only 35 m by 20 m in extent) within the Newman LS. This area supported very scattered shrubs of *Acacia coriacea* subsp. *coriacea, A. monticola, \*Prosopis pallida* hybrid (one individual only), *Rhagodia eremaea* and *Wrightia saligna* over a sparse cover of grasses dominated by \**Cenchrus ciliaris* with small amounts of *Triodia pungens* and *Cymbopogon ambiguus*. Low shrubs were uncommon but included *Enchylaena tomentosa, Solanum gabrielae* and *Triumfetta clementii*. The sparse cover of herbs included \**Bidens bipinnata, Euphorbia* species, *Gomphrena cunninghamii, \*Malvastrum americanum, Polycarpaea longiflora* (pale form), *Trichodesma zeylanicum* and *Zaleya galericulata*. The liane *Tinospora smilacina,* which often occurs in rocky situations, was also recorded. This vegetation was in good condition, with weed species representing the major disturbance. (Site M062).

### Nr4 Regenerating low open shrubland over open herbland and open grassland

Site M012 sampled a narrow ridge of small boulder material that had been recently burnt. The early seral stage of vegetation was thus dominated by an open cover of herbs, particularly *Gomphrena canescens* and *G. cunninghamii*, over an open cover of the grass *Paspalidium clementii*. A large number of other herbs and grasses was recorded. Scattered regenerating shrubs were noted, including *Abutilon lepidum, Acacia ancistrocarpa, A. monticola, A. pyrifolia, Petalostylis labicheoides, Scaevola spinescens, Tribulus platypterus* and *Triumfetta clementii*. Note that the proximity of this site to a small flowline (Site M009) may have influenced the species composition noted. (Site M012 (burnt)).

#### 4.1.5 Rocklea Land System

Similar to the Newman LS, hummock grasslands of the low hills of the Rocklea

(RO) LS frequently occurred as a mosaic and hence could not be mapped separately. These were separated on the basis of differing overstoreys, which ranged from virtually absent, to low open shrublands of the pea *Indigofera monophylla*, to sparse or open shrublands of mixed *Acacia* species.

#### ROh1a Triodia wiseana hummock grassland

As mentioned previously, some stony hillslopes of the Rocklea LS supported *Triodia wiseana* hummock grasslands with very little overstorey. These were very similar to the Nh1 vegetation type of the Newman LS and have not been described again. This vegetation type was typically in very good condition, with only scattered weeds (primarily Buffel grass). (Sites M023 & M038).

### ROh1b Indigofera monophylla low open shrubland over Triodia wiseana hummock grassland

Stony hillslopes in the northern section of the survey area, particularly on Cape Preston, typically supported a low shrubland dominated by Indigofera monophylla, often with Corchorus walcottii, over a moderately dense hummock grassland of Triodia wiseana. Other low shrub species recorded included Crotalaria novae-hollandiae, Hibiscus aff. platychlamys (M39.14), Melhania oblongifolia, Scaevola spinescens, Solanum diversiflorum, S. lasiophyllum, Tephrosia supina and Triumfetta clementii. Tall shrubs were occasional only and included Acacia bivenosa, A. coriacea subsp. coriacea and A. pyrifolia. The very sparse cover of grasses other than spinifex included \*Cenchrus ciliaris, Cymbopogon ambiguus and Paspalidium clementii. The variety of herbs which contributed a very sparse cover was often dominated by Euphorbia schultzii, and also included Boerhavia gardneri, Bonamia media var. villosa, Evolvulus alsinoides var. villosicalyx, Gomphrena cunninghamii, Hybanthus aurantiacus, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea longiflora (pale form), Pterocaulon sphacelatum, Rhynchosia cf. minima, Trachymene oleracea and Trichodesma zeylanicum. This vegetation type was typically in very good condition, with only scattered weeds (primarily Buffel grass). (Sites M076, M080, M087 & M098).

# ROh2a Acacia inaequilatera, A. bivenosa scattered shrubs over Triodia wiseana hummock grassland

This vegetation occurred on gentle footslopes of hills, particularly in the northern half of the project area. Site M026 was located close to Snakewood shrublands of the Paraburdoo LS, and consequently shared some similarities with those vegetation types. It consisted of a very sparse shrubland of *Acacia inaequilatera* and *A. bivenosa* over a moderately dense hummock grassland of *Triodia wiseana*. Scattered low shrubs included *Hibiscus* aff. *platychlamys* (M39.14), *Indigofera monophylla, I. trita, Solanum lasiophyllum* and *Triumfetta clementii*. Scattered grasses included \**Cenchrus ciliaris, Dichanthium sericeum* subsp. *humilius* and *Paspalidium clementii,* while the very sparse herb stratum included *Bonamia media* var. *villosa, Evolvulus alsinoides* var. *villosicalyx, Gomphrena cunninghamii* and species with affinities to *Mukia maderaspatana*. This vegetation type was in very good condition, with scattered weeds being the main disturbance. (Sites M026, M031 & M042).

# ROh2b Acacia ancistrocarpa, A. bivenosa open shrubland over Triodia wiseana hummock grassland

This vegetation type had a shrubland of *Acacia ancistrocarpa* or *A. bivenosa* over a moderately dense hummock grassland of *Triodia wiseana*. Scattered low shrubs typically included *Abutilon lepidum, Corchorus laniflorus, Hibiscus* aff. *coatesii* (Site 664), *Sida* sp. 'rugose', *Tephrosia supina* and *Triumfetta clementii*. Very sparse grasses were dominated by \**Cenchrus ciliaris* and also included *Cymbopogon ambiguus*. The sedge *Fimbristylis dichotoma* was also present. Scattered

herbs included *Bonamia media* var. *villosa, Crotalaria medicaginea, Evolvulus alsinoides* var. *villosicalyx, Gomphrena cunninghamii, Rhynchosia* cf. *minima* and *Trachymene oleracea.* This vegetation type was generally in very good condition, with occasional weeds being the main disturbance. (Sites M040, M079 (burnt) & M088).

#### ROp1 Triodia angusta hummock grassland

This vegetation type occurred as a narrow strip (frequently only 12-15 m wide) on gentle stony slopes fringing coastal areas of the Rocklea LS. Its distribution reflected calcretisation caused by seepage (M. Trudgen, pers. obs.), and this vegetation type was localised at the bottom of slopes between the belt of samphire fringing the coast and the Triodia wiseana hummock grassland vegetation of the hills. It consisted of a moderately dense hummock grassland of Triodia angusta, with occasional patches of Themeda triandra. Other scattered grasses included Cymbopogon ambiguus, Eriachne mucronata and Eulalia aurea. Shrubs were rare but included very occasional Acacia bivenosa, Achvranthes aspera, Indigofera monophylla, I. trita, Solanum horridum, S. lasiophyllum, Tephrosia clementii and Triumfetta clementii. Sparse herbs were dominated by Cassytha capillaris, and also included Cleome viscosa, Euphorbia coghlanii, Gomphrena cunninghamii, Phyllanthus maderaspatensis var. angustifolius and Polycarpaea longiflora (pale form). This vegetation was in very good condition, with low invasion by weeds. (Site M035).

# ROx1 *Acacia xiphophylla* open shrubland over patches of *Triodia wiseana* hummock grassland

Patches of Snakewood *Acacia xiphophylla* shrubland over *Triodia wiseana* hummock grassland occurred occasionally within the Rocklea LS, but were much more common within the Paraburdoo LS. They have been described under the latter. The patch of this vegetation type sampled by Site M092 was heavily invaded by *\*Cenchrus ciliaris,* and was therefore classed as being in moderate condition. (Site M092).

### ROc1 Corymbia hamersleyana low woodland over Acacia bivenosa high shrubland over Triodia wiseana hummock grassland

This vegetation type occurred in minor flowlines and was sampled at Site M090 along the proposed Access Corridor. It consisted of an open cover of Corymbia hamersleyana low trees over an open tall shrubland dominated by Acacia bivenosa. Other tall shrubs recorded included Acacia ancistrocarpa, A. coriacea subsp. pendens, A. pyrifolia and Senna glutinosa subsp. x luerssenii. The sparse cover of low shrubs included various species such as Corchorus laniflorus, Isotropis atropurpurea, Solanum lasiophyllum and Triumfetta clementii. A moderately dense cover of the spinifex Triodia wiseana occurred with a sparse cover of other grasses, which was dominated by \*Cenchrus ciliaris and also included Cymbopogon ambiguus, Digitaria ctenantha, Paraneurachne muelleri and Sporobolus australasicus. A variety of herbs was recorded, including Euphorbia species, Flaveria australasica, Hybanthus aurantiacus, \*Malvastrum americanum, Trichodesma zeylanicum and the lianes Mukia aff. maderaspatana sp. F and Porana commixta. This vegetation was in good to very good condition, with minimal invasion by Buffel grass. (Site M090).

ROc2 Acacia coriacea high shrubland over hummock / tussock grassland This flowline vegetation was common in the Rocklea LS. It consisted of a tall shrubland of Acacia coriacea subsp. pendens, sometimes with A. inaequilatera, over sparse spinifex (Triodia wiseana and/or T. angusta) and moderately dense tussock grasses. The latter was dominated by a variable amount of \*Cenchrus ciliaris, with small amounts of other species such as Sorghum plumosum and Themeda triandra. Other tall shrubs recorded included Acacia bivenosa and A. farnesiana, while scattered lower shrubs included Indigofera monophylla, I. trita, Melhania oblongifolia, Solanum horridum and S. lasiophyllum. Very sparse herbs included Alternanthera nana, Cassytha capillaris, Euphorbia tannensis subsp. eremophila, Hybanthus aurantiacus, Portulaca oleracea, Pterocaulon sphacelatum and Trichodesma zeylanicum. This vegetation was in moderate to good condition with some invasion by Buffel grass. (Sites M033, M039 & M089).

#### ROc3 Acacia sclerosperma high shrubland over \*Cenchrus ciliaris, Themeda triandra tussock grassland and Triodia wiseana open hummock grassland

This vegetation was recorded from one group of flowlines in the northern section of the project area. The overstorey consisted of a tall shrubland dominated by Acacia sclerosperma, with small amounts of A. bivenosa and occasional A. ancistrocarpa, A. farnesiana, A. victoriae and Eremophila longifolia. Scattered low shrubs included Abutilon trudgenii ms. (Priority 3), Enchylaena tomentosa, Melhania oblongifolia, Solanum diversiflorum and S. lasiophyllum. The moderately dense grassland was dominated by \*Cenchrus ciliaris with lesser amounts of Themeda triandra. Other grasses recorded included *Dichanthium sericeum* subsp. *humilius* and *Digitaria ctenantha*. The sparse cover of spinifex was dominated by Triodia wiseana and occasional T. angusta hummocks were also present. Herbs included Alternanthera nana, Cleome viscosa, Euphorbia species, Hybanthus aurantiacus, \*Malvastrum americanum, Phyllanthus maderaspatensis var. angustifolius, Pterocaulon sphacelatum and Stemodia grossa. This vegetation type was in good to moderate condition, with invasion by Buffel grass representing the most serious disturbance. (Site M032).

# ROc4 *Acacia coriacea, A. bivenosa* high shrubland over mixed shrubs and grasses

A relatively well developed creekline on Cape Preston supported variable vegetation which was sampled at a single site. This consisted of a high shrubland dominated by *Acacia bivenosa* and *A. coriacea* subsp. *pendens*, with lesser amounts of several species including *Acacia ampliceps* and *Rhagodia eremaea*. The diverse array of low shrubs included *Abutilon cunninghamii, Capparis spinosa* var. *nummularia, Senna artemisioides* subsp. *oligophylla, Solanum gabrielae, S. lasiophyllum, Tephrosia rosea* var. *clementii* and *Triumfetta clementii*. At ground level there was a variable cover of the spinifex *Triodia wiseana* with other grasses dominated by \**Cenchrus ciliaris*. Scattered herbs included *Corchorus tridens, Dysphania rhadinostachya* and *Pterocaulon sphacelatum,* and patches of the sedge *Cyperus vaginatus* were also recorded. This vegetation type was in good condition, with some invasion by Buffel grass. (Site M093).

# ROc5 *Acacia ampliceps* high shrubland over *Triodia angusta* hummock grassland and tussock grasses

This vegetation type was recorded from two small creeklines. It consisted of an open tall shrubland of *Acacia ampliceps*, with occasional individuals of other species such as *Acacia coriacea* subsp. *pendens* and *Sesbania cannabina*. The sparse to open grass cover was dominated by a small amount of the spinifex *Triodia angusta*, and a variable cover of *\*Cenchrus ciliaris* or *Sporobolus virginicus*. Very sparse herbs included *Corchorus tridens, Ipomoea muelleri, \*Malvastrum americanum, Phyllanthus maderaspatensis* var. *angustifolius* and *Trichodesma zeylanicum*. This vegetation type ranged from very good to good condition depending on the level of invasion by Buffel grass. (Sites M067 & M073).

#### **Rockpiles of the Rocklea LS**

### ROr1 Acacia coriacea, Ficus platypoda high open shrubland over lianes dominated by Canavalia rosea

This vegetation type was recorded on three boulder rockpiles, one of

which was located within the Newman LS. It consisted of a sparse tall shrubland of Acacia coriacea subsp. coriacea, usually with similar amounts of Ficus platypoda var. minor, over a very sparse to open cover of lianes, principally Canavalia rosea, but also including Operculina aequisepala and Trichosanthes cucumerina. \*Passiflora foetida was recorded from one site. Scattered low shrubs included Abutilon species, Achyranthes aspera, Capparis spinosa var. nummularia, Rhagodia eremaea, Scaevola spinescens, Solanum lasiophyllum and Triumfetta clementii. Buffel grass \*Cenchrus ciliaris was recorded from all three rockpiles, however the extent of invasion varied from negligible to more than 30% cover. Other grasses were not common but included Paspalidium tabulatum and occasional hummocks of Triodia wiseana. Scattered herbs included a variety of species such as \*Bidens bipinnata, Cleome viscosa, Commicarpus australis, Gomphrena cunninghamii, Polycarpaea longiflora (pale form), Portulaca oleracea, Trachymene oleracea and Trichodesma zeylanicum. The condition of vegetation on these rockpiles ranged from very good at Site M013 to moderate at the remaining sites due to higher weed invasion. (Sites M013, M041 & M091).

#### ROr2 Acacia coriacea high shrubland over Cymbopogon, \*Cenchrus ciliaris, Triodia wiseana tussock / hummock grassland

The overstorey of this vegetation type comprised an open tall shrubland dominated by Acacia coriacea subsp. coriacea, with scattered individuals of other species including Acacia bivenosa, A. pyrifolia, Ehretia saligna, Ficus opposita var. aculeata and Santalum lanceolatum. Scattered low shrubs were dominated by Achyranthes aspera, and also included Enchylaena tomentosa, Solanum gabrielae, S. horridum and Triumfetta *clementii*. The open cover of grasses was typically dominated by \*Cenchrus ciliaris and Cymbopogon ambiguus, with the spinifex Triodia wiseana providing a sparse to open cover. Themeda triandra was common in places, and other scattered grasses included Chrysopogon fallax, Digitaria ctenantha and Paspalidium clementii. Scattered herbs included Cleome viscosa, Crotalaria medicaginea, Gomphrena cunninghamii and Polycarpaea longiflora (pale form). Scattered lianes included Tinospora smilacina and Trichosanthes cucumerina. This vegetation type was generally in good condition, with some weed invasion. (Sites M078 & M085).

# ROr3 Acacia coriacea, A. bivenosa scattered tall shrubs over Cymbopogon ambiguus tussock grassland

This vegetation type was recorded on two adjacent rockpiles within the Rocklea LS, just south of Preston Creek. It consisted of scattered to sparse tall shrubs of *Acacia coriacea* subsp. *coriacea*, with less *A. bivenosa*, over a very sparse to sparse cover of grasses, particularly *Cymbopogon ambiguus* with occasional \**Cenchrus ciliaris*. Scattered other shrub species included *Capparis spinosa* var. *nummularia*, *Enchylaena tomentosa*, *Eremophila longifolia*, *Sida* aff. *fibulifera* (M37.16), *Sida* sp. 'rugose', *Tephrosia* aff. *densa* and *Triumfetta clementii*. Very occasional herbs included *Gomphrena cunninghamii*, *Hybanthus aurantiacus*, *Mukia maderaspatana*, *Phyllanthus maderaspatensis* var. *angustifolius* and *Rhynchosia* cf. *minima*. This vegetation was in very good condition, with occasional weeds being the main disturbance. (Sites M037 & M037A).

### 4.1.6 Paraburdoo Land System

Snakewood (*Acacia xiphophylla*) shrublands characterise the Paraburdoo LS, and a number of distinct Snakewood types were recognised for it, based primarily on the composition of the understorey. These shrublands frequently occurred in a mosaic with annual herblands on cracking clay and with the grasslands described for the Horseflats LS. Snakewood shrublands also dominated the section of Boolgeeda LS within the study area and occurred occasionally within the Rocklea LS.

### Px1 Acacia xiphophylla open shrubland over patches of Triodia wiseana hummock grassland

This represented the most common of the Snakewood vegetation types, occurring generally on the stony plains of the Paraburdoo LS. It consisted of a sparse to open (typically ~5-10 % cover) tall shrubland of *Acacia xiphophylla* over patches of moderately dense *Triodia wiseana* hummock grassland. Other shrubs were infrequent, however the low shrubs *Enchylaena tomentosa* and *Maireana planifolia* were commonly present. Grasses other than spinifex generally contributed a very sparse cover but included a variety of species (eg. *Aristida contorta, \*Cenchrus ciliaris, \*C. setigerus, Enneapogon caerulescens, Eragrostis xerophila, Eriachne pulchella* subsp. *dominii, Iseilema dolichotrichum, Paspalidium clementii, Sporobolus australasicus* and *Tragus australianus*). Very sparse herbs included *Evolvulus alsinoides* var. *villosicalyx, Leptopus decaisnei, Portulaca oleracea* and *Sclerolaena eriacantha*. This vegetation was generally in very good condition, with only scattered weeds at most sites. (Sites M007, M008, M024, M054, M096 & M110).

### Px2 Acacia xiphophylla open shrubland over patches of Eragrostis xerophila tussock grassland

Areas of clayey plain within the Paraburdoo LS, particularly near boundaries with the Horseflats LS, supported open shrublands of *Acacia xiphophylla* over occasional low shrubs such as *Enchylaena tomentosa* and *Neptunia dimorphantha*. The patches of moderately dense tussock grasses were typically dominated by *Eragrostis xerophila*, sometimes with significant amounts of *\*Cenchrus ciliaris* and/or *Eriachne benthamii*. Other species recorded included *Enneapogon caerulescens*, *Enteropogon acicularis*, *Sporobolus australasicus* and *Xerochloa imberbis*. Herbs were very sparse but included *Cleome viscosa*, *Heliotropium heteranthum*, *Hibiscus brachysiphonius* (Priority 3), *\*Malvastrum americanum*, *Portulaca oleracea* and *Streptoglossa liatroides*. This vegetation type was generally in very good condition, with only minor invasion by weed species. (Sites M003, M028 & M103 (mosaic)).

### Px3 Mixed chenopod very open herbland

Patches of more gravelly soil within the Snakewood shrublands supported herblands. These were dominated by chenopods, particularly *Sclerolaena eriacantha* with lesser amounts of *Atriplex codonocarpa*, and also typically supported *Streptoglossa liatroides*. Other herbaceous species recorded included the Priority 3 species *Hibiscus brachysiphonius*, *Portulaca pilosa*, *Ptilotus aervoides*, *P. murrayi* var. *murrayi* and *Sclerolaena glabra*. Occasional grasses included *Brachyachne prostrata*, *Dactyloctenium radulans*, *Tragus australianus* and *Xerochloa imberbis*, while the sedge *Fimbristylis depauperata* was also recorded. Very occasional low shrubs included *Sida* aff. *fibulifera* 'var. L'. These vegetation types were generally in very good condition, with few signs of disturbance. (Site M028B).

Pp1 *Acacia bivenosa* open shrubland over *Indigofera trita* low open shrubland over *Triodia wiseana* hummock grassland

This vegetation type dominated stony plains of the Paraburdoo LS. It consisted of a sparse to open shrubland of *Acacia bivenosa*, over a low open shrubland dominated by *Indigofera trita*, usually with *Triumfetta clementii*. Other low shrubs recorded included *Hibiscus* aff. *platychlamys* (M39.14), *Indigofera monophylla*, *Solanum horridum* and *S. lasiophyllum*. The moderately dense to dense hummock grassland of *Triodia wiseana* included scattered individuals of \**Cenchrus ciliaris*. Very sparse herbs included *Euphorbia coghlanii*, *Evolvulus alsinoides* var. *villosicalyx*, *Pterocaulon sphacelatum*, *Ptilotus exaltatus* and *Rhynchosia* cf. *minima*. This vegetation type was typically in very good condition, with only scattered weeds noted. (Sites M004, M030, M034, M044 & M094).

Pp2 Triodia angusta hummock grassland with patches of open herbland This vegetation occurred broadly on stony plains in the northern section of the survey area. It consisted of a moderately dense to dense hummock grassland of Triodia angusta, with a very sparse to sparse overstorey of low shrubs, principally Atriplex bunburyana, Indigofera trita and Sclerolaena hostilis. Very occasional grasses included \*Cenchrus ciliaris, Dactyloctenium radulans and Dichanthium sericeum subsp. humilius, while occasional sedges (Fimbristylis dichotoma) were also present. Herbs were very sparse within the general hummock grassland and included Cassytha capillaris, Corchorus tridens, Crotalaria medicaginea, Evolvulus alsinoides var. villosicalyx, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea corymbosa and Portulaca pilosa. Small patches of open herblands in the area supported greater densities of these species, together with others such as Trianthema turgidifolia and Sclerolaena eriacantha. This vegetation type was in very good condition, with occasional weeds being the main disturbance noted. (Site M082).

#### Pc1 *Eucalyptus victrix, E. camaldulensis* woodland over *Acacia coriacea,* Mesquite high shrubland over open herbland

This vegetation type was recorded within the bed of a major creekline. It consisted of a woodland of Eucalyptus victrix and E. camaldulensis over a high shrubland dominated by Acacia coriacea subsp. pendens, with significant invasion by Mesquite (\*Prosopis pallida hybrid). Other tall shrubs recorded included Acacia pyrifolia, A. trachycarpa, Ehretia saligna, Eremophila longifolia, Melaleuca glomerata and Santalum lanceolatum. Scattered low shrubs included Achyranthes aspera, Plumbago zeylanicum, Sesbania cannabina and Triumfetta clementii. Grasses such as \*Cenchrus ciliaris, \*C. setigerus, Eragrostis tenellula and Eriachne benthamii provided a very sparse to sparse cover. The sparse to open herb stratum was dominated by Alternanthera nana, with lesser amounts of Vigna lanceolata var. lanceolata. A variety of other species was recorded including Cleome viscosa, Hybanthus aurantiacus, Ipomoea muelleri, \*Malvastrum americanum, \*Melochia pyramidata, the Priority 3 species Phyllanthus aridus, Phyllanthus maderaspatensis var. angustifolius, Pterocaulon sphacelatum, Rostellularia adscendens var. clementii. Trichodesma zevlanicum and the lianes \*Cucumis melo subsp. agrestis, Ipomoea muelleri and \*Passiflora foetida. Occasional sedges included Cyperus bifax and C. vaginatus. This vegetation type was in moderate condition with the invasion by Mesquite being the major disturbance. (Site 59).

# Pc2 *Eucalyptus victrix* open woodland over *Acacia coriacea* high shrubland over *\*Cenchrus* species tussock grassland

This vegetation type occurred along minor creeklines within the Paraburdoo LS. It consisted of trees of Eucalyptus victrix, ranging in cover from scattered to an open woodland, over a high shrubland dominated by Acacia coriacea subsp. pendens. Other tall shrub species recorded included Acacia farnesiana and A. pyrifolia, while scattered low shrubs included Achyranthes aspera, Sesbania cannabina and Triumfetta *clementii.* The moderately dense to dense grassland was dominated by \*Cenchrus ciliaris and \*C. setigerus. Other grasses recorded included Dactyloctenium radulans, the Priority 3 species Eriachne tenuiculmis (only at Site M006), and spinifex (Triodia angusta or T. pungens). While the spinifex usually occurred only as scattered individuals, the cover of T. angusta at Site M043 was as high as 10%. A variety of herbs contributed a very sparse cover, including Alternanthera nana, Amaranthus pallidiflorus, \*Bidens bipinnata, Cleome viscosa, Hybanthus aurantiacus, Leptopus decaisnei, \*Malvastrum americanum, Operculina aequisepala, Phyllanthus maderaspatensis var. angustifolius and Rostellularia adscendens var. clementii. This vegetation was generally in good to moderate condition, with invasion by Buffel Grass being the major disturbance factor noted. (Sites M006, M025, M043 & M066).
#### Pc3 *Eucalyptus victrix* open woodland over *Acacia coriacea* high open shrubland over *Triodia epactia* open curly spinifex grassland and \**Cenchrus ciliaris* open tussock grassland

This vegetation type was recorded within a single small creekline. It had an open woodland of Eucalyptus victrix over a high open shrubland of Acacia coriacea subsp. pendens, with occasional other species such as Acacia bivenosa, A. pyrifolia and Eremophila longifolia. Scattered low shrubs included Achyranthes aspera, Isotropis atropurpurea, Solanum horridum, S. lasiophyllum, Triumfetta clementii and Waltheria indica. Triodia epactia contributed ~12 % cover, while the moderate cover of other grasses was dominated by \*Cenchrus ciliaris, and also included small amounts of Cymbopogon ambiguus, Digitaria brownii, D. ctenantha and Themeda triandra. A variety of herbs was recorded, including Alternanthera nana, Amaranthus pallidiflorus, Cassytha capillaris, Glycine canescens, Ipomoea muelleri, \*Malvastrum americanum, various species with affinities to Mukia maderaspatana, Polymeria ambigua and Vigna lanceolata var. lanceolata. This vegetation type was in very good condition, with minor invasion by weeds being the major disturbance. (Site M029).

# Pc4 *Eucalyptus victrix* scattered trees over *Acacia ancistrocarpa* high open shrubland over *Sorghum* open annual tussock grassland and *Triodia wiseana* very open hummock grassland

This vegetation type was recorded in a small creek at the western end of the proposed access corridor to the Highway. It consisted of scattered low trees of Eucalyptus victrix over a sparse tall shrubland dominated by Acacia ancistrocarpa. Other tall shrubs included Acacia bivenosa, A. coriacea subsp. pendens and A. pyrifolia. Scattered low shrubs included Indigofera monophylla, I. trita, Solanum diversiflorum, S. horridum, S. lasiophyllum and Triumfetta clementii. The open grassland was dominated by annual Sorghum plumosum, with lesser amounts of \*Cenchrus ciliaris, Eulalia aurea, Themeda triandra and the spinifex Triodia wiseana. Other species recorded included Bothriochloa ewartiana and *Chrysopogon fallax*. The very sparse herb stratum was dominated by Ipomoea muelleri, and also included Alternanthera nana. Cleome viscosa. Hybanthus aurantiacus, \*Malvastrum americanum, Polymeria ambigua, Trichodesma zeylanicum and Vigna lanceolata var. lanceolata. This vegetation type was in very good condition, with minor invasion by weeds. (Site M083),

# Pf1 Scattered patches of *Corymbia hamersleyana* low open woodland over patches of *Acacia trachycarpa* high shrubland over \**Cenchrus ciliaris* closed tussock grassland

This vegetation type was recorded only from a narrow floodplain adjacent to Edward Creek. It comprised scattered patches of *Corymbia hamersleyana* low trees over patches of tall shrubs of *Acacia trachycarpa*, with occasional *A. coriacea* and *A. pyrifolia*. Scattered low shrubs included *Abutilon* species, *Indigastrum parviflorum, Indigofera* species, *Solanum diversiflorum, S. lasiophyllum* and *Triumfetta clementii*. The dense grassland was dominated by *\*Cenchrus ciliaris*, which occurred with scattered *\*Cenchrus setigerus* and *Chrysopogon fallax*. The spinifex *Triodia angusta* and *T. epactia* occurred only as occasional hummocks. A variety of herbs was recorded, including *Alysicarpus rugosus*, *Amaranthus pallidiflorus*, *Cleome viscosa*, *Euphorbia* species, *\*Malvastrum americanum*, *Phyllanthus maderaspatensis* var. *angustifolius*, and the lianes *\*Cucumis melo* subsp. *agrestis*, *Ipomoea muelleri* and *Vigna lanceolata* var. *lanceolata*. This vegetation was in moderate condition, with heavy invasion by Buffel grass. (Site M005).

# 4.1.7 Macroy Land System

# Mp1 Acacia bivenosa, A. ancistrocarpa shrubland over Triodia wiseana hummock grassland

This vegetation occurred generally on the calcareous loamy soils of plains along the eastern portion of the Access Road. It consisted of a shrubland dominated by *Acacia bivenosa*, with lesser amounts of *A. ancistrocarpa*, over a moderately dense hummock grassland of *Triodia wiseana*. Other tall shrubs recorded included *Acacia pyrifolia* and *Senna glutinosa* subsp. *glutinosa*. Scattered low shrubs were dominated by *Corchorus walcottii*, and also included *Heliotropium ovalifolium*, *Ptilotus astrolasius*, *Sida clementii* and *Triumfetta clementii*. Very sparse grasses included *Cymbopogon ambiguus*, *Dichanthium sericeum* subsp. *humilius*, *Enneapogon caerulescens* and *Sporobolus australasicus*. Scattered herbs included *Boerhavia* species, *Bonamia media* var. *villosa*, *Evolvulus alsinoides* var. *villosicalyx*, *Hybanthus aurantiacus*, *Phyllanthus maderaspatensis* var. *angustifolius*, *Pterocaulon sphacelatum* and *Trachymene oleracea*. This vegetation was in very good to excellent condition, with low weed invasion. (Site M086).

## Mr1 Fimbristylis dichotoma low sedgeland

This vegetation type was recorded only on shallow soil fringing a sheet outcrop along the proposed Access Corridor. It was characterised by a very open to moderately dense, low (~10 cm tall) sedgeland dominated by Fimbristylis dichotoma, which occurred with a variety of annual grasses and herbs. The sparse grass cover was dominated by Aristida contorta, with lesser amounts of Tripogon Ioliiformis and scattered other species such as \*Cenchrus ciliaris, \*C. setigerus, Dactyloctenium radulans, Dichanthium sericeum subsp. humilius, Digitaria ctenantha and Enneapogon caerulescens. The very sparse herb cover supported a variety of species including Crotalaria medicaginea, Euphorbia australis, E. coghlanii, Gomphrena cunninghamii, Heliotropium tenuifolium, Indigofera colutea, Portulaca oleracea, P. pilosa, Ptilotus helipteroides and Streptoglossa decurrens. Very occasional low shrubs were recorded, including Indigastrum parviflorum and Triumfetta clementii. This vegetation type was in very good condition, with only occasional weeds. (Site M075).

#### Mr2 Acacia ancistrocarpa high open shrubland over Indigofera monophylla low shrubland over Triodia epactia curly spinifex grassland and open herbland

This vegetation type occurred on a small outcrop of large boulders, with pockets of calcareous soil in between. It consisted of an open tall shrubland of *Acacia ancistrocarpa*, with very occasional *A. bivenosa*, over a low shrubland of *Indigofera monophylla*. Other low shrubs recorded included *Corchorus laniflorus, Isotropis atropurpurea, Solanum horridum* and *Triumfetta clementii*. The cover of spinifex was dominated by *Triodia epactia* with small amounts of *T. wiseana*. Sparse other grasses were dominated by \**Cenchrus ciliaris*, and also included *Aristida contorta* and *Paspalidium clementii*. The open cover of herbs was dominated by *Rhynchosia* cf. *minima*, and included *Gomphrena cunninghamii*, *Hybanthus aurantiacus, Phyllanthus maderaspatensis* var. *angustifolius, Portulaca oleracea*, *P. pilosa, Streptoglossa decurrens, Trachymene oleracea* and *Trichodesma zeylanicum*. This vegetation type was in very good condition, with scattered weeds being the main disturbance noted. (Site M077).

# 4.1.8 Boolgeeda Land System

# Bx1 *Acacia xiphophylla* open shrubland over *Triodia epactia* hummock grassland

The single site located on the area of Boolgeeda LS west of the Southern OB comprised an open shrubland of *Acacia xiphophylla* over a moderately dense *Triodia epactia* hummock grassland. *Triodia wiseana* was present only as very occasional hummocks. Other species noted were relatively similar to those recorded for the more broadly distributed Snakewood shrublands over *Triodia wiseana* (see Px1). Scattered low shrubs

included Enchylaena tomentosa, Indigastrum parviflorum, Solanum horridum, S. lasiophyllum and Triumfetta clementii. Occasional grasses again included \*Cenchrus ciliaris, Enneapogon caerulescens, Eriachne pulchella subsp. dominii, Paspalidium clementii and Sporobolus australasicus. The very sparse herb stratum was not particularly diverse but included Evolvulus alsinoides var. villosicalyx, the Priority 3 Hibiscus brachysiphonius and Leptopus decaisnei. This vegetation type was in very good condition, with only scattered weeds. (Site M106).

#### 4.1.9 River Land System

#### Rc1 Scattered riverine trees and shrubs

Areas of scoured creekbed occurred within major creeklines associated with the Fortescue River system. These consisted primarily of bare gravels, with occasional trees and tall shrubs of species occurring on the creek banks (eg. *Eucalyptus camaldulensis* and *Melaleuca glomerata*). Herbs and grasses were sometimes abundant on islands within the creekbeds.

### Rc2 Cadjeput *Melaleuca argentea*, River Redgum *Eucalyptus camaldulensis* open forest over patches of *Acacia coriacea* high shrubland over \**Cenchrus* species tussock grassland

Only one location supporting Cadjeputs was observed during the field survey (although it should be noted that the entire river system was not traversed). Site M126 was located on a permanent pool which supported an open forest (12-15 m tall) of *Melaleuca argentea* and *Eucalyptus camaldulensis*. Patches of tall shrubs were dominated by *Acacia coriacea* subsp. *pendens*, and also included scattered *Acacia trachycarpa*, *Erythrina vespertilio* and a single Mesquite (*\*Prosopis pallida* hybrid). *\*Cenchrus ciliaris* and *\*C. setigerus* dominated the moderately dense cover of grasses, while small patches of sedges included *Bulbostylis barbata*, *Cyperus bifax*, *C. squarrosus* and *C. vaginatus*. A variety of herbs was recorded, including *Alternanthera nodiflora*, *Ipomoea muelleri*, *\*Malvastrum americanum*, *Marsilea hirsuta*, *\*Melochia pyramidata* and *Rostellularia adscendens* var. *clementii*. This vegetation was in good condition, with invasion by introduced grasses being the only obvious disturbance. (Site M126).

#### Rc3 *Eucalyptus camaldulensis* woodland over patches of *Melaleuca glomerata* high shrubland over patches of *Cyperus vaginatus* sedgeland

This riverine vegetation was recorded only within major tributaries of the Fortescue River system. It consisted of a woodland of Eucalyptus camaldulensis, with occasional individuals of E. victrix, over patches of tall shrubs dominated by Melaleuca glomerata. Other tall shrubs recorded included Acacia coriacea subsp. pendens and very occasional Mesquite \*Prosopis pallida hybrid. The sparse cover of low shrubs included Achyranthes aspera and Sesbania cannabina. Patches of sedges were dominated by Cyperus vaginatus. Other species noted included Cyperus squarrosus and Typha domingensis. Sparse grasses were typically dominated by \*Cenchrus ciliaris. The sparse herb stratum contained a variety of species including Amaranthus pallidiflorus, \*Argemone ochroleuca (only at Site M124), Basilicum polystachyon, Datura leichhardtii, \*Melochia pyramidata, Mimulus gracilis, Rostellularia adscendens var. clementii, and the lianes \*Cucumis melo subsp. agrestis, Operculina aequisepala and \*Passiflora foetida. This vegetation type was in good condition, with the major disturbance being invasion by weeds. (Sites M122 & M124).

# Rc4 *Eucalyptus victrix, E. camaldulensis* woodland over patches of *Melaleuca glomerata* high shrubland over \**Cenchrus* species tussock grassland

This vegetation type occurred in tributaries of the Fortescue River System

and in Eramurra Creek. It consisted of a woodland of *Eucalvptus victrix* with lesser amounts of *E. camaldulensis* over patches of tall shrubs dominated by Melaleuca glomerata, frequently with small amounts of Acacia ampliceps. Other tall shrub species included Acacia coriacea subsp. pendens and scattered Mesquite \*Prosopis pallida hybrid, recorded from Site M101 only. Low shrubs such as Sesbania cannabina provided a very sparse cover. The moderately dense cover of grasses was dominated by \*Cenchrus ciliaris and \*C. setigerus, with occasional individuals of other species such as Dactyloctenium radulans and \*Setaria verticillata. Scattered patches of sedges included the species Cyperus bifax, C. bulbosus, C. squarrosus, C. vaginatus and Schoenoplectus litoralis. Herbs provided a very sparse to sparse cover and included Amaranthus pallidiflorus, Corchorus tridens, Ipomoea muelleri, Nicotiana rosulata subsp. rosulata, Phyllanthus maderaspatensis var. angustifolius, Pluchea rubelliflora and Stemodia grossa. This vegetation was considered to be in moderate condition, with the heavy infestations of introduced grasses being the major disturbance. (Sites M084 & M101).

# Rf1 *Eucalyptus victrix* open woodland over \**Cenchrus* species tussock grassland

This vegetation type occurred on floodplains associated with the Fortescue River system. It consisted of scattered tall trees of *Eucalyptus victrix* with occasional low trees of *Erythrina vespertilio* over a moderately dense grassland dominated by \**Cenchrus ciliaris* and \**C. setigerus*. Very occasional tall shrubs included *Melaleuca glomerata*, which had been killed by a fire. A variety of herbs contributed a very sparse cover, including species such as *Alternanthera nodiflora*, *Amaranthus pallidiflorus*, *Ammannia baccifera*, Mexican poppy \**Argemone ochroleuca*, *Basilicum polystachyon*, *Datura leichhardtii*, *Glinus lotoides*, *Rostellularia adscendens* var. *clementii*, *Stemodia grossa*, and the lianes *Ipomoea muelleri*, *Operculina aequisepala* and \**Passiflora foetida*. This vegetation was in moderate condition, with heavy invasion by introduced grasses representing the major disturbance. (Site M099).

#### Rf2 Mesquite \*Prosopis pallida hybrid high shrubland to open scrub Moderately dense, tall shrublands (>2m in height) of the Declared Weed Mesquite (a hybrid form of \*Prosopis pallida) occurred in the south of the survey area on dense clayey plains associated with the Fortescue River system. These shrublands tended to occur over patches of Birdwood grass (\*Cenchrus setigerus) and Buffel grass (\*C. ciliaris). The few other species present included occasional low shrubs (eg. Sida aff. fibulifera 'var. L') and herbs such as Euphorbia tannensis subsp. eremophila, Ptilotus aervoides, Salsola tragus and Trianthema triquetra. These shrublands were completely degraded, being heavily infested by Mesquite. (Site M108).

#### 4.1.10 Yamerina Land System

Yp1 Mosaic of patches of *Triodia angusta* hummock grassland with open herblands and Mesquite scattered tall shrubs The Yamerina LS occurred as broad plains close to the coast, west of the Northern OB. This LS appears to support extremely variable vegetation, dependent on small-scale variations in soil type and topography, but was only surveyed in a very cursory manner due to a lack of time. The primary vegetation identified consisted of a mosaic of moderately dense hummock grasslands of *Triodia angusta* with scattered patches of chenopod herbs, particularly *Sclerolaena eriacantha*. Scattered shrubs of Mesquite occurred throughout the plains. This vegetation was in good to moderate condition.

# Yc1 Avicennia marina high shrubland over patches of Schoenoplectus litoralis open sedgeland

This vegetation was recorded within the tidal reaches of Edward Creek. It

consisted of a high shrubland dominated by the mangrove Avicennia marina, with occasional individuals of Melaleuca glomerata, over patches of the sedge Schoenoplectus litoralis. Scattered Bulrushes Typha domingensis were also recorded. Occasional low shrubs included Halosarcia halocnemoides subsp. tenuis and Samolus repens. The grass Sporobolus virginicus provided a sparse cover on the banks, and occasional tall shrubs of Acacia ampliceps were also noted in this area. The alga Chara sp. was recorded from pools. The only herb species recorded was Flaveria australasica. This vegetation was in very good condition. (Site M113).

## 4.1.11 TWINSPAN Analysis

The results of the TWINSPAN divisive analysis are presented in Figure 4.1. As previously mentioned (Section 3.1.2), primarily perennial species were used in the analysis (see Appendix C).

The first division within the analysis separated five sites in saline habitats from the remainder of the quadrats assessed, with the samphire *Halosarcia halocnemoides* subsp. *tenuis* being the indicator species. The sites included samphire low open shrublands (Ls2), a saline low shrubland (Ld5), a tidal creek (Yc1) and a near-coastal creek in the Rocklea LS (ROc5).

The second division separated a group of 14 sites based on the following indicator species: Acacia coriacea, \*Cenchrus ciliaris, \*C. setigerus, Eucalyptus camaldulensis, E. victrix, Ipomoea muelleri, \*Passiflora foetida, Rostellularia adscendens subsp. clementii and Sesbania cannabina. These sites were principally located along major creekline habitats (Rc2-4, Rf1-2, Pc1-2) or less well-developed drainages (Nc4, ROc5), however one site was located in a *Triodia angusta* hummock grassland (Lp1) and appears to have clustered out with the creekline sites due to the presence of this spinifex species.

The remainder of the sites within the second division were dominated by hummock grasslands which were characterised by the following indicator species: *Bonamia media* var. *villosa, Evolvulus alsinoides* var. *villosicalyx, Rhynchosia* cf. *minima, Solanum lasiophyllum, Triodia wiseana* and *Triumfetta clementii.* These sites were separated at the third level of divisions into a group of sites occurring on heavy clay soils and the remainder of sites which were generally located on more loamy substrates. The former group included tussock grasslands, herblands, *Sida* aff. *fibulifera* low shrublands and drainage vegetation of the Horseflats LS (Hpg1-3, Hps1, Hc1), and a number of Snakewood *Acacia xiphophylla* vegetation types of the Paraburdoo LS (Px1-3).

The remaining sites were separated at the fourth division into a group of coastal dune (Ld1-4), rockpile (Nr1-3, ROr1-3) and drainage (Pc2-3, Pf1, ROc2-4) vegetation sites, together with three Acacia xiphophylla dominated sites (Bx1, Px1, Rox1). The indicator species for these sites were Acacia coriacea, Achyranthes aspera, Capparis spinosa var. nummularia, \*Cenchrus ciliaris, Enchylaena tomentosa, Operculina aequisepala and Tinospora smilacina. The remaining sites principally comprised hummock grasslands and shrublands in drainage habitats of the Newman and Rocklea LS. Indicator species for these sites were Acacia ancistrocarpa, Bonamia media var. villosa, Corchorus laniflorus, Evolvulus alsinoides var. villosicalyx, Indigofera monophylla, Senna glutinosa subsp. *glutinosa, Tephrosia supina* and *Triodia wiseana*. This latter group of sites was separated into two groups at the fifth level of divisions. One group was dominated by flowline (Nc1-3, ROc1, Pc4) and rockpile (Nr2, Nr4, Mr2) sites, principally of the Newman and Rocklea LS. The remaining sites were dominated by Triodia wiseana hummock grasslands which occurred on the low hills of the Newman and Rocklea LS (Nh1-5, ROh1a-2b) and on the stony plains of the Paraburdoo LS (Pp1).



Figure 4.1: TWINSPAN dendrogram showing relationships between detailed flora survey sites (based on cover of primarily perennial species).

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#### 4.1.12 Conservation Significance of Vegetation of the Study Area

A statement of limitations regarding the following assessments is given in Section 2.2.

4.1.12.1 Assessment of the vegetation at the level of Beard's (1975) mapping of the vegetation of the Pilbara

The vegetation types mapped as occurring in the project area by Beard (1975) are:

- *Triodia pungens* steppes (hummock grasslands). This unit was mostly shown as occurring in the Cape Preston part of the project area;
- Shrub steppes of Acacia pyrifolia over Triodia pungens;
- Mosaics of grass savanna with spinifex Triodia pungens; and
- Mangroves and tidal mudflats. Mapped as occurring along coastal portions of Cape Preston.

Beard's map shows all of these vegetation units as being relatively widespread and of fairly extensive occurrence. However, within these units in the project area there is substantial variation and it is not possible from Beard's descriptions to relate this to the variation that must occur within his units over their range. What can be said is that:

- the substantial variation in these units in the project area indicates that there
  is likely to be a very wide range of variation in the vegetation of these units
  over their range;
- the variation within these units in the project area is likely to only represent a part of the overall variation in them;
- the variation in Beard's units is likely to be unevenly distributed, being affected over their ranges by changes in underlying geology, soils and climate.

From this discussion, it can be said that the vegetation has significant conservation value and that this value is likely to be similar to that of other similar sized areas of the same units. However, it is not possible, at this level of assessment, to exclude the possibility that some values (ie. some variation within Beard's units) may be restricted to the project area.

### 4.1.12.2 Assessment of the Vegetation at the Land System Level

The extent of each Land System occurring in the project area in the surrounding region is given in Table 2.1. As Land Systems are strongly related to geology, the following patterns also hold true for underlying geology (see Kriewaldt *et al*, 1964; Williams *et al.*, 1964). Of the nine Land Systems occurring within the survey area, the Littoral, Horseflats, Rocklea and Boolgeeda land systems are fairly widespread. The vegetation types occurring on these land systems in the project area are therefore also likely to be widely distributed in the region, although it is possible that some may not be. Thus while the vegetation of the areas of these land systems in the project area has conservation value, this is not likely to be very high, although the possibility that some of the variation is restricted to the project area cannot be excluded.

The three ore bodies in the project area form the near-coastal part of the Newman Land System, which typically occurs further inland, where it has an extensive distribution. The vegetation of the areas of this land system in the project area are therefore of particular value as they occur at the limit of the range of the system. It

is possible that some of the vegetation types occurring on the ore bodies may have a limited distribution, since coastal influences may result in a differing range of species from the areas of the Newman LS that occur further inland. In the area around the project area, the ranges of low hills are generally examples of the Rocklea and Ruth land systems rather than the Newman land system (note that the Ruth LS does not occur within the project area).

The River Land System is widely distributed in the region, but is not very abundant as it covers only a small proportion of the land surface, occurring as strips along rivers. The areas of this land system in the project area (as for the land system as a whole) tend to be degraded by grazing and subsequent weed invasion. The degree of degradation is very variable, with more stony areas resisting invasion by weeds and the more loamy areas being more degraded and often severely infested with \**Cenchrus ciliaris* (Buffel grass). The parts of this land system in the project area that are in good condition have significant conservation value for vegetation due to the degree of degradation of the land system as a whole and the limited area of its occurrence.

The Yamerina Land System occurs as a single broad swathe in the project area, associated with the Fortescue River delta. There are extensive areas of this land system to the south-west of the project area and while the portion of it in the project area has conservation value, these values are probably well represented outside the project area. In addition, this Land System is unlikely to be directly impacted by the proposed development. The Paraburdoo and Macroy Land Systems have the most limited representation (in terms of areal extent) of those recorded, however they are still relatively broadly distributed in the region.

Four of the nine land systems occurring within the project area (Littoral, Horseflats, Rocklea and Boolgeeda) were also present within the area of the proposed Ausi Iron Project located east of Karratha (Dames & Moore, 1995). The vegetation types present within these land systems in the two project areas are reasonably similar structurally, however the floristic makeup of stands from the two areas is likely to vary somewhat.

# 4.1.12.3 Assessment of the vegetation at the plant community / vegetation association level

The vegetation units described for the project area in the vegetation survey carried out for this report (see Section 4.1 above) range from the plant community to the vegetation association level. The extent of each of these vegetation units within the survey area is given in Table 4.1. As noted in Section 2.2, there is no mapping of the region including the project area at this level of vegetation description and there is no systematic listing of plant communities or vegetation associations for the Fortescue Botanical District giving areas or distributions. It is therefore not possible to give an objective assessment of the conservation value of each of the vegetation units described for the project area based on the overall distribution of that unit, the number of occurrences of it and its overall range.

However, based on field experience it is possible to give an opinion of the conservation significance of the units at the plant community/vegetation association level, while noting that this is necessarily subjective. Table 4.1 provides such an opinion for the vegetation units recorded for the project area, as well as comments on them. Note that the mangals (unit Lm) are discussed separately in Section 6).

Veretetion	Concernation	Factures	Aree menned
Type	Significance	reatures	(ha)
Lb & Ld1	Low	Beaches are widespread along the coast. Flora common and widespread.	37.10 & 22.17
Lm	See Section 6.0.	See Section 6.0.	42.74
Ls1 &	Moderate	Saline flats are abundant along the coast.	344.72 &
Ls2		Communities likely to be relatively similar in floristic composition. Susceptible to physical disturbance such as vehicle trafficking.	333.01
Ld2 & Ld3	High	Coastal dune habitat relatively widespread but has a limited area. Similar habitat and vegetation occurs to the east at Cape Lambert (M. Maier, pers. obs.) and Karratha (Dames & Moore, 1995). Dunes susceptible to invasion by Buffel grass and erosion following physical disturbance.	348.51 & 39.30
Ld4	High	High species richness. Habitat likely to be poorly distributed along coast.	48.79
Ld5	Moderate	Flora quite widespread and common. Habitat restricted to sandy swales. Similar vegetation likely to occur in equivalent habitat elsewhere along coast.	8.99
Lp1	Moderate	Flora quite widespread and common. Sandy plain habitat likely to be poorly distributed along coast.	97.39
Hpg1, Hpg2, Hpg3, Hps1 & Hc1	Moderate to High	Red cracking clay habitat quite widespread on the Abydos Plain, and typical flora also relatively widespread and common. Vegetation in good condition within the study area, and supports some Priority flora ( <i>Hibiscus brachysiphonius</i> ). Cracking clays susceptible to weed invasion and erosion following physical disturbance.	Hpg1-3 & Hps1 mapped as a mosaic: combined area 1834.70 Hc1 = 20.06
Nh1, Nh2, Nh3, Nh4 & Nh5	Moderate	Flora widespread and common. Hummock grasslands dominate the three orebodies, however these vegetation types are possibly restricted in the region, given their occurrence on the most coastal part of the Newman LS.	Nh1-5 mapped as a mosaic: combined area 3670.32
Nc1, Nc2, Nc3 & Nc4	Moderate to High	Minor creeklines relatively species rich and have a small representation in the landscape. Where influenced by underlying geology, vegetation types of these creeklines are possibly restricted in the region, given their occurrence on the most coastal part of the Newman LS.	Nc1-4 mapped as a mosaic: combined area 536.27
Nr1, Nr2, Nr3 & Nr4	Moderate to High	Rocky outcrops relatively species rich and support restricted species (eg. lianes and rock figs). Very variable in composition. Outcrops make up a very small proportion of the landscape. Outcrop vegetation types possibly restricted in the region, given their occurrence on the most coastal part of the Newman LS.	Nr1-4 mapped as a mosaic: combined area 4.39
ROh1a, ROh1b, ROh2a & ROh2b	Low to Moderate	Flora largely common and widespread. Hummock grasslands likely to be broadly distributed in the coastal areas, given the extensive occurrence of the Rocklea LS in the region.	ROh1a-b mapped as a mosaic: combined area 2504.84; ROh2a-b mapped as a mosaic: combined area 2029.34
ROp1	Low to Moderate	Vegetation type associated with calcretisation caused by seepage; occurs elsewhere along the coast in similar habitat (eg. where rocky slopes abut beaches on the Burrup; M. Trudgen, pers. obs.). Some areas support restricted species.	213.67
ROx1	Low to Moderate	Flora relatively common and widespread. Limited distribution within the general Rocklea LS, and may therefore have a minor representation in the region. Subject to weed invasion by Buffel grass.	19.23

Table 4.1:	Conservation sig	unificance of ver	netation types	s within the surve	v area.
	Conservation sig	ginnicance of veg	getation types		y area.

# Table 4.1: continued.

Vegetation	Conservation Significance	Features	Area mapped
ROc1, ROc2, ROc3, ROc4 & ROc5	Moderate	Minor creeklines relatively species rich and have a small representation in the landscape. Vegetation types unlikely to be restricted in the region, given the broad distribution of the Rocklea LS. Some areas support Priority flora ( <i>Abutilon trudgenii</i> ms.)	20.85, 365.09, 14.79, 0.64 & 3.52
ROr1, ROr2 & ROr3	Moderate	Rocky outcrops very variable in composition, relatively species rich and support habitat restricted species (eg. lianes and rock figs). Make up a very small proportion of the landscape. Vegetation types unlikely to be restricted in the region, given the extensive occurrence of the Rocklea LS.	ROr1-3 mapped as a mosaic: combined area 20.95
Px1, Px2, Px3 & Bx1	Moderate	Snakewood shrublands variable in composition, but typical flora are common and widespread, and suitable habitat is broadly distributed in the region within the Paraburdoo and Boolgeeda LS. Vegetation types therefore unlikely to be restricted. Habitat susceptible to weed invasion (Buffel grass; also potentially Mesquite near Fortescue River). Some areas support Priority flora ( <i>Hibiscus brachysiphonius</i> ).	2543.41, 1667.37, Px3 not mapped separately: occurred within Px1-2, & 197.49
Pp1 & Pp2	Moderate	Flora generally common and widespread. Suitable habitat likely to exist elsewhere along coast within Paraburdoo LS, thus vegetation types unlikely to be restricted in the region. Vegetation typically in very good condition with little weed invasion.	415.14 & 502.84
Pc1, Pc2, Pc3, Pc4 & Pf1	Moderate to High	Creeklines have high species richness and support various habitat-specific flora, including Priority flora in some areas ( <i>Eriachne tenuiculmis, Phyllanthus aridus</i> ). Make up small proportion of landscape. Vegetation very variable, but unlikely to be restricted in region given extensive occurrence of Paraburdoo LS. Susceptible to weed invasion (Buffel grass and Mesquite).	Pc1-3 not mapped separately: combined area 171.94, 3.09 & 1.47
Mp1	Moderate	Flora relatively common and widespread. Macroy LS relatively widely distributed in region, therefore vegetation type unlikely to be restricted. Vegetation in very good to excellent condition with little weed invasion.	504.10
Mr1 & Mr2	Moderate to High	Rocky outcrops very variable in composition, relatively species rich and support very different flora from surrounding hummock grasslands. Outcrops make up a very small proportion of the landscape in the Macroy LS, and some vegetation types may be restricted in the region.	<0.05 & <0.05
Rc1, Rc2, Rc3 & Rc4	High	Riverine vegetation has a high species richness and supports a range of habitat-specific flora. Flora relatively widespread and typical of such habitats. River LS widely distributed in region and vegetation types are therefore unlikely to be restricted. However river systems make up a small proportion of the land surface, and riverine forest with Cadjeputs is likely to have a particularly limited distribution in the region. Vegetation susceptible to weed invasion and changes in water levels. Occurs in the Fortescue River and its tributaries, which represent the major drainage system for the area. Disturbance to vegetation or habitat may therefore affect areas dependent on this system (both upstream and downstream).	85.71, 0.14, 112.03 & 182.54
Rf1	Moderate	Flora largely common and widespread. Vegetation would occur elsewhere in region on floodplains of the River LS. Floodplains are an important component of drainage systems. Susceptible to weed invasion.	1234.54
I Rf2	None / Verv Low	Degraded; intested with Mesquite.	318.64

Table 4.1: continued.

Vegetation	Conservation	Features	Area mapped
Type	Significance		(ha)
Yp1 & Yc1	Moderate	Very limited sampling of these areas indicated extremely variable vegetation, reflecting minor differences in water relationships and depositional changes on a very fine scale. Yamerina LS broadly distributed to west, and broad vegetation types therefore unlikely to be restricted, however some plant assemblages likely to be uncommon.	225.62 & 6.75

# 4.2 Terrestrial Flora

# 4.2.1 General

A total of 426 taxa of vascular flora was recorded from the survey area (see Appendix D). These taxa belong to 190 genera from 64 families. Six of the species were mangroves (see Section 6.0). Nonvascular flora (eg. algae, mosses and liverworts) and fungi were not specifically sampled. One green alga, *Chara* sp., was recorded from riverine pools, while blue-green algal crusts were noted on tidal mudflats. Two fungi were recorded; the gasteromycete *Podaxis pistillaris* and an undetermined black fungi.

The number of species recorded is high and reflects a number of factors:

- the large size of the project area;
- the presence of a wide variety of habitats and therefore vegetation types;
- the opportune timing of the survey following substantial rainfall in the region, such that ephemeral species were abundant, with approximately half of the species recorded being annual or weakly perennial flora.

The families and genera recorded with the greatest number of taxa are shown in Table 4.2. These are typical of the dominant plant groups of the western Pilbara. Twenty six families and 114 genera were represented by only one taxon. The most frequently recorded species were Buffel grass \**Cenchrus ciliaris* (91 records), *Triumfetta clementii* (82 records), *Triodia wiseana* (78 records), *Rhynchosia* cf. *minima* (75 records), *Trichodesma zeylanicum* (72 records), *Evolvulus alsinoides* var. *villosicalyx* (66 records), *Acacia bivenosa* (65 records) and *Solanum lasiophyllum* (62 records). Seventy two species were recorded from only a single collection.

# Table 4.2: Most species rich families and genera within the project area.

Family	No. of Taxa
Poaceae (grasses)	65
Malvaceae (hibiscus etc)	43
Papilionaceae (peas)	39
Chenopodiaceae (samphires, saltbush, bindii etc) & Amaranthaceae	26 taxa each
(mulla-mullas etc)	
Mimosaceae (wattles)	20
Asteraceae (daisies)	16
Convolvulaceae (morning glory etc)	15
Euphorbiaceae (spurges etc)	14
Caesalpiniaceae (cassias), Cyperaceae (sedges) & Goodeniaceae	12 taxa each
(fan-flowers)	
Genus	No. of Taxa
Acacia (wattles)	18
Sida (Hibiscus family)	16
Ptilotus (mulla-mullas)	15
Abutilon (Hibiscus family)	14
Senna (cassias)	13

Species richness per quadrat ranged between 9 and 70 taxa, with an average of 35 taxa. Detailed flora survey sites with the lowest species richness included M113 (tidal creek; 9 taxa), M010 & M064 (hummock grasslands on hillslopes; 10 & 13 taxa), M065 (hummock grassland on Cape Preston; 11 taxa), M108 (Mesquite shrubland; 11 taxa) and M074 (samphire; 13 taxa). Sites with the highest species richness values were predominantly flowlines (Sites M019, M045, M049 & M055; 70, 65, 63 & 60 taxa), but also included diverse sandbank vegetation on Cape Preston (M069; 62 taxa) and a burnt area of Snakewood (M007; 60 taxa).

# 4.2.2 Flora of Conservation Significance

# **Declared Rare and Priority Flora**

While all native flora are protected under the *Wildlife Conservation* Act 1950-1979, a number of plant species are assigned an additional level of conservation significance based on the limited number of known populations and the perceived threats to these locations (Table 4.3). Species of the highest conservation significance are designated Declared Rare Flora, either extant or presumed extinct. Species that appear to be rare or threatened, but for which there is insufficient information to properly evaluate their conservation significance, are assigned to one of four Priority flora categories. In addition, some flora species are listed as triggers for Federal referral under the *Environment Protection and Biodiversity Conservation* Act 1999.

# Table 4.3:Categories of conservation significance for flora species (Atkins,<br/>1999).

**Declared Rare Flora - Extant Taxa.** 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.

**Declared Rare Flora - Presumed Extinct.** Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently.

**Priority 1 - Poorly Known Taxa.** Taxa which are known from one or a few (generally <5) populations which are under threat.

**Priority 2 - Poorly Known Taxa.** Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under threat.

**Priority 3 - Poorly Known Taxa.** Taxa which are known from several populations, at least some of which are not believed to be under threat.

**Priority 4 - Rare Taxa.** Taxa which are considered to have been adequately surveyed and which whilst being rare, are not currently threatened by any identifiable factors.

A search of CALM's *Threatened (Declared Rare) Flora* database, *Priority Species List,* and the *Western Australian Herbarium Specimen* database was commissioned for the rectangular area bounded by 20° 45' – 21° 20' and 116° 00' – 116° 15'. No records were obtained from the two databases, which is likely to be a function of the paucity of botanical collection for the region. The *Priority Species List* described eight Priority flora as occurring in the area.

- the Priority 1 Gunniopsis sp. Fortescue (M Trudgen 11019);
- the Priority 2 Ischaemum albovillosum; and
- the Priority 3 Abutilon trudgenii ms., Acacia glaucocaesia, Hibiscus brachysiphonius, Sida sp. Wittenoom (WR Barker 1962), Tephrosia sp. Cathedral Gorge (FH Mollemans 2420) and Themeda sp. Hamersley Station (ME Trudgen 11431).

No Declared Rare Flora were located during the field survey and none would be expected to occur in the habitats present in the project area. Of the Priority

species found by the search of the *Priority Species List, Abutilon trudgenii* ms., *Hibiscus brachysiphonius* and *Sida* sp. Wittenoom were recorded during the field survey. Three additional Priority species, *Eriachne tenuiculmis, Goodenia omearana* ms. and *Phyllanthus aridus*, were collected. Each of the Priority species recorded is discussed below, while a summary of the distribution of each species is given in Table 4.4. Rare Flora Report Forms are presented in Appendix E. None of the species recorded are listed under the Commonwealth *EPBC* Act 1999.

# • Goodenia omearana ms. Priority 1

This small herb was collected only once within the survey area, from tussock grassland on clay soils at Site M027. This species is more typical of calcareous soils and is known from relatively few populations in the Weeli Wolli Springs – Marillana Creek area in the eastern Pilbara.

# • Abutilon trudgenii ms. Priority 3

This low shrub was recorded from six locations within the survey area. The typical habitat comprised minor flowlines through stony hills of the Rocklea or Newman LS. Specimens of *A. trudgenii* ms. are lodged with the WA Herbarium from only four areas west of Newman, including Cane River, Hillside Station, Goldsworthy and Tom Price, however according to the *Priority Species List* this species is known from other locations including Warralong, Woodstock, Point Sampson and Pannawonica (Atkins, 1999). This species is poorly collected, rather than rare, with 23 records by Trudgen & Casson (1998).

# • Eriachne tenuiculmis Priority 3

Scattered clumps of this grass species were recorded from two locations within creekline habitat in the Paraburdoo LS. This species is poorly collected rather than uncommon. *E. tenuiculmis* is known from several locations in the Hamersley Range including Serpentine Creek, Yandi and Millstream, all within large creeklines. It has been collected in a number of creeks in the Newman area (Biota, in prep.), is common in creeklines on the Burrup Peninsula (M. Trudgen, pers. obs.), and was recorded 69 times (from 1200 sites) by Trudgen & Casson (1998).

# • Hibiscus brachysiphonius Priority 3

This low spreading herb occurred as scattered individuals on clay soils of clayey or stony plains at five locations. Most of these sites occurred within the Horseflats or Paraburdoo LS, with a single collection from the Boolgeeda LS. Specimens of *H. brachysiphonius* are lodged with the WA Herbarium from several Pilbara locations including Minilya River, Tom Price, Karratha and Millstream, and this species appears largely restricted to cracking clays.

# Phyllanthus aridus Priority 3

This small perennial shrub occurred as scattered individuals at a single site within creekline habitat in the Paraburdoo LS. While known from several Kimberley populations, this species had apparently not been recorded from the Fortescue District prior to the survey of the West Angelas rail corridors (Trudgen & Casson, 1998). Twelve populations of *P. aridus* were recorded from the southern slopes of the Chichester Range during the West Angelas survey, and the species was described as being not uncommon along creeks in the area (Trudgen & Casson, 1998).

# • Sida sp. Wittenoom (WR Barker 1962) Priority 3

This perennial shrub was recorded from a single location within a creek in the project area. This species is known from several Pilbara locations including Warralong Station, Nickol Bay, near Onslow, Roy Hill, east of Pannawonica and Fortescue Roadhouse (Atkins, 1999).

# Flora of Interest

In addition to the DRF and Priority Flora categories, some "Flora of Interest" have

also been identified. These are described as flora species that are not listed as DRF or Priority but which are poorly known and/or could not be identified to species level for reasons other than poor condition of specimens. A detailed description of these flora is presented below.

#### Apparently new species

#### • Tephrosia aff. clementii (1) (M1/M2)

*Tephrosia* aff. *clementii* (1) (M1/M2) was recorded once in the current survey area (adjacent to Site M001) on cracking clay soil. It was recognised as being of possible conservation significance and was actively looked for when working in appropriate habitat later in the survey. This taxon was not recorded during surveys of several potential rail routes through the Chichester Ranges, where there are extensive areas of cracking clay soils (Trudgen & Casson, 1998). This suggests that the taxon may be more restricted in its distribution than other taxa in the *Tephrosia clementii* group of species. *Tephrosia* aff. *clementii* (1) (M1/M2) has palmate leaves with leaflets broader than other taxa in the group and also has pinkish (rather than orange) flowers. While the overall *Tephrosia clementii* group of species needs further study and collecting, this taxon should on current knowledge be considered poorly collected and uncommon.

## • Tephrosia aff. clementii (2) (M35-14)

*Tephrosia* aff. *clementii* (2) (M35-14) was only seen at the northern part of the mainland part of the study area just above high tide mark (but probably inside areas subject to storm surges). It can be distinguished both on leaf and calyx characters, particularly the long, erect, dense indumentum on the lower side of the leaflets. Given that little work was done in the habitat in which it was found, this taxon may be more common in the survey area and adjoining areas than the single collection would indicate. On current knowledge, *Tephrosia* aff. *clementii* (2) (M35-14) should be regarded as poorly collected and uncommon. The only other collections known are from the Burrup Peninsula, where only two collections have been made despite intensive survey effort.

# • Tephrosia aff. supina (M.E. Trudgen 12,357)

*Tephrosia* aff. *supina* (M.E. Trudgen 12,357) has been regarded as poorly collected prior to the current survey with only three or four collections in the Western Australian Herbarium. Trudgen & Casson (1998) assessed it as "probably poorly collected rather than rare, as the specimens are from fairly widely separated localities". It was common in appropriate habitat in the current survey area, being recorded from 22 locations. Subsequent field work for another project, on the Burrup Peninsula (some 100 kilometres north-east of the current survey area along the coast), showed that this taxon is very common at that locality, including in areas zoned for conservation. *Tephrosia* aff. *supina* (M.E. Trudgen 12,357) should now be considered to be common on the coast, less common inland, and not of particular concern for conservation.

## • Hibiscus aff. platychlamys (M9-15)

*Hibiscus* aff. *platychlamys* (M9-15) was collected at 13 of the sites recorded during the survey. It belongs to a group of species that is badly in need of taxonomic review and collecting, but it would be premature to consider it rare. However, it does not match any of the forms (species) recognised in the group by Trudgen & Casson (1998) and on current knowledge should be considered restricted in distribution and moderately poorly collected. Although it is locally common (in the survey area), it may not be common outside it.

#### • Hibiscus aff. platychlamys (M35-11)

*Hibiscus* aff. *platychlamys* (M35-11) was collected at only one of the sites recorded and was not common in the survey area. It does not match any of the forms (species) recognised in the group by Trudgen & Casson (1998), however as for the previous taxon, it would be premature to consider it rare. On current knowledge, it should be considered very poorly collected and possibly uncommon and/or restricted in distribution.

#### • Other Malvaceae

Several taxa with affinities to *Sida fibulifera* were collected from the project area, while a number of *Abutilon* taxa also appear to represent undescribed taxa. The genus *Sida* is under revision, and many unnamed species have been identified (M. Trudgen, pers. comm.). Other genera in the Malvaceae family similarly contain numerous undescribed species. Given the limited amount of information available for this family and the paucity of collecting in the area, it is not possible to determine the conservation significance of these species. However, most species are likely to be poorly collected rather than restricted or rare.

#### • Urochloa sp. "glabrous apices"

A single specimen of the grass *Urochloa* recorded from creekline habitat at Site M059 appears to represent an undescribed species. This specimen could not be matched to any named species held at the WA Herbarium, but closely resembles two unnamed specimens from the Dampier Archipelago (PERTH 05232201) and Hamersley Range (PERTH 5465559). These specimens share features which are not present in the named species of *Urochloa*, the most obvious of which are that the lower portions of the florets are covered with a close indumentum of silvery hairs, while the apices of the lemmas are glabrous.

#### Range extensions

#### • Senna sp. Karajini (ME Trudgen 10,392)

This poorly collected species was found at a single site (M48). This specimen extends the range of the species from the central Hamersley Range (Karijini National Park and adjoining areas) to near the coast. While poorly collected, this species is not rare. It is apparently confined to cracking clay soils and is fairly common in the West Angelas and Hamersley Station areas (Trudgen & Casson, 1998).

#### Other poorly collected species

#### Boerhavia paludosa

This species was recorded from four sites within the project area, all on clayey plains. While poorly collected in the Pilbara region, *B. paludosa* is not uncommon there. There are also a number of collections from the Kimberleys.

#### • Mukia sp. D (Flora of Australia)

While currently poorly collected, this taxon appears to be relatively common in the Fortescue Botanical District, with numerous locations known from the Hamersley and Chichester Ranges (Trudgen & Casson, 1998). It was recorded from two locations within the project area.

## Table 4.4: Distribution of significant flora within the survey area.

Species	No. of Flora Survey Sites	Additional Opportunistic		
		Collections		
Priority 1 Flora				
Goodenia omearana ms.	1 (M027)	-		
Priority 3 Flora				
Abutilon trudgenii ms.	6 (M009, 19, 26, 32, 49, 79)	-		
Eriachne tenuiculmis	1 (M006)	1 (near M025)		
Hibiscus brachysiphonius	5 (M003, 22, 24, 28, 106)	-		
Phyllanthus aridus	1 (M059)	-		
Sida sp. Wittenoom (WR Barker 1962)	1 (M083)	-		
Flora of Interest				
Apparently new species				
Tephrosia aff. clementii (type 1) (M1/M2)	-	1 (near M001)		
Tephrosia aff. clementii (type 2) (M35-14)	1 (M035)	-		
Tephrosia aff. supina (ME Trudgen 12,357)	20 (M019, 20, 43, 45, 46, 49,	2 (near M039,		
	51, 55, 57, 62, 69, 71, 75, 77,	SW of M052)		
Hibicous off platychlamys (MQ 15)	83, 90, 91, 111, 114, 120) 13 (M000, 11, 15, 16, 17, 10			
Tibiscus all. platychiantys (M9-15)	42 47 55 57 95 107 & 109)	-		
Hibiscus aff. platychlamys (M35-11)	1 (M035)	-		
Urochloa sp. "glabrous apices"	1 (M059)	-		

# Table 4.4:continued.

Species	No. of Flora Survey Sites	Additional Opportunistic Collections
Range extensions		
Senna sp. Karajini (ME Trudgen 10,392)	1 (M048)	-
Other poorly collected species		
Boerhavia paludosa	4 (M003, 21, 22 & 27)	-
Mukia sp. D (Flora of Australia)	1 (M027)	1 (near M105)

# 4.2.3 Introduced Flora

Twelve species of introduced flora were recorded from the project area. One of these, Mesquite, is listed as a Declared Plant under the *Agriculture and Related Resources Protection* Act 1999. Further discussion of this species is presented below.

# • Mesquite \*Prosopis pallida hybrid

Several species of *\*Prosopis*, collectively known as Mesquite, were introduced to parts of the State as ornamental plants. The original stock lacked thorns, however this quickly reverted to the heavily-spined and highly invasive wild type. All species of *\*Prosopis* are listed as Declared Plants (Noxious Weeds) in Western Australia.

The species in the Karratha area is described as a hybrid of *\*Prosopis pallida* (Hussey *et al.*, 1997). Mesquite was recorded from over 25 locations within the project area, the majority of which occurred on or around the Southern Orebody (see Table 4.5; Appendix B). Mature plants were largely associated with tributaries and floodplains of the Fortescue River system. Scattered seedlings were observed germinating from Emu droppings on areas of stony hills, but did not appear to survive to maturity in this harsher environment. The dense shrublands of Mesquite on the Fortescue floodplain west of Balmoral Homestead (eg. Site

M108) represent the most significant stands of this species within the project area. Open patches were also recorded from major creeklines in the Paraburdoo LS to the north of the Southern Orebody.

The remaining weed species were largely common and widespread species of the Pilbara region.

- Mexican poppy \*Argemone ochroleuca, while not a Declared Plant for the Pilbara, is listed as such for other areas of the State. This potentially invasive species characteristically spreads along creeklines. It was recorded from two sites within this habitat in the project area.
- Buffel grass \*Cenchrus ciliaris and Birdwood grass \*C. setigerus were introduced as fodder species by pastoralists. While these highly invasive species have demonstrated allelopathic capacities (whereby they release chemicals which inhibit growth of other species), they are not listed as Declared Weeds due to their importance to the pastoral industry. Dense grasslands of \*Cenchrus species were prevalent along creeklines and on floodplains within the project area. Scattered individuals of \*Cenchrus ciliaris were recorded from most of the remaining sites.
- Kapok \*Aerva javanica was recorded as scattered individuals from ten sites;
- Beggar's Ticks \*Bidens bipinnata and Spiked Malvastrum \*Malvastrum americanum were both recorded commonly from flowlines and rockpiles;
- The cucurbid creeper Pie Melon \**Citrullus lanatus* was collected from a single creekline site, while Ulcardo Melon \**Cucumis melo* subsp. *agrestis* was collected from eight sites, primarily on creeklines or floodplains.
- \**Melochia pyramidata* was recorded from five sites located along major creeklines;
- The creeper Stinking Passion Flower \**Passiflora foetida* was recorded from 10 creekline sites;
- Whorled Pigeon Grass \*Setaria verticillata was recorded from six sites and an opportunistic collection, principally on plains.

Creekline habitats are particularly susceptible to weed invasion, and the majority of sites with significant weed invasion (both in terms of numbers of species and in the degree of cover) were such habitats.

Weed Species	No. of Flora Survey Sites	Additional Opportunistic Records
Declared Weeds		
*Prosopis pallida hybrid	23 (M001, 56, 58, 59, 60, 62, 64, 66, 73, 97, 99, 101, 103, 106, 108, 109, 110, 111, 116, 118, 122, 124, 126)	Several
Other Weeds		
*Aerva javanica	10 (M025, 38, 44, 68, 71, 81, 90, 92, 98, 100)	-
*Argemone ochroleuca	2 (M099, 124)	-
*Bidens bipinnata	34 (M006, 9, 12, 13, 14, 15, 16, 17, 19, 20, 25, 33, 37, 41, 42, 43, 45, 46, 47, 48, 49, 51, 53, 55, 62, 73, 85, 95, 98, 107, 109, 111, 114, 120)	1
*Cenchrus ciliaris	91 (most sites)	Common and abundant on

#### Table 4.5: Distribution of weed species within the survey area.

		deeper, loamy soils of floodplains and large creeks
*Cenchrus setigerus	30 (M004, 5, 6, 7, 8, 21, 22, 25, 29, 32,	-
	33, 34, 45, 54, 55, 59, 62, 66, 75, 84, 86, 90, 92, 99, 101, 108, 110, 122, 124, 126)	
*Citrullus lanatus	1 (M124)	-
*Cucumis melo subsp.	8 (M005, 15, 50, 59, 99, 101, 122, 126)	-
agrestis		
*Malvastrum	34 (M003, 5, 6, 15, 22, 27, 29, 32, 33, 42,	2
americanum	43, 45, 47, 49, 54, 55, 59, 62, 66, 67, 71,	
	73, 83, 89, 90, 92, 93, 94, 95, 103, 107, 111, 114, 126)	
*Melochia pyramidata	5 (M045, 59, 122, 124, 126)	-
*Passiflora foetida	10 (M041, 43, 45, 59, 66, 99, 101, 111,	-
	122, 124)	
*Setaria verticillata	6 (M024, 28, 59, 84, 92, 100)	1

# 5.0 Fauna

The survey recorded a combined total of 179 vertebrate species. Table 5.1 provides a summary of the number of species recorded from each major vertebrate group during the surveys.

Table 5 1·	Snacia	s recorded	during	ı tha	SURVOV
	opecies	siecolueu	uuring		Survey.
		-			

Fauna Group	Total
Native Mammals	17*
Introduced Mammals	5
Avifauna	96
Reptiles	$58^{\dagger}$
Amphibians	3
Total	179

\* Includes two species of bats, Scotorepens greyii and Vespadelus findlaysoni, that were recorded from the Fortescue River Bridge adjacent to the project area.

† Note that the species of marine turtle nesting on Cape Preston could not be identified. There may be up to four different species, although Green Turtles and Flatbacks are considered the most likely.

#### 5.1 **Birds**

# Introduction

The regional (Pilbara) avifauna has been summarised by Storr (1984) who provides an annotated list of 284 species of birds. The only known survey in the locality was carried out by Johnstone (1990) who surveyed the mangals at the mouth of the Fortescue River. Johnstone (1990) recorded six species of mangrove birds including the Striated Heron Butorides striatus, Collared Kingfisher Todiramphus chloris, Dusky Gerygone Gerygone tenebrosa, White-breasted Whistler Pachycephala lanioides, White-breasted Woodswallow Artamus leucorynchus and the Yellow White-eye Zosterops luteus.

Johnstone et al. (in press) have summarised the avifauna of the Carnarvon Basin, the northern boundary of which lies approximately 100 km to the south of the project area. These authors document 277 bird species including 159 breeding species. Whilst the range of many of these species does not extend into the project area, the paper summarises the distribution, abundance and habitat preferences of all but seven of the species recorded during the current survey.

#### The Assemblage

A total of 96 species of birds was recorded during the survey of the project area. This total represented 40 families and included 59 non-passerines and 37 passerines (Table 5.2).

The 96 species were represented by 2458 records, 42% of which were contributed by just one species, the Little Corella (Table 5.3). Sixty-four species were recorded from ten or fewer individuals, with 20 being recorded from just one individual (Table 5.3).

The most abundant group of birds were the granivores. The 13 granivorous species comprised just 14% of the total number of species, but represented 60% of all records. Included as granivores are the Little Button-quail, Brown Quail, Crested Pigeon, Spinifex Pigeon, Diamond Dove, Peaceful Dove, Bar-shouldered Dove, Galah, Little Corella, Australian Ringneck, Cockatiel, Zebra Finch and Painted Finch. The majority of these records were of the Little Corella.

The most abundant of the non-granivores were the small insectivorous species including the Yellow White-eye, Variegated Fairy-wren and Willie Wagtail. The Singing Bushlark, which feeds on small grasses, seeds and insects, was also relatively common.

#### Breeding

Breeding records were obtained for just three species:

- Emu: One adult male observed with two chicks;
- Red-capped Plover: One adult observed flying off a nest amongst rocks on the margins of a salt flat.
- Diamond Dove: Single adult on a nest of loose sticks containing two eggs. The nest was approximately 1.2m above the ground and constructed in a dead *Acacia coriacea* shrub.

#### Annotated List

Table 5.2 presents data for all bird species recorded from each fauna habitat unit. Each species is discussed individually in the following.

#### CASUARIIDAE

Emu - Dromaius novaehollandiae

Uncommon. Recorded on three occasions. Tracks were observed on the road adjacent to Site 7 (low stony hill), two adult birds were observed at Site 5 (stony plain vegetated with *Triodia angusta*), whilst a pair of adults with two younger birds were recorded adjacent to Site 4 (rocky hill).

#### PHASIANIDAE

Brown Quail - Coturnix ypsilophora

Uncommon. Only recorded from amongst grasses on the pale coastal sands of Cape Preston. Recorded as single birds and groups of 2, 5 and twelve.

#### ANATIDAE

Pacific Black Duck - Anas superciliosa

Uncommon. Recorded on just two occasions, both from small ephemeral pools in Creeklines. A single bird was recorded from Edward Creek at Site 10 and another from a large pool on Eramurra Creek at Site 84.

#### PODICIPEDIDAE

Australasian Grebe - *Tachybaptus novaehollandiae* Single bird seen in a large rock pool on Eramurra Creek at Site 84.

#### ARDEIDAE

White-faced Heron - Ardea novaehollandiae

Two sightings of possibly the same individual at Site 10 in Edward Creek on consecutive days. First observed foraging in a small ephemeral pool populated with tadpoles (possibly of *Litoria rubella*) and subsequently perched in a tall dead Eucalypt above the same pool.

Little Egret - Ardea garzetta Single birds recorded on three occasions perched in the upper branches of mangrove trees on Preston Creek.

Eastern Reef Egret - *Ardea sacra* Both the grey and white forms of this species were seen perched in mangrove trees along Preston Creek. In one case thirteen Egrets were seen in a single tree at the mouth of Preston Creek.

White-necked Heron - *Ardea pacifica* A single bird seen flying over the mudflats adjacent to Site 5.

Striated Heron - *Butorides striatus* One individual recorded in the mangals of Preston Creek.

Nankeen Night Heron - *Nycticorax caledonicus* Single bird in the mangals on Preston Creek.

#### ACCIPITRIDAE

Osprey - *Pandion haliaetus* One bird recorded on a low dead shrub in the samphire flats at Site 8 adjacent to a muddy inlet. Another individual was observed feeding on a fish on the beach of Cape Preston adjacent to Site 9.

Whistling Kite - *Haliastur sphenurus* A single bird observed flying overhead at Edward Creek (Site 10).

Brahminy Kite - *Haliastur indus* Single birds recorded on two occasions over Preston Creek.

White-bellied Sea-eagle - *Haliaeetus leucogaster* Recorded on two occasions above Preston Creek.

Spotted Harrier - *Circus assimilis* Single birds recorded on three occasions. Seen above Edward Creek at Sites 6 and 10 and also recorded from a creekline near Marda Pool at Site 122.

Brown Goshawk - *Accipiter fasciatus* Single bird observed perched in a Cadjeput *Melaleuca argentea* above an ephemeral pool at Site 10 on Edward Creek.

### Wedge-tailed Eagle - Aquila audax

A pair recorded circling above Edward Creek at Site 10, a single bird seen above the same locality the following day, and one bird recorded above grassy plain (cracking clay) near Site 1.

#### FALCONIDAE

Brown Falcon - Falco berigora

Recorded on four occasions as single birds above Creeklines (Sites 6 and 10), rocky hills (Site 4), and opportunistically over cracking clay close to Site 1.

Australian Hobby - *Falco longipennis* Recorded perched in a tree adjacent to Edward Creek at Site 6.

#### Nankeen Kestrel - Falco cenchroides

Recorded on 12 occasions, as single birds or in twos. Seven records came from Edward Creek at Sites 6 and 10. It is probable that the same birds were being noted at each of these sites. Also seen near Marda Pool (Site 122), an un-named drainage line (Site 84) and over coastal dunes on Cape Preston.

# OTIDIDAE

Australian Bustard - Ardeotis australis

As many as six individuals regularly seen on grassy plains near the intersection of the main access track to the mouth of the Fortescue River with the turn-off to Marda Well.

# TURNICIDAE

Little Button-quail - Turnix velox

Scarce. Five individuals recorded from three censuses. Two birds recorded from Site 1, two from Site 5 and a single from Site 201.

#### SCOLOPACIDAE

Eastern Curlew – *Numenius madagascariensis* Uncommon. Primarily recorded from the mudflats adjacent to the mangals. A total of 11 birds was recorded from seven censuses.

Grey-tailed Tattler – *Tringa brevipes* Uncommon. A single group of nine birds seen resting on the beach in a large mixed flock with several Greater Sand Plovers and Ruddy Turnstones.

Ruddy Turnstone - Arenaria interpres

Uncommon to moderately common. Two flocks, one of nine and one of 11, were seen resting on the beach on the western side of Cape Preston. A single bird was observed at the mouth of a tidal creek and three birds were seen foraging on mudflats adjacent to Site 8.

Red-necked Stint - Calidris ruficollis

Uncommon. Recorded twice. Sixteen birds seen resting on the beach in a mixed flock with Grey-tailed Tattler, Ruddy Turnstone and Greater Sand Plovers.

#### BURHINIDAE

Bush Stone-curlew - Burhinus grallarius

Rare. Single bird seen on the access track whilst spotlighting. Two additional birds were recorded from the North West Coastal Highway adjacent to the Fortescue Roadhouse.

Beach Stone-curlew - *Esacus neglectus* Scarce. Three birds recorded from the beach on the western side of Cape Preston. The birds were species were spaced approximately 200m apart.

#### HAEMATOPODIDAE

Pied Oystercatcher - *Haematopus longirostris* Moderately common. A single group of 11 birds observed resting on a beach on the western side of Cape Preston. A single bird observed on the same stretch of beach and two birds observed flying Preston Creek.

#### CHARADRIIDAE

Red-capped Plover - *Charadrius ruficapillus* Scarce. Recorded on two censuses. One bird recorded from the beach on the western side of Cape Preston and one seen on a nest amongst rocks in a large mudflat near Site 5.

Greater Sand Plover - *Charadrius leschenaultii* Scarce. Two birds seen resting on a beach in a large mixed flock.

Black-fronted Dotterel - *Charadrius melanops* Moderately common. Recorded from small rock pools adjacent to a granite outcrop at Site 84 and numerous pairs seen along the pebbly shores of the Fortescue River.

Banded Lapwing - Vanellus tricolor

Scarce. Single bird seen on an extensive plain of stony cracking clays adjacent to Site 6.

#### LARIDAE

Silver Gull - *Larus novaehollandiae* Uncommon. A total of 15 individuals recorded across six censuses, seen as singles, twos and fours. Most records from the beach on the western side of Cape Preston, but also seen over the mangals on Preston Creek and the samphire at Site 8.

Caspian Tern - *Sterna caspia* Scarce. Two birds seen flying along the beach on the western side of Cape Preston.

Lesser Crested Tern - Sterna bengalensis Scarce. Five resting on the beach in a mixed flock with Crested Terns and Silver Gulls.

Crested Tern - *Sterna bergii* Scarce. Eight resting on the beach in a mixed flock with Lesser Crested Terns and Silver Gulls.

Bridled Tern - *Sterna anaethetus* One seen flying over the mouth of the tidal creek at the southern boundary of Cape Preston.

#### COLUMBIDAE

Crested Pigeon - Ocyphaps lophotes

Recorded on five occasions from three sites as either single birds or in pairs. Single birds were recorded on two occasions from Edward Creek at Site 10 whilst a pair was recorded from the same creek at Site 6. A single bird and one pair were also observed from emergent *Acacia coriacea* at Site 1.

#### Spinifex Pigeon - Geophaps plumifera

Typically recorded from rocky and stony habitats. One pair and a single bird were recorded from Site 4, a single bird was seen on a rocky outcrop at Site 7, and two birds were recorded from rocky outcrops on the Southern Ore Body during transects. Three birds were recorded from amongst the *Triodia angusta* at Site 5.

#### Diamond Dove - Geopelia cuneata

Seven individuals recorded from vegetation adjacent to a tidal creek at Site 113. Single birds recorded from Edward Creek at Site 10 and from a small drainage feature at Site 7. The latter bird was on a nest of loose sticks containing two eggs. The nest was approximately 1.2m above the ground and built in the branches of a dead *Acacia coriacea* shrub.

#### Peaceful Dove - Geopelia striata

Recorded on four occasions from two sites. Restricted to creeklines. Recorded as single birds, pairs and small flocks of up to five individuals. Recorded from Edward Creek at Site 10, and from Jilan Jilan Pool.

Bar-shouldered Dove - Geopelia humeralis

Uncommon. Two groups, one of three and one of four, seen behind the mangals on Cape Preston.

# PSITTACIDAE

#### Galah - Cacatua roseicapilla

Common to very common particularly along Edward Creek. Seen as single birds, pairs, small flocks and on a single occasion as a large flock of 150 birds. Often seen in the company of the Little Corella *Cacatua sanguinea*. Noted resting in *Acacia xiphophylla* along the margins of Edward Creek.

### Little Corella - Cacatua sanguinea

Very common, particularly at Site 6 on Edward Creek where several large flocks were recorded, including two of 50 birds, one of approximately 120, one of approximately 300 and one of about 500. Also seen as pairs perched in tall Eucalypts at Site 10 and Site 122 near Marda Pool.

Cockatiel - Nymphicus hollandicus

A group of three birds was recorded flying along the edge of Edward Creek at Site 10.

#### Australian Ringneck - Platycercus zonarius

Recorded on four censuses from four sites, all within the Creekline habitat. Pairs were observed on Edward Creek at Sites 6 and 10, and at Site 122 near Marda Pool. A group of three was recorded from Site 124 at Jilan Jilan Pool.

#### CUCULIDAE

Pallid Cuckoo - Cuculus pallidus

Often recorded from its call, this species was recorded from Edward Creek at Site 6 on three occasions, also from *Eucalyptus camaldulensis / E. victrix* low forest in Eramurra Creek and flying overhead at Site 2.

Black-eared Cuckoo - *Chrysococcyx osculans* A single bird was observed calling from an emergent shrub at Site 1, and another heard calling at the same site. Two birds heard calling at Site 2.

#### Horsfield's Bronze-Cuckoo - *Chrysococcyx basalis* Rare. Recorded on two occasions. Single birds recorded from the coastal dunes of Cape Preston and from Edward Creek at Site 10.

#### CENTROPODIDAE

Pheasant Coucal - Centropus phasianinus

Restricted to the creekline vegetation. Calls were often heard at Site 6 and 10, with two birds seen amongst the branches of a Eucalypt at the former site. One bird seen walking across a track at Site 99. Single birds also recorded from Site 122 near Marda Pool and Site 124 at Jilan Jilan Pool.

# STRIGIDAE

Southern Boobook - *Ninox novaeseelandiae* Recorded from the access track on most nights of the survey. A single pair was seen roosting in the same Eucalypt on Edward Creek at Site 6 each morning of the survey. Also heard calling from Site 10 while mist-netting for bats.

# PODARGIDAE

Tawny Frogmouth - *Podargus strigoides* Rare. Single bird heard calling and one observed in an *Acacia* thicket at Site 10 on Edward Creek.

#### CAPRIMULGIDAE

Spotted Nightjar - Eurostopodus argus

Seen sitting in the middle of the access track on most nights of the survey, mostly as single birds but on one occasion as a group of five.

#### HALCYONIDAE

Blue-winged Kookaburra - Dacelo leachii

Restricted to the Creekline vegetation, particularly *Eucalyptus camaldulensis / E. victrix* low forest. Recorded from its calls or by the presence of single birds in tall Eucalypts at Sites 6 and 10 on Edward Creek, one group of three birds was also recorded from Site 6. Single birds recorded from Site 124 at Jilan Jilan Pool.

Red-backed Kingfisher - *Todiramphus pyrrhopygia* A single bird was seen perched in a Eucalypt at Eramurra Creek.

#### Sacred Kingfisher - Todiramphus sanctus

Common, typically recorded from creekline vegetation. Recorded from dense creekline vegetation at Site 10 on six occasions, one bird seen eating a large grasshopper. Also recorded from Site 122 near Marda Pool and Site 124 at Jilan Jilan Pool. A pair was frequently seen in tall shrubs adjacent to Site 1. Also recorded from two localities within mangals.

Collared Kingfisher - *Todiramphus chloris* Recorded from the edge of mangals on three occasions.

#### MEROPIDAE

Rainbow Bee-eater - Merops ornatus

Recorded on 11 occasions from a variety of habitats, but predominantly adjacent to creeklines. Single birds recorded from Edward Creek at Sites 6 and 10. Also recorded as single birds from Site 122 near Marda Pool, Site 124 at Jilan Jilan Pool and Site 85 at Eramurra Creek. A pair recorded flying above samphire at Site 8. Single birds seen flying over Sites 1 and 7.

#### MALURIDAE

Variegated Fairy-wren - Malurus lamberti

Common. Recorded as single birds, pairs or in small groups of between three and six. Observed in a variety of habitats including creeklines (Sites 6, 10, 122 and 124), snakewood on cracking clay (Sites 1 and 2), drainage lines on low stony hills (Site 7) and in *Acacia* shrublands on coastal dunes (Transect 201).

White-winged Fairy-wren - Malurus leucopterus

Moderately common. The single day investigation for this species, which was conducted jointly with CALM and the WA Museum, confirmed that the species present was the common Blue and White Fairy Wren and not the restricted Black and White race. Typically recorded from the more open habitats especially the low snakewood shrublands and coastal dunes. Recorded from its conspicuous calls or observed in small groups of two to nine individuals. Singles recorded from the cracking clay habitat at Site 1 and a small group of four birds recorded from the same habitat at Site 2. Singles and a family of six recorded from the *Triodia* hummock grassland at Site 5, seen in emergent *Acacia* shrubs in drainage foci. Single recorded from the snakewood adjacent to Site 10. Recorded on two occasions from the samphire at Site 8 including from a single call and as a group of six. Families also recorded from the *Spinifex* clumps on the foredunes of Cape Preston.

#### Rufous-crowned Emu-wren - Stipiturus ruficeps

Calls of this species recorded from the *Triodia angusta* hummock grassland at Site 5. This species is well out of its known range and the calls need to be confirmed with sightings (pers. comm. Mr. R. Johnstone).

#### Striated Grasswren - Amytornis striatus

A single bird seen running / flying over low *Triodia* on the rocky slopes of the Central Ore Body. As with the Rufous-crowned Emu-wren this species is well out of its known range and may well represent an isolated population (pers. comm. Mr. R. Johnstone).

#### PARDALOTIDAE

Red-browed Pardalote - *Pardalotus rubricatus* One bird recorded from a young Eucalypt on a tributary of Edward Creek at Site 10.

# ACANTHIZIDAE

Redthroat - Pyrrholaemus brunneus

Very common in *Acacia coriacea* shrublands on the coastal dunes of Cape Preston. Typically recorded from its conspicuous call and as single or pairs in dense shrubs. Also recorded from Mesquite shrubland on the banks of the Fortescue River.

#### Dusky Gerygone - Gerygone tenebrosa

Recorded from mangals at a variety of sites. Typically as singles (four records) or twos (four records), and on one occasion as a group of four.

#### MELIPHAGIDAE

Yellow-throated Miner - *Manorina flavigula* Uncommon, recorded only from Creekline habitats. Recorded as single birds or in twos from Sites 6 and 10.

#### Singing Honeyeater - Lichenostomus virescens

Very common throughout the project area particularly in the *Acacia coriacea* shrublands on the coastal dunes of Cape Preston. Recorded on 40 occasions typically as single birds or pairs, but also recorded in groups of three, four and occasionally five. Recorded from the following habitats; cracking clay (Sites 1 and 2), rocky hills (Site 4), stony low hills (Site 7), creekline (Site 10), and coastal dunes of Cape Preston.

White-plumed Honeyeater - *Lichenostomus penicillatus* Common, restricted to creeklines with either *Eucalyptus camaldulensis* or *E victrix*. Recorded as singles or in groups of up to eight from Edward Creek at Sites 6 and 10, near Marda Pool at Site 122, Jilan Jilan at Pool Site 124 and Eramurra Creek at Site 85.

Brown Honeyeater - *Lichmera indistincta* Generally rare, although moderately common in mangals. A single bird was recorded from dense vegetation on the banks of Edward Creek at Site 10. Numerous individuals were recorded from the mangals at the southern boundary of Cape Preston.

#### PETROICIDAE

Hooded Robin - *Petroica cucullata* Scarce. A pair was observed in the *Acacia xiphophylla* at Site 2.

# POMATOSTOMIDAE

Grey-crowned Babbler - *Pomatostomus temporalis* Scarce. Two birds recorded from an *Acacia coriacea* shrub on the banks of Edward Creek at Site 10.

# PACHYCEPHALIDAE

Crested Bellbird - *Oreoica gutturalis* Moderately common. Ten records of this species, made primarily from its call. Recorded from Sites 1, 2, 4, 7 and 10.

Mangrove Golden Whistler - *Pachycephala melanura* Common, restricted to mangals. Ten records of this species from the mangals at the southern boundary of Cape Preston.

White-breasted Whistler - *Pachycephala lanioides* Uncommon, restricted to mangals. Recorded on three occasions from mangals over water.

#### DICRURIDAE

?Leaden Flycatcher - Myiagra rubecula

Vagrant. Single female of what was thought to be a Leaden Flycatcher was recorded from Edward Creek at Site 10. The individual was observed perched in a branch three meters above ground and was observed at night whilst spotlighting. The bird was seen by two observers for approximately 5 minutes. If it was a Leaden Flycatcher, it is likely that this individual was transported to the locality by Tropical Cyclone Steve which passed over the Kimberley region before recrossing the coast close to Cape Preston.

#### Magpie-lark - Grallina cyanoleuca

Moderately common. Recorded on eleven occasions as single birds, pairs or in groups of three individuals. Typically associated with creeklines. A pair and a single bird were recorded from tall Eucalypts adjacent to Site 1, single birds at Site 6 and singles, pairs and a group of three from Site 10. A single bird from Jilan Jilan Pool at Site 124 and a pair from Site 84 on Eramurra Creek.

#### Mangrove Grey Fantail - Rhipidura phasiana

Uncommon, restricted to mangals. Five records of either singles or pairs from the mangrove communities at the southern boundary of Cape Preston.

# Willie Wagtail - Rhipidura leucophrys

Common. Recorded on 24 censuses mostly from creeklines but also cracking clay and the coastal dunes of Cape Preston.

#### CAMPEPHAGIDAE

Black-faced Cuckoo-shrike - *Coracina novaehollandiae* Common. Recorded as singles or in groups of two to four. Typically from wooded creeklines but also adjacent habitats. Recorded from Sites 1, 6, 7, 8, 10, 84, 113, 122 and 124.

#### ARTAMIDAE

White-breasted Woodswallow - *Artamus leucorynchus* Moderately common. Small groups of between two and four birds seen flying over mangals and adjacent habitats including the samphire at Site 8.

Black-faced Woodswallow - Artamus cinereus

Uncommon. Recorded on five censuses from a range of habitats including a single from Site 6, two from the coastal dunes on Cape Preston, small groups of four from the burnt rocky hills on the Southern Ore Body and at Site 4, and a group of five over Site 1.

#### CRACTICIDAE

Pied Butcherbird - Cracticus nigrogularis

Moderately common. Recorded on 14 censuses from nine sites. Often recorded from its call. Seen as singles, twos, threes and in one case as a group of five. Most commonly recorded from the creekline sites (6, 10, 124 and a transect along the Fortescue River). Also from a rocky gully in the Southern Ore Body, stony low hill at Site 7, coastal dunes on Cape Preston and adjacent to the mangals at the southern boundary of Cape Preston.

Australian Magpie - Cracticus tibicen

Scarce. Recorded on two occasions, two birds recorded from Edward Creek at Site 10 and another two recorded from Site 84.

#### CORVIDAE

Little Crow - *Corvus bennetti* Scarce. Recorded on one occasion from its call.

Torresian Crow - Corvus orru

Uncommon. Twenty eight records from seven censuses across three sites. Single recorded from Site 6 and three small groups of 4, 5 and 6 recorded from Site 10.

#### HIRUNDINIDAE

Welcome Swallow - Hirundo neoxena

Rare. Tentatively recorded as a Welcome Swallow. A single individual flying towards the mangals at the southern boundary of Cape Preston was observed from Site 4. It is unlikely that the individual would have been a Barn Swallow (known to occur from Cape Keraudren to Exmouth Gulf between September and December).

#### Tree Martin - Hirundo nigricans

Uncommon. Observed on eight censuses from six sites. Recorded most commonly in twos, but also as a single and groups of six and seven. Single bird recorded over the mangals at the western mouth of the tidal creek at the base of Cape Preston. Pairs recorded from the samphire community at Site 8, *Triodia angusta* hummock grassland at Site 5, and Edward Creek at Sites 6 and 10. A group of six recorded from Site 10 and a group of seven from the Fortescue River (Transect MF).

#### Fairy Martin - Hirundo ariel

Twenty nests recorded from a culvert under the North West Coastal Highway at Eramurra Creek.

### ZOSTEROPIDAE

Yellow White-eye - Zosterops luteus

Common. Largely restricted to the mangals but also from adjacent habitats and one record of four birds from Edward Creek over 5 km from the nearest mangals. All observations were of groups of between three and eight individuals.

#### SYLVIIDAE

#### Spinifex-bird - Eremiornis carteri

Moderately common. Largely restricted to habitats dominated by *Triodia* (Sites 4 and 5) where it was typically recorded as singles and occasionally as twos. Also recorded from patches of *Triodia* at Site 1. These records represent knew records for this part of the Pilbara (pers. comm. Mr. R. Johnstone).

Brown Songlark - *Cincloramphus cruralis* Scarce. Recorded on two occasions as singles from Sites 5 and 113.

### ALAUDIDAE

#### Singing Bushlark - Mirafra javanica

Very common. Recorded throughout the project area from a variety of habitats including cracking clays (Sites 1 and 2 - 71 records), *Triodia* hummock grassland (Site 5 - three records), low stony hills (Site 7 - three records), samphire (Site 8 - six records) and coastal dunes (Transect 150 - three records). Most abundant in the grasslands on cracking clay; absent from the mangals, creeklines and rocky hills.

#### PASSERIDAE

#### Zebra Finch - Taeniopygia guttata

Common. Recorded on 30 censuses from a variety of habitat types including cracking clay (Sites 1 and 2), rocky hills (Site 4), *Triodia* hummock grassland (Site 5), creeklines (Sites 6, 10, 84 and 122), stony hills (Site 7), samphire (Site 8), mangals (Transects 150 and 154) and coastal dunes (Transect 201). Recorded as single birds, pairs and in groups from two to eight.

#### Painted Finch - Emblema pictum

Moderately common. Recorded from 19 censuses across five habitats including cracking clay (Sites 1 and 2 - 10 records), rocky hills (Site 4 - four records), stony hills (Site 7 - 18 records) and creeklines (Site 84 - three records).

#### MOTACILLIDAE

#### Australian Pipit - Anthus australis

Moderately common. Recorded from most open habitats including cleared vehicle tracks in vegetation associations with moderately dense cover, and on the beach. Typically seen as singles or twos. During censuses, singles were recorded from Sites 1, 4 and 10. Singles also recorded from beach transects on four occasions and from a transect across the Southern Ore Body (much of which was burnt). Twos recorded from Site 8 on three occasions and from coastal dunes (Transect 150) on one occasion.

**Table 5.2. Avifauna recorded from the Austeel project area (**Be = Beach, CC = Cracking Clay, CD = Coastal Dunes, CL = Creekline, LH = Low Hills, Ma = Mangroves, RH = Rocky Hill, S = Samphire, SP = Stony Plain, TC = Tidal Creek, Opp = Opportunistic).

Species		Habita						S				
•	Be	CC	CD	CL	LH	Ма	RH	S	SP	Орр	Total	
CASUARIIDAE												
Emu - Dromaius novaehollandiae		4			1				2		7	
PHASIANIDAE												
Brown Quail - Coturnix ypsilophora			16	5							21	
ANATIDAE												
Pacific Black Duck - Anas superciliosa				2							2	
PODICIPEDIDAE												
Australasian Grebe - Tachybaptus novaehollandiae				1							1	
ARDEIDAE												
White-faced Heron - Ardea novaehollandiae				2							2	
Little Egret - Ardea garzetta						3					3	
Eastern Reef Egret - Ardea sacra						1					1	
White-necked Heron - Ardea pacifica									1		1	
Striated Heron - Butorides striatus						1					1	
Nankeen Night Heron - Nycticorax caledonicus						1					1	
ACCIPITRIDAE												
Osprey - Pandion haliaetus								1			1	
Whistling Kite - Haliastur sphenurus				1							1	
Brahminy Kite - Haliastur indus			1			2					2	
White-bellied Sea-Eagle - Haliaeetus leucogaster						2					2	
Spotted Harrier - Circus assimilis				3							3	
Brown Goshawk - Accipiter fasciatus				1							1	
Wedge-tailed Eagle - Aquila audax				4							4	
FALCONIDAE												
Brown Falcon - Falco berigora				2			1			1	4	
Australian Hobby - Falco longipennis				1							1	
Nankeen Kestrel - Falco cenchroides			1	12				1		1	15	
OTIDIDAE												
Australian Bustard - Ardeotis australis				2						4	6	
TURNICIDAE												
Little Button-guail - Turnix velox		2	1						2		5	
SCOLOPACIDAE											-	
Eastern Curlew – Numenius madagascariensis						9		2			11	
Grev-tailed Tattler – Tringa brevipes	9					-					9	
Ruddy Turnstone - Arenaria interpres	17					1		3			21	
Red-necked Stint - Calidris ruficollis	16					1		-			17	
BURHINIDAE	-											
Bush Stone-curlew - Burhinus grallarius										1	1	
Beach Stone-curlew - Esacus neglectus	3										3	
											Ŭ	
Pied Ovstercatcher - Haematonus Iongirostris	12					2					14	
CHARADRIIDAF	12					-						
Red-capped Ployer - Charadrius ruficanillus	5								<u> </u>		5	
Greater Sand Ployer - Charadrius leschenaultii	2										2	
Black-fronted Dotterel - Charadrius melanons				7					<u> </u>	1	<u>ک</u> 8	
Banded Lapwing - Vanallus tricolor				1						'	1	
Danueu Lapwing - Vaneilus (1100101				I					1		1	

**Table 5.2.** Avifauna recorded from the Austeel project area (Be = Beach, CC = Cracking Clay, CD = Coastal Dunes, CL = Creekline, LH = Low Hills, Ma = Mangroves, RH = Rocky Hill, S = Samphire, SP = Stony Plain, TC = Tidal Creek, Opp = Opportunistic).

Species	Habitats										
	Be	CC	CD	CL	LH	Ma	RH	S	SP	Орр	Total
LARIDAE											
Silver Gull - Larus novaehollandiae	9					4		2			15
Caspian Tern - Sterna caspia	2										2
Lesser Crested Tern - Sterna bengalensis	5										5
Crested Tern - Sterna bergii	8										8
Bridled Tern - Sterna anaethetus						1					1
COLUMBIDAE											
Crested Pigeon - Ocyphaps lophotes		3		4							7
Spinifex Pigeon - Geophaps plumifera					1		5		3		9
Diamond Dove - Geopelia cuneata				8	1						9
Peaceful Dove - Geopelia striata				10							10
Bar-shouldered Dove - Geopelia humeralis						7					7
CACATUIDAE											
Galah - Cacatua roseicapilla		10		212						2	224
Little Corella - Cacatua sanguinea				1031							1031
Cockatiel - Nymphicus hollandicus				3							3
PSITTACIDAE											
Australian Ringneck - Platycercus zonarius				9							9
CUCULIDAE											
Pallid Cuckoo - Cuculus pallidus		1		4							5
Black-eared Cuckoo - Chrysococcyx osculans		3									3
Horsfield's Bronze-Cuckoo - Chrysococcyx basalis			1	1							2
CENTROPODIDAE											
Pheasant Coucal - Centropus phasianinus				7							7
STRIGIDAE											
Southern Boobook - Ninox novaeseelandiae				1						1	2
PODARGIDAE											
Tawny Frogmouth - Podargus strigoides				2							2
CAPRIMULGIDAE											
Spotted Nightjar - Eurostopodus argus										3	3
HALCYONIDAE											
Blue-winged Kookaburra - Dacelo leachii				10							10
Red-backed Kingfisher - Todiramphus pyrrhopygia				1							1
Sacred Kingfisher - Todiramphus sanctus		2		14		3					19
Collared Kingfisher - Todiramphus chloris						4					4
MEROPIDAE											
Rainbow Bee-eater - Merops ornatus		2		8	1			2			13
MALURIDAE											
Variegated Fairy-wren - Malurus lamberti		11	13	24	3	6					57
White-winged Fairy-wren - Malurus leucopterus		6	9	12		2		7	8		44
Rufous-crowned Emu-wren - Stipiturus ruficeps									4		4
Striated Grasswren - Amytornis striatus		1					1		1	1	1
PARDALOTIDAE											
Red-browed Pardalote - Pardalotus rubricatus				1						1	1
Redthroat - Pyrrholaemus brunneus		† – – –	9					-	† – – †		9
Dusky Gerygone - Gerygone tenebrosa						18					18

**Table 5.2.** Avifauna recorded from the Austeel project area (Be = Beach, CC = Cracking Clay, CD = Coastal Dunes, CL = Creekline, LH = Low Hills, Ma = Mangroves, RH = Rocky Hill, S = Samphire, SP = Stony Plain, TC = Tidal Creek, Opp = Opportunistic).

					Habi	tats				
Be	CC	CD	CL	LH	Ма	RH	S	SP	Орр	Total
			7							7
	4	4	16	1	33	10		3		71
			47							47
			1							1
	2									2
			2							2
	4		4	1		1				10
					11					11
					1					1
			1							1
	3		13							16
					8					8
	2	1	21		3				1	28
	6		29	1			1			37
					15		2			17
	5	2	1			8				16
	2	2	15	3	1	1				24
			4							4
	1									1
			16	11						27
						1				1
			19		1		2	2		24
									20	20
			4		90		5			99
	1					6		3	2	12
								1		2
	71			3	3		6	3	3	89
	8	5	34	2	29	9	5	5	2	99
	10		8	18		5			2	43
2	1	2	1		2	2	6			16
ls 90	164	66	1650	47	265	50	45	37	44	2458
es 12	24	14	53	13	30	12	14	12	14	96
	Be Be Be Be Be Be Be Be Be Be Be Be Be B	Be         CC           I         I	Be         CC         CD           4         4           2         2           2         2           3         3           4         4           2         3           3         3           2         1           3         3           3         2           3         3           2         1           3         3           3         3           3         3           3         3           3         3           3         3           3         3           3         3           3         3           3         3           3         3           3         3           3         3           3         3           3         3           3         3           4         3           5         2           3         3           4         1           5         2           3         3           4	Be         CC         CD         CL           4         4         16           2         4         4           2         1           2         2           2         2           2         2           3         2           4         4           2         2           3         1           3         13           3         13           3         13           3         13           3         13           3         13           3         13           4         4           2         1           2         1           3         13           3         13           3         13           3         13           4         4           5         2           4         4           4         4           1         1           2         1           3         13           4         1           5         2	Be         CC         CD         CL         LH           4         4         16         1           4         4         16         1           2         1         1         1           2         2         1         1           2         2         1         1           2         2         1         1           2         2         1         1           2         2         1         1           2         1         2         1           3         1         1         1           3         1         1         1           4         1         1         1           3         1         1         1           4         1         1         1           4         1         1         1         1           5         2         1         1         1           4         1         1         1         1           5         2         1         1         1           1         1         1         1         1           1<	Be         CC         CD         CL         LH         Ma           1         4         4         16         1         33           1         4         4         16         1         33           1         1         1         1         1         1           1         2         1         1         1         1           1         2         1         1         1         1           1         2         1         1         1         1           1         1         1         1         1         1           1         1         1         1         1         1           1         1         1         1         1         1           1         1         1         1         1         1           1         1         1         1         1         1           1         1         1         1         1         1           1         1         1         1         1         1           1         1         1         1         1         1         1 <td< td=""><td>Be         CC         CD         CL         LH         Ma         RH           I         4         4         16         1         33         10           I         4         4         16         1         33         10           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I</td><td>Be         CC         CD         CL         LH         Ma         RH         S           4         4         16         1         33         10           2         4         4         16         1         33         10           2         1         1         1         1         1         1           2         2         1         1         1         1         1           4         4         1         1         1         1         1           2         2         1         1         1         1         1           4         4         1         1         1         1         1           3         13         1         1         1         1         1           3         13         1         1         1         1         1           3         13         1         1         1         1         1           4         4         1         1         1         1         1           4         2         1         3         1         1         1           5         2</td><td>Be         CC         CD         CL         LH         Ma         RH         S         SP           1         1         7         1         1         33         10         3           1         4         4         16         1         33         10         3           1         1         1         33         10         3         1</td><td>Habitats           Be         CC         CD         CL         LH         Ma         RH         S         SP         Opp           4         4         16         1         33         10         3         -</td></td<>	Be         CC         CD         CL         LH         Ma         RH           I         4         4         16         1         33         10           I         4         4         16         1         33         10           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I         I         I         I         I         I           I         I	Be         CC         CD         CL         LH         Ma         RH         S           4         4         16         1         33         10           2         4         4         16         1         33         10           2         1         1         1         1         1         1           2         2         1         1         1         1         1           4         4         1         1         1         1         1           2         2         1         1         1         1         1           4         4         1         1         1         1         1           3         13         1         1         1         1         1           3         13         1         1         1         1         1           3         13         1         1         1         1         1           4         4         1         1         1         1         1           4         2         1         3         1         1         1           5         2	Be         CC         CD         CL         LH         Ma         RH         S         SP           1         1         7         1         1         33         10         3           1         4         4         16         1         33         10         3           1         1         1         33         10         3         1	Habitats           Be         CC         CD         CL         LH         Ma         RH         S         SP         Opp           4         4         16         1         33         10         3         -

Species	Records	Species	Records
Australasian Grebe - Tachybaptus novaehollandiae	1	Crested Pigeon - Ocyphaps lophotes	7
Eastern Reef Egret - Ardea sacra	1	Bar-shouldered Dove - Geopelia humeralis	7
White-necked Heron - Ardea pacifica	1	Pheasant Coucal - Centropus phasianinus	7
Striated Heron - Butorides striatus	1	Yellow-throated Miner - Manorina flavigula	7
Nankeen Night Heron - Nycticorax caledonicus	1	Black-fronted Dotterel - Charadrius melanops	8
Osprey - Pandion haliaetus	1	Crested Tern - Sterna bergii	8
Whistling Kite - Haliastur sphenurus	1	Mangrove Grey Fantail - Rhipidura phasiana	8
Brown Goshawk - Accipiter fasciatus	1	Grey-tailed Tattler – Tringa brevipes	9
Australian Hobby - Falco longipennis	1	Spinifex Pigeon - Geophaps plumifera	9
Bush Stone-curlew - Burhinus grallarius	1	Diamond Dove - Geopelia cuneata	9
Banded Lapwing - Vanellus tricolor	1	Australian Ringneck - Platycercus zonarius	9
Bridled Tern - Sterna anaethetus	1	Redthroat - Pyrrholaemus brunneus	9
Red-backed Kingfisher - Todiramphus pyrrhopygia	1	Peaceful Dove - Geopelia striata	10
Striated Grasswren - Amytornis striatus	1	Blue-winged Kookaburra - Dacelo leachii	10
Red-browed Pardalote - Pardalotus rubricatus	1	Crested Bellbird - Oreoica gutturalis	10
Brown Honeyeater - Lichmera indistincta	1	Eastern Curlew - Numenius madagascariensis	11
White-breasted Whistler - Pachycephala lanioides	1	Mangrove Golden Whistler - Pachycephala melanura	11
Leaden Flycatcher - Myiagra rubecula	1	Spinifex-bird - Eremiornis carteri	12
Little Crow - Corvus bennetti	1	Rainbow Bee-eater - Merops ornatus	13
Welcome Swallow - Hirundo neoxena	1	Pied Oystercatcher - Haematopus longirostris	14
Pacific Black Duck - Anas superciliosa	2	Nankeen Kestrel - Falco cenchroides	15
White-faced Heron - Ardea novaehollandiae	2	Silver Gull - Larus novaehollandiae	15
Brahminy Kite - Haliastur indus	2	Magpie-lark - Grallina cyanoleuca	16
White-bellied Sea-Eagle - Haliaeetus leucogaster	2	Black-faced Woodswallow - Artamus cinereus	16
Greater Sand Plover - Charadrius leschenaultii	2	Australian Pipit - Anthus australis	16
Caspian Tern - Sterna caspia	2	Red-necked Stint - Calidris ruficollis	17
Horsfield's Bronze-Cuckoo - Chrysococcyx basalis	2	White-breasted Woodswallow - Artamus leucorynchus	17
Southern Boobook - Ninox novaeseelandiae	2	Dusky Gerygone - Gerygone tenebrosa	18
Tawny Frogmouth - Podargus strigoides	2	Sacred Kingfisher - Todiramphus sanctus	19
Hooded Robin - Petroica cucullata	2	Fairy Martin - <i>Hirundo ariel</i>	20
Grey-crowned Babbler - Pomatostomus temporalis	2	Brown Quail - Coturnix ypsilophora	21
Brown Songlark - Cincloramphus cruralis	2	Ruddy Turnstone - Arenaria interpres	21
Little Egret - Ardea garzetta	3	Pied Butcherbird - Cracticus nigrogularis	24
Spotted Harrier - Circus assimilis	3	Tree Martin - Hirundo nigricans	24
Beach Stone-curlew - Esacus neglectus	3	Torresian Crow - Corvus orru	27
Cockatiel - Nymphicus hollandicus	3	Willie Wagtail - Rhipidura leucophrys	28
Black-eared Cuckoo - Chrysococcyx osculans	3	Black-faced Cuckoo-shrike - Coracina novaehollandiae	37
Spotted Nightjar - Eurostopodus argus	3	Painted Finch - Emblema pictum	43
Wedge-tailed Eagle - Aquila audax	4	White-winged Fairy-wren - Malurus leucopterus	44
Brown Falcon - Falco berigora	4	White-plumed Honeyeater - Lichenostomus penicillatus	47
Collared Kingfisher - Todiramphus chloris	4	Variegated Fairy-wren - Malurus lamberti	57
Rufous-crowned Emu-wren - Stipiturus ruficeps	4	Singing Honeyeater - Lichenostomus virescens	71
Australian Magpie - Cracticus tibicen	4	Singing Bushlark - Mirafra javanica	89
Little Button-quail - Turnix velox	5	Zebra Finch - Taeniopygia guttata	99
Red-capped Plover - Charadrius ruficapillus	5	Yellow White-eye - Zosterops luteus	99
Lesser Crested Tern - Sterna bengalensis	5	Galah - Cacatua roseicapilla	224
Pallid Cuckoo - Cuculus pallidus	5	Little Corella - Cacatua sanguinea	1031
Australian Bustard - Ardeotis australis	6	-	
Emu - Dromaius novaehollandiae	7		

 Table 5.3:
 Number of records for each species in rank order.

#### Summary

The total of 96 species of birds, including 59 non-passerines and 37 passerines, compares favourably with surveys carried out in other areas of the Pilbara given the relative survey effort. A total of 147 species (99 non-passerine and 48 passerine) has been recorded from or is expected to occur in or adjacent to the Yardie Creek Gorge, based on the occurrence of these species nearby (Ron Johnstone, pers. comm.). Johnstone (1983) lists 135 bird species (74 non-passerines and 61 passerines) for the Karijini National Park. He considered that the non-passerine numbers could be added to following heavy cyclonic rains. How *et al.* (1991) note 104 bird species (61 non-passerines and 43 passerines) from Abydos-Woodstock Reserve and adjacent parts of the Soansville Plateau. Storr (1984) notes 284 species as having been recorded from the Pilbara region.

Neither of the two inland studies are particularly relevant in determining expected species composition for the current survey area, as they represent quite different suites of habitats. The avifauna of the Yardie Creek Gorge area perhaps represents the most similar assemblage and probably reflects more closely the expected species composition, i.e. a far greater proportion of non-passerines compared to passerines. Based on this, the survey of the Austeel project area has recorded 60% of the non-passerines and 77% of the passerines potentially occurring in the area. By far the greater proportion of non-passerines yet to be recorded are migratory waders. The level of use of this area by waders is unclear, although Ron Johnstone (WA Museum, pers. comm.) indicates that the area is probably not used as a wintering location for large numbers of waders, but rather as a stopover point for feeding and resting as they move up or down the coastline.

Migratory wader species are protected under the *Environment Protection and Biodiversity Conservation* Act 1999 (*EPBC* ACT). In addition, the national List of Migratory Species consists of those species listed under the following International Conventions:

- Japan-Australia Migratory Bird Agreement (JAMBA)
- China-Australia Migratory Bird Agreement (CAMBA)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)

#### Habitat Utilisation

Habitat types are described in Section 3.2.2.

Beach

Twelve species were recorded during transects along the beaches of Cape Preston including the Grey-tailed Tattler, Ruddy Turnstone, Red-necked Stint, Beach Stone-Curlew, Pied Oystercatcher, Red-capped Plover, Greater Sand Plover, Silver Gull, Caspian Tern, Lesser Crested Tern, Crested Tern and Richard's Pipit. More species would undoubtedly be recorded during the summer months with the usual influx of migratory wader species.

Mangroves (Mangals)

This survey recorded nine species of mangrove birds including the Striated Heron, Bar-shouldered Dove, Collared Kingfisher, Dusky Gerygone, Mangrove Golden Whistler, White-breasted Whistler, Mangrove Grey Fantail, White-breasted Woodswallow and Yellow White-eye. Johnstone (1990) lists 11 species of mangrove birds known from the Pilbara coastline. The two additional species comprise the Mangrove Robin and Shining Flycatcher. While the Mangrove Robin would be expected to occur in the mangroves of the project area, all Pilbara records of the Shining Flycatcher have come from mangroves between Cossack and Point Sampson (Johnstone, 1990), and the latter species is therefore not expected to occur in the project area. Twenty one additional species were recorded from, or adjacent to, the mangals (Table 5.2). Many of these species such as the Little Egret, Brahminy Kite, Sacred Kingfisher, Variegated Fairy-wren, Tree Martin, Brown Honeyeater and Singing Honeyeater are either largely dependent on or frequent visitors to the mangroves (Johnstone, 1990).

#### Coastal Dunes

A total of 14 species was recorded from this habitat. The Singing Honeyeater was particularly common in the Acacia behind the foredunes. Other species from the thickets include species such as the Redthroat and the Variegated Fairy-wren.

• Samphire

A total of 14 species was recorded from this habitat, including many species more common in adjacent habitats (eg. the Singing Bushlark, Zebra Finch and Yellow White-eye). The Eastern Curlew and Ruddy Turnstone were noted foraging in the mudflats on the margins of the samphire.

Creeklines

Although only accounting for a relatively small proportion of the entire project area, this habitat supported the most species rich bird community by far. Fifty three species were recorded, including the Pacific Black Duck, Pheasant Coucal, Bluewinged Kookaburra and White-plumed Honeyeater which were largely restricted to this habitat type in the region, and more cosmopolitan species such as the Nankeen Kestrel, Singing Honeyeater, Black-faced Woodswallow and Zebra Finch. The habitat also supported the greatest concentration of birds, with large flocks (in excess of 500) of Corella and Galah frequently observed. Although Fairy Martins were not recorded during the survey, nests of this species were observed along the North West Coastal Highway in a culvert on Eramurra Creek. The occurrence of this species in the region has possibly increased in the region as a result of the provision of nesting locations (bridges and culverts etc) and ponding water in such locations.

Cracking Clays

After the Creekline, this habitat supported the next most species rich avian assemblage with a total of 24 species. The Singing Bushlark was particularly abundant in this habitat, and may well represent one of the most abundant species within the surveyed area given the extent of cracking clays. It was the only habitat from which the Hooded Robin and Black-eared Cuckoo were recorded.

• Stony Plains

The stony plains habitat was particularly uniform, comprising mostly vegetation type ROp1. This uniform nature is reflected by the relatively low species count of 12. The tally includes the White-necked Heron which was observed flying overhead during a census, and the Singing Bushlark which was recorded from patches of grasses in poorly drained areas. These areas of grasses were often quite small (ie. less than 20m<sup>2</sup>). It was the only habitat from which the Rufous-crowned Emu-wren was recorded during the survey.

Low Stony hills

The avifauna of this habitat was similar to both the Stony Plains and Rocky Hills and Outcrops habitats. Only 13 species were recorded.

• Rocky hills and outcrops

With just 12 species recorded, this habitat supported the least species rich bird assemblage along with the Stony Plains habitat.

Other

Records of the Bush Stone-curlew and Spotted Nightjar from the Highway and access corridor respectively have not been assigned a habitat. Habitat preferences for these species are lightly wooded company and sparsely vegetated areas respectively (Johnstone & Storr, 1998).

# 5.2 Mammals

#### Introduction

No systematic survey work has occurred in the project area prior to the current survey. Ongoing survey work of islands in the region and at Cane River is being undertaken by CALM. As with the avifauna, the mammals of the Carnarvon Basin, the northern boundary of which lies approximately 100 km to the south of the project area, have been described.

Note that the identification of some specimens lodged with the Western Australian Museum have yet to be determined. The M – numbers of these specimens have been assigned an asterisk (\*).

#### Assemblage

The survey recorded 22 species of mammals comprising the echidna, four dasyurids, two macropods, two molossid bats, three vespertilionid bats, five native and one introduced murid rodent, two canids, one felid and one bovid.

None of the mammal species were recorded in large numbers, with the exception of the Euro *Macropus robustus* which was particularly abundant. The most commonly trapped species was the bat *Mormopterus loriae cobourgiana* (20 records) followed by *Sminthopsis macroura* (16 records). The next most commonly recorded species was *Ningaui timealeyi* (13 records) (Table 5.4).

Bats comprise a significant component of the mammal assemblage in the Pilbara region of Western Australia. Approximately 18 chiropteran species have been recorded from the region, including two megachiropterans (flying foxes) and 16 microchiropterans (insect-eating bats). They utilise a range of habitats, some of which are found in the lease area (Table 5.5). Although summarised in the annotated list below, they are discussed in more detail in Section 5.2.1.

Of the 73 total mammal records, the Dasyuridae accounted for the greatest proportion (49%), followed by the three species of molossid bats (29%). The murid rodents comprised 14% of all records. The total number of captures translates to an approximate trap success rate of 3.2%. This low trap success is attributed in part to the fact that much of the project area had been recently burnt prior to the survey.

# Annotated List

Table 5.4 contains the mammal records from each fauna habitat type. The species are discussed individually in the following.

# TACHYGLOSSIDAE

Echidna - Tachyglossus aculeatus

Numerous scats of this species were recorded from amongst rock outcrops on the hill slopes in the immediate vicinity of Site 4.

# DASYURIDAE

Common Planigale - Planigale maculata

Trapped on four occasions. A female was recorded from an island of *Triodia wiseana* on heavy stony soils in a mosaic of *T. wiseana* and native grasses on cracking clay. Three individuals were recorded from the *T. angusta* hummock grassland at Site 5.

# Pilbara Ningaui - Ningaui timealeyi

Thirteen records of this species. It was most common in *Triodia* spp hummock grassland on stony substrates including Sites 3 (three records), 7 (five records) and 5 (single capture). Two records also from the cracking clay at Site 1 and the creekbank at Site 10.

Stripe-faced Dunnart - *Sminthopsis macroura* Recorded on 16 occasions from five sites. Most records came from *Triodia*
*wiseana* hummock grassland on heavy soils. Absent from the rocky substrates of Site 4 and the pale coastal sands at Site 9. Seven records from the pit line at Site 2 that was centred on a raised island of *T. wiseana*. Five records from Site 5, an extensive hummock grassland of *T. angusta* on heavy stony soils. Single records from Sites 3, 6 and 8 on a low stony hill, creekline and samphire respectively.

#### Little Red Kaluta - Dasykaluta rosamondae

Trapped on four occasions. A female was recorded from an island of *Triodia wiseana* on heavy stony soils in a mosaic of *T. wiseana* and native grasses on cracking clay at Site 2. Three individuals were recorded from the *T. angusta* hummock grassland on heavy stony soils at Site 5.

#### MACROPODIDAE

Euro - Macropus robustus erubescens

Very common throughout the project area. Most females observed were with a young at heel and/or one in the pouch.

Red Kangaroo - Macropus rufus

Although not as common as the Euro, this species was regularly observed on the grassy plains.

### VESPERTILIONIDAE

Arnhem Land Long-eared Bat - *Nyctophilus arnhemensis* One adult male (M52375) was captured in a mist net set against a stand of *Rhizophora* in the main tidal river channel of Preston Creek on the 19/4/00 at 7.15pm.

#### MOLOSSIDAE

Little North-western Mastiff Bat - *Mormopterus Ioriae cobourgiana* Note that this taxa is currently undergoing revision and the nomenclature adopted here follows that currently being used by CALM (CALM, 2000).

A total of 20 individuals was captured (9 adult males, 11 adult females) in mist nets set against *Rhizophora* and with a harp trap between *Avicennia* on the 19/4/00 - 20/4/00 between 7.00 - 9.00pm. Four specimens are lodged in the Western Australian Museum (M52376 – M52379).

Northern Freetail-bat - *Chaerephon jobensis* Calls were recorded at Site 10.

Little Broad-nosed Bat - *Scotorepens greyi* Calls recorded from the Bridge of the Fortescue River Roadhouse.

Inland Cave Bat - Vespadelus finlaysoni Calls recorded from the Bridge of the Fortescue River Roadhouse.

#### MURIDAE

Short-tailed Mouse - Leggadina lakedownensis

Three animals recorded, one each from Sites 2, 3 and 7. Records to date suggest that the main habitat for this species on the mainland comprises areas of cracking clay (Mr. Stuart Anstee, pers. comm.), although they have also been recorded from rocky hills (Dr. P. Kendrick, pers comm.). Extensive areas of cracking clay occur throughout the project area and Site 2 was established within this habitat type. Site 3 was located on a low stony hill vegetated with *Triodia wiseana* adjacent to Site 2. Site 7 was located on a stony hill within the Central Ore Body and was therefore somewhat removed from areas of cracking clay.

Undescribed species - Pseudomys sp. "hamersley"

Several individuals of this as yet undescribed species were recorded from the survey area. Ms. Norah Cooper of the WA Museum has confirmed the identity of M52371 recorded from Site 10. In most cases live individuals are readily distinguishable from both *P. hermannsburgensis* and *P. chapmani*, based on pelage. The undercoat of this species is relatively uniform like *P. chapmani*, but

unlike this species it has numerous guard hairs.

#### Western Pebble-mound Mouse - Pseudomys chapmani

A small active mound of this species was observed at Site 7 on a low stony hill. The mound had a raised parapet around the entrance and was also observed by Mr K. Armstrong who scored it as a "7" on the scale developed by Anstee (1996). Many of the pebbles appeared to have been recently added to the parapet, as soil was noted adhering to the pebble surface despite heavy rainfall in the preceding week. Numerous old mounds were recorded throughout suitable habitat in the project area. Another active mound of this species is know from the area (Mr. Stephen van Leeuwen, pers. comm.).

#### Delicate Mouse - Pseudomys delicatulus

Recorded on two occasions, including one from the pale coastal sands at Site 9 and one from Site 7 on a low stony hill within the Central Ore Body. Two specimens have been lodged with the WAM (M52364\* and M52374\*).

Sandy Inland Mouse - *Pseudomys hermannsburgensis* Four records of this species all from site 9 including M52372, M52365, M52382 and M52368\*.

# INTRODUCED MAMMALS

#### MURIDAE

House Mouse - *Mus musculus* A single *Mus* was captured in an Elliott trap from Buffel grass fringing Edward Creek at Site 6.

#### CANIDAE

Dingo - *Canis lupus dingo* A single animal was observed near the bank of Edward Creek at Site 6.

Red Fox - Vulpes vulpes Tracks of this species were common along the beach and coastal dunes on Cape Preston.

#### FELIDAE

Cat - *Felis catus* Tracks of this species were seen in the dunes at Site 9.

#### BOVIDAE

Sheep - Ovis aries

Sheep are still run on the pastoral station and several large flocks were observed at a number of localities including Edward Creek at Site 10 and near Marda Well.

#### Habitat Utilisation

Beach

Just one species, the Red Fox *Vulpes vulpes,* was recorded from its track along the beaches of Cape Preston.

Coastal Dunes

Four species were recorded from this habitat during the survey, including two species of murid rodent (the Delicate Mouse *Pseudomys delicatulus* and the Inland Sandy Mouse *P. hermannsburgensis*). The introduced Red Fox *Vulpes vulpes* and Feral Cat *Felis catus* were also recorded.

• Mangroves (Mangals)

Just two species were recorded from this habitat, both bats. *Nyctophilus arnhemensis* and *Mormopterus loriae cobourgiana* were captured in mist nets set against *Rhizophora* and with a harp trap in a cleared access-way within a dense stand of *Avicennia*.

#### • Samphire

Just one species, the Stripe-faced Dunnart *Sminthopsis macroura*, was recorded from this habitat.

Creeklines

Much of the original understorey of this habitat within the two trapping grids had been replaced by Buffel grass \**Cenchrus ciliaris*. It was the only habitat from which the House Mouse *Mus musculus* was recorded. Also recorded were the Dingo *Canis lupus familiaris*, Sheep *Ovis aries*, Pilbara Ningaui *Ningaui timealeyi*, Stripe-faced Dunnart *Sminthopsis macroura*, and an as yet undescribed species of murid rodent *Pseudomys* sp "hamersley".

Cracking Clays

The systematic trapping grids within this habitat yielded five species of mammals including the Little Red Kaluta *Dasykaluta rosamondae*, Pilbara Ningaui *Ningaui timealeyi*, Common Planigale *Planigale maculata* and Stripe-faced Dunnart *Sminthopsis macroura*. In addition, both species of macropod *M. rufus* and *M. robustus* were observed opportunistically in this habitat across the project area. Calls of the Northern Freetail Bat *Chaerephon jobensis* were heard from above the canopy.

• Stony Plains

Just four species of mammals (all dasyurids) were recorded from this habitat during the course of the survey. They included the Little Red Kaluta *Dasykaluta rosamondae*, Pilbara Ningaui *Ningaui timealeyi*, Common Planigale *Planigale maculata* and the Stripe-faced Dunnart *Sminthopsis macroura*.

Low Stony hills

Three species of rodent and two dasyurids were recorded from this habitat. The rodents included *Leggadina lakedownensis*, *Pseudomys delicatulus* and evidence of *P chapmani* in the form of an active mound. The dasyurids were *Ningaui timealeyi* and *Sminthopsis macroura*.

• Rocky Hills and Outcrops

The Euro and Echidna were the only two species recorded from the systematic censusing site within this habitat.

**Table 5.4. Mammals recorded from the Austeel project area (**Be = Beach, CC = Cracking Clay, CD = Coastal Dunes, CL = Creekline, LH = Low Hills, Ma = Mangroves, RH = Rocky Hill, S = Samphire, SP = Stony Plain, TC = Tidal Creek, Opp = Opportunistic).

Species Habitats												
NATIVE MAMMALS Be CC CD CL LH Ma RH S SP Opp T												
TACHYGLOSSIDAE												
Echidna - Tachyglossus aculeatus							1				1	
DASYURIDAE												
Common Planigale - Planigale maculata		1							2		3	
Pilbara Ningaui - Ningaui timealeyi		2		2	8				1		13	
Stripe-faced Dunnart - Sminthopsis macroura		7		1	1			1	6		16	
Little Red Kaluta - Dasykaluta rosamondae		1							3		4	
MACROPODIDAE												
Euro - Macropus robustus erubescens		Ν					S			Ν	Ν	
Red Kangaroo - Macropus rufus		Ν								Ν	Ν	
VESPERTILIONIDAE												
?Little Broad-nosed Bat – Scotorepens greyi				С							?C	
?Inland Cave Bat – Vespadelus finlaysoni				С							?C	
Arnhem Land Long-eared Bat - Nyctophilus arnhemensis						1					1	
MOLOSSIDAE												
Little North-western Mastiff Bat - Mormopterus Ioriae						20					20	
cobourgiana Northern Freetail-bat - Chaerenhon inhensis				1							1	
MIRIDAE				•								
Short-tailed Mouse - Leggadina lakedownensis		1			2						3	
Undescribed species - Desudamus sp. "hamersley"		'		1	2						1	
Western Pehble-mound Mouse - Pseudomys chapmani				•	\$						۱ ۲	
Delicate Mouse - Resudomys delicatulus			1		1						2	
Sandy Inland Mouse - Pseudomys bermannsburgensis			1		· ·						2 1	
			4								4	
House Mouse - Mus musculus				1							1	
				•								
Dingo - Canis Junus dingo				1							1	
Red Fox - Vulpes vulpes	S		1								1	
FFLIDAF			·									
Cat - Felis catus			1								1	
BOVIDAE												
Sheep - Ovis aries				S							S	
Species Richness	1	7	4	9	5	2	2	1	4	2	22	

# 5.2.1 Bats

A summary of the species recorded and echolocation call parameters is presented in Table 5.6. Positive identification was made of the two species captured (using the key in Churchill, 1998) and a number of calls are tentatively presented as identification of three other species. Two species have a reported strong preference for mangal habitats.

In the mangal, two species were captured and recorded: *Nyctophilus arnhemensis* and *Mormopterus loriae cobourgiana*. The genus *Mormopterus* is currently undergoing revision. The *Mormopterus* captured in this survey correspond with 'Population U' of Adams *et al.* (1988), which is currently known as *M. loriae cobourgensis* (Churchill, 1998) although the nomenclature used here follows CALM (2000) (ie. *M. loriae cobourgiana*).

Only one individual of *N. arnhemensis* was captured; an adult male in a mist net against a stand of *Rhizophora* in the main tidal river channel (19/4/00, 7:15 p.m.).

This bat species has a preference for mangal habitats (Churchill, 1998). The specimen is lodged in the Western Australian Museum (WAM number M52375).

*M. loriae cobourgiana* was captured in mist nets against *Rhizophora* and with the harp trap between *Avicennia* (19/4/00 – 20/4/00, 7.00 - 9.00 p.m.). A total of 20 individuals was captured (9 adult males, 11 adult females, none in reproductive condition, mean  $\pm$  SE forearm length = 33.94  $\pm$  0.17 mm, mean  $\pm$  SE weight = 6.8  $\pm$  0.08 mm). Although the diet of this species has not been studied, it is possible that they were foraging on the numerous moths observed flying around the mangrove trees. All bat captures (including *N. arnhemensis*) had insect material in their mouth indicating that they were foraging in the mangrove species, although it does move to adjacent areas. They are recorded as roosting in hollows of *Avicennia* above the high tide mark and form congregations soon after emergence before dispersing to feed (Churchill, 1998). Four specimens are lodged in the WAM (M52376 – M52379).

Calls of three other bat species are tentatively included in this report, although positive identification could not be made without a capture.

No captures were made at Site 6 or Site 10 both within Edward Creek. A bat call sequence was recorded at Site 6 (23/4/00) but was not of sufficient quality for identification. Calls of *Chaerephon jobensis* were recorded at Site 10 (24/4/00; Figure 5.1). A small group of three or more was observed foraging above and within the canopy of burnt Eucalypts in the confines of the riparian zone.

One bat species was recorded foraging over Du Boulay Creek at the ford (**GPS**), however the call was not of sufficient quality for identification.

Two species were recorded from the Fortescue River Bridge (Table 5.6). Calls of *Scotorepens greyi* (Figure 5.2) and *Vespadelus findlaysoni* (Figure 5.3) were identified with some certainty. Other low frequency, narrow band calls were not of sufficient quality for identification. The bat species recorded at the bridge are also likely to occur within the project area, given the close proximity of the bridge and the fact that the Fortescue River runs through the lease area.

#### Summary

1. The comprehensiveness of this survey was limited by time constraints.

2. The mangal constitutes an important habitat for *N. arnhemensis* and *M. loriae cobourgiana*. The size of the mangal habitat at Cape Preston indicates that good populations of these species are likely to be present and therefore the loss of this mangal would be detrimental, at least locally.

3. The status of the other bats identified in this survey is currently secure and development would not have any major foreseeable impact on the populations.

# Table 5.5. Summary of bat species recorded in the Pilbara region (Western Australian Museum; Churchill, 1998; McKenzie & Rolfe, 1986; <sup>1</sup> Foraging habitats summarised from Churchill (1998) and are not necessarily present in the Pilbara).

Common Name	Scientific Name	Roost habitats	Foraging habitat1	Food Preference	Aerial foraging niche
Black flying-fox	Pteropus alecto	Among tree branches	Tropical and subtropical forests + woodlands	Blossoms, fruit and leaves	N/A
Little red flying-fox	Pteropus scapulatus	Among tree branches	Semi-arid to tropical eucalypt, monsoon +	Blossoms, fruit and leaves	N/A
			paperbark forests		
Yellow-bellied sheathtail bat	Saccolaimus flaviventris	Tree hollows, other unusual roosts	Forest, woodland, grassland, desert	Predominantly beetles	Above tree canopy, open areas
Common sheathtail bat	Taphozous georgianus	Caves, boulder piles and mines	Forests, woodlands, grasslands	Predominantly beetles	Above tree canopy, open areas
Hill's sheathtail bat	Taphozous hilli	Caves, boulder piles and mines	Woodlands, shrublands, grasslands	Unknown	Above tree canopy, open areas
Ghost bat	Macroderma gigas	Caves, boulder piles and mines	Rainforest, forest, woodland, grasslands, plains	Small vertebrates, grasshoppers	Sit-and-wait predator
Orange leaf-nosed bat	Rhinonicteris aurantius	Caves and mines, possibly boulder piles	Forests, woodlands, grasslands, gorges	Moths and beetles	Over grasses, over and beside shrubs
Gould's wattled bat	Chalinolobus gouldii	Tree hollows, foliage, buildings,	Most habitats	Predominantly moths but a	Within the lower level of canopy
		under bark		generalist	and along edges
Chocolate wattled bat	Chalinolobus morio	Tree hollows, buildings, under	Forest, woodland, scrub	Predominantly moths but a	Between canopy and understorey,
		bark, bridges, martin nests		generalist	forest trails
Arnhem long-eared bat	Nyctophilus arnhemensis	Under bark, among foliage of	Mangroves, open forest, woodland,	Unknown	Within dense thickets and tunnel-
		some trees	paperbark forest		like passages
Northern long-eared bat	Nyctophilus bifax	Under bark, tree hollows,	Rainforest, monsoon forest, riverine	Predominantly moths	Edge of tree canopy, inside stands
		epiphytes and fig roots, foliage	paperbark forest		
Lesser long-eared bat	Nyctophilus geoffroyi	Tree hollows, foliage, buildings, under bark	Various: forest, woodland, scrub	Predominantly moths but a generalist	Gleaner, in and around vegetation
Little broad-nosed bat	Scotorepens greyii	Mainly tree hollows, man-made	Monsoon and paperbark forest, woodland,	Generalist	Around, against and inside
		structures	grassland		vegetation, waterholes
Inland cave bat	Vespadelus findlaysoni	Caves, rock crevices and mines	Grassland, woodland, open forest near cavernous areas	Unknown	In and around vegetation
Northern freetail bat	Chaerephon jobensis	Tree hollows, caves and buildings	Monsoon and paperbark forests, woodland, savanna	Predominantly moths but a generalist	Above tree canopy
Beccari's freetail bat	Mormopterus beccari	Tree hollows	Rainforest, woodland, grassland,	Moths and beetles	Above tree canopy, along
			watercourses		watercourses, over water
Little western freetail bat	Mormopterus loriae	Spouts and crevices in mangroves	Restricted to mangroves and adjacent areas	Unknown	Above and beside forest canopy,
	cobourgiana				along passages
White-striped freetail bat	Tadarida australis	Trees	Forest, woodland, scrub, urban	Moths and beetles	Open areas, above canopy,
					ground



Figure 5.1. Call sequence of free-flying *Chaerophon jobensis* from Fauna Site 10. Recorded from a small group observed foraging above and beside a canopy of burnt eucalypt in a drainage line (Division ratio 16, F7 time expansion).



Figure 5.2. Call sequence from a free-flying *Scotorepens greyi* beneath the Fortescue River Bridge (Division ratio 16, F7 time expansion).





# Table 5.6: A summary of the species recorded and echolocation call parameters.

Species	Site	Method of ID <sup>A</sup>	$F_{min}^{B}$	<b>F</b> <sub>max</sub> <sup>B</sup>	DUR <sup>B</sup>	No. pulses <sup>c</sup>	Function 1 <sup>D</sup>	Function $2^{D}$	CS <sup>⊭</sup>
Nyctophilus arnhemensis	Mangal	Capture	-	-	-		-	-	LC (lc)
Scotorepens greyii	Fortescue R. Bridge	Ċall	36.8	38.8	7.6	10	5.0	2.0	LC (lc)
Vespadelus findlaysoni	Fortescue R. Bridge	Call	58.1	70.1	5.7	9	20.3	-4.0	LC (lc)
Chaerophon jobensis	Fauna Site 10	Call	19.5	38	11.1	8	-6.6	1.4	LC (lc)
			20.9	39.5	11.6	14	-5.5	1.1	
			19.6	39	9.2	4	-6.8	2.0	
Mormopterus loriae cobourgensis	Mangal	Capture	-	-	-		-	-	DD

# 5.3 Herpetofauna

# Introduction

The most applicable of the regional reviews is that of the herpetofauna of the Onslow Region (Storr & Harold, 1985). These authors documented 96 species of herpetofauna from 12 families and 49 genera, which compares to 114 species from the Exmouth area documented by Storr & Hanlon (1980). Clearly these tallys would need to be reviewed in light of additional collections and taxonomic changes subsequent to publication.

# The Assemblage

The current survey recorded 228 records of 57 reptile species comprising one sea-turtle, seven agamids (dragon lizards), two varanids (monitors), eight geckos, four pygopodids (legless lizards), 22 skinks, three pythons, six elapids (front-fanged snakes), three blind snakes and one sea-snake. One additional skink *Cryptoblepharus carnabyi* was tentatively identified from a rock pile within the project area. A new species of *Ctenotus* was identified during the course of the survey.

Evidence of nesting by sea-turtles was observed on one beach however the species involved was unclear. This is not included in the tally above but is shown in Tables 5.7 and 5.8 and Appendix F.

The survey also recorded two hylid frogs, *Litoria rubella* and *Cyclorana maini*. Calls of a third frog were tentatively identified as belonging to *Uperoleia russelli*.

Table 5.7 summarises the records of herpetofauna from each fauna habitat type and opportunistic collections. Each species is discussed individually in the following.

# Annotated List

# HYLIDAE

Recorded from Site 10 at Edward Creek during spotlighting activities.

# Cyclorana maini

Litoria rubella

Very common. Large numbers of individuals were recorded across a range of habitats, although most records came from the drainage line and samphire habitats. Twenty-two records came from Sites 6 and 10 established in drainage lines. Sixteen trapping events were recorded from Site 8 established in a samphire flat. Single records also came from Sites 2 and 5. The samphire was bordered by coastal dunes, an extensive area of mudflats, rocky hills and lay just below Preston Creek.

Uperoleia russelli

Calls of this species were recorded from Edward Creek at Site 10, amongst clumps of reeds in a gravel river bed.

# CHELONIDAE

Chelonia mydas

A number of green turtles were seen both in Preston Creek and in the water near the beach along the western side of Cape Preston.

#### Chelonia sp.

Body holes were noted on a broad beach on the western side of Cape Preston. It is unclear which species of turtle is using these beaches for nesting, since Greens, Flatbacks and Hawksbills are all known to nest in the region. Loggerheads have also been recorded from Exmouth and the Muiron Islands.

# AGAMIDAE

#### Amphibolurus gilberti

Positive identification of this species was made from the mangrove communities but none were captured. No assessment of its abundance was made.

#### Amphibolurus longirostris

Moderately common to common along the creeklines and larger drainage systems of the project area. One large male (R141373) was captured from Site 6 during the survey. Juvenile animals were also very common in the *Spinifex longifolius* clumps on the coastal dunes especially near Site 9. One individual (R141302) was pit-trapped from Site 9.

#### Ctenophorus caudicinctus

Moderately common. This species is not as abundant at this locality as in parts of the eastern Pilbara. Six individuals were recorded during the survey, comprising four (including R141345) from beneath rocks on a granite outcrop at Site 75, one (R141305) from cracking clay at Marda Well and one from the banks of Edward Creek at Site 6 (R141337). This species' low abundance may in part be a result of the fire which had burnt much of the suitable habitat within the project area.

#### Ctenophorus isolepis

Very common on sandy substrates, particularly coastal dunes (eg. Site 9). Despite the abundance of this species, relatively few were captured. Seven were pit-trapped on the pale coastal sands of the dunes at Site 9 (including R141364), one was pit-trapped on samphire at Site 8 and another animal (R141315) was hand captured from coastal dunes vegetated with *Spinifex longifolius* adjacent to Site 8.

#### Ctenophorus nuchalis

Scarce. A single animal was pit-trapped from samphire at Site 8.

#### Pogona minor mitchelli

Moderately common across a variety of habitats including cracking clays (Site 2), rocky hills (Site 4), coastal dunes (Site 9) and creeklines (several opportunistic collections).

#### Tympanocryptus cephala

Although only recorded twice, this cryptic species could easily have been overlooked on occasions. One animal (R141336) was excavated during construction of the fence-line at Site 1 whilst a second (R141351) was pit-trapped at the same site. Habitat at this site comprised cracking clay vegetated with a variety of native grasses including *Chrysopogon fallax*.

#### GEKKONIDAE

*Diplodactylus conspicillatus* A single individual (R141359) was trapped from Site 3 during the survey. This species is probably more common than this record suggests, and targeted spotlighting would undoubtedly yield further records.

#### Diplodactylus mitchelli

A single individual (R141285) was pit-trapped from Site 3 (a low stony hill vegetated with *Triodia wiseana*).

#### Diplodactylus savagei

One animal (R141346) pit-trapped from Site 5 (stony plain vegetated with *Triodia* angusta).

#### Gehyra pilbara

Single animal (R141314) hand captured from a rock pile at Site 4. No termitaria were seen in the project area.

#### Gehyra punctata

Very common. Recorded from rock piles and other rocky habitats including a granite outcrop and windrows where rocks had piled up. Twenty-four individuals were recorded across four sites, including five captures from the granite outcrop at Site 75 (R141386 - 389, R141392), 17 captures from amongst rocks at Site 4 (including R141295, R141299, R141312, R141332-33, R141344, R141352), and one capture from Site 1 (R141338) and Site 3 (R141284).

#### Gehyra variegata

Uncommon. This species was largely restricted to drainage lines where it was found under bark of dead trees (n=3). On the coastal dunes (Site 9) it was found in a number of microhabitats, including one animal (R141282) inside a large baler shell.

#### Heteronotia binoei

Eight animals recorded from six sites including Sites 1 (R141355), 2, 5 (R141347), 6, 7 and 10.

#### Nephrurus wheeleri cinctus

Although just one individual (R141385) was pit-trapped from Site 7, several more were observed on the North West Coastal Highway whilst spotlighting. It is likely that additional individuals would be located within the project area given the opportunity to do further spotlighting.

#### PYGOPODIDAE

Delma nasuta

Two animals (including R141317) pit-trapped from Site 7 (low stony hill).

#### Delma pax

A single animal (R141311) pit-trapped from the banks of Edward Creek at Site 6.

#### Lialis burtonis

Moderately common. Typically observed crossing vehicle tracks in a range of habitats including samphire (Site 8) (R141384) and rocky hills (Site 4). Numerous specimens also seen crossing the North West Coastal Highway whilst spotlighting.

#### Pygopus nigriceps

Pit-trapped on four occasions from three sites, including Sites 1 (R141353), 2 (R141383) and 6. Also captured opportunistically from cracking clays adjacent to Site 3.

#### Carlia munda

### SCINCIDAE

Commonly recorded species, particularly from Edward Creek (Site 6) where 14 capture events were recorded (including R141283, R141316 and R141354). Five records from Site 1 (including R141350) and single capture events at Sites 2 and 10.

# *Carlia tricantha* A single adult male (R141292) was recorded from samphire (Site 8).

#### Cryptoblepharus plagiocephalus

One individual was observed on the branches of a dead Eucalypt at Site 6. Unfortunately the animal avoided capture.

#### Cryptoblepharus carnabyi

Observed on a rock pile near Site 86. Unlike *C. plagiocephalus,* which is grey, this second individual was a coppery colour.

#### Ctenotus sp. nov.

Single specimen (R141577) captured from stony clay soil vegetated with *Triodia* at Site 2. According to Mr. Greg Harold (pers. comm.) this may represent the Pilbara form of *Ctenotus uber*.

#### Ctenotus affin. helenae

Typically recorded from stony substrates vegetated with *Triodia wiseana*. One animal (R141280) recorded from the loamy soil on the banks of Edward Creek at Site 6. Two individuals were pit-trapped from the stony islands within expanses of cracking clay at Site 2 (including R141300), one record from Site 4 (R141307) and two records from the low stony hill at Site 7 (including R141301).

#### Ctenotus affin. robustus

Pit-trapped on cracking clay or creeklines contiguous with cracking clay. A single individual (R141372) was recorded from Site 1, whilst two animals (including R141379) were collected from Site 10.

#### Ctenotus duricola

Collected from stony soils at Site 4 and Site 7 (R141296).

#### Ctenotus grandis titan

Four individuals (including R141390) collected from the stony soils at Site 7.

#### Ctenotus pantherinus ocellifer

Recorded from a range of habitats predominantly vegetated with *Triodia* species. The single exception was a juvenile animal hand-collected from the pit fence-line set in samphire at Site 8. A single individual (R141391) was trapped at Site 1, two (R141310 and R141377) were recorded from Site 3, a single animal was recorded from Site 4 and another was collected from a sand chenier on the mudflat at the base of Cape Preston.

#### Ctenotus saxatilis

Nine records from rocky substrates, comprising seven (including R141380) from Site 4 and two from Site 7. Adult animals were captured using medium-sized Elliott traps whilst juveniles were pit-trapped.

#### Ctenotus serventyi

Three records of this species, all from sandy substrates. Two individuals (including R141288) captured on the pale coastal dunes at Site 9 and a single animal (R141304) from a chenier in the mudflats at the base of Cape Preston.

#### Cyclodomorphus melanops melanops

Recorded from *Triodia wiseana* hummock grassland and from creeklines. Two individuals were collected from Site 6 (Edward Creek), and one animal was collected from each of Sites 3 (low stony hill) (R141329), 5 (stony plain) (R141375) and 7 (low stony hill).

#### Egernia depressa

Recorded from rocky habitats. One individual captured from beneath an exfoliating slab of granite at Site 75, a second (R141371) was captured in an Elliott trap at Site 3 and a third was observed in a rock pile at Site 4.

#### Glaphyromorphus isolepis

Three records (including R141382) of this species, all from the banks of Edward Creek at Site 6.

#### Lerista bipes

Very common in the pale sands of the coastal sand dunes of Cape Preston. Nine individuals (including R141339 - 41, R141361 - 62) were captured from Site 9, with numerous tracks observed throughout the dunes.

Lerista elegans

Recorded on two occasions. One individual (R141330) pit-trapped from a mosaic of dense *Cenchrus* and *Triodia* on the banks of Edward Creek at Site 10 and the second (R141334) from *Triodia angusta* hummock grassland on heavy stony soils at Site 5.

#### Lerista muelleri

Four specimens recorded from three sites. Note that this species was identified as true *L. muelleri* according to the latest revision of the species complex (Mr. Laurie Smith WA Museum, pers. comm.). Two animals (R141298 and R141357) pit-trapped from the dense *Cenchrus* on the banks of Edward Creek at Site 6, one (R141369) hand captured from the pit fence-line at Site 4 and another pit-trapped within dense grasses at Site 1.

#### Menetia greyii

Nineteen records of this very common species. Pit-trapped from seven sites typically vegetated with *Triodia wiseana*. Apparently absent from the creekline and sand dune sites. One from Site 1, three (including R141363 and R141365) from Site 2, six (including R141331 and R141356) from Site 4, six also (including R141348, R141360, R141368 and R141370) from Site 5, one (R141367) from Site 7 and one (R141297) from Site 8.

#### Menetia surda

Uncommon. Pit-trapped (R141342) from the banks of Edward Creek at Site 6 and also from the *Triodia angusta* hummock grassland at Site 5 (R141291).

#### Proablepharus reginae

One animal (R141290) hand-captured from *Triodia wiseana* hummock grassland on rocky skeletal soil at Site 4.

#### Tiliqua multifasciata

Six records of this species from four sites. Captured in pits and medium sized Elliott traps. A single animal (R141289) recorded from a mosaic of native grasses and *Triodia wiseana* at Site 2. Single records also from the banks of Edward Creek at Sites 6 and 10, and three records from a narrow drainage feature at Site 7.

# VARANIDAE

Uncommon. Recorded on five occasions and always on rocky habitat. Two individuals (including R141395) were collected from beneath rocks on a granite outcrop at Site 74, one individual (R141394) was collected from beneath a large rock on the Central Ore Body and single animals were trapped at Sites 2 (cracking clay) and 7 (low stony hill).

#### Varanus panoptes

Varanus acanthurus

Uncommon. Observed on three occasions during the survey. Recorded from Sites 2, 4 and 10.

#### **TYPHLOPIDAE**

*Rhamphotyphlops diversus ammodytes* One animal (R141313) pit-trapped from heavy soils associated with the samphire habitat at Site 8 and a second pit-trapped from cracking clay at Site 2 (R141306).

#### Rhamphotyphlops grypus

A single specimen (R141287) pit-trapped from the stony soils adjacent to a drainage feature at Site 7.

*Rhamphotyphlops hamatus* Pit-trapped from stony soils at Site 3 (R141303).

#### BOIDAE

#### Antaresia perthensis

One individual seen crossing the North West Coastal Highway near the intersection with the access road. Additional road kills were seen frequently on the North West Coastal Highway between the access road and the Fortescue Roadhouse.

#### Antaresia stimsoni

Acanthophis wellsi

A single road kill recorded from the North West Coastal Highway close to the proposed access corridor.

#### Aspidites melanocephalus

One individual hand-captured from the access road adjacent to Site 75 and a second seen crossing the track near Site 105.

### ELAPIDAE

One animal observed basking on the track adjacent to Site 8 and a second observed on the North West Coastal Highway adjacent to the proposed access corridor. Additional sightings were made on the North West Coastal Highway on most nights of the survey, including numerous road kills. One freshly killed individual (R141281) was vouchered.

#### Demansia psammophis cupreiceps

Four animals recorded including three from the clayey soils of Sites 1 (including R141396) and 2 (R141402). One specimen also recorded from the *Triodia wiseana* hummock grassland at Site 7.

#### Parasuta monachus

Recorded on three occasions from or adjacent to creeklines. Two animals (R141399 and R141401) pit-trapped from the banks of Edward Creek at Site 6 and the third (R141293) observed crossing the access track adjacent to Eramurra Creek whilst spotlighting.

#### Parasuta punctata

Recorded twice. One animal (R141397) hand-captured from clayey soils at Site 1 and the second (R141398) from *Triodia wiseana* hummock grassland on stony soils at Site 3.

#### Pseudechis australis

Two records of this species, both from the access track adjacent to Site 85. The records may represent the same individual.

#### Pseudonaja nuchalis

One individual seen basking in the open between *Triodia wiseana* hummocks on the rocky slopes at Site 4.

#### HYDROPHIIDAE

*Hydrelaps darwiniensis* Several individuals observed amongst the mangroves.

# Table 5.7. Herpetofauna recorded from the project area during the survey of the Austeel project area.

	1	2	3	4	5	6	7	8	9	10	75	86	105	200	201	300	301	302	303	Орр	Tot
HYLIDAE																					
Litoria rubella										С											С
Cyclorana maini		1			1	22		16		22											62
MYOBATRACHIDAE																					
Uperoleia russelli										С											С
CHELONIDAE																					
Chelonia mydas															3						3
Chelonia sp.															1						1
AGAMIDAE																					
Ctenophorus caudicinctus						1					4							1			6
Ctenophorus isolepis								2	6												8
Ctenophorus nuchalis								1													1
Amphibolurus gilberti														1							1
Amphibolurus longirostris						1			1												2
Pogona minor mitchelli		2		1					1								1			1	6
Tympanocryptus cephala	1																				1
GEKKONIDAE																					
Diplodactylus conspicillatus			1																		1
Diplodactylus mitchelli		1																			1
Diplodactylus savagei					1																1
Gehyra pilbara				1																	1
Gehyra punctata	1		1	17							5										24
Gehyra variegata						3			1												4
Heteronotia binoei	1	1			2	2	1			1											8
Nephrurus wheeleri cinctus							1														1
PYGOPODIDAE																					
Delma nasuta							2														2
Delma pax			1			1	1	1								1	1		1	1	1
Lialis burtonis				1		1	1	1								1	1		1	2	4
Pygopus nigriceps	1	1				1														1	4

# Table 5.7. Herpetofauna recorded from the project area during the survey of the Austeel project area.

	1	2	3	4	5	6	7	8	9	10	75	86	105	200	201	300	301	302	303	Opp	Tot
SCINCIDAE																					
Carlia munda	5	1				14				1											21
Carlia tricantha								1													1
Cryptoblepharus plagiocephalus						1															1
Cryptoblepharus carnabyi																				1	1
Ctenotus sp. nov.		1																			1
Ctenotus affin helenae		1		1		1	2														5
Ctenotus affin robustus	1									2											3
Ctenotus duricola				1			1														2
Ctenotus grandis titan							4														4
Ctenotus pantherinus ocellifer	1		2	1				1								1					6
Ctenotus saxatilis				7			2														9
Ctenotus serventyi									1							2					3
Cyclodomorphus melanops melanops			1		1	2	1													1	6
Egernia depressa			1	1							1										3
Glaphyromorphus isolepis						3															3
Lerista bipes									12												12
Lerista elegans					1					1											2
Lerista muelleri	1			1		2															4
Menetia greyii	1	3		6	6		1	1												1	19
Menetia surda					1	1															2
Proablepharus reginae				1																	1
Tiliqua multifasciata		1				1	3			1											6
VARANIDAE																					
Varanus acanthurus		1	1	1		1	1				2					1	1	1	1		5
Varanus panoptes		1		1						1											3

Table 5.7. Herpetofauna recorded from the project area during the survey of the Austeel project area.

	1	2	3	4	5	6	7	8	9	10	75	86	105	200	201	300	301	302	303	Орр	Tot
TYPHLOPIDAE																					
Rhamphotyphlops diversus ammodytes		1						1													2
Rhamphotyphlops grypus							1														1
Rhamphotyphlops hamatus			1																		1
BOIDAE																					
Antaresia perthensis											1										1
Antaresia stimsoni											1										1
Aspidites melanocephalus											1		1								2
ELAPIDAE																					
Acanthophis wellsi								1			1										2
Demansia psammophis cupreiceps	1	2					1														4
Parasuta monachus						2					1										3
Parasuta punctata	1		1																		2
Pseudechis australis												2									2
Pseudonaja nuchalis				1																	1
HYDROPHIIDAE																					
Hydrelaps darwiniensis															1						1
Total number of records	15	18	8	41	13	58	21	25	22	29	17	2	1	1	5	3	1	1	1	7	289
Number of species	11	14	7	14	7	16	13	9	6	9	9	1	1	1	3	2	1	1	1	6	61*

\* Note that this tally includes evidence of nesting marine turtles.

#### Summary

A search of the Western Australian Museum database was commissioned for herpetofauna collected from a rectangular area encompassing the project area (Northern Latitude 20.75°S; Southern Latitude 21.3333°S; Western Longitude 116°E and Eastern Longitude 116.3333°E). This yielded just 18 species, reflecting the relatively poor sampling history in this locality (Appendix F). This compares to a grand total of 60 species for the project area, including 46 taxa not on the list provided by the Museum. Only four species *Furina ornata*, *Pseudonaja modesta*, *Diplodactylus stenodactylus* and *Rhynchoedura ornata* that are listed on the Museum database were not recorded from the survey area.

The tally of 60 species recorded during the current survey represents a diverse herpetofaunal community and compares favourably with other Pilbara localities such as the Abydos-Woodstock reserve (73 species: How *et al.*, 1991), Karijini National Park (73 species: *in* How *et al.*, 1991), Hope Downs project area (62 species; Halpern Glick Maunsell, 2000b) and the Mining Area C project area (46 species; in HGM, 2000). This is particularly significant when relative sampling effort is taken into consideration. Although the single survey added a considerable number of records to the previously collected herpetofauna assemblage for the area, further survey effort will undoubtedly record additional species.

The project area is known to, or may support, a number of Pilbara endemics or geographically restricted taxa. These include *Diplodactylus mitchelli, D. savagei, Nephrurus wheeleri cinctus, Ctenotus angusticeps, C. duricola, C. grandis titan, Egernia pilbarensis, Lerista quadrivincula, Morethia ruficauda exquisita, Notoscincus butleri, Ramphotyphlops diversus ammodytes, Demansia rufescens* and *Acanthophis wellsi.* The distribution of the as yet undescribed species *Ctenotus* aff. *robustus* is not understood, however it has been recorded from areas of cracking clay in the west Pilbara (Hamersley Iron's Nammuldi/Silvergrass lease, Roy Teale, pers. obs. 1999). The new species of *Ctenotus* recorded during this survey is only known from the single record at this locality. However, it may represent the northern form of the *Ctenotus uber* species complex (Greg Harold, pers. comm.). Further survey effort is required to determine its distribution and abundance in the project area.

Aplin *et al.* (ms) provide a summary of the herpetofauna assemblage of the Pilbara region (ie. those species that are either endemic or have disjunct populations in the region). These authors identify 33 reptiles and two frogs as belonging to this assemblage. Many of these species, whilst relatively geographically restricted, do not appear to be uncommon. Species such as *Acanthophis wellsi, Nephrurus wheeleri cinctus, Ctenotus duricola* and *C. grandis titan* are recorded relatively often. In contrast, some species such as *Egernia pilbarensis* appear to be genuinely uncommon.

The most commonly captured species were the gecko *Gehyra punctata* (24 records) and the smaller skinks *Carlia munda* (21 records), *Menetia greyii* (19 records) and *Lerista bipes*. *Ctenophorus isolepis* were also very abundant but not readily sampled. Numerous recruits were captured or observed during the course of the survey, particularly of *Ctenotus pantherinus*, *C. serventyi* and *Ctenophorus isolepis*. Many females also appeared to be gravid, particularly the *Carlia munda*.

Two species of frogs *Litoria rubella* and *Cyclorana maini* were positively identified from the survey area. Calls of a third species, tentatively identified as *Uperoleia russelli*, were recorded from Edward Creek at Site 10. The habitat comprised clumps of reeds in a gravel river bed. No individuals were captured and as such this record has not been verified.

#### Habitat Utilisation

Habitat types are described in Section 3.2.2.

Beach

Old body holes dug by marine turtles were observed on the beaches near the tip of Cape Preston.

Coastal Dunes

Eight species of reptiles were recorded from this habitat including *Ctenophorus isolepis*, *Pogona minor mitchelli*, *Amphibolurus longirostris*, *Gehyra variegata*, *Ctenotus serventyi*, *Lerista bipes*. There was also evidence of nesting by marine turtles.

Mangroves (Mangals)

Just three species were recorded from the mangals including *Chelonia mydas*, *Amphibolurus gilberti* and *Hydrelaps darwiniensis*.

• Samphire

Nine species of reptiles were recorded from this habitat including *Cyclorana maini*, *Ctenophorus isolepis*, *C. nuchalis*, *Lialis burtonis*, *Carlia tricantha*, *Ctenotus pantherinus ocellifer*, *Menetia greyii*, *Ramphotyphlops diversus ammodytes* and *Acanthophis wellsi*. The samphire was surrounded by pale coastal dunes vegetated with a mixture of *Triodia wiseana* or *Spinifex longifolius* which may explain the presence of *Ctenophorus isolepis*, *Carlia tricantha* and *Ctenotus pantherinus ocellifer* in this habitat.

Creeklines

A total of 22 species was recorded from this habitat including three species of frog *Cyclorana maini, Litoria rubella* and *Uperoleia russelli.* The tally includes several species that are typically associated with creeklines in the Pilbara region such as *Amphibolurus longirostris, Delma pax, Glaphyromorphus isolepis* and *Parasuta monachus.* Although not exclusively recorded from this habitat, *Carlia munda* was particularly abundant in the dense grasses on the banks. *Ctenotus* aff. *robustus* was recorded from this habitat but it is probable that it came from the cracking clays which abutted the creekline.

Cracking Clays

Twenty species were recorded from this habitat including *Ctenotus* sp. nov. This habitat encompassed a mosaic of cracking clay vegetated with grasses interspersed with *Triodia wiseana* on slightly elevated stony "islands". Species recorded from this habitat therefore included those that apparently have strong affinities with cracking clays such as *Ctenotus* affin. *robustus* and those preferring spinifex dominated stony substrates such as *Diplodactylus mitchelli*, *Tympanocryptus cephala* and *Varanus acanthurus*.

Stony Plains

Just seven species were recorded from this habitat including *Cyclorana maini*, *Diplodactylus savagei*, *Heteronotia binoei*, *Cyclodomorphus melanops melanops*, *Lerista elegans*, *Menetia greyii* and *Menetia surda*.

Low Stony hills

Nineteen species were recorded from the two trapping grids established in this habitat. The tally included the saxicoline (rock dwelling) species *Ctenotus saxatalis* and *Gehyra punctata*, and those preferring stony substrates such as *Ctenotus duricola* and *Nephrurus wheeleri cinctus*.

Rocky hills and outcrops

Fifteen species were recorded from this habitat type. Many of the species recorded from the stony substrates of the low stony hills were also recorded from this habitat including *Ctenotus duricola, C. saxatilis* and *Gehyra punctata*.

Additional

A small granite outcrop adjacent to the current access track yielded four species including *Gehyra punctata*, *Ctenophorus caudicinctus*, *Varanus acanthurus* and *Egernia depressa*, whilst spotlighting along the access track and the North West Coastal Highway yielded a further five species including *Antaresia perthensis*, *Antaresia stimsoni*, *Aspidites melanocephalus*, *Acanthophis wellsi* and *Parasuta monachus*.

# 5.4 Habitat Comparisons

The habitat units provide a convenient mechanism by which to describe the potential occurrence and expected distribution of species within the project area. However, expected species lists generated on the basis of these habitat maps must recognise that the habitat requirements of many species are not well understood and that many species occupy habitats provided by plants or animals (Tinley, 1991).

Meaningful comparison of species assemblages between habitats is difficult as there is a difference in survey effort across habitats. Furthermore, survey effort is inadequate in some habitats, thereby reducing comparisons to a review of emerging trends only. Nevertheless a summary of species richness within each of the habitats is given in Table 5.8 and discussed below.

Habitats	Avifauna	Mammals	Herpetofauna	Total
Beach	12	1	1	14
Mangroves	30	2	3	35
Coastal Sand Dunes	14	4	8*	25
Samphire	14	1	9	24
Stony Plain	12	4	7	23
Low Stony Hill	13	5	19	37
Rocky Hills and Outcrops	12	2	15	29
Cracking Clays	24	7	20	51
Creeklines	53	9	22	84
Total	96	22	61*	

Table 5.8: Number of species recorded within each habitat type during the corridor surveys.

\*Note that records of nesting by sea turtles within the coastal dunes habitat have been included in this tally.

Despite being fairly degraded, the Creekline habitat yielded the greatest species richness across the three groups of vertebrate fauna examined (Table 5.8). The Cracking Clay habitat was the second most species rich community overall, although the avifauna assemblage was less species rich than that recorded from the mangals. This may in part be due to the increased structural diversity of vegetation in the latter habitat. Certainly avifauna fauna assemblages were relatively depauperate outside of the two most structurally complex habitats (the Creeklines and Mangroves).

The beach strand was not adequately surveyed as many avifauna species would only be seasonal visitors to this habitat and would not have been detected given the timing of the first survey. A summer visit would also be required to determine which species of marine turtle utilises the beaches for nesting. The level of usage of these beaches is unclear, as cyclonic activity prior to the survey had probably erased most of the evidence of nesting on the exposed beaches on the western side. Nevertheless a small area of activity was recorded at the northwestern tip of Cape Preston. Similarly the level of migratory wader use of the beaches habitat is unclear. However, Ron Johnstone (WA Museum) indicates that the area is probably not used as a wintering location for large numbers of waders, but rather that it may be used as a stopover point as they move up or down the coastline.

During the latter part of the survey, one additional habitat (a small area of red sandplain) was identified on Cape Preston. This habitat was not sampled and should be targeted in the follow up survey.

Heavy rainfall for several months prior to and during the survey meant that much of the project area was under water or unnavigatable (particularly the cracking clay). This reduced the time spent on systematic avifauna censusing and opportunistic searching for reptiles. A second (seasonal) survey would enhance the quality of the biological survey and assist to more clearly identify constraints.

# 5.5 Rare or Threatened Fauna

Native fauna species which are rare, threatened with extinction or have high conservation value are specially protected by law under the *Western Australian Wildlife Conservation* Act 1950. In addition, some species of fauna are covered under the 1991 ANZECC convention and/or are listed as referral triggers under the *Environment Protection and Biodiversity Conservation* Act 1999 (*EPBC* Act).

#### **Migratory Wader Species**

Migratory wader species are protected under the *EPBC* Act. The national List of Migratory Species consists of those species listed under the following International Conventions:

- Japan-Australia Migratory Bird Agreement (JAMBA);
- China-Australia Migratory Bird Agreement (CAMBA);
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

#### **Marine Turtles**

Other than migratory wader species, the only species recorded from the project area which is listed under the *EPBC* Act was the Green Turtle. However, the identity of nesting sea-turtles along the beaches of Cape Preston is unclear, and it is worth noting that the Loggerhead Turtle, Hawksbill Turtle and Flatback Turtle are all listed under the Act.

Classification of rare and endangered fauna under the *Wildlife Conservation* (Specially Protected Fauna) Notice 1998 recognises four distinct schedules of taxa:

- Schedule 1 taxa are fauna which are rare or likely to become extinct and are declared to be fauna in need of special protection;
- Schedule 2 taxa are fauna which are presumed to be extinct and are declared to be fauna in need of special protection;
- Schedule 3 taxa are birds which are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction which are declared to be fauna in need of special protection; and
- Schedule 4 taxa are fauna that are in need of special protection, otherwise than for the reasons mentioned in paragraphs (1), (2) and (3).

In addition to the above classification, fauna are also recognised under four Priority levels:

Priority One	Taxa with few, poorly known populations on threatened lands.
	Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Two	Taxa with few, poorly known populations on conservation lands, or taxa with several, poorly known populations not on conservation lands.
	Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent

survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Three Taxa with several, poorly known populations, some on conservation lands.

Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Four Taxa in need of monitoring.

Taxa which are considered to have been adequately surveyed or for which sufficient knowledge is available and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. Taxa which are declining significantly but are not yet threatened.

The field survey did not record any Schedule listed fauna species. However seven Priority listed fauna taxa were recorded; the Little Western Freetail Bat *Mormopterus loriae cobourgensis*, Western Pebble-mound Mouse *Pseudomys chapmani*, Lakeland Downs Mouse *Leggadina lakedownensis*, Bush Stonecurlew *Burhinus grallarius*, Beach Stonecurlew *Esacus neglectus*, Eastern Curlew *Numenius madagascariensis* and Green Turtle *Chelonia mydas*. (As described previously, the Green Turtle is also included on the Threatened Species list of the *EPBC* Act). In addition, one undescribed species of rodent (*Pseudomys* sp. "hamersley") and two undescribed skinks (*Ctenotus* aff. *robustus* and *Ctenotus* sp. nov.) of possible conservation significance were recorded.

A search of CALM's database of threatened fauna species recorded from or potentially occurring in the area yielded the following nine species:

#### • Schedule 4 Fauna

#### Peregrine Falcon Falco peregrinus

Not recorded during the current survey. The habitat of this species comprises cliffs along coasts, rivers and ranges and wooded water courses (Johnstone & Storr, 1998). Storr (1984) suggests that most Pilbara records have come from 'hilly country, especially the Hamersley Range'. It is likely that this species would occur within the creekline vegetation.

#### • Priority Species

#### Asian Dowitcher Limnodromus semipalmatus (Priority 3)

The field survey was not conducted at an opportune time for recording migratory waders and may explain the failure to detect this and possibly other wader species. The preferred habitat of the Asian Dowitcher comprises mudflats and tidal creeks, which in this document are encompassed by the Beach and Mangrove habitats respectively. It is a seasonal visitor (between late August to early April) and is considered rare (Johnstone & Storr, 1998).

#### Water Rat Hydromys chrysogaster (Priority 4)

This species inhabits marine waters along the Pilbara coast. It is known from Barrow Island and has been recorded from a tidal creek at Cape Lambert (Roy Teale, pers. obs.).

#### Grey Falcon Falco hypoleucos (Priority 4)

Not recorded from the project area. Storr (1984) indicates that in the Pilbara, the Grey Falcon is mostly recorded from the coastal plain between the de Grey and Ashburton Rivers. Johnstone & Storr (1998) indicate that the preferred habitat of

this species comprises lightly wooded coastal and riverine plains. In the project area this translates to the Creekline habitat.

#### Square-tailed Kite Lophoictinia isura (Priority 4)

Not recorded from the project area. Johnstone & Storr (1998) suggest that this species would most likely only be transient in the Pilbara region. Storr (1984) does not mention this species in his account of birds of the Pilbara.

#### Bush Stonecurlew Burhinus grallarius (Priority 4)

A single bird was seen on the access track whilst spotlighting. Two additional birds were recorded from the North West Coastal Highway adjacent to the Fortescue Roadhouse. This species prefers lightly wooded country near shelter (Johnstone & Storr, 1998) and is considered rare to uncommon in the region (Storr, 1984; Johnstone & Storr, 1998).

#### Beach Stonecurlew Esacus neglectus (Priority 4)

Three birds were recorded from the beach on the western side of Cape Preston. The preferred habitat of this species comprises sandy or shingle beaches and tidal reef flats (Johnstone & Storr, 1998). It is considered to be rare on the Pilbara coast.

#### Eastern Curlew Numenius madagascariensis (Priority 4)

This species was recorded from mudflats adjacent to the mangroves at the base of Cape Preston. It is regarded as a visitor between October and February, when it is considered moderately common along tidal mudflats, reef flats and sandy beaches of the Pilbara coast (Johnstone & Storr, 1998).

# White-shafted Tern (Little Tern) Sterna (albifrons) sinensis (Priority 4)

The preferred habitat of this species comprises sheltered seas, estuaries and mangrove creeks. It is mainly a non-breeding visitor (all months, although mostly September to June). Johnstone & Storr (1998) suggest that this species is generally uncommon but plentiful in the Pilbara and Kimberley during passage.

In addition to those already listed above, a further four Priority listed taxa were recorded during the survey:

### Little Western Freetail Bat Mormopterus Ioriae cobourgensis (Priority 1)

A total of 20 individuals (9 adult males, 11 adult females) was captured in mist nets set against *Rhizophora* and with a harp trap between *Avicennia*. This subspecies of bat is listed as a Priority 1 taxa as there is little data available and it has a distribution restricted to the mangroves of the North-west of Western Australia.

#### Short-tailed Mouse Leggadina lakedownensis

Three individuals of this Priority 4 rodent were recorded from the services corridor. Regional records to date strongly suggest that the main habitat for this species on the mainland comprises areas of cracking clay. Extensive areas of cracking clay occur throughout the project area and the sites from which the species was recorded included, or were adjacent to, this habitat type. Until recently, *L. lakedownensis* was only known from offshore islands and a restricted locality in the Central Pilbara. The species has been recorded more frequently in recent surveys and is apparently more widely distributed in the region than initial records indicated.

#### Western Pebble-mound Mouse Pseudomys chapmani (Priority 4)

A small active mound with a raised parapet around the entrance was observed on the low stony hill at Site 7. Numerous old mounds were recorded throughout suitable habitat in the project area. Another active mound of this species is know from the region (Stephen van Leeuwen, pers. comm.). Although very common in parts of the eastern Pilbara, this species is apparently scarce on this part of the Pilbara Coast and absent from the Burrup Peninsula. Dunlop has reported active mounds in the hills south of the Fortescue River in the vicinity of the North-west Coastal Highway (N. Dunlop, pers. comm. *in* Start, 1996), but no live specimens have yet been recorded from the area.

# Green Turtle Chelonia mydas (Priority 4)

Several Green Turtles, both adults and sub-adults, were observed in the tidal creek at the base of Cape Preston. Furthermore, body holes of marine turtles were observed on the beaches at the northern end of Cape Preston. While these may possibly belong to Green Turtles, other species of marine turtles cannot be excluded as Hawksbills, Loggerheads and Flatbacks are all known to nest in the region. Significantly, the Loggerhead turtle is listed as a Schedule 1 species whilst the Hawksbill is listed as a Priority 4 species. Clearly there is a need to identify the species using the beaches for nesting so that the species involved and the potential impacts can be clearly identified.

#### • Species of Interest

*Pseudomys* sp. "hamersley". The conservation status of this as yet undescribed taxon is unclear. It was first collected from Cape Lambert (Roy Teale, pers. obs.) and later at Nammuldi and Silvergrass (Stuart Anstee, Norah Cooper, pers. comm.; Roy Teale, pers. obs.). It may have been confused in previous collections with either *Pseudomys chapmani* or *P. hermannsburgensis,* with which it bears a close resemblance.

*Ctenotus* aff. *robustus*. This undescribed species has been recorded from cracking clays near Tom Price and several individuals were recorded from the same habitat during the current survey. The conservation status of this undescribed species is unclear. It appears to be restricted to areas of cracking clay.

*Ctenotus* sp. nov. A single specimen of what is believed to be a new species of *Ctenotus* was collected from the cracking clay.

# 6.0 Mangroves

# 6.1 Mangrove Communities

# 6.1.1 Introduction

Mangrove communities provide a range of significant ecological functions on the Pilbara coast, including physical stabilisation of shorelines and sediments (Thom, 1982; Semeniuk, 1985), provision of terrestrial and marine fauna habitats (Robertson & Duke, 1987; Robertson, 1991) and inputs of nutrients to coastal ecosystems (Semeniuk *et al.*, 1978; Paling & McComb, 1994). This is in addition to their intrinsic cultural and scientific value (Semeniuk, 1997; EPA, 2000).

A well developed and structurally complex mangrove system occurs at the northern end of the project area. It is associated with the major tidal creek and connective tidal land that joins Cape Preston with the mainland to the south. This creek is unnamed on topographic maps, but will be referred to here as Preston Creek. Other areas of mangal occur in the wider locality, including a generally narrow zone of *Avicennia marina* which borders the western shoreline and embayments between Preston Creek and the mouth of the Fortescue River. These areas of mangal are beyond the current impact zone of the project, and the assessment of potential impacts described in Section 7.5 focused on the mangroves of Preston Creek.

# 6.1.2 Methodology

The mangrove assemblages of the study area were mapped from colour aerial photography (WA3117(C) Dampier 2256) at a scale of 1:25,000 (enlarged to 1:5,000). A field survey was conducted in April 2000 to ground truth assemblages identified from the aerial photography. Field data were collected on species occurrences, mangal assemblages, heights, geomorphological conditions and other relevant information and related directly to the aerial photography. Mangroves were surveyed within the study area either by boat access through tidal creeks or from land reconnaissance from more elevated positions within the study area. Mapped mangrove assemblage categories were described in detail and their distribution mapped (see Figure 6.1). Note that the occurrence of some assemblages, particularly narrow fringes of *Aegialitis annulata* on creek banks, was frequently too small to appear on the scale of this mapping.

# 6.1.3 Mangrove Species Pool

Seven species of mangroves are known to occur in coastal environments in the Pilbara region (Semeniuk *et al.*, 1978; Kenneally, 1982). Six of the seven species were recorded from the Cape Preston study area during the field survey. The only Pilbara species not recorded, *Osbornia octodonta*, has its known southern limit of occurrence at Cossack (Semeniuk *et al.*, 1978; Semeniuk, 1997; Eric Paling, pers. comm., 2000).

The species present in the Cape Preston area were:

- Avicennia marina
- White Mangrove Yellow-leaved Spurred Mangrove
- Ceriops tagal
- Rhizophora stylosa Stilt-rooted Mangrove
- Aegiceras corniculatum Horned Mangrove
  - Aegialitis annulata Club Mangrove
  - Bruguiera exaristata Rib-fruited Orange Mangrove

The most abundant and widespread species in the study area were *Avicennia marina* (dominant or codominant in most assemblages in the study area) and *Rhizophora stylosa* (which formed dense monospecific assemblages). The other species recorded typically occurred as subdominant members of assemblages, as small monospecific stands or as scattered understorey species (see Section 6.1.4).

#### 6.1.4 Mangrove Community Assemblages

The local occurrence of mangrove species and assemblages within the Preston Creek system followed similar patterns to those observed elsewhere in the region in relation to species distribution, local geomorphology and substrate. The occurrence of *Aegialitis annulata* and *Aegiceras corniculatum* in particular was strongly related to newly formed islands, accretionary creek banks or other zones of recent deposition. In the most seaward sections of the creek system, the substrates were sandy and rocky and the mangroves occurred as a relatively narrow fringe. Further into the creek system, mangal development became more structurally complex and species richness increased upon the connective tidal land that bridges Cape Preston and the mainland. Extensive areas of cyanobacterial mats (Paling *et al.*, 1989; Paling & McComb, 1994) also occurred on the tidal flat areas to the east of Preston Creek but were not mapped as part of this assessment.

Mangrove assemblages identified from the study area were categorised as listed below and in Table 6.1. The assemblages were divided based on species composition, vegetation structure and physiognomy, substrate and geomorphology. The assemblage types are mapped in Figure 6.1 with estimated total areas of occurrence in Preston Creek summarised in Table 6.1.

# Ac Aegiceras corniculatum low, dense cover on recently deposited banks

This association w as largely restricted to recent deposition zones, either on accretionary sections of creek banks or on newly deposited islands. *Aegiceras corniculatum* formed low, dense monospecific thickets on these areas.

# Rs Tall, closed canopy *Rhizophora stylosa* pure stands

This assemblage consisted entirely of tall, closed *Rhizophora stylosa* mangal. It occurred occasionally on the more silty mud shores of the upper and lower reaches of Preston Creek, but was most common in the best developed sections of intertidal connective land.

#### As Tall, closed canopy Avicennia marina pure stands

This assemblage consisted entirely of tall, closed *Avicennia marina* mangal. The association was common on the most seaward margins of the creek system in the middle and lower reaches of Preston Creek. It commonly occurred in conjunction with the Rs and AmRs assemblages, and was typically backed by areas of more stunted *A. marina* scrubland.

#### AmRs Tall mixed Avicennia marina and Rhizophora stylosa

This assemblage was also relatively common, either as a fringe containing, and immediately behind, the most seaward *Avicennia marina* or as dense and extensive stands on intertidal islands and banks further into the creek system.

#### AmCt Low open cover of Avicennia marina and Ceriops tagal

This assemblage formed a low, open shrubland of *Avicennia marina* and *Ceriops tagal*. The two species typically formed a mosaic in this assemblage, with small stands of *C. tagal* interspersed with more pure stands of *A. marina*. *C. tagal* occurred either as a fringe on eroding banks or behind the *A. marina* dominated mangal.

# Am1 Pure open Avicennia marina shrubland on rocky shores

Consisting entirely of low to moderate height, open Avicennia marina, this association was restricted to the more seaward margins of Preston Creek (see

Figure 6.1). It was distinguished from other *A. marina* assemblages on the basis of substrate, occurring on sandy / rocky substratum, and was very similar to other assemblages recorded further north at the Dampier Archipelago (Semeniuk & Wurm, 1987) and the Maitland Delta (Halpern Glick Maunsell, 1999).

# Am2 Low, open Avicennia marina with scattered Rhizophora stylosa and Aegiceras corniculatum

Consisting predominantly of *Avicennia marina* (with rare *Rhizophora stylosa* and *Aegiceras annulata*), this assemblage occurred either as a thin fringe on the seaward edges of major creeks or as extensive stands bounded by creeks behind the *Rhizophora* assemblages.

#### Am3 Low to moderate Avicennia marina pure stands

Generally occurring landward of Am1 and Am2, this association was more open and contained shorter (<5 m) trees interspersed with areas of bare sediment. This is a typical response to decreased tidal inundation in higher elevation areas of the mangal (Semeniuk & Wurm, 1987). Cover in this assemblage graded from 100% at the most seaward occurrence to 50% at its most landward.

# Am4 Stunted, very open and scattered Avicennia marina on samphire flats

These areas occurred at the most landward extent of the mangal and largely comprised consolidated mudflats with stunted, scattered *Avicennia marina* interspersed with scattered samphire patches dominated by *Halosarcia halocnemoides* subsp. *tenuis* and *Threlkeldia diffusa*.

# Ct Low shrubland dominated by *Ceriops tagal* with occasional *Avicennia marina*

This assemblage typically occurred as small stands of low, moderate to open *Ceriops tagal* with scattered, rare *A. marina*. It occurred either in the higher salinity areas behind the remainder of the mangal or in areas where historical creek erosive processes have brought the assemblage to the current edge of the creek.

# M1 Mixed assemblage of *Avicennia marina, Rhizophora stylosa* and *Aegiceras corniculatum* on depositional islands

This diverse association contained all species present in the system and was represented in only a few locations in the heart of the mangrove creek. It occurred as a tall, closed canopy association on larger depositional islands in the most structurally developed mangal in Preston Creek.

# M2 Mixed assemblage of Avicennia marina, Rhizophora stylosa, Ceriops tagal and Aegialitis annulata on sandy substrates

This assemblage was largely restricted to the sandy shores to the north of the most seaward section of Preston Creek (see Figure 6.1). It was structurally complex and species rich, but relatively narrow in area. It consisted of a dense woodland of *Avicennia marina, Rhizophora stylosa* and *Ceriops tagal* over a scattered understorey of *Aegiceras corniculatum* and patches of *Aegialitis annulata*.

# S Supratidal mudflats

Saline mudflat areas with occasional samphires beyond the extent of regular tidal influence.

Total mangal cover for the area mapped was estimated at approximately **35.5** ha of dense mangrove associations and a further **7** ha of very open *Avicennia marina* scrubland.





# Table 6.1:Mangrove assemblages of the Cape Preston area and their<br/>extent of local occurrence.

Code	Assemblage	Area (ha)
Ac	Aegiceras corniculatum low, dense cover on recently deposited banks	0.11
Rs	Tall, closed canopy Rhizophora stylosa pure stands	3.68
As	Tall, closed canopy Avicennia marina pure stands	3.21
AmRs	Tall mixed Avicennia marina and Rhizophora stylosa	4.44
AmCt	Low open cover of Avicennia marina and Ceriops tagal	0.11
Am1	Pure open Avicennia marina shrubland on rocky shores	1.24
Am2	Low, open Avicennia marina with scattered Rhizophora stylosa and Aegiceras corniculatum	5.85
Am3	Low to moderate Avicennia marina pure stands	15.28
Am4	Stunted, very open and scattered Avicennia marina on samphire flats	7.25
Ct	Low shrubland dominated by Ceriops tagal with occasional Avicennia marina	0.66
M1	Mixed assemblage of Avicennia marina, Rhizophora stylosa and Aegiceras corniculatum on depositional islands	0.05
M2	Mixed assemblage of Avicennia marina, Rhizophora stylosa, Ceriops tagal and Aegialitis annulata on sandy substrates	0.86

# 6.1.5 Other Mangrove Community Biota

The mangal of the study area also supported a range of other species typically associated with mangrove habitat in the Pilbara. Fauna species routinely sighted included the Mudskipper (gobiid species including *Periophthalmus* spp.), occasional Mud Crabs *Scylla serrata*, numerous Red Fiddler Crabs *Uca flammula*, various species of grapsid crabs, and large epifaunal molluscs (*Littorina* spp). Reptiles recorded from mangal habitats at Cape Preston included *Amphibolurus gilbertii*, which was relatively common, and a single sighting of the Banded Mangrove Mud Snake *Hydrelaps darwiniensis*. A relatively diverse and abundant bird fauna utilised the mangroves at the site, including several species which are regarded as effectively restricted to mangrove habitat (Johnstone, 1990) (see Section 5.1).

# 7.0 Impacts to Features of Conservation Significance

The significance of an impact is dependent on the conservation status and reservation of the vegetation types, fauna habitats, and individual flora or fauna species that would be affected. It is also dependent on the intensity and duration of the impact.

Significant terrestrial vegetation and flora, fauna and mangroves of the project area have been discussed in the preceding sections. These are summarised briefly in the following, to provide a context for potential impacts resulting from the proposed project. It should be noted that only generic impacts were able to be discussed, as the final locations and designs of infrastructure and other aspects of the development were not known at the time this report was prepared. The impacts on significant vegetation types, habitats and species are discussed individually where sufficient detail of the probable impacts is known. Proposed management measures to address the impacts discussed below are detailed in Section 8.0.

# 7.1 Terrestrial Vegetation

As previously discussed, it is difficult to assess the conservation significance of the vegetation of the survey area given the lack of comparable data for the region (see Section 4.1.12). However, the vegetation types considered to be of the highest conservation significance are:

- The Littoral Land System vegetation type Ld4;
- Major creekline vegetation (particularly units Rc1/2/3);
- Cracking clay vegetation types (units Hpg1/2/3 & Hps1); and
- Rockpile vegetation types (units Nr1/2/3/4, ROr1/2/3 & Mr1/2).

Potential impacts to vegetation arising from the proposed development are considered to include the following (all of which could also affect individual flora):

• Vegetation clearing

Clearing of vegetation will be required prior to excavation of the ore bodies, and for establishment of infrastructure including waste dumps, plant sites, borrow pits and transport corridors. Clearing is also particularly important with respect to the various populations of significant flora identified within the area (see Section 7.2).

Additional disturbance to vegetation may result from other project-related activities including off-road driving. Samphire and spinifex vegetation is particularly susceptible to this type of physical damage and can take extended periods to recover.

Some significant vegetation will be removed (eg. the rockpiles located over the ore body areas), though the extent cannot be determined without an accurate mine plan. Sensitive location of infrastructure should minimise disturbance to conservation significant areas.

Erosion

Clearing of vegetation has the potential to lead to increased rates of erosion. Susceptible vegetation types within the project area include creekline habitats, clayey plains of the Horseflats and Paraburdoo LS, and areas of the Littoral LS with sandy substrates. Loss of coastal dune vegetation on Cape Preston would cause at least temporary instability of these landforms, and could lead to significant wind-driven erosion. In addition, destabilisation would almost certainly lead to the invasion or spread of Buffel Grass within the grass layer, potentially largely replacing the native grass vegetation.

• Disturbance of surface hydrology

The Fortescue River system borders the western side of the project area, and numerous tributaries intersect the area. Disturbance to surface drainage flow has the potential to negatively impact downstream vegetation.

• Introduction and/or spread of weed species

Several introduced flora species were recorded from the survey area, one of which (Mesquite) is a Declared Weed under the *Agriculture and Related Resources Protection* Act 1981. Earthworks and disturbance to vegetation have the potential to introduce additional weeds to the area and to spread the existing populations of introduced flora. This is most significant with respect to the populations of Mesquite, since this species is highly invasive and extremely difficult to control. Mesic environments such as major creeklines are particularly susceptible to weed invasion.

• Dust

Dust generated during establishment of infrastructure and operation of the mine has the potential to negatively affect surrounding vegetation. Vegetation in areas adjacent to regularly trafficked roads and waste dumps are usually the worst affected by dust deposition.

• Fire

The frequency of fires within the study area is already likely to be higher than in the surrounds due to pastoral management practices. The presence of additional personnel and equipment in the area resulting from development of the mine may result in more frequent unplanned fires in the area. The consequences of this potential for increased fire frequency would depend on the receiving vegetation. Open vegetation types such as samphire and Snakewood shrublands tend not to support fires. The hummock grassland communities dominating the hills and ridges of the Newman and Rocklea Land Systems are highly flammable, but are adapted to fire and recover relatively quickly. Increased fire frequency leads to changes to floristic composition and a prevalence of early seral stages of the vegetation (ie. the climax vegetation is prevented from developing). Fire in the linear coastal dunes of Cape Preston could also lead to wind-driven erosion.

# 7.2 Terrestrial Flora

The survey area has a fairly rich flora. Significant flora species include:

- The single Priority 1 and five Priority 3 species recorded from the project area: *Goodenia omearana* ms., *Abutilon trudgenii* ms., *Eriachne tenuiculmis, Hibiscus brachysiphonius, Phyllanthus aridus* and *Sida* sp. Wittenoom (WR Barker 1962);
- The Flora of Interest *Tephrosia* aff. *clementii* (1) (M1/M2) and *Tephrosia* aff. *clementii* (2) (M35.14), which on current knowledge appear to be uncommon.

Potential impacts to significant flora arising from the proposed development include:

Physical disturbance

Clearing of vegetation may result in disturbance to habitats containing significant flora, or to individuals of the species. Locations of significant flora should be taken into consideration during mine planning and avoided if possible (Section 8.1).

Erosion Erosion of landforms may have a

Erosion of landforms may have an indirect effect on significant flora populations by causing the loss of some areas of suitable habitat.

- Disturbance of surface hydrology Again, disturbance to surface hydrology may have indirect impacts on vegetation, and thus flora, particularly downstream. This issue is particularly important given that two of the Priority flora recorded from the survey area were restricted to creekline habitats, while a third occurred principally in minor flowlines.
- Introduction and/or spread of weed species
   Some of the weed species recorded have the potential to exclude native
   species through effective competition. A number of significant flora are largely
   restricted to creekline habitats, which are highly susceptible to weed invasion,
   particularly by Buffel Grass and Mesquite.
- Dust and Fire

These two factors may negatively impact on significant flora. Dust is likely to be of main concern where such populations are located immediately adjacent to disturbance areas. The effect of fire on particular flora species will depend on the recovery strategy of the species (eg. seeder vs. resprouter).

# 7.3 Fauna Habitats

None of the habitat types present in the project area appear to be unique to the locality or regionally significant on this basis. Several habitat types are, however, significant on a local scale and support species which are or may be of regional significance. These habitat units include:

- several of the broader beaches (given evidence of nesting by sea turtles);
- the linear sand dunes on the western margin of Cape Preston;
- the small area of red sandplain habitat on Cape Preston;
- mangroves (given the dependence of some bird and bat species on this habitat);
- cracking clay habitat units (given the presence of *Leggadina lakedownensis*, *Ctenotus* aff. *robustus* and *Ctenotus* sp. nov. in this habitat); and
- major drainage lines (the most species rich fauna habitat unit in the project area).

The primary impact to fauna habitats comprises:

• Habitat Loss and Modification

Clearing of vegetation will result in disturbance or removal of areas of fauna habitat, some of which may be reclaimed through rehabilitation. The extent of the resulting loss of fauna resident in or dependent on the cleared area would be proportional to the area of habitat destroyed, except for linear impacts such as roads or pipelines.

The major areas where fauna habitat will be affected include the ore bodies, plant sites and waste dump areas. Many of the habitat units represented in these areas are of only moderate conservation value, but others are of significance locally and are potentially regionally significant (see Section 3.2.2). These significant habitat types will be taken into consideration as more detailed mine planning advances (see Section 8.2). Fauna habitats occurring along the length of the haul route are likely to be modified to a lesser degree, although drainage design sensitive to local hydrology will need to be implemented to ensure this (see Section 8.1).

The mangal constitutes an important habitat for the bats *Nyctophilus arnhemensis* and *Mormopterus loriae cobourgiana* and a suite of bird species primarily dependent on mangrove habitat. The extent of the mangal habitat at

Cape Preston indicates that sizeable populations of these species are likely to be present and therefore the loss of this mangal would be detrimental, at least locally and possibly regionally. The transport corridor is the only aspect of the project likely to affect these habitats and the design of this will be finalised to the satisfaction of CALM (see Commitment 7 of the PER; HGM, 2000a).

# 7.4 Fauna

The site generally appears to support a diverse and intact fauna, with a relatively species rich assemblage compared to other localities in the Pilbara (see Section 5.0). This includes several species of conservation significance that are specially protected under both State and Federal legislation (see Section 5.5).

Whilst no Schedule listed fauna species were recorded, seven Priority listed fauna taxa occur in the project area. These include the Little Western Freetail Bat *Mormopterus loriae cobourgensis*, Western Pebble-mound Mouse *Pseudomys chapmani*, Lakeland Downs Mouse *Leggadina lakedownensis*, Bush Stonecurlew *Burhinus grallarius*, Beach Stonecurlew *Esacus neglectus*, Eastern Curlew *Numenius madagascariensis* and Green Turtle *Chelonia mydas*. This is in addition to one undescribed species of rodent (*Pseudomys* sp. "hamersley") and two undescribed skinks (*Ctenotus* aff. *robustus* and *Ctenotus* sp. nov.) of possible conservation significance. The majority of these species have been recorded from other sites in the Pilbara, but their regional conservation status is currently unclear.

Impacts to fauna resulting from the proposed development are largely a reflection of impacts to vegetation. The primary impacts are believed to be:

- Direct fauna impacts
   There will be some local loss of fauna due to direct mortality arising from more frequent vehicle movements, machinery operation, and blasting activity.
- Disturbance to nesting marine turtles and migratory waders The significance of the beaches associated with Cape Preston to marine turtle nesting is not fully known, although there is clearly some level of use occurring (see Section 5.3). Creation of port infrastructure and associated disturbance has the potential to affect the value of the area for turtle breeding. Light pollution from port infrastructure has been shown to cause disorientation in marine turtle hatchlings of several species (Peters & Verhoeven, 1994; Witherington & Martin 1996; Roy Teale, pers. obs.), leading to increased predation and mortality rates. Careful selection of lighting colour frequencies and intensities appears to reduce the loss of hatchlings.

The beach and mudflat habitats of the project area do not appear to be regionally significant to migratory wader species based on current knowledge (see Section 5.4). The species present are considered likely to be resident or utilising the habitats of the area as a stop-over point. One of the objectives of the additional seasonal fauna work will be to clarify the significance of the area to marine turtles and waders.

# 7.5 Mangroves

In his regional review of the conservation significance of mangroves in the Pilbara, Semeniuk (1997) identified Cape Preston (including Preston Creek) as being a Type 'A' area. The study considered the area to contain mangroves significant on international, regional and local scales. This assessment considered geomorphology, vegetation structural diversity, species richness and physiognomy and the inter-relation between these factors. The site was also identified as the most southern occurrence of true ria shore mangrove formation in the Pilbara (Semeniuk, 1997).
The field survey recorded six species of mangroves, which were varyingly represented in approximately **43** ha of habitat. The mangrove community assemblages of the area were generally in very good to excellent condition.

The principal impact of the proposal on mangrove communities relates to the infrastructure corridor that links the mine and plant areas with the port facilities at Cape Preston. Whilst the exact alignment of this infrastructure has not been fixed, a broad corridor has been identified within which it will be located, including a section of the Preston Creek mangal.

The infrastructure corridor will include provision for a conveyor and for road transport. The impacts arising from this include direct removal of mangroves to carry out the construction works and other more indirect impacts that may result from the ongoing presence of these structures.

These longer term impacts could include:

- potential reduction in tidal flushing in creeks and reduction in extent of inundation under high tides. This typically results in loss of mangroves in marginal fringing environments which have high salinities under natural conditions (see Gordon, 1988);
- changes in erosion or accretion which may result in the undermining of fringing mangroves, the reduction of tidal flushing to mangroves or burial of pneumatophores by altered sedimentation patterns (see Ellison, 1999);
- impoundment of water at higher than natural levels, which can result in mangrove decline and death due to sustained inundation of pneumatophores and a decline in water quality;
- other longer term indirect impacts which may reduce mangrove condition, such as alteration of freshwater surface drainage hydrology or dust deposition on mangrove communities near the infrastructure corridor.

# 8.0 Management Recommendations

The environmental management measures described in the following are largely generic, as few details of the locations of the development are currently available. Additional biological survey work has been committed to by the proponent and this may identify additional terrestrial flora and fauna issues. The currently know management issues, and any others that arise as an outcome of the seasonal biological survey, will be addressed further in the final project EMP. This will be prepared in consultation with CALM and DEP once wider project planning and design become more advanced.

# 8.1 Vegetation and Flora

A variety of management strategies will be implemented as part of the project to minimise disturbance to terrestrial vegetation and flora:

- More detailed stages of mine planning will take into account significant vegetation types and the locations of Priority flora populations. These areas will be protected from disturbance wherever possible by sensitive location of infrastructure. This design process must also consider locations of weed infestations (primarily Mesquite), in order to minimise their spread. Areas prone to erosion and surface drainage features should likewise be avoided wherever possible. The final design and location of infrastructure will be the subject of consultation with CALM (see Commitment 7 of the PER; Halpern Glick Maunsell, 2000a).
- The detailed design of the transport corridor will taken into account local hydrological patterns that may have ecological significance. This will include adequate provision for drainage line habitats and dispersal of sheet flow to ensure that downstream vegetation is not adversely affected.
- Vegetation clearing will be kept to the minimum necessary for safe operations, particularly in sensitive areas such as creeklines, coastal dunes and samphire flats. This will also minimise disturbance to fauna habitats, and reduce the potential for erosion.
- Off-road driving will be prohibited and disused access tracks will be closed and rehabilitated.
- Staff will be educated with respect to significant environmental issues as part of the on-site induction programme.
- Weed control measures will be implemented with respect to the infestations of the Declared Plant Mesquite which occur along the Fortescue River system. Movement of soil from infected areas can be prevented by appropriate hygiene measures including vehicle washdown. A Weed Management Plan will be prepared to the satisfaction of CALM and the APB prior to construction.
- A Fire Management Plan will be prepared to reduce the risk of unplanned fires and provide contingency measures to minimise any associated impacts.
- A Topsoil Management and Rehabilitation Plan will be prepared to the satisfaction of CALM and DME prior to any construction activities. This plan will include, but not be limited to, strategies such as:
  - use of locally collected seed (ie. within 50 km) of native species during reseeding;
  - respreading of cleared vegetative material over disturbed areas;

- clearing and appropriate stockpiling of topsoil;
- sensitive location and design of waste dumps, borrow pits and other features;
- an appropriate monitoring programme, the results of which should feed back into the rehabilitation process.
- Standard dust suppression measures (use of a water cart etc) and dust monitoring will be implemented across the site to minimise effects on surrounding vegetation.

These management actions will be incorporated into the EMP to be prepared for the project to the satisfaction of CALM and the DEP.

# 8.2 Fauna and Fauna Habitats

A number of the potential impacts to fauna may be minimised by application of the strategies described below:

- Detailed mine planning and infrastructure design will take into account the locations of and proximity to potentially significant habitat types within the project area (see Section 3.2.2).
- A marine turtle management plan will be developed for the port and load-out areas at Cape Preston to ensure impacts on marine turtles are minimised. This should include consideration of relevant detailed design matters such as the situation, intensity and colour frequencies of port lighting and the location of other infrastructure.
- Additional seasonal survey work is required including targeted surveys for marine turtles and migratory waders.
- As part of the environmental induction, staff should be made aware that all native fauna are protected and that there are substantial penalties associated with disturbance to fauna. Firearms, traps and domestic pets will be prohibited on-site.
- Fencing may be required along certain sections of roads to prevent excessive losses of kangaroos, given that Euros in particular were abundant within the survey area. This will be the subject of ongoing monitoring and consultation with the regional CALM office to identify specific fencing requirements. No barbed wire will be used should fencing be necessary.
- All bore-holes will be capped to prevent the loss of small ground fauna.

These management actions will be incorporated into the EMP to be prepared for the project to the satisfaction of CALM and the DEP.

# 8.3 Mangroves

The area of mangal that will be directly impacted, and the extent to which ongoing impacts will influence the remainder of Preston Creek, are determined by two factors.

The final alignment of the conveyor and road corridor will largely determine the total area of mangal affected. A narrow area of mangrove cover occurs towards the mouth of Preston Creek where several of the creek arms converge (see Figure 6.1). This would provide an ideal crossing point that would minimise direct impacts on mangroves. The final alignment of this corridor will be the subject of discussion with CALM and will be located to the Department's satisfaction (see Commitment 7 of the PER; Halpern Glick Maunsell, 2000a).

The extent to which the remainder of Preston Creek is influenced by ongoing changes to tidal hydrodynamics will be determined by the nature of the crossing structures. If these are designed such that they are transmissive to tidal flux and create no net reduction in the extent of tidal elevation and influence downstream in the creek system, then little or no significant impact would be expected for the majority of the mangal downstream of the crossing point. Similarly, other issues such as dust deposition would be managed through standard practices of water spray and water cart dust suppression on conveyors and roads near mangrove communities.

The EPA's recently released 'Draft Guidance for the protection of tropical arid zone mangroves along the Pilbara coastline' identifies the Cape Preston area (Area 9) as being subject to its Draft Guideline 3 (EPA, 2000). That is, the mangroves of Preston Creek are of very high conservation value but they occur within an area that has designated industrial or port use. The EPA's guidance in this respect indicates that for the proposal to be considered environmentally acceptable, it must demonstrate a significant understanding of the mangrove systems to be affected (see Section 6) and evaluate how the mangrove system would be impacted.

The preceding discussion has addressed potential impacts of the proposal and the management approaches necessary to address these. The EPA's final statement is that it expects the proposal to demonstrate best practice engineering design that minimises potential environmental impacts. To meet this requirement, the final alignment of the infrastructure corridor will be developed in consultation with CALM with the objectives of:

- Removing the minimum possible area of mangrove community at Preston Creek, within engineering design standards and safety constraints; and
- Maximising the permeability of the creek crossing structures to tidal exchange to ensure that the mangal downstream of the crossing point is not affected by reduced flushing.

The proponent believes that this approach is in accordance with the requirements of the EPA's Draft Guidance Statement.

# 9.0 Acknowledgements

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- Bob Bromilow of CALM Karratha assisted with installation of the fauna pit traps.
- Kyle Armstrong analysed the bat call data and prepared the relevant text for this fauna group.
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# Appendix A

**Descriptions of Flora Survey Sites** 

#### Site M001 Described by MET Date 4/15/00 Quadrat Size ~6m x 0.8m AMG Zone 50 413361, 7670802 413345, 7670836 413377, 7670849 Horseflats LS. Clayey plain. Gutter within plain, with a very gentle slope to the east; forms an arc about 6m long and about 70-80 Habitat cm wide. Soil Red-brown clay; would be cracking when dry, currently very wet. Eriachne benthamii / Eragrostis xerophila tussock grassland. Vegetation Large area of Eragrostis xerophila to the east (see M002); more to west but more patchy there. Also adjacent to this site is an Notes open pebbly area similar to those within M002: this supports some Salsola tragus. Eremophila forrestii under Acacia xiphophylla nearby. Dominant Species List Eragrostis xerophila (<5-15%), Eriachne benthamii (60-80%) Associated Species List Centipeda minima, Cyperus iria, Cyperus squarrosus, Indigofera trita, Lotus australis, Marsilea hirsuta, Neptunia dimorphantha, Phyllanthus maderaspatensis var. angustifolius, \*Prosopis pallida hybrid, Pterocaulon sphacelatum, Rhynchosia cf. minima, Stemodia kingii Site M002A Described by MM Date 4/15/00 Quadrat Size 50m x 50m AMG Zone 50 413531, 7670746 413594, 7670738 413603, 7670688 413544, 7670682 Horseflats or Paraburdoo LS. Plain. Habitat Soil Red clay soil with deep holes in places. Vegetation Eragrostis xerophila tussock grassland. Excellent. No signs of disturbance within site; occasional \*Cenchrus near track. Veg Condition 0-2% leaf litter; negligible wood litter. Patches of Sida ?fibulifera low shrubland within grassland are described under M002B. Notes There were occasional shrubs of Acacia xiphophylla within the site previously (now dead). Dominant Species List Eragrostis xerophila (90%) Associated Species List Cleome viscosa, Indigofera trita, Lotus australis, Phyllanthus maderaspatensis var. angustifolius, Polygala sp., Rhynchosia cf. minima, Sida aff. fibulifera (M85.15), Streptoglossa sp. Site M002B Described by MM Date 4/15/00 AMG Zone 50 413531, 7670746 413594, 7670738 413603, 7670688 413544, 7670682 Habitat Horseflats or Paraburdoo LS. Plain. Soil Red clay soil with deep holes in places. Vegetation Sida aff. fibulifera low shrubland. Veg Condition Excellent. No signs of disturbance within site; occasional \*Cenchrus near track. Notes 0-2% leaf litter; negligible wood litter. This shrubland occurs in patches within the Eragrostis xerophila grassland described as M002A Dominant Species List Sida aff. fibulifera (M85.15) (30%), Streptoglossa liatroides (5%) Associated Species List Aristida contorta, Cenchrus ciliaris, Dichanthium sericeum subsp. humilius, Enneapogon caerulescens var. occidentalis, Neptunia dimorphantha, Oldenlandia crouchiana, Phyllanthus maderaspatensis var. angustifolius, Podaxis pistillaris, Rhynchosia cf. minima, Sclerolaena costata, Sporobolus australasicus Site M003 AMG Zone 50 413298, 7670854 413235, 7670863 Boundary of Paraburdoo and Horseflats LS. Clayey plain. Gentle slope to east. Habitat Red-brown clay loam, cracking slightly in dryer areas. Dryer at western end, wet at eastern end. Acacia xiphophylla open shrubland over scattered patches of \*Cenchrus ciliaris and Eragrostis xerophila. Soil Vegetation Has some damper patches (one with a temporary pool after rain on the previous day). Notes Dominant Species List Acacia xiphophylla (<5-<10%), Aristida contorta (<10%), \*Cenchrus ciliaris (±5%) Associated Species List Abutilon oxycarpum subsp. prostratum, Alysicarpus rugosus, Boerhavia coccinea, B. paludosa, Bonamia media var. villosa, Brachyachne convergens, B. prostrata, Bulbostylis barbata, Chloris pectinata, Cleome oxalidea, C. viscosa, Corchorus walcottii, Dactyloctenium radulans, Dichanthium sericeum subsp. humilius, Enchylaena tomentosa, Enneapogon caerulescens var. occidentalis, Eragrostis xerophila, Eriachne benthamii, E. pulchella subsp. dominii, Euphorbia boophthona, E. coghlanii, E. aff. drummondii (MET 15211), Evolvulus alsinoides var. villosicalyx, Goodenia forrestii, Heliotropium heteranthum, Hibiscus brachysiphonius, Indigastrum parviflorum, Indigofera colutea, I. trita, Iseilema dolichotrichum, I. membranaceum, \*Malvastrum americanum, Neptunia dimorphantha, Paspalidium clementii, Portulaca oleracea, Ptilotus aervoides, P. murrayi var. murrayi, Rhynchosia cf. minima, Senna artemisioides subsp. oligophylla (thinly sericeous), Sida aff. fibulifera var. L', Solanum horridum, Sporobolus australasicus, Streptoglossa decurrens, S. liatroides, Streptoglossa sp., Śwainsona leeana, Synaptantha tillaeacea var. tillaeacea, Trianthema triquetra, Triodia pungens, Xerochloa imberbis Site M004 Described by MM Date 4/15/00 Quadrat Size 30m x 50m AMG Zone 50 413370, 7670622 413381, 7670652 413335, 7670638 413339, 7670671 Paraburdoo LS. Stony plain. Habitat Red clayey loam with continuous surface scatter of quartz and other pebbles (including calcareous nodules). Soil Vegetation Acacia bivenosa shrubland over Triodia wiseana mid-dense hummock grassland. Veg Condition Very good. Some weeds, particularly scattered \*Cenchrus near track. Vegetation all burnt on west side of track. Smaller site to fit available unburnt habitat. Site located on slightly raised area within more general clayey plain. Notes **Dominant Species List** Acacia bivenosa (10%), Triodia wiseana (70%) Associated Species List

Abutilon lepidum, Acacia victoriae, Boerhavia coccinea, \*Cenchrus ciliaris, \*C. setigerus, Convolvulus remotus, Dactyloctenium radulans, Digitaria ctenantha, Euphorbia aff. australis type 1 (erect stems), E. coghlanii, E. tannensis subsp. eremophila, Evolvulus alsinoides var.

villosicalyx, Goodenia forrestii, Hibiscus aff. platychlamys (M39.14), Indigofera trita, Leptopus decaisnei, Mukia aff. maderaspatana sp. B, Mukia aff. maderaspatana sp. C, Paspalidium clementii, Pterocaulon sphacelatum, Ptilotus auriculifolius, P. exaltatus var. exaltatus, P. helipteroides, Rhynchosia cf. minima, Sclerolaena costata, Senna notabilis, Sida aff. fibulifera (oblong; MET 15 220), Solanum lasiophyllum, Sporobolus australasicus, Swainsona formosa, Tephrosia supina, Tribulus hirsutus, T. occidentalis, Trichodesma zeylanicum, Triumfetta clementii

#### Site M005

Described by N	1ET Date 4/15/00	Quadrat Size 60m x 20m	
AMG Zone 50	413080, 7670553	413139, 7670496	413109, 7670496
Habitat	Paraburdoo LS. Narrow floodpla	in (~30m wide) adjacent to me	dium-sized Edward Creek. Creek cuts through a low spur.
Soil	Soil quite variable: gravelly / peb	bly coarse sand in places, red	brown loamy soil in others; all with thin surface of red-brown
	clay loam from recent flood.		
Vegetation	Scattered patches of Corymbia h	namersleyana over scattered p	atches of Acacia trachycarpa over *Cenchrus ciliaris mid-dense
	tussock grassland.		
Veg Condition	Moderate to poor. Heavily infeste	ed by *Cenchrus; burnt.	
Fire Age	Burnt recently.		
Notes	Short narrow quadrat to fit narrow	w floodplain. Cover estimates f	or Acacia and Corymbia are pre-fire. Some Acacia seedlings
	present. Many of the Corymbia h	have been killed by the fire.	
Dominant Spec	<u>cies List</u>		
	( ( ) ) + O ( )		(

Acacia trachycarpa (<10%), \*Cenchrus ciliaris (±60%), Corymbia hamersleyana (<10%)

Associated Species List

Abutilon aff. lepidum (1) (MET 15 352), Abutilon fraseri, Acacia coriacea subsp. pendens, A. pyrifolia, Alysicarpus rugosus, Amaranthus mitchellii, Amaranthus pallidiflorus, Boerhavia type 1, \*Cenchrus setigerus, Chrysopogon fallax, Cleome viscosa, Corchorus tridens, Cucumis melo subsp. agrestis, Euphorbia coghlanii, E. schultzii, Euphorbia tannensis subsp. eremophila, Goodenia forrestii, Hybanthus aurantiacus, Indigastrum parviflorum, Indigofera linifolia, I. monophylla, I. trita, Ipomoea muelleri, Leptopus decaisnei, \*Malvastrum americanum, Melhania oblongifolia, Mukia aff. maderaspatana sp. C, M. aff. maderaspatana sp. F, Phyllanthus maderaspatensis var. angustifolius, Polymeria ambigua, Portulaca oleracea, Pterocaulon sphacelatum, Ptilotus exaltatus var. exaltatus, Rhynchosia cf. minima, Salsola tragus, Senna artemisioides subsp. oligophylla x helmsii, Sida aff. fibulifera (MET Site 1308), Solanum diversiflorum, S. lasiophyllum, Sporobolus australasicus, Swainsona canescens, Tribulus occidentalis, Trichodesma zeylanicum, Triodia angusta, T. epactia, Triumfetta clementii, Vigna lanceolata var. lanceolata, Zaleya galericulata

#### Site M006

Described by MM Quadrat Size 80m x 10m? Date 4/15/00 AMG Zone 50 413058, 7670531 413109, 7670496 413099, 7670496 Habitat Paraburdoo LS. Creekline (Edward Creek). Soil Red clayey soil. Vegetation Open Eucalyptus victrix over moderately dense tall shrubs dominated by Acacia coriacea over dense Buffel grass. Veg Condition Moderate to poor. Heavily invaded by \*Cenchrus; burnt. Notes Small narrow site to fit creekline. Dominant Species List

Acacia coriacea subsp. pendens (30-50%), \*Cenchrus ciliaris (50-70%), \*C. setigerus (10-20%), Eucalyptus victrix (20-30%) Associated Species List

Acacia farnesiana, Acacia pyrifolia, Acacia trachycarpa, Achyranthes aspera, Alternanthera nana, Amaranthus pallidiflorus, Bidens bipinnata, Boerhavia coccinea, Cleome viscosa, Crotalaria medicaginea, Cynanchum floribundum, Dactyloctenium radulans, Eriachne tenuiculmis, Euphorbia coghlanii, Hybanthus aurantiacus, Indigofera colutea, Indigofera trita, Ipomoea muelleri, \*Malvastrum americanum, Marsilea hirsuta, Operculina aequisepala, Phyllanthus maderaspatensis var. angustifolius, Portulaca oleracea, Pterocaulon sphacelatum, Rostellularia adscendens var. clementii, Sesbania cannabina, Sporobolus australasicus, Trichodesma zeylanicum, Triodia angusta, Triumfetta clementii, Vigna lanceolata var. lanceolata, Waltheria indica

#### Site M007

Described by M	ET Date 4/16/00	Quadrat Size 50 x 50m	
AMG Zone 50	413146, 7670647	413083, 7670633	
Habitat	Paraburdoo LS. Crest and upper slopes of low rise.		
Soil	Gravelly / pebbly red-brown loam; some patches around Acacia xiphophylla shrubs are less pebbly.		
Vegetation	Acacia xiphophylla open shrubland over Triodia wiseana hummock grassland.		
Fire Age	Recent fire.		
Notes	Most parts burnt quite recently. Upp	per slope is more loamy than crest and has more annuals post-fire. Similar habitat to M008	
	(unburnt).		
D	I		

**Dominant Species List** 

Acacia xiphophylla (±5%), Triodia wiseana (15-20%)

Associated Species List

Abutilon lepidum, Abutilon aff. lepidum (2) (MET 15 970), Alysicarpus rugosus, Aristida contorta, Boerhavia coccinea, Bonamia media var. villosa, \*Cenchrus ciliaris, \*C. setigerus, Cleome oxalidea, C. viscosa, Corchorus walcottii, Dichanthium sericeum subsp. humilius, Digitaria ctenantha, Dysphania rhadinostachya, Enchylaena tomentosa, Enneapogon caerulescens var. occidentalis, Eremophila longifolia, Eriachne pulchella subsp. dominii, Euphorbia aff. australis type 2 (prostrate), Euphorbia boophthona, Evolvulus alsinoides var. villosicalyx, Flaveria australasica, Goodenia forrestii, Goodenia microptera, Heliotropium heteranthum, Hibiscus aff. platychlamys (M39.14), Indigastrum parviflorum, Indigofera colutea, Iseilema dolichotrichum, Leptopus decaisnei, Mukia aff. maderaspatana sp. F, Paspalidium clementii, Phyllanthus lacunellus, Polycarpaea corymbosa var. corymbosa, Polygala aff. isingii, Portulaca oleracea, Ptilotus auriculifolius, Ptilotus exaltatus var. exaltatus, Ptilotus helipteroides, Rhynchosia cf. minima, Sarcostemma viminale subsp. australe, Sclerolaena costata, Senna glutinosa subsp. x luerssenii, Senna notabilis, Sida ?cardiophylla (juvenile), Sida aff. fibulifera (MET Site 1346), Sida clementii, Solanum horridum, Solanum lasiophyllum, Sporobolus australasicus, Streptoglossa decurrens, Streptoglossa liatroides, Tephrosia supina, Tribulus hirsutus, Tribulus occidentalis, Trichodesma zeylanicum, Triumfetta clementii

Described by M	M Date 4/16/00	Quadrat Size 50 x 50m
AMG Zone 50	413028, 7670418	412951, 7670422
Habitat	Paraburdoo LS. Stony plain.	
Soil	Red clay loam with quartz and oth	er pebbles on surface.
Vegetation	Sparse Acacia xiphophylla tall shr	ubs over 50-70% Triodia wiseana.

Veg Condition Very good. Scattered weeds are only disturbance evident. Notes Similar habitat to M007 but unburnt.

Dominant Species List

Acacia xiphophylla (10%), Triodia wiseana (50-70%)

Associated Species List

Abutilon aff. lepidum (1) (MET 15 352), Acacia victoriae, Aristida contorta, Boerhavia coccinea, Brachyachne prostrata, Bulbostylis barbata, \*Cenchrus ciliaris, Cenchrus setigerus, Cleome oxalidea, Dactyloctenium radulans, Dichanthium sericeum subsp. humilius, Digitaria ctenantha, Enchylaena tomentosa, Enneapogon caerulescens var. occidentalis, Eragrostis xerophila, Eremophila forrestii subsp. forrestii, Eriachne pulchella subsp. dominii, Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Gomphrena cunninghamii, Indigastrum parviflorum, Indigofera linifolia, Indigofera trita, Iseilema dolichotrichum, Leptopus decaisnei, Maireana planifolia, Paspalidium clementii, Phyllanthus lacunellus, Polycarpaea corymbosa var. corymbosa, Polygala aff. isingii, Portulaca oleracea, Ptilotus exaltatus var. exaltatus, Rhagodia eremaea, Rhynchosia cf. minima, Sclerolaena uniflora, Senna glutinosa subsp. pruinosa x ?glutinosa, Senna glutinosa subsp. x luerssenii, Solanum horridum, Sporobolus australasicus, Tragus australianus, Trichodesma zeylanicum, Triodia pungens, Triumfetta clementii, Xerochloa imberbis

### Site M009

Described by	MET	Date 4/16/00	Quadrat Size ~120 x 10m
AMG Zone 50	)	411351, 7668987	411349, 7669111
Habitat	Newman	LS. Small to medium-sized	creek; at one side of a small open valley through ridge system, adjacent to low rocky slope
	(western	side).	
Soil	Pebbly / gravelly red-brown loam, some sand in places.		
Vegetation	Scattered low Corymbia hamersleyana and Acacia coriacea subsp. pendens over Acacia monticola / A. bivenosa tall open shrubland over Petalostylis labicheoides shrubland over Indigofera monophylla low open shrubland and Triodia wiseana hummock grassland.		
Fire Age	Burnt (hot) fairly recently.		
Notes	Narrow site to fit linear habitat. Vegetation cover estimated from remaining stems and regrowth. Very little Triodia regeneration		

Notes Narrow site to fit linear habitat. Vegetation cover estimated from remaining stems and regrowth. Very little Triodia regeneration but would have been +-30%.

# Associated Species List

Abutilon trudgenii, Acacia ancistrocarpa, Acacia bivenosa, Acacia coriacea subsp. pendens, Acacia monticola, Acacia pyrifolia, Alternanthera nana, Bidens bipinnata, Bonamia media var. villosa, Bonamia pannosa, Convolvulus remotus, Corchorus laniflorus, Corymbia hamersleyana, Crotalaria medicaginea, Cullen pogonocarpum, Dysphania rhadinostachya, Euphorbia boophthona, Euphorbia coghlanii, Evolvulus alsinoides, Goodenia stobbsiana, Haloragis gossei, Hibiscus aff. platychlamys (M9.15), Hybanthus aurantiacus, Indigofera monophylla, Leptopus decaisnei, Paspalidium clementii, Petalostylis labicheoides, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea longiflora (pale form), Portulaca oleracea, Ptilotus auriculifolius, Ptilotus calostachyus, Rhynchosia cf. minima, Scaevola spinescens, Senna glutinosa subsp. glutinosa, Senna glutinosa subsp. pruinosa x ?glutinosa, Senna notabilis, Senna venusta, Sida ?cardiophylla (juvenile), Sida rohlenae, Sida sp. 'rugose', Solanum diversiflorum, Solanum lasiophyllum, Swainsona canescens, Tephrosia supina, Trachymene oleracea, Trichodesma zeylanicum, Triodia wiseana, Triumfetta clementii

#### Site M010

Described by M	1M Date 4/16/00	Quadrat Size 50 x 50m	
Location	Central OB.		
AMG Zone 50	411463, 7669283	411482, 7669207	
Habitat	Newman LS. Hill slope.		
Soil	Shallow red clayey soil with co	ntinuous surface layer of angular pebbles.	
Vegetation	Very scattered shrubs of Acacia and Senna over 40-60% Triodia wisea		
Veg Condition	Condition Excellent. No obvious signs of disturbance.		
Dominant Spec	sies List		
Triodia wiseana	a (40-60%)		
Associated Species List			

Acacia ancistrocarpa, Acacia bivenosa, Bonamia media var. villosa, Hybanthus aurantiacus, Indigofera monophylla, Polygala aff. isingii, Ptilotus aervoides, Ptilotus calostachyus, Senna glutinosa subsp. glutinosa x luerssenii, Senna glutinosa subsp. pruinosa x ?glutinosa

# Site M011

Described by M	ET	Date 4/16/00	Quadrat Size 50 x 50m		
Location		Central Ore Body, near M07	12 etc.		
AMG Zone 50		411655, 7669073	411718, 7669078		
Habitat	Newma	n LS. Crest and upper slope	es of ridge.		
Soil	Red-bro	own pebbly / gravelly loam w	ith some cobbles amongst low outcrops; more loamy in patches between outcrops.		
Vegetation	Scattere	ed Acacia arida and Senna g	glutinosa subsp. glutinosa / S. g. subsp. pruinosa over Triodia wiseana hummock grassland.		
Veg Condition	Most of	site burnt.			
Fire Age	Fairly re	ecent.			
Dominant Speci	es List				
Triodia wiseana	(<1-30+	⊦%)			
Associated Spe	cies List	<u>t</u>			
Abutilon lepidun	sbutilon lepidum, Acacia arida, Acacia pyrifolia, Bonamia media var. villosa, Corchorus laniflorus, Cymbopogon ambiguus, Dysphania				
nadinostachya, Enneapogon caerulescens var. occidentalis, Euphorbia boophthona, Gomphrena cunninghamii, Haloragis gossei, Hibiscus aff.					
latychlamys (M9.15),					
Indigofera mono	phylla,	Oldenlandia crouchiana, Pa	spalidium clementii, Polycarpaea holtzei, Polygala aff. isingii, Portulaca oleracea, Ptilotus		
calostachyus, P	alostachyus, Ptilotus exaltatus var. exaltatus, Ptilotus fusiformis var. fusiformis, Senna glutinosa subsp. glutinosa, Senna glutinosa subsp.				

pruinosa x ?glutinosa, Senna notabilis, Sida ?cardiophylla (juvenile), Solanum horridum, Solanum lasiophyllum, Streptoglossa decurrens, Synaptantha tillaeacea var. tillaeacea, Tephrosia clementii, Tephrosia supina, Trachymene oleracea, Tribulus hirsutus, Trichodesma zeylanicum, Triumfetta clementii

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Described by M	M Date 4/16/00	Quadrat Size 110m x 10m
Location	Central Ore Body, roc	ky ridgeline adjacent to M009.
AMG Zone 50	411302, 7669002	411327, 7669117
Habitat	Newman LS. Rocky ridgeline.	

Soil Pockets of red clay loam between rocks.

Vegetation Sparse low shrubs over sparse to open grasses and open to dense herbs.

Veg Condition Very good? Burnt; scattered weeds.

Notes Narrow site to fit available habitat (narrow rocky ridge).

Dominant Species List

Gomphrena canescens (2-20%), Gomphrena cunninghamii (2-20%), Paspalidium clementii (10-20%)

Associated Species List

Abutilon lepidum, Acacia ancistrocarpa, Acacia monticola, Acacia pyrifolia, Amaranthus mitchellii, Bidens bipinnata, Bonamia media var. villosa, Cenchrus ciliaris, Corchorus laniflorus, Cymbopogon ambiguus, Dysphania rhadinostachya, Enneapogon oblongus, Eriachne mucronata, Euphorbia boophthona, Evolvulus alsinoides var. villosicalyx, Haloragis gossei, Hybanthus aurantiacus, Indigofera monophylla, Leptopus decaisnei, Mukia aff. maderaspatana sp. C, Nicotiana benthamiana, Paspalidium tabulatum, Petalostylis labicheoides, Polycarpaea longiflora (pale form), Portulaca oleracea, Ptilotus auriculifolius, Ptilotus clementii, Ptilotus exaltatus var. exaltatus, Ptilotus fusiformis var. fusiformis, Ptilotus obovatus, Rhynchosia cf. minima, Scaevola spinescens, Senna glutinosa subsp. glutinosa, Senna glutinosa subsp. pruinosa x ?glutinosa, Senna notabilis, Senna venusta, Sida sp. 'rugose', Streptoglossa decurrens, Tephrosia aff. densa, Tephrosia supina, Trachymene oleracea, Tribulus hirsutus, Tribulus platypterus, Trichodesma zeylanicum, Trichosanthes cucumerina Triodia wiseana, Triumfetta clementii

#### Site M013

Described by	MET	Date 4/16/00	
Location		Central OB.	
AMG Zone 50	)	411229, 7669444	411237, 7669469
Habitat	Newman	LS. Boulder pile on cre	st of ridge.
Soil	Red-brown gravelly/cobbly loam amongst boulders; more clayey soil around base of boulder pile.		
Rock Type	Outcrop is siliceous with some darker (bresciated) pieces as inclusions.		
Vegetation	Scattered	Ficus platypoda and A	cacia coriacea subsp. pendens over herbs, vines and grasses.
Notes	Irregular s	shaped area sampled,	defined by outcropping boulders (rock pile). Low outcrop area with soil patches between rocks
	was not s	ampled. Dense herbs	primarily Tribulus) around base of outcrop.
Dominant Spe	ecies List		

Acacia coriacea subsp. pendens (1-2%), Ficus platypoda var. minor (1-2%)

Associated Species List

Abutilon lepidum, Alysicarpus rugosus, Amaranthus mitchellii, Bidens bipinnata, Brachyachne prostrata, Canavalia rosea, Cenchrus ciliaris, Cleome viscosa, Commicarpus australis, Convolvulus remotus, Cuscuta victoriana, Cymbopogon ambiguus, Enchylaena tomentosa, Enneapogon caerulescens var. occidentalis, Eragrostis cumingii, Gomphrena cunninghamii, Jasminum didymum subsp. lineare, Nicotiana benthamiana, Operculina aequisepala, Paspalidium tabulatum, Polycarpaea longiflora (pale form), Portulaca oleracea, Ptilotus calostachyus, Rhynchosia cf. minima, Scaevola spinescens, Solanum horridum, Solanum lasiophyllum, Trachymene oleracea, Tribulus hirsutus, Trichodesma zeylanicum, Trichosanthes cucumerina, Triodia wiseana, Triumfetta clementii

# Site M014

Described by M	M Date 4/26/00	Quadrat Size 50 x 50m		
Location	Central OB.			
AMG Zone 50	411129, 7669394	411119, 7669326		
Habitat	Newman LS. Hill slope.			
Soil	Skeletal red clay loam with cor	ntinuous surface layer of angular pebbles		
Vegetation	Sparse Acacia bivenosa tall sh	rubs over 30-50% Triodia wiseana.		
Veg Condition	Very good. Occasional weed within site; drill pad to side of guadra			
Notes	0-2% leaf litter; negligible wood litter.			
Dominant Spec	ies List			
Acacia bivenosa (2-5%), Triodia wiseana (30-50%)				
Associated Spe	cies List	,		
A	Annale environment Annale environmenter antiques Annale violatories. Dislama histories			

Acacia ancistrocarpa, Acacia coriacea subsp. coriacea, Acacia victoriae, Bidens bipinnata, Bonamia media var. villosa, Corymbia hamersleyana, Euphorbia boophthona, Evolvulus alsinoides var. villosicalyx, Haloragis gossei, Indigofera monophylla, Mukia aff. maderaspatana sp. F, Paspalidium clementii, Polycarpaea holtzei, Polygala aff. isingii, Ptilotus calostachyus, Senna glutinosa subsp. glutinosa, Senna glutinosa subsp. pruinosa x ?glutinosa, Tephrosia supina, Trachymene oleracea, Trichodesma zeylanicum

Site M015			
Described by	MET Date 4/16/00	Quadrat Size ~30 x 10m	
Location Cen	tral OB.		
AMG Zone 50	<b>410870, 766766</b> 1	410871, 7667627	
Habitat	Newman LS. Lower part of a small flowline; on moderate slope, NNW aspect.		
Soil	Red-brown gravelly / pebbly loam; thin litter layer, particularly under the Eucalypts.		
Vegetation	Corymbia hamersleyana low mallee woodland with some Acacia coriacea subsp. pendens over scattered Acacia species over		
-	Triodia wiseana / T. epactia	a hummock grassland.	
Notes	Narrow transect to fit flowlin	ne. Site quite short as the vegetation changes abruptly (see Site M017). Corymbia occur on the banks,	
	not in the channel.		

**Dominant Species List** 

Acacia coriacea subsp. pendens (1-2%), Corymbia hamersleyana (15%), Triodia epactia (±5%), Triodia wiseana (>50%)

Associated Species List

Acacia ancistrocarpa, Acacia monticola, Acacia pyrifolia, Bidens bipinnata, Bonamia media var. villosa, Cassytha capillaris, Corchorus laniflorus, Cucumis melo subsp. agrestis, Cymbopogon ambiguus, Digitaria brownii, Evolvulus alsinoides, Goodenia stobbsiana, Hibiscus aff. platychlamys (M9.15), Hybanthus aurantiacus, Indigofera monophylla, Jasminum didymum subsp. lineare, Malvastrum americanum, Petalostylis labicheoides, Phyllanthus maderaspatensis var. angustifolius, Porana commixta, Rhynchosia cf. minima, Solanum horridum, Tephrosia supina, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

Described by M	M Date 4/16/00	Quadrat Size 50 x 50m	
Location	Central OB.		
AMG Zone 50	410792, 7667595	410859, 7667620	
Habitat	Newman LS. Hill slope.		
Soil	Red clay loam with continuous	surface layer of quartz and angular pebbles.	
Vegetation	Sparse tall shrubs dominated b	y Acacia bivenosa over 40-60% Triodia wisear	na.

#### Veg Condition Very good. Occasional weeds. Notes 1 x old pebble-mouse mound. <u>Dominant Species List</u> Triodia wiseana (40-60%) <u>Associated Species List</u>

Acacia ancistrocarpa, Acacia bivenosa, Acacia coriacea subsp. coriacea, Acacia pyrifolia, Bidens bipinnata, Bonamia media var. villosa, Cassytha capillaris, Cenchrus ciliaris, Corchorus laniflorus, Cymbopogon ambiguus, Dodonaea coriacea, Dysphania rhadinostachya, Evolvulus alsinoides var. villosicalyx, Goodenia stobbsiana, Hibiscus aff. platychlamys (M9.15), Hybanthus aurantiacus, Indigofera monophylla, Leptopus decaisnei, Paspalidium clementii, Polygala aff. isingii, Ptilotus clementii, Salsola tragus, Scaevola spinescens, Senna glutinosa subsp. glutinosa, Senna glutinosa subsp. glutinosa x luerssenii, Senna glutinosa subsp. pruinosa x ?glutinosa, Sida aff. cardiophylla (site 1086), Solanum gabrielae, Tephrosia supina, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

### Site M017

Described by MET Date 4/16/00 Location Central OB. AMG Zone 50 410871, 7667627 410848, 7667529 Habitat Newman LS. Middle and upper parts of small flowline; on a moderate slope, NNW aspect. Soil Very pebbly / gravelly red-brown loam Vegetation Acacia monticola shrubland to tall shrubland / thicket over scattered Acacia bivenosa, A. ancistrocarpa and Senna glutinosa subsp. pruinosa over scattered low shrubs of Hybanthus aurantiacus and Indigofera monophylla over Triodia wiseana / T. pungens hummock grassland.

Dominant Species List

Acacia monticola (35-75%), Triodia epactia (1-5%), Triodia wiseana (25-40%)

Associated Species List

Acacia ancistrocarpa, Acacia bivenosa, Acacia coriacea subsp. pendens, Acacia pyrifolia, Bidens bipinnata, Bonamia media var. villosa, Cassytha capillaris, Corchorus laniflorus, Cymbopogon ambiguus, Digitaria brownii, Dodonaea coriacea, Evolvulus alsinoides, Goodenia stobbsiana, Hibiscus aff. platychlamys (M9.15), Hybanthus aurantiacus, Indigofera monophylla, Paspalidium clementii, Scaevola spinescens, Senna glutinosa subsp. pruinosa x ?glutinosa, Sida aff. cardiophylla (site 1086), Solanum lasiophyllum, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

#### Site M018

Sile WOTO			
Described by MM	Date 4/16/00	Quadrat Size ~100 x 25m	
Location	Central OB.		
AMG Zone 50	410918, 7667609	410922, 7667503	
Habitat	Newman LS. Crest of tall ridge.		
Soil	Skeletal red clay loam with con	tinuous surface layer of pebbles and massive ?ironstone.	
Vegetation	Occasional tall shrubs over Aca	acia arida low open shrubland over Triodia wiseana hummock grassland.	
Veg Condition	Excellent.		
Notes	Long narrow site to fit ridge.		
Dominant Species	s List		
Acacia arida (2-5%	%), Triodia wiseana (40-60%)		
Associated Speci	es List		
Acacia bivenosa,	Acacia monticola, Acacia pyrifo	lia, Bonamia media var. villosa, Cassytha capillaris, Corchorus laniflorus, Cymbopogon	
ambiguus Eupho	rbia boophthona. Gomphrena c	unninghamii Goodenia microptera Hybanthus aurantiacus Polygala aff isingii Senna	

glutinosa subsp. glutinosa, Sida ?cardiophylla (juvenile), Sida clementii, Trachymene oleracea, Trichodesma zeylanicum,

#### Site M019

Described by	MET Date 4/17/00			
Location	Central OB.			
AMG Zone 50	) 411585, 7670357 411662, 7670498			
Habitat	Newman LS. Medium-sized flowline in an open gap through a ridge.			
Soil	Red-brown gravelly / pebbly loam.			
Vegetation	Scattered low mallees of Corymbia hamersleyana over Acacia tumida tall shrubland to scrub over scattered Acacia ancistrocarpa,			
-	A. pyrifolia (slender), A. bivenosa shrubs over low open shrubland of Indigofera monophylla, Isotropis atropurpurea and Hibiscus			
	over Triodia pungens hummock grassland.			
Notes	Flora list obtained from burnt section on north side of access track. Vegetation description partly from section on south side of			
	track, which is a regeneration (ca. 5 years since burnt) and is also a narrower, dryer part of the flowline. There would be Triodia			
	wiseana at the edges.			
Dominant Spe	<u>ecies List</u>			
A a a a la turnid				

Acacia tumida (>20%)

Associated Species List

Abutilon lepidum, Abutilon oxycarpum subsp. prostratum, Abutilon trudgenii, Acacia ancistrocarpa, Acacia bivenosa, Acacia coriacea subsp. pendens, Acacia pyrifolia, Alternanthera nana, Bidens bipinnata, Boerhavia coccinea, Bonamia media var. villosa, Bonamia pannosa, Bulbostylis barbata, Cenchrus ciliaris, Cleome viscosa, Corchorus laniflorus, Corchorus tridens, Corymbia hamersleyana, Cymbopogon ambiguus, Digitaria ctenantha, Dysphania rhadinostachya, Enneapogon caerulescens var. occidentalis, Eriachne aristidea, Euphorbia aff. australis type 2 (prostrate), Euphorbia boophthona, Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Flaveria australasica, Gomphrena cunninghamii, Goodenia stobbsiana, Hibiscus aff. platychlamys (M39.14), Hibiscus aff. platychlamys (M9.15), Hybanthus aurantiacus, Indigastrum parviflorum, Indigofera colutea, Indigofera monophylla, Ipomoea muelleri, Isotropis atropurpurea, Jasminum didymum subsp. lineare, Leptopus decaisnei, Mollugo molluginis,

Mukia aff. maderaspatana sp. C, Mukia aff. maderaspatana sp. F, Paspalidium clementii, Phyllanthus lacunellus, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea holtzei, Portulaca oleracea, Ptilotus aervoides, Ptilotus auriculifolius, Ptilotus exaltatus var. exaltatus, Ptilotus fusiformis var. fusiformis, Rhynchosia cf. minima, Scaevola spinescens, Senna notabilis, Sida clementii, Solanum diversiflorum, Solanum horridum, Solanum lasiophyllum, Solanum lasiophyllum, Sporobolus australasicus, Tephrosia aff. supina (ME Trudgen 12,357), Tephrosia clementii, Tephrosia supina, Trachymene oleracea, Tribulus hirsutus, Trichodesma zeylanicum, Triodia pungens, Triumfetta clementii, Waltheria indica

Described by MM	Date 4/17/00	Quadrat Size 50 x 50m
Location	Northern end of Central OB	

Associated Species List

Abutilon lepidum, Acacia ancistrocarpa, Acacia bivenosa, Bidens bipinnata, Bonamia media var. villosa, Brachyachne prostrata, Bulbostylis barbata, Cassytha capillaris, Cymbopogon ambiguus, Digitaria brownii, Dysphania rhadinostachya, Euphorbia aff. australis type 2 (prostrate), Euphorbia boophthona, Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Gomphrena cunninghamii, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Indigastrum parviflorum, Paraneurachne muelleri, Paspalidium clementii, Polygala aff. isingii, Ptilotus aervoides, Senna glutinosa subsp. pruinosa x ?glutinosa, Solanum lasiophyllum, Sporobolus australasicus, Tephrosia aff. supina (ME Trudgen 12,357), Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

#### Sito M021

Described b	y MET Date 4/17/00	Quadrat Size 50 x 50m	
Location	Just north of M022.		
AMG Zone 5	60 415588, 7672944	415635, 7672992	
Habitat	Horseflats LS. Clayey plain; very	gentle slope to east.	
Soil	Orange-brown cracking clay. Some small patches more bare of vegetation (slightly raised and more pebbly), and some slig depressions that are a little wetter. Some pebbles.		
Vegetation	<ul> <li>Eragrostis xerophila mid-dense tussock grassland with small patches of Eriachne benthamii (and other patches with Sida fibulifera or annual herbs).</li> </ul>		
Notes	On the largest dryer patch, Sida fi	bulifera had a cover of <10%. This area had calcareous pebbles and an orange-brown loamy	

soil. Acacia farnesiana recorded just outside plot.

Dominant Species List

Eragrostis xerophila (25-30%)

Associated Species List

Abutilon malvifolium, Alysicarpus rugosus, Aristida contorta, Boerhavia paludosa, Capparis spinosa var. nummularia, Cenchrus ciliaris, Cenchrus setigerus, Cleome viscosa, Corchorus tridens, Cyperus bulbosus, Dactyloctenium radulans, Desmodium muelleri, Dichanthium sericeum subsp. humilius, Enneapogon caerulescens var. occidentalis, Eragrostis setifolia, Eriachne benthamii, Euphorbia aff. drummondii (MET 15211), Heliotropium sp. 1, Indigastrum parviflorum, Indigofera linifolia, Indigofera trita, Iseilema membranaceum, Neptunia dimorphantha, Oldenlandia sp. 'gilgai', Phyllanthus maderaspatensis var. angustifolius, Polygala sp., Ptilotus carinatus, Ptilotus exaltatus var. exaltatus, Rhynchosia cf. minima, Sida aff. fibulifera (MET Site 1308), Solanum horridum, Sporobolus australasicus, Stemodia kingii, Tephrosia supina, Tribulus occidentalis, Xerochloa imberbis

# Site M022

Described by MM Date 4/17/00 Quadrat Size ~100 x 25m AMG Zone 50 415479, 7672837 415558, 7672784 Horseflats LS. Small flowline within clayey plain supporting Snakewood shrubland. Habitat Soil Red clav loam. Vegetation Acacia sclerosperma, Acacia coriacea high shrubland over Chrysopogon fallax tussock grassland. Moderate: Grazing?; variable amounts of weeds (primarily buffel and birdwood grass). Veg Condition Notes Fauna Site 1. 10-30% leaf litter. Dominant Species List Acacia coriacea subsp. pendens (2-10%), Acacia sclerosperma (10-30%), Cenchrus ciliaris (2-10%), Cenchrus setigerus (2-10%), Chrysopogon fallax (60-70%), Eriachne benthamii (2-10%) Associated Species List Acacia farnesiana, Acacia inaequilatera, Acacia xiphophylla, Alysicarpus rugosus, Boerhavia paludosa, Bonamia media var. villosa,

Bothriochloa ewartiana, Capparis spinosa var. nummularia, Convolvulus remotus, Crotalaria medicaginea, Dactyloctenium radulans, Dichanthium sericeum subsp. humilius, Eragrostis xerophila, Eremophila longifolia, Euphorbia aff. drummondii (MET 15211), Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Goodenia forrestii, Heliotropium sp. 1, Hibiscus brachysiphonius, Indigastrum parviflorum, Indigofera linifolia, Ipomoea muelleri, Iseilema membranaceum, Leptopus decaisnei, Malvastrum americanum, Mukia aff. maderaspatana sp. E, Panicum decompositum, Phyllanthus maderaspatensis var. angustifolius, Polymeria ambigua, Pterocaulon sphacelatum, Rhynchosia cf. minima, Rostellularia adscendens var. clementii, Sida rohlenae, Solanum diversiflorum, Solanum horridum, Solanum lasiophyllum, Sporobolus australasicus, Stemodia kingii, Themeda triandra, Triodia epactia, Triumfetta clementii, Vigna lanceolata var. lanceolata

#### Site M023

Described by MET Date 4/17/00 Quadrat Size 50 x 50m 416398, 7675830 AMG Zone 50 416445, 7675882 Boundary of Paraburdoo and Rocklea LS. Lower slope of a low rounded hill; WNW aspect. Habitat Soil Very gravelly / pebbly red-brown loam with some cobbles (?basaltic). Vegetation Triodia wiseana mid-dense hummock grassland. Notes Some species only seen in small, open, more loamy areas (see under species notes). No Eriachne pulchella seen. **Dominant Species List** Triodia wiseana (35-40%) Associated Species List Aristida contorta, Boerhavia coccinea, Bonamia media var. villosa, Bulbostylis barbata, Corchorus laniflorus, Crotalaria medicaginea, Cymbopogon ambiguus, Dichanthium sericeum subsp. humilius, Enneapogon caerulescens var. occidentalis, Euphorbia aff. australis type 2 (prostrate), Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Indigastrum parviflorum, Indigofera linifolia, Iseilema dolichotrichum,

Leptopus decaisnei, Oldenlandia crouchiana, Paspalidium clementii, Polygala aff. isingii, Ptilotus exaltatus var. exaltatus, Rhynchosia cf. minima, Sclerolaena uniflora, Sida clementii, Solanum horridum, Solanum lasiophyllum, Sporobolus australasicus, Tephrosia supina, Tragus

# Site M024

Described by M	M Date 4/17/00	Quadrat Size 50 x 50m
AMG Zone 50	416041, 7675944	416029, 7676017
Habitat	Paraburdoo LS. Stony plain.	

australianus, Triumfetta clementii

Soil Red clay loam with continuous surface layer of pebbles and stones. Vegetation Acacia xiphophylla high open shrubland over Triodia wiseana hummock grassland. Veg Condition Very good: occasional weeds otherwise no disturbance evident. Fauna Site 2. 0-2% leaf and wood litter. Notes Dominant Species List

Acacia xiphophylla (10%), Sclerolaena eriacantha (2-5%), Triodia wiseana (30-50%) Associated Species List

Abutilon fraseri, Amaranthus mitchellii, Aristida contorta, Boerhavia coccinea, Cenchrus ciliaris, Enchylaena tomentosa, Enteropogon acicularis, Eragrostis xerophila, Eremophila forrestii subsp. forrestii, Evolvulus alsinoides var. villosicalyx, Fimbristylis depauperata, Gomphrena canescens, Hibiscus brachysiphonius, Maireana planifolia, Neptunia dimorphantha, Paspalidium clementii, Portulaca oleracea, Portulaca pilosa, Ptilotus exaltatus var. exaltatus, Sarcostemma viminale subsp. australe, Senna glutinosa subsp. chatelainiana, Setaria verticillata, Sida aff. fibulifera (MET Site 1346), Sporobolus australasicus, Tephrosia supina

# Site M025

Described by MET Date 4/17/00 Quadrat Size ~200 x 10m AMG Zone 50 416436, 7677089 416309, 7677210 Paraburdoo LS. Small creek incised into a plain; narrow floodplain and banks. Habitat Gravelly to cobbly, brown sandy loam. Soil Vegetation Eucalyptus victrix woodland over Acacia coriacea subsp. pendens low open woodland over \*Cenchrus ciliaris mid-dense grassland. Notes Scattered individuals of Triodia angusta on banks, with some patches of T. angusta in the creekbed. Dominant Species List

Cenchrus ciliaris (±30%), Eucalyptus victrix (10%)

Associated Species List

Acacia coriacea subsp. pendens, Acacia farnesiana, Acacia pyrifolia, Achyranthes aspera, Aerva javanica, Alternanthera nana, Alysicarpus rugosus, Amaranthus pallidiflorus, Bidens bipinnata, Boerhavia burbidgeana, Boerhavia type 2, Bonamia media var. villosa, Capparis spinosa var. nummularia, Cenchrus setigerus, Chrysopogon fallax, Cleome viscosa, Clerodendrum tomentosum var. ?, Commicarpus australis, Dicladanthera forrestii, Enchylaena tomentosa, Flueggea virosa subsp. melanthesoides, Glycine canescens, Goodenia forrestii, Hybanthus aurantiacus, Indigofera linifolia, Leptopus decaisnei, Operculina aequisepala, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea longiflora (pale form), Porana commixta, Rostellularia adscendens var. clementii, Santalum lanceolatum, Senna artemisioides subsp. oligophylla, Sida aff. fibulifera (MET Site 1346), Solanum gabrielae, Solanum lasiophyllum, Swainsona formosa, Themeda triandra, Trichodesma zeylanicum, Triodia angusta, Triodia pungens, Triumfetta clementii,

# Site M026

Described by MM	Date 4/17/00	Quadrat Size 50 x 50m
AMG Zone 50	416447, 7676028	416518, 7676033
Habitat	Paraburdoo LS (near section of	Rocklea LS). Stony plain.
Soil	Red clay loam with continuous s	surface layer of pebbles.
Vegetation	Very occasional tall shrubs of A	cacia inaequilatera over Triodia wiseana hummock grassland.
Veg Condition	Very good: occasional weeds a	re only disturbance evident.
Dominant Species	<u>s List</u>	
Triodia wiseana (3	30-50%)	
Associated Specie	<u>es List</u>	
Abutilon lepidum,	Abutilon trudgenii, Acacia inaeq	uilatera, Amaranthus mitchellii, Aristida contorta, Boerhavia coccinea, Bulk
Cenchrus ciliaris,	Crotalaria medicaginea, Dactylc	ctenium radulans, Dichanthium sericeum subsp. humilius, Enchylaena ton

oostylis barbata. nentosa, Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Fimbristylis depauperata, Hibiscus aff. platychlamys (M39.14), Indigofera linifolia, Paspalidium clementii, Phyllanthus lacunellus, Polycarpaea corymbosa var. corymbosa, Polygala aff. isingii, Pterocaulon sphacelatum, Ptilotus aervoides, Rhagodia eremaea, Rhynchosia cf. minima, Sclerolaena eriacantha, Solanum horridum, Sporobolus australasicus, Triumfetta clementii

# Sito M027

Described by	MET Date 4/17/00	Quadrat Size ~55 x 30m	
AMG Zone 50	417145, 7680293	417187, 7680279	417154, 7680342
Habitat	Paraburdoo LS. Clayey plain; gentle	slope to north.	
Soil	Red-brown cracking clay with small d	epressions.	
Vegetation	Eriachne benthamii / Eragrostis xerop	phila mid-dense tussock gras	sland.
Notes	Quadrat 55m long by 37m (south end tussock grasses: two of these suppor patches of Eriachne benthamii tussoo grasses (supporting mixed herbs), ar	I) and 20m (north end), to av t Sida ?fibulifera low open sh ck grassland, Eragrostis xero d areas with Acacia xiphoph	bid Snakewood area. Site includes some 'open' areas (lacking arublands (very small patches). To the north is a mosaic of phila tussock grassland, small patches of cracking clay without ylla low shrubland.
Dominant Sn	cioe Liet		

Eragrostis xerophila (10-15%), Eriachne benthamii (>25%), Sida aff. fibulifera 'var. L' (2-3%) Associated Species List

Abutilon malvifolium, Atriplex codonocarpa, Blumea tenella, Boerhavia paludosa, Brachyachne prostrata, Bulbostylis barbata, Cenchrus ciliaris, Centipeda minima, Chloris pectinata, Chrysopogon fallax, Corchorus tridens, Crotalaria dissitiflora subsp. benthamiana, Cullen graveolens, Cyperus iria, Cyperus squarrosus, Desmodium muelleri, Dichanthium sericeum subsp. humilius, Enneapogon caerulescens var. occidentalis, Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Goodenia omearana ms., Haloragis gossei, Indigastrum parviflorum, Indigofera linifolia, Indigofera trita, Malvastrum americanum, Marsilea hirsuta, Mukia sp.D Flora of Australia (A.A.Mitchell PRP 1121), Neptunia aff. dimorphantha (M27), Phyllanthus maderaspatensis var. angustifolius, Ptilotus aervoides, Ptilotus carinatus, Ptilotus gomphrenoides var. gomphrenoides, Rhynchosia cf. minima, Sclerolaena glabra, Senna hamersleyensis, Sida rohlenae, Solanum horridum, Solanum lasiophyllum, Sporobolus australasicus, Stemodia kingii, Streptoglossa liatroides

Described by	MM	Date 4/17/00	Quadrat Size 50 x 50m
AMG Zone 50	)	417131, 7680243	417050, 7680246
Habitat	Paraburd	oo LS. Stony plain.	
Soil	Red clay loam with continuous surface layer of pebbles and stones.		
Vegetation	Scattered Acacia xiphophylla low shrubs over patches of dense Eragrostis xerophila.		
Notes	This vegetation is interspersed with more clayey patches dominated by Maireana/Sclerolaena and Atriplex (see Site M028B).		
Dominant Species List			

Acacia xiphophylla (2-5%), Eragrostis xerophila (70-80%) Associated Species List

Abutilon aff. lepidum (1) (MET 15 352), Abutilon fraseri, Amaranthus mitchellii, Cenchrus ciliaris, Enchylaena tomentosa, Enteropogon acicularis, Fimbristylis depauperata, Hibiscus brachysiphonius, Maireana tomentosa, Neptunia dimorphantha, Panicum decompositum, Portulaca oleracea, Portulaca pilosa, Rhagodia eremaea, Senna glutinosa subsp. chatelainiana, Setaria verticillata, Solanum horridum, Sporobolus australasicus, Streptoglossa liatroides, Xerochloa imberbis

#### Site M028B

Described by MM Date 4/17/00 Opp. Collecns. AMG Zone 50 417131, 7680243 Habitat Paraburdoo LS. Stony plain Soil Red clay loam with continuous surface layer of pebbles and stones; more clayey patches within site M028. Vegetation Open herbs dominated by Sclerolaena eriacantha and Atriplex codonocarpa. Notes See site M028. Dominant Species List

Atriplex codonocarpa (2-5%), Sclerolaena eriacantha (2-10%)

Associated Species List

Aristida contorta, Boerhavia coccinea, Brachyachne prostrata, Dactyloctenium radulans, Evolvulus alsinoides var. villosicalyx, Fimbristylis depauperata, Hibiscus brachysiphonius, Portulaca pilosa, Ptilotus aervoides, Ptilotus murrayi var. murrayi, Sclerolaena glabra, Senna hamersleyensis, Sida aff. fibulifera 'var. L', Streptoglossa liatroides, Tragus australianus, Xerochloa imberbis

#### Site M029

Described by	MET	Date 4/17/00	Quadrat Size ~220 x 10m	
AMG Zone 50	)	417396, 7679923	417246, 7679960	
Habitat	Paraburd	oo LS. Small creekline; no	defined banks, bed mostly vegetated.	
Soil	Gravelly t	o cobbly red-brown loamy	sand.	
Vegetation	Eucalyptus victrix low open woodland over Acacia coriacea tall open shrubland / low open woodland over scattered Acacia pyrifolia / A. bivenosa over *Cenchrus ciliaris, Triodia epactia, Themeda triandra, Cymbopogon ambiguus mid-dense grassland.			
Notes	Some small bare areas with cobbles. Strip ~220m long recorded on west side of track to fit habitat.			
Dominant Sp	ecies List			
<u> </u>				

Cenchrus ciliaris (>30%), Eucalyptus victrix (<5%), Themeda triandra (2-3%), Triodia epactia (10-15%)

# Associated Species List

Abutilon cunninghamii, Acacia bivenosa, Acacia coriacea subsp. pendens, Acacia farnesiana, Acacia pyrifolia, Achyranthes aspera, Alternanthera nana, Amaranthus pallidiflorus, Boerhavia type 1, Cassytha capillaris, Cenchrus setigerus, Cleome viscosa, Cymbopogon ambiguus, Cymbopogon bombycinus, Digitaria brownii, Digitaria ctenantha, Eremophila longifolia, Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Glycine canescens, Goodenia forrestii, Grevillea pyramidalis, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Indigofera monophylla, Indigofera trita, Ipomoea muelleri, Isotropis atropurpurea, Jasminum didymum subsp. lineare, Leptopus decaisnei, Malvastrum americanum, Melaleuca glomerata, Mukia aff. maderaspatana sp. A, Mukia aff. maderaspatana sp. E, Mukia aff. maderaspatana sp. F, Phyllanthus maderaspatensis var. angustifolius, Polymeria ambigua, Portulaca oleracea, Pterocaulon sphaeranthoides, Rhagodia eremaea, Rhynchosia cf. minima, Scaevola spinescens, Solanum horridum, Solanum lasiophyllum, Triumfetta clementii, Vigna lanceolata var. lanceolata, Waltheria indica

# Site M030

Described by MM Date 4/17/00 Quadrat Size 50 x 50m AMG Zone 50 417410, 7679702 417459, 7679662 Habitat Paraburdoo LS. Plain (not stony). Red clay loam with scatters of pebbles and occasional stones on surface. Soil Vegetation Acacia bivenosa high open shrubland over Triodia wiseana hummock grassland. Veg Condition Very good: occasional weed. Notes 0-2% leaf and wood litter. Vegetation around guadrat tends to be scattered Hakea suberea / Acacia inaeguilatera over Triodia wiseana

Dominant Species List

Acacia bivenosa (2-10%), Triodia wiseana (70-90%)

Associated Species List

Acacia coriacea subsp. coriacea, Acacia elachantha golden hairy variant, Acacia marramamba, Acacia tenuissima, Aristida holathera, Cassytha capillaris, Cenchrus ciliaris, Cymbopogon ambiguus, Cymbopogon obtectus, Dichanthium sericeum subsp. humilius, Digitaria brownii, Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Gomphrena canescens, Goodenia microptera, Hakea lorea subsp. suberea, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Indigofera monophylla, Indigofera trita, Mukia aff. maderaspatana sp. C, Paspalidium clementii, Pterocaulon sphacelatum, Ptilotus auriculifolius, Rhagodia eremaea, Rhynchosia cf. minima, Scaevola spinescens, Senna notabilis, Solanum horridum, Solanum lasiophyllum, Trichodesma zeylanicum, Triumfetta clementii

#### Site M031

Described by	MET	Date 4/17/00	Quadrat Size 50 x 50m	
AMG Zone 50	)	417175, 7678649	417248, 7678692	
Habitat	Rocklea I	_S. Gentle lower slopes of a	low hill.	
Soil	Red-brow	n pebbly / gravelly loam. Lo	west part of plot has fewer pebbles.	
Vegetation	Scattered	Acacia inaequilatera and A	. bivenosa over Triodia wiseana mid-dense hummock grassland.	
Notes	Some low outcrops of basaltic (?) rock. Hakea lorea subsp. Suberea recorded just outside plot.			
Dominant Species List				
.cacia bivenosa (1-2%), Triodia wiseana (50-60%)				
Associated Si	sociated Species List			

Abutilon lepidum, Acacia inaequilatera, Bonamia media var. villosa, Cenchrus ciliaris, Dichanthium sericeum subsp. humilius, Digitaria brownii, Enchylaena tomentosa, Euphorbia australis, Evolvulus alsinoides var. villosicalyx, Gomphrena cunninghamii, Hibiscus aff. platychlamys (M39.14), Indigofera monophylla, Indigofera trita, Mukia aff. maderaspatana sp. C, Paspalidium clementii, Phyllanthus lacunellus, Polygala aff. isingii, Pterocaulon sphacelatum, Ptilotus exaltatus var. exaltatus, Rhynchosia cf. minima, Sclerolaena eriacantha, Senna glutinosa subsp. glutinosa, Senna glutinosa subsp. pruinosa x ?glutinosa, Senna notabilis, Solanum lasiophyllum, Streptoglossa decurrens, Swainsona formosa, Tribulus hirsutus Triumfetta clementii

Described by MM	Date 4/17/00	Quadrat Size ~120 x 10m	
AMG Zone 50	417265, 7678841	417356, 7678749	
Habitat	Rocklea LS. Minor drainage.		
Soil	Red clay.		
Vegetation	Acacia sclerosperma high shrubland over dense grasses (primarily Themeda triandra and Buffel grass).		
Veg Condition	Moderate: extensive invasion by Buffel.		
Notes	30-50% leaf litter. Narrow quadrat to fit habitat.		
Dominant Species	<u>s List</u>		

Acacia bivenosa (2-10%), Acacia sclerosperma (20-30%), Cenchrus ciliaris (40-60%), Cenchrus setigerus (2-10%), Themeda triandra (10-30%), Triodia wiseana (2-10%)

# Associated Species List

Abutilon fraseri, Abutilon trudgenii, Acacia ancistrocarpa, Acacia farnesiana, Acacia victoriae, Alternanthera nana, Aristida contorta, Boerhavia coccinea, Chrysopogon fallax, Cleome viscosa, Dichanthium sericeum subsp. humilius, Digitaria ctenantha, Enchylaena tomentosa, Eremophila longifolia, Euphorbia aff. australis type 1 (erect stems), Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Goodenia forrestii, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Indigofera trita, Leptopus decaisnei, Malvastrum americanum, Melhania oblongifolia, Mukia aff. maderaspatana sp. F, Phyllanthus maderaspatensis var. angustifolius, Portulaca oleracea, Pterocaulon sphacelatum, Ptilotus obovatus, Rhynchosia cf. minima, Scaevola spinescens, Senna artemisioides subsp. oligophylla, Sida aff. fibulifera (MET Site 1346), Solanum diversiflorum, Solanum lasiophyllum, Stemodia grossa, Triodia angusta, Triumfetta clementii

# Site M033

Sile M033			
Described by	MET	Date 4/18/00	Quadrat Size ~150 x 10m
AMG Zone 50	) .	416958 7681378	417078 7681339
Habitat	Mapped as	s Rocklea LS, but rather ext	ension of Paraburdoo LS? Small creekline across gently undulating plain.
Soil	Gravelly /	pebbly red-brown sandy loa	m; cobbly / bouldery in places.
Vegetation	Acacia coriacea tall shrubland to low open woodland with scattered low Erythrina vespertilio over *Cenchrus ciliaris, Triodia angusta and Themeda triandra mid-dense grassland.		
Notes	Site is a st abundant. recorded c	trip including the creekbed ( Calcareous material (calcre putside plot.	vegetated) and small floodplain / banks. Site comprises area in which *Cenchrus is te) present at edges of creek. Cymbopogon ambiguus and Gomphrena canescens

Dominant Species List

Acacia coriacea subsp. pendens (10-15%), Cenchrus ciliaris (25-40%), Themeda triandra (<5%), Triodia angusta (<5%) Associated Species List

Abutilon cunninghamii, Acacia bivenosa, Acacia farnesiana, Acacia pyrifolia, Adriana tomentosa, Alternanthera nana, Amaranthus pallidiflorus, Bidens bipinnata, Boerhavia gardneri, Boerhavia repleta, Cassytha capillaris, Cenchrus setigerus, Ehretia saligna, Erythrina vespertilio, Euphorbia coghlanii, Euphorbia tannensis subsp. eremophila, Evolvulus alsinoides var. villosicalyx, Glycine canescens, Goodenia forrestii, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Indigofera monophylla, Indigofera trita, Ipomoea muelleri, Leptopus decaisnei, Malvastrum americanum, Melhania oblongifolia, Mukia aff. maderaspatana sp. E, Mukia aff. maderaspatana sp. F, Panicum decompositum, Phyllanthus maderaspatensis var. angustifolius, Polymeria ambigua, Portulaca oleracea, Pterocaulon sphacelatum, Rhynchosia cf. minima, Santalum lanceolatum, Senna artemisioides subsp. oligophylla, Senna glutinosa subsp. glutinosa, Solanum diversiflorum, Solanum horridum, Solanum lasiophyllum, Sorghum plumosum, Stemodia grossa, Trichodesma zeylanicum, Triodia pungens, Triumfetta clementii, Vigna lanceolata var. lanceolata,

#### Site M034

Sito MO25

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Described by MM	Date 4/18/00	Quadrat Size 50 x 50m
AMG Zone 50	416982, 7681498	417032, 7681445
Habitat	Rocklea? LS. Stony plain.	
Soil	Red/orange clay loam with c	ontinuous surface layer of pebbles and stones, including calcareous nodules.
Vegetation	Scattered shrubs (primarily A	Acacia bivenosa) over Triodia wiseana hummock grassland.
Veg Condition	Very good: occasional weed	is only disturbance.
Notes	2-10% leaf litter. Stone flake	s and shell scatters present.
Dominant Species	s List	-
Triodia wiseana (	50-70%)	
Associated Speci	es List	
Abutilon lepidum,	Acacia bivenosa, Boerhavia	coccinea, Boerhavia gardneri, Bonamia media var. villosa, Cassytha capillaris, Cenchrus ciliaris
Cenchrus setiger	us, Corchorus walcottii, Dicha	anthium sericeum subsp. humilius, Enchylaena tomentosa, Euphorbia aff. australis type 2
(manadanata) Europa	and a second level. Even handle ter	annois a dhan annanachta. Fualachta alaineidea uan uilleaineide. Ceanalachta a suariachtan i

Cenchrus setigerus, Corchorus walcottii, Dichanthium sericeum subsp. humilius, Enchylaena tomentosa, Euphorbia aff. australis type 2 (prostrate), Euphorbia coghlanii, Euphorbia tannensis subsp. eremophila, Evolvulus alsinoides var. villosicalyx, Gomphrena cunninghamii, Hibiscus aff. platychlamys (M39.14), Indigofera monophylla, Indigofera sessiliflora, Indigofera trita, Maireana tomentosa, Mukia aff. maderaspatana sp. A, Phyllanthus maderaspatensis var. angustifolius, Pterocaulon sphacelatum, Ptilotus aervoides, Ptilotus exaltatus var. exaltatus, Rhynchosia cf. minima, Salsola tragus, Scaevola spinescens, Senna glutinosa subsp. pruinosa x ?glutinosa, Sida aff. fibulifera (MET Site 1346), Solanum horridum, Solanum lasiophyllum, Sporobolus australasicus, Tephrosia supina, Triodia angusta, Triumfetta clementii

Described by	MET	Date 4/18/00	Quadrat Size ~150 x 10m
AMG Zone 50	)	419016, 7689834	419156, 7689804
Habitat	Boundary	of Littoral and Rocklea LS.	Gentle stony slope adjacent to beach. Defined by beach on lower side and change in
	Triodia or	n upper side.	
Soil	Red-brown gravelly / pebbly loam amongst cobbles, some low outcrops and boulders.		ongst cobbles, some low outcrops and boulders.
Vegetation	n Triodia angusta mid-dense hummock grassland with patches of Themeda triandra and Cassytha capillaris.		
Notes	Narrow strip quadrat within band of Triodia angusta. Quadrat extends from corners 1 and 2 down to edge of samphire.		
	Sporobolu	us virginicus and some succ	ulents recorded at lower edge: these referred to adjoining unit (see M036).
Dominant Spe	ecies List		

Triodia angusta (30-45%)

Associated Species List

Abutilon lepidum, Acacia bivenosa, Achyranthes aspera, Boerhavia gardneri, Cassytha capillaris (+-5%)Chrysopogon fallax, Cleome viscosa, Corchorus walcottii, Cymbopogon ambiguus, Enchylaena tomentosa, Eriachne mucronata, Eulalia aurea, Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Gomphrena cunninghamii, Hibiscus aff. platychlamys (M35.11), Indigofera monophylla, Indigofera trita, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea longiflora (pale form), Portulaca pilosa, Pterocaulon sphaeranthoides, Rhynchosia cf. minima, Scaevola spinescens, Sesbania cannabina, Solanum horridum, Solanum lasiophyllum, Tephrosia aff. clementii type 2 (M35.14), Tephrosia clementii, Tephrosia supina, Themeda triandra, Trianthema turgidifolia, Triodia wiseana, Triumfetta clementii

# Site M036

Described by MM Date 4/18/00 Quadrat Size ~250 x 10m Location Samphire fringing southern margin of tidal inlet between mainland and Cape Preston. AMG Zone 50 418941, 7689849 418715, 7689740 Littoral LS. Tidal mudflat. Habitat Soil Coarse brown mud Vegetation Samphire Veg Condition Very good to excellent: only visible disturbance is a single vehicle track. Narrow quadrat within strip of samphire. Notes Dominant Species List Halosarcia halocnemoides subsp. tenuis (10-30%), Hemichroa diandra (2-10%), Muellerolimon salicorniaceum (2-10%) Associated Species List Avicennia marina, Dysphania plantaginella, Eragrostis falcata, Eragrostis xerophila, Frankenia ambita, Halosarcia indica subsp. leiostachya, Halosarcia pruinosa, Halosarcia pterygosperma subsp. denticulata, Neobassia astrocarpa, Sporobolus virginicus, Trianthema turgidifolia Site M037 Described by MET Date 4/18/00 419146, 7689774 AMG Zone 50 419177, 7689765 Habitat Rocklea LS. Rockpile of large boulders; about 70m up a gentle slope from the beach (about one third or less up a north-facing hillslope). Acacia coriacea open shrubland over scattered Acacia bivenosa over Cymbopogon ambiguus open grassland. Vegetation Notes 1. Linear area of rockpile / boulder outcrop on change of slope (M037). Area of Triodia wiseana at back of rocks not included. 2. Higher rockpile (of paler rock) 75m to the west (M037A). Dominant Species List Acacia coriacea subsp. coriacea (+-5%), Cymbopogon ambiguus (<10%) Associated Species List Acacia bivenosa, Achyranthes aspera, Alternanthera nana, Amaranthus mitchellii, Bidens bipinnata, Capparis spinosa var. nummularia, Cenchrus ciliaris, Chrysopogon fallax, Cleome viscosa, Commicarpus australis, Dactyloctenium radulans, Digitaria brownii, Digitaria ctenantha,

Enchylaena tomentosa, Eremophila longifolia, Gomphrena cunninghamii, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Mukia aff. maderaspatana sp. C, Nicotiana benthamiana, Paspalidium clementii, Paspalidium tabulatum, Phyllanthus maderaspatensis var. angustifolius, Portulaca oleracea, Portulaca pilosa, Rhynchosia cf. minima, Scaevola spinescens, Sida aff. fibulifera (M37.16), Sida sp. 'rugose', Tephrosia aff. densa, Trichosanthes cucumerina, Triodia wiseana, Triumfetta clementii

#### Site M037A

Described by	/ MET	Date 4/18/00
Location		~75m west of M037.
AMG Zone 5	0	419071, 7689774
Habitat	Rocklea	LS. Rockpile.
Vegetation	See deta	ils for M037.
Notes	See deta	ils for M037.
Associated S	Species Lis	t

Acacia bivenosa, Acacia coriacea subsp. coriacea, Capparis spinosa var. nummularia, Cenchrus ciliaris, Cymbopogon ambiguus, Ehretia saligna, Enchylaena tomentosa, Eremophila longifolia, Eriachne mucronata, Flueggea virosa subsp. melanthesoides, Gomphrena cunninghamii, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Mukia aff. maderaspatana sp. C, Operculina aequisepala, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea longiflora (pale form), Rhagodia eremaea, Rhynchosia cf. minima, Senna artemisioides subsp. oligophylla, Sida aff. fibulifera (M37.16), Sida sp. 'rugose', Tephrosia aff. densa, Tinospora smilacina, Triumfetta clementii

#### Site M038

Described by MM Date 4/18/00 Quadrat Size 50 x 50m AMG Zone 50 419033. 7689826 419083, 7689765 Habitat Edge of Rocklea LS. Slope of low hill. Soil Very shallow red soil with continuous surface layer of stones and rocks. Solid rock close to surface. Rock Type Volcanic (MET). Vegetation Triodia wiseana hummock grassland. Veg Condition Very good: occasional weed present. Dominant Species List Triodia wiseana (40-60%) Associated Species List Abutilon lepidum, Acacia bivenosa, Aerva javanica, Boerhavia coccinea, Bonamia media var. villosa, Capparis spinosa var. nummularia,

Cassytha capillaris, Corchorus walcottii, Cymbopogon ambiguus, Enchylaena tomentosa, Evolvulus alsinoides var. villosa vai. Turinfindiaria, Cassytha capillaris, Corchorus walcottii, Cymbopogon ambiguus, Enchylaena tomentosa, Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Gomphrena cunninghamii, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus Indigofera monophylla, Indigofera trita, Mukia aff. maderaspatana sp. E, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea longiflora (pale form), Pterocaulon sphacelatum, Rhynchosia cf. minima, Scaevola spinescens, Solanum horridum, Solanum lasiophyllum, Tephrosia supina, Trachymene oleracea, Trianthema turgidifolia, Trichodesma zeylanicum, Triodia angusta

#### Site M039

Described by	MET	Date 4/18/00	Quadrat Size ~100 x 10m
AMG Zone 50	)	418303, 7687760	418201, 7687774
Habitat	Rocklea L	S. Open flowline in broad	valley between two low hills.
Soil	Brown sa	ndy loam with black (blue-g	green) algal crust on surface.
Vegetation	Scattered ciliaris / T	l Acacia coriacea over Acac riodia wiseana mid-dense g	cia inaequilatera tall open shrubland over Acacia bivenosa open shrubland over *Cenchrus grassland.
Notes	Area reco bivenosa there are the creek	orded is a short length of the over *Cenchrus ciliaris / Tr the same associated speci (~100m), there is more Ac	e creek that has more dense Acacia cover. Downslope the creek has scattered Acacia iodia angusta grassland. Tephrosia aff. supina collected here. In the open part of the creek es, but they are more common (particularly Indigofera trita and I. monophylla). Further down acia coriacea.
Dominant Sp	ecies List		

Acacia inaequilatera (5%), Cenchrus ciliaris (50-60%), Triodia wiseana (>5%)

# Associated Species List

Abutilon lepidum, Acacia bivenosa, Acacia coriacea subsp. pendens, Acacia farnesiana, Acacia victoriae, Achyranthes aspera, Alternanthera nana, Alysicarpus rugosus, Bonamia media var. villosa, Bulbostylis barbata, Cassytha capillaris, Chrysopogon fallax, Corchorus tridens, Corchorus walcottii, Dactyloctenium radulans, Enchylaena tomentosa, Eragrostis dielsii, Eremophila longifolia, Euphorbia tannensis subsp. eremophila, Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Goodenia microptera, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Indigofera linifolia, Indigofera monophylla, Indigofera trita, Melhania oblongifolia, Mukia aff. maderaspatana sp. C, Mukia aff. maderaspatana sp. F, Phyllanthus maderaspatensis var. angustifolius, Portulaca oleracea, Portulaca pilosa, Pterocaulon sphacelatum, Ptilotus auriculifolius, Rhagodia eremaea, Rhynchosia cf. minima, Scaevola spinescens, Sida clementii, Solanum horridum, Solanum lasiophyllum, Swainsona colutoides, Trichodesma zeylanicum, Triodia angusta

Site M040 Described by MM Date 4/18/00 Quadrat Size 50 x 50m Location ~2 km south of tidal creek separating Cape Preston from mainland, west of main vehicle track. AMG Zone 50 418327.7687851 418247, 7687873 Rocklea LS. Slope of low hill. Habitat Soil Skeletal red clay loam with continuous surface layer of pebbles and stones. Vegetation Scattered tall shrubs (primarily Acacia bivenosa) over Triodia wiseana hummock grassland. Veg Condition Very good to excellent: occasional weed present. 0-2% leaf and wood litter. Notes Dominant Species List Triodia wiseana (50-60%) Associated Species List Abutilon lepidum, Acacia bivenosa, Acacia elachantha golden hairy variant, Acacia inaequilatera, Bonamia media var. villosa, Cassytha

capillaris Cenchrus ciliaris, Corchorus walcottii, Crotalaria golden nany variant, Acacia inaequilatera, Bohamia media var. vinosa, Cassynia capillaris Cenchrus ciliaris, Corchorus walcottii, Crotalaria medicaginea, Cymbopogon ambiguus, Euphorbia schultzii, Evolvulus alsinoides var., Fimbristylis dichotoma, Gomphrena cunninghamii, Hibiscus aff. coatesii (site 664), Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Indigofera monophylla, Mukia aff. maderaspatana sp. E, Mukia aff. maderaspatana sp. F, Portulaca oleracea, Ptilotus fusiformis var. fusiformis, Rhagodia eremaea, Rhynchosia cf. minima, Scaevola spinescens, Senna glutinosa subsp. pruinosa x ?glutinosa, Sida aff. cardiophylla (site 1086), Sida echinocarpa, Sida sp. 'rugose', Solanum lasiophyllum, Tephrosia supina, Trachymene oleracea, Triumfetta clementii

# Site M041

Described by MET Date 4/18/00 Quadrat Size ~100 x 50m AMG Zone 50 417988, 7686521 418025, 7686467 Habitat Rocklea LS. Rockpile; boulder-scree type on steep west-facing slope. Soil Red-brown loam amongst cobbles and boulders. Vegetation Acacia coriacea / Flueggea virosa subsp. melanthesioides open shrubland over Canavalia rosea / Passiflora foetida / Trichosanthes cucumerina low 'vineland'. Notes Have probably underestimated cover of Passiflora (>=5%) and possibly also the Canavalia.

Dominant Species List

Cenchrus ciliaris (10-15%)

Associated Species List

Abutilon fraseri, Acacia bivenosa, Acacia coriacea subsp. coriacea, Achyranthes aspera, Bidens bipinnata, Canavalia rosea, Capparis spinosa var. nummularia, Cleome viscosa, Commicarpus australis, Cymbopogon ambiguus, Digitaria brownii, Enneapogon oblongus, Ficus opposita var. indecora, Ficus platypoda var. minor, Flueggea virosa subsp. melanthesoides, Jasminum didymum subsp. lineare, Mukia aff. maderaspatana sp. A, Mukia aff. maderaspatana sp. C, Operculina aequisepala, Paspalidium tabulatum, Passiflora foetida, Portulaca oleracea, Rhagodia eremaea, Rhynchosia cf. minima, .Scaevola spinescens, Solanum lasiophyllum, Tephrosia aff. densa, Trachymene oleracea, Trichodesma zeylanicum, Trichosanthes cucumerina, Triumfetta clementii, Vigna lanceolata var. latifolia

#### Site M042

Described by MM	Date 4/18/00	Quadrat Size 50 x 50m
Location	On footslopes at base of M	t. Rough.
AMG Zone 50	417809, 7686553	417858, 7686585
Habitat	Rocklea LS (near boundary with	Paraburdoo LS). Gentle footslopes.
Soil	Skeletal red clay loam with contin	nuous surface layer of pebbles and stones.
Vegetation	Scattered tall shrubs (primarily A	cacia inaequilatera) over Triodia wiseana hummock grassland.
Veg Condition	Very good to excellent: occasiona	al weeds present.
Dominant Species	<u>s List</u>	
Triadia wisaana (k	50 70%)	

Triodia wiseana (50-70%)

Associated Species List

Acacia bivenosa, Acacia elachantha golden hairy variant, Acacia inaequilatera, Acacia victoriae, Achyranthes aspera, Bidens bipinnata, Bonamia media var. villosa, Cenchrus ciliaris, Corchorus walcottii, Cymbopogon ambiguus, Dichanthium sericeum subsp. humilius, Eremophila longifolia, Euphorbia tannensis subsp. eremophila, Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Gomphrena cunninghamii, Hibiscus aff. platychlamys (M39.14), Hibiscus aff. platychlamys (M9.15), Indigofera monophylla, Indigofera trita, Ipomoea muelleri, Leptopus decaisnei, Maireana tomentosa, Malvastrum americanum, Mukia aff. maderaspatana sp. E, Mukia aff. maderaspatana sp. F, Paspalidium clementii, Phyllanthus maderaspatensis var. angustifolius, Portulaca pilosa, Rhynchosia cf. minima, Senna glutinosa subsp. pruinosa x ?glutinosa, Sida echinocarpa, Solanum diversiflorum, Solanum lasiophyllum, Tephrosia supina, Trachymene oleracea, Triumfetta clementii

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Described by	MET	Date 4/18/00		
AMG Zone 5	0	417380, 7685086	417472, 7684973	
Habitat	Parabur	doo LS. Small creek; sl	oping banks and bed.	
Soil	Brown lo	oam with some pebbles	, particularly in centre of b	ed.
Vegetation	Eucalyp over *Ce	tus victrix low woodland enchrus ciliaris / Triodia	d over Acacia coriacea tall angusta mid-dense to de	open shrubland over scattered low shrubs of Abutilon cunninghamii nse grassland.
Notes	*Cenchrus contributes >80% cover in some patches.			
Dominant Sp	ecies List	t		
Acacia coriad	ea subsp	pendens (<=5%), Cas	ssytha capillaris (<5%), Ce	enchrus ciliaris (40-50%), Eucalyptus victrix (>=10%), Triodia angusta (+
10%)				
Associated S	pecies Li	<u>st</u>		

Abutilon amplum, Abutilon cunninghamii, Acacia ampliceps, Acacia bivenosa, Acacia farnesiana, Acacia pyrifolia, Acacia sclerosperma Alternanthera nana, Alysicarpus rugosus, Atriplex bunburyana, Bidens bipinnata, Corchorus tridens, Corchorus walcottii, Crotalaria medicaginea, Eremophila longifolia, Eriachne benthamii, Euphorbia coghlanii, Euphorbia tannensis subsp. eremophila, Evolvulus alsinoides, Goodenia forrestii, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Indigofera trita, Ipomoea muelleri Jasminum didymum subsp. lineare, Leptopus decaisnei, Malvastrum americanum, Melhania oblongifolia, Mukia aff. maderaspatana sp. C, Myoporum acuminatum, Operculina aequisepala, Panicum decompositum, Paspalidium clementii, Passiflora foetida, Phyllanthus maderaspatensis var. angustifolius, Polymeria ambigua, Ptilotus obovatus, Rhynchosia cf. minima, Santalum lanceolatum, Scaevola spinescens, Sida aff. fibulifera (M37.16), Solanum horridum, Solanum lasiophyllum, Swainsona kingii, Tephrosia aff. supina (ME Trudgen 12,357), Tinospora smilacina, Trichosanthes cucumerina, Triumfetta clementii, Vigna lanceolata var. latifolia

### Site M044

Described by MM Date 4/18/00 Quadrat Size 50 x 50m 417135, 7685147 AMG Zone 50 417114, 7685211 Boundary of Paraburdoo and Rocklea LS. Stony plain. Habitat Red clay loam with continuous surface layer of pebbles and stones. Soil Vegetation Scattered tall shrubs (primarily Acacia bivenosa) over Triodia wiseana hummock grassland. Veg Condition Very good: occasional weeds present. 0-2% leaf and wood litter. Notes Dominant Species List Triodia wiseana (30-50%) Associated Species List Abutilon amplum, Acacia bivenosa, Acacia coriacea subsp. coriacea, Aerva javanica, Bulbostylis barbata, Cenchrus ciliaris, Corchorus

walcottii, Crotalaria medicaginea, Eremophila forrestii subsp. forrestii, Euphorbia tannensis subsp. eremophila, Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Gomphrena cunninghamii, Gossypium australe, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Indigofera monophylla, Indigofera trita, Maireana tomentosa, Mukia aff. maderaspatana sp. A, Polycarpaea corymbosa var. corymbosa, Polycarpaea longiflora (pale form), Portulaca pilosa, Pterocaulon sphacelatum, Ptilotus exaltatus var. exaltatus, Rhagodia eremaea, Rhynchosia cf. minima, Scaevola spinescens, Senna glutinosa subsp. glutinosa, Sida echinocarpa, Solanum horridum, Solanum lasiophyllum, Tephrosia supina, Trichodesma zeylanicum, Triumfetta clementii

# Site M045

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Described by	MET Date 4/19/00
Location	Northern OB.
AMG Zone 50	0 411929, 7673230 411900, 7673281
Habitat	Newman LS. Small flowline; along base of a low spur forming the southwest part of a ridge, and next to a plain which slopes
	slightly to east.
Soil	Light brown loam with some pebbles and small cobbles on surface; algal (blue-green) crust in places; also some areas of
	cracking clay.
Vegetation	Acacia coriacea tall shrubland over *Cenchrus ciliaris / Eriachne benthamii dense tussock grassland.
Notes	The site is not typical of creeks in the area. Upper (southern) end of flowline is more open and has Triodia wiseana instead of
	*Cenchrus. This is a mixed site (creek and cracking clay areas), and includes a few vernal pools in the cracking clay. The
	northern end is more typical of creeks in the area, with Triodia angusta dominant in the grass layer (>30% cover). Acacia
	elachantha was recorded in this area. The average cover of grasses varies from >50% to +-80%, and varies from dense
	*Cenchrus ciliaris to dense Eriachne benthamii. Patches of *Cenchrus ciliaris tend to occur around the bases of the Acacia
	coriacea tall shrubs.
D	a star i tat

Dominant Species List

Acacia coriacea subsp. pendens (15-20%), Cenchrus ciliaris (>-25(40)%), Chrysopogon fallax (<5%), Eriachne benthamii (>35-60%) Associated Species List

Abutilon aff. lepidum (1) (MET 15 352, Acacia bivenosa, Acacia elachantha golden hairy variant, Acacia farnesiana, Achyranthes aspera Alternanthera nana, Bidens bipinnata, Blumea tenella, Bothriochloa ewartiana, Bulbostylis barbata Cenchrus setigerus, Centipeda minima, Chloris pectinata, Cleome viscosa, Corchorus tridens, Crotalaria medicaginea, Cyperus iria, Dichanthium sericeum subsp. humilius, Ehretia saligna, Eragrostis cumingii, Eragrostis tenellula, Eragrostis xerophila, Euphorbia coghlanii, Evolvulus alsinoides, Fimbristylis depauperata, Gomphrena canescens, Goodenia sp. 1, Heliotropium cunninghamii, Hibiscus panduriformis, Hybanthus aurantiacus, Indigofera colutea, Indigofera linifolia, Indigofera monophylla, Indigofera trita, Ipomoea coptica, Ipomoea muelleri, Isotropis atropurpurea, Leptopus decaisnei, Malvastrum americanum, Marsilea hirsuta, Melochia pyramidata, Mukia aff. maderaspatana sp. A, Neptunia dimorphantha, Passiflora foetida, Perotis rara, Phyllanthus maderaspatensis var. angustifolius Pterocaulon sphaeranthoides, Rhynchosia cf. minima, Rostellularia adscendens var. clementii, Sida aff. fibulifera (MET Site 1346), Sida rohlenae, Solanum lasiophyllum, Sporobolus australasicus, Tephrosia aff. supina (ME Trudgen 12,357), Trichodesma zeylanicum, Triodia angusta, Triodia epactia, Triodia wiseana, Triumfetta clementii, Xerochloa imberbis

# Site M046

Described by M	Μ	Date 4/19/00	Quadrat Size 50 x 50m
Location		Southwestern edge of North	hern OB.
AMG Zone 50		411945, 7673315	412018, 7673285
Habitat	Newma	in LS. Gentle footslopes.	
Soil	Shallow	red clay loam with continue	ous surface layer of angular pebbles and stones.
Vegetation	Very oc	casional tall shrubs (primari	ily Acacia bivenosa and Senna glutinosa subsp. pruinosa) over Triodia wiseana hummock
	grassla	nd.	
Veg Condition	Very go	od: occasional weeds prese	ent.
Notes	0-2% leaf and wood litter.		
Dominant Spec	ies List		
Triodia wiseana	(40-509	%)	
Associated Spe	cies Lis	t	
Abutilon lepidur	n, Acaci	a bivenosa, Acacia coriacea	a subsp. coriacea, Acacia pyrifolia, Acacia xiphophylla, Alternanthera nana, Bidens

bipinnata, Bonamia media var. villosa, Bulbostylis barbata, Cassytha capillaris, Corchorus laniflorus, Eriachne pulchella subsp. domini, Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Indigastrum parviflorum, Indigofera monophylla, Leptopus decaisnei, Maireana tomentosa, Mukia aff. maderaspatana sp. C, Oldenlandia crouchiana, Paspalidium clementii, Polygala aff. isingii, Pterocaulon sphacelatum, Ptilotus aervoides, Rhynchosia cf. minima, Sclerolaena eriacantha, Senna glutinosa subsp. pruinosa x ?glutinosa, Sida clementii, Sida clementii, Solanum gabrielae, Solanum lasiophyllum, Sporobolus australasicus, Tephrosia aff. supina (ME Trudgen 12,357), Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

# Site M047

 Described by MET
 Date 4/19/00

 Location
 Northern OB.

 AMG Zone 50
 411472, 7674159
 411544, 7674266

 Habitat
 Newman LS. Small flowline; flowline trends WSW on a gently sloping spur of a ridge.
 Dull orange-brown loam with some pebbles on surface.

 Vegetation
 Acacia coriacea tall open shrubland to tall shrubland over Acacia bivenosa open shrubland to shrubland over Triodia wiseana / Cymbopogon obtectus mid-dense hummock grassland with lianes of Cassytha capillaris.

Notes Very diverse for the size of the flowline which varies from about 5-10m across. No Euphorbia or Boerhavia seen.

Dominant Species List

Acacia bivenosa (<10-15%), Acacia coriacea subsp. pendens (<10-15%), Cassytha capillaris (>15%), Cymbopogon obtectus (+-5%) Associated Species List

Acacia pyrifolia, Achyranthes aspera, Alternanthera nana, Aristida latifolia, Bidens bipinnata, Bonamia media var. villosa, Bothriochloa ewartiana, Cenchrus ciliaris, Corchorus laniflorus, Cucumis melo subsp. agrestis, Cymbopogon ambiguus, Dactyloctenium radulans, Dichanthium sericeum subsp. humilius, Digitaria brownii, Digitaria ctenantha, Eulalia aurea, Evolvulus alsinoides, Gomphrena canescens, Goodenia stobbsiana, Heliotropium ovalifolium, Hibiscus aff. coatesii (site 664), Hibiscus aff. platychlamys (M39.14), Hibiscus aff. platychlamys (M9.15), Hybanthus aurantiacus, Indigofera monophylla, Indigofera trita, Isotropis atropurpurea, Leptopus decaisnei, Malvastrum americanum, Melhania oblongifolia, Paraneurachne muelleri, Paspalidium clementii, Phyllanthus maderaspatensis var. angustifolius, Portulaca pilosa, Pterocaulon sphaeranthoides, Rhagodia eremaea, Rhynchosia cf. minima, Scaevola spinescens, Senna glutinosa subsp. pruinosa x ?glutinosa, Sida aff. cardiophylla (site 1086), Sida clementii, Solanum horridum, Solanum lasiophyllum, Sporobolus australasicus, Tephrosia supina, Trachymene oleracea, Trichodesma zeylanicum, Triodia wiseana, Triumfetta clementii

#### Site M048

Described by MM Quadrat Size 50 x 50m Date 4/19/00 Location Southern end of Northern OB, immediately north of fenceline. 412160. 7673481 AMG Zone 50 412230, 7673462 Habitat Newman LS. Near crest of ridge. Soil Skeletal red clay loam with continuous surface layer of stones and rock. Rock Type ?Ironstone. Very scattered tall shrubs (primarily Acacia bivenosa and Senna glutinosa subsp. pruinosa) over Triodia wiseana hummock Vegetation grassland. Veg Condition Excellent: no disturbance evident.

Notes 0-2% leaf and wood litter. Vegetation all burnt to east. 1 x very old pebble-mound adjacent to quadrat.

Dominant Species List

Triodia wiseana (30-40%)

Associated Species List

Acacia bivenosa, Acacia coriacea subsp. coriacea, Acacia inaequilatera, Bidens bipinnata, Bonamia media var. villosa, Cassytha capillaris, Corchorus laniflorus, Dysphania rhadinostachya, Goodenia microptera, Hybanthus aurantiacus, Indigastrum parviflorum, Oldenlandia crouchiana, Paspalidium clementii, Polycarpaea holtzei, Polygala aff. isingii, Senna glutinosa subsp. pruinosa x ?glutinosa, Senna sp.Karajini(M.E.Trudgen 10392), Sida aff. cardiophylla (site 1086), Solanum gabrielae, Solanum horridum, Solanum lasiophyllum, Tephrosia supina, Trachymene oleracea

# Site M049

Site MU49			
Described by	ET Date 4/19/00		
Location	Northern OB.		
AMG Zone 50	411860, 7676531 411903, 7676645		
Habitat	ewman LS. Small flowline; quite open, located between the mid and upper spurs of a ridge.		
Soil	ull orange-brown loam with some pebbles on surface.		
Vegetation	cacia coriacea / A. elachantha / Acacia tumida tall open shrubland to tall shrubland over Acacia b	ivenosa open shrubland over	
	caevola spinescens / Indigofera monophylla low shrubland over Triodia wiseana / Cymbopogon a	mbiguus grassland.	
Fire Age	Burnt fairly recently.		
Notes	Increases from about 5m wide at southern end to 25m+ wide at northern end. Some annuals were very common (see species notes). Vegetation description based on estimates of pre-fire covers. Next creek to east is similar except A. coriacea is taller.		

Dominant Species List

Acacia bivenosa (+-5%), Acacia coriacea subsp. pendens (>2%), Acacia elachantha golden hairy variant (+-2%), Scaevola spinescens (10-15%), Triodia wiseana (>5(30)%)

# Associated Species List

Abutilon lepidum, Abutilon macrum, Abutilon trudgenii, Acacia pyrifolia, Acacia tumida, Achyranthes aspera, Alternanthera nana, Bidens bipinnata, Bonamia media var. villosa, Bulbostylis barbata, Cassytha capillaris, Cenchrus ciliaris, Corchorus laniflorus, Corchorus tridens, Crotalaria medicaginea, Cymbopogon ambiguus, Dichanthium sericeum subsp. humilius, Digitaria brownii, Digitaria ctenantha, Euphorbia aff. australis type 2 (prostrate), Euphorbia coghlanii, Euphorbia tannensis subsp. eremophila, Evolvulus alsinoides var. villosicalyx, Evolvulus sp., Haloragis gossei, Hibiscus aff. platychlamys (site 1139), Hybanthus aurantiacus, Indigastrum parviflorum, Indigofera monophylla, Isotropis atropurpurea, Leptopus decaisnei, Malvastrum americanum, Melhania oblongifolia, Mukia aff. maderaspatana sp. F, Oldenlandia crouchiana, Paspalidium clementii, Phyllanthus maderaspatensis var. angustifolius, Polymeria aff. ambigua, Portulaca pilosa, Pterocaulon sphaeranthoides, Ptilotus exaltatus var. exaltatus, Ptilotus fusiformis var. fusiformis, Rhynchosia cf. minima, Senna glutinosa subsp. pruinosa x ?glutinosa, Senna notabilis, Sida clementii, Solanum diversiflorum, Solanum lasiophyllum, Sporobolus australasicus, Tephrosia aff. supina (ME Trudgen 12,357), Tephrosia supina, Themeda triandra, Trachymene oleracea, Tribulus hirsutus, Trichodesma zeylanicum, Triumfetta clementii, Vittadinia obovata, Waltheria indica

Described by MM		Date 4/19/00	Quadrat Size 50 x 50m
Location		Just west of western side of	Northern OB.
AMG Zone 50	)	411473, 7674319	411531, 7674320
Habitat	Newman	LS. Low footslopes / stony u	ndulating plain.
Soil	Skeletal r	ed clay loam with continuous	s surface layer of pebbles, stones and exposed rock.
Vegetation	Scattered	I tall shrubs (primarily Senna	glutinosa subsp. pruinosa) over Triodia wiseana.
Veg Condition	n Very goo	d: occasional weed present.	
Notes	0-2% leaf	and wood litter.	
Dominant Spe	ecies List		

#### Triodia wiseana (30-40%) Associated Species List

Acacia bivenosa, Acacia coriacea subsp. coriacea, Bonamia media var. villosa, Cassytha capillaris, Corchorus laniflorus, Cucumis melo subsp. agrestis, Evolvulus alsinoides var. villosicalyx, Haloragis gossei, Indigofera monophylla, Indigofera trita, Oldenlandia crouchiana, Paspalidium clementii, Polygala aff. isingii, Pterocaulon sphacelatum, Sclerolaena eriacantha, Senna glutinosa subsp. pruinosa x ?glutinosa, Solanum diversiflorum, Solanum gabrielae, Solanum horridum, Trachymene oleracea, Trianthema turgidifolia, Trichodesma zeylanicum, Triumfetta clementii, Yakirra australiensis

# Site M051

Described by	MET	Date 4/19/00	Quadrat Size 30 x 15m	
Location		Northern OB.		
AMG Zone 50	)	412568, 7673560		
Habitat	Newman	LS. Small rock pile / bo	ulder outcrop; soil present between the rocks.	
Soil	Orange-brown pebbly loam.			
Rock Type	e Highly siliceous, pale grey or pale pink in places.			
Vegetation	Acacia coriacea tall open shrubland over Cymbopogon ambiguus open tussock grassland with lianes of Operculina aequisepala and Trichosanthes cucumerina.			
Fire Age	Burnt fairly recently.			
Notes	Small site to fit outcrop. Several Ficus platypoda killed by the fire.			
Dominant Sp	ecies I ist			

Acacia coriacea subsp. coriacea (?10%), Operculina aequisepala (2-3%), Trichosanthes cucumerina (1-2%)

Associated Species List

Abutilon fraseri, Abutilon lepidum, Achyranthes aspera, Alysicarpus rugosus, Amaranthus mitchellii, Bidens bipinnata, Boerhavia burbidgeana, Bonamia media var. villosa, Bonamia pannosa, Capparis spinosa var. nummularia, Cenchrus ciliaris, Cleome viscosa, Corchorus tridens, Cuscuta victoriana, Cymbopogon ambiguus, Evolvulus alsinoides var. villosicalyx, Ficus platypoda var. minor ?, Gomphrena cunninghamii, Indigofera colutea, Jasminum didymum subsp. lineare, Leptopus decaisnei, Mukia aff. maderaspatana sp. C, Nicotiana benthamiana, Paspalidium clementii, Portulaca oleracea, Portulaca pilosa, Rhynchosia cf. minima, Senna notabilis, Solanum gabrielae, Solanum lasiophyllum, Striga squamigera, Tephrosia aff. supina (ME Trudgen 12,357), Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

# Site M052

Described by N	1M Date 4/19/00	Quadrat Size 50 x 50m
Location	Northern end of Northern	OB.
AMG Zone 50	411940, 7676447	411902, 7676524
Habitat	Newman LS. Crest / slope of low	hill.
Soil	Skeletal red clay loam with contin	nuous surface layer of angular pebbles, stones and exposed rock.
Vegetation	Acacia bivenosa open shrubland	over Triodia wiseana hummock grassland.
Veg Condition	Excellent: no disturbance evident	- -
Notes	0-2% leaf and wood litter. 1 x ver	y old pebble-mound southwest of quadrat.
Dominant Space	vioc Liet	

Dominant Species List

Acacia bivenosa (2-10%), Triodia wiseana (40-60%)

Associated Species List

Acacia arida, Acacia coriacea subsp. coriacea, Acacia elachantha golden hairy variant, Acacia pyrifolia, Bonamia media var. villosa, Cassytha capillaris, Corchorus laniflorus, Cymbopogon ambiguus, Digitaria brownii, Enchylaena tomentosa, Eriachne pulchella subsp. dominii, Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Goodenia microptera, Hibiscus aff. coatesii (site 664), Hybanthus aurantiacus, Indigofera monophylla, Mukia aff. maderaspatana sp. F, Oldenlandia crouchiana, Paspalidium clementii, Phyllanthus maderaspatensis var. angustifolius, Polygala aff. isingii, Ptilotus aervoides, Ptilotus exaltatus var. exaltatus, Rhynchosia cf. minima, Scaevola spinescens, Sclerolaena eriacantha, Senna glutinosa subsp. pruinosa x ?glutinosa, Sida aff. cardiophylla (site 1086), Solanum diversiflorum, Solanum horridum, Solanum lasiophyllum, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

# Site M053

Described by MM

AMG Zone 50 412852, 7673810

Habitat Newman LS. Rocky outcrop; outcropping with some boulders, at abrupt end of a ridgeline.

Red-brown gravelly / pebbly loam in places between rocks. Soil

Rock Type Banded ironstone (iron / silica).

Acacia coriacea tall open shrubland over Tephrosia aff. densa low open shrubland and Cymbopogon ambiguus grassland. Vegetation

Dominant Species List

Acacia coriacea subsp. coriacea (1-2%), Cymbopogon ambiguus (+-5%)

Associated Species List

Acacia pyrifolia, Achyranthes aspera, Alternanthera nana, Alysicarpus rugosus, Bidens bipinnata, Boerhavia burbidgeana, Bonamia media var. villosa, Cenchrus ciliaris, Cleome viscosa, Enchylaena tomentosa, Eremophila longifolia, Eriachne mucronata, Ficus platypoda var. minor, Gomphrena cunninghamii, Hybanthus aurantiacus, Mukia aff. maderaspatana sp. C, Nicotiana benthamiana, Operculina aequisepala, Paspalidium clementii, Phyllanthus maderaspatensis var. angustifolius, Portulaca oleracea, Ptilotus auriculifolius, Ptilotus obovatus, Rhynchosia cf. minima, Solanum gabrielae, Solanum horridum, Sporobolus australasicus, Tephrosia aff. densa (>=2%), Trachymene oleracea, Tribulus hirsutus, Trichodesma zeylanicum, Trichosanthes cucumerina, Triodia wiseana, Triumfetta clementii

# Site M054

Described by MM Date 4/19/00 Quadrat Size 50 x 50m AMG Zone 50 413614, 7673416 413652, 7673466 Habitat Paraburdoo LS. Stony plain. Soil Red clay loam with continuous surface layer of pebbles. Acacia xiphophylla open shrubland over patches of Triodia wiseana hummock grassland. Vegetation Veg Condition Very good: occasional weeds present. Notes 0-2% leaf and wood litter. Large patches within quadrat were bare of spinifex: these contained greater amounts of herbs. **Dominant Species List** Acacia xiphophylla (2-10%), Triodia wiseana (30-50%) Associated Species List

Abutilon fraseri, Acacia bivenosa, Acacia coriacea subsp. coriacea, Acacia farnesiana, Acacia victoriae, Aristida contorta, Boerhavia coccinea, Brachyachne prostrata, Cenchrus ciliaris, Cenchrus setigerus, Corchorus tridens, Crotalaria medicaginea, Dicladanthera forrestii, Enchylaena tomentosa, Enneapogon caerulescens var. occidentalis, Enteropogon acicularis, Eriachne pulchella subsp. dominii, Euphorbia aff. australis type 1 (erect stems), Evolvulus alsinoides var. villosicalyx, Hibiscus aff. platychlamys (M39.14), Indigastrum parviflorum, Indigofera linifolia, Indigofera sessiliflora, Leptopus decaisnei, Maireana planifolia, Malvastrum americanum, Melhania oblongifolia, Paspalidium clementii, Phyllanthus maderaspatensis var. angustifolius, Ptilotus aervoides, Rhagodia eremaea, Rhynchosia cf. minima, Sclerolaena eriacantha, Solanum gabrielae, Solanum horridum, Solanum lasiophyllum, Sporobolus australasicus, Tragus australianus, Triodia epactia, Triumfetta clementii

#### Site M055

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Described by	/ MET	Date 4/20/00	Quadrat Size ~150 x 20m
Location		Southern OB.	
AMG Zone 5	0	409593, 7665753	409580, 7665617
Habitat	Newman	LS. Flowline; lower pa	art of a flowline on a gentle NNW facing slope.
Soil	Red-brown loam with pebbles below		pelow surface; wet after recent rain.
Vegetation	Corymbia hamersleyana low open mallee woodland over Acacia bivenosa / A. monticola tall open shrubland over Hibiscus a platychlamys / Indigofera monophylla low open shrubland to shrubland over Triodia wiseana hummock grassland with lianes Cassytha and Porana		
Fire Age	Not burnt recently (+-10 years since last fire?).		
Notes	Narrow quadrat to fit habitat. Corymbia is not present upslope; the creek here has Acacia bivenosa / A. ancistrocarpa shrubla		

over Triodia wiseana. A nearby creek has the same species, with Petalostylis labicheoides and some Acacia coriacea. **Dominant Species List** 

Acacia bivenosa (<5%), Acacia monticola (>5%), Triodia wiseana (>50%)

Associated Species List Abutilon aff. lepidum (1) (MET 15 352), Abutilon lepidum, Acacia ancistrocarpa, Acacia coriacea subsp. pendens, Acacia farnesiana, Acacia pyrifolia, Acacia trachycarpa, Achyranthes aspera, Bidens bipinnata, Bonamia media var. villosa, Bonamia pannosa, Cassytha capillaris, Cenchrus ciliaris, Cenchrus setigerus, Chrysopogon fallax, Corchorus Ianiflorus, Corymbia hamersleyana (<10%), Digitaria brownii, Enchylaena tomentosa, Eremophila forrestii subsp. forrestii, Eremophila longifolia, Euphorbia tannensis subsp. eremophila, Evolvulus alsinoides, Goodenia microptera, Haloragis gossei, Heliotropium ovalifolium, Hibiscus aff. platychlamys (M39.14), Hibiscus aff. platychlamys (M9.15), Hybanthus aurantiacus, Indigofera monophylla (2-3%), Ipomoea muelleri, Isotropis atropurpurea, Leptopus decaisnei, Malvastrum americanum, Mukia aff. maderaspatana sp. C, Mukia aff. maderaspatana sp. F, Paraneurachne muelleri, Polygala aff. isingii, Porana commixta, Pterocaulon sphacelatum, Ptilotus astrolasius, Ptilotus clementii, Senna artemisioides subsp. oligophylla, Senna glutinosa subsp. glutinosa, Senna notabilis, Sida aff. fibulifera (M37.16), Sida clementii, Solanum diversiflorum, Solanum horridum, Solanum lasiophyllum, Tephrosia aff. supina (ME Trudgen 12,357), Trachymene oleracea, Trichodesma zeylanicum, Triodia epactia, Triumfetta clementii, Waltheria indica

#### Site M056

Described by M	IM Date 4/20/00	Quadrat Size 50 x 50m	
Location	Northeastern portion of	Southern OB.	
AMG Zone 50	409670, 7665738	409707, 7665679	
Habitat	Newman LS. Footslope of very	low range.	
Soil	Skeletal red clay loam with cont	inuous surface layer of pebbles, stones and exposed rock.	
Vegetation	Very scattered tall shrubs over Triodia wiseana hummock grassland.		
Veg Condition	Excellent: no disturbance evide	nt.	
Notes	0-2% leaf and wood litter. Speci	ies poor quadrat.	
Dominant Spec	ies List		
Triodia wiseana	a (30-40%)		
Associated Spe	ecies List		
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Acacia inaequilatera, Boerhavia coccinea, Bonamia media var. villosa, Cucumis melo subsp. agrestis, Euphorbia boophthona, Fimbristylis depauperata, Indigastrum parviflorum, Polycarpaea holtzei, Polygala aff. isingii, Prosopis pallida, Sclerolaena costata, Senna glutinosa subsp. glutinosa, Senna glutinosa subsp. pruinosa x ?glutinosa, Tephrosia supina, Trachymene oleracea, Trichodesma zeylanicum,

### Site M057

Described by M	IET Date 4/20/00	Quadrat Size ~100 x 7m
Location	Southern OB.	
AMG Zone 50	409541 7664686	409595 7664624
Habitat	Newman LS. Small flowline betw	een two spurs of a low ridge, near highpoint.
Soil	Red-brown gravelly / pebbly loan	n, damp in patches from recent rain.
Vegetation	Acacia monticola / Petalostylis la	bicheoides tall shrubland over Indigofera monophylla / Hybanthus aurantiacus low open
	shrubland over Triodia wiseana i	nid-dense hummock grassland.
Notes	Narrow quadrat to fit habitat. Tric	dia ?epactia occurs in occasional (presumably wetter) patches. Eriachne mucronata occurs in
	lower part of site. Site ends when	e a second flow line joins. A similar flowline to the SE also has Eremophila forrestii, Bidens
	bipinnata, and scattered Corymb	ia hamersleyana, Digitaria brownii and Solanum gabrielae (1.3m tall; spreading / arched, light
	green (not whitish) branches; flow	vers pale mauve; fruit reflexed).

**Dominant Species List** 

Acacia monticola (>=25%), Indigofera monophylla (<=5%), Triodia wiseana (>=50%)

Associated Species List

Abutilon lepidum, Acacia ancistrocarpa, Acacia bivenosa, Acacia tumida, Bonamia media var. villosa, Corchorus laniflorus, Eriachne benthamii, Eriachne mucronata, Evolvulus alsinoides var. villosicalyx, Hibiscus aff. platychlamys (M9.15), Hybanthus aurantiacus, Isotropis atropurpurea, Paraneurachne muelleri, Petalostylis labicheoides (>=35%), Sida aff. cardiophylla (site 1086), Solanum horridum, Tephrosia aff. supina (ME Trudgen 12,357), Trachymene oleracea, Trichodesma zeylanicum, Triodia epactia, Triumfetta clementii

Described by M	M Date 4/20/00	Quadrat Size 50 x 50m
Location Northwestern portion of Southern OB.		uthern OB.
AMG Zone 50	409397, 7665605	409348, 7665656
Habitat	Newman LS. Crest of low ridge.	
Soil	Skeletal orange/red clay loam with	continuous surface layer of pebbles and stones.
Rock Type	Quartz and other.	
Vegetation	Scattered Acacia bivenosa tall shru	bs over Triodia wiseana hummock grassland.

Veg Condition Excellent: no disturbance evident. 0-2% leaf and wood litter. 1 x very old pebble-mound near site. Notes Dominant Species List Triodia wiseana (30-40%)

Associated Species List

Abutilon lepidum, Acacia bivenosa, Acacia victoriae, Bonamia media var. villosa, Corchorus laniflorus, Cymbopogon ambiguus, Dichanthium sericeum subsp. humilius, Euphorbia aff. australis type 2 (prostrate), Evolvulus alsinoides var. villosicalyx +, Indigastrum parviflorum, Indigofera monophylla, Iseilema dolichotrichum, Mukia aff. maderaspatana sp. D, Oldenlandia crouchiana, Polygala aff. isingii, Prosopis pallida hybrid, Sclerolaena costata, Sclerolaena eriacantha, Senna artemisioides subsp. oligophylla (thinly sericeous), Solanum horridum, Solanum lasiophyllum, Tephrosia clementii, Tephrosia supina, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

# Site M059

Described by MET Date 4/20/00 AMG Zone 50 409949.7665381 Boundary of Paraburdoo and Newman LS? Creekline; bed of a large creek. Habitat Soil Red-brown soft wet loam on edges of bed; gravelly / pebbly coarse sandy loam in the middle of bed, with large loamy sections. Vegetation Eucalyptus victrix / E. camaldulensis open woodland over Acacia coriacea and Mesquite high shrubland over herbs. Notes This site covers the section not invaded by Buffel grass. "Island" areas have litter material (detrital?) that is quite deep in places

Dominant Species List

Acacia coriacea subsp. pendens (>25%), Alternanthera nana (>10%), Eucalyptus camaldulensis (>=10%), Eucalyptus victrix (<10%), Prosopis pallida hybrid (<=10%), Vigna lanceolata var. lanceolata (<=5%)

Associated Species List

Acacia farnesiana, Acacia pyrifolia, Acacia trachycarpa, Achyranthes aspera, Amaranthus pallidiflorus, Cenchrus ciliaris, Cenchrus setigerus, Chenopodium melanocarpum forma leucocarpum, Cleome viscosa, Cucumis melo subsp. agrestis, Cullen leucanthum, Cyperus bifax, Cyperus vaginatus, Dactyloctenium radulans, Dysphania rhadinostachya, Ehretia saligna, Eragrostis tenellula, Eremophila longifolia, Eriachne benthamii, Eriachne ovata, Gomphrena canescens, Goodenia lamprosperma, Hibiscus panduriformis, Hybanthus aurantiacus, Ipomoea muelleri, Leptopus decaisnei, Malvastrum americanum, Melaleuca glomerata, Melochia pyramidata, Passiflora foetida, Phyllanthus aridus, Phyllanthus maderaspatensis var. angustifolius, Plumbago zeylanica, Portulaca oleracea, Pterocaulon sphacelatum, Rostellularia adscendens var. clementii, Santalum lanceolatum, Sesbania cannabina, Setaria verticillata, Synaptantha tillaeacea var. tillaeacea, Trichodesma zeylanicum, Triumfetta clementii, Urochloa sp. "glabrous apices"

# Site M060

Described by M	IM D	ate 4/20/00	Quadrat Size 50 x 50m	
Location	N	orthern end of South	rn OB (most northerly high point on range).	
AMG Zone 50	40	09685, 7664548	409637, 7664544	
Habitat	Newman	LS. Hill crest.		
Soil	Skeletal re	ed clay loam with co	tinuous surface layer of angular pebbles, stones	and rocks.
Vegetation	Scattered	Senna glutinosa sul	sp. pruinosa tall shrubs over Triodia wiseana hu	mmock grassland.
Veg Condition	Very good	: occasional weeds	resent.	
Notes	0-2% leaf	and wood litter. Mes	uite seedlings sprouting from emu scats. 1 x ve	ry old pebble-mound inside quadrat; 4 x very old
	pebble-me	ounds outside quadra	t.	
Dominant Spec	ies List			

Triodia wiseana (30-40%)

Associated Species List

Acacia inaequilatera, Bonamia media var. villosa, Corchorus laniflorus, Fimbristylis dichotoma, Goodenia forrestii, Indigofera monophylla, Iseilema dolichotrichum, Polygala aff. isingii, Prosopis pallida hybrid, Ptilotus aervoides, Senna glutinosa subsp. pruinosa x ?glutinosa, Sida clementii, Tephrosia supina, Trachymene oleracea, Triumfetta clementii

#### Site M061

Described by MET Date 4/21/00 Quadrat Size 50 x 50m AMG Zone 50 416713, 7690326 416711, 7690260 Habitat Littoral LS. Broad (~65-70m), linear saline swale between two dunes; surface has slight depressions a few centimetres deep. Pale brown (dun), silty fine sand; algal (blue-green) crust in lower parts. Soil Frankenia / Lawrencia / Dissocarpus / Hemichroa / Sclerolaena / Samphire low open heath to low heath. Vegetation Notes An old vehicle track through the swale has less Lawrencia in parts of it. **Dominant Species List** Dissocarpus paradoxus (15%), Frankenia pauciflora (+-10%), Halosarcia indica subsp. leiostachya (+-5%), Hemichroa diandra (<-5%), Lawrencia viridigrisea (>=5%), Neobassia astrocarpa (>5%) Associated Species List Cenchrus ciliaris, Cyperus bulbosus, Dactyloctenium radulans, Dysphania rhadinostachya, Eragrostis falcata, Euphorbia coghlanii, Flaveria australasica, Halosarcia halocnemoides subsp. tenuis, Portulaca pilosa, Swainsona kingii, Triodia angusta, Xerochloa imberbis Site M062 Described by MM Date 4/20/00 Quadrat Size ~35 x 10m Southern OB. Location 409605, 7664029 AMG Zone 50 Newman LS. Small rockpile with tiny sinkholes. Habitat Iron-cemented alluvium / colluvium (MET). Soil

Scattered tall shrubs over sparse grasses and herbs. Vegetation

Small quadrat to fit habitat. More Cymbopogon at one end of site. Notes

Dominant Species List

Cenchrus ciliaris (2-10%), Triodia pungens (>25%)

Associated Species List

Acacia coriacea subsp. coriacea, Acacia monticola, Bidens bipinnata, Cenchrus setigerus, Cuscuta victoriana, Cymbopogon ambiguus, Enchylaena tomentosa, Euphorbia australis, Euphorbia tannensis subsp. eremophila, Gomphrena cunninghamii, Leptopus decaisnei, Malvastrum americanum, Oldenlandia crouchiana, Polycarpaea longiflora (pale form), Portulaca oleracea, Prosopis pallida, Pterocaulon sphacelatum, Rhagodia eremaea, Solanum gabrielae, Tephrosia aff. supina (ME Trudgen 12,357), Tinospora smilacina, Trachymene oleracea, Trichodesma zeylanicum, Triodia pungens, Triumfetta clementii, Wrightia saligna, Zaleya galericulata +

# Site M063

Described by MET Date 4/21/00 416721, 7690217

Quadrat Size 100 x 15m 416794, 7690285

AMG Zone 50 Littoral LS. Dune crest; low dune (1.5m tall), trending E-W between a saline linear swale and a small plain between dunes (the Habitat latter open to the ocean with samphires on its lower edge).

Very fine to fine pale brown sand with some silty material; thin black surface crust in places. Soil

Scattered Acacia coriacea / Atriplex bunburyana over Triodia pungens / \*Cenchrus ciliaris mid-dense to dense grassland. Vegetation Dune has Triodia pungens along the crest and T. angusta along the sides. Quadrat contains portions of the T. angusta in places, Notes but includes other species that are not in the T. pungens areas. East end of the quadrat is more degraded, with \*Cenchrus providing >50% cover.

Dominant Species List

Cenchrus ciliaris (>20%) Associated Species List

Acacia coriacea subsp. coriacea, Aristida holathera, Atriplex bunburyana, Bulbostylis barbata, Cleome viscosa, Corchorus walcottii, Crotalaria medicaginea, Cyperus bulbosus, Eragrostis cumingii, Eragrostis eriopoda, Eriachne ovata, Evolvulus alsinoides var. villosicalyx, Evolvulus sp., Indigofera colutea, Indigofera trita, Ipomoea polymorpha, Melhania oblongifolia, Panicum decompositum, Portulaca pilosa, Pterocaulon sphacelatum, Rhynchosia cf. minima, Trianthema turgidifolia

#### Site M064

Described by M	M Date 4/20/00	Quadrat Size 35 x 60 m
_ocation	Towards northern end of So	buthern OB.
AMG Zone 50	409223, 7664421	409292, 7664492
Habitat	Newman LS. Hill slope.	
Soil	Red clay loam with continuous surface	ace layer of angular pebbles.
√egetation	Very scattered Acacia bivenosa tall	shrubs over Triodia wiseana hummock grassland.
Veg Condition	Excellent: no disturbance evident.	
Notes	0-2% leaf and wood litter. Quadrat	shortened to avoid flowline. 1 x very old pebble-mound.
Dominant Spec	ies List	
Acacia bivenos	a (0-2%), Triodia wiseana (30-40%)	
Associated Spe	cies List	

Acacia farnesiana, Acacia victoriae, Corchorus laniflorus, Evolvulus alsinoides var. villosicalyx, Maireana melanocoma, Polygala aff. isingii, Prosopis pallida, Sclerolaena eriacantha, Sclerolaena eriacantha, Solanum horridum, Trachymene oleracea, Triumfetta clementii

#### Site M065

Described by MET Date 4/21/00 Location Cape Preston. AMG Zone 50 416966, 7690077 417037, 7690082 Littoral LS. Small depressions with gentle slope to shore; dunes on northern and southern sides, Habitat

tidal flats to the east.

Light brown silty loam with a small amount of fine sand; dark crust on surface in places. Soil

Triodia angusta / \*Cenchrus ciliaris dense grassland. Vegetation

Dominant Species List

Cenchrus ciliaris (≤20%), Triodia angusta (>55%)

Associated Species List

Cyperus bulbosus, Eragrostis falcata, Indigofera trita, Melhania oblongifolia, Neobassia astrocarpa, Panicum decompositum, Portulaca oleracea, Trianthema triquetra, Trianthema turgidifolia

# Site M066

Described by N	IM Date 4/20/00	Quadrat Size ~200 x 10m
AMG Zone 50	410021, 7665581	409949, 7665381
Habitat	Paraburdoo LS. Sloping bank of B	oulay Creek
Soil	Red clay.	
Vegetation	Scattered Eucalyptus victrix over A	Acacia coriacea high shrubland over *Cenchrus spp. closed tussock grassland.
Veg Condition	Moderate: heavily invaded by Buff	el.
Notes	Continued up to 250m length but	no additional species in last 50m

Dominant Species List

Acacia coriacea subsp. pendens (10-20%), Cenchrus ciliaris (40-60%), Cenchrus setigerus (30-40%)

Associated Species List

Achyranthes aspera, Alternanthera nana, Cleome viscosa, Corchorus tridens, Cucumis melo subsp. agrestis, Dactyloctenium radulans, Erythrina vespertilio, Eucalyptus camaldulensis, Eucalyptus victrix, Evolvulus alsinoides, Goodenia forrestii, Hibiscus panduriformis, Leptopus decaisnei, Malvastrum americanum, Melaleuca glomerata, Mukia aff. maderaspatana sp. F, Operculina aequisepala, Passiflora foetida, Phyllanthus maderaspatensis var. angustifolius, Portulaca oleracea, Prosopis pallida, Pterocaulon sphacelatum, Rostellularia adscendens var. clementii, Sesbania cannabina, Sida rohlenae, Vigna lanceolata var. lanceolata, Wrightia saligna

Described by	MET	Date 4/22/00
AMG Zone 50	)	418389, 7689093
Habitat	Rocklea I	_S. Small creek; located between gently sloping areas.
Soil	Light-mid	brown fine sandy loam, pebbly to cobbly in places.
Vegetation	Acacia ar	npliceps open shrubland.
Notes	Site ends	near the top of a samphire 'inlet', and includes a very narrow channel and slopes with more dense A. ampliceps.
Dominant Sp	ecies List	
Acacia amplio	ceps (10-1	5%), Halosarcia pruinosa (2-3%), Neobassia astrocarpa (>2%), Sporobolus virginicus (>15(20)%), Triodia angusta
(≤5%)		
Associated S	pecies Lis	<u>t</u>
Abutilon crypt	topetalum,	Achyranthes aspera, Amaranthus pallidiflorus, Cassytha capillaris, Cenchrus ciliaris, Corchorus tridens, Corchorus
walcottii, Cull	en pogono	carpum, Cyperus bulbosus, Dactyloctenium radulans, Dysphania plantaginella, Enchylaena tomentosa, Eragrostis
falcata Evolv	ulus alsino	pides var villosicalyz. Flaveria australasica, Halosarcia halocnemoides subsp. tenuis. Inomoea muelleri, Malvastrum

americanum, Mukia aff. maderaspatana sp. F, Myoporum acuminatum, Phyllanthus maderaspatensis var. angustifolius, Pterocaulon sphacelatum, Ptilotus exaltatus var. exaltatus, Samolus repens, Sesbania cannabina, Solanum gabrielae, Solanum horridum, Solanum lasiophyllum, Swainsona formosa, Swainsona kingii, Threlkeldia diffusa, Trianthema turgidifolia, Trichodesma zeylanicum, Triumfetta clementii

### Site M068

Described by MM	Date 4/21/00	Quadrat Size ~150 x 20m
Location	Western edge of Cap	Preston.
AMG Zone 50	416139, 7690565	416197, 7690709
Habitat Littora	al LS. Frontal dunes - very	undulating (2-3m tall).
Soil Coars	e brown sand.	
Vegetation Acaci	a bivenosa open shrublan	over Spinifex longifolius grassland.
Veg Condition	Very good: occasional we	ds present.
Notes 2-10%	6 leaf litter under spinifex.	Corner pegs mark landward side of quadrat: site extends down to beachfront.
<b>Dominant Species L</b>	<u>_ist</u>	
Acacia bivenosa (2-	10%), Spinifex longifolius	30-50%)
Associated Species	List	
Acacia coriacea sub eremophila, Mairean occidentalis	osp. coriacea, Aerva javan na melanocoma, Ptilotus v	ca, Cenchrus ciliaris, Cleome viscosa, Euphorbia schultzii, Euphorbia tannensis subsp. losiflorus, Rhagodia preissii subsp. obovata, Salsola tragus, Threlkeldia diffusa, Tribulus
Site M069		

Described by	MET Date 4/22/00
Location	Cape Preston.
AMG Zone 50	) 417768, 7692466 417789, 7692573
Habitat	Littoral LS. Dune slope?; moderate slope of sand bank blown up against the lower slope of a hill; S facing.
Soil	Orange-brown (red) sand with hard-setting surface.
Vegetation	Scattered tall shrubs of Acacia coriacea over Rhagodia eremaea / Gossypium australe / Adriana tomentosa open shrubland over
•	Scaevola spinescens / Solanum lasiophyllum / Waltheria indica low open shrubland over Triodia pungens / Eriachne ovata /
	*Cenchrus ciliaris mid-dense grassland.

Dominant Species List

Cenchrus ciliaris (<5%), Triodia pungens (>60%), Waltheria indica (<5%)

Associated Species List

Abutilon cunninghamii, Abutilon lepidum, Abutilon otocarpum, Abutilon oxycarpum subsp. prostratum, Acacia coriacea subsp. coriacea, Adriana tomentosa, Aristida holathera, Boerhavia coccinea, Bonamia media var. ?media, Bulbostylis barbata, Cassytha capillaris, Corchorus walcottii, Crotalaria cunninghamii, Crotalaria medicaginea, Crotalaria ramosissima, Cyperus blakeanus, Desmodium filiforme, Digitaria brownii, Dolichandrone heterophylla, Enchylaena tomentosa, Eragrostis eriopoda, Eriachne ovata, Euphorbia tannensis subsp. eremophila, Evolvulus sp., Gomphrena cunninghamii, Gomphrena sordida, Goodenia microptera, Gossypium australe, Grevillea pyramidalis, Heliotropium foliatum, Hibiscus aff. platychlamys (M39.14), Indigofera linifolia, Indigofera sessiliflora, Indigofera trita, Ipomoea polymorpha, Mollugo molluginis, Phyllanthus lacunellus, Polycarpaea corymbosa var. corymbosa, Portulaca oleracea, Portulaca pilosa, Pterocaulon sphacelatum, Ptilotus axillaris, Ptilotus polystachyus, Rhagodia eremaea, Scaevola spinescens, Schizachyrium fragile, Setaria surgens, Sida aff. fibulifera (M69.12), Solanum diversiflorum, Solanum gabrielae, Solanum horridum, Solanum lasiophyllum, Tephrosia aff. supina (ME Trudgen 12,357), Tinospora smilacina, Trianthema turgidifolia, Trichodesma zeylanicum, Urochloa holosericea subsp. velutina, Whiteochloa airoides, Zornia muelleriana

#### Site M070

Described by N	IM Date 4/21/00	Quadrat Size 50 x 50m	
Location	Cape Preston.		
AMG Zone 50	416253, 7690566	416212, 7690604	
Habitat	Littoral LS. Gently undulating ba	acking dunes.	
Soil	Coarse brown sand.	-	
Vegetation	Acacia coriacea shrubland over	patches of Buffel grass.	
Veg Condition	Moderate: patches of Buffel gra	SS.	
Notes	30-50% leaf litter (primarily under Acacia shrubs). Fauna Site 9.		
Dominant Spec	ies List		
Acacia bivenos	a (2-5%), Acacia coriacea subsp	. coriacea (20-40%), Cenchrus ciliaris (20-30%)	

Associated Species List

Amaranthus pallidiflorus + M70.4, Cleome viscosa, Dysphania plantaginella, Euphorbia schultzii, Euphorbia tannensis subsp. eremophila, Ptilotus exaltatus var. exaltatus, Rhagodia preissii subsp. obovata, Salsola tragus, Scaevola spinescens, Swainsona formosa, Synaptantha tillaeacea var. tillaeacea, Threlkeldia diffusa, Tribulus occidentalis

#### Site M071

Described by M	ET Date 4/22/00	Quadrat Size ~60 x 4m
AMG Zone 50	417318, 7693049	417355, 7693113
Habitat	Newman LS. Small flowline; betwee	en two fairly steeply sloping spurs of a low ridge.
Soil	Red-brown gravelly / pebbly loam	with some cobbles.
Vegetation	Scattered tall shrubs of Acacia cor hummock grassland with lianes of	acea over scattered low shrubs of Scaevola spinescens and Triodia wiseana mid-dense Mukia.
Notes	Narrow quadrat (2-4 m wide) to fit	nabitat. No. 3 peg is just upstream of a large Scaevola spinescens.

**Dominant Species List** 

Acacia coriacea subsp. pendens (≤1%), Mukia aff. maderaspatana sp. E (±10%), Triodia wiseana (±40%)

Associated Species List

Acacia pyrifolia, Achyranthes aspera, Aerva javanica, Alternanthera nana, Boerhavia coccinea, Bonamia media var. villosa, Cenchrus ciliaris, Cleome viscosa, Corchorus walcottii, Crotalaria medicaginea, Cymbopogon ambiguus, Ehretia saligna, Enchylaena tomentosa, Eremophila longifolia, Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Gomphrena cunninghamii, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Indigofera monophylla, Malvastrum americanum, Melhania oblongifolia, Paspalidium clementii, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea longiflora (pale form), Portulaca oleracea, Portulaca pilosa, Pterocaulon sphacelatum, Ptilotus exaltatus var. exaltatus, Rhagodia eremaea, Rhynchosia cf. minima, Scaevola spinescens, Solanum gabrielae, Solanum horridum, Solanum lasiophyllum, Swainsona formosa, Tephrosia aff. supina (ME Trudgen 12,357), Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii, Waltheria indica

# Site M072

Described by M	M Date 4/21/00	Quadrat Size 50 x 50m
Location	Cape Preston.	
AMG Zone 50	416219, 7690858	416284, 7690867
Habitat	Littoral LS. Reasonable sized	swale (?flow area).
Soil	Coarse brown sand.	. ,
Vegetation	Acacia coriacea, A. bivenosa	open shrubland.
Veg Condition	Very good: occasional weeds	present.
Notes	2-10% leaf litter (only under sh	nrubs).

Dominant Species List

Acacia bivenosa (2-10%), Acacia coriacea subsp. coriacea (2-10%)

Associated Species List

Adriana tomentosa, Amaranthus pallidiflorus, Boerhavia coccinea, Cenchrus ciliaris, Cleome viscosa, Enneapogon caerulescens var. occidentalis, Eulalia aurea, Euphorbia schultzii, Euphorbia tannensis subsp. eremophila, Heliotropium cunninghamii, Oldenlandia crouchiana, Ptilotus exaltatus var. exaltatus, Rhagodia preissii subsp. obovata, Salsola tragus, Scaevola spinescens, Threlkeldia diffusa, Tribulus occidentalis, Trichodesma zeylanicum +, Triraphis mollis

#### Site M073

Described by M	ET Date 4/22/00	Quadrat Size ~80 x 5m
AMG Zone 50	418312, 7689157	
Habitat	Rocklea LS. Small creek; loca	ated between low rises of volcanic rock.
Soil	Red-brown loam on banks (cu	urrently wet); seasonal pool in bed.
Vegetation	Acacia ampliceps, A. coriacea	a high shrubland over *Cenchrus ciliaris tussock grassland (on banks).
Notes	Narrow quadrat to fit habitat.	Located east of access track. Site includes area with Acacia ampliceps - creek bed and steep
	banks (nearly vertical in place	es) - and edge of small floodplain (which has scattered A. ampliceps over *Cenchrus ciliaris).
Densinent Case	ten Lint	

Dominant Species List

Acacia ampliceps (10-15%), Cenchrus ciliaris (>60%), Triodia angusta (<5%)

Associated Species List

Acacia bivenosa, Acacia coriacea subsp. pendens, Acacia farnesiana, Alternanthera nana, Alternanthera nodiflora, Bidens bipinnata, Corchorus tridens, Corchorus walcottii, Cullen graveolens, Cyperus bulbosus, Cyperus iria, Cyperus squarrosus, Dactyloctenium radulans, Digitaria brownii, Eragrostis tenellula, Eriachne benthamii, Eucalyptus victrix, Euphorbia coghlanii, Goodenia lamprosperma, Indigofera trita, Ipomoea muelleri, Malvastrum americanum, Marsilea hirsuta, Operculina aequisepala, Panicum decompositum, Phyllanthus maderaspatensis var. angustifolius, Prosopis pallida hybrid, Ptilotus murrayi var. murrayi, Sesbania cannabina, Sporobolus virginicus, Stemodia grossa, Trichodesma zeylanicum, Vigna lanceolata var. latifolia, Waltheria indica

# Sito M07/

Described by M	M Date 4/22/00	Quadrat Size ?250 x 10m	
Location	Samphire at boat-lau	inching location.	
AMG Zone 50	418252, 7689682	-	
Habitat	Littoral LS. Tidal mudflat.		
Soil	Brown mud.		
Vegetation	Samphire.		
Veg Condition	Very good: occasional dumped tyres, otherwise no disturbance evident.		
Notes	0-2% leaf and wood litter.		
Dominant Spec	ies List		
Frankenia ambi	ta (2-10%), Halosarcia halocr	nemoides subsp. tenuis (30-50%), Hemichroa diandra (2-10%)	
Associated Spe	cies List		
Amaranthus pallidiflorus, Avicennia marina, Cyperus bulbosus, Dysphania plantaginella, Eragrostis falcata, Halosarcia indica subsp.			
leiostachya, Ha	losarcia pruinosa, Muellerolim	ion salicorniaceum, Neobassia astrocarpa, Trianthema turgidifolia	

# Site M075

Described by M	1ET Date 4/23/00		
AMG Zone 50	422221, 7671430 422193, 7671397		
Habitat	Macroy LS. Sheet outcrop with shallow soil fringe.		
Soil	Varies from red-brown sandy loam with an algal crust on the surface to orange-brown sandy loam with a coarse sandy surface.		
Rock Type	Granite.		
Vegetation	Fimbristylis dichotoma low very open to mid-dense sedgeland with annual herbs and grasses.		
Notes	Area recorded comprises the sheet outcrop and shallow red-brown loamy soil out to (but not including) adjoining areas of		
	Triodia wiseana hummock grassland. The areas of coarser orange-brown loam have less run-on and support Tripogon		
	loliiformis low open tussock grassland (<5%). This extends into areas with Triodia wiseana to 15%.		

Dominant Species List

Aristida contorta (<5%), Fimbristylis dichotoma (<5-25%)

Associated Species List

Abutilon lepidum, Alysicarpus rugosus, Boerhavia coccinea, Bulbostylis barbata, Cenchrus ciliaris, Cenchrus setigerus, Cleome viscosa, Corchorus tridens, Corchorus walcottii, Crotalaria medicaginea, Cymbopogon ambiguus, Dactyloctenium radulans, Dichanthium sericeum subsp. humilius, Digitaria ctenantha, Enneapogon caerulescens var. occidentalis, Euphorbia australis, Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Gomphrena cunninghamii, Goodenia microptera, Heliotropium cunninghamii, Hybanthus aurantiacus, Indigastrum parviflorum, Indigofera colutea, Indigofera linifolia, Iseilema dolichotrichum, Leptopus decaisnei, Phyllanthus lacunellus, Polygala aff. isingii, Portulaca oleracea, Portulaca pilosa, Ptilotus helipteroides, Sida clementii, Streptoglossa decurrens, Synaptantha tillaeacea var. tillaeacea, Tephrosia aff. supina (ME Trudgen 12,357), Tephrosia clementii, Trachymene oleracea, Tripogon Ioliiformis, Triumfetta clementii

Described by M	1M Date 4/22/00	Quadrat Size 50 x 50m
Location	Cape Preston.	
AMG Zone 50	417670, 7692747	417757, 7692778
Habitat	Rocklea LS. Slope of low range	of hills.
Soil	Skeletal red clay loam with conti	nuous surface layer of rounded pebbles and stones.
Vegetation	Indigofera monophylla low open	shrubland over Triodia wiseana hummock grassland.
Veg Condition	Very good: occasional weeds pro	esent.

Notes 0-2% leaf and wood litter. SE aspect. <u>Dominant Species List</u> Indigofera monophylla (2-5%), Triodia wiseana (50-70%)

Associated Species List

Acacia bivenosa, Acacia coriacea subsp. coriacea, Acacia pyrifolia, Boerhavia gardneri, Bonamia media var. villosa, Cenchrus ciliaris, Corchorus walcottii, Crotalaria medicaginea, Cymbopogon ambiguus, Digitaria brownii, Euphorbia coghlanii, Euphorbia schultzii, Evolvulus alsinoides var. villosicalyx, Evolvulus sp., Goodenia microptera, Grevillea pyramidalis, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Melhania oblongifolia, Mollugo molluginis, Mukia aff. maderaspatana sp. A, Phyllanthus maderaspatensis var. angustifolius, Polygala aff. isingii, Pterocaulon sphacelatum, Ptilotus aervoides, Rhynchosia cf. minima, Scaevola spinescens, Senna glutinosa subsp. glutinosa, Sida aff. fibulifera (M37.16), Solanum diversiflorum, Solanum gabrielae, Solanum lasiophyllum, Swainsona formosa, Tephrosia supina, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii, Waltheria indica

# Site M077

••			
Described by M	ET Date 4/23/00		
AMG Zone 50	422193, 7671381 422156, 7671380		
Habitat	Macroy LS. Boulder outcrop; boulders to 1m high with soil in between.		
Soil	Light brown, hard-setting loam with some coarse sand grains.		
Rock Type	Granite.		
Vegetation	Acacia ancistrocarpa tall open shrubland over Indigofera monophylla low open shrubland / low shrubland over Triodia epactia		
-	*Cenchrus ciliaris mid-dense grassland with lianes of Rhynchosia cf. minima.		
Notes	Area recorded is within boulders and outcrop only; thin sand over rock similar to M075 was not included.		

# Dominant Species List

Acacia ancistrocarpa (<5-15%), Indigofera monophylla (±10%), Rhynchosia cf. minima (>10-15%), Triodia epactia (20%) Associated Species List

Abutilon lepidum, Acacia bivenosa, Alysicarpus rugosus, Aristida contorta, Boerhavia coccinea, Bulbostylis barbata, Cenchrus ciliaris, Corchorus laniflorus, Corchorus tridens, Cymbopogon ambiguus, Digitaria brownii, Digitaria ctenantha, Eriachne mucronata, Euphorbia australis, Evolvulus alsinoides, Gomphrena cunninghamii, Goodenia microptera, Grevillea pyramidalis, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Indigofera trita, Isotropis atropurpurea, Jasminum didymum subsp. lineare, Melhania oblongifolia, Mukia aff. maderaspatana sp. A, Paspalidium clementii, Phyllanthus lacunellus, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea corymbosa var. corymbosa, Portulaca oleracea, Portulaca pilosa, Pterocaulon sphacelatum, Senna glutinosa subsp. glutinosa, Solanum horridum, Streptoglossa decurrens, Tephrosia aff. supina (ME Trudgen 12,357), Tephrosia clementii, Trachymene oleracea, Trichodesma zeylanicum, Triodia wiseana, Triumfetta clementii

#### Site M078

Described by N	1M Date 4/22/00	Quadrat Size ~100 x 10m
Location	Cape Preston.	
AMG Zone 50	417619, 7692884	417599, 7692767
Habitat	Rocklea LS. Rocky outcroppin	gs along ridge of hill.
Soil	Pockets of red loam amongst	large rocks / boulders.
Vegetation	Acacia coriacea open shrubla	nd over Triodia wiseana and tussock grasses
Veg Condition	Moderate to very good: some	weeds present.
Notes	2-10% leaf litter. Quadrat alte	ed to fit habitat.
Dominant Spec	<u>cies List</u>	

Acacia coriacea subsp. coriacea (2-10%), Cenchrus ciliaris (2-10%), Cymbopogon ambiguus (10-20%), Themeda triandra (10%), Triodia wiseana (30-40%)

# Associated Species List

Acacia bivenosa, Acacia pyrifolia, Achyranthes aspera, Alternanthera nana, Boerhavia gardneri, Bonamia media var. villosa, Bothriochloa ewartiana, Capparis spinosa var. nummularia, Chrysopogon fallax, Cleome viscosa, Crotalaria medicaginea, Crotalaria novae-hollandiae, Digitaria ctenantha, Enchylaena tomentosa, Euphorbia schultzii, Evolvulus alsinoides var. villosicalyx, Ficus opposita var. aculeata, Gomphrena cunninghamii, Grevillea pyramidalis, Hybanthus aurantiacus, Indigofera monophylla, Ipomoea muelleri, Melhania oblongifolia, Mukia aff. maderaspatana sp. A, Paspalidium clementii, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea longiflora (pale form), Portulaca pilosa, Pterocaulon sphacelatum, Rhagodia eremaea, Rhynchosia cf. minima, Scaevola spinescens, Solanum diversiflorum, Solanum gabrielae, Solanum horridum, Tephrosia supina, Tinospora smilacina, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii, Vittadinia obovata

#### Site M079

Described by M	ET Date 4/23/00	Quadrat Size 50 >	50m
AMG Zone 50	419188, 7670069	419140, 7670020	
Habitat	Rocklea LS. Hill slope; moderate	slope on mid-upper	part of a ridge; north facing; considerable low outcrops of volcanic rock.
Soil	Gravelly / pebbly brown loam wit	h gravel to cobble sui	face.
Vegetation	Scattered Acacia inaequilatera /	A. ancistrocarpa over	Triodia wiseana hummock grassland.
Fire Age	Burnt fairly recently (+-3 years ag	jo).	-
Notes	Veg description based on appare	ent pre-fire condition (	see site M088). Appear to be >50 juvenile Acacia ancistrocarpa within
	quadrat. The two Sida aff. cardio	phylla species grow a	t the upper and lower ends of the plot, and also occur together between
	rocks at the top of the slope: the	/ differ in their indume	ntum and in their colouration.
Dominant Spec	ios List		

Corchorus laniflorus (±5%), Triodia wiseana (±15%)

Associated Species List

Abutilon ?lepidioicum, Abutilon lepidum, Abutilon trudgenii, Acacia ancistrocarpa, Acacia bivenosa, Acacia inaequilatera, Acacia pyrifolia, Aristida contorta, Boerhavia coccinea, Bonamia media var. villosa, Bulbostylis barbata, Cenchrus ciliaris, Cleome viscosa, Cymbopogon ambiguus, Dichanthium sericeum subsp. humilius, Enneapogon caerulescens var. occidentalis, Eriachne pulchella subsp. dominii, Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Gomphrena cunninghamii, Hibiscus aff. coatesii (site 664), Hibiscus aff. platychlamys (M39.14), Hibiscus aff. platychlamys (MET 15 067), Hibiscus leptocladus, Indigofera linifolia, Indigofera monophylla, Iseilema dolichotrichum, Oldenlandia crouchiana, Paspalidium clementii, Polygala aff. isingii, Ptilotus clementii, Ptilotus exaltatus var. exaltatus, Rhynchosia cf. minima, Senna glutinosa subsp. glutinosa, Senna glutinosa subsp. pruinosa x ?glutinosa, Senna notabilis, Sida aff. cardiophylla (M79.27), Sida aff. cardiophylla (site 1086), Sida aff. fibulifera 'var. L', Sida clementii, Sida sp. 'rugose', Solanum diversiflorum, Solanum horridum, Streptoglossa decurrens, Tephrosia clementii, Tephrosia supina (<5%), Trichodesma zeylanicum, Triumfetta clementii, Yakirra australiensis Quadrat Size 50 x 50m

Date 4/22/00 Location Cape Preston. 417433, 7693083 AMG Zone 50 417369, 7693068 Habitat Rocklea LS. Hillslope with scattered rockpiles. Soil Skeletal red clay loam with continuous surface layer of pebbles. Indigofera monophylla, Corchorus walcottii low open shrubland over Triodia wiseana hummock grassland. Vegetation Veg Condition Very good: occasional weeds present. Notes 0-2% leaf and wood litter. Scattered rock piles include additional species Melhania oblongifolia, Eremophila longifolia, Canavalia rosea, Operculina aequisepala, Cleome viscosa, Trichosanthes cucumerina & Tinospora smilacina.

Dominant Species List

Corchorus walcottii (2-5%), Indigofera monophylla (2-5%), Triodia wiseana (50-70%)

Associated Species List

Acacia coriacea subsp. coriacea, Acacia pyrifolia, Achyranthes aspera, Alternanthera nana, Amaranthus mitchellii, Boerhavia coccinea, Boerhavia gardneri, Bonamia media var. villosa, Cenchrus ciliaris, Corchorus tridens, Crotalaria novae-hollandiae, Cymbopogon ambiguus, Eriachne mucronata, Euphorbia schultzii, Evolvulus alsinoides var. villosicalyx, Gomphrena cunninghamii, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Mukia aff. maderaspatana sp. E, Paspalidium clementii, Pentalepis trichodesmoides, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea longiflora (pale form), Portulaca oleracea, Portulaca pilosa, Pterocaulon sphacelatum, Rhynchosia cf. minima, Scaevola spinescens, Solanum gabrielae, Stemodia grossa, Tephrosia supina, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

#### Site M081

Described by M	ET Date 4/23/00	
AMG Zone 50	418663, 7670027	418724, 7669960
Habitat	Rocklea LS. Low stony rise.	
Soil	Gravelly / pebbly / cobbly red-brow	n loam, with some low outcrops of volcanic rock.
Vegetation	Scattered shrubs of Grevillea pyra hummock grassland with lianes of	midalis and Acacia pyrifolia (slender stems, not corky) over Triodia wiseana mid-dense Rhynchosia cf. minima.
Notes	High diversity seems to be due to very old pebble-mound in the quad	a moisture-retaining soil (note the Phyllanthus and Flaveria - usually creek species). One drat (near an A. pyrifolia shrub).
Dominant Spec	ies List	

Triodia wiseana (20%?)

Associated Species List

Abutilon lepidum, Acacia bivenosa, Acacia pyrifolia, Acacia victoriae, Aerva javanica, Alysicarpus rugosus, Boerhavia coccinea, Bonamia media var. villosa, Cenchrus ciliaris, Cheilanthes sieberi subsp. sieberi, Corchorus laniflorus, Crotalaria medicaginea, Dichanthium sericeum subsp. humilius, Digitaria ctenantha, Euphorbia aff. australis type 2 (prostrate), Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Flaveria australasica, Gomphrena cunninghamii, Grevillea pyramidalis, Indigastrum parviflorum, Indigofera colutea, Indigofera linifolia, Indigofera monophylla, Iseilema dolichotrichum, Leptopus decaisnei, Oldenlandia crouchiana, Paspalidium clementii, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea longiflora (pale form), Polygala aff. isingii, Pterocaulon sphacelatum, Ptilotus exaltatus var. exaltatus, Ptilotus helipteroides, Rhynchosia cf. minima, Senna glutinosa subsp. x luerssenii, Sida aff. fibulifera (M85.15), Sida aff. fibulifera (oblong; MET 15 220), Sida clementii, Solanum lasiophyllum, Sporobolus australasicus, Swainsona formosa, Tephrosia clementii, Tephrosia supina, Trachymene oleracea, Tribulus hirsutus, Trichodesma zeylanicum, Triumfetta clementii

Site M082

Described by M	M Date 4/22/00	Quadrat Size 50 x 50m
AMG Zone 50	416933, 7684928	
Habitat	Paraburdoo LS. Stony plain.	
Soil	Red clay loam with scatters of	pebbles and stones on surface.
Vegetation	Triodia angusta hummock gras	ssland with patches of Sclerolaena open herbland.
Veg Condition	Very good: occasional weeds	present.
Notes	0-2% leaf and wood litter.	
Dominant Spec	ies List	
Indigofera trita (	2-5%), Triodia angusta (50-70%	%)

Associated Species List

Atriplex bunburyana, Cassytha capillaris, Cenchrus ciliaris, Corchorus tridens, Crotalaria medicaginea, Dactyloctenium radulans, Dichanthium sericeum subsp. humilius, Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Goodenia forrestii, Indigofera linifolia, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea corymbosa var. corymbosa, Portulaca pilosa, Rhynchosia cf. minima, Sclerolaena hostilis

# Site M083

Described by M	ET Date 4/23/00	Quadrat Size ~100 x 30m
AMG Zone 50	415022, 7670454	414931, 7670504
Habitat	Paraburdoo LS. Small creek; narrow	w channel (bed) and sloping 'floodplain'.
Soil	Red-brown loam on banks and floor	dplain, pebbly in the bed.
Vegetation	Scattered low trees of Eucalyptus v	ictrix over Acacia ancistrocarpa high open shrubland over Triodia wiseana hummock
-	grassland with annual Sorghum gra	ssland and annual Indigofera trita low open herbland.
Notes	Narrow quadrat to fit habitat. Some	Acacia coriacea and Cymbopogon downstream from area recorded.
Dominant Spec	ies List	

Acacia ancistrocarpa (<1-5%), Sorghum plumosum (<15-20%), Triodia wiseana (25%)

Associated Species List

Abutilon aff. lepidum (1) (MET 15 352), Acacia bivenosa, Acacia coriacea subsp. pendens, Acacia inaequilatera, Acacia pyrifolia, Alternanthera nana, Aristida contorta, Boerhavia coccinea, Bonamia media var. villosa, Bonamia pannosa, Bothriochloa ewartiana, Cenchrus ciliaris, Chrysopogon fallax, Cleome viscosa, Corchorus walcottii, Dactyloctenium radulans, Eucalyptus victrix, Eulalia aurea, Evolvulus alsinoides var. villosicalyx, Evolvulus sp., Gomphrena cunninghamii, Goodenia forrestii, Goodenia microptera, Goodenia sp. 1, Grevillea pyramidalis, Hybanthus aurantiacus, Indigofera linifolia, Indigofera monophylla, Indigofera trita (<10%), Ipomoea muelleri, Malvastrum americanum, Mukia aff. maderaspatana sp. C, Phyllanthus maderaspatensis var. angustifolius, Polymeria ambigua, Pterocaulon sphacelatum, Rhynchosia cf. minima, Sida sp. Wittenoom (W.R. Barker 1962), Solanum diversiflorum, Solanum horridum, Solanum lasiophyllum, Tephrosia aff. supina (ME Trudgen 12,357, Themeda triandra, Trichodesma zeylanicum, Triumfetta clementii, Vigna lanceolata var. lanceolata, Zaleya galericulata

Described by M	IM Da	ate 4/23/00	Quadrat Size ~200 x 10m
Location	Er	amurra Creek (towards e	eastern end of proposed access road).
AMG Zone 50	42	22402, 7671503	422419, 7671358
Habitat	Boundary of Macroy and Horseflats LS. Creekline.		s LS. Creekline.
Soil	Red clay le	oam.	
Vegetation Eucalyptus camaldulensis / E. victrix woodland over patches of Melaleuca glomerata and/or Acacia ar		ix woodland over patches of Melaleuca glomerata and/or Acacia ampliceps tall shrubs over	
-	*Cenchrus	s spp. closed tussock ara	issland.

Notes 50-70% leaf litter; ~1 cm deep, and 2% wood litter. Quadrat is ~150m long in straight-line distance, but follows bend in creek. <u>Dominant Species List</u>

Acacia ampliceps (2-10%), Cenchrus ciliaris (40-50%), Cenchrus setigerus (50%), Eucalyptus camaldulensis (10-20%), Eucalyptus victrix (10-30%), Melaleuca glomerata (10-30%)

Associated Species List

Abutilon amplum, Amaranthus pallidiflorus, Chara sp., Cleome viscosa, Corchorus tridens, Cyperus bifax, Cyperus squarrosus, Cyperus vaginatus, Dactyloctenium radulans, Eragrostis dielsii, Eragrostis falcata, Flaveria australasica, Ipomoea coptica, Ipomoea muelleri, Mukia aff. maderaspatana sp. F, Nicotiana rosulata subsp. rosulata, Operculina aequisepala, Phyllanthus maderaspatensis var. angustifolius, Pluchea rubelliflora, Portulaca oleracea, Rhynchosia cf. minima, Scaevola spinescens, Schoenoplectus litoralis, Sesbania cannabina, Setaria verticillata, Sporobolus virginicus, Stemodia grossa, Swainsona kingii, Triodia angusta

# Site M085

Described by M	ET Date 4/24/00	Quadrat Size ~40m x 10m
AMG Zone 50	418624, 7688147	418628, 7688111
Habitat	Rocklea LS. Rockpile; small rockpil	e / outcrop on break in slope; midslope of west side of a low ridge.
Soil	Red-brown gravelly / pebbly loam a	mongst boulders. Significant areas of soil between rocks (ca. 20%).
Vegetation	Acacia coriacea tall open shrublanc	l over scattered Santalum lanceolatum, Eremophila longifolia and Ehretia saligna over
-	*Cenchrus ciliaris / Triodia wiseana	/ Cymbopogon grassland with vines of Trichosanthes cucumerina.
Notes	Small lenticular-shaped quadrat to f	iit habitat.

Dominant Species List

Acacia coriacea subsp. coriacea (±5%), Cenchrus ciliaris (15%), Trichosanthes cucumerina (<5%), Triodia wiseana (<5%) Associated Species List

Abutilon fraseri, Abutilon lepidum, Acacia bivenosa, Acacia pyrifolia, Achyranthes aspera, Amaranthus mitchellii, Amaranthus pallidiflorus, Bidens bipinnata, Boerhavia coccinea, Chrysopogon fallax, Cleome viscosa, Crotalaria medicaginea, Cymbopogon ambiguus, Dactyloctenium radulans, Digitaria ctenantha, Ehretia saligna, Enchylaena tomentosa, Eremophila longifolia, Euphorbia tannensis subsp. eremophila, Evolvulus alsinoides var. villosicalyx, Gomphrena cunninghamii, Hibiscus aff. platychlamys (M39.14), Mukia aff. maderaspatana sp. E, Paspalidium clementii, Paspalidium tabulatum, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea longiflora (pale form), Portulaca oleracea, Rhynchosia cf. minima, Santalum lanceolatum, Sida aff. fibulifera (M85.15), Solanum horridum, Tephrosia aff. densa, Tinospora smilacina, Triumfetta clementii

# Site M086

Described by	MM	Date 4/23/00	Quadrat Size 50 x 50m
Location		Near Eramurra Creek.	
AMG Zone 50	)	422001, 7671405	422014, 7671463
Habitat	Macroy L	S. Plain.	
o ''	D		

Soil Brown (orange tinge) calcareous loam with scatters of quartz and other pebbles on surface.

Vegetation Acacia bivenosa open shrubland over Corchorus walcottii low open shrubland over Triodia wiseana hummock grassland. Dominant Species List

Acacia bivenosa (2-10%), Corchorus walcottii (2-5%), Triodia wiseana (30-50%)

Associated Species List

Acacia ancistrocarpa, Acacia pyrifolia, Aristida contorta, Boerhavia coccinea, Boerhavia gardneri, Bonamia media var. villosa, Cenchrus setigerus, Cymbopogon ambiguus, Dichanthium sericeum subsp. humilius, Enneapogon caerulescens var. occidentalis, Euphorbia australis, Evolvulus alsinoides var. villosicalyx, Goodenia microptera, Heliotropium ovalifolium, Hybanthus aurantiacus, Phyllanthus maderaspatensis var. angustifolius, Polygala aff. isingii, Pterocaulon sphaeranthoides, Ptilotus astrolasius, Senna glutinosa subsp. glutinosa, Senna glutinosa subsp. pruinosa x ?glutinosa, Sida clementii, Sporobolus australasicus, Stemodia grossa, Tephrosia clementii, Trachymene oleracea, Triumfetta clementii

# Site M087

Described by	MET	Date 4/24/00	
_ocation		Near northern end of Cape	Preston.
AMG Zone 50	D	417095, 7694064	417023, 7694069
Habitat	Rocklea L	S. Hillslope; NNW facing m	idslope on a ridge; slope moderate.
Soil	Red-brow	n pebbly / gravelly / cobbly	loam, with very minor outcropping at surface.
Vegetation	Triodia wi	seana mid-dense hummock	grassland with Indigofera monophylla low open shrubland
Notes	Old pebbl	e-mound outside quadrat, ~	8m south of corner peg 3.
Dominant Spe	ecies List		
ndigofera mo	onophylla (:	±2%), Triodia wiseana (±50	%)
Associated S	pecies List	t	

Abutilon lepidum, Acacia bivenosa, Acacia pyrifolia, Bonamia media var. villosa, Bulbostylis barbata, Cenchrus ciliaris, Cleome viscosa, Crotalaria medicaginea, Crotalaria novae-hollandiae, Cymbopogon ambiguus, Digitaria ctenantha, Euphorbia coghlanii, Euphorbia schultzii, Euphorbia tannensis subsp. eremophila, Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Gomphrena cunninghamii, Hybanthus aurantiacus, Indigofera linifolia, Melhania oblongifolia, Mukia aff. maderaspatana sp. A, Paspalidium clementii, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea longiflora (pale form), Polygala aff. isingii, Ptilotus exaltatus var. exaltatus, Rhagodia eremaea, Rhynchosia cf. minima, Scaevola spinescens, Solanum diversiflorum, Solanum lasiophyllum, Tephrosia supina, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

# Site M088

Described by MMDate 4/23/00Quadrat Size 50 x 50mAMG Zone 50419129 7670146419194 7670095HabitatRocklea LS. Rocky hillslope / crest of a small hill.SoilSkeletal red clay loam with continuous surface layer of pebbles, stones and rocks.VegetationScattered Acacia ancistrocarpa tall shrubs over Triodia wiseana hummock grassland.

Veg Condition Very good; occasional weeds present. Notes 0-2% leaf and wood litter. <u>Dominant Species List</u> Acacia ancistrocarpa (2-5%), Triodia wiseana (30-50%)

Associated Species List

Abutilon lepidum, Acacia coriacea subsp. coriacea, Aristida contorta, Boerhavia coccinea, Bonamia media var. villosa, Bulbostylis barbata, Cenchrus ciliaris, Corchorus laniflorus, Crotalaria medicaginea, Cymbopogon ambiguus, Eremophila longifolia, Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Gomphrena cunninghamii, Hibiscus aff. coatesii (site 664), Hibiscus aff. platychlamys (MET 15 067), Indigofera monophylla, Iseilema dolichotrichum, Paspalidium clementii, Polycarpaea holtzei, Polycarpaea longiflora (pale form), Polygala aff. isingii, Ptilotus exaltatus var. exaltatus, Rhynchosia cf. minima, Senna glutinosa subsp. glutinosa, Senna glutinosa subsp. pruinosa x ?glutinosa, Sida sp. 'rugose', Solanum horridum, Sporobolus australasicus, Stemodia grossa, Tephrosia supina, Trachymene oleracea, Triumfetta clementii

#### Site M089

Described by MET Date 4/24/00 Location Cape Preston. 417189, 7694210 AMG Zone 50 417142, 7694140 Rocklea LS. Small creek; bed 1-1.5m across, banks <1m tall. Habitat Soil Light brown hard-setting loam Vegetation Acacia coriacea tall shrubland over scattered Santalum lanceolatum over \*Cenchrus ciliaris dense tussock grassland. Veg Condition Very degraded. Site recorded is within the area of Acacia coriacea. Outer floodplain has Atriplex low open shrubland over \*Cenchrus mid-dense Notes

Notes Site recorded is within the area of Acacia coriacea. Outer floodplain has Atriplex low open shrubland over \*Cenchrus mid-dense tussock grassland with some Triodia angusta; Eragrostis xerophila was also observed here. GPS reading taken in middle of section inspected.

# Dominant Species List

Acacia coriacea subsp. pendens (>15%), Cenchrus ciliaris (>70%)

Associated Species List

Abutilon cunninghamii, Acacia farnesiana, Acacia inaequilatera, Achyranthes aspera, Alternanthera nana, Bulbostylis barbata, Capparis spinosa var. nummularia, Capparis umbonata, Chrysopogon fallax, Cleome viscosa, Corchorus tridens, Cyperus bulbosus, Dactyloctenium radulans, Eragrostis cumingii, Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Indigofera colutea, Ipomoea muelleri, Malvastrum americanum, Mukia aff. maderaspatana sp. F, Perotis rara, Phyllanthus lacunellus, Pterocaulon sphacelatum, Rhagodia eremaea, Rhynchosia cf. minima, Santalum lanceolatum, Scaevola spinescens, Sida aff. fibulifera (M85.15), Solanum horridum, Trichodesma zeylanicum, Triodia pungens, Triumfetta clementii

#### Site M090

Described by	MM	Date 4/23/00	Quadrat Size ~80 x 15m
AMG Zone 50	)	419151, 7670200	419078, 7670212
Habitat	Rocklea L	_S. Drainage line.	
Soil	Red clay loam with ~continuous surface layer of stones in bed.		
Vegetation	Corymbia	hamersleyana open low wo	podland over Acacia bivenosa high shrubland over Triodia wiseana mid-dense hummock
	grassland	1.	
Notes	Narrow q	uadrat to fit habitat.	

Dominant Species List

Acacia bivenosa (20-30%), Cenchrus ciliaris (2-10%), Corymbia hamersleyana (10-20%), Triodia wiseana (50-70%)

Associated Species List

Acacia ancistrocarpa, Acacia coriacea subsp., Acacia pyrifolia, Aerva javanica, Boerhavia coccinea, Bonamia media var. villosa, Cenchrus setigerus 0-2, Corchorus laniflorus, Cymbopogon ambiguus, Digitaria ctenantha, Euphorbia aff. australis type 1 (erect stems), Euphorbia coghlanii, Euphorbia tannensis subsp. eremophila, Evolvulus alsinoides, Flaveria australasica, Grevillea pyramidalis, Hibiscus aff. platychlamys (M39.14), Hibiscus aff. platychlamys (MET 15 067), Hybanthus aurantiacus, Isotropis atropurpurea, Leptopus decaisnei, Malvastrum americanum, Mukia aff. maderaspatana sp. F, Paraneurachne muelleri, Paspalidium clementii, Phyllanthus maderaspatensis var. angustifolius, Porana commixta, Pterocaulon sphacelatum, Ptilotus obovatus, Senna artemisioides subsp. v luerssenii, Sida aff. fibulifera (M37.16), Sida sp. 'rugose', Solanum lasiophyllum, Sporobolus australasicus, Swainsona formosa, Tephrosia aff. supina (ME Trudgen 12,357), Tribulus hirsutus, Trichodesma zeylanicum, Triumfetta clementii, Wrightia saligna

#### Site M091

Described by	T Date 4/24/00
Location	Cape Preston.
AMG Zone 50	417243, 7694722 417255, 7694770
Habitat	cklea LS. Boulder rockpile and outcrop.
Soil	d-brown pebbly / gravelly loam amongst boulders.
Vegetation	attered Acacia coriacea shrubs over Canavalia rosea vines.
Fire Age	rnt fairly recently (?3-4 years ago).
Notes	st fire killed many of the Acacia coriacea that were present. Prior to this fire there was a strip of Acacia coriacea tall shrubland
	ng the lower edge of the boulder pile.

Dominant Species List

Acacia coriacea subsp. coriacea (±2%), Canavalia rosea (±15%) Associated Species List

Abutilon fraseri, Abutilon lepidum, Achyranthes aspera, Amaranthus pallidiflorus, Capparis spinosa var. nummularia, Cenchrus ciliaris (>30%), Corchorus tridens, Crotalaria medicaginea, Cymbopogon ambiguus, Enchylaena tomentosa, Gomphrena cunninghamii, Mukia aff. maderaspatana sp. E, Operculina aequisepala, Phyllanthus maderaspatensis var. angustifolius, Plumbago zeylanica, Polycarpaea longiflora (pale form), Rhagodia eremaea, Rhynchosia cf. minima, Solanum gabrielae, Solanum lasiophyllum, Tephrosia aff. supina (ME Trudgen 12,357), Tinospora smilacina, Trachymene oleracea, Trichodesma zeylanicum, Triodia wiseana, Triumfetta clementii

Described by	MM Date 4/23/00	Quadrat Size 50 x 50m
AMG Zone 50	418627, 7670083	418689, 7670058
Habitat	Within Rocklea LS. Stony plain.	
Soil	Brown calcareous clay loam with ~co	ntinuous surface layer of gravel and stones; thin crust on surface.

Vegetation Acacia xiphophylla shrubland over Triodia wiseana hummock grassland and \*Cenchrus ciliaris tussock grassland. Veg Condition Good; weed invasion.

Notes 0-2% leaf and wood litter. Patches of 'bare' ground dominated by herbs.

Dominant Species List

Acacia xiphophylla (10-20%), Cenchrus ciliaris (30-50%)

Associated Species List

Abutilon fraseri, Acacia coriacea subsp. coriacea, Acacia farnesiana, Aerva javanica, Capparis spinosa var. nummularia, Cenchrus setigerus, Corchorus tridens, Corymbia hamersleyana, Crotalaria medicaginea, Dicladanthera forrestii, Digitaria ctenantha, Enchylaena tomentosa, Eremophila forrestii subsp. forrestii, Euphorbia aff. australis type 1 (erect stems), Euphorbia coghlanii, Evolvulus alsinoides var. villosicalyx, Flaveria australasica, Leptopus decaisnei, Malvastrum americanum, Melhania oblongifolia, Paspalidium clementii, Porana commixta, Ptilotus exaltatus var. exaltatus, Ptilotus helipteroides, Ptilotus obovatus, Rhagodia eremaea, Rhynchosia cf. minima, Salsola tragus, Senna artemisioides subsp. oligophylla (sericea form), Senna glutinosa subsp. x luerssenii, Setaria verticillata, Sida aff. fibulifera (oblong; MET 15 220), Sida sp. 'rugose', Solanum horridum, Swainsona kingii, Triodia pungens, Triodia wiseana (20-30%)

# Site M093

Described by I	MET	Date 4/24/00
Location		Cape Preston.
AMG Zone 50		417686, 7694103
Habitat	Rocklea L	S. Creek; in valley in centre of Cape Preston.
Soil	Not recor	ded.
Vegetation	Open tall	shrubland of Acacia coriacea and A. bivenosa over Triodia wiseana and *Cenchrus ciliaris.
Notes	Open patch with Cyperus vaginatus cover of >25% occurs at north end of site. After first 100m, Abutilon fraseri drops out ar becomes Acacia bivenosa / A. coriacea shrubland over *Cenchrus and Triodia wiseana with open Senna artemisioides sub oligophylla and Trianthema turgidifolia.	

Dominant Species List

Acacia bivenosa (2-10%?), Acacia coriacea subsp. pendens (2-10%), Cenchrus ciliaris (2-10%), Triodia wiseana (2-10%?) Associated Species List

Abutilon cunninghamii, Acacia ampliceps, Acacia pyrifolia, Capparis spinosa var. nummularia, Corchorus tridens, Corchorus walcottii, Cyperus vaginatus, Dactyloctenium radulans, Dysphania rhadinostachya, Ehretia saligna, Enchylaena tomentosa, Ipomoea muelleri, Malvastrum americanum, Melhania oblongifolia, Paspalidium clementii, Phyllanthus maderaspatensis var. angustifolius, Pterocaulon sphacelatum, Rhagodia eremaea, Senna artemisioides subsp. oligophylla x helmsii, Solanum gabrielae, Solanum lasiophyllum, Tephrosia rosea var. clementii, Tinospora smilacina, Trianthema turgidifolia, Triumfetta clementii

# Site M094

Described by	MM	Date 4/23/00	Quadrat Size 50 x 50m
AMG Zone 50	)	416338, 7670298	416268, 7670356
Habitat	Rocklea L	S. Stony plain.	
Soil	Red brow	n clay loam with continuou	s surface layer of pebbles and stones.
Vegetation	Scattered	Acacia bivenosa (with ver	y occasional Acacia inaequilatera) over Triodia wiseana hummock grassland.
Veg Condition	n Very	y good; occasional weeds i	present.
Notes	0-2% leaf	and wood litter.	
Dominant Spo	ecies List		
Triodia wisea	na (30-50%	%)	
Associated S	pecies List	<u>t</u>	
Abutilon lepid	um, Acaci	a bivenosa, Acacia inaequ	ilatera, Acacia pyrifolia, Alysicarpus rugosus, Aristida contorta, Boerhavia coccinea, Bonamia
media var. vil	losa, Cenc	chrus ciliaris, Cleome visco	sa, Corchorus walcottii, Crotalaria medicaginea, Dichanthium sericeum subsp. humilius,
Euphorbia co	ghlanii, Ev	olvulus alsinoides, Gomph	rena cunninghamii, Hibiscus aff. platychlamys (M39.14), Hibiscus aff. platychlamys (MET 15
067), Hybantł	nus aurant	iacus, Indigastrum parviflo	rum, Indigofera linifolia, Indigofera monophylla, Indigofera trita, Leptopus decaisnei,
Malvastrum a	mericanur	n Mukia aff maderasnatar	na sp. F. Oldenlandia crouchiana. Paspalidium clementii. Polygala aff. isingii. Portulaca

ortulaca oleracea, Pterocaulon sphacelatum, Ptilotus aervoides, Ptilotus exaltatus var. exaltatus, Rhynchosia cf. minima, Sclerolaena costata, Solanum horridum, Solanum lasiophyllum, Sporobolus australasicus, Tephrosia clementii, Trachymene oleracea, Tribulus hirsutus, Trichodesma zeylanicum, Trichosanthes cucumerina, Triumfetta clementii

#### CHA MOOF

Site 1095			
Described by	MET Date 4/25/00		
Location	Southern OB.		
AMG Zone 50	0 408922, 7662699 408866, 7662559		
Habitat	Newman LS. Small creek / flowline; between spurs on the west side of a ridgeline.		
Soil	Red-brown gravelly / pebbly loam.		
Vegetation	Scattered low mallees of Corymbia hamersleyana over Acacia ancistrocarpa / Petalostylis labicheoides / Acacia bivenosa tall open shrubland to tall shrubland over Indigofera monophylla low open shrubland over Triodia pungens hummock grassland.		
Fire Age	Not burnt for some years.		
Notes	No Tephrosia seen. Hybanthus aurantiacus heavily grazed.		
Dominant Spe	ecies List		
Acacia ancist	rocarpa (5->10%), Acacia bivenosa (2-10%), Indigofera monophylla (1-2%), Petalostylis labicheoides (15%), Porana commixta		
(<5%), Triodia	a pungens (20-35%), Triodia wiseana (<5%)		
Associated S	pecies List		
Abutilon lepid	um. Acacia arida, Acacia farnesiana, Acacia tumida, Achyranthes aspera, Bidens bipinnata, Bonamia media var, villosa, Cassyth		

capillaris, Cenchrus ciliaris, Corchorus laniflorus, Corymbia hamersleyana, Cymbopogon ambiguus, Digitaria brownii, Enchylaena tomentosa, Eremophila forrestii subsp. forrestii, Eriachne mucronata, Euphorbia aff. australis type 2 (prostrate), Evolvulus alsinoides, Evolvulus sp., Goodenia stobbsiana, Hibiscus aff. platychlamys (M9.15), Hibiscus aff. platychlamys (site 1139), Hybanthus aurantiacus, Isotropis atropurpurea, Leptopus decaisnei, Malvastrum americanum, Mukia aff. maderaspatana sp. F, Paraneurachne muelleri, Paspalidium clementii, Pterocaulon sphacelatum, Ptilotus calostachyus, Ptilotus exaltatus var. exaltatus, Rhynchosia cf. minima, Scaevola spinescens, Senna glutinosa subsp. pruinosa x ?glutinosa, Sida aff. cardiophylla (site 1086), Sida clementii, Solanum gabrielae, Solanum horridum, Solanum lasiophyllum, Trichodesma zeylanicum, Triumfetta clementii, Waltheria indica

#### Site M096

Described by MM	Date 4/23/00	Quadrat Size 50 x 50m
AMG Zone 50	414544, 7670307	414587, 7670296

Bonamia

### Habitat Paraburdoo LS. Stony plain.

Soil Red clay loam with continuous surface layer of pebbles and stones.

Vegetation Acacia xiphophylla shrubland over Triodia wiseana hummock grassland.

Veg Condition Very good; occasional weeds present.

Notes 0-2% leaf and wood litter. Mosaic with patches of Eragrostis xerophila and patches of Aristida contorta.

Dominant Species List

Acacia xiphophylla (10-20%), Eragrostis xerophila (2%), Triodia wiseana (20%)

Associated Species List

Abutilon aff. lepidum (2) (MET 15 970), Aristida holathera, Boerhavia coccinea, Cenchrus ciliaris, Chloris pectinata, Digitaria ctenantha, Enchylaena tomentosa, Enneapogon caerulescens var. occidentalis, Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Indigofera trita, Iseilema dolichotrichum, Maireana planifolia, Oldenlandia crouchiana, Portulaca oleracea, Rhagodia eremaea, Rhynchosia cf. minima, Senna glutinosa subsp. x luerssenii, Solanum horridum, Tragus australianus, Urochloa gilesii subsp. occidentalis

#### Site M097

Described by MET Location Southern OB. AMG Zone 50 408638, 7662691 408699, 7662728 Habitat Newman LS. Hillslope; NW facing lower slope of a spur from a low ridge. Soil Red-brown pebbly / gravelly loam with a coarse pebble surface; some low outcrops. Vegetation Triodia wiseana hummock grassland with scattered low shrubs of Acacia victoriae, A. bivenosa and A. pyrifolia. <u>Dominant Species List</u> Triodia wiseana (≥40%)

Associated Species List

Abutilon lepidum, Acacia arida, Acacia bivenosa, Acacia coriacea subsp. coriacea, Acacia pyrifolia, Acacia victoriae, Bonamia media var. villosa, Cenchrus ciliaris, Corchorus laniflorus, Cucumis melo subsp. agrestis, Dysphania rhadinostachya, Evolvulus alsinoides var. villosicalyx, Paspalidium clementii, Polygala aff. isingii, Prosopis pallida, Sarcostemma viminale subsp. australe, Sclerolaena eriacantha, Solanum lasiophyllum, Sporobolus australasicus, Tephrosia supina, Trachymene oleracea, Tribulus suberosus, Trichodesma zeylanicum, Triumfetta clementii

# Site M098

Described by MM Date 4/24/00 Quadrat Size 50 x 50m AMG Zone 50 418453, 7688186 418492, 7688115 Rocklea LS. Stony slope of low hill. Habitat Soil Skeletal red clay loam with continuous surface layer of pebbles and stones. Vegetation Scattered Acacia bivenosa tall shrubs over Triodia wiseana hummock grassland . Very good; occasional weeds present. Veg Condition 0-2% leaf and wood litter. Notes Dominant Species List Acacia bivenosa (0-2%), Triodia wiseana (50-70%)

Associated Species List

Abutilon lepidum, Acacia coriacea subsp. coriacea, Acacia elachantha golden hairy variant, Achyranthes aspera, Aerva javanica, Alternanthera nana, Bidens bipinnata, Bonamia media var. villosa, Cenchrus ciliaris, Cleome viscosa, Corchorus walcottii, Cymbopogon ambiguus, Dactyloctenium radulans, Digitaria brownii, Digitaria ctenantha, Evolvulus alsinoides var. villosicalyx, Gomphrena cunninghamii, Hibiscus aff. platychlamys (M39.14), Hybanthus aurantiacus, Indigofera linifolia, Indigofera monophylla, Indigofera trita, Leptopus decaisnei, Melhania oblongifolia, Mollugo molluginis, Mukia aff. maderaspatana sp. D, Mukia aff. maderaspatana sp. E, Paraneurachne muelleri, Paspalidium clementii, Phyllanthus lacunellus, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea corymbosa var. corymbosa, Portulaca oleracea, Portulaca pilosa, Pterocaulon sphacelatum, Ptilotus exaltatus var. exaltatus, Rhynchosia cf. minima, Scaevola spinescens, Sida aff. fibulifera (M85.15), Solanum gabrielae, Solanum lasiophyllum, Tephrosia aff. densa, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

# Site M099

Described by M	ЛЕТ		
AMG Zone 50	405881, 7659827 405812, 7659831		
Habitat	River LS. Floodplain of Fortescue River; undulating where floods have cut small channels.		
Soil	Fine light brown loamy soil (fine sand / silt).		
Vegetation	Eucalyptus victrix open woodland to woodland over scattered low trees of Erythrina vespertilio over scattered Melaleuca glomerata (dead) tall shrubs over *Cenchrus mid-dense / dense tussock grassland.		
Fire Age	Burnt recently (?1999).		
Notes	Seedlings of Mesquite common but only one large plant (dead). Many larger Erythrina killed by fire, but seedlings noted.		
D	alan Lint		

Dominant Species List

Cenchrus ciliaris (≥60%), Cenchrus setigerus (>10%), Eucalyptus victrix (<5%)

Associated Species List

Alternanthera angustifolia, Alternanthera nodiflora, Amaranthus pallidiflorus, Ammannia baccifera, Argemone ochroleuca, Basilicum polystachyon, Centipeda minima, Cleome viscosa, Corchorus tridens, Crotalaria novae-hollandiae, Cucumis melo subsp. agrestis, Datura leichhardtii, Dysphania plantaginella, Eragrostis tenellula, Erythrina vespertilio, Glinus lotoides, Goodenia lamprosperma, Ipomoea muelleri, Leptopus decaisnei, Melaleuca glomerata, Nicotiana rosulata subsp. rosulata, Operculina aequisepala, Passiflora foetida, Phyllanthus maderaspatensis var. angustifolius, Portulaca oleracea, Prosopis pallida hybrid, Pterocaulon sphacelatum, Rostellularia adscendens var. clementii, Sesbania cannabina, Stemodia grossa

Described by	MM Date 4/24/00		
Location	Cape Preston.		
AMG Zone 50	0 416869, 7693879	416789, 7693948	
Habitat	Littoral LS. Foredunes.		
Soil	Brown sand.		
Vegetation	n Acacia coriacea, A. bivenosa shrubland over Triodia epactia hummock grassland.		
Notes	On raised dune at eastern edge of quadrat grass cover is to 60-80% dominated by *Cenchrus ciliaris, with Eragrostis eriopoda		
	and some Triodia pungens; some pa	tches have more E. eriopoda.	
Dominant Sp	ecies List		

Acacia bivenosa (2-5%), Acacia coriacea subsp. coriacea (20-30%), Eragrostis eriopoda (<2%), Rhagodia preissii subsp. obovata (2-5%), Triodia epactia (30-50%)

# Associated Species List

Abutilon cunninghamii, Adriana tomentosa, Aerva javanica, Amaranthus pallidiflorus, Boerhavia type 2, Cenchrus ciliaris, Cleome viscosa, Corchorus walcottii, Cuscuta victoriana, Enneapogon caerulescens var. occidentalis, Euphorbia coghlanii, Euphorbia schultzii, Euphorbia tannensis subsp. eremophila, Evolvulus alsinoides var. villosicalyx, Heliotropium cunninghamii, Indigofera linifolia, Melhania oblongifolia, Rhynchosia cf. minima, Salsola tragus, Santalum lanceolatum, Scaevola spinescens, Senna artemisioides subsp. oligophylla x helmsii, Setaria verticillata, Sida aff. fibulifera (M100.22), Swainsona formosa, Synaptantha tillaeacea var. tillaeacea, Threlkeldia diffusa, Triraphis mollis

# Site M101

Described by	MET
AMG Zone 50	) 406741, 7659556 406803, 7659559
Habitat	River LS. Large creek; bed of a tributary of the Fortescue River.
Soil	Red-brown clayey loam, pebbly to cobbly in places.
Vegetation	Eucalyptus victrix low woodland to woodland over Melaleuca glomerata / Acacia ampliceps / Prosopis pallida hybrid tall open
	shrubland to tall shrubland over patches of *Cenchrus ciliaris dense grassland (on elevated areas) or patches of Cyperus bifax
	mid-dense sedgeland (on lower parts).
Notes	Recent floods have killed ~two thirds of the *Cenchrus. Some small patches of Cyperus vaginatus in a small pool just outside the

quadrat. Well downstream from the quadrat there are larger pools with Eucalyptus camaldulensis. Dominant Species List

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Cenchrus ciliaris (?30%), Cyperus bifax (>15%), Cyperus bulbosus (<5%), Eucalyptus victrix (<5-15%), Melaleuca glomerata (≤5%) Associated Species List

Acacia ampliceps, Acacia coriacea subsp. pendens, Achyranthes aspera, Alternanthera angustifolia, Alternanthera nodiflora, Amaranthus pallidiflorus, Ammannia baccifera, Ammannia multiflora, Basilicum polystachyon, Cenchrus setigerus, Corchorus tridens, Cucumis melo subsp. agrestis, Cyperus squarrosus, Cyperus vaginatus, Dactyloctenium radulans, Datura leichhardtii, Dichanthium fecundum, Eragrostis dielsii, Eragrostis tenellula, Eucalyptus camaldulensis, Fimbristylis microcarya, Goodenia lamprosperma, Ipomoea muelleri, Marsilea hirsuta, Mimulus gracilis, Nicotiana rosulata subsp. rosulata, Passiflora foetida, Peplidium sp. E (Flora of Australia), Phyllanthus maderaspatensis var. angustifolius, Pluchea rubelliflora, Prosopis pallida hybrid, Rostellularia adscendens var. clementii, Samolus repens, Sesbania cannabina, Solanum horridum, Stemodia grossa, Trianthema triquetra, Trichodesma zeylanicum, Vigna lanceolata var. lanceolata

#### Site M102

Described by	MM Date 4/24/00	Quadrat Size ~30 x 5m	
Location	Cape Preston.		
AMG Zone 50	) 417241, 7694619	417246, 7694572	
Habitat	Within Rocklea LS. Clayey plain; small drainage area within plain.		
Soil	Heavy brown cracking clay.		
Vegetation	Xerochloa imberbis grassland.		
Notes	Very small site to fit tiny vegetation	n unit.	
Dominant Spe	ecies List		
Ptilotus murra	ayi var. murrayi (2-5%), Xerochloa	imberbis (30-50%)	

Associated Species List

Atriplex bunburyana, Cenchrus ciliaris, Corchorus tridens, Dactyloctenium radulans, Enchylaena tomentosa, Neptunia dimorphantha, Portulaca oleracea, Portulaca pilosa, Ptilotus exaltatus var. exaltatus, Rhynchosia cf. minima, Sida aff. fibulifera 'var. L', Trianthema triquetra, Trianthema turgidifolia

# Site M103

 Described by MET

 AMG Zone 50
 409253, 7660492
 409261, 7660581

 Habitat
 Paraburdoo LS. Clayey plain; gentle slope to SE, at the base of a ridge / upper part of a plain.

 Soil
 Mosaic of small patches of red-brown cracking clay with patches of pebbly / gravelly red-brown clay loam.

 Vegetation
 Acacia xiphophylla shrubland / tall shrubland over patches of Eragrostis xerophila mid-dense tussock grassland, patches of Triodia mid-dense hummock grassland and barer areas with herbs.

 Notes
 The slope is a mosaic of 5 communities: 1. Cracking clay patches; 2. 'Bare' areas with herbs; 3. Snakewood patches; 4. Triodia

from the Eragrostis patches but are undoubtedly wetter. One contained a 'gutter' (vernal pool, currently dry).

Dominant Species List

Acacia xiphophylla (≥15%), Eragrostis xerophila (±10%), Eriachne benthamii (±2%), Triodia epactia (<10%) Associated Species List

Abutilon fraseri, Acacia victoriae, Bergia pedicellaris, Bulbostylis barbata, Centipeda minima, Chrysopogon fallax, Cleome viscosa, Corchorus tridens, Crotalaria dissitiflora subsp. benthamiana, Cyperus iria, Cyperus squarrosus, Ehretia saligna, Enchylaena tomentosa, Enneapogon caerulescens var. occidentalis, Enteropogon acicularis, Eragrostis tenellula, Euphorbia aff. australis type 2 (prostrate), Euphorbia aff. drummondii (MET 15211), Goodenia lamprosperma, Heliotropium heteranthum, Heliotropium sp. 1, Ipomoea coptica, Maireana planifolia, Malvastrum americanum, Marsilea hirsuta, Mimulus gracilis, Neptunia dimorphantha, Phyllanthus maderaspatensis var. angustifolius, Portulaca pilosa, Prosopis pallida hybrid, Pterocaulon sphacelatum, Ptilotus aervoides, Ptilotus exaltatus var. exaltatus, Ptilotus gomphrenoides var. gomphrenoides, Rhagodia eremaea, Rhynchosia cf. minima, Salsola tragus, Schoenoplectus laevis, Sclerolaena eriacantha, Senna glutinosa subsp. chatelainiana, Sesbania cannabina, Sida aff. fibulifera (MET Site 1346), Solanum gabrielae, Solanum horridum, Solanum lasiophyllum, Sporobolus australasicus, Stemodia kingii, Streptoglossa liatroides, Trichodesma zeylanicum, Triodia wiseana

# Site M104

Described by MM Date 4/25/00 Location Middle of Southern OB. AMG Zone 50 409005, 7662763 409008, 7662680 Habitat Newman LS. Hillslope; midway up range. Soil Skeletal red clay loam with continuous surface layer of pebbles and stones. Vegetation Scattered shrubs of Senna glutinosa subsp. pruinosa x ?glutinosa over Triodia wiseana hummock grassland. Veg Condition Excellent

Notes 1 x very old pebble-mound inside quadrat, another outside.

Dominant Species List

Senna glutinosa subsp. pruinosa x ?glutinosa (<1%), Triodia wiseana (30%)

Associated Species List

Acacia ancistrocarpa, Acacia victoriae, Bonamia media var. villosa, Dysphania rhadinostachya, Euphorbia tannensis subsp. eremophila, Indigofera monophylla, Polygala aff. isingii, Sida aff. cardiophylla (site 1086), Solanum gabrielae, Tephrosia clementii, Tephrosia supina, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

# Site M105

Described by MET Quadrat Size 50 x 50m 409588, 7660037 AMG Zone 50 409555, 7659965 Habitat Horseflats LS. Clayey plain; very gently sloping. Red-brown cracking clay with small undulations and a few pebbles. Soil Vegetation Eragrostis xerophila mid-dense grassland. Veg Condition Appears good; evidence of horses recently. Dominant Species List Eragrostis xerophila (>35%) Associated Species List

Corchorus tridens, Dichanthium sericeum subsp. humilius, Euphorbia coghlanii, Heliotropium sp. 1, Indigofera trita, Lotus australis, Oldenlandia crouchiana, Phyllanthus maderaspatensis var. angustifolius, Pterocaulon sphacelatum, Ptilotus gomphrenoides var. gomphrenoides, Rhynchosia cf. minima, Sclerolaena cornishiana, Sida aff. fibulifera 'var. L', Xerochloa imberbis

#### Site M106

Described by MM	Date 4/25/00	Quadrat Size 50 x 50m
AMG Zone 50	408513, 7662773	408526, 7662707

Habitat Boolgeeda LS. Clayey plain with elevated areas.

Soil Red clay in Snakewood patches; more elevated areas have a loamy clay with gravel and typically support herbs.

Vegetation Acacia xiphophylla open shrubland over Triodia epactia hummock grassland.

Veg Condition Moderate; evidence of grazing and some weeds present.

Dominant Species List

Acacia xiphophylla (2-10%), Triodia epactia (40-60%)

Associated Species List

Abutilon aff. lepidum (1) (MET 15 352), Abutilon aff. lepidum (3) (MET 16 120), Acacia victoriae, Amaranthus mitchellii, Atriplex codonocarpa, Boerhavia coccinea, Bulbostylis barbata, Cenchrus ciliaris, Dactyloctenium radulans, Dysphania rhadinostachya, Enchylaena tomentosa, Enneapogon caerulescens var. occidentalis, Eremophila forrestii subsp. forrestii, Eremophila longifolia, Eriachne benthamii, Eriachne pulchella subsp. dominii, Evolvulus alsinoides var. villosicalyx, Gomphrena cunninghamii, Hibiscus aff. platychlamys (M39.14), Hibiscus brachysiphonius, Indigastrum parviflorum, Leptopus decaisnei, Mimulus gracilis, Paspalidium clementii, Prosopis pallida hybrid, Pterocaulon sphacelatum, Ptilotus aervoides, Rhagodia eremaea, Rhynchosia cf. minima, Salsola tragus, Sclerolaena eriacantha, Sclerolaena uniflora, Senna glutinosa subsp. x luerssenii, Sida aff. cardiophylla (site 1086), Solanum horridum, Solanum lasiophyllum, Sporobolus australasicus, Stemodia grossa, Trachymene oleracea, Trianthema triquetra, Trichodesma zeylanicum, Triodia wiseana, Triumfetta clementii

# Site M107

 Described by MET

 Location
 Southern OB.

 AMG Zone 50
 408146, 7661156
 408132, 7661051

 Habitat
 Newman LS. Small creekline; between two spurs of a ridge, relatively open.

 Soil
 Hard-setting red-brown gravelly / pebbly loam.
Vegetation Corymbia hamersleyana low mallee woodland over Acacia tumida / Petalostylis labicheoides thicket over scattered Acacia bivenosa and A. ancistrocarpa over Hibiscus low open shrubland and Triodia pungens hummock grassland.
 Fire Age Burnt ~5-10 years ago.
 Notes Corymbia regenerating well from bases but slower growing than the Acacia (some escaped the fire). No Tephrosia or Cassytha

seen. Dominant Species List

Acacia ancistrocarpa (±1%), Acacia bivenosa (±1%), Acacia tumida (>75%), Petalostylis labicheoides (5-10%), Triodia pungens (15-25%), Triodia wiseana (<5%)

Associated Species List

Abutilon lepidum, Acacia pyrifolia, Alternanthera nana, Bidens bipinnata, Cleome viscosa, Corchorus laniflorus, Corymbia hamersleyana, Digitaria brownii, Eremophila longifolia, Eriachne mucronata, Evolvulus sp., Gomphrena cunninghamii, Goodenia stobbsiana, Hibiscus aff. platychlamys (M9.15), Hybanthus aurantiacus, Indigofera monophylla, Ipomoea muelleri, Isotropis atropurpurea, Leptopus decaisnei, Malvastrum americanum, Mukia aff. maderaspatana sp. E, Paraneurachne muelleri, Paspalidium clementii, Phyllanthus maderaspatensis var. angustifolius, Polycarpaea longiflora (pale form), Porana commixta, Pterocaulon sphacelatum, Ptilotus obovatus, Rhynchosia cf. minima, Senna glutinosa subsp. glutinosa, Senna glutinosa subsp. pruinosa x ?glutinosa, Senna notabilis, Solanum diversiflorum, Solanum gabrielae, Solanum horridum, Solanum lasiophyllum, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii, Waltheria indica

## Site M108

Described by	MM	Date 4/25/00	
AMG Zone 50	)	405961, 7659674	406006, 7659643
Habitat	River LS.	Floodplain.	
Soil	Dense he	avy clay soil.	
Vegetation	*Prosopis	s pallida hybrid open scr	ub over patches of *Cenchrus tussock grassland.
Veg Condition	n Cor	npletely degraded: infes	ed by mesquite, grazed by cattle.
Notes	10% leaf	litter, <1 cm deep.	
Dominant Spe	ecies List		
Cenchrus cilia	aris (2-10%	%), Cenchrus setigerus	30-40%), Prosopis pallida hybrid (50-70%)
Associated Sp	becies Lis	<u>t</u>	
Dactylocteniu	m radulan	is, Enchylaena tomentos	a, Euphorbia tannensis subsp. eremophila, Indigofera trita, Ptilotus aervoides, Salsola tragus,
Sida aff. fibuli	fera 'var. I	L', Trianthema triquetra	
0.4.			

# Site M109

Location       Southern OB.         AMG Zone 50       408119, 7661062       408079, 7661022         Habitat       Newman LS. Small outcrop / breakaway; E facing.         Soil       Red-brown pebbly / cobbly loam.         Vegetation       Scattered Acacia coriacea, Ficus platypoda and Ehretia saligna tall shru         Notes       Dead Sesbania cannabina to 1.4m.         Dominant Species List       Southern OB.	Described by	
AMG Zone 50       408119, 7661062       408079, 7661022         Habitat       Newman LS. Small outcrop / breakaway; E facing.         Soil       Red-brown pebbly / cobbly loam.         Vegetation       Scattered Acacia coriacea, Ficus platypoda and Ehretia saligna tall shru         Notes       Dead Sesbania cannabina to 1.4m.         Dominant Species List       List	Location	Southern OB.
Habitat       Newman LS. Small outcrop / breakaway; E facing.         Soil       Red-brown pebbly / cobbly loam.         Vegetation       Scattered Acacia coriacea, Ficus platypoda and Ehretia saligna tall shru         Notes       Dead Sesbania cannabina to 1.4m.         Dominant Species List       Dead Sesbania cannabina to 1.4m.	AMG Zone 50	408119, 7661062 408079, 7661022
Soil Red-brown pebbly / cobbly loam. Vegetation Scattered Acacia coriacea, Ficus platypoda and Ehretia saligna tall shru Notes Dead Sesbania cannabina to 1.4m. Dominant Species List	Habitat	Newman LS. Small outcrop / breakaway; E facing.
Vegetation Scattered Acacia coriacea, Ficus platypoda and Ehretia saligna tall shru Notes Dead Sesbania cannabina to 1.4m. Dominant Species List	Soil	Red-brown pebbly / cobbly loam.
Notes Dead Sesbania cannabina to 1.4m. Dominant Species List	Vegetation	Scattered Acacia coriacea, Ficus platypoda and Ehretia saligna tall shrubs.
Dominant Species List	Notes	Dead Sesbania cannabina to 1.4m.
	Dominant Spe	ecies List

Acacia coriacea subsp. coriacea (1-2%), Acacia tumida (<5%), Ehretia saligna (<1%), Ficus platypoda var. minor (<5%), Triodia wiseana (<5%) Associated Species List

Abutilon cunninghamii, Abutilon lepidum, Alectryon oleifolius, Amaranthus mitchellii, Bidens bipinnata, Boerhavia burbidgeana, Boerhavia coccinea, Cenchrus ciliaris, Cleome viscosa, Cuscuta victoriana, Enchylaena tomentosa, Eremophila longifolia, Eriachne mucronata, Gomphrena cunninghamii, Hibiscus aff. platychlamys (M9.15), Indigofera monophylla, Leptopus decaisnei, Mukia aff. maderaspatana sp. F, Nicotiana benthamiana, Operculina aequisepala, Polycarpaea longiflora (pale form), Prosopis pallida hybrid, Senna glutinosa subsp. glutinosa, Senna notabilis, Sesbania cannabina, Sida sp. 'rugose', Solanum gabrielae, Solanum horridum, Trachymene oleracea, Tribulus suberosus, Trichosanthes cucumerina

## Site M110

Described by	MM			
AMG Zone 50	)	407041, 7659576	407247, 7659564	
Habitat	River LS.	Stony plain.		
Soil	Deep red	I clay loam with continu	ous surface layer of pebbl	es and stones.
Vegetation	Acacia xi	phophylla open shrubla	and over Triodia wiseana h	ummock grassland
Veg Condition	n Ver	y good condition; some	e weeds and grazing?	
Notes	Large 'ba	ire' areas dominated by	/ herbs.	
Dominant Spe	ecies List			
Acacia xiphor	ohvlla (2-5	%). Triodia wiseana (1	0-30%)	

Acacia xiphophylla (2-5%), Triodia wiseana ( <u>Associated Species List</u>

Aristida contorta, Boerhavia type 1, Bonamia media var. villosa, Cenchrus ciliaris, Cenchrus setigerus, Dactyloctenium radulans, Dichanthium sericeum subsp. humilius, Enneapogon caerulescens var. occidentalis, Eriachne pulchella subsp. dominii, Euphorbia aff. australis type 1 (erect stems), Euphorbia tannensis subsp. eremophila, Evolvulus alsinoides var. villosicalyx, Flaveria australasica, Goodenia forrestii, Hakea lorea subsp. suberea, Heliotropium heteranthum, Hibiscus aff. platychlamys (M39.14), Iseilema dolichotrichum, Leptopus decaisnei, Maireana planifolia, Polygala aff. isingii, Prosopis pallida hybrid, Salsola tragus, Sclerolaena eriacantha, Senna artemisioides subsp. oligophylla (sericea form), Solanum lasiophyllum, Sporobolus australasicus, Trachymene oleracea, Tragus australianus, Triodia pungens

## Site M111

Described by	MET
Location	Southern OB.
AMG Zone 50	0 408273, 7660449 408308, 7660554
Habitat	Newman LS. Boulder outcrop / rockpile; on mid to upper slope of spur of a ridge.
Rock Type	Bresciated banded ironstone with quartz cement; grey / pink (with white) appearance.
Vegetation	Scattered tall shrubs of Ehretia saligna, Ficus platypoda and Acacia coriacea over scattered shrubs of Eremophila longifolia and
-	Capparis spinosa var. nummularia over *Cenchrus ciliaris / Triodia wiseana grassland with vines of Tinospora and Trichosanthes.
Fire Age	Most of area burnt quite recently.
Dominant Spe	ecies List
Cenchrus cilia	aris (±10%), Ehretia saligna (±1%), Ficus platypoda var. minor (±1%), Triodia wiseana (±1%)
Associated Si	pecies List

Acacia coriacea subsp. coriacea, Achyranthes aspera, Alectryon oleifolius, Alternanthera nana, Amaranthus mitchellii, Bidens bipinnata, Boerhavia burbidgeana, Boerhavia coccinea, Bonamia media var. villosa, Bulbostylis barbata, Capparis spinosa var. nummularia, Cleome viscosa, Convolvulus remotus, Corchorus laniflorus, Crotalaria medicaginea, Cymbopogon ambiguus, Dysphania rhadinostachya, Enchylaena tomentosa, Enneapogon oblongus, Eremophila longifolia, Eriachne mucronata, Eriachne pulchella subsp. dominii, Fimbristylis dichotoma, Flaveria australasica, Gomphrena cunninghamii, Leptopus decaisnei, Malvastrum americanum, Nicotiana benthamiana, Operculina aequisepala, Paspalidium clementii, Passiflora foetida, Polycarpaea longiflora (pale form), Portulaca oleracea, Portulaca pilosa, Prosopis pallida, Rhynchosia cf. minima, Senna notabilis, Senna venusta, Sida rohlenae, Solanum gabrielae, Solanum lasiophyllum, Tephrosia aff. supina (ME Trudgen 12,357), Tinospora smilacina, Trachymene oleracea, Trichodesma zeylanicum, Trichosanthes cucumerina, Triumfetta clementii

## Site M112

 Described by MM

 Location
 Eastern side of Southern OB.

 AMG Zone 50
 409053, 7660551
 409087, 7660489

 Habitat
 Newman LS. Hillslope; gentle lower slopes of ridge.

 Soil
 Skeletal red-brown clay loam with continuous surface layer of pebbles.

 Vegetation
 Scattered tall shrubs of Acacia bivenosa and A. ancistrocarpa over Triodia wiseana hummock grassland.

 Dominant Species List
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Acacia ancistrocarpa (1-2%), Acacia bivenosa (<2%), Triodia pungens (2-5%), Triodia wiseana (50-70%)

Associated Species List

Acacia victoriae, Aristida contorta, Bonamia media var. villosa, Corchorus laniflorus, Cymbopogon ambiguus, Enchylaena tomentosa, Eremophila forrestii subsp. forrestii, Eremophila longifolia, Eriachne pulchella subsp. dominii, Evolvulus alsinoides var. villosicalyx, Goodenia microptera, Goodenia stobbsiana, Heliotropium ovalifolium, Hibiscus aff. coatesii (site 664), Hibiscus aff. platychlamys (M39.14), Hibiscus aff. platychlamys (site 1139), Hybanthus aurantiacus, Indigofera monophylla, Isotropis atropurpurea, Keraudrenia nephrosperma, Maireana planifolia, Polygala aff. isingii, Pterocaulon sphacelatum, Ptilotus astrolasius, Sclerolaena eriacantha, Senna glutinosa subsp. pruinosa x ?glutinosa, Senna notabilis, Solanum gabrielae, Solanum horridum, Solanum lasiophyllum, Tephrosia clementii, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii, Wrightia saligna

## Site M113

Described by MET

AMG Zone 50 411143, 7673131

Habitat Yamerina LS. Tidal creek; bed of a small tidal creek with freshwater flow at low tide (<500ppm?).

Soil Areas of flat calcrete with shallow pools containing black mud (with a thin red-brown surface).

Vegetation Avicennia marina tall open shrubland over patches of Schoenoplectus litoralis dense sedgeland.

Notes The banks have a strip (to 5m wide) of Sporobolus virginicus grassland and scattered Acacia ampliceps and samphire. Also present \*Cenchrus ciliaris and Flaveria australasica. One mesquite on sand bar with Sporobolus and A. ampliceps. Avicennia drops out a little further upstream.

Dominant Species List

Avicennia marina (±2%), Schoenoplectus litoralis (>40%), Sporobolus virginicus (<5%)

Associated Species List

Chara sp., Flaveria australasica, Halosarcia halocnemoides subsp. tenuis, Melaleuca glomerata, Samolus repens, Typha domingensis

# Site M114

Described by M	M Date 4/25/00	Quadrat Size ~200 x 10m
Location	Southern OB.	
AMG Zone 50	408811, 7660585	408622, 7660549
Habitat	Newman LS. Drainage line.	
Soil	Red clay loam with pebbles and s	stones on surface.
Vegetation	Scattered Corymbia hamersleyar	a over Acacia tumida open scrub over Triodia pungens hummock grassland.
Veg Condition	Very good; only occasional weed	s, sheets of tin within drainage.
Fire Age	Burnt some years ago (3-5?).	-
Dominant Spec	ies List	
	/ · · · · /	

Acacia ancistrocarpa (2-5%), Acacia tumida (50-70%), Corymbia hamersleyana (<2%), Petalostylis labicheoides (2-5%), Triodia pungens (10-30%)

Associated Species List

Abutilon lepidum, Acacia bivenosa, Acacia coriacea subsp. pendens, Acacia farnesiana, Acacia pyrifolia, Bidens bipinnata, Bonamia media var. villosa, Cassytha capillaris, Cenchrus ciliaris, Cleome viscosa, Clerodendrum floribundum var. angustifolium, Corchorus laniflorus, Cymbopogon ambiguus, Digitaria brownii, Dodonaea coriacea, Enchylaena tomentosa, Eremophila longifolia, Eriachne mucronata, Evolvulus alsinoides var. villosicalyx, Evolvulus sp., Goodenia stobbsiana, Hibiscus aff. platychlamys (site 1139), Hybanthus aurantiacus, Indigofera monophylla, Isotropis atropurpurea, Malvastrum americanum, Mukia aff. maderaspatana sp. F, Paraneurachne muelleri, Paspalidium clementii, Pterocaulon sphacelatum, Ptilotus astrolasius, Rhagodia eremaea, Solanum diversiflorum, Solanum gabrielae, Solanum lasiophyllum, Tephrosia aff. supina (ME Trudgen 12,357), Trachymene oleracea, Trichodesma zeylanicum, Triodia wiseana, Triumfetta clementii

## Site M116

Described by M	M Date 4/26/00	Quadrat Size 50 x 50m
Location	Southern OB.	
AMG Zone 50	408236, 7661046	408170, 7661109
Habitat	Newman LS. Hillslope; W facing.	
Soil	Skeletal red clay loam with continue	ous surface layer of pebbles stones and exposed rock.
Vegetation	Scattered Acacia bivenosa tall shru	ibs over Triodia wiseana hummock grassland.
Veg Condition	Very good; occasional weeds.	
Notes	Eastern 20m of quadrat extends on	to the ridge crest, which supports very scattered Senna glutinosa subsp. pruinosa over
	Triodia wiseana hummock grasslar	d. 0-2% leaf litter. Mesquite seedlings germinating from Emu scats
Dominant Spec	ies List	
Acacia bivenos	a (±1%)	
Associated Spe	cies List	
A have the second	Assais available. Demonstrationalis ve	n villaga Carabanya laniflanya Cymhananan amhinyya Ilibianya aff nlatychlanyya (aita

Abutilon fraseri, Acacia pyrifolia, Bonamia media var. villosa, Corchorus laniflorus, Cymbopogon ambiguus, Hibiscus aff. platychlamys (site 1139), Indigofera monophylla, Paspalidium clementii, Petalostylis labicheoides, Polygala aff. isingii, Prosopis pallida hybrid, Rhynchosia cf.

minima, Senna glutinosa subsp. glutinosa, Senna glutinosa subsp. pruinosa x ?glutinosa, Solanum gabrielae, Solanum lasiophyllum, Tephrosia supina, Trachymene oleracea, Tribulus platypterus, Trichodesma zeylanicum, Triodia wiseana (30-50%)

### Site M118

Described by M	1M Date 4/26/00	Quadrat Size 50 x 50m
Location	Southern OB.	
AMG Zone 50	408378, 7661032	408373, 7661088
Habitat	Newman LS. Ridge crest.	
Soil	Skeletal red clay loam with contin	nuous surface layer of pebbles and stones.
Vegetation	Scattered tall shrubs (mainly Sen	na glutinosa subsp. pruinosa) over Triodia wiseana hummock grassland.
Notes	Small 'strike' (rocky ridgeline) run	ning through centre of quadrat, supports some typical rocky species (see notes below).
Dominant Spec	sies List	

Senna glutinosa subsp. pruinosa x ?glutinosa (<1%), Triodia wiseana (30-40%)

Associated Species List

Abutilon cunninghamii, Acacia pyrifolia, Bonamia media var. villosa, Corchorus laniflorus, Cymbopogon ambiguus, Enneapogon caerulescens var. occidentalis, Evolvulus alsinoides var. villosicalyx, Gomphrena cunninghamii, Indigastrum parviflorum, Oldenlandia crouchiana, Paspalidium clementii, Polygala aff. isingii, Prosopis pallida hybrid, Stemodia grossa, Tephrosia supina, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

### Site M120

Described by N	IM Date 4/26/00	Quadrat Size 50 x 50m
Location	Southern OB.	
AMG Zone 50	408313, 7660510	408350, 7660495
Habitat	Newman LS. Hillslope; E facing.	
Soil	Skeletal red clay loam with continu	ous surface layer of angular pebbles and stones.
Vegetation	Triodia wiseana hummock grassla	nd (negligible overstorey).
Veg Condition	Very good; occasional weeds.	
Fire Age	SE corner recently burnt.	
Notes	Burnt SE corner flora list is presen	ted under M120A.
Dominant Spec	ties List	
Triodia wiseana	a (30-50%)	
Associated Spe	ecies List	
Acacia victoriae	e. Achvranthes aspera. Bidens bipir	inata. Boerhavia coccinea. Bulbostvlis barbata. Cleom

Acacia victoriae, Achyranthes aspera, Bidens bipinnata, Boerhavia coccinea, Bulbostylis barbata, Cleome viscosa, Crotalaria medicaginea, Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Gomphrena cunninghamii, Indigofera colutea, Mukia aff. maderaspatana sp. F, Paspalidium clementii, Phyllanthus lacunellus, Portulaca oleracea, Tephrosia aff. supina (ME Trudgen 12,357), Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

# Site M120A

Described by M	IM Date 4/26/00
Location	Southern OB.
AMG Zone 50	408313, 7660510
Habitat	Newman LS. Burnt section of hillslope (see M120).
Vegetation	2-10% herbs and shrub seedlings.
Notes	See M120.
Associated Spe	ecies List

Abutilon oxycarpum subsp. prostratum, Alysicarpus rugosus, Amaranthus mitchellii, Boerhavia coccinea, Bonamia pannosa, Bulbostylis barbata, Cleome viscosa, Corchorus laniflorus, Crotalaria medicaginea, Dysphania rhadinostachya, Euphorbia boophthona, Evolvulus alsinoides var. villosicalyx, Fimbristylis dichotoma, Gomphrena cunninghamii, Indigofera colutea, Indigofera linifolia, Leptopus decaisnei, Paspalidium clementii, Phyllanthus lacunellus, Portulaca oleracea, Pterocaulon sphacelatum, Ptilotus aervoides, Ptilotus auriculifolius, Ptilotus exaltatus var. exaltatus, Senna notabilis, Solanum diversiflorum, Stemodia grossa, Tephrosia aff. supina (ME Trudgen 12,357), Trachymene oleracea, Tribulus hirsutus, Trichodesma zeylanicum, Triodia wiseana, Triumfetta clementii

### Site M122

Described by M	IM Date 4/27/00
Location	Near Marda Pool.
AMG Zone 50	410994, 7672701
Habitat	Yamerina LS. Creekline.
Soil	Red clayey soil on banks and in bed.
Vegetation	Eucalyptus camaldulensis woodland over patches of dense tall shrubs (mainly Melaleuca glomerata).
	Madenates estimates of evening and energy used investor

Veg Condition Moderate; evidence of grazing and some weed invasion.

Dominant Species List

Cyperus vaginatus (2-10%), Eucalyptus camaldulensis (30-50%), Melaleuca glomerata (20-30%), Passiflora foetida (2-10%), Sporobolus virginicus (2-10%)

Associated Species List

Abutilon amplum, Acacia ampliceps, Acacia coriacea subsp. pendens, Achyranthes aspera, Amaranthus pallidiflorus, Ammannia baccifera, Cenchrus ciliaris, Cenchrus setigerus, Chara sp., Cucumis melo subsp. agrestis, Eucalyptus victrix, Ipomoea coptica, Melochia pyramidata, Myoporum acuminatum, Phyllanthus maderaspatensis var. angustifolius, Prosopis pallida hybrid, Rostellularia adscendens var. clementii, Schoenoplectus litoralis, Sesbania cannabina, Stylobasium spathulatum, Triodia angusta, Typha domingensis, Vigna lanceolata var. lanceolata

# Site M124

Described by N	IM Date 4/28/00	
Location	Near Jilan Jilan Pool.	
AMG Zone 50	406444, 7660568	406400, 7660701
Habitat	River LS. Creekline.	
Soil	Brown sandy loam on banks	
Vegetation	Eucalyptus camaldulensis wood sedges.	land over patches of Melaleuca glomerata tall shrubs over patches of Cyperus vaginatus
Notes	70% leaf litter. Jilan Jilan Pool is	a ~160m away according to GPS location.

Dominant Species List

Basilicum polystachyon (2-5%), Cenchrus ciliaris (2-10%), Cyperus vaginatus (10-30%), Eucalyptus camaldulensis (30-50%), Melaleuca glomerata (30%), Rostellularia adscendens var. clementii (2-5%) Associated Species List

Acacia coriacea subsp. pendens, Achyranthes aspera, Alternanthera nana, Alternanthera nodiflora, Amaranthus pallidiflorus, Argemone ochroleuca, Cenchrus setigerus, Centipeda minima, Citrullus lanatus, Cleome viscosa, Cyperus bulbosus, Cyperus squarrosus, Datura leichhardtii, Eragrostis tenellula, Erythrina vespertilio, Eucalyptus victrix, Flueggea virosa subsp. melanthesoides, Goodenia lamprosperma, Ipomoea muelleri, Leptopus decaisnei, Melochia pyramidata, Mimulus gracilis, Nicotiana rosulata subsp. rosulata, Operculina aequisepala, Passiflora foetida, Peplidium sp. E (Flora of Australia), Prosopis pallida hybrid, Sesbania cannabina, Stemodia grossa, Trichodesma zeylanicum

# Site M126

Described by MM Date 4/28/00 AMG Zone 50 409817, 7666269 409931, 7666269 Habitat Within Paraburdoo LS. Permanent pool in creek. Vegetation Melaleuca argentea / Eucalyptus camaldulensis woodland over patches of Acacia coriacea tall shrubs over dense \*Cenchrus on banks.

Veg Condition Moderate; weedy on banks, otherwise good.

Notes Cadjeputs in good condition; drop out prior to end peg #3 (<20 individuals). Odd Cadjeput recorded in next creek to west. Dominant Species List

Acacia coriacea subsp. pendens (2-10%), Cenchrus ciliaris (10-30%), Cenchrus setigerus (10-30%), Eucalyptus camaldulensis (2-10%), Melaleuca argentea (20-30%)

Associated Species List

Abutilon amplum, Acacia trachycarpa, Alternanthera nana, Alternanthera nodiflora, Ammannia baccifera, Ammannia multiflora, Bulbostylis barbata, Cleome viscosa, Corchorus tridens, Crotalaria novae-hollandiae, Cucumis melo subsp. agrestis, Cyperus bifax, Cyperus squarrosus, Cyperus vaginatus, Dichanthium fecundum, Erythrina vespertilio, Eucalyptus victrix, Evolvulus alsinoides var. villosicalyx, Goodenia lamprosperma, Gossypium australe, Ipomoea muelleri, Malvastrum americanum, Marsilea hirsuta, Melaleuca linophylla, Melochia pyramidata, Phyllanthus maderaspatensis var. angustifolius, Prosopis pallida hybrid, Rostellularia adscendens var. clementii, Sesbania cannabina, Swainsona formosa, Themeda triandra, Tinospora smilacina, Trichodesma zeylanicum, Triodia angusta, Vigna lanceolata var. lanceolata

# Site MOPP Various opportunistic collections

Abutilon aff. lepidum (1) (MET 15 352), Abutilon cunninghamii, Abutilon lepidum, Acacia bivenosa, Acacia inaequilatera, Acacia trachycarpa, Achyranthes aspera, Alectryon oleifolius, Amaranthus mitchellii, Amaranthus pallidiflorus, Ammannia baccifera, Ammannia multiflora, Aristida latifolia, Atriplex bunburyana, Atriplex codonocarpa, Atriplex isatidea, Basilicum polystachyon, Boerhavia burbidgeana, Boerhavia coccinea, Boerhavia type 2, Bonamia pannosa, Brachyachne prostrata, Bulbostylis barbata, Capparis umbonata, Cassytha capillaris, Cheilanthes sieberi subsp. sieberi, Chrysopogon fallax, Codonocarpus cotinifolius, Corchorus laniflorus, Crotalaria dissitiflora subsp. benthamiana, Crotalaria medicaginea, Crotalaria novae-hollandiae, Cymbopogon ambiguus, Cyperus squarrosus, Cyperus vaginatus, Datura leichhardtii, Dicladanthera forrestii, Dysphania rhadinostachya, Ehretia saligna, Enneapogon caerulescens var. occidentalis, Enneapogon oblongus, Eragrostis cumingii,

Eragrostis dielsii, Eremophila longifolia, Eriachne pulchella subsp. dominii, Euphorbia aff. australis type 2 (prostrate), Euphorbia boophthona, Euphorbia schultzii, Euphorbia tannensis subsp. eremophila, Gomphrena canescens, Goodenia forrestii, Goodenia lamprosperma, Hakea lorea, Haloragis gossei, Heliotropium crispatum, Heliotropium inexplicitum, Hibiscus aff. coatesii (site 664), Hibiscus aff. platychlamys (M39.14), Indigastrum parviflorum, Indigofera linifolia, Ipomoea coptica, Ipomoea costata, Ipomoea muelleri, Iseilema dolichotrichum, İseilema eremaeum, Keraudrenia nephrosperma, Maireana tomentosa, Malvastrum americanum, Marsilea hirsuta, Melhania oblongifolia, Mukia sp.D Flora of Australia (A.A.Mitchell, PRP 1121), Myoporum acuminatum, Neobassia astrocarpa, Neptunia dimorphantha, Nicotiana benthamiana, Oldenlandia crouchiana, Paspalidium clementii, Peplidium sp. E (Flora of Australia), Phyllanthus lacunellus, Pluchea ferdinandi-muelleri, Pluchea rubelliflora, Polycarpaea corymbosa var. corymbosa, Polycarpaea holtzei, Polygala aff. isingii, Portulaca oleracea, Prosopis pallida hybrid, Pterocaulon sphaeranthoides, Ptilotus aervoides, Ptilotus auriculifolius, Ptilotus clementii, Ptilotus murrayi var. murrayi, Rhagodia eremaea, Rhagodia preissii subsp. obovata, Rhynchosia cf. minima, Salsola tragus, Scaevola thesioides subsp. thesioides, Sclerolaena eriacantha, Sclerolaena glabra, Sclerolaena uniflora, Senna artemisioides subsp. oligophylla, Senna artemisioides subsp. oligophylla (thinly sericeous), Senna glutinosa subsp. glutinosa, Senna glutinosa subsp. pruinosa x ?glutinosa, Sesbania cannabina, Setaria verticillata, Sida aff. fibulifera 'var. L', Sida aff. fibulifera (M37.16), Sida clementii, Sida rohlenae, Solanum gabrielae, Solanum horridum, Spinifex longifolius, Stemodia grossa. Streptoglossa decurrens, Synaptantha tillaeacea var. tillaeacea. Tephrosia aff. supina (ME Trudgen 12,357), Tephrosia clementii, Tephrosia rosea var. clementii, Tephrosia supina, Threlkeldia diffusa, Tinospora smilacina, Trianthema aff. kimberleyi (MET 15 060), Trianthema triquetra, Tribulus hirsutus, Triodia angusta, Triraphis mollis, Triumfetta appendiculata, Triumfetta clementii, Triumfetta maconochieana, Urochloa gilesii subsp. occidentalis, Vallisneria sp., Vittadinia / Minuria sp., Vittadinia obovata, Waltheria indica, Whiteochloa airoides, Xerochloa imberbis, Zaleva galericulata

#### Site MOPP1 Various opportunistic collections from clay plains.

Abutilon aff. lepidum (1) (MET 15 352), Acacia victoriae, Ammannia multiflora, Bulbostylis barbata, Cenchrus ciliaris, Chrysopogon fallax, Cleome viscosa, Crotalaria dissitiflora subsp. benthamiana, Crotalaria medicaginea, Dichanthium fecundum, Dichanthium sericeum subsp. sericeum M1.15, Enneapogon caerulescens var. occidentalis, Enteropogon acicularis, Eremophila forrestii subsp. forrestii, Eremophila longifolia, Fimbristylis depauperata, Fimbristylis dichotoma, Gomphrena canescens, Hakea lorea, Malvastrum americanum, Mimulus gracilis, Neptunia dimorphantha, Oldenlandia sp. 'gilgai', Polycarpaea corymbosa var. corymbosa, Portulaca pilosa, Ptilotus exaltatus var. exaltatus, Ptilotus gomphrenoides var. gomphrenoides, Salsola tragus, Sarcostemma viminale subsp. australe, Solanum lasiophyllum, Tephrosia aff. clementii type 1 (M1/M2), Themeda triandra, Triumfetta clementii, Vittadinia / Minuria sp., Xerochloa imberbis

Site MOPP2 Various opportunistic collections from creeklines. Abutilon aff. lepidum (1) (MET 15 352), Abutilon amplum, Acacia ampliceps, Acacia bivenosa, Acacia coriacea subsp. pendens, Amaranthus pallidiflorus, Bidens bipinnata, Cenchrus ciliaris, Cleome viscosa, Corymbia hamersleyana, Digitaria brownii, Eremophila forrestii subsp. forrestii, Eriachne tenuiculmis, Eucalyptus victrix, Grevillea pyramidalis, Melaleuca glomerata, Paraneurachne muelleri, Petalostylis labicheoides, Pimelea ammocharis, Prosopis pallida hybrid, Schoenoplectus laevis, Schoenoplectus litoralis, Sclerolaena costata. Sclerolaena hostilis, Sida ?cardiophylla (juvenile), Solanum gabrielae, Sporobolus virginicus, Stylobasium spathulatum, Trianthema turgidifolia

#### Site MOPP3 Various opportunistic collections from hills.

Euphorbia schultzii, Hakea lorea, Pentalepis trichodesmoides, Polymeria aff. ambigua, Senna artemisioides subsp. oligophylla, Solanum gabrielae, Solanum horridum, Tribulus suberosus, Triumfetta maconochieana

#### Various opportunistic collections from dunes. Site MOPP4

Cenchrus ciliaris, Cyperus bulbosus, Dactyloctenium radulans, Digitaria ctenantha, Eragrostis falcata, Frankenia ambita, Halosarcia halocnemoides subsp. tenuis, Indigofera trita, Ipomoea muelleri, Lawrencia viridigrisea, Melhania oblongifolia, Neobassia astrocarpa, Panicum decompositum, Ptilotus exaltatus var. exaltatus, Rhynchosia cf. minima, Santalum lanceolatum, Sporobolus virginicus, Stackhousia intermedia, Swainsona kingii, Synaptantha tillaeacea var. tillaeacea, Themeda triandra, Trianthema triquetra, Trianthema turgidifolia, Triodia angusta

#### Site MOPP5 Various opportunistic collections from rocky outcrops (Macroy LS).

Crotalaria medicaginea, Eragrostis dielsii, Eriachne pulchella subsp. dominii, Flaveria australasica, Indigofera linifolia, Ipomoea costata, Mollugo molluginis, Polycarpaea longiflora (pale form), Portulaca oleracea, Sporobolus australasicus, Tribulus hirsutus, Tripogon Ioliiformis

#### Site MOPP6 Various opportunistic collections from rocky outcrops (Newman LS).

Acacia ancistrocarpa, Acacia arida, Acacia bivenosa, Acacia coriacea subsp. coriacea, Acacia pyrifolia, Cymbopogon ambiguus, Gomphrena cunninghamii, Grevillea pyramidalis, Hibiscus aff. platychlamys (M39.14), Indigofera monophylla, Senna glutinosa subsp. glutinosa, Senna glutinosa subsp. pruinosa x ?glutinosa, Trachymene oleracea, Trichodesma zeylanicum, Triumfetta clementii

#### Site MOPP7 Various opportunistic collections from mangroves.

Aegialitis annulata, Aegiceras corniculatum, Avicennia marina, Bruguiera exaristata, Ceriops tagal, Rhizophora stylosa

# Appendix B

**Austeel Vegetation Maps** 

M001	Significant Flora	Introduced Flora	Flora Survey Sites	Significant Flora	Introduced Flora
	and the second	Pp	M066	0.0000000000000000000000000000000000000	Pp, Cc, Cs, Ma, Pf
M002A			M067		Cc, Ma
M002B		Cc	M068		Aj, Cc
M003	Hb, Bp	Cc, Ma	M069	Ts	Cc
M004		Cc, Cs	M070		Cc
M005		Cc, Cs, Cm, Ma	M071	Ts	Ai, Cc, Ma
M006	Et	Bb. Cc. Cs. Ma	M072	19	Co
M007		Cr. Cs	M073		Po Bh Co Ma
MOOR		Cc. Cc	M074		Pp, bb, Cc, Ma
MOOD	At Lat	Db	M074	7.	0.0
MOUS	At, Hp1	BD	M075	IS	Cc, Cs
MOTO	200		M076		Cc
M011	Hp1		M077	Ts	Cc
M012		Bb, Cc	M078		Cc
M013		Bb, Cc	M079	At	Cc
M014		Bb	M080		Cc
M015	Hp1	Bb, Cm, Ma	M081		Aj, Cc
M016	Hp1	Bb, Cc	M082		Cc
M017	Hp1	Bb	M083	Sw. Ts	Cc. Ma
M018			M084		CC Cs Sv
M019	At Hot Ts	Bh Cc	M085		Bb Cc
M020	Te	Bb	MORE		60, 60
M020	15 De	0.0	MOOD		Cs
M021	вр	Cc, Cs	M087		Co
M022	HD, BD	Cc, Cs, Ma	M088		Cc
M024	Hb	Cc, Sv	M089		Cc, Ma
M025		Aj, Bb, Cc, Cs	M090	Ts	Aj, Cc, Cs, Ma
M026	At	Cc	M091	Ts	Cc
M027	Bp, Md	Cc, Ma	M092	1. A. C.	Ai, Cc, Cs, Ma, Sv
M028	Hb	Cc. Sv	M093		Cc Ma
M028B	10		M094		Co Ma
M020D		Co. Co. Ma	W1094	11-1	UC, Ma
1029		CC, CS, Ma	M095	нрт	BD, CC, Ma
M030		Cc	M096		Cc
M031		Cc	M097		Pp, Cc
M032	At	Cc, Cs, Ma	M098		Ai, Bb, Cc
M033		Bb. Cc. Cs. Ma	M099		Pp Ao Cc Cs Cm DL Pf
M034		Cc Cs	M100		AL Co. Su
MODE	Teg Heg	00,05	MITOU		AJ, CC, SV
10000	TUZ, HPZ		MIUI		Pp, Cc, Cs, Cm, DI, Pl
MU36		B. 7.9	M102		Cc
M037		Bb, Cc	M103		Pp, Ma
M037A		Cc	M104		
M038		Aj	M105		
M039		Cc	M106	Hb	Pp Cc
M040		Cc	M107	Hot	Bb Ma
MO41		Bb Co Pf	M109	np.	Bo, Ma
10041	11.2	BD, GC, FI	MIUS	10-11-11-11-11-11-11-11-11-11-11-11-11-1	Pp, Cc, Cs
MU42	нрт	BD, CC, Ma	M109	Hp1	Pp, Bb, Cc
M043	Ts	Bb, Cc, Ma, Pf	M110		Pp, Cc, Cs
M044		Aj, Cc	M111	Ts	Pp, Bb, Cc, Ma, Pf
M045	Ts	Bb, Cc, Cs, Ma, Mp, Pf	M112		and the second
M046	Ts	Bb	M113		
M047	Hp1. Md	Bb Cc Ma	M114	Ts	Bb Cc Ma
M048	Sk	Bh	M116	10	Do, Co, Ma
MOAD	At Te	Ph Co Mo	A440		rp De
MOED	rst, 13	Cm	WITO NO.		Pp
MOOU	· ·		M120	15	BD
M051	Ts	Bb, Cc	M120A		
M052			M122		Pp, Cc, Cs, Cm, Mp, Pf
M053		Bb, Cc	M124		Pp, Ao, Cc, Cs, Cl, Dl, Mp, Pf
M054		Cc, Cs, Ma	M126		Pp, Cc, Cs, Cm, Ma, Mp
M055	Hp1, Ts	Bb, Cc, Cs, Ma	OP1		DI
M056	5	Pp	OP2	Md	
M057	Hn1 Te	10	OP3	1110	Ph
MOED	tubit is	Re	013		DU DI
WU00		rp	OP4		Pp, Cc
M059	Pa, Us	Pp, Cc, Cs, Cm, Ma, Mp, Pf, Sv	OP5	Ts	
M060		Pp	OP6		Ma
M061		Cc	OP7	Tc1	Cc, Ma
M062	Ts	Pp, Bb, Cc, Cs, Ma	OP8		Pp
M063		Cc	OP9	Ft	2.E
M064		Pn	OP11		Co Su
MOGS		60	OPIO	7.	00, 30
Significant Flora		Significant Flora	Introduced	Flora	
Flora of Interest		Priority 3 Flore	Other Weeds		
Tc1 = Tephrosia aff	clementii (type 1) /M	(M2) At = Abutilon trudgenii ms	Ai = "Aerva iau	anica	Cm = *Cucumis melo subso acresti
Tc2 = Tenhrosia aff	clementii (type 2) (M	5-14) Et = Friachne teouioulmic	Ao = "Argemo	ne ochroleuca	DI = "Datura leichbardtii
Ho1 = Hibiscus aff	latychlamys (MQ.15)	Hh = Hibicous brachusishasiu	Bb = *Bidene I	pipinnata	Ma = *Malvastrum americanum
Ho2 = Hibicous aff o	latuchlamue (MAGE 44	Pa - Dhullanthua andua	Co - Concha	s ciliarie	Mn - Malochia puramidata
cipe - muiscus an. p	ini (ME Touris	ra = Phylianthus andus		o oniario	Df tBaceilles fortid
on = Germa sp. Karaj	in (IVIE Trudgen 10,3	SW = Sida sp. Wittenoom	US = "Cenchil	a seugerus	r i = rassiliora loetida
Is = Tephrosia aff. s	upina (ME Trudgen 1	2,357) (WR Barker 1962)	CI = "Citrullus	ianatus	Sv = "Setaria verticillata
	abrous apices"				
Us = Urochioa sp. "gl	losa	Introduced Flora			
Us = Urochloa sp. "gl Bp = Boerhavia paluo	ora of Australia)	Declared Weeds			
Us = Urochloa sp. "gl Bp = Boerhavia paluo Md = Mukia sp. D (Fil	ora or Australia				
Us = Urochloa sp. "gl Bp = Boerhavia paluo Md = Mukia sp. D (Fi	ora of Australia)	Pp = "Prosonis nallida hubrid			

Author: M. Maler - Drawn: CAD Resources - Tel 9246 3242 - Fax 9246 3202 - URL www.cadresources.com.au - Date Nov 2000 - CAD Ref j620code.dgn

					TESTS COPTES	CUE RIVER	1	20805		7662	
L	Littoral Land System	ROc1	Minor flowlines:	1000	FURIL			100ml		Soont	
Lb	Beaches.	_	over Triodia wiseana hummock grassland				2			-	
Lm	Bare sand with scattered grasses and herbs Intertidal zones:	ROc2	Minor flowlines: Acacia coriacea high shrubland over hummock / tussock grassland								
lat	Mangals Tidal mudflats	ROc3	Minor flowines: Acaria sciencenerma, hinh shrihland over "Cenchrus ciliaris, Thempola, biandra		7						1/
	Mudflat with Halosarcia scattered low shrubs		lussock grassland and Triodia wiseana open hummock grassland	40000	RM	Bf1	Rf1	J 4	/	Bt1	Bc3
Car	Halosarcia halocnemoides subsp. tenuis low open shrubland to low open heath	hour	Acacia coriacea, A. bivenosa high shrubland over mixed shrubs and grasses			Z //	-	2 C			- h
Lai	Beach edges: Acacla bivenosa low open shrubland over Spinifex longifolius grassland	HOc5	Minor flowlines: Acacia ampliceps high shrubland over Triodia angusta hummock grassland and	1		RC	NU99	OP1 RI1 R	Re3 Hei	5	R
Ld2	Foredunes: Acacia coriaces A. bivenosa open shrubland to shrubland over scattered	Bor	tussock grasses Bockniles	1			M108	DH2	Rc3	Rt1	m
L d3	grasses Backing dunas		Scattered tall shrubs dominated by Acacia coriacea over lianes, spinifex and/or bunch grasses (BOrt / BOr2 / BOr2)		Pv1 Px	2 Nh H		RIT	lc3		Px1
Cuo	Acacia coriacea , A. bivenosa open shrubland over Triodia apactia curty spinitex	ROr1	Rockpiles:		FAI ()	SHO-	11	M124			~ ) ~
Ld4	grassiand Sandy plains / dunes:	_	Canavalia rosea		Nh			112			
	Acacla corlacea scattered shrubs over mixed low shrubland and Triodia pungens, "Cenchrus citiaris curly spinifex / tussock grassland	MAS ROT2	Rockpiles: Acacia coriacea high shrubland over Cymbopogon, "Cenchrus ciliaris . Triodia			I Nh	PX2	1		Px1	
Ld5	Dune swales: Saline low shrubland	BOr3	wiseana tussock / hummock grassland Rockpiles:		PX2	1 YCen	1/1		Rf2 Rf1	12 -	26
Lp1	Sandy plains: Triodia acousta, hummock grassland		Acacla coriacea, A. bivenosa scattered tall shrubs over Cymbopogon ambiguus	1		Nh	X	Nh2	Px1	1	$\sim$
	Horneflate Land System			/		Nn	1 1100	IF II		Rc4	Rf1
		Р	Paraburdoo Land System			Nh Nh	MIUX	Nh2	Px1	1	
ub	Mosaic of Eragrostis xerophila open tussock grassland / Eriachne benthamii	Px1	Stony / clayey plains;				// //	Warad !!	AT LAT	-	T Pri
-	tussock grassland / Sida fibuilifera low shrubland over very open herbland (Hpg1 / Hpg2 / Hps1)		Acacia xphophylla open shrubland over patches of Triodia wiseana hummock grassland	1	10		MIT		A PULL	Bx1	
NMS Hpg1	Clayey plains: Eragrostis xerophila open tussock grassland	Px2	Clayey plains; Acacla xiphophylla open shrubland over patches of Eragrostis xarophila tussock	F	5 de	Y //	1111	1 your	- ANP		
MMS Hpg2	Clayey plains: Erischne benthamii tussock grassland	NMS Pra	grassland Clavey plains:			P	x2 Ha			No	×
NMS Hpg3	Clayey plains: Xerochina imberhia, grassland	Pot	Mixed chenopod very open herblands			Нр	Bra	) / la	500000	~ IX e	Нр
NMS Hps1	Clayey plains:	- rpi	Acacia bivanosa open shrubland over Indigotera trita low open shrubland over			1 P	Hp	s Sill	, Jak	ad/yc	
Hc1	Flowlines:	Pp2	Plains:		Px2			Px1	e Ins	- Jank P	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
	Acacia sclerosperma high shrubland over Chrysopogon fallax tussock grassland	Pc	Triodia angusta hummock grassland with patches of open herbland Ceeklines:		Hp )	Hp	HP ///	6 0%	5 6.5	ALVI	M106-
N	Newman Land System		Open to sparse tall woodlands of Eucalyptus camaldulensis and/or E. victrix over tall shrubs dominated by Acacia coriacea, over herbs, grasses or		/ //	1110	11	TRI	M109	MIOT SYN	
Nh	Low hills and slopes:	MAS Pet	spinifex (Pc1 / Pc2 / Pc3) Creektines:			Rt1	1:00	NOF	M116	Nh ()	NA ST
_	Triodia wiseana hummock grassland with scattered emergent Acacia or Senna shrubs (mosaic of Nh1 / Nh2 / Nh3 / Nh4 / Nh5)		Eucalyptus victrix, E. camaldulansis woodland over Acacia conacea , Mesquite bidt shrubland over open berbland	-	1P	11 0	Nh	al		M118 1/D	P (Mail)
Nh1	Low hills and slopes: Trindia wiseana hummock crassland	Pc2	Creeklines: Euralizative victory, onen woodland over, Acacle corriectes, biob shoubland over				11	Nh2	M120		· Mess
Nh2	Low hills and slopes: Acadia hiveness A ancistrocarpa open shuibland over Triodia wireans	De-1	*Cenchrus species tussock grassland	TENOME	1 _ 19	1.00	/ 10	12 IN	AND STATIST	1 Solat	M095
M62	hummock grassland		Eucalyptus victrix open woodland over Acacia coriacea high open shrubland over	4010-	12	/// //	111	P'S	Nh G		MIU4
Nibe	Acacia bivenosa open shrubland over Triodia wiseana hummock grassland		open tussock grassland		n F	_ / //	Px1		- Junia		De Actor
13114	Senna glutinosa subsp. pruinosa scattered shrubs over Triodia wiseana	PC4	Eucalyptus victrix scattered trees over Acacia ancistrocarpa high open shrubland		// Px2 /	- 11	11 4	Balmoral )	perel to be	1	
NMS Nh5	Low hills and slopes:	_	over Sorghum open annual lussock grassland and Triodia wiseana very open hummock grassland		1 //	Px2				SOUTHERN	OPERODY
No	Acacia arida low open shrubland over Triodia wiseana hummock grassland Minor flowlines:	Pf1	Floodplains: Scattered patches of Corymbia hamersleyana low open woodland over patches		1 11	M	1		Martin Part	Southerder	Part TV
_	Variable low open woodlands and/or high shrublands over spinifex and/or tussock grasses (Nc1 / Nc2 / Nc3 / Nc4)		of Acacia trachycarpa high shrubland over "Cenchrus ciliaris closed tussock grassland			115/1	/		225	) mal	Atta 1
NMS No1	Minor flowlines: Corymbia hamersleyana scattered low trees over Acacia ancistrocarpa, A.				~ /	11/10			M103	V VK	DY MALL
	turnida, Petalostylls labicheoides open scrub over Triodia pungens hummock grassland	м	Macroy Land System			11/1	0/	1 Co		~ VV	JAR JTIN
NMS Nc2	Minor flowlines: Acacia monticola dominated open scrub over Triodia wiseana hummock	Mp1	Plains: Acacia bivenosa A ancistrocama shruhland over Triorlia wiseana hummock		Hp		Px2	XXX			201 201
NAR Neg	grassiand Minor Bowlines	Fines Adve	grassland		B	c4	~ 1 10/	IN	Nh2	PAG OF	
Ned	Acacia coriacea high shrubland over Triodia wiseana hummock grassland	Basel Mar	Fimbristylis dichotoma low sedgeland		//	// (	2)21	Px2	• OP2	No. N	12/ Nh2
THE HOA	Acacla coriacea high shrubland over Eriachne benthamii , "Cenchrus ciliaris	MEZ MEZ	Acacla ancistrocarpa high open shrubland over Indigofera monophylla low		11				M105 ·		15
Nr	russock grassland Rockpilles:		shrubland over Triodia epactia curly spinitex grassland and open herbland		11		401	12.0		12	2
_	Scanered tail shrups dominated by Acacla cortaceal over lianes, spinifex and/or bunch grasses (Nr1 / Nr2 / Nr3 / Nr4)			1.17	Rf1		) D	X	10	Nh2	21
NMS NO	Hockpiles: Acacia coriacea, Ficus platypoda high open shrubland over Cymbopogon	-	Boolgeeda Land System	X			p( //			a i i co	Lon
	ambiguus open lussock grassland and Operculina aequisepala, Trichosanthes cucumerina lianes	Bx1	Stony plains; Acacia xiphophylla open shrubland over Triodia apactia hummock grassland			$\cap$	1110			ALL	Nº A
NMS Nr2	Rockpiles: Ficus platypoda, Acacia coriacea, Ehretia saligna high open shrubland over					$\bigcirc$		10			() > ~
Nr3	Triodia wiseana open hummock grassland and scattered lianes Rockpiles:	R	River Land System			A		51		Px2	1112
_	Acacla coriacea scattered tall shrubs over "Canchrus citiaris, Cymbopogon ambiguus open tussock grassland	Rct	Scoured creekbeds: Scattered riverine trees and shrubs				Нр			No h	· · · · · · · · · · · · · · · · · · ·
NMS Nr4	Burnt rocky ridges: Regenerating low open shrubland over open herbland and open grassland	Rc2	Creeklines: Cadeout Melakuca arcentea , River Redouto, Euralimtus camatriulancia, cono			Px2				Jam	
			forest over patches of Acacia coriacea high shrubland over "Cenchrus species tiesnok ornestand			() /			N	(Hp pro)	U BEF
RO	Rocklea Land System	Rc3	Major creeklines:						520	10	
ROh1	Low hills and slopes:		shrubland over patches of Cyperus vaginatus sedgeland					0		1	PC Px1
	/ROh1b)	Hol	Major creeklines: Eucalyptus victrix, E. camaldulensis woodland over patches of Melaleuca	- nomE			/	) and		Rf1	111-
HONTA	Low hills and slopes: Triodia wiseana hummock grassland	Rf1	glomerata high shrubland over * Cenchrus species tussock grassland Floodplains:	410000				/PAZ	1-11		
HOh1b	Low hills and slopes: Indigofera monophylia low open shrubland over Triodia wiseana hummock	Rf2	Eucalyptus victrix open woodland over "Cenchrus species tussock grassland Floodplains:						11/-		0
ROh2	grassland Low hills and slopes:	_	Mesquite "Prosopis pallida" hybrid high shrubland to open scrub						1		1
_	Triodia wiseana hummock grassland with scattered. Acacia tall shrubs (mosaic of ROh2a / ROh2b)	Y	Yamerina Land System						12		1
ROh2a	Low hills and slopes: Acacia inaequilatera, A. bivenosa scattered shrubs over Triodia wiseana	T Yet	Plains						1		1-1
ROh2b	hummock grassland Low hills and slopes:		Mosaic of patches of <i>Triodia angusta</i> hummock grassland with open herblands and Mesouite scattered tall shrubs						1 1	1	
-	Acacia ancistrocarpa , A. bivenosa open shrubland over Triodia wiseana hummock grassland	Yc1	Tidal creeks: Aviannia marina hinh shrubland over natches of Schoenon/creus literatio						1		
ROp1	Plains: Triodia angusta hummock grassland		sedgeland						1		
ROx1	Stony plains: Acacia xinhophylia, open shrubland over patches of Triodia viscours, hummouth	NMS	Nol mapped separately	N.					1		
	grassland			1					1		
				N.			N		1 1		nE.
_									( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )	412500	



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				Logar Logar
		_		2000 0000
L	Littoral Land System	ROc1	Minor flowlines: Corymbia hamerslevana low woodland over Acacia bivenosa, high shruhland	
Lb	Beaches:		over Triodia wiseana hummock grassland	
Lm	Interidal zones:	HUCZ	Acacla coriacear high shrubland over hummock / tussock grassland	RI2
List	Mangals Tidal mudflats:	ROc3	Minor flowlines: Acacla sclarosperma, high shrubland over, "Cenchrus ciliaris, Themeda, triandra,	Red Brit
	Mudflat with Halosarcia scattered low shrubs	-	tussock grassland and Triodia wiseana open hummock grassland	
	Halosarcia halocnemoides subsp. Ienuis low open shrubland to low open heath	HUCH	Acacia coriacea, A. bivenosa high shrubland over mixed shrubs and grasses	
Ld1	Beach edges: Acacia bivenosa low open shrubland over Spinifex longitolius grassland	ROc5	Minor flowlines: Acacia ampliceos high shrubland over Tricdia angusta hummock grassland and	Rt2 Rt2
Ld2	Foredunes:		tussock grasses	Bra Bra
	grasses	Hor	Scattered tall shrubs dominated by Acacia coriacea over lianes, spinifex and/or	RT2 RT2
Ld3	Backing dunes: Acacia corriacea . A bivenosa open shrubland over Tricdia apactia curly spinifex	BOrt	bunch grasses (ROr1 / ROr2 / ROr3) Bockpiles:	here hin Px1
	grassland		Acacia coriacea, Ficus platypoda high open shrubland over lianes dominated by	
1.04	Acacia conacea scattered shrubs over mixed low shrubland and Triodia pungens,	MMS ROr2	Canavalia rosea Rockpiles:	
L d5	"Cenchrus ciliaris curty spinifex / tussock grassland Dune swales:	_	Acacia coriacea high shrubland over Cymbopogon, "Cenchrus ciliaris , Triodia wiseana tussock / bummock grassland	
Hist	Saline low shrubland	ROr3	Rockpiles:	
L Lpi	Triodia angusta hummock grassland		Acader contactes, A. brenosar scattered tail strubs over Cympopogon ambiguus tussock grassland	BES
н	Horseflats Land System			Part
	Olarian eleitar	P	Paraburdoo Land System	
Пир	Mosaic of Eragrostis xerophila open tussock grassland / Eriachne benthamii	Px1	Stony / clayey plains:	
	tussock grassland / Sida fibulifera low shrubland over very open herbland (Hog1 / Hog2 / Hos1)		Acacia xiphophylla open shrubland over patches of Triodia wiseana hummock grassland	
NMS Hpg1	Clayey plains:	Px2	Clayey plains:	PX1 PX1 PX1
NMS Hpg2	Clayey plains:	_	grassland	
NMS Hpg3	Eriachne benthamii tussock grassland Clavev plains:	NMS Px3	Clayey plains: Mixed chenopod very open herblands	PX1 / A S MA S A
Mary Lines	Xerochloa imberbis grassland	Pp1	Stony plains:	
and rups I	Sida aff. fibulilera low shrubland over very open herbland	_	Triodia wiseana hummock grassland	RH//J
Hc1	Flowlines: Acacia scierosperma high shrubland over Chrysopogon fallax tussock grassland	Pp2	Plains: Triodia anousta hummock grassland with patches of open herbland	Bxt X
	,	Pc	Ceeklines.	A share and a set a start of the set of the
N	Newman Land System		tall shrubs dominated by Acacia coriacea over herbs, grasses or	Px1
Nb	Low hills and slopes.	MARS Pc1	spinifex (Pc1 / Pc2 / Pc3) Creektines:	
	Triodia wiseana hummock grassland with scattered emergent Acacia or Senna		Eucalyptus victrix, E. camaldulensis woodland over Acacia coriacea , Mesquite	HALLE SALES OF A LINE OF A LINE
Nh1	Low hills and slopes:	Pc2	righ strubtand over open nerbland Creeklines:	MOGA (A Nh) JA MAGA AND AND AND AND AND AND AND AND AND AN
Nh2	Triodia wiseena hummook grassland Low hills and slopes:	_	Eucalyptus victrix open woodland over Acacia coriacea high shrubland over "Cenchrus species tussock grassland	MUSO MI26 F/0
	Acacia bivenosa, A ancistrocarpa open shrubland over Triodia wiseana	Pc3	Creeklines;	MOST 2 March All
Nh3	Low hills and slopes:		Eucalyptus victrix open woodland over Acacia coriacea high open shrubland over Triodia epactia open curly spinifex grassland and "Cenchrus ciliaris	OP3
Nh4	Acacia bivenosa open shrubland over Triodia wiseana hummock grassland Low hills and slopes:	Ped	open tussock grassland Creeklines:	M052 M052 M052 PX
	Senna glutinosa subsp. pruinosa scattered shrubs over Triodia wiseana	104	Eucalyptus victrix scattered trees over Acacia ancistrocarpa high open shrubland	
NMS Nh5	Low hills and slopes:	-	over Sorgnum open annual tussock grassland and Triodia wiseana very open hummock grassland	MALE MOIA
No	Acacla arida low open shrubland over Triodia wiseana hummock grassland Minor flowlines:	Pf1	Floodplains: Scattered patches of Corumbia hamerelevane, low onen workland must patches	M016 M013
	Variable low open woodlands and/or high shrublands over spinifex and/or tussock		of Acacia trachycarpa high shrubland over "Cenchrus ciliaris closed	
NMS No1	grasses (NC1 / NC2 / NC3 / NC4) Minor flowlines:		(ussock grassiand	MO18 MO20
	Corymbia hamersleyana scattered low trees over Acacia ancistrocarpa, A. tumida, Petalostvils labicheoides open scrub over Triodia nungens hummork	м	Macrov Land System	HT C I I I I I I I I I I I I I I I I I I
Free Party	grassiand	-	Distance of patern	Px1 / A Ch. dyAm Photos A A A A
MMS NC2	Acacia monticola dominated open scrub over Triodia wiseana hummock	Mp1	Plains: Acacia bivenosa, A. ancistrocarpa shrubland over Triodia wiseana hummock	I MOTT
MMS No3	grassland Minor flowlines:	NMS Mr1	grassland Sheet outcrons:	
Eller Net	Acacia coriacea high shrubland over Triodia wiseana hummock grassland	E	Fimbristylis dichotoma low sedgeland	
MAND NO.	Acacia coriacea high shrubland over Eriachne benthamil , "Cenchrus ciliaris	LINIC MES	Boulder outcrops: Acacia ancistrocarpa high open shrubland over Indigofera monophylla low	
Nr	tussock grassland Rockpiles:		shrubland over Triodia epactia curly spinifex grassland and open herbland	
-	Scattered tall shrubs dominated by Acacia conecua over lianes, spinitex and/or bunch grasses (Nrt / Nrd / Nrd / Nrd)			(Pri) Pri2
NMS Nrs	Rockpiles:		Booigeeda Land System	
	Acacia coriacea, Ficus platypoda high open shrubland over Cymbopogon ambiguus open tussock grassland and Operculina aeguisepala, Trichosanthes	Bat	Stony plains:	
MAC Nr2	cucumerina lianes		Acacia xiphophylla open shrubland over Triodia epactia hummock grassland	
Tanto I ta	Ficus platypoda, Acacia coriacea, Ehretia saligna high open shrubland over			
Nr3	rnoae weekana open nummook grassland and scattered lianes Rockpiles:	R	Hiver Land System	Pit of the pit is a start of the start of th
	Acacia coriacea scattered tall shrubs over "Cenchrus ciliaris, Cymbopogon ambinuus open tussock grassland	Rc1	Scottand revelbeds:	
NMS Nr4	Burnt rocky ridges:	Rc2	Creeklines:	
	Hegenerating low open shrubland over open herbland and open grassland		Cadjeput Melaleuca argentea, River Redgum, Eucalyptus camaldulensis open forest over patches of Acacia corracea, high shrubland over "Canchrus species.	PXZ Ho
80	Booklan Land Sustem	10-0	tussock grassland	The state of the s
	House Land System	nes	Eucalyptus camaldulensis woodland over patches of Melaleuca glomerata high	A A A A A A A A A A A A A A A A A A A
ROhl	Low hills and slopes: Triodia wiseana hummock grassland with scattered emergent low shrubs (ROh1a	Bc4	shrubland over patches of Cyperus vaginatus sedgeland Maior creeklines:	His His A POCAS . NH3
BObte	/ ROh1b) Low hills and stones:		Eucalyptus victrix, E. camaldulensis woodland over patches of Melaleuca	
	Triodia wiseana hummock grassland	Rft	Floodplains:	
HONTO	Low hills and stopes: Indigatera monophylia low open shrubland over Triadia wiseana hummock	Rf2	Eucalyptus victrix open woodland over "Cenchrus species tussock grassland Floodplains:	a critica de la companya de la compa
ROb?	grassland Low hills and slopes		Mesquite 'Prosopis pallida' hybrid high shrubland to open scrub	
- TRANZ	Triodia wiseana hummock grassland with scattered Acacia tall shrubs (mosaic of			
ROh2a	Low hills and slopes:	Y	Yamerina Land System	
	Acacia inaequilatera, A. bivenosa scattered shrubs over Triodia wiseana hummock grassland	Yp1	Plains: Menaic of vatchas of Triodia accurate burnershared with accurate	atizone
ROh2b	Low hills and slopes:	-	and Mesquite scattered tail shrubs	
	Acacia ancistrocarpa , A. bivenosa open shrubland over Triodia wiseana hummock grassland	Yc1	Fidal creeks: Avicennia marina high shrubland over patches of Schoenoplectus literalle open	
ROp1	Plains: Trictie anguste hummock grassland		sedgeland	
BOx1	Stony plains:	MMS	Not mapped separately	
	Acacia xipriophylla open shrubland over patches of Triodia wiseana hummock grassland			
			Table 1 and 1 an	







L	Littoral Land System	ROc1	Minor flowines:	
Lb	Beaches:		over Thodia wiseena hummook grassland	
L.m.	Bare sand with scattered grasses and herbs Intertidal zones:	ROc2	Minor flowines: Access considered, birth sheribland over hummock / tweetick organized	Attendente P12 mbg car
- Child	Marigals	ROc3	Minor flowines:	
Lsi	Tidal mudflats: Mudflat with Halosarcia scattered low shrubs	_	Acacia sclerosperma high shrubland over "Cenchrus ciliaris, Themeda triandra fussock grassland and Triodia wiseana open hummock grassland	A start for the
Ls2	Tidal mudflats:	ROc4	Minor flowlines:	Hp HUNZ G CUT
Ld1	Halosarcia halocnemoides' subsp. renuis low open shrubland to low open heath Beach edges:	ROc5	Acacia conacea, A. bivenosa high shrubland over mixed shrubs and grasses. Minor flowlines:	Por Por
1.42	Acacia bivenose low open shrubland over Spinifex longitolius grassland		Acacia ampliceps high shrubland over Triodia angusta hummock grassland and	Co Goon The Area Area Area Area Area Area Area Are
LUE	Acacla corlacea, A. bivenosa open shrubland to shrubland over scattered	Ror	Rockpiles:	
1.d3	grasses Backing dunes:		Scattered tall shrubs dominated by Acacia coriaceal over lianes, spinifex and/or hunch prasses (BOrt / BOr2 / BOr3)	
	Acacia coriacea , A. bivenosa open shrubland over Triodia epactia curly spinitex	ROrt	Rockpiles	Rohib Nh3 (Ropi) Ls1
Ld4	grasseau Sandy plains / dunes:		Acacia conacea, Ficus platypoda high open shrubland over tranes dominated by Canavalia rosea	
	Acacia coriacea scattered shrubs over mixed low shrubland and Triodia pungens,	NMS ROr2	Rockpiles:	By By By By
Ld5	Dune swales:	-	wiseana tussock / hummock grassland	Pext C C C C C C C C C C C C C C C C C C C
Lot	Saline low shrubland Sandy plains:	ROr3	Rockpiles: Aceria conjaces 4 bivences scattered tell shruhe over Cumbonocon ambigues	Mb24 F2 Nh3 Book A LHp3
- ch.	Triodia angusta hummock grassland		tussock grassland	Pp2 Pp2
н	Horseflats Land System			Ph2 PX2 PX1 CV Pp2
Lin	Chause aloins	P	Paraburdoo Land System	( ROADE /Hp) PD1
np	Mosaic of Eragrostis xerophila open tussock grassland / Erlachne benthamii	Px1	Stony / clayey plains:	M023 F3 that Rf1 M025 PX1 A C
	tussock grassland / Sida fibuil/era low shrubland over very		Acacia xiphophylla open shrubland over patches of Triodia wiseana hummock	Pot Pot
MMS Hpg1	Clayey plains:	Px2	Clayey plains:	PAR TO BE PORT PAR TO P
MAS Hpg2	Eragrostis xerophila open tussock grassland Clavey plains:		Acacia xiphophylla open shrubland over patches of Eragrostis xerophila tussock arassland	Pp1 ( ) Pp1 (
Line 1	Erlachne benthamii tussock grassland	NMS Px3	Clayey plains:	
MAS Hpg3	Xerochioa imberbis grassland	Pp1	Mixed chenopod very open herblands Stony plains:	Pri
MMS Hps1	Clayey plains:		Acacia bivenosa open shrubland over Indigofera trita low open shrubland over	Rohla Rohla
Hc1	Flowlines:	Pp2	Plains:	Mil I I A A A A A A A A A A A A A A A A A
	Acacia scierosperma high shrubland over Chrysopogon fallax tussock grassland	Pc	Triodia angusta hummock grassland with patches of open herbland Ceeklines:	MO28 MO27
N	Newman Land System		Open to sparse tall woodlands of Eucalyptus camaldulensis and/or E. victrix over tall aburbs dominated by Accels and/or environment and	M031 M028B M028B
			spinitex (Pc1 / Pc2 / Pc3)	Roht Roht Russ
INIT	Triodia wiseana hummock grassland with scattered emergent Acacia or Senna	NMS PC1	Creekines: Eucalyptus victrix, E. camaidulensis woodland over Acacia coriacea. Mesquite	FIGES MURAN
Nh1	shrubs (mosaic of Nh1 / Nh2 / Nh3 / Nh4 / Nh5) Low hills and slones:	DPc2	high shrubland over open herbland	Algome A A A A A A A A A A A A A A A A A A A
	Triodia wiseana hummock grassland		Eucalyptus victrix open woodland over Acacia coriacea high shrubland over	Rohz Rohz
MILZ	Acacia bivenosa, A ancistrocarpa open shrubland over Triodia wiseana	Pc3	Creeklines:	
Nh3	hummock grassland Low hills and slopes:		Eucalyptus victrix open woodland over Acacia coriacea high open shrubland over Tricitis energia open curb spinifex preseland and "Conchrist cliarie	Ronz Px1 Ronz
Nh4	Acacia bivenosa open shrubland over Triodia wiseana hummock grassland		open tussock grassland	Rohi Rohi
14114	Senna glutinosa subsp. pruinosa scattered shrubs over Triodia wiseana	PC4	Eucalyptus victrix scattered trees over Acacla ancistrocarpa high open shrubland	RUPATION DE CARACTERISTICA DE
Nh5	hummock grassland Low hills and slopes:		over Sorghum open annual tussock grassland and Triodia wiseana very open hummock grassland	
No	Acacia arida low open shrubland over Triodia wiseana hummock grassland	Pf1	Floodplains:	
-	Variable low open woodlands and/or high shrublands over spinifex and/or tussock		of Acacla trachycarpa high shrubland over "Cenchrus ciliaris closed	
MAS Not	grasses (Nc1 / Nc2 / Nc3 / Nc4) Minor flowlines:		lussock grassland	
	Corymbia hamersleyana scattered low trees over Acacia ancistrocarpa, A. tumida. Patalostufis labicheoides, onen schub over, Triodia ourgens, hummock	M	Harrow Land Sustam	
Mar No2	grassland			Rohi
THE HELE	Acacia monticola dominated open scrub over Triodia wiseana hummock	Mp1	Acacla bivenosa, A. ancistrocarpa shrubland over Triodia wiseana hummock	
MMS NC3	grassland Minor flowlines:	NMS Mr1	grassland Sheet outcrops:	- LI I THE DI
MAG Ned	Acacia coriacea high shrubland over Triodia wiseana hummock grassland Minor flowlinea	RULES MAD	Fimbristylis dichotoma low sedgeland	ROh1
There is a second	Acacia coriacea high shrubland over Eriachne benthamii , "Cenchrus ciliaris	THE WE	Acacia ancistrocarpa high open shrubland over Indigolera monophylla low	Y ALV. N. DV.
Nr	Rockpiles:		shrubland over Triodia epactia curly spinifex grassland and open herbland	Roxi
	Scattered tall shrubs dominated by Acacia coriacea: over lianes, spinifex and/or bunch grasses (Nr1 / Nr2 / Nr3 / Nr4)			In the second se
NMS Nr1	Rockpiles:		Boolgeeda Land System	
	ambiguus open tussock grassland and Operculina aequisepala, Trichosanthes	Bx1	Stony plains:	( A NTHE ) !! LAK!
MMS Nr2	cucumerina lianes Rockoiles:		Acacia xiphophylla open shrubland over Triodia epactia hummock grassland	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	Ficus platypoda, Acacia coriacea, Ehretia saligna high open shrubland over		Direction of Contemport	L' N.L IN WILL IN
Nr3	Rockpiles:	R	HIVE LENG SYSTEM	I was the to the the
	Acacta conacea scattered tall shrubs over "Cenchrus ciliaris, Cymbopogon ambiguus open tussock grassland	Rc1	Scoured creekbeds: Scattered riverine trees and shrubs	
NMS Nr4	Burnt rocky ridges: Reconcepting low open should and open perbland and open	Rc2	Creeklines:	and a second sec
	regenerancy we open amusiano over open nerosano and open grassiand		Caciepon menaeuca argentea, niver reedgum Eucaryptus camaldulensis open forest over patches of Acacia coriacea, high shrubland over 'Cenchrus species.	10 1000 A LAY
RO	Rocklea Land System	Bc	tussock grassland Major creeklines:	42000mE
Poh	Low hills and slange	1100	Eucalyptus camaldulensis woodland over patches of Melaleuca glomerata high	Rohzb
nom	Triodia wisearia hummock grassland with scattered emergent low shrubs (ROh1a	Ro4	snrubland over patches of <i>Cyperus vaginatus</i> sedgetand Major creeklines:	Rode
BOhta	/ ROh1b) Low bills and slopes	_	Eucalyptus victrix, E. camaldulensis woodland over patches of Melaleuca	
ROLIN	Triodia wiseana hummock grassland	Rf1	Floodplains:	
HOMO	Low hills and stopes: Indigotera monophylfa low open shrubland over Triodia wiseana hummock	Rt2	Eucalyptus victrix open woodland over "Cenchrus species lussock grassland Floodplains:	Bobi
E BOhz	grassland		Mesquite "Prosopis pallida" hybrid high shrubland to open scrub	
- nonz	Triodia wiseana hummock grassland with scattered Acac/a tall shrubs (mosaic of POhoa (POhoa)			tra a
ROh2a	Low hills and slopes:	Y	Yamerina Land System	
	Acacia inaequilatera, A. biveriosa scattered shrubs over Triodia wiseana hummock grassland	Yp1	Plains: Monair of natches of Triodia apprents, humanity apprentiated at	0
ROh2b	Low hills and slopes:		and Mesquite scattered tall shrubs	Bohzb
_	hummock grassland	Yc1	Avicennia marina high shrubland over patches of Schoenoplectus litoralis open	
ROp1	Plains: Triodia angusta hummock grassland		sedgeland	Px1
ROx1	Stony plains:	NMS	Not mapped separately	
	grassland			



				1047 1047
1.1	Litteral Land System	- Doort	Mart Harford	000m 000m
	Littoral Land System	HUCI	Kinor nowines. Corymbia hamersleyana low woodland over Acacla bivenosa high shrubland	2 2 2 2
Lb	Beaches: Bare sand with scattered grasses and herbs	ROc2	over Triodia wiseana hummock grassland Minor flowlines:	41500mF
Lm	Intertidal zones: Mangals	ROc3	Acacia confacea high shrubland over hummock / tussock grassland Minor flowlines:	
Ls1	Tidal mudflats. Mudflat with Halosarcia scattered low shrubs	_	Acacia sclerosperma high shrubland over "Cenchrus cillaris, Themeda triandra tussock grassland and Triodia wiseana open hummock grassland	INDIAN OCEAN
Ls2	Tidal mudflats. Halosarcia halocoemoides, subsp. tanuis low open shrubland to low open bests	ROc4	Minor flowlines:	
Ld1	Beach edges: Acada bizances, low open shrubland over Spinifer investation processed	ROc5	Minor flowines:	
Ld2	Foredunes:		tussick grasses	
	grasses Destroyed a functional of the structure of the st	Hor	Hockpiles. Scattered tall shrubs dominated by Acacia coriacea over lianes, spinifex and/or	
Las	Acacia conlacea . A. bivenosa open shrubland over Triodia epactia curly spinifex	ROr1	bunch grasses (HOr1 / HOr2 / HOr3) Rockpiles:	
Ld4	grassland Sandy plains / dunes:	_	Acacia corlacea, Ficus platypoda high open shrubland over lianes dominated by Canavalia rosea	
	Acacia coriacea scattered shrubs over mixed low shrubland and Triodia pungens, "Cenchrus ciliaris curly spinifex / tussock grassland	NMS ROr2	Rockpiles: Acacia coriacea high shrubland over Cymbopogon, "Cenchrus ciliaris , Triodia	
Ld5	Dune swales: Saline low shrubland	BOra	wiseana tussock / hummock grassland Rockpiles:	
Lp1	Sandy plains: Triodia angusta, hummock grassland		Acacia coniacea, A. bivenosa scattered tall shrubs over Cymbopogon ambiguus tussock crassland	
н	Horseflats Land System			
	Clause plains	P	Paraburdoo Land System	
	Mosaic of Eragrostis xerophila open tussock grassland / Erlachne benthamil	Px1	Stony / clayey plains:	Ropi
-	open herbland (Hpg1 / Hpg2 / Hps1)	_	Acadia xiphophysia open shrubland over patches of Triodia wiseana hummock grassland	Rohz Ls1 Ls2
NMS Hpg1	Clayey plains. Eragrostis xerophila open tussock grassland	PX2	Clayey plains: Acacia xiphophylla open shrubland over patches of Eragrostis xarophila tussock	
MMS Hpg2	Gayey prains: Eriachne benthamii tussock grassland	NMS Px3	grassiand Clayey plains:	the state of the s
MMS Hpg3	Clayey plains: Xerochlog imberbis grassland	Pp1	Mixed chenopod very open herblands Stony plains:	
NMS Hps1	Clayey plains: Sida aft. fibuilera low shrubland over very open herbland		Acacla bivenosa open shrubland over Indigofera trita low open shrubland over Triodia wiseana hummock grassland	P-5 M082
Hc1	Flowlines: Acacia sclerosperma, high shrubland over Chrysopodon fallar, jussock grassland	Pp2	Plains: Triodia andusta, hummonk grassland with natches of open herbland	Pp2 OP10 MO/3
		Pc	Ceeklines: Once to ensure tail unordiande of Eucalimitic comatérianais andior Euleteix auto	List the state of
N	Newman Land System		tall shrubs down and by Acacia conlacea over herbs, grasses or minimum (Pol ( Pol)	Rohz & CO
Nh	Low hills and slopes:	NMS Pc1	Creeklines:	10 MI043 Pp1
	shrubs (mosaic of Nh1 / Nh2 / Nh3 / Nh4 / Nh5)		Eucalyptus victinx, E. camaidulensis woodland over Acacia coriacea , Mesquite high shrubland over open herbland	Alter PPI ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) (
- NITE	Triodia wiseana hummock grassland	Pc2	Creektines: Eucalyptus victrix open woodland over Acacla corlacea high shrubland over	Ppi Pri Pri Pri Pri Pri Pri Pri Pri Pri Pr
Nn2	Low hills and slopes: Acacia bivenosa, A ancistrocarpa open shrubland over Tricdia wiseana	Pc3	*Cenchrus species tussock grassland Greeklines:	Rohib Px1
Nh3	hummock grassland Low hills and slopes:	_	Eucalyptus victrix open woodland over Acacia coriacea high open shrubland over Triodia epactia open curly spinifex grassland and "Cenchrus ciliaris	ROM2 ROM2 ROM2 ROM2 ROM2 ROM2 ROM2 ROM2
Nh4	Acacia bivenosa open shrubland over Triodia wiseana hummock grassland Low hills and slopes;	Pc4	open tussock grassland Creeklines	Roat 1 2 Parts Mode Mode
_	Sanna glutinosa subsp. pruinosa scattered shrubs over Triodia wiseana hummock grassland		Eucalyptus victrix scattered trees over Acacia ancistrocarpa high open shrubland over Sorahum open annual tussock crassland and Triodia wiseana very open	Rohz Rohz Rohz
NMS Nh5	Low hills and slopes: Acada arida low open shnibland over Triodia wiseana hummook arassland	C PH	hummock grassland	BON2 BON2 BON2 BON2 BON2 BON2 BON2 BON2
Nc	Minor flowlines: Variable law open wywtlands and/or binh shrublands over epinifex and/or bieseck		Scattered patches of Corymbia hamersleyana low open woodland over patches	HAR MILLINGHAUGH
Fair Net	grasses (Nc1 / Nc2 / Nc3 / Nc4) Minor flowlines:		fussock grassland	Ron Ron Alter
THE THE	Corymbia hamersleyana scattered low trees over Acacia ancistrocarpa , A.	5	and the second	P/2 Rohib AUG98 AUG98 AUG98
En la	rumida, Pelalostylis labicheoides open scrub over Thodia pungens hummock grassland	M	Macroy Land System	Rohib Rohib
MMS NC2	Minor flowlines: Acacia monticola dominated open scrub over Triodla wiseana hummock	Mp1	Ptains. Acacla bivenosa, A. ancistrocarpa shrubland over Triodia wiseana hummock	HON2 Pat
NMS No3	grassland Minor flowlines:	NMS Mrt	grassland Sheet outcrops:	DALL PARTY
MMS No4	Acacia coriacea high shrubland over Triodia wiseana hummock grassland Minor flowlines:	NMS Mr2	Fimbristylis dichotoma low sedgeland Boulder outcrops:	Rohts (Rohts) & Rohts
	Acacia coriacea high shrubland over Eriachne benthamii , "Cenchrus cillaris tussock grassland		Acacia ancistrocarpa high open shrubland over Indigo/era monophylla low shrubland over Triodia opactia curty spinifex grassland and open herbland	
Nr	Rockpiles: Scattered tall shrubs dominated by Acacia coriacea over lianes, spinifex and/or			Rohtb ( P
NAMS NET	bunch grasses (Nr1 / Nr2 / Nr3 / Nr4) Rockpiles:		Boolgeeda Land System	Robits Park
Times I to 1	Acacia coriacea, Ficus platypoda high open shrubland over Cymbopogon ambiguus open tussock grassland and Opergulina appuisanala. Trichosanthae	D <sub>Pv1</sub>	Story plaine	
MAS N/2	cucumerina lianes Rocknies	L OSI	Acacia xiphophylla open shrubland over Triodia epactia hummock grassland	
THIS THE	Ficus platypoda, Acacia coriacea, Ehretia saligna high open shrubland over		Blues Land Sustan	
Nr3	Rockpiles:	-	niver Land system	A MOUNT POTTER
	Acacia conacea scanered tai sinutis over "Cenchrus cilians, Cymbopogon ambiguus open tussock grassland	Hc1	Scoured creekbeds. Scattered riverine trees and shrubs	MOUNTPOTTER
NMS Nr4	ourine rocky noges: Regenerating low open shrubland over open herbland and open grassland	Rc2	Greekines: Cadjeput Melaleuca argentea, River Redgum Eucalyptus carnaldulensis open	
1.1		-	forest over patches of Acacla cariacea high shrubland over "Cenchrus species tussock grassland	42000mF
RO	Rocklea Land System	Rc3	Major creeklines: Eucalvolus camaldulensis woodland over patches of Melaleuca domerate birth	
ROh1	Low hills and slopes: Triodia viseana hummock grassland with scattered emergent low shrubs (BObte	Bet	shrubland over patches of Cyperus vaginatus sedgeland Major creaklines:	
RObt	/ ROhib) a Low hills and slopes:		Eucalyptus victrix, E. camaldulensis woodland over patches of Melaleuca	
RONI	Triodia wiseana hummock grassland	Rf1	Floodplane untra an under over central species tossock grassiano	
- nonit	Indigotara monophylla low open shrubland over Triodia wiseana hummock	Rf2	Eucaryprus vicinit open woodland over "Cenchrus species tussock grassland Floodplains:	
ROh2	gressenu Low hills and slopes		Mesquite "Prosopis pallida" hybrid high shrubland to open scrub	
	Inoma wiseana hummock grassland with scattered Acacla tall shrubs (mosaic of ROh2a / ROh2b)	Y	Yamerina Land System	
ROh2	Low hills and slopen: Acacia inaequilatera, A. bivenosa scattered shrubs over Triodia wiseana	TYp1	Ptains:	
ROh2	hummock grassland Low hills and slopes:		Mosaic of patches of Triodia angusta hummock grassland with open herblands and Mesquite scattered tall shrubs	
	Acacia ancistrocarpa , A. bivenosa open shrubland over Triodia wiseana hummock grassland	Yc1	Tidal creeks: Avicennia marina, high shrubland over balches of Schoenoplantus lituratis, onen	
ROp1	Plains: Triodia angusta hummock grassland		sedgeland	A Contraction of the second se
ROx1	Stony plains: Acacie xiphophylla open shrubland over patches of Triodia wisease hummock	NMS	Not mapped separately	
	grassland			





# Appendix C

Flora Species by Site Matrix used for TWINSPAN Analysis

Species	1 24	1 26	3	4	5	9	7	8	1 10	11 11	12	13	14	15	16 1	17 1	10	20	51	22	23	24	25	26	27 2	8 28	B 2	30
Abutilon ?lepidioicum	0 0	0	0	0	0	0	0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abutilon aff. lepidum (1) (MET 15 352)	0	0	0	0	0.1	0	0	1.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0	0	1	0 0	0
Abuttion att. lepidum (2) (MET 15 970)				0	0 0	5 0	50			0 0	0 0	<b>o</b> c						0 0	0 0	0 0	5 0							
Abutilon att. lepidum (3) (MET 16.120) Abutilon amolium				0 0		0 0	0 0			0 0	0 0		o c	o c				0 0		- c	0 0	o 0	0 0					
Abuilon environetalim				0	0	0							0 0					0		0	0	0	0 0				0 0	0
Abutiton cunninghamii		0	0	0	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0			0	0
Abutilon fraseri	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	-	0	0
Abutilon lepidum	0	0	0	-	0	0	7.1 (	0	0	0.1	٢	0.1	0	0	0	0	0.1	0.1	0	0	0	0	0	1.0	0	0	0	0
Abutilon macrum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abutilon malvifolium		0 0		0 0	0 0	0 0	0 0		0 0	0 0	0 0	0 0	0 0	0 0				0 0	5 0	0 0	0 0	0 0						
Abutilon oxycarpum subsp. prostratum	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Abutilon trudgenii	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	1.1	0	0	0	0
Acacia ampliceps		0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Acacia ancistrocarpa Acacia arida				0 0	) c	0 0			5 0	2 0	- 0	o c	50	50			5 0	- 0		0 0	0 0	0 0	0 0					
Acacia bivenosa	0	0	0	10	0	0	0	0	-	0	0	0	0	0	0	10	0.1	-	0	0	0	0	0	0	0	0	0.1	9
Acacia coriacea subsp. coriacea	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Acacia coriacea subsp. pendens	0 0	0	0	0	0.1	40	0	F	0	0	0	1.5	0	1.01	0	1	0.1	0	0	9	0	0	0.1	0	0	0	4.	0
Acacia elachantha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0	0 0	0	0	0	0	0	0	0 0	0 0	0 0	0	0.1
Acacia tarriestana Acacia inceruitatera					5 0	- 0							0 0	0 0										) -			5 C	
Acacia marramamba		0		0 0	0 0	0 0			0		0								0	5 0	0	0	0	- 0				0.1
Acacia monticola	0 0	0	0	0	0	0	0	0	0	0	-	0	0	0.5	0	5 0.	1	0	0	0	0	0	0	0	0	0	0	0
Acacia pyrifolia	0	0	0	0	0.1	-	0	0	0	0.1	-	0	0	0.1 0	1.0	-	0.1	0	0	0	0	0	0.1	0	0	0	0.1	0
Acacia sclerosperma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0
Acacia tenuissima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Acacia trachycarpa		0 0	0 0	0	00 0	- 0	0	0	0 0	0	0	0 0	0 0	0 0			0 0	0	0	0	0	0	0 0		0	0	0 0	0
Acacia tumida		0 0			0 0	0 0		0 0	0 0	0 0	0 0	0 0	0 +	0 0			02	0 0	0 0	0 0	0 0	0 0	0 0					0 0
Acada vicinacian Acada xiphophulla		0	7 0	0	0	0	5 50	0	0	0	0	0	- 0	0			0	0	0	0.1	0	0	0		0 0	0	0	0
Achvranthes aspera	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0
Adriana tomentosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aerva javanica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Alectryon oleifolius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida contorta	0	0.1	00	0	0	0	1.1	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0.1	0	0.1	0	0	0	0
Aristida holathera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Aristida latifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atriplex bunburyana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Avicennia marina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boerhavia burbidgeana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Boerhavia coccinea	0	0	0.1	-	0	-		0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0.1	0	1.1	0	Ö	0	0
Boerhavia gardneri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boerhavia paludosa	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0 0	0	- 0	0	0 0	0
Boernavia repleta		o	0 0	0	0 0	0 0			0 0	0	0	5 0	5 0	0 0					0	0 0	5 0	0 0	0 0					
Boothavia type 1				0	50	0 0			0 0	0 0	0 0	5 0	5 0	0 0				0		0 0	0 0						5 0	
Bonamia media			0		0 0	0 0			o c	0 0	0 0	o c					0	0	0	0	0	0	0			0	0	0
Bonamia media var. villosa	0	0	0.1	0	0	0	E.	0	-	0.1	N	0	0.1 0	0.1 0	0	1 0	1 0.1	0.1	0	0.1	0.1	0	0.1	0	0	0	0	0
Bonamia pannosa	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Bothriochloa ewartiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Canavalia rosea	0	0	0	0	0	0	0	0	0	0	0	0.1	0 0	0 0		0	0	0	0	0	0	0 0	0 7		0	0	0 0	0
Capparis spiriosa var. nurninuraria Camaris umhonata						0 0													5 0	5 0	0 0							0
Capparis unitoriata Cassytha cabillaris		0	0	0	0	0		0	0	0	0	0	0	10	0		0	0	0	0	0	0	0		0	0	0.1	0.1
Cenchrus ciliaris	0 0	0.1	2	-	60	60 0	E	0	0	0	-	0.1	0	0	5	0	0.1	0	0.1	9	0	0.1	30 0	1 0.1	1 0.	1	30	0.1
Cenchrus setigerus	0	0	0	-	0.1	15 0	1	0	0	0	0	0	0	0	0	0	0	0	0.1	9	0	0	0.1	0	0	0	0.1	0
Cheilanthes sieberi subsp. sieberi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chrysopogon fallax		0 0	0 0	0 0	0.1	0		0 0	0	0	0	0 0	0 0	0 0			0	0 0	0 0	65	0 0	0 0					0 0	
Citrarius lanatus Clerodendrum florihundum var annustifolium																			0 0		o c	0						
Clerodendrum tomentosum var. ?		0	0	0	0	0		0	0	0	0	0	0	0			0	0	0	0	0	0	1.0		0	0	0	0
Commicarpus australis	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Corchorus laniflorus	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0.1 0	.1 0.	1 1	0.1	0	0	0	0.1	0	0	0	0	0	0	0
Corchorus walcottii	0	0	0.1	0	0	0	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corymbia hamersleyana	0 0	0	0 0	0	00 0	0 0	0	- 0	0	0	0 0	0 0	- 0	12			0.5	0	0	0	0 0	0	0 0			0 0		0
Crotalaria dissitifica suben beethemiana				0 0	0 0	0 0							0 0									o 0						0
Crotalaria novae-hollandiae	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Cucumis melo subsp. agrestis	0 0	0	0	0	0.1	0	0	0	0	0	0	0	0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cullen graveolens	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 0	0	0	0
Cullen leucanthum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cullen pogonocarpum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbopogon ambiguus		0 0	0	0 0	0 0	0 0		0 0	0 0	0.1	- 0	0.1	0 0				6	- 0	0	0 0	5.0	0 0	0 0				- 0	0
																											5 0	0 0
Cynanchum floribundum		0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus bifax	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus blakeanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus bulbosus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0 0	0 0	0
Cyperus vaginatus				0 0	0 0	0 0			0 0	0 0	0 0	0 0	0 0	0 0					0 0	0 0	0 0	0 0	0 0					
Desmodium muelleri		0	0	0	0	0		0	0	0	0	0	0	0			0	0	0.1	0	0	0	0	0	0	0	0	0
Dichanthium fecundum	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicladanthera forrestii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Digitaria brownii	0 0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	0	- 0	0	- 0	0	0	0	0 0	0 0	0 0	0	0	0 0	0.1
Digitaria ctenantna Dissocarous paradoxus		0 0	0 0	0	0 0	0 0	50	> 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	> 0	50	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20	> 0	5 °	0 0
Dodonaea coriacea	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 0.	50	0	0	0	0	0	0	0	0	0	0	0	0

					0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0       0         0       0       0       0       0       0       0       0         0       0       0       0       0       0       0       0         0       0       0       0       0       0       0       0         0       0       0       0       0       0       0       0         0       0       0       0       0       0       0       0         0       0       0       0       0       0       0       0         0       0       0       0       0       0       0       0         0       0       0       0       0       0       0       0         0       0       0       0       0       0       0       0         0       0       0       0       0       0       0       0         0       0       0       0       0       0	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0       0
					0       0	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			1     1     0
					0         0	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	0       0		
					0       0	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		0     0 <th>0       0</th>	0       0
					0         0	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0	0       0
					0       0	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		0     0     0     0     0     0       12     75     0     0     0     0     0       25     0     0     0     0     0     0       12     13     0     0     0     0     0       12     0     0     0     0     0     0       13     0     0     0     0     0     0       14     0     0     0     0     0     0       15     0     0     0     0     0     0       16     0     0     0     0     0     0       17     0     0     0     0     0     0       16     0     0     0     0     0     0       17     0     0     0     0     0       16     0     0     0     0     0       17     0     0     0     0     0       17     0     0     0     0     0       17     0     0     0     0     0       18     0     0     0     0     0       19     0     0     0     0	0       0
					0       0	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		12     12     12     13       12     12     12     12     12       12     13     12     12     12       12     13     12     12     12       13     13     12     12     12       14     12     12     12     12       15     12     12     12     12       15     12     12     12     12       15     12     12     12     12       16     12     12     12     12       17     12     12     12     12       16     12     12     12     12       17     12     12     12     12       16     12     12     12     12       17     12     12     12     12       17     12     12     12     12       17     12     12     12     12       17     13     12     12     12       17     13     12     12     12       16     12     12     12     12       17     13     12     12     12       16     12     12     12	0       0
					0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0 <t< td=""><td><math display="block">\begin{array}{c ccccccccccccccccccccccccccccccccccc</math></td><td></td><td>12     75       12     75       12     75       12     75       12     75       12     75       12     75       12     75       12     75       12     75       12     75       12     75       13     71       14     71       15     71       15     71       16     10       17     10       18     10       19     10       10     10       10     10       11     10       11     10       12     10       13     10       14     10       15     10       16     10       17     10       18     10       19     10       10     10       10     10       10     10       11     10       12     10       13     10       14     10       15     10       16     10       17     10       18     10       19</td><td>0     0.1     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0</td></t<>	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		12     75       12     75       12     75       12     75       12     75       12     75       12     75       12     75       12     75       12     75       12     75       12     75       13     71       14     71       15     71       15     71       16     10       17     10       18     10       19     10       10     10       10     10       11     10       11     10       12     10       13     10       14     10       15     10       16     10       17     10       18     10       19     10       10     10       10     10       10     10       11     10       12     10       13     10       14     10       15     10       16     10       17     10       18     10       19	0     0.1     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0
					0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0       0         0       0       0       0       0       0       0       0         0       0       0       0       0       0       0       0       0         0       0       0       0       0       0       0       0       0       0         0       0       0       0       0       0       0       0       0       0         0	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			0         0
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					0         0         0         0           0         0         0         0         0           0         0         0         0         0         0           0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			0       0
					0       0       0       0         0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0         0       0       0       0       0       0         0	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0       0     0     0     0     0
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					0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0 <td></td> <td></td> <td></td> <td>0       0</td>				0       0
					0.1     0     0       0.1     0     0       0     0     0				0       0
					0.1       0				0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0
					0.1     0     0       0.1     0     0       0     0     0				0.1       0.1       0.1       0.1       0.1         0.1       0.1       0       0       0       0       0       0         0.1       0.1       0       0       0       0       0       0       0       0         0.1       0       0       0       0       0       0       0       0       0       0         0 <t< td=""></t<>
					0     0     0       0     0     0     0	0.1         0         0.1         0         0.1         0 </td <td></td> <td></td> <td>0.1         0.1         0.1           0         0         0         0         0           0         0         0         0         0         0           0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0<!--</td--></td>			0.1         0.1         0.1           0         0         0         0         0           0         0         0         0         0         0           0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0 </td
					0     0     0       0     0     0     0	0       0			0       0
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				0       0	0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0	0       0			0       0
				0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0	0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0	0       0			0         0
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					0     0     0       0     1     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0	0       0			0       0
					0.1     0     0.1       0.1     0     0.1       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0	0       0			0       0
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					0     0     0     0     0       0     0     0     1     0     0       0     0     0     0     0     0       0     0     0     0     1       0     0     0     0     1	0 0 0 0 0 0			
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				0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				0 0 0 0 0 0 0
				0.1000000000000000000000000000000000000	0.1 0 0.1 0 0 0 0 0 0 01		0		0 0 0 0 0
0 0 0	c .			0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0.1	0 0 0	> > >	0 0 0	0 0 0 0
	0 0 0			0 0 0 0 0 0 0 0 0 0	0 0 0.1		0 0 0	2 2	0 0 0
0 1 0	0 0.1 0 0			0000	0 0 0	0.1 0 0	0 0 0	0.1 0 0	0 0 0 0
0 0 0	0 0 0			0 0 0 0 0 0	, , ,	0 0 0	0 0 0	0 0 0	0
0 0 0	0 0 0 0	0 0 0		0 0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	-
0.1 0 0 0	0 0 0	0 0 0		0	0 0 0	0 0 0.1	0 0.1 0	0 0 0.	0.1 0
0 0 0	0 0 0		0 0		0 0 0	0 0 0	0 0 0	0 0 0	0
0 0 0	0 0 0 0	0 0 0	C C 1	0	0 0 0	0 0 0	0 0 0	0 0	0
0 0 0.1 1	1 0 0 0.1	1 0.1 0 1	2	0.1 0.1	0.1 0.1 0.1	0.1 0 0	0 0 0.1	0	0 0.1
0.1 0 0.1 0	0 0.1 1 0	0 0	0	0	0 0 0.1	0.1 0.1 2	0.1 0 0	0 0.1 0	0
0.1 0 0 0.	.1 0.1 0 0	0 0 0	0 0	0 0	0 0 0				
									0 0.1
0 0 0	0000	0 0 0	0 0 0	0	0 0 0	0 0	0 0 0	0 0 0	0 0
0.1 1 0.1 1	1 0 1 0	0 0 0	0 0 0	0	0 0 0	0 0.1 0	0 0 0	0 0.1 0	0 0.1
0 0 0	0 0 0 0	0 0 0 0	0 0 0	0 0	0 0 0	0 0 0	0 0 0	0 0 0	0
0 0 0.1 1	1 0 0 0	0 0 0	0 0 0	0 0	0 0 0.1	0 0 0.1	0	0	0 0.1
0 0 0	0 0 0	0	0 0	0	0 0 0.1	0	0	0	0 0.1
0 0 0	0 0 0	0	0 0.1 0	0.1 0	0 0 0.1	0 0	0 0	000	0 0.1
0 0 0	0	0	0	0	0	0			0
0 0 0	0	0	0	0	0 0				
								0 01 0	
			0 0	0	0 0 0	0 0	0	0 0 0	0
0 0 0	0 0 0 0	0 0 0 0	0 0 0	0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0.1
0 0 0	0 0 0 0	0 0 0	0 0 0	0	0 0 0	0 0 0	0 0 0	0 0 0	0 0
0 0 0.1 0	0 0 0	0 0 0	0 0	0	0 0	0 0	0 0	0 0	0 0
									0
									0
			0 0	0	0 0	000	0 0	0 0 0	0
		0000	0 0 0	0 0	0 0 0	0 0 0.1	0 0 0	0 0 0	0 0.1
0 0 0.1 0	0 0.1 0 0	0 0 0	0 0 1	0 0	0 0 0.1	0 0 0	0 0 0	0 0 0	0 0.1
0 0 0	0 0 0	0 0 0	0 0 0	0 0	0000	0 0 0	0 0 0	0 0	0
0 0 0	0	0 0 0	0 0	0	0	0	0 0	0 0	0
0.1.0									
			0 0 0	0		0.1 0 0	0 0 0	0 0	0
0 0 0	0 0 0	0 0 0	0 0 0	0	0 0	000	0 0 0	0 0 0	0 0
0 0 0	0 0 0 0	1 0 0 1	1 0 0	0.1 0	0 0 0	0 0 0	0 0 0	0 0	0
0 0 0	0 0 0	0 0 0	0 0	0	0 0	0 0	0 0		0
	> 0 0	2000	0 0	0	00000	0 0 0	0 0 0	0 0	0
0 0 0	0 0 0	1.1 0.1 0.1 0	0 0.1 1	0	V V T	0 0 0	0 0 0	0 0	Contraction of the
		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	V. V.I.         V.I.	0         0	0         0	1         0	0         0	0         0	0             0

sabade	62 03	64	65	99	57 6	8	2	11	22	73 7	4 7	2 10	11	78	62	20	ō	N N	3	c g	2	0	7 00	80	60	91	6	63	-
Abutilon ?lepidioicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0			0	2	0 0	0 0	0	0	-
Abutilon aff. lepidum (1) (MET 15 352)		0 0	0 0	0 0		0 0	0 0	0 0	0 0			0 0	0 0	0 0	0 0	0 0	0 0								0 0	0 0		0	-
Abutilon aft. lepidum (2) (MET 15 970)													0	0 0	0	0	00				0	0	0	0	0	0	0	0	-
Abutilon aff. lepidum (3) (MET 16 120)		0	0	5 0				5 0															0 0	0	0	0	0	0	-
Abutilon amplum		0	0	0 0			<b>D</b> 0	5 0				5 0				0 0								0 0	0	0	0	0	-
Abutilon cryptopetalum	0	0	0	0 0		> 2	> 0	0																0	0	0	0	0.1	-
Abutilon cunninghamii		0	0	0 0		5	0													C				0	0	0	0	0	1
Abutilon traseri								0 0			C	0	0.1	0	-	0	10	0	0	0	0	0	1 0.1	0	0	0.1	0	0	-
Abutilon lepidum						5 0	0	0 0			; C		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
		0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Abutilon oxycarpum subsp. prostratum	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1
Abutilon trudgenii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0				0	0 0	0 0	0 0	0	0	0	-
Acacia ampliceps	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0 0										5 0	-
Acacia ancistrocarpa	0	0	0	0	0	0	0	0	0		0	0	10	0	0.5	0	0 0	0 0	5 0				n c		5 0				-
Acacia arida	0	0	0	0	0	0	0	0 0					0		0		5					c			25	0 0		0 0	-
Acacia bivenosa		- 0		0 0			200					- 0	5 0	5 4	5 0							0	0.1	0	0	0	0.1	0	-
Acada cortacea subsp. cortacea				b t		5 0	20	-				; c	0	0	0	0	0	0	-	0	0	0	0	15	-	0	0	0.1	
Acadia Collacea subsp. perioris		0	0	2 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	_
Acacia farnesiana	0 0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	-
Acacia inaequilatera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	5	0	0	0	0	0.1	0	0	0	0	- 1
Acacia marramamba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0	0	0 0	0	0	0	0	-
Acacia monticola	0.1 0	0	0	0	0	0	0	0	0		0	0	0	0	0	0 3	0		0 1										1
Acacia pyrifolia	0	0	0 0	0 0		0	) (	50	0 0			50		5	5		5 0								1 0	00	0	5 0	-
Acacia sclerosperma			0 0	0 0													0 0						0	0	0	0	0	0	1
Acacia tenuissima													0	0	0 0	0 0	0 0	0 0				0	0	0	0	0	0	0	1
Acacia tracnycarpa													0	0 0	0	0	0	0				0	0	0	0	0	0	0	-
Acada tumida			0	0		0	0	0	0		0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	-
Acadia Victoriae		5 0	0	0		o c	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	-
Acada Alprioprigia Achiranthae senara		0	0	0.1.0	0	0	0	0.1	0	0	0	0	0	-	0	0.1	0	0	0	0	0	0	0	0.1	0	-	0	0	-
Actives tomentees		0	0	0		0.5	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
		0	0	0 0	0	0	0	10	0	0	0	0	0	0	0	0	1.0	0	0	0	0	0	0	0	0.1	0	0.1	0	-
Aerva javanica								5 0	0			o c	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	-
Alectryon diendius		0	0	0	0	0	0	0	0	0	5	0	0.1	0	0.1	0	0	0	1.1	0	0	1	0	1 0	0	0	0	0	-
Aristida bolathera	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Aristida latifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	a	0	0	0	0	0	0	0	0	0	0	-
Atriolex bunburvana	0 0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	-
Avicennia marina	0	0	0	0	0	0	0	0	0	0 0	1 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Boerhavia burbidoeana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Boerhavia coccinea	0	0	0	0	0	0.1	0	0.1	0.1	0	0.	1 0	0.1	0	0.1	0.1	0.1	0	1.1	0	1.0		0	1	0.1	0	0	0	-
Boerhavia gardneri	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0.1	0	0	0	0	0	-	0	0	0	0	0	0	
Boerhavia paludosa	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Boerhavia repleta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	T
Boerhavia type 1	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	T
Boerhavia type 2	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bonamia media	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Bonamia media var. villosa	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0	0.1	-	0.1	0.1	0	1.0	0	0	10.	10.	-	0.	0	0	0	T
Bonamia pannosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.	0	0	0		0	0	0 0	0	0	T
Bothriochloa ewartiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	1.1	0	0				0		0 0	0 0	1
Canavalia rosea	0	0	0	0	0	0	0	0	0	0		0	0 0	0	0	0 0	0	0 0	0 0	0 0									Τ.
Capparis spinosa var. nummularia		0	0	0 0	0 0		0 0	0 0	0 0	0 0				5 0		0 0			0 0					0 0	0 0	0	0	0	1
Capparis umbonata													0	0	0	0 0	0	10	0	0	0	0	0	0	0	0	0	0	T
Cassytha capillaris	0 9		0 00	202		5 4	22			09		10		0 0	0.1	0.1	0.1	0.1	2 10	12	2	0	-	2	9 0	30	40	0	-
Cenchrus cinaris Cenchrus setioerus	0.1 0	0	0	35	0	0	0	0	0	0	0	1 0	0	0	0	0	0	0	0	00	0	1.1	0	0	-	0	0	0	1
Cheilanthes sieberi subsp. sieberi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	1
Chrysopogon fallax	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	1.0	0	-	0	0	0	1	0	0	0	1
Citrullus lanatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Clerodendrum floribundum var. angustifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Clerodendrum tomentosum var. ?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0 0	0 0	0	0 0	
Commicarpus australis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					0 0			Ĩ.
Corchorus laniflorus	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	2	0	0.1	0	0	0	0		0.0		o °				1.
Corchorus walcottii	0 0	1 0	0	0	0.1	0	0	0.1	0	0.1	0	1.0	0	0	0	m (	0	0 0	1.0	0 0	0 0	5 0						5 0	-1.
Corymbia hamersleyana	0	0	0	0	0	0	0	0	0	0	0	0	0 0	0	0	0 0	0	0 0	5 0	5 0					2 0		- 0		T
Crotalaria cunninghamii	0	0	0	0	0 0	0 0	0 0	0	0	0 0						0 0		0 0			00					0	0	0	T
Crotalaria dissitifora subsp. benthamiana	0 0	0 0	0	0 0	0 0			5 0						50		5				0	00		-		0	0	0	0	1
Crotalaria novae-hollandiae														5 0	0	5 0	0	0	0	0	0	0		0	0	0	0	0	1
Cucumis melo subsp. agrestis				5 0											o c	0	0	0	0	0	0	0	0		0	0	0	0	T
										5 0				0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1-
Cullen leucantnum										0 0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Cullen pogonocarpum				5 C					0 0	0 0			0	5	0.1		0	0	0	0	-	0.1 0	1 0	-	0	10.	-	0	
Cymbopogon ambiguus							o c	5 0	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
			0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Cynanchum floribundum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	_
Cyperus bifax	0	0	0	0	0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	
Cyperus blakeanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cyperus bulbosus	0	1 0	0.1	0	0.1	0	0	0	0	0.1 0	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0	-				
Cyperus vaginatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0				0	-
Desmodium filiforme	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0	0 0	0 0							
Desmodium muelleri	0	0	0	0	0	0	0	0	0	0	0 0		0 0	0 0	0	0	0 0	0 0	0 0										20
Dichanthium fecundum	0	0	0	0	0		0 0	0 0	0	0 0	5 0						0		o 0								0		
Dicladanthera forrestii		0 0	0 0	0 0	0 0				5 0		5 0						0 0	0 0	0	0	0	0	0	0	0				0
Digitaria brownii Digitaria stenantha				0	0 0		0	0	0	0	0	1.0	0	0.1	0	0	0.1	0	0	0	0.1	0	1.	0	0	-	0	-	0
Digitaria ctenantria Diseocarnite naradoxits	) 0	20	20	> 0	0 0		, 0	, 0	, 0	0 0	0	: 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dodonaea coriacea	, 0	0	0	0	0	0	0	0	0	0	0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Species	\$ 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93	100
Ptilotus obovatus		0
Hriagoola eremaea Rhaqodia preissii subsp. obovata		- 0
Rhynchosia cf. minima		0 0
Rostellularia adscendens var. clementii		0
Salsola tragus Samolus repens	0       0	0
Santalum lanceolatum		00
Sarcostemma viminale subsp. australe	0       0	0
Scaevola spinescens Schoenonlactus litoralis		0
Sclerolaena cornishiana		2 0
Sclerolaena costata		
Sclerolaena eriacantha	0     0.1     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0       0     0     0     0     0     0	0
Scierolaena glabra Scierolaena hostilis	0     0       0 <th>0</th>	0
Sclerolaena uniflora		
Senna artemisioides subsp. oligophylla (thinly sericeo		-
Senna artemisioides subsp. oligophylla	0       0	
Senna glutinosa subsp. glutinosa x ?pruinosa Senna diutinosa subsp. chatalainiana		0
Senna glutinosa subsp. glutinosa		
Senna glutinosa subsp. x luerssenii		
Senna hamersleyensis		1-
Senna notabilis		
Serina sp.rxarajiiii(w.c. rruugeri 10332) Serina venusta		-
Sesbania cannabina		
Sida ?cardiophylla (juvenile)		T
Sida aff. cardiophylla (M79.27)		1
Sida aff. cardiophylla (site 1086)	0         0	
Sida aff. fibulifera (M100.22)		. I
Sida aff fibulifera (M69.12) Sida aff fibulifera (M69.12)		
Sida aff. fibulifera (M85.15)		1
Sida aff. fibulifera (MET Site 1308)		T
Sida aff. fibulifera (MET Site 1346)		1.
Sida aff. fibulifera (oblong; MET 15 220)	0         0	1.1
Sida aff. fibulifera 'var. L'		
Sida echinocarpa		T
Sida rohlenae		1
Sida sp. 'rugose'		1
Sida sp. Wittenoom (W.R. Barker 1962)	0         0	
Solanum diversifiorum		
Solanum gabrielae Solanum horridum		-1
Solanum lasiophyllum		17
Sorghum plumosum		1
Spinifex longifolius	0       0	1.1
Sporobolus Virginicus Stylobasium snathulatum		
oryrobasium spannarum Swainsona canescens		1
Swainsona formosa		-
Tephrosia aff. clementii type 2 (M35.14)	0       0         0       0	
Tephrosia aπ. densa Tephrosia aff. supina (ME Trudgen 12.357)		
Tephrosia clementii		1
Tephrosia rosea	0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0       0     0     0     0	1
Lepurosia supina Themeda triandra		T
Threlkeldia diffusa		1
Tinospora smilacina	0.1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1
Trianthema turgidifolia	0       0.1       0       0.1       0       0.1       0 </td <td>1.1</td>	1.1
i ribulus piatypterus Tribulus suberosus		12
Trichodesma zeylanicum		1
Frichosanthes cucumerina		1
friodia angusta	0       0       55       0       5       0	
riodia epacita Triodia punnens		-
Triodia wiseana		-
Triraphis mollis	0       0	
Triumfetta clementii Tunha dominonosio		-
Vigna lanceolata var. latifolia		1
Vigna lanceolata var. lanceolata	0         0	-
Vittadinia obovata Valtheria indica		
Arightia saligna		
Kerochloa imberbis		
		-

Species	\$ 62 6	3 64	65	99	67 6	8	02 6	12	72	73 7	4 75	76	4	78	70 8	0 81	82	83	84	50	8 92	88 7	00	8	5	6	C
Ptilotus obovatus	0 0	0	0	0	0	0	0	0	0	0	20	2 0		20	20		0	3 0	5 0	3 0		3 0	3 0			1	2 0
Rhagodia eremaea	0.1 0	0	0	0	0	0.	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	5 0	10	1 0	-
Rhagodia preissii subsp. obovata	0 0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0 0	0	0	0	0	0	10
Rhynchosia cf. minima	0 0.1	1 0	0	0	0	0	0	0.1	0	0	0	0.1	12	0.1 0	.1 0.	1.0.1	0.1	0.1	0.1	1.0	0.0	1 0.1	0.1	0	0.1 0	-	
Rostellularia adscendens var. clementii	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Salsola tragus	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	-
Samolus repens			0 0	0 0	0.0		0	0 0	0 0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Sarcostemma viminale subso. australe		0		0 0				0 0						0 0				0 0						0 0	0 0		-
Scaevola spinescens	0	0	0	0	0	0.1	0.1		0.1		0	0.1	0				0 0	0	10		0						
Schoenoplectus litoralis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0			1
Sclerolaena cornishiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0	0	0	0	0	0	0	0	0	0	0	0	
Sclerolaena costata	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Sclerolaena eriacantha	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sclerolaena glabra	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Sclerolaena hostilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	1
Scierolaena uniflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Senna artemisioides subsp. oligophylla (thinly sericeou	0 0 sr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	1 0.	-
Senna artemisioides subsp. oligophylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	
Senna glutinosa subsp. glutinosa x ?pruinosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.1	0	0.1	0	0	-
Senna glutinosa subsp. chatelainiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Senna glutinosa subsp. glutinosa	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0 0	1 0	0	0	0	0	0	1 0	0.1	0	0	0	0	
Senna glutinosa subsp. x luerssenii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0	-	
Senna hamersleyensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Senna notabilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Senna sp.Karajini(M.E.Trudgen 10392)		0	0 0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Serina Verusia		0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Sesbarila carinapina Sida 2004ila (imposito)		0	0 0	5		0	0	0 0	0 0	0	0	0	0		0	0	0	0	0.1	0	0	0	0	0	0	0	- 1
Sida : cardiophiyila juverille) Sida aff cardiophulla /M70.071											) (	0 0	0 0			0	0	0	0 0		0	0	0	0	0	0	1
Sida att. cardiophylia (NV 3.27) Sida att. cardiophylia (sita 1002)			0	0 0			0	0 0			0	0	0 0	0 0		0	0	0	0		0	0	0	0	0	0	1
Sida aff fibulifara (M100.20)								0 0				0	0 0	0 0		0	0	0	0 0		0 0	0	0	0		0	T
Sida att. Ilbuilleta (M100.22) Sida att fibuilitara (M27.16)							0	5 0			0	0	0 0		0 0	0	0	0	0 0	0	0	0	0	0	0	0	- 1
Sida alf fibulifara (MSC.10) Sida aff fibulifara (MGC.10)			0				0	0 0			0	5.0	0 0		0 0	0	0	0 0	0 0		0	0	0	1.0	0	0	-
Sida aff fibrilifera (MAS 15)			0			5 0					0		0 0			0	0	0 0	0 0	0 0	0	0	0	0		0	-
Sida aff fibuilifera (MET Site 1308)								5 0					0 0			50	0	0 0			0	0	50	0 0		0	-
Sida aff fibulitera (MET Sita 1346)																	5 0					0		0 0			1
Sida aff. fibulifera (oblond: MET 15 220)	0	0	0	0		0	0	0 0									0										T
Sida aff. fibulifera 'var. L'		0	0			0	0									5 0							0				-
Sida clementii		0	0 0																							0	-
Sida echinocarpa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5 0	0	0			0	0	0				1
Sida rohlenae	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0		o c	-
Sida sp. 'rugose'	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	1.0	0	0	1
Sida sp. Wittenoom (W.R. Barker 1962)	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	-
Solanum diversifiorum	0 0	0	С	0	0 0	0.1	0	0	0	0	0	0.1	0	1 0.	0	0	0	1.0	0	0	0.1	0	0	0	0	0	-
Solanum gabrielae	0.1 0	0	0	0 0	1	0.1	0	0.1	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0 0	1 0	0.1	1
Solanum horridum	0 0	0.1	0	0 0	1 0	0.1	0	0.1	0	0	0	0	0.1 0	1 0.	0	0	0	0.1	0	1 0	0	0.1	0.1	0	0.	0	-
Solanum Iasiophyllum	0	0	0	0	-	-	0	0.1	0	0	0	0.1	0	0	0	0.1	0	0.1	0	0	0.1	0	0	0.1 0.	1	0.1	- 1
sorgnum plumosum		0	0 0	0 0	0	0	0	0 0		0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	
opirimes tongriorius Sporobolus virainique		0 0	0 0		04 0	0 0	0 0			0 0	0 0	0 0			0 0	0 0	0 0	0 0		0 0	0	0	0 0	0 0	0 0	0 0	-
Stylobasium spathulatum		0	0 0									5 0										0	0 0				-
Swainsona canescens	0 0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0			0	0	0	0 0				-
Swainsona formosa	0 0	0	0	0 0	0	0	0.1	1.0	0	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0	0	1.1	0	0	-
Fephrosia aff. clementii type 2 (M35.14)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
rephrosia aff. densa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.	1 0	0	0	0	0	0	0	-
rephrosia aff. supina (ME Trudgen 12,357)	0.1 0	0	0	0	0	0.1	0	1.0	0	0	0.1	0	1.0	0	0	0	0	1.1	0	0	0	0	0	0.1 0.	1 0	0	-
Lephrosia clemenui		0	0 0		0	0	0 0		0 0	0	0.1	0	1.0	0.0	0	0.1	0	0	0	0.1	0	0	0	0	0	0	
reprirosia rosea Fenhrosia sunina		0 0	0 0			0	5 0			0 0	0 0	0 7			0	0	0 0	0 0		0	0	0	0 0		0 0	0.	
reprinces suprila Themedia triandra											0	50			5	5	0 0				50	5.0	0 0		0 0	0	_
Threfkeldia diffusa		0 0			0		0.1											0.0							0 0	0 0	-
linospora smilacina	0 1 0	0	0 0		5 0	50	5 0																				-
rianthema turgidifolia	0 0.1	0	0.1	0	0	0.1	0	0	0	-	0	0			0	0 0	0 0			0	0	0	0 0				-
ribulus platvoterus	0 0	0	0	0	0	0	0	0	0	- c	0 0	> c				0	0 0				0	0 0	0			5 0	
ribulus suberosus	0	0	0	0	0	0	0	0	0	0	0 0	0 0			0 0	0	0			0	0						_
richodesma zevlanicum	0.1 0	0	0	0	0	0.1	0	0.1 0.	10	0		0.10	0 1 0	101	0	0,1				c		0	0.1				
richosanthes cucumerina	0	0	0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 0	0	0	0	0	0	0	0	
riodia angusta	0 0	0	55	0 5	0	0	0	0	5	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0	_
riodia epactia	0 0	0	0	0	0	0	0	0	0 0	0	0	0	20 0	0	0	0	0	0	0 0	0	0	0	0	0	0	0	-
riodia pungens	0.5 25	0	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	-	0	
riodia wiseana	0	35	0	0	0	0	0	0	0	0	0	60	2 3	15	60	20	0	5	5	40	50	40	0	0 0	1 25	0.1	_
riraphis mollis	0	0	0	0	0	0	0	0 0	1 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
riumfetta clementii	0.1 0	0.1	0	0	0	0	0	0	0	0	0.1 0	0.1 0	1.1	-	0.1	0.1	0	÷.	0.0	1 0.1	0.1	-	0.1 0	1 0.	0	0.1	_
ypha domingensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
igita lariceolata var. latriolia finna lanceolata var. lanceolata		0 0				o 0	0 0		50	0	0 0	0 0		0	0	0 0	0 0			0	0	0	0 0		0	0	
fittadinia obovata	0 0	0	0	0	0	0	0								0						0 0						
Valtheria indica	0	0	0	0	0	2	0	1.	0.1	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Vrightia saligna	0.1 0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
(erochloa imberbis	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		ľ																									1

Species	5 94 95	96 9	67	98	66	100	101	102 1	03 10	04 10	05 10	06 10	71 10	8 10	9 11	11 0	1112	2 113	114	116	118	120 1	ZOA	122	124	+
Ptilotus obovatus	0 0	0	0	0	0	0	0	0	0	0	0	0	1 0	0	0	0	0	0	0	0	0	0	0	0	0	10
Rhagodia eremaea	0 0	0.1	0	0	0	0	0	0 0	1 0	0	0	1	0	0	0	0	0	0	0.1	0	0	0	0	0	0	10
Rhagodia preissii subsp. obovata	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhynchosia cf. minima	0.1 0.1	0.1	0	0.1	0	0.1	0	.1 0.	-	ö	0	1 0	0	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0
Rostellularia adscendens var. clementii	0	0	0	0	0.1	0	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Salsola tragus Samulus renens		00	00	0 0	0 0	1.0	0	0 0		00	0 0	00	0 0	0 0	0.1	0 0	0 0	0	0 0	0 0	0 0	0 0	0 0	0 0	00	
Santalum lanceolatum		0	0	0	0	1.0	0		0	0	0	0	0	0 0	0 0	0	0	0	0 0	0	0 0	0 0	00	0 0	0 0	- 1 -
Sarcostemma viminale subsp. australe	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Scaevola spinescens Schoenonlactus litoralis	0 0.1	0 0	0 0	0.1	0 0		0 0	00	00	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0	0	0 0	0	0 0	0 0	0 0	0	0	100
Scienciaena cornishiana	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	3 0	0 0	0	0	0 0	0 0	- 0	0 0	
Sclerolaena costata	0.1 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sclerolaena eriacantha	0 0	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	-
ocierolaena giakria Sclerolaena hostilis		0	0 0	0 0	0 0	0 0					0 0	0 0		0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	
Sclerolaena uniflora	0 0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$\sim$
Senna artemisioides subsp. oligophylla (thinly serice	ous 0 0	0	0	0 0	0 0		0	00	0 0	0 0	0 0	0 0	0 0	0 0	0.1	0	0	0	0	0	0	0	0	0	0	
Senna alternisiones subsp. oligopriyila Senna alutinosa subsp. alutinosa × ?pruinosa	0 0		0 0	0 0	0 0										0 0	0 0		0 0	0 0	0 5		0 0	0 0	0 0	0 0	
Senna glutinosa subsp. chatelainiana	0	0	0	0	0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0 0	0 0	00	0 0	
Senna glutinosa subsp. glutinosa	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	
Senna glutinosa subsp. x luerssenii	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Senna notabilis		0 0	0 0	0 0	0 0	0 0				0 0	0 0	0 0	0 0	0.1	0 0	0 10	0 10	0 0	0 0	0 0	0 0	0 0	0 -	0 0	0 0	
Senna sp.Karajini(M.E.Trudgen 10392)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	. 0	0	0	
Senna venusta	00	0	0	0	0	0	0	0	0 0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	-
sida ?cardiophylla (juvenile)		0 0	0 0	0 0	- 0			0 0		0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0				$\circ$
sida aff. cardiophylla (M79.27)	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
sida aff. cardiophylla (site 1086)	0 0.1	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
olda aff. fibulitera (M100.∠∠) šida aff. fibulitera (M37.16)		o c	o 0	0 0					0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0		-
sida aff. fibulifera (M69.12)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
ida aff. fibulifera (M85.15)	0	0	0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-		
oida aff. fibulifera (MET Site 1308) sida aff. fibulifera (MET Site 1346)		0,0	0 0	0 0	0 0			0 0		0 0	0 0	0 0	0 0	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0	-	~	
vida aff. fibulifera (obiong; MET 15 220)	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0					
sida aff. fibulifera 'var. L'	0	0	0	0	0	0	0	1 0	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0	0	0			
ida clementii ida achinocena	0 0.1	0	0 0	0 0	0 0		00	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	~	-
ida rohienae		0 0							o c		0 0			0 0	0 0	0 0	0 0	0 0	0 0	0 0						<u> </u>
ida sp. 'rugose'	0 0	0	0	0	0	-	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0 0					
ida sp. Wittenoom (W.R. Barker 1962)	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
olanum diversiñorum	0 0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0	-	-	-	
olanum paprielae olanum horridum	0 0.1	0 0	0 0		0 0			0.1	0	0	0	0.1	0	0.1	0	0.1	0.1	0 0	0.1	1.0	0 0	0		-	_	-
olanum lasiophyllum	0.1 0.1	0	11 0	-				0			0 0			5 0												
orghum plumosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
pinifex longifolius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-		
porobolus virginicus tvlobasium snathulatum		0 0	0 0	0 0	0 0		0 0	0 0	0	0	0	0	0	0	0 0	0	0 0	s c	0 0	0 0	0 0					2
wainsona canescens		0	0	0 0	0	0	0	0	0	0	0	0	0	0 0	0	0 0	0 0	0 0	0 0	0 0	00		50	_		
wainsona formosa	0 0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
ephrosia aff. clementii type 2 (M35.14)	00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
epirrosia arr. censa ephrosia aff. supina (ME Trudgen 12,357)		0 0	0 0	- 0		0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0.1	0 0	0 0	0.1	0 0	0 0	0				
ephrosia clementii	0.1 0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0			
ephrosia rosea ephrosia supina		0 0	0	0 0	0 0		0 0	0 0	0	0	0 0	0 0	0	0	0 0	0 0	0 0	0 0	0 0	0	0		00			
opricosa suprita nemeda triandra		0	. 0	0	0	0	0 0	0	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	1.0					0	
rrelkeldia diffusa	0	0	0	0	0.0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
nospora smilacina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	
iarimema turgianolia ibulus platvoterus		0 0					0.0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0			00			
ibulus suberosus		0	5		0	0	0	0	0	0 0	0 0	0	0	0.1	0 0	0 0	0	0 0	0 0	. 0						
ichodesma zeylanicum	0.1 0.1	0	0.1.0	-	0	0	0	0.1	0.1	0	0.1	0.1	0	0	0	0.1	0.1	0	0.1	.1 0	1 0.	1 0.	0	°.	0	
richosanthes cucumerina	0.1 0	0 0	0	0	0	0 0	0 0	0	0 0	0	0	0	0	0.1	0	0.1	0	0 0	0 0	0	0	0	0,	0	-	~
iodia epactia		0 0	00		4	0	0	o co	0	0 0	20 0	0	0 0	0 0	0 0	0 0	0 0	00	0 0	00		5 0	- 0	5 0		
iodia pungens	0 27	0	0	0	0	0	0	0	0	0	0	20	0	0	-	0	0	0	0	0	0	0	0	0		
fodia wiseana irrechie mollie	40 0	50	000	0	0	0	0	0.1	30	0	- 0	5	0	s a	50	- (	09	0	2 0	6 0	5 4(	0	-	0		-
iumfetta clementii	0.1 0.1	0 0	1		0 0	0 0	0 0	0 0	0.1	0 0	0.1	0.1	0 0	0 0	0 0	0.1	0 1	0 0	0 5			0 0	0 0	0 0		
pha domingensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	0	0	0		0	0		
gna lanceolata var. latifolia		0 0	0		0 0	0	0 0	0	0	0	0	0	0	0	0	0 0	0 0	0	0	0	0	0	0	0	-	-
gria iariceorata var. iariceorata Itadinia obovata		0 0			0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0				o 0		0	
altheria indica	0 0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0		
rightia saligna	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0		
erochloa imberbis	0 0	0	0	0 0	0	0	40	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-

Species	6 .	4 9	5 9	6 9	1 98	66	100	101	102	103 1	04 10	05 10	6 10	7 100	8 109	110	111	112	113	114 1	116 1	18 1	20 12	0A 12	22 12	4 126
Abutilon ?lepidioicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abutilon aff. lepidum (1) (MET 15 352) Abutilon aff tenidum (2) (MET 15 970)	0 0	00	0	0 0	00	00	00	0 0	0 0	0 0	00	0 0	00	0 0	0 0	0	0	0 0	0 0	0 0	00	00	0	0 0	0 0	0 0
Abutilon aff. lepidum (3) (MET 16 120)	0	0	5 °	0	0	0	0	0	0	00	0	0	0 0	0	0 0	0 0	0 0	0 0	0 0	0 0				0	0 0	0 0
Abutilon amplum	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Ö.	0	0.1
Abutiton cryptopetatum Abutiton cunninghamii	00	0 0	0 0	0 0	0 0	0 0	0.1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0.1	0 0	0 0	0 0	0 0	0 0	0 0	00		00	0 0	0 0
Abutilon fraseri	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	1.	0	0	0	0	0
Abutilon lepidum	0.1	0.1	0	0.1	0.1	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	F.	0	0	0	0	0	0
Abutilon macrum Abutilon malvifolium		0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	00	00	0 0	0 0	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	00	0 0	0	0
Abutilon otocarpum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0	0	0	0 0							
Abutilon oxycarpum subsp. prostratum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abutilon trudgenii	0 0	0 0	0 0	0 0	0	0 0	0 0	0 ,	0	0	0 0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia ampliceps Acacia ancistrocarba		D N	0 0	0 0	0 0	0 0	0 0	- 0	0 0			0 0	0 -	0 0	0 0	0 0	0 0	0 4	0 0					0 0		0
Acacia arida	0	0.1	0	0.1	0	0	0	0	0		0	0	- 0	0	0	0	0	20	0 0	0		0		0	0	0
Acacia bivenosa	-	9	0	0.1	-	0	0	0	0	0	0	0	-	0	0	0	0	N	0	5	0	0	0	0	0	0
Acacia coriacea subsp. coriacea	0	0	0	0.1	0.1	0	25	0	0	0	0	0	0	0	1.5	0	0.1	0	0	0	0	0	0	0	0	0
Acacia coriacea subsp. pendens Acacia elachantha	0 0	0 0	0 0	0 0	0	0 0	0 0	- · ·	0 0		0 0	0	0 0	0	0	0	0 0	0 0	0 0	5.0	0 0	0 0	0 0	0 0	0.0	60
Acacia farnesiana	0	0.1	0	0	0	0	0	0 0	0	0	0	0		0 0		0	0	0 0							0 0	0 0
Acacia inaequitatera	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				0	0		0	o
Acacia marramamba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
Acacia monticola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia pyrifolia	0.1	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	1 0.	1 0.	1 0	0	0	0	0
Acacia sclerosperma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia tenuissima	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia tracitycarpa Acacia tumida			0 0		0 0	0 0	0 0	0 0			0 0	0 0	0 4	0	0 4	0	0 0	0 0				0 0	0 0	0 0	0	0.1
Acacia victoriae	0	0	0	0.1	0	0	0	0 0	0	1 0		0	2 0			0										
Acacia xiphophylla	0	0	12	0	0	0	0	0	1 0	0	0	9	0	0	0	0	0	0			0	0	0	0	0	0
Achyranthes aspera	0	0.1	0	0	0.1	0	0	1.1	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0	0.1	0.1	0
Adriana tomentosa	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aerva javanica	0 0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alectryon olertolius	0	0 0	0	0	0	0	0 0	0 0	0	0 0	0 0	0	0	0	0.1	0	0.1	0		0	0	0	0	0	0	0
Aristida bolathera	5 0		7			5 c	0 0	5 0				0 0	0 0	0 0	0 0	0.1	0 0					0 0	0 0	0	0	0
Aristida latifolia	C	C	C	0	0	0 0	0 0																			
Atriplex bunburyana	0	0	0	0	0	0	0	0	1 0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0
Avicennia marina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boerhavia burbidgeana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0
Boerhavia coccinea	0.1	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0.1	0	0	0	0	0.1	0.1	0	0	0
Boerhavia gardneri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boerhavia paludosa	0 0	2 0	0 0	0	0	0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boernavia tropeta	0 0	0	0	0	0	0 0	0 0	0 0		0	0	0	0	0	0	0	0 0	0		0	0	0 (	0	0	0	0
Boerhavia type 1 Boerhavia type 2			0 0		0 0	0 0	0 -					0 0	0 0	0 0	0 0		0 0						0 0	0	0	0
Bonamia media	0	0	0	0	0	0	50								0	0 0	0 0									o c
3onamia media var. villosa	0.1	0.1	0	0.1	0.1	0	0	0	0	0.1	0	0	0	0	0	0.1	0.1 0	-	0	1 0	1 0.1	0	0	0	0	0
3onamia pannosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
3othriochloa ewartiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Janavalla rosea Dapparis spinosa var nummularia	0 0	0 0	0 0	0 0	0 0	0 0	0 0			0 0	0 0	0 0	0 0	0	0 0	0 0	0 0			0 0	0 0	0	0 0	0	0	0
Capparis umbonata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	v 0				0	0	0	0	0	
Cassytha capillaris	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.	1 0	0	0	0	0	0	0
Cenchrus ciliaris	0.1	0.1	0.1	0.1	0.1	60	0.1 3	0	0	0	0	0.1	0	9	0.1	-	10	0	0.	1 0	0	0	0	0.1	9	20
Cenchrus setigerus Chaitanthas siabari subar aichari	0 0	0	0	0	0	10	0 0	- , ,	0 0	0	0	0	0	35	0	0.5	0 0	0	0	0 0	0 0	0	0	0.1	0.1	20
cheilantnes siebert subsp. siebert Chrvsopogon fallax		<b>o</b> o	0 0	0 0	0 0	0 0	0 0				0 0	0 0	0 0	0 0	0 0	0 0	0 0			0 0	0 0	0 0	0 0	0 0	0	0
Ditrullus lanatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					0	0	0		0.1	
Clerodendrum floribundum var. angustifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clerodendrum tomentosum var. ?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
commicarpus australis	0	0	0	0	0	0	0 0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corchorus larinitorus Corchorus walcottij		5 0		5 0	0	0 0	0 5			0 0	0 0	0 0		0 0	0 0		1.0		0 0	0.0	0.0	0 0	0.1	0 0	0 0	0 0
Corymbia hamersleyana	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0			0	0	0	0	0	0	0
Crotalaria cunninghamii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crotalaria dissitifiora subsp. benthamiana	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crotalaria novae-hollandiae	0	0	0	0	0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
cucumis meio subsp. agrestis Cullen graveolens		0 0	0 0	0.10	0 0	L.O 0			0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0			0 0	0 0	0	0 0	0.1	0	0.1
Cullen leucanthum	0	0	0	0	0	0		0	0	o		0 0	0 0		0 0	0 0					o c					
Cullen pogonocarpum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbopogon ambiguus	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.1.0	-	Ö	1 0.1	0.1	0	0	0	0	0
Symbopogon bombycinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Symbopogon obtectus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ynanchum rioribungum Winerris hifay	0 0	0 0	0 0	0 0	0 0	0 0	0 0			0 0	0	0	0	0	0 0	0				0	0	0	0	0	0	0
yperus blakeanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0 0	v 0
Cyperus bulbosus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
Syperus vaginatus	0	0	0	0	0	0	0 0	1 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	20	0.1
Jesmodium Illiforme Demodium muallari	0 0	0 0	0 0	0 0	0 0	0 0			0	0 0	0	0	0	0	0	0 0	0 0		0	0 0	0	0	0	0	0	0
lichanthium fecundum	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0 0						0	0			
licladanthera forrestii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ligitaria brownii	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Digitaria ctenantha	0 0	0 0	0.1	0 0	0.1	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
dissocarpus paravosus Jordonaea contiacea	> 0	2 0	0 0	o c	o c	5 C	) C	> 0	> 0	> c	5 C	5 c	5 0	5 c	5 c	) c			2 c	> <	) C	5 0		5 C	5 c	0 0
					>						>	>		5	5	5			5					2	>	2

Species	6 .,	4 9	5 96	16	98	66	00 1	01 10	02 10:	3 104	105	106	107 4	11 80	11 00	111	112	112	VII	110	10 11	01 40	A AC	01 00	A 40
Dolichandrone heterophylla	C	0	0	C	c	c	0	0	0	0	2	2						2	-	0	0		NA IS	Y	T I
Ehretia saliona		0	0	0	0	0				0	>		5	0	0	<b>D</b>	5	0	0	0	0	-		0	0
Enchvlaena tomentosa		c			0 0				5	0 0	0 0	0	0	0	2 0		0	0	0	0	0	0	0	0	0
		5 C	5 0	0	0			o '	5	o	0	0.1	0	.1 0	0	0.1	0.1	0	0.1	0	0	0	0	0	0
				0	0	0			0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Eragrosus eriopoda	0	0	0	0	0	0	~	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis talcata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrosus seuroria Eragrostis varionia			0 0	0	0 0	0 0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eremonhila forrestii subsn forrestii			N C		0 0	0 0			00	0	35	0	0 0		0	0	0	0	0	0	0	0	0	0	0
Eremophila longifolia	0	5 0	0	0	0													0 0	0			0	0 0	0	0
Eriachne aristidea	0	0	0	0	0	0	0	0	0	0	0	0	0		0	20	5 0	0	. 0						
Eriachne benthamii	0	0	0	0	0	0	0	0	N	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Eriachne mucronata	0	0.1	0	0	0	0	0	0	0	0	0	0	F.	0	0	0.1	0	0	0.1	0	0 0	0	0	0	0
Erischne ovata	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0	0	0	0	0
Endonne renucunnis Endhrine vesnertijo		0	0	0	0 0	0,		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus camaldulensis		0 0	0 0	0 0		- 0			0 0	0 0	0 0	0 0		0 0	0 0	0	0 0	0 0	0 0	0 0	0	0 0	0	0.1	0.1
Eucalyptus victrix	0	0	0	0	0	2 2	10	0	0	0	0												0 <del>4</del> +	04	0 0
Eulalia aurea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5 0
Evolvulus alsinoides	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Evolvulus alsinoides var. villosicalyx	0	0	0.1	0.1	0.1	0	1 0	0	0	0	0	1.0	0	0	0.1	0	0.1	0	1.0	0	1 0.1	0.1	0	0	0.1
Ervivaius sp.	0	50	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	1.0	0	0	0	0	0	0
Ficus opposita var. acureata				0 0	0 0		0 0	0	0	0	0 0	0 0		0	0	0	0	0	0	0	0	0	0	0	0
Ficus platypoda var. minor	c	0	0 0							0					0	, ,	0 0	0 0	0 0			0	0	0	0
Fimbristylis dichotoma	0	0	0.1	0	0		0	0	0	0 0	, c											o c	0 0	0	0 0
Flueggea virosa subsp. melanthesoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				5 0	5 0			
Frankenia ambita	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frankenia paucifiora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia stobbsiana	0	0.1	0	0	0	0	0	0	0	0	0	0 0	1 0	0	0	0	0.1	0	1.1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Hakes lores when whene	0 0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halosarcia halocnemoides subso tenuis				0 0			0 0	0 0	0	0 0	0 0		0 0	0	0.1	0	0	0	0	0	0	0	0	0	0
Halosarcia indica subso. leiostachva				> c					<b>o</b> o		0 0		0 0	0 0	0	0	0			0	0	0	0	0	0
Halosarcia pruinosa	o c	c	0	0 0						0 0					э с	0 0	0 0	0 0		0	0	0	0	0	0
Halosarcia pterygosperma subsp. denticulata	0	0	0	0	0	0	0	0	0	, c															0 0
Heliotropium ovalifolium	0	0	0	0	0		0	0		0 0														0	) c
Heliotropium sp. 1	0	0	0	0	0	0	C	0	0															0	0
Hemichroa diandra	0	0	0	0					5 0												o (	0	0	0	0
Hibiscus aff. coatesii (site 664)	0	0	0	0											5		5				0	0	0	0	0
Hibiscus aff. platychlamys (M9.15)	0	0.1	0	0 0			0 0														<b>o</b> o	0 0	0 0	0	0
Hibiscus aff. platychlamys (M35.11)	0	5 0	0	0										5 0		5 0					0	0 0	0	0	0
Hibiscus aff. platychlamys (M39.14)	0.1	0	0	0	-	0	0	0	0	0	0		0	0	0		-								0 0
Hibiscus aff. platychlamys (MET 15 067)	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	00	0		0	0	0	0	0	0	0
Hibiscus aff. platychlamys (site 1139)	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	0	1 0.	1 0	0	0	0	0	0
Hibiscus brachysiphonius	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Hibiscus leptocladus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hibiscus panduriformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybanthus aurantiacus	0.1	0.1	0	0	1.1	0	0	0	0	0	0	0	0	0	0	0	-	0	-	0	0	0	0	0	0
Indigastrum parvifiorum	0.1	0	0	0	0	0	0	0	0	0	0 0	1 0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Indigofera colutea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0
Indigorera linitolia	CN	0	0	0		0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
inuigorera monopriyila Indirofera sessilifiora	0.1	1.5	0	0		0	0	0	0	0.1	0	0	0	0.1	0	0	-	0	1 0.	0	0	0	0	0	0
Indiaofera trita	0 0	0 0	0 5			0 0	0 0	0	0 0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ipomoea coptica	4 0	0	5 0										5	0 0	0 0	0 0			0 0	0	0	0	0	0	0
ipomoea muelleri	0	0	0	0	0	0	0	0	5 0													0 0	5.0	0 0	0 2
Isotropis atropurpurea	0	0.1	0	0	0	0	0	0	0	0		0	0	0	0									5 0	5 0
Jasminum didymum subsp. lineare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Keraudrenia nephrosperma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0 0	0 0
Lawrencia viridigrisea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maireana melanocoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maireana planifolia	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	1	0	0	0	0	0	0	0	0
Maireana tomentosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marsilea hirsuta	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Melaleuca argentea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
Melaleuca gloriterata	0	0	0	0	0	0	ß	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	25	30	0
Melhania ahlaanikalia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0
Muellania optorgrouta Muellanimon selioneitanum	0	0	0	0	- 0	50	0	o	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mukia aff maderasnatana sn A	0 0	0 0	0 0	0 0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mukia aff maderasonatana so. R		0 0	5 0	0 0	0 0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mukia off modoromotono on C	> <	0	0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mukia aff. maderaspatana sp. C						0 0	0	0 0	0 0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mukia aff. maderaspatana sp. E	0	0 0							5 0				0	0 0	0 0			0 0	0	0	0	0	0	0	0
Mukia aff. maderaspatana sp. F	0	0.1	0	0	0		0	0 0				5 0									5	0	0 0	0 0	0 0
Myoporum acuminatum	0	0	0	0	0	0	0	0	0	0		o c	0	5 0				5 0			5 0	0			
Neobassia astrocarpa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	5 0		
Neptunia aff. dimorphantha (M27)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0	
Neptunia dimorphantha	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operculina aequisepala	0	0	0	0	-	0	0	0	0	0	0	0	0	0.1	0	0.1 0	0	0	0	0	0	0	0	0.1	0
Paraneurachne muelleri	0	0.1	0	0	1 0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Passifiora toetida	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	1.1	0	0	0	0	0	0	9	0.1	0
Pluchea ruhellifiora	- c	2 0	0 0		0 0	0	0	0	0 0		0	~	0	0	0	0	0	en 1	0.1	0	0	0	0	0	0
Plumbado zevlanica	0 0						5 0	0 0				0 0	0	0 0	0 0		0 0	0	0 (	0	0	0	0	0	0
Prosopis pallida	0	0					- 0						0 0	0 7	0		0 0		0	0	0 0	0	0	0	0
Ptilotus astrolasius	, 0	) c	2 0		> 0	> C	- c	5 c			50	2 0	ng c	1.0	5 0		> <	2 6	50	50	0 0	0 0	0.1	0.1 0	
Ptilotus calostachyus	0	1.0	, 0	0	0	> 0	> 0	) C	2 0	, 0	> 0	> 0	> c	5 C	) c	50	> 0	50	2 0	5 C	o c	o c	o c	0 0	0 0
									6			1	1	,	,	5	1	1	1	,	,	>	2	2	7

# Appendix D

**Flora Species List** 

# FUNGI

Podaxis pistillaris Unidentified black fungus ALGAE Chara sp. 7: ADIANTACEAE Cheilanthes sieberi subsp. sieberi **13: MARSILEACEAE** Marsilea hirsuta **20: TYPHACEAE** Typha domingensis 29: HYDROCHARITACEAE Vallisneria sp. 31: POACEAE Aristida contorta Aristida holathera Aristida latifolia Bothriochloa ewartiana Brachyachne convergens Brachyachne prostrata \*Cenchrus ciliaris \*Cenchrus setiaerus Chloris pectinata Chrysopogon fallax Cymbopogon ambiguus Cymbopogon bombycinus Cymbopogon obtectus Dactyloctenium radulans Dichanthium fecundum Dichanthium sericeum subsp. humilius Dichanthium sericeum subsp. sericeum Digitaria brownii Digitaria ctenantha Enneapogon caerulescens var. occidentalis Enneapogon oblongus Enteropogon acicularis Eragrostis cumingii Eragrostis dielsii Eragrostis eriopoda Eragrostis falcata Eradrostis setifolia Eragrostis tenellula Eragrostis xerophila Eriachne aristidea Eriachne benthamii Eriachne mucronata Eriachne ovata Eriachne pulchella subsp. dominii Eriachne tenuiculmis (Priority 3 species) Eulalia aurea Iseilema dolichotrichum Iseilema eremaeum Iseilema membranaceum Panicum decompositum Paraneurachne muelleri Paspalidium clementii Paspalidium tabulatum Perotis rara Schizachyrium fragile Setaria surgens \*Setaria verticillata Sorghum plumosum Spinifex Ionaifolius Sporobolus australasicus Sporobolus virginicus Themeda triandra Tragus australianus Triodia angusta Triodia epactia

Triodia pungens Triodia wiseana Tripogon Ioliiformis Triraphis mollis Urochloa gilesii subsp. occidentalis Urochloa holosericea subsp. velutina Urochloa sp. "glabrous apices" Whiteochloa airoides Xerochloa imberbis Yakirra australiensis 32: CYPERACEAE Bulbostylis barbata Cyperus bifax Cyperus blakeanus Cyperus bulbosus Cyperus iria Cyperus squarrosus Cyperus vaginatus Fimbristylis depauperata Fimbristylis dichotoma Fimbristylis microcarya Schoenoplectus laevis Schoenoplectus litoralis 87: MORACEAE Ficus opposita var. aculeata Ficus opposita var. indecora Ficus platypoda var. minor 90: PROTEACEAE Grevillea pyramidalis Hakea lorea subsp. suberea 92: SANTALACEAE Santalum lanceolatum **105: CHENOPODIACEAE** Atriplex bunburyana Atriplex codonocarpa Atriplex isatidea Chenopodium melanocarpum forma leucocarpum Dissocarpus paradoxus Dysphania plantaginella Dysphania rhadinostachya Enchylaena tomentosa Halosarcia halocnemoides subsp. tenuis Halosarcia indica subsp. leiostachya Halosarcia pruinosa Halosarcia pterygosperma subsp. denticulata Maireana melanocoma Maireana planifolia Maireana tomentosa Neobassia astrocarpa Rhagodia eremaea Rhagodia preissii subsp. obovata Salsola tragus Sclerolaena cornishiana Sclerolaena costata Sclerolaena eriacantha Sclerolaena glabra Sclerolaena hostilis Sclerolaena uniflora Threlkeldia diffusa

# **106: AMARANTHACEAE**

Achyranthes aspera \*Aerva javanica Alternanthera angustifolia Alternanthera nana Alternanthera nodiflora Amaranthus mitchellii Amaranthus pallidiflorus Gomphrena canescens Gomphrena cunninghamii Gomphrena sordida Hemichroa diandra Ptilotus aervoides Ptilotus astrolasius Ptilotus auriculifolius Ptilotus axillaris Ptilotus calostachyus Ptilotus carinatus Ptilotus clementii Ptilotus exaltatus var. exaltatus Ptilotus fusiformis var. fusiformis Ptilotus gomphrenoides var. gomphrenoides Ptilotus helipteroides Ptilotus murravi var. murravi Ptilotus obovatus Ptilotus polystachyus Ptilotus villosiflorus **107: NYCTAGINACEAE** Boerhavia burbidgeana Boerhavia coccinea Boerhavia gardneri Boerhavia paludosa Boerhavia repleta Boerhavia type 1 Boerhavia type 2 Commicarpus australis **108: GYROSTEMONACEAE** Codonocarpus cotinifolius 110: AIZOACEAE Trianthema aff. kimberleyi (MET 15 060) Trianthema triguetra Trianthema turgidifolia Zaleya galericulata 110A: MOLLUGINACEAE Glinus lotoides Mollugo molluginis **111: PORTULACACEAE** Portulaca oleracea Portulaca pilosa **113: CARYOPHYLLACEAE** Polycarpaea corymbosa var. corymbosa Polycarpaea holtzei Polycarpaea longiflora (pale form) **122: MENISPERMACEAE** Tinospora smilacina 131: LAURACEAE Cassytha capillaris **135: PAPAVERACEAE** \*Argemone ochroleuca 137A: CAPPARACEAE Capparis spinosa var. nummularia Capparis umbonata Cleome oxalidea Cleome viscosa **160: SURIANACEAE** Stylobasium spathulatum 163: MIMOSACEAE Acacia ampliceps Acacia ancistrocarpa Acacia arida Acacia bivenosa Acacia coriacea subsp. coriacea Acacia coriacea subsp. pendens Acacia elachantha (golden hairy variant) Acacia farnesiana Acacia inaequilatera Acacia marramamba Acacia monticola

Acacia pyrifolia Acacia sclerosperma Acacia tenuissima Acacia trachycarpa Acacia tumida Acacia victoriae Acacia xiphophylla Neptunia dimorphantha Neptunia aff. dimorphantha (M27) \*Prosopis pallida hybrid (Declared Plant - Noxious Weed) **164: CAESALPINIACEAE** Petalostylis labicheoides Senna artemisioides subsp. oligophylla Senna artemisioides subsp. oligophylla (sericea form) Senna artemisioides subsp. oligophylla (thinly sericeous) Senna artemisioides subsp. oligophylla x helmsii Senna glutinosa subsp. chatelainiana Senna glutinosa subsp. glutinosa Senna glutinosa subsp. glutinosa x luerssenii Senna glutinosa subsp. pruinosa x ?glutinosa Senna glutinosa subsp. x luerssenii Senna hamersleyensis Senna notabilis Senna venusta Senna sp. Karajini (M.E.Trudgen 10392) 165: PAPILIONACEAE Alysicarpus rugosus Canavalia rosea Crotalaria cunninghamii Crotalaria dissitiflora subsp. benthamiana Crotalaria medicaginea Crotalaria novae-hollandiae Crotalaria ramosissima Cullen graveolens Cullen leucanthum Cullen pogonocarpum Desmodium filiforme Desmodium muelleri Erythrina vespertilio Glycine canescens Indigastrum parviflorum Indigofera colutea Indigofera linifolia Indigofera monophylla Indigofera sessiliflora Indigofera trita Isotropis atropurpurea Lotus australis Rhynchosia cf. minima Sesbania cannabina Swainsona canescens Swainsona colutoides Swainsona formosa Swainsona kingii Swainsona leeana Tephrosia clementii Tephrosia aff. clementii (1) (M1/M2) Tephrosia aff. clementii (2) (M35.14) Tephrosia aff. densa Tephrosia rosea var. clementii Tephrosia supina Tephrosia aff. supina (ME Trudgen 12,357) Vigna lanceolata var. lanceolata Vigna lanceolata var. latifolia Zornia muelleriana **173: ZYGOPHYLLACEAE** Tribulus hirsutus Tribulus occidentalis

Tribulus platypterus Tribulus suberosus **183: POLYGALACEAE** Polygala aff. isingii Polygala sp. **185: EUPHORBIACEAE** Adriana tomentosa Euphorbia australis Euphorbia aff. australis type 1 (erect stems) Euphorbia aff. australis type 2 (prostrate) Euphorbia boophthona Euphorbia coghlanii Euphorbia aff. drummondii (MET 15211) Euphorbia schultzii Euphorbia tannensis subsp. eremophila Flueggea virosa subsp. melanthesoides Leptopus decaisnei Phyllanthus aridus (Priority 3 species) Phyllanthus lacunellus Phyllanthus maderaspatensis var. angustifolius 202: STACKHOUSIACEAE Stackhousia intermedia **207: SAPINDACEAE** Alectrvon oleifolius Dodonaea coriacea 220: TILIACEAE Corchorus laniflorus Corchorus tridens Corchorus walcottii Triumfetta appendiculata Triumfetta clementii Triumfetta maconochieana 221: MALVACEAE Abutilon amplum Abutilon cryptopetalum Abutilon cunninghamii Abutilon fraseri Abutilon ?lepidioicum Abutilon lepidum Abutilon aff. lepidum (1) (MET 15 352) Abutilon aff. lepidum (2) (MET 15 970) Abutilon aff. lepidum (3) (MET 16 120) Abutilon macrum Abutilon malvifolium Abutilon otocarpum Abutilon oxycarpum subsp. prostratum Abutilon trudgenii ms. (Priority 3 species) Gossypium australe Hibiscus brachysiphonius (Priority 3 species) Hibiscus aff. coatesii (site 664) Hibiscus leptocladus Hibiscus panduriformis Hibiscus aff. platychlamys (M9.15) Hibiscus aff. platychlamys (M35.11) Hibiscus aff. platychlamys (M39.14) Hibiscus aff. platychlamys (MET 15,067) Hibiscus aff. platychlamys (site 1139) Lawrencia viridigrisea \*Malvastrum americanum Sida ?cardiophylla (juvenile) Sida aff. cardiophylla (M79.27) Sida aff. cardiophylla (site 1086) Sida clementii Sida echinocarpa Sida aff. fibulifera (M100.22) Sida aff. fibulifera (M37.16) Sida aff. fibulifera (M69.12) Sida aff. fibulifera (M85.15) Sida aff. fibulifera (MET Site 1308) Sida aff. fibulifera (MET Site 1346)

Sida aff. fibulifera (oblong; MET 15 220) Sida aff. fibulifera 'var. L' Sida rohlenae Sida sp. 'rugose' Sida sp. Wittenoom (W.R. Barker 1962) (Priority 3 species) 223: STERCULIACEAE Keraudrenia nephrosperma Melhania oblongifolia \*Melochia pyramidata Waltheria indica 235: ELATINACEAE Bergia pedicellaris 236: FRANKENIACEAE Frankenia ambita Frankenia pauciflora 243: VIOLACEAE Hybanthus aurantiacus 248: PASSIFLORACEAE \*Passiflora foetida 263: THYMELEACEAE Pimelea ammocharis 265: LYTHRACEAE Ammannia baccifera Ammannia multiflora 269: RHIZOPHORACEAE Bruguiera exaristata Ceriops tagal Rhizophora stylosa 273: MYRTACEAE Corymbia hamersleyana Eucalyptus camaldulensis Eucalyptus victrix Melaleuca argentea Melaleuca glomerata Melaleuca linophylla 276: HALORAGACEAE Haloragis gossei 281: APIACEAE Trachymene oleracea 292: MYRSINACEAE Aegiceras corniculatum 293: PRIMULACEAE Samolus repens

# 294: PLUMBAGINACEAE Aegialitis annulata Muellerolimon salicorniaceum Plumbago zevlanica 301: OLEACEAE Jasminum didymum subsp. lineare **304: APOCYNACEAE** Wrightia saligna **305: ASCLEPIADACEAE** Cynanchum floribundum Sarcostemma viminale subsp. australe 307: CONVOLVULACEAE Bonamia media var. ?media Bonamia media var. villosa Bonamia pannosa Convolvulus remotus Evolvulus alsinoides Evolvulus alsinoides var. villosicalyx Evolvulus sp. Ipomoea coptica Ipomoea costata Ipomoea muelleri Ípomoea polymorpha Operculina aequisepala Polymeria ambigua Polymeria aff. ambigua Porana commixta 307A: CUSCUTACEAE Cuscuta victoriana **310: BORAGINACEAE** Ehretia saligna Heliotropium crispatum Heliotropium cunninghamii Heliotropium foliatum Heliotropium heteranthum Heliotropium inexplicitum Heliotropium ovalifolium Heliotropium sp. 1 Trichodesma zeylanicum 311: VERBENACEAE Clerodendrum floribundum var. angustifolium Clerodendrum tomentosum var. ? **312: AVICENNIACEAE** Avicennia marina 313: LAMIACEAE Basilicum polystachyon **315: SOLANACEAE** Datura leichhardtii Nicotiana benthamiana Nicotiana rosulata subsp. rosulata Solanum diversiflorum Solanum gabrielae Solanum horridum Solanum lasiophyllum

# 316: SCROPHULARIACEAE

Mimulus gracilis Peplidium sp. E (Flora of Australia) Stemodia grossa Stemodia kingii Striga squamigera **317: BIGNONIACEAE** Dolichandrone heterophylla 325: ACANTHACEAE Dicladanthera forrestii Rostellularia adscendens var. clementii 326: MYOPORACEAE Eremophila forrestii subsp. forrestii Eremophila longifolia Myoporum acuminatum 331: RUBIACEAE Oldenlandia crouchiana Oldenlandia sp. 'gilgai' Synaptantha tillaeacea var. tillaeacea 337: CUCURBITACEAE \*Citrullus lanatus \*Cucumis melo subsp. agrestis Mukia aff. maderaspatana sp. A Mukia aff. maderaspatana sp. B Mukia aff. maderaspatana sp. C Mukia aff. maderaspatana sp. D Mukia aff. maderaspatana sp. E Mukia aff. maderaspatana sp. F Mukia sp. D Flora of Australia (A.A.Mitchell PRP 1121) Trichosanthes cucumerina 341: GOODENIACEAE Goodenia forrestii Goodenia lamprosperma Goodenia microptera Goodenia omearana ms. (Priority 1 species) Goodenia stobbsiana Goodenia sp. 1 Scaevola spinescens Scaevola thesioides subsp. thesioides 345: ASTERACEAE \*Bidens bipinnata Blumea tenella Centipeda minima Flaveria australasica Pentalepis trichodesmoides Pluchea ferdinandi-muelleri Pluchea rubelliflora Pterocaulon sphacelatum Pterocaulon sphaeranthoides Streptoglossa decurrens Streptoglossa liatroides Streptoglossa sp. Vittadinia obovata Vittadinia / Minuria sp.

# Appendix E

**Rare Flora Report Forms** 

# DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT $\heartsuit$

von. Co	odenia onearana ms POPULATION No.:
	Priority Species 1 Partial Survey D Full Survey New Population
OM: M.Ma	TITLE: Bota Env Sciences SURVEY DATE: 17-4-00
GION: Plbe	DISTRICT: SHIRE:
e Ref.:	Nature Reserve       Private       Gravel Res. MRD       Gravel Res. Shire         National Park       Pastoral Lease       Rd. Verge MRD       Rd. Verge Shire         State Forest       VCL       Rail Reserve       Other Shire Res.         Water Reserve       Other       Specify:       Minure Reserve
CATION:	Site \$27 Austed survey area (see attached map); near
ATITUDE: <u>20</u> ANDFORM:	D * 58 '33 (#S)       LONGITUDE:       116 * 12 '10 5 #E       G.P.S. USED:       ASPECT:       IN         Hilltop       Cliff       Slope       Valley       Swamp       IN         Outcrop       Breakaway       Low Plain       Gully       Riverbank       IN         Ridge       Sand Dune       Flat       Drainageline       Lake Edge       In
)CK TYPE: OCK FORM: OIL TYPE: )IL COLOUR: OIL CONDITI(	Laterite       Granite       Dolerite       Limestone       Other:
EGETATION ( SSOCIATED S	CLASSIFICATION (Muir's): Eriachne benhamin / Eragnostis xerophila tussack iPECIES: As above also Corchorus tridensgrassiand. hamersleypness, too Indigastrum part florum
1. OF PLANTS: LEPRODUCTIV OLLINATORS Other observ	Mature: <u>720+</u> Seedlings:       Dead:       Actual D Estimate D Area Occupied:         /E STATE:       Flower bud D       Flower D       Immat. fruit D       Fruit D       Fruit Dehisced D       Vegetative D         S:       Native bees D       Honey bees D       Other insects D       Birds D       Mammals D         vations:
ONDITION O	FPOPULATION: Healthy Moderate Poor Disturbed Comment:
POTENTIAL TI Weeds	HREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disease       Prescribed Burning       Other       Comment:
ENCING:	Not Required Fenced Required Replace/Repair
.OADSIDE MA	ARKERS: Not Required Present Required Replace Reposition
OPY SENT T	0: Regional Office District Office Of Other Specify:
Signed:	hilade las Dale: <u>8-1-01</u>
OTE: More the	an one hox, in any section may be ticked. Map or further information may be given on the hack of this form.
- rease return con	mpreter form to Executive Director, Criteria, For Don Frag, Control and Wrong

# DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT $\heartsuit$

	POPULATION No.:	_
ON: Abi	Pinity Service 12 Partial Survey D Full Survey New Population	
DRF	PHONY Species LO SURVEY DATE: 16-4-00	_
M: Mimale	DISTRICT: SHIRE:	
Rel:	Map/Site Rcf.:	
ND STATUS:	Nature Reserve       Private       Gravel Res. MRD       Gravel Res. MRD       Gravel Res. Shire         National Park       Pastoral Lease       Rd. Verge MRD       Rd. Verge Shire       Other Shire Res.         State Forest       Other       Specify:       Main Specify:       Other Shire Res.	
CATION:	ite 9 Austeel survey area ( see attached map) new	
Cap	Preston, W.A.	
	ASPECT:	
TITUDE: <u>21</u> NDFORM:	• 04 '40.4*S       LONGITUDE: 116 '08 '478L       Sind Control         Hilltop       Cliff       Slope       Valley       Swamp         Outcrop       Breakaway       Low Plain       Gully       Riverbank         Ridge       Sand Dune       Flat       Drainageline       Lake Edge	
)CK TYPE: DCK FORM: DIL TYPE: DIL COLOUR: DIL CONDITI(	Laterite       Granite       Dolerite       Limestone       Other:	
SSOCIATED S <u>A</u> . of plants: Reproductive Ollinators	ECIES: As above, also Availe and strong of A conducte says for a second seco	
Other observ	tions: Disturbed Comment:	
ONDITION O	POPULATION: Healthy Moderate Poor Busineed Comment	
POTENTIAL T Weeds	REATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disease       Prescribed Burning       Other       Comment:	
FIRE HISTOR	Not known a Burn in Ma Herb of Other	
DUCHER SP	CIMEN: District Actor	
ATTACHED:	Map Mudmap Mustration C Replace/Repair	
ENCING:	Not Required Fenced Required Replace Reposition	J
OADSIDE M	RKERS: Nol Required Present Present Required Present	
THER COM	IENTS (include action taken/required):	_
OPY SENT 7	D: Regional Office District Office Office Specify.	
	Dale: $3 - 1 = 01$	
Signed:	in care i the second se	
Signed:	n one box, in any section may be licked. Map or further information may be given on the back of this form.	

# DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT $\bigtriangledown$

vov. Ab.	POPULATION No.:
	Priority Species 3 Partial Survey Full Survey New Population
OM: mm	vier- Botanist TITLE: Bota Env Sciences SURVEY DATE: 17-4-00
GION: Pibe	DISTRICT: SHIRE:
e Ref.:	Map/Site Rel.:
ND STATUS:	Nature Reserve     Private     Private     Gravel Res. MRD     Gravel Res. Shire       National Park     Pastoral Lease     Rd. Verge MRD     Rd. Verge Shire       State Forest     VCL     Rail Reserve     Other Shire Res.
ICATION: _S	pe Preston, WA.
TITUDE: 21	1 ° 03 '55-9"S LONGITUDE: 116 ° 08 '56-1"E G.P.S. USED: ASPECT:
ANDFORM:	Hilltop     Cliff     Slope     Valley     Swamp       Outcrop     Breakaway     Low Plain     Gully     Riverbank       Ridge     Sand Dune     Flat     Drainageline     Lake Edge
)CK TYPE: OCK FORM: OIL TYPE: )IL COLOUR: OIL CONDITIC	Laterite       Granite       Dolerite       Limestone       Other:         Sheet       Boulder       Fluviatile Gravel       Concretionary Gravel       Gravel         Sand       Loam       Clay       Peat       Gravel       Gravel         Red       Red Brown       Yellow       White       Grey       Grey         ON:       Inundated       Moist       Dry       Saline       Other:
FORTATION (	CLASSIFICATION (Muir's): Aracia tunida tall shrusland
SSOCIATED S	iPECIES: As above also Cognilia hamereleyena, Acaia ancistraca
). OF PLANTS:	Mature: - ? Seedlings: Dead: Actual C Estimate C Area Occupied:
REPRODUCTIV	VE STATE: Flower bud D Flower D Immat. fruit D Fruit D Fruit Dehisced D Vegetative
Ollier observ	S: Native bees Honey bees Other insects Birds Mammals
ONDITION OI	FPOPULATION: Healthy Dr Moderate D Poor D Disturbed D Comment:
POTENTIAL TI	HREATS: Firebreaks Mining Recreational activities Roadworks Grazing
FIRE HISTORY	Y: Not known Burnt in 1995? Summer Autumn Winter Spring
<b>DUCHER SPE</b>	SCIMEN: District Herb. D WA Herb. D Other C
ATTACHED: ENCING:	Map Mudmap Mudma
OADSIDE MA	ARKERS: Not Required Present Required Replace Reposition
OPY SENT T	O: Regional Office D District Office O Other - Specify:
Signed:	hirade le Dale: 8-1-01
OTE: More tha	an one box, in any section may be ticked. Map or further information may be given on the back of this form, upleted form to Executive Director, CALM PO Box 104, COMO WA 6152
- ACHINE COLUMN COL	more to the to the control of the to the control of the to

# DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT $\heartsuit$

vor. Ab.	blog toudeenin POPULATION No .:
DRF D	Priority Species 3 Partial Survey Full Survey New Population
OM: m.m.	ier - Batanot TITLE: Biota Env Sucres SURVEY DATE: 17-4-00
GION: PILbe	DISTRICT: SHIRE:
e Ref.:	Maprone Ref Brivela Gravel Res MRD Gravel Res Shire
IND STATUS:	National Park Pastoral Lease Rd. Verge MRD Rd. Verge Shire
	State Forest U VCL Rail Reserve O Other Shire Res.
	Water Reserve D Other D Specify: Mining lease
CATION: C	to 26 Auster survey area (see attacked map) near
	ane Prestan WA
ATITUDE: 21	<u>• 00 · 52-2"S</u> LONGITUDE: <u>116 • 11 · 45 6"E</u> G.P.S. USED: ASPECT:
ANDFORM:	Hilliop Cliff Slope Valley Swamp
	Outcrop Breakaway L Low Plain Gully Riverbank
	Ridge L Sand Dune Flat Dramageline L Lake Edge
	Firebreak
ICK TYPE:	Sheet Boulder Fluviatile Gravel Concretionary Gravel
OLL TYPE	Sand Loam Clay Peat Gravel
HL COLOUR:	Red Brown Vellow Vellow White Grey
OIL CONDITIO	N: Inundated Moist Dry Dry Saline Other:
EGETATION C	LASSIFICATION (Muir's): Scattered Acane inceguilatera tall shrips over
SSOCIATED SI	ECIES: Also Acaua inacerillatera hummocie grassiona.
1. OF PLANTS: REPRODUCTIV OLLINATORS: Other observ	Mature:
ONDITION OF	POPULATION: Healthy Moderate Poor Disturbed Comment:
POTENTIAL TH	REATS: Firebreaks Mining Recreational activities Roadworks Grazing
	Autumn Winter Spring
FIRE HISTORY	
<b>DUCHER SPE</b>	CIMEN: District Herb. WA Herb. Other C
ATTACHED:	Map Mudmap III Illustration Photo Field Notes
ENCING:	Not Required Fenced Required Replace/Repair
OADSIDE MA	RKERS: Not Required D Present D Required Replace Reposition D
THER COMM	ENTS (include action taken/required):
then comm	
OPY SENT TO	: Regional Office District Office Office Other Specify:
Signed:	Date: 8-1-01
Manager and States	
OTE: More the	i one hox, in any section may be ticked. Map or further information may be given on the back of this form.
OTE: More tha	none box, in any section may be ticked. Map or further information may be given on the back of this form.

# DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT RARE FLORA REPORT FORM

all. I'm	I UI ULA HORANA
UN: MOU	Partial Survey D Full Survey New Population
DRF U	Priority Species Lo 3 Fritting Control SURVEY DATE: 17-4-00
M: <u>m.</u> m.	Naver - Botanist III LE. Diotal Erity Butters SHIRE:
GION: PUDO	Map/Site Ref.: Reserve No.:
Rel.:	Private Gravel Res. MRD Gravel Res. Shire
ID STATUS:	Nature Reserve D Pastoral Lease Rd. Verge MRD Rd. Verge Shire
	State Forest VCL VCL Rail Reserve Other Shire Res.
	Water Reserve O Other D' Specify: Mining lease
<b>- 1.1.1</b> (12	main histing a crea (see attached map) near
CATION:	bite 32, Austeel success a same F
(	ape Preston, Weth
	ASPECT:
TITUDE: <u>A</u>	Stone Valley Swamp
ANDFORM:	Hilltop
	Outcrop D Breakilway D Elat D Drainageline Lake Edge
	Ridge C Sand Dune D
	Fireoreak
ICK TYPE:	Laterite Granite Gravel Concretionary Gravel
JCK FORM:	Sneet D Bounder Clay Clay Peat Gravel
DIL TYPE:	Brown Vellow White Grey
ML COLOUR:	ON: Inundated Moist Dry Dry Saline Other:
JIL CORDITI	a supportion adding stepsoerma high shrubland over dense
EGETATION	CLASSIFICATION (Mains). Addie Decare friendig « (encirus grasses.
SSOCIATED S	SPECIES: As above and the second and and and
	actual & Estimate Actual Actual Actual Actual Area Occupied:
). OF PLANTS:	: Mature: Seedlings: Dead: Action = International Vegetative
REPRODUCTI	VE STATE: Flower bud   Flower   Immat. Irun   France France Prover bud   Flower   Immat. Irun   France Prover Bud   Flower   Immat. Irun   France Prover Bud   Flower   Flower   Immat. Irun   France Prover Bud   Flower   Flower   Immat. Irun   France Prover Bud   Flower   Flower   Immat. Irun   Flower   Flowe
<b>JLLINATOR</b>	S: Native bees Honey bees Other insects Birds Mammais
Other obser	valions:
ONDITION C	FPOPULATION: Healthy Moderate Poor Disturbed Comment:
DOTENTIL	
FUTENTIAL I	THREATS: Firebreaks I Mining I Recreational activities Roadworks Grazing
Vorde	THREATS: Firebreaks Mining Recreational activities Roadworks Grazing
Weeds	THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disease       Prescribed Burning       Other       Comment:
Weeds	THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disease       Prescribed Burning       Other       Comment:
Vecds GIRE HISTOR	THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disease       Prescribed Burning       Other       Comment:
FIRE HISTOR DUCHER SP	THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disease       Prescribed Burning       Other       Comment:
FIRE HISTOR DUCHER SP ATTACHED:	THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disease       Prescribed Burning       Other       Comment:
Weeds FIRE HISTOR DUCHER SP ATTACHED: ENCING:	THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disease       Prescribed Burning       Other       Comment:
Weeds Weeds FIRE HISTOR DUCHER SP ATTACHED: ENCING:	THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disense       Prescribed Burning       Other       Comment:
Weeds Weeds GIRE HISTOR JUCHER SP ATTACHED: ENCING: OADSIDE M THER COM	THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disease       Prescribed Burning       Other       Comment:
FIRE HISTOR JUCHER SP ATTACHED: ENCING: OADSIDE M THER COM	THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disease       Prescribed Burning       Other       Comment:
FOTENTIAL T Weeds FIRE HISTOR DUCHER SP ATTACHED: ENCING: OADSIDE M THER COM	THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disease       Prescribed Burning       Other       Comment:
Vecds FIRE HISTOR DUCHER SP ATTACHED: ENCING: OADSIDE M THER COM OPY SENT	THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disease       Prescribed Burning       Other       Comment:
Vecds FIRE HISTOR DUCHER SP ATTACHED: ENCING: OADSIDE M THER COM OPY SENT Signed:	THREATS:       Firebreaks       Mining       Prescribed Burning       Other       Comment:
Vecds Vecds FIRE HISTOR DUCHER SP ATTACHED: ENCING: OADSIDE M THER COM OPY SENT Signed:	THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disease       Prescribed Burning       Other       Comment:
Vecds Wecds C FIRE HISTOR DUCHER SP ATTACHED: ENCING: OADSIDE M THER COM OPY SENT Signed: OTE: More to	FIIREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Disease       Prescribed Burning       Other       Comment:

# DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT V RARE FLORA REPORT FORM

IXON: Abutilen trudgenii	POPULATION No.:
DRF Priority Species 3 Partial Survey	Full Survey D New Population
(OM: M Maier-Botanist TITLE: Biota Env 5	SURVEY DATE: 19-4-00
EGION: Pilbara DISTRICT:	SHIRE:
	Gravel Res MRD Gravel Res Shire
AND STATUS: Nature Reserve D Private D	Rd Verge MRD Rd Verge Shire
State Forest VCL	Rail Reserve O Other Shire Res
Water Reserve O Other Of S	specify: Mining lease
MATION. SIE HE ANARA CONTRACTOR	(we attached and) need
Cape Preston W.A	
ATITUDE: 21 °00 '35-1 "S LONGITUDE: 116 ° 09'	Coord "E G.P.S. USED: La ASPECT:
ANDFORM: Hilltop Cliff Slo	ope Valley Swamp U
Dutcrop Breakaway L Low PL	all Oully Riveroank
Firebreak	
ICK TYPE: Laterite Granite Dolerite	Limestone O Other:
TOCK FORM: Sheet D Boulder D Fluviatile Grave	el 🖸 Concretionary Gravel 🗖
DIL TYPE: Sand Loam Cla	w 🖸 Peat 🖸 Gravel 🗍
JIL COLOUR: Red OrgeBrown Yello	w 🔲 🤄 White 🔲 Grey 🗍
OIL CONDITION: Inundated D Moist D I	Dry Saline Other:
EGETATION CLASSIFICATION (Muir's): A crice concrea	, A. elachantia, A. turnida tall open
.3SOCIATED SPECIES: snowsland over T	tridue wheene hummark grassland
As above, also Saevola spinesiens in	digotera monophylla.
1. of PLANTS: Mature: Seedlings: Dead:	Actual 🖸 Estimate 🔲 Area Occupied:
REPRODUCTIVE STATE: Flower bud D Flower D Immat.	fruit 🗍 Fruit 🗍 Fruit Dehisced 🗍 Vegetative 🗐
Other observations:	Other insects D Birds D Mammals D
ONDITION OF POPULATION: Healthy D Moderate D Burnt relatively recen	Poor Disturbed Comment:
POTENTIAL THREATS: Firebreaks Mining D Recr	reational activities 🛛 Roadworks 🔲 Grazing 🗖
Werds Disease Prescribed Burning Other	Comment
Summer Story: Not known D Burnt in 19 2000 Summer	
JUCHER SPECIMEN: District Herb. U WA Herb. U	Other U
ATTACHED: Map I Mudmap I Illustration L	Plioto Field Notes
ENCING: Not Required 🗍 Fenced 🗍 Required	1 🖸 Replace/Repair 🗖
OADSIDE MARKERS: Not Required D Present	Required Replace Reposition
THER COMMENTS (include action taken/actional)	
OPY SENT TO: Regional Office District Office	Other D Specify:
Signed: Mulach le D	ale: $\frac{8-1-01}{2}$
OTT Marg than one box in any raction may be ticked Man on further	e information may be given on the back of this form
	i mjormanon maje be gren on me rack of ma form.

# DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT V

vor Ahat	Ion trudgenii	POPULATION No.:
DRF D	Priority Species 3 Partial Survey	Full Survey 🔲 New Population 🗗
OM: m. Maie	- Botanist TITLE: Biota Enu Sue	nces SURVEY DATE: 23-4-00
GION: Pibers	DISTRICT:	SHIRE: Reserve No :
e Ref.:	Nature Reserve Private G National Park Pastoral Lease G State Forest VCL U Water Reserve Other Specif	Bravel Res. MRD     Gravel Res. Shire       Rd. Verge MRD     Rd. Verge Shire       Rail Reserve     Other Shire Res.
ICATION: _Sim	e 79 Austeel survey area ( ar cape Preston, WA.	see attacted map)
ATITUDE: <u>21 °</u> ANDFORM: (	04 '06.5"S       LONGITUDE: 116° 13' 195         Hilliop       Cliff       Slope         Dutcrop       Breakaway       Low Plain         Ridge       Sand Dune       Flat         Other       Other       Other	"E"       G.P.S. USED:       ASPECT:         J       Valley       Swamp         Gully       Riverbank         Drainageline       Lake Edge
)CK TYPE: L: OCK FORM: OIL TYPE: )IL COLOUR: OIL CONDITION:	aterite Granite Dolerite Sheet Boulder Fluviatile Gravel Sand Loam Clay Red Brown Yellow Inundated Dry	Limestone Other: Concretionary Gravel Gravel Gravel White Grey Saline Other:
EGETATION CLA	ISSIFICATION (Muir's): Scattered Acacia i CIES: Triodia wiseena	hummock greissland.
1. OF PLANTS: N REPRODUCTIVE S OLLINATORS: Other observation ONDITION OF P	Vature: Seedlings: Dead: A STATE: Flower bud D Flower D Immat. fruit Native bees D Honey bees D Other ons: OPULATION: Healthy D Moderate D	Actual       Image: Second state inserts       Image: Area Occupied:
POTENTIAL THRI Weeds II FIRE HISTORY: DUCHER SPECH ATTACHED: ENCING: No OADSIDE MARH THER COMME	EATS: Firebreaks Mining Recreation Disease Prescribed Burning Ollier Not known Burnt in 19 1997 Summer O MEN: District Herb. WA Herb. Map Mudinap Hilustration Map Hilustration Sequired Fenced Required KERS: Not Required Present Required NTS (include action taken/required):	onal activities Roadworks Grazing   Comment:
OPY SENT TO:		Other Specify:
Signed: <u>A</u>	<u>Aacle</u> <u>Le</u> Date: <u>Date:</u> Date:	8-1-00 formation may be given on the back of this form.
DRF       Priority Species       3       Partial Survey       Full Survey       New Population         OM:       Maiser - Botmet TITLE:       Beta Enu Sciences       SURVEY DATE:       IS-4-00         CGION:       Pilbara       DISTRICT:       SHIRE:       Reserve No.:         Ref.:       Map/Site Ref.:       Reserve       Reserve No.:       Reserve No.:         ND STATUS:       Nature Reserve       Private       Gravel Res. MRD       Gravel Res. Shire         ND STATUS:       Nature Reserve       Private       Red. Verge MRD       Rd. Verge Shire         State Forest       VCL       Rail Reserve       Other Specify:       Maing Lease         VCL       Rail Reserve       Other Specify:       Maing Lease       Other Shire Res.         VCL       Rail Reserve       Other Specify:       Maing Lease       Other Shire Res.         VCL       Rail Reserve       Other Specify:       Maing Lease       Other Shire Res.       District Res.         VCL       Rail Reserve       Other Specify:       Maing Lease       Swamp Lease       Swamp Lease         VCL       Rail Reserve       Cliff       Slope       Valley       Swamp Lease         ATHTUDE:       21 ° 03 ' 505"S       LONGITUDE:       IL6 ° 06 ' 4		
---		
OM:       Majer - Botanst TITLE:       Bota Enu Sciences       SURVEY DATE:		
GION:       Pibera       DISTRICT:       SHIRE:         Spef.:       Map/Site Ref.:       Reserve No.:       Reserve No.:         ND STATUS:       Nature Reserve       Private       Gravel Res. MRD       Gravel Res. Shire         ND STATUS:       Nature Reserve       Private       Gravel Res. MRD       Gravel Res. Shire       Reserve No.:         ND STATUS:       Nature Reserve       Private       Gravel Res. MRD       Gravel Res. Shire       Reserve         ND STATUS:       National Park       Pastoral Lease       Rd. Verge MRD       Rd. Verge Shire       Rd. Verge Shire         State Forest       VCL       Rail Reserve       Other Specify:       Maing Lease       Other Specify:       Maing Lease         NCATION:       Side 6       Avsteel       Gravel green       (See       Attached       map)       new         VTITUDE:       21 ° 03 · 50 5''S       LONGITUDE:       116 ° 09 · 472"E       G.P.S. USED:       ASPECT:         VTITUDE:       21 ° 03 · 50 5''S       LONGITUDE:       116 ° 09 · 472"E       G.P.S. USED:       Aspect:         NDFORM:       Hillop       Cliff       Slope       Valley       Swamp       Riverbank         Outcrop       Breakaway       Low Plain       Gully       Ri		
Ref.:		
OCATION:       Sile 6       Austeal       average and formed       attached       map       new         ATHTUDE:       21 ° 03 ' 50.5"S       LONGITUDE:       116 ° 09 ' 472"E       G.P.S. USED:       ASPECT:         ATHTUDE:       21 ° 03 ' 50.5"S       LONGITUDE:       116 ° 09 ' 472"E       G.P.S. USED:       ASPECT:         ANDFORM:       Hilliop       Cliff       Slope       Valley       Swamp         Outcrop       Breakaway       Low Plain       Gully       Riverbank       Inverbank         NDFORM:       Hilliop       Sand Dune       Flat       Drainageline       Lake Edge       Inverbank         Other       Other       Other       Inverbank       Inverbank <t< td=""></t<>		
THTUDE:       21 ° 03 ' 50 5"S       LONGITUDE:       116 ° 09 ' 472"E       G.P.S. USED:       ASPECT:         INDFORM:       Hilltop       Cliff       Slope       Valley       Swamp         Outcrop       Breakaway       Low Plain       Gully       Riverbank       Riverbank         NDFORM:       Hilltop       Sand Dune       Flat       Drainageline       Lake Edge         OCK TYPE:       Laterite       Granite       Dolerite       Limestone       Other:         OCK FORM:       Sheet       Boulder       Fluviatile Gravel       Concretionary Gravel       Gravel         OIL TYPE:       Sand       Cloam       Clay       Peat       Gravel       Gravel         OUL COL OUR:       Red       Brown       Yellow       White       Grey       Grey		
OCK TYPE:       Laterite       Granite       Dolerite       Limestone       Other:		
DIL CONDITION: Inundated D Moist D ~ Dry Dr Saline D Other:		
EGETATION CLASSIFICATION (Muirs): <u>Marchander de se recentras</u> cultaris grassientes SSOCIATED SPECIES: <u>As above</u> also Acade pyrificilies		
h. of PLANTS:       Mature:       Seedlings:       Dead:       Actual       Estimate       Area Occupied:         LEPRODUCTIVE STATE:       Flower bud       Flower       Immat. fruit       Fruit       Fruit Dehisced       Vegetative         DLLINATORS:       Native bees       Honey bees       Other insects       Birds       Mammals         Other observations:		
OTENTIAL THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Weeds       Disease       Prescribed Burning       Other       Comment:		
OPY SENT TO: Regional Office District Office Office Office Specify:		
OTE: More than one box, in any section may be ticked. Map or further information may be given on the back of this form.		

#### DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT $\smile$ RARE FLORA REPORT FORM

VON: T.P	facture tenui culmis	POPULATION No.:	
DRF 0	Priority Species 2 3 Partial S	urvey 🗍 Full Survey 🗍	New Population
OM: m.ma	ier Botanist TITLE: Biota En	J. Swences, SURVEY DAT	E: 17-4-00
510N: P.16	DISTRICT:	SHIRE:	rve No.:
ND STATUS:	Nature Reserve     Private       National Park     Pastoral Lease       State Forest     VCL       Water Reserve     Other	Gravel Res. MRD	Gravel Res. Shire Rd. Verge Shire Other Shire Res.
CATION:	New Sile 25, Austreel su near Cape Preston, WA.	rvey area (see at	tailed map);-
TITUDE: <u>21</u> NDFORM:	• ∞ • 16·8″S       LONGITUDE: 16 • 1         Hilltop       Cliff         Outcrop       Breakaway         Ridge       Sand Dune         Firebreak       Ot	1     '46'S "E     G.P.S. USED:       Slope     Valley       ow Plain     Gully       Flat     Drainageline       her	ASPECT: Swamp Riverbank Lake Edge
OCK TYPE: OCK FORM: OL TYPE: OL COLOUR: OL CONDITIC	Laterite Granite Granite Dolerite Sheet Boulder Fluviatile Sand Loam Fluviatile Red Brown Source DN: Inundated Moist	Gravel Limestone O Gravel Concretionary Clay Peat O Yellow White O Dry Saline O	ther: Gravel Gravel Gravel Grey Other:
GETATION C SOCIATED SI	PECIES: As above also Arac mguta, T. pungens Mature: Seedlings: Dead:	Actual [] Estimate [	J Area Occupied:
EPRODUCTIV DLLINATORS: Other observ	/E STATE: Flower bud  Flower  Im : Native bees  Honey bees	umat, fruit D Fruit D Fruit Other insects D Bin	Dehisced Vegetative ds Mammals
ONDITION OF	F POPULATION: Healthy Dr Moderate	Poor Disturbed	Comment:
OTENTIAL TI	IREATS: Firebreaks I Mining I Disease Prescribed Burning I OU	Recreational activities D Ro	adworks Grazing
IRE HISTORY	1: Not known F Burnt in 19 S CIMEN: District Herb. F WA Herb	Summer L Autumn L	Winter Spring
TTACHED:	Map 🛛 Mudmap 🗖 Illustrati	on D Plioto D Fic	Id Notes
ENCING: OADSIDE MA	Not Required Fenced Re ARKERS: Not Required Present	quired Replace/Repair   Required Replace	C Reposition
THER COMM	AENTS (include action taken/required):		
OPY SENT TI	0: Revioual Office District Office	Other D- Specify:	
Signed:	hitagle te	Date: <u>8-1-01</u>	
OTE: More tha	in one hox, in any section may be licked. Map or j	further information may be given on the second seco	on the back of this form.
TIPTCO PALIFE	THE REAL PROPERTY AND A RE	UNAUT. COMMONITA VIJE	

#### DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT $\smile$ RARE FLORA REPORT FORM

vor Hibis	POPULATION No.:
	Priority Species 3 Partial Survey Full Survey New Population
OM: m.m	micr - Botanist TITLE: Biota Env. Surences SURVEY DATE: 15-4-00.
GION: P.TL	DISTRICT: SHIRE:
e Ref.:	Map/she Ret.
ND STATUS:	Nature Reserve Private Private Graver Kes. MRD B Glaver Kes. Shire D
	National Park D Pastoral Lease D Rul Reserve Other Shire Res.
	Water Parente O Other I Specify: Mining lease
	Water Reserve D outer
CATION:	Dite 3 Austeel survey a ear see cannot op
	near cape prestor with
TITUDE 2	
	Hillion Cliff Slope Valley Swamp
ANDFURM:	Outcrop Gully Breakaway Gully Low Plain Gully Gully Riverbank
	Ridge Sand Dune Flat Drainageline Lake Edge
	Firebreak 🗍 Other 🗖
ICK TYPE:	Laterite Granite Dolerite Limestone Other:
OCK FORM:	Sheet Boulder Fluviatile Gravel Concretionary Gravel
DIL TYPE:	Sand Loam Clay Peat Gravel
JIL COLOUR	Red Red Brown Yellow White Grey
OIL CONDITI	ON: Inundated Moist A Dry Dry Saline U Other:
EGETATION	CLASSIFICATION (Muir's): Acadie xiphophylla open shristend
SSOCIATED S	SPECIES: Aristida contarta & Cenchrus culturis Sida aff.
	hibuliféra Triodia pungens.
1. OF PLANTS:	Mature: _? Seedlings: Dead: Actual L' Estimate L Area Occupied:
EPRODUCTI	VE STATE: Flower bud 🗍 Flower 🕞 Immat. Truit 🗍 Fruit 🗍 Fruit Dehisced 🗍 Vegetative
ALLINATOR	S. Native bees Honey bees Other insects Birds Mammals
Other obser	valions:
ONDITION O	FROPULATION: Healthy A Moderate Poor Disturbed Comment:
on brinder o	
OTENTIAL T	IIREATS: Firebreaks I Mining I Recreational activities Roadworks I Grazing
Weeds	Disease Prescribed Burning Other Comment:
FIRE HISTOR	V. Not known D Burnt in 19 Summer Autumn Winter Spring
Ducuence	FORMER DE WA Harb Pt Other D
JUCHERSPI	ECIMIEN: District Herb. D WA Herb. D Other D
ATTACHED:	Map Mudimap Mudimap Mustration Photo Field Notes
ENCING:	Not Required Fenced Required Replace/Repair
OADSIDE M	ARKERS: Not Required Present Required Replace Reposition
THER COM	MENTS (include action taken/required):
THEN COM	aren is (menue action taketorequired).
OPY SENT T	10: Regional Office District Office Office Other Specify:
Signed:	hirach le Dale: 8-01-01
OTE: More th	an one box, in any section may be ticked. Map or further information may be given on the back of this form.
r lease return co	ampleted form to Executive Director, CALM, PO Box 104, COMO WA 6152

# DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT $\heartsuit$

DRF       Priority Species	VON: Hobiscus braches phones POPULATION No .:	
10M:       Online:       Other:       Starter:       Starte	DRF Priority Species 3. Partial Survey Full Survey New Population	-
COLON:       DISTRICT:       SHIRE:         Ref::	OM: M. Maier Botonist TITLE: Biota Env. Success SURVEY DATE: 17-4-00	
b Rd:       Institute The second of the second	GION: Pibara DISTRICT: SHIRE:	
ND STATUS:       Nature Reserve       Pastoral Losse ()       Ref. Verge NRD ()       Ref. Verge NRD ()         Nature Reserve ()       Other ()       Rail Reserve ()       Other Shire Res. ()         NATURE Reserve ()       Other ()       Specify:	e Ref.: Map/Site Ref.: Reserve Non.	7
ICATION:       Size       22       Austeed       Sources area       Case       Attached       Ample: 1         ITTUDE:       21.º 02/25.9"S       LONGITUDE:       IIC * II 'IL 5 'E'       G.P.S. USED:       ASPECT:         ANDFORM:       Hillop       Breakway       Low Plain       Gully       Riverbank         Ridge       Sand Dune       Fit       Drainageline       Lake Edge         Firebreak       Granite       Dolerite       Limestone       Other:         OCK FORM:       Steet       Boulde:       Fluviatile Gravel       Concretionary Gravel       Free         JLL TYPE:       Sand       Boulde:       Fluviatile Gravel       Concretionary Gravel       Gravel       Free         JLL COLOUR:       Red       Bounde:       Fluviatile Gravel       Concretionary Gravel       Gravel       Gravel         JLL COLOUR:       Red       Bounde:       Fluviatile Gravel       Concretionary Gravel       Gravel       Gravel         JLL COLOUR:       Red       Bounde:       Poor       Saline       Other:         SOCIATED SPECIES:       Accusat       Cargen Processing       Accusat       Frain Dehiseed       Vegetative         JLL NATORS:       Nalive bees       Other       Frain	ND STATUS:       Nature Reserve       Private       Private       Gravel Res. MRD       Gravel Res. Shire       G	j ]
ATTTUDE:       21.° OZ'35-9*S       LONGITUDE:       11.6 ° 11 '11.5 *E G.P.S. USED:       ASPECT:         ANDFORM:       Hilliop       Cliff       Slope       Valey       Swamp         Ridge       Breakaway       Low Plain       Oully Plant       Riverbank         Ridge       Sand Dune       Flat       Drainageline       Lake Edge         JCK TYPE:       Laterite       Granite       Dolerite       Linestone       Other:         JCK TYPE:       Sand       Boulder       Fluviatile Gravel       Concretionary Gravel       Gravel         OIL CONDR:       Red       Boulder       Fluviatile Gravel       Concretionary Gravel       Gravel         OIL COLOUR:       Red       Brown       Yellow       White       Gravel       Gravel         OIL CONDITION:       Inundated       Moist       > Drainageline       Area Occupied:       Sociace         SOCIATED SPECIES       Flat.       Discource       Area Occupied:       Sociace       So	ICATION: <u>Site 22 Austeel survey area (see attached map)</u> near cape Preston, W.A	
ANDFORM:       Hillop       Chiff       Slope       Valley       Swamp         Outcrop       Breakaway       Low Plain       Gully       Riverbank         Bidge       Sand Dune       Flat       Drainageline       Lake Edge         JCK TYPE:       Laterite       Granite       Dolerite       Limestone       Other:         JCK TYPE:       Laterite       Granite       Dolerite       Limestone       Other:         JL COLOUR:       Red       Brown       Yellow       White       Gravel         JL COLOUR:       Red       Brown       Yellow       White       Gravel         JL COLOUR:       Red       Moist       Concretionary Gravel       Gravel         JL COLOUR:       Red       Brown       Yellow       White       Gravel         JL COLOUR:       Red       Brown       Yellow       White       Gravel         JSOCIATED SPECIES:       Accusa       Science Science       Gravel       Gravel         JSOCIATED SPECIES:       Mature:       Z Seedlings:       Dead:       Accusa       Fruit       Fruit       Manmals         JLINATORS:       Native bees       Honey bees       Other insects       Birds       Manmals	ATITUDE: G.P.S. USED: ASPECT:	
JCK TYPE:       Laterile       Granite       Dolerite       Limestone       Other:         OCK FORM:       Siteet       Boulder       Fluviatile Gravel       Concretionary Gravel       Gravel         OIL TYPE:       Sand       Loan       Fluviatile Gravel       Peat       Gravel       Gravel         OIL CONDITION:       Red       Brown       Yellow       White       Gravel       Gravel         OIL CONDITION:       Inundated       Moist       Concretionary Gravel       Gravel       Gravel         SOCIATED SPECIES:       Formation       Actual       Estimate       Area Occupied:         SSOCIATED SPECIES:       Formation       Actual       Estimate       Area Occupied:          Area occupied:       Actual       Estimate       Area Occupied:          SSOCIATED SPECIES:       Flower bud       Flower       Immat. fruit       Fruit Debisced       Vegetative          OPLANTS:       Native bees       Honey bees       Other insects       Birds       Mammals         OLLINATORS:       Native bees       Honey bees       Other insects       Birds       Grazing         OLLINATORS:       Native bees       Moderate       Poor       Disturbed       Com	ANDFORM: Hilltop Cliff Slope Valley Swamp Outcrop Breakaway Low Plain Gully Riverbank Ridge Sand Dune Flat Drainageline Lake Edge Firebreak Other Other	
EGETATION CLASSIFICATION (Muir's):       Accura biggering Accurate Accurates biggering         .socclated SPECIES:       Encarbore beaching Accurate Accurates Ac	OCK TYPE:       Laterite       Granite       Dolerite       Limestone       Other:         OCK FORM:       Sheet       Boulder       Fluviatile Gravel       Concretionary Gravel       Gravel         OIL TYPE:       Sand       Loam       Clay       Peat       Gravel       Gravel         OIL COLOUR:       Red       Brown       Yellow       White       Grey       Grey         OIL CONDITION:       Inundated       Moist       Yellow       Saline       Other:	]
h. of PLANTS:       Mature:	EGETATION CLASSIFICATION (Muir's): <u>Acadia Eulerosperma</u> A. corialea his shr SSOCIATED SPECIES: <u>L'Ériachne</u> benhamii, Aladia incequillatera Triodia	epack
2OTENTIAL THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Grazing         Weeds       Disease       Prescribed Burning       Other       Comment:	n. of PLANTS:       Mature:       Seedlings:       Dead:       Actual L' Estimate L' Area Occupied:         LEPRODUCTIVE STATE:       Flower bud L' Flower L' Immat, fruit L' Fruit Dehisced L' Veget:       DLLINATORS:       Native bees L' Honey bees L' Other insects L' Birds L' Mammals         Other observations:	ative
FIRE HISTORY:       Not known       Burnt in 19	Veeds Disease Prescribed Burning Outer Comment:	ng 🗖
ATTACHED:       Map       Mudmap       Illustration       Pluoto       Field Notes         ENCING:       Not Required       Fenced       Required       Replace/Repair       Illustration         .OADSIDE MARKERS:       Not Required       Present       Required       Replace       Reposition         .OADSIDE MARKERS:       Not Required       Present       Required       Replace       Reposition         THER COMMENTS (include action taken/required):	FIRE HISTORY: Not known B Burnt in 19 Summer Autumn Winter Spring DUCHER SPECIMEN: District Herb. WA Herb. Other O	
OADSIDE MARKERS:       Not Required       Present       Required       Replace       Reposition         THER COMMENTS (include action taken/required):	ATTACHED: Map Mudmap Illustration Photo Field Notes	
OPY SENT TO:     Regional Office     District Office     Other     Specify:       Signed:	OADSIDE MARKERS: Not Required D Present Required Replace Replace Reposition THER COMMENTS (include action taken/required):	
OPY SENT TO:     Regional Office     District Office     Other     -       Signed:		
	OPY SENT TO: Regional Office District Office Doller - Specify: Signed: Minach Le: Date: 17-4-00	
clease return completed form to Executive Director, CALM, PO Box 104, COMO WA 6152	OTE: More than one box, in any section may be ticked. Map or further information may be given on the back of this form clease return completed form to Executive Director, CALM, PO Box 104, COMO WA 6152	
RECORDS: PLEASE FORWARD TO ADMINISTRATIVE OFFICER, FLORA, WILDLIFE BRANCH	RECORDS: PLEASE FORWARD TO ADMINISTRATIVE OFFICER, FLORA, WILDLIFE BRANCH	

#### DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT RARE FLORA REPORT FORM

AXON: Hibiscuss brackyciphonius POPULATION No .:	
DRF D Priority Species 2 3. Partial Survey D Full Survey New Population	F
KOM: M. Maier Botaist TITLE: Biota Env. Sciences SURVEY DATE: 17-4-00	H.
EGION: <u>Pibara</u> <u>DISTRICT:</u> <u>SHIRE:</u> <u>Man/Site Bel</u>	
e Rel.:	
ICATION: Site 24 Austeel mining lease (see attached map); new Cape Preston, WA	
ATITUDE:       21 ° @ '54 9"S       LONGITUDE:       116 ° (1 '31 5 "E ' G.P.S. USED:       ASPECT:         LANDFORM:       Hilltop       Cliff       Slope       Valley       Swamp         Outcrop       Breakaway       Low Plain       Gully       Riverbank         Ridge       Sand Dune       Flat       Drainageline       Lake Edge         Other       Other       Other       Other       Other	
ICK TYPE:       Laterite       Granite       Dolerite       Limestone       Other:         ROCK FORM:       Sheet       Boulder       Fluviatile Gravel       Concretionary Gravel       Gravel         FOIL TYPE:       Sand       Loam       Clay       Peat       Gravel         JIL COLOUR:       Red       Brown       Yellow       White       Gravel         SOIL CONDITION:       Inundated       Moist       Dry       Saline       Other:	3
EGETATION CLASSIFICATION (Muir's): <u>Arace reprophylic high open christend c</u> Also <u>Scienciace enigencha</u> <u>Side aff fibulifica</u> nof PLANTS: Mature: <u>?</u> Seedlings: <u>Dead:</u> <u>Actual</u> Estimate Area Occupied: <u>_</u> REPRODUCTIVE STATE: Flower bud Flower I Immat. fruit Fruit Fruit Dehisced Vege DLLINATORS: Native bees Honey bees Other insects Birds Mammals	etative 🗍
Other observations: ONDITION OF POPULATION: Healthy Moderate Poor Disturbed Comment:	
POTENTIAL THREATS:       Firebreaks       Mining       Recreational activities       Roadworks       Graz         Weeds       Disease       Prescribed Burning       Other       Comment:	ting 🗍
ATTACHED: Map Mudmap Illustration Photo Field Notes ENCING: Not Required Fenced Required Replace/Repair OADSIDE MARKERS: Not Required Replace Reposition	. 🗆
THER COMMENTS (include action taken/required):         OPY SENT TO:       Regional Office         District Office       Other         Specify:	
Signed: Mir ach line Date: 8-01-01	
OTE: More than one box, in any section may be ticked. Map or further information may be given on the back of this form rlease return completed form to Executive Director, CALM, PO Box 104, COMO WA 6152	1.

YON: 14	this was brack us phonius POPULATION No .:
DRF D	Priority Species 3 Partial Survey Full Survey New Population
IOM: mm	nier Botanist TITLE: Biota Enu Sucres SURVEY DATE: 17-4-00
EGION: PILSO	DISTRICT: SHIRE:
e Ref.:	Map/Site Ref.: Reserve No.:
ND STATUS:	Nature Reserve       Private       Gravel Res. MRD       Gravel Res. Shire         National Park       Pastoral Lease       Rd. Verge MRD       Rd. Verge Shire         State Forest       VCL       Rail Reserve       Other Shire Res.         Water Reserve       Other       Specify:
CATION:	Site 28 Austeel survey wear (see attached map)
ATITUDE: 2	20 58 353 "S LONGITUDE: 16 12 100 "E G.P.S. USED: ASPECT:
ANDFORM:	Hilltop     Cliff     Slope     Valley     Swamp       Outcrop     Breakaway     Low Plain     Gully     Riverbank       Ridge     Sand Dune     Flat     Drainageline     Lake Edge
)CK TYPE: tock form: "Dil type: )il colour: oil condition	Laterite       Granite       Dolerite       Linestone       Other:         Sheet       Boulder       Fluviatile Gravel       Concretionary Gravel       Gravel         Sand       Log       Loam       Clay       Peat       Gravel         Sand       Log       Brown       Yellow       White       Gravel         ON:       Inundated       Moist       Dry       Saline       Other:
EGETATION	CLASSIFICATION (Muir's): Scattened Active andhophylia are pateles of Eragra
SSOCIATED S	species: xcophila grassland
Also	Enchylaena tomentosa xerochloa imberbis-
. OF PLANTS:	Mature: > Seedlings: Dead: Actual C Estimate C Area Occupied:
TEPPODUCTI	VE STATE: Flower bud Flower I Immat fruit Fruit Fruit Dehisced Vegetative
OLLINATORS	S: Native bees Honey bees O Other insects Birds Mammals
Other observed	FPOPULATION: Healthy Moderate Poor Disturbed Comment:
POTENTIAL T	HREATS: Firebreaks Mining Recreational activities Roadworks Grazing
FIRE HISTORY	Y: Not known Burnt in 19 Summer Autumn Winter Spring
<b>DUCHER SPE</b>	ECIMEN: District Herb. WA Herb. D Other D
ATTACHED:	Map Mudmap I Illustration Photo Field Notes
ENCING:	Nol Required  Fenced  Required  Required  Replace/Repair
OADSIDE MA	ARKERS: Not Required Present Required Replace Reposition
THER COMP	WENTS (include action taken/required):
OPY SENT T	O: Regional Office D District Office O Other Specify:
Signed:	trinach la Dale: 8-1-01
OTE: More the	an one box, in any section may be ticked. Map or further information may be given on the back of this form.
	ADDRESS BALLED FOR THE DESCRIPTION OF THE STATE

vor. Hibi	srus brachysishonius	POPULATION No.:	
	Priority Species 2 3 Part	ial Survey 🗍 Full Survey 🗍	New Population
OM: m.m.	nier Botanist TITLE: Biota	Ens Sucres SURVEY DA	TE: 25-4-00
GION: Pib	DISTRICT:	SHIRE:	erve No ·
e Ref.:	Nature Reserve Privat National Park Pastoral Leas State Forest VC Water Reserve Othe	te Gravel Res. MRD Gravel Res. MRD Rd. Verge MRD C Rd. Verge MRD Rail Reserve C er Specify:	Gravel Res. Shire Rd. Verge Shire Other Shire Res.
CATION: <u>S</u>	the 100 Austeel surv near cape Preston, WA	ey area (see attad	red map)
ATITUDE: <u>21</u> ANDFORM:	• OS • c2-c*S       LONGITUDE: 116         Hilliop       Cliff         Outcrop       Breakaway         Ridge       Sand Dune         Firebreak       Image: Cliff	• 07 '08 2"E G.P.S. USED: Slope Valley Low Plain Gully Flat Drainageline Other	ASPECT: Swamp Riverbank Lake Edge
)CK TYPE: OCK FORM: OIL TYPE: )IL COLOUR: OIL CONDITIC	Laterite Granite Dole Sheet Boulder Fluvia Sand Loam Red Brown O N: Inundated Moist O	rite Limestone Concretionan Clay Peat Yellow White Dry Saline	Other: Gravel Gravel Gravel Grey Other:
EGETATION C .SSOCIATED SI 	PECIES: <u>epactia huma</u> Also <u>Sclerolacea</u> enu Mature: <u>?</u> <u>Seedlings</u> : <u>Do</u>	ead: Actual [] Estimate [	Area Occupied:
DILLINATORS: Other observ	E STATE: Flower bud Flower Flower Flower Flower La Flowe	Other insects Bi	rds Ammals
ONDITION OF	POPULATION: Healthy Mod	erate D Poor D Disturbed	Comment:
POTENTIAL TI Weeds	IREATS: Firebreaks Mining Disease Prescribed Burning C Not known D Burnt in 19 CIMEN: District Herb. WA 1	Recreational activities     Recreational activities     Comment:      Summer     Autumn Herb.     Other	Winter Spring
ATTACHED: ENCING: OADSIDE MA	Map Mudmap Mudmap Hlus Not Required Fenced Mudmap RKERS: Not Required Prese	stration Photo Fi Required Replace/Repair nt Required Replace	eld Notes
THER COMM	IENTS (include action taken/required):		
OPY SENT TO	D: Regional Office District O	Tice O Other Specify	:
Signed:	Milade he	Date: $S-1-O1$	
OTE: More that	n one box, in any section may be ticked. Map upleted form to Executive Director, CALM P	o or further information may be given O Box 104, COMO WA 6152	on the back of this form.
	presentation to Excentite proceeding of the right		WILDI JEE DE LNCH

AXON: Phyllan thus aridus. POPULATION No.:
DRF Priority Species 3 Partial Survey Full Survey New Population
KOM: M. Maier Botanist TITLE: Biota Env. Sciences SURVEY DATE: 20-4-00.
EGION: <u>Pilbara</u> DISTRICT: SHIRE: Reserve No:
e Rel.
National Park Pastoral Lease Rd. Verge MRD Rd. Verge Shire
State Forest VCL VCL Rail Reserve Other Shire Res.
Water Reserve O Other Specify:
ICATION: Ste 59 Austeel survey area (see attached map).
near Cape. Preston, WA
\TITUDE: <u>21 ° 06 '37.4 "S</u> LONGITUDE: <u>116 ° 07 '585"E</u> G.P.S. USED: M ASPECT:
ANDFORM: Hilltop Cliff Stope Valley Swamp
Bidge C Sand Dune C Elat Drainageline V Lake Edge
Firebreak
CK TYPE: Laterite Granite Granite Dolerite DLimestone Olher:
ROCK FORM: Sheet Boulder Fluviatile Gravel Concretionary Gravel
DIL TYPE: Sand Loam Clay Peat Gravel
DIL COLOUR: Red Red Brown Yellow Yellow Grey
OIL CONDITION: Inundated D Moist D ~ Dry D Saline D Other:
EGETATION CLASSIFICATION (Muir's): Full any pros such in E. canadulensis open
SSOCIATED SPECIES: woodland over Acaua contacea, *Prosopis pathdo
ngn shrustana.
h. of PLANTS: Mature: Seedlings: Dead: Actual D Estimate D Area Occupied:
REPRODUCTIVE STATE: Flower bud Flower I Immat. fruit Fruit Fruit Dehisced Vegetative L
OLLINATORS:     Native bees     Honey bees     Other insects     Birds     Mammals
ONDITION OF POPULATION: Healthy D Moderate Poor D Disturbed D Comment:
POTENTIAL THREATS: Firebreaks Mining Recreational activities Roadworks Grazing
Words Director Director Received Burning O Other Comment:
Summer Stores winter Spring Standard Winter Spring S
JUCHER SPECIMEN: District Herb. D WA Herb. D Other
ATTACHED: Map Mudmap III Illustration Photo Field Notes
ENCING: Not Required 🗍 Fenced 🗍 Required 🗍 Replace/Repair
OADSIDE MARKERS: Not Required 🛛 Present 🗔 Required 🔲 Replace 🗔 Reposition 🗔
THER COMMENTS (include action taken/required):
UPY SENT TO: Regional Office D District Office D Other D. Specify:
Signed: Milaele la Dale: <u>8-1-01</u>
OTE: More than one box, in any section may be ticked. Map or further information may be given on the back of this form.
rlease return completed form to Executive Director, CALM, PO Box 104, COMO WA 6152
RECORDS: PLEASE FORWARD TO ADMINISTRATIVE OFFICER, FLORA, WILDLIFE BRANCH

### DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT $\heartsuit$

NON. Sil	a ca Wittenon	~	POPULATION No .: _	
DRF	Priority Species	3 Partial Survey	Full Survey	New Population
ON: mm	her Botanist TIT	LE: Biota Enu	Sciences SURVEY DAT	E: 23-4-00
GION: P.15	ara DIST	RICT:	SHIRE:	zie No i
Ref.:	Map/Site	: Rel.:	Count Day MED	Crowd Pag Shire
ND STATUS:	Nature Reserve U National Park U State Forest U Water Reserve U	Private Pastoral Lease VCL Other S	Rd. Verge MRD Rail Reserve	Rd. Verge Shire
CATION:	te 83 Austei	el survey are	a (see attached	timap);
<u> ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( </u>	near Cape Pre	ston wa	<u>.</u>	
			SZ "F" CPS USED.	Y ASPECT:
NDFORM:	Hilltop Brea Outcrop Brea Ridge Sand	Cliff Slo kaway Low Pla Dune F Other	pe Valley   in Gully   lat Drainageline	Swamp Riverbank Lake Edge
)CK TYPE: OCK FORM: DIL TYPE: DIL COLOUR: DIL CONDITI(	Laterite Granite Sheet Boulder Sand Red Red DN: Inundated	Dolerite Dol	Limestone O Concretionary Pent O White O Dry Saline	Gravel Gravel Gravel Gravel Gravel Gravel Grey Grey Grey Grey Grey Grey Grey Grey
EGETATION (	CLASSIFICATION (Muir's)	: Acada ancish	rocapa high ope	- shristend aver
SSOCIATED S	PECIES: Trio	dià wiscana	hummack grass	ited with
	Sorghum	plumosum com	nual gracesiand	
I. OF PLANTS:	Mature: Seedling	gs: Dead:	Actual Li Estimate L	Area Occupied:
EPRODUCTIV	E STATE: Flower bud	] Flower [] Immat.	fruit U Fruit U Fruit	Dehisced U Vegetative L
OLLINATORS	: Native bees	Honey bees 🛛 🛛	Other insects D Bin	ds 🗌 Mammals 🗌
ONDITION OI	F POPULATION: Healt	hy 🖉 Moderate 🛛	Poor Disturbed	Comment:
OTENTIAL TI	IREATS: Firebreaks	Mining Recr	reational activities D Ros	adworks 🗍 Grazing 🗖
TIRE HISTORY	': Not known I	Burnt in 19 Summ		Winter 🗍 Spring 🗍
TTACHED	Man F Mudur		J Plioto D Fie	Id Notes
ENCING	Not Required T	enced  Required	Replace/Repair (	J
OADSIDE MA	RKERS: Not Require	ed D Present D	Required  Replace	Reposition
THER COMM	IENTS (include action taken	/required):		
OPY SENT T	0: Regional Office	District Office	Other D Specify:	51001 W 1 20
Signed:	hirach to	D	hale: $5-1-01$	
and the second second second	and the second	who ticked Man on furthe	a information more he given	n the hack of this form.
OTE: More tha	in one box, in any section ma	v be neked. Mup of jarme	a mjormanon mie be gren e	

#### Appendix F

#### Fauna Species Lists and Results of Database Searches

Habitats	Codes
Beach	Be
Mangroves	Ма
Coastal Sand Dunes	CD
Samphire	S
Stony Plain	SP
Low Stony Hill	LH
Rocky Hills and Outcrops	RH
Cracking Clays	CC
Creeklines	CL
Opportunity	Орр

N = Numerous

C = Calls

S = Signs

CASUARIIDAE	Be	CC	CD	CL	LH	Ма	RH	S	SP	Орр	Total
Emu - Dromaius novaehollandiae		4			1				2		7
PHASIANIDAE											
Brown Quail - Coturnix ypsilophora			16	5							21
ANATIDAE											
Pacific Black Duck - Anas superciliosa				2							2
PODICIPEDIDAE											
Australasian Grebe - Tachybaptus novaehollandiae				1							1
ARDEIDAE											
White-faced Heron - Egretta novaehollandiae				2							2
Little Egret - Egretta garzetta						3					3
Eastern Reef Egret - Egretta sacra						1					1
White-necked Heron - Ardea pacifica									1		1
Striated Heron - Butorides striatus						1					1
Nankeen Night Heron - Nycticorax caledonicus						1					1
ACCIPITRIDAE											
Osprey - Pandion haliaetus								1			1
Whistling Kite - Haliastur sphenurus				1							1
Brahminy Kite - Haliastur indus			1			2					2
White-bellied Sea-Eagle - Haliaeetus leucogaster						2					2
Spotted Harrier - Circus assimilis				3							3
Brown Goshawk - Accipiter fasciatus				1							1
Wedge-tailed Eagle - Aquila audax				4							4
FALCONIDAE											
Brown Falcon - Falco berigora				2			1			1	4
Australian Hobby - Falco longipennis				1							1
Nankeen Kestrel - Falco cenchroides			1	12				1		1	15
OTIDIDAE											
Australian Bustard - Ardeotis australis				2						4	6
TURNICIDAE											
Little Button-quail - Turnix velox		2	1						2		5

	Be	CC	CD	CL	LH	Ма	RH	S	SP	Орр	Total
SCOLOPACIDAE											
Eastern Curlew - Numenius madagascariensis						9		2			11
Grey-tailed Tattler - Heteroscelus brevipes	9										9
Ruddy Turnstone - Arenaria interpres	17					1		3			21
Red-necked Stint - Calidris ruficollis	16					1					17
BURHINIDAE											
Bush Stone-curlew - Burhinus grallarius										1	1
Beach Stone-curlew - Esacus neglectus	3										3
HAEMATOPODIDAE											
Pied Oystercatcher - Haematopus longirostris	12					2					14
CHARADRIIDAE											
Red-capped Plover - Charadrius ruficapillus	5										5
Greater Sand Plover - Charadrius leschenaultii	2										2
Black-fronted Dotterel - Elseyornis melanops				7						1	8
Banded Lapwing - Vanellus tricolor				1							1
LARIDAE											
Silver Gull - Larus novaehollandiae	9					4		2			15
Caspian Tern - Sterna caspia	2										2
Lesser Crested Tern - Sterna bengalensis	5										5
Crested Tern - Sterna bergii	8										8
Bridled Tern - Sterna anaethetus						1					1
COLUMBIDAE											
Crested Pigeon - Ocyphaps lophotes		3		4							7
Spinifex Pigeon - Geophaps plumifera					1		5		3		9
Diamond Dove - Geopelia cuneata				8	1						9
Peaceful Dove - Geopelia striata				10							10
Bar-shouldered Dove - Geopelia humeralis						7					7
CACATUIDAE											
Galah - Cacatua roseicapilla		10		212						2	224
Little Corella - Cacatua sanguinea				1031							1031
Cockatiel - Nymphicus hollandicus				3							3
PSITTACIDAE											
Australian Ringneck - Barnardius zonarius				9							9

	Be	CC	CD	CL	LH	Ма	RH	S	SP	Орр	Total
CUCULIDAE											
Pallid Cuckoo - Cuculus pallidus		1		4							5
Black-eared Cuckoo - Chrysococcyx osculans		3									3
Horsfield's Bronze-Cuckoo - Chrysococcyx basalis			1	1							2
CENTROPODIDAE											
Pheasant Coucal - Centropus phasianinus				7							7
STRIGIDAE											
Southern Boobook - Ninox novaeseelandiae				1						1	2
PODARGIDAE											
Tawny Frogmouth - Podargus strigoides				2							2
CAPRIMULGIDAE											
Spotted Nightjar - Eurostopodus argus										3	3
HALCYONIDAE											
Blue-winged Kookaburra - Dacelo leachii				10							10
Red-backed Kingfisher - Todiramphus pyrrhopygia				1							1
Sacred Kingfisher - Todiramphus sanctus		2		14		3					19
Collared Kingfisher - Todiramphus chloris						4					4
MEROPIDAE											
Rainbow Bee-eater - Merops ornatus		2		8	1			2			13
MALURIDAE											
Variegated Fairy-wren - Malurus lamberti		11	13	24	3	6					57
White-winged Fairy-wren - Malurus leucopterus		6	9	12		2		7	8		44
Rufous-crowned Emu-wren - Stipiturus ruficeps									4		4
Striated Grasswren - Amytornis striatus							1				1
PARDALOTIDAE											
Red-browed Pardalote - Pardalotus rubricatus				1							1
Redthroat - Pyrrholaemus brunneus			9								9
Dusky Gerygone - Gerygone tenebrosa						18					18
MELIPHAGIDAE											
Yellow-throated Miner - Manorina flavigula				7							7
Singing Honeyeater - Lichenostomus virescens		4	4	16	1	33	10		3		71
White-plumed Honeyeater - Lichenostomus penicillatus				47							47
Brown Honeyeater - Lichmera indistincta				1							1

	Be	CC	CD	CL	LH	Ма	RH	S	SP	Орр	Total
PETROICIDAE											
Hooded Robin - Melanodryas cucullata		2									2
POMATOSTOMIDAE											
Grey-crowned Babbler - Pomatostomus temporalis				2							2
PACHYCEPHALIDAE											
Crested Bellbird - Oreoica gutturalis		4		4	1		1				10
Mangrove Golden Whistler - Pachycephala melanura						11					11
White-breasted Whistler - Pachycephala lanioides						1					1
DICRURIDAE											
?Leaden Flycatcher - Myiagra rubecula				1							1
Magpie-lark - Grallina cyanoleuca		3		13							16
Mangrove Grey Fantail - Rhipidura phasiana						8					8
Willie Wagtail - Rhipidura leucophrys		2	1	21		3				1	28
CAMPEPHAGIDAE											
Black-faced Cuckoo-shrike - Coracina novaehollandiae		6		29	1			1			37
ARTAMIDAE											
White-breasted Woodswallow - Artamus leucorynchus						15		2			17
Black-faced Woodswallow - Artamus cinereus		5	2	1			8				16
Pied Butcherbird - Cracticus nigrogularis		2	2	15	3	1	1				24
Australian Magpie - Gymnorhina tibicen				4							4
CORVIDAE											
Little Crow - Corvus bennetti		1									1
Torresian Crow - Corvus orru				16	11						27
ALAUDIDAE											
Singing Bushlark - Mirafra javanica		71			3	3		6	3	3	89
MOTACILLIDAE											
Richard's Pipit - Anthus novaeseelandiae	2	1	2	1		2	2	6			16
PASSERIDAE											
Zebra Finch - Taeniopygia guttata		8	5	34	2	29	9	5	5	2	99
Painted Finch - Emblema pictum		10		8	18		5			2	43

CASUARIIDAE	В	Be	CC	CD	CL	LH	Ма	RH	S	SP	Орр	Total
HIRUNDINIDAE												
Welcome Swallow - Hirundo neoxena								1				1
Tree Martin - Hirundo nigricans					19		1		2	2		24
Fairy Martin - Hirundo ariel											20	20
SYLVIIDAE												
Spinifexbird - Eremiornis carteri			1					6		3	2	12
Brown Songlark - Cincloramphus cruralis					1					1		2
ZOSTEROPIDAE												
Yellow White-eye - Zosterops luteus					4		90		5			99
T	otal 1	2	24	14	53	13	30	12	14	12	14	96

NATIVE MAMMALS											
TACHYGLOSSIDAE	Be	CC	CD	CL	LH	Ма	RH	S	SP	Орр	Total
Echidna - Tachyglossus aculeatus							1				1
DASYURIDAE											
Common Planigale - Planigale maculata		1							2		3
Pilbara Ningaui - Ningaui timealeyi		2		2	8				1		13
Stripe-faced Dunnart - Sminthopsis macroura		7		1	1			1	6		16
Little Red Kaluta - Dasykaluta rosamondae		1							3		4
MACROPODIDAE											
Euro - Macropus robustus erubescens		N					S			Ν	N
Red Kangaroo - Macropus rufus		N								Ν	N
VESPERTILIONIDAE											[
?Little Broad-nosed Bat – Scotorepens greyi											[
?Inland Cave Bat – Vespadelus finlaysoni				С							[
Arnhem Land Long-eared Bat - Nyctophilus arnhemensis				С		1					1
MOLOSSIDAE											
Little North-western Mastiff Bat - Mormopterus loriae cobourgiana						20					20
Northern Freetail-bat - Chaerephon jobensis				1							1
MURIDAE											
Short-tailed Mouse - Leggadina lakedownensis		1			2						3
Undescribed species - Pseudomys "hamersley"				1							1
Western Pebble-mound Mouse - Pseudomys chapmani					S						S
Delicate Mouse - Pseudomys delicatulus			4		1						5
Sandy Inland Mouse - Pseudomys hermannsburgensis			1								1
INTRODUCED MAMMALS											
MURIDAE											
House Mouse - Mus musculus				1							1
CANIDAE											
Dingo - Canis lupus dingo				1							1
Red Fox - Vulpes vulpes	S		1								1
FELIDAE											
Cat - Felis catus			1								1
BOVIDAE				1							1
Sheep - Ovis aries				S							S
	1	7	4	9	5	2	2	1	4	2	22

	Be	CC	CD	CL	LH	Ма	RH	S	SP	Орр	Total
HYLIDAE											
Litoria rubella				1						Ν	>25
Cyclorana maini		1		44				16	1	Ν	> 50
MYOBATRACHIDAE											
Uperoleia russelli				С						Ν	>10
CHELONIDAE											
Chelonia mydas			3			3					6
Chelonia sp.	S		S								S
AGAMIDAE											
Amphibolurus gilberti						3					3
Amphibolurus longirostris				1							1
Ctenophorus caudicinctus				1							1
Ctenophorus isolepis			6					2			8
Ctenophorus nuchalis								1			1
Pogona minor mitchelli		2	1	1			1				5
Tympanocryptus cephala		2									2
VARANIDAE											
Varanus acanthurus		1			1						2
Varanus panoptes		1		1			1				3
GEKKONIDAE											
Diplodactylus conspicillatus					1						1
Diplodactylus mitchelli		1									1
Diplodactylus savagei									1		1
Gehyra pilbara							1				1
Gehyra punctata		1			1		17				19
Gehyra variegata			1	3							4
Heteronotia binoei		2		3	1				2		8
Nephrurus wheeleri cinctus					1						1

	Be	CC	CD	CL	LH	Ма	RH	S	SP	Орр	Total
PYGOPODIDAE											
Delma nasuta					2						2
Delma pax				1							1
Lialis burtonis							1	1			2
Pygopus nigriceps		2		1							3
SCINCIDAE											
Carlia munda		6		15							21
Carlia tricantha								1			1
Cryptoblepharus plagiocephalus				1							1
Cryptoblepharus carnabyi										1	1
Ctenotus sp. nov.		1									1
Ctenotus affin helenae		1		1	2		1				5
Ctenotus affin robustus		1		2							3
Ctenotus duricola					1		1				2
Ctenotus grandis titan					4						4
Ctenotus pantherinus ocellifer		1			2		2	1			6
Ctenotus saxatilis					2		7				9
Ctenotus serventyi			1				2				3
Cyclodomorphus melanops melanops				2	2				1		5
Egernia depressa					1		1				2
Glaphyromorphus isolepis				3							3
Lerista bipes			12								12
Lerista elegans				1					1		2
Lerista muelleri		1		2			1				4
Menetia greyii		4			1		6	1	6		18
Menetia surda				1					1		2
Proablepharus reginae							1				1
Tiliqua multifasciata		1		2	3						6
TYPHLOPIDAE											
Rhamphotyphlops diversus ammodytes		1						1			2
Rhamphotyphlops grypus					1						1
Rhamphotyphlops hamatus					1						1

	Be	CC	CD	CL	LH	Ма	RH	S	SP	Орр	Total
BOIDAE											
Antaresia perthensis										1	
Antaresia stimsoni										1	
Aspidites melanocephalus										2	
ELAPIDAE											
Acanthophis wellsi								1			1
Demansia psammophis cupreiceps		3			1						4
Parasuta monachus				2							2
Parasuta punctata		1			1						2
Pseudechis australis										1	1
Pseudonaja nuchalis							1				1
HYDROPHIIDAE											
Hydrelaps darwiniensis			1								1
Total	1	20	7	22	19	2	15	9	7	10	61