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## SUMMARY

Newcrest Mining Limited is proposing to expand the existing Telfer Gold Mine in the eastern Pilbara region of north-western Australia and commence processing ore in 2004. In order to expand its operations and meet the increased power requirements, a gas-fired power station will be installed which will require a constant supply of natural gas. Gas supplies will be provided for the power station at Telfer via a 440km long buried pipeline from Port Hedland.

As part of the environmental commitments to minimise the impact of development to populations of Rare and Priority flora and fauna, *ecologia* Environmental Consultants were commissioned by Newcrest Mining Limited to undertake a Declared Rare and Priority Flora and Fauna survey of the proposed gas pipeline route.

Prior to the field survey a search of the DCLM (Florabase) and WA Herbarium and WA Museum databases was conducted to reveal the presence of any significant flora and fauna and an examination of flora collections lodged at the WA Herbarium to assist in the identification of potentially occurring Declared Rare (DRF) or Priority flora taxa.

The survey was conducted at three stages during July and August 2003 and involved a combination of intensive searches of the alignment, driving along the alignment and spot checks in different vegetation communities. The fauna survey involved walking through all ideal habitats that were thought most likely to contain Priority species. In some instances, foot traverses were limited by restricted access and time constraints, however much of the route was accessible. The survey was designed to represent the widest range of habitats as possible in order to maximise the chances of detecting any DRF or Priority flora and fauna present.

A total of 348 species from 59 families and 150 genera of flora were recorded during the survey (Appendix A). The most commonly recorded families were Papilionaceae (45 taxa), Poaceae (37 taxa) and Mimosaceae (27 taxa), whilst the most commonly recorded genera were *Acacia* (23 taxa), *Tephrosia* (15 taxa) and *Ptilotus*, *Sida* and *Triodia* (all with 10 taxa).

No species listed under the EPBC Act were collected or recorded in the project area, however six Priority flora were collected during the survey:

- *Goodiana hartiana* (Priority 2)
- *Dampiera atriplicina* (Priority 2)
- *Euphorbia clementii* (Priority 2)
- *Abutilon trudgenii* (Priority 3)
- *Acacia glaucocaesia* (Priority 3)
- *Comesperma pallidum* (Priority 3)

Seven species of introduced flora were recorded within the gas pipeline infrastructure corridor; *\*Parkinsonia aculeata*, *\*Aerva javanica*, *\*Argemone ochroleuca*, *\*Cenchrus ciliaris*, *\*Cynodon dactylon*, *\*Indigofera oblongifolia* and *\*Stylosanthes hamata*. The most important of these in terms of pipeline construction are *Indigofera oblongifolia*, which is a recent invasive species along the De Grey floodplain region of the northern Pilbara. It is advised that all management plans contained within the Flora and Fauna Management Plan (Newcrest, 2003) regarding the control and spread of weeds are followed by contractors.

Despite the abundance of suitable habitat no signs of Mulgara activity in the form of tracks, scats or burrows were observed in any of these areas apart from a single disused burrow entrance between KP176 and KP17. Bilby activity was confirmed in the area to the West of the major dune systems between KP310.16 and KP289.47 where there were alternating sections of rocky substrate and mixed shrubland over *Triodia* sp. on soft sandy loam. In the sandy areas there were characteristic Bilby diggings and a recently used burrow located at KP295.75 on the centre line of the pipeline corridor.

## **1.0 INTRODUCTION**

### **1.1 BACKGROUND**

The Telfer Gold Mine is located in the Pilbara approximately 400 km east southeast of Port Hedland. Newcrest Mining Limited is proposing to expand the existing Telfer Gold Mine and commence processing ore in 2004. The Telfer Project will use existing infrastructure where possible but will require some new facilities including the installation of a gas-fired power station. Natural gas will be supplied to the power station at Telfer via a 440 km long buried pipeline from Port Hedland (Figure 1.1).

Pipeline construction will involve progressive clearing, trench excavation, pipe laying, backfilling and restoration. For the majority of the route the area required for clearing will be 30 m wide, although this figure will vary according to environmental and other restrictions. Access to the pipeline in the Port Hedland/ Shay Gap section and the Telfer Road section of the alignment will be along established access roads and tracks which run parallel, and generally less than 200-300 m from the corridor (Newcrest, 2003). Due to ongoing maintenance requirements a number of tracks which allow direct access to the pipeline from these parallel roads will also be retained. In the remote Pardoo/Shay Gap to Telfer road section of the route, access for monitoring and maintenance purposes will be via a narrow (3 m wide) four wheel drive track that will be retained along the corridor after construction is completed (Newcrest, 2003). The duration of pipeline construction is expected to take several months during the summer period of 2003.

An ecological survey by Hart, Simpson and Associates during October 2001 confirmed the presence of five Priority flora species, with an additional six known or considered likely to occur in the surrounding region. Records indicate 19 species of Rare fauna potentially occur along the alignment.

### **1.2 OBJECTIVES**

The pre-clearance survey for Rare and Priority flora and fauna of the proposed pipeline route was conducted by *ecologia* Environmental Consultants in June and July 2003 as per the management commitments detailed within *Telfer Project: Power Supply and Infrastructure Corridor – Flora and Fauna Management Plan* (Newcrest, 2003) to minimise the impact of development to populations of Rare, Priority or significant flora and fauna.

This report documents where possible the extent of populations, viability of these populations and the potential impacts of the Telfer Gas Pipeline construction. The study also details appropriate specific management strategies for designated species.

In order to achieve the above general objective, some specific aims of the survey were to;

- Investigate all accessible habitats along the alignment that may harbour Priority species,
- Document the distribution and density of Priority and Rare species along the alignment, and
- Make collections as geographically regular as possible in order to cover the available habitats.

**Figure 1.1 Proposed Alignment**

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## 2.0 FAUNA SURVEY METHODOLOGY

### 2.1 FAUNA SURVEY PROGRAMME

The survey for Rare, Priority and significant fauna was conducted along the proposed Telfer Gas Pipeline alignment in two stages, 20<sup>th</sup>-29<sup>th</sup> June 2003 and 21<sup>st</sup>-26<sup>th</sup> July 2003. The first stage involved a comprehensive search of the proposed pipeline corridor from KP176 – KP270, and the second stage covered KP270 - KP442.

The survey methodology consisted of:

- Familiarisation with potential Rare and Priority Fauna species and secondary evidence prior to the site visit.
- Transects on foot, encompassing a width of approximately 30 metres. Due to the length of the alignment and the time constraints of the survey, the entire route was not traversed by foot. Transects were walked in each vegetation community and habitats most likely to contain Rare fauna.
- Vehicle based searches along the sections of the alignment that were not traversed by foot.
- recording data on potential significant fauna including location (using a Global Positioning System (GPS)) and abundance.
- taking photographs of potential significant fauna, secondary evidence and general habitats.
- researching information on the conservation significance of identified Rare, Priority Fauna and fauna of interest by consulting specialist zoologists, DCLM threatened Listings, WA Museum FaunaBase and data available from specimens lodged with the Western Australian Museum.

The survey consisted of ground assessment for secondary evidence and opportunistic observations along the proposed areas of impact, with a particular focus on Rare and Priority taxa highlighted during the ecological survey conducted during September – October 2001 (Hart, Simpson and Associates, 2001). Due to the nocturnal nature of many of the Rare mammals species ground assessment surveys were conducted in order to identify activity in the form of scats, tracks, burrows and diggings. In addition, vegetation communities and associated species were noted to assist in describing the fauna habitat. Rare avifauna species were noted along the proposed pipeline corridor via opportunistic sightings and the identification of tracks, scats and scratchings.

Nomenclature is based on the Census of Australian Vertebrate Species (CAVS) Version 8.1 (Endangered Resources Information Network, May 1994) and Christidis and Boles (1994) for the avifauna. Fauna species were identified in the field.

## 2.2 VEGETATION AND FLORA SURVEY METHODOLOGY

The survey for Rare, Priority and significant flora along the proposed pipeline corridor was conducted in three stages during June and July 2003. Table 2.1 shows the specific locations and dates of the route investigated. To assist with the logistical arrangements encountered when accessing remote regions of the alignment, the Heritage, Fauna and Flora surveys were conducted concurrently.

**Table 2.1 Stages and Survey Times of the Rare and Priority Flora Survey**

Stage	Time of Survey	Distance along Alignment (KP) (in kms)	Methodology used
1 <sup>st</sup> Stage	20/6/03 – 29/6/03	001 – 017	Walking long stretches along the alignment. Secondary and 4WD tracks were used for access.
		043 – 73	Driving adjacent to the alignment along the Great Northern Highway. Regular stoppages, walking small sections with all habitats investigated.
		176 – 270 (remote section)	Driving on the alignment. Regular stoppages, walking small sections with all habitats investigated.
2 <sup>nd</sup> Stage	11/7/03 – 15/7/03	019 – 038.7	Walking long stretches on the alignment. Secondary and 4WD tracks were used for access.
		074 – 175.75	Driving adjacent to the alignment along the Great Northern Highway, Goldsworthy Rd and power line access tracks. Regular stoppages, walking small sections with all habitats investigated.
3 <sup>rd</sup> Stage	21/7/03 – 26/7/03	270.70 – 374 (remote section)	Driving on the alignment. Regular stoppages, walking small sections with all habitats investigated.
		375 – 430.98	Driving adjacent to the alignment along Telfer Rd. Regular stoppages, walking small sections with all habitats investigated.

In order to achieve the objective and aims of the survey, a combination of methods were used in order to find Rare and Priority flora:

- Driving adjacent to the alignment along parallel access roads and tracks,
- Driving slowly over the alignment through the remote section,
- Walking long sections (0.5-3km) of the alignment where vehicle access was restricted, and
- Walking short (100-300m) but regular sections of the alignment where access was good.

All major habitat types along the alignment were investigated. At regular intervals along the alignment (usually every 1 or 2 km) small sections were walked in order to intensively search for Rare flora. In addition, all recognisable changes in vegetation communities and topography were investigated for Rare

species where possible. A concerted effort was made to survey at regular intervals along the whole route, even where there was extreme habitat uniformity and the likelihood of encountering new species was low.

Prior to the search, an examination of collections lodged at the WA Herbarium was conducted to assist in the identification of potentially occurring taxa. Focus was largely concentrated on the Priority flora previously collected by Hart, Simpson and Associates in 2001, where they performed a preliminary survey of the alignment (Table 2.2). The Priority flora found in this survey were researched beforehand and specifically targeted so that field recognition of these species was adequate. The more remote region of the alignment (KP175-375) was more intensively investigated than other sections as this region is still largely unexplored and therefore the potential for finding new and/or Priority taxa was believed to be higher.

**Table 2.2. Priority Flora species previously found along the alignment  
(from Newcrest Flora and Fauna Management Plan, 2003)**

Species	Status <sup>1</sup>	Occurrence <sup>2</sup>	Habitat and Location
<i>Abutilon trudgenii</i>	Priority 3	b	Goldsworthy
<i>Acacia glaucocaesia</i>	Priority 3	b	Goldsworthy
<i>Bulbostylis burbridgeae</i>	Priority 3	b	Granite rocks near Goldsworthy railway
<i>Dampiera atriplicina</i>	Priority 2	b	South of Telfer Road
<i>Dentella minutissima</i>	Distribution extension	a	Low-lying areas near Telfer Road
<i>Euphorbia clementii</i>	Priority 2	b	East of the De Grey along Great Northern Highway
<i>Fimbristylis</i> sp.	Priority 1	b	Shay Gap
<i>Fuirena incrassata</i>	Priority 3	a	Low-lying areas near Telfer Road
<i>Goodenia hartiana</i>	Priority 2	a	Swales east of Mt. Cecelia and along Telfer Road
<i>Goodenia lyrata</i>	Priority 1	a	Low-lying areas near Telfer Road
<i>Stemodia linophylla</i>	Priority 1	a	Low-lying areas near Telfer Road

<sup>1</sup> CALM listed species

<sup>2</sup> a = recorded along corridor during the current survey.

b = previously recorded or likely to occur in the wider Pilbara/Great Sandy Desert region.

The flora survey methodology consisted of:

- familiarisation with potential DRF and Priority Flora species prior to the site visit;
- Transects on foot, encompassing a width of approximately 30 metres (width of the proposed impact of the pipeline construction activities). Due to the length of the alignment and the time constraints of the survey, the entire route was not traversed by foot. Transects were walked in each vegetation community type;
- Vehicle based searches that were unable to be traversed by foot. Vegetation communities that had been sufficiently represented by the survey were searched from the back of a slow moving tray back vehicle, with periodic stoppage points for more intensive searches for Rare and Priority flora;
- collecting voucher specimens of potential significant flora (DRF, Priority Flora species and any species of conservation or scientific interest, such as previously unknown or poorly collected flora);

- recording data on potential significant flora including location (using a Global Positioning System (GPS)), population distribution and abundance;
- taking photographs of potential significant flora and general habitats;
- confirmation of collected specimens using the resources of the Western Australian Herbarium;
- establishing the conservation status of flora using the most current EPBC Act list and DRF and Priority Flora List (Atkins, 2001);
- researching information on the conservation significance of identified DRF, Priority Flora and flora of interest by consulting specialist botanists, DCLM threatened Listings, DCLM FloraBase and data available from specimens lodged with the Western Australian Herbarium;
- submission of flora voucher specimens to the Western Australian Herbarium; and
- completion and submission of Rare Flora Report forms to DCLM.

The survey consisted of opportunistic collecting of plant specimens within the proposed areas of impact, with a particular focus on Declared Rare and Priority taxa previously recorded during the ecological survey conducted during September – October 2001 (Hart, Simpson and Associates, 2001). Accurate plotting of the location of particular taxa was achieved by taking a series of GPS “waypoints” and relating the collected specimens to these points. Plant locations in relation to chainage locations were also noted. In addition, the abundance and height of each taxon collected was estimated, using coverage ranges or, in instances where a particular species was locally scarce, by estimating total plant numbers.

The vegetation communities present and associated species were noted to assist in describing the habitat of any Rare flora populations which might be encountered. Plant species were either identified in the field or specimens were collected for later identification and verification. Vegetation type, life-form strata and percentage cover of each stratum were recorded based upon Muir’s (1977) classification system.

The identity of collected specimens was confirmed using current taxonomic keys and comparison to specimens previously lodged at the Western Australian Herbarium. Nomenclature employed in this report is based on Hnatiuk (1990) and the conventions currently adopted by the Western Australian Herbarium, as detailed by FloraBase (WA Herbarium, Department of Conservation and Land Management, 2003).

## **2.3 SURVEY LIMITATIONS AND CONSTRAINTS**

### **2.3.1 Fauna**

As with any Rare fauna survey of a specified area there will be limitations. In particular in remote areas with few previous surveys and with constraints on the length of the survey, there will be certain deficiencies. A survey of the kind undertaken in this study provides a good baseline of information against which potential environmental impacts can be examined in context, but is not likely to provide a completely comprehensive inventory of Rare vertebrate fauna species present in the project area (many of which are nocturnal), due in part to the size of the area and the vagaries of natural populations of

animals. Reptiles such as the Woma were unlikely to be recorded during the survey as it was conducted during a season when reptiles are mostly inactive. The noise of the survey convoy would also mean that reptiles and mammals were unlikely to be observed.

The large size of the project area precluded examination of every available location, but the great majority of the habitat types represented were surveyed. The focus of the study was on the low lying plains of Spinifex over loamy soil, within areas that the Mulgara and Bilby burrow. Mulgara burrows are often cryptic in nature and due to the size of the area that required surveying and the time restrictions while areas of suitable habitat could be identified, Mulgara activity could not be accurately assessed.

### **2.3.2 Flora**

The conditions during the survey were favourable for plant collections as many of the species were flowering at some point along the route. The survey was conducted in three stages over a month and a half period, and as a result, there was a higher chance of encountering a species during its flowering season. In addition, collections were conducted over large distances, and some species with broad geographic distributions with flowering times cued to environmental cues, were likely to be flowering at some point along the route.

Time constraints meant that not all of the alignment could be rigorously examined by foot. Only a portion of the route was traversed by foot at regular intervals and the areas were specifically selected to encompass as many variations in vegetation as possible in order to maximise the chances of recorded flora of particular conservation significance. Some parts of the alignment had to be driven through and the flora surveyed from the back of a moving vehicle or driven around. This method is effective in areas where the vegetation was uniform, and did not warrant further intensive investigations. This technique was not done in areas where there was a change in habitat that could potentially possess different flora species.

### 3.0 RARE AND SPECIALLY PROTECTED FAUNA

Fauna species that have been formally recognised as Rare, threatened with extinction, or as having high conservation value are protected by law under Commonwealth and State Legislation. At the national level, fauna are protected under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act). Within Western Australia Rare fauna are listed under the Western Australian Wildlife Conservation Act 1950, incorporating the Japan-Australia Migratory Bird Agreement (JAMBA). The China-Australia Migratory Bird Agreement (CAMBA) covers migratory species of avifauna, particularly transequatorial waders.

#### 3.1 Species Protected by International Agreements

Three international agreements address components of the Australian fauna, with a focus on protecting migratory species. These three agreements are the JAMBA, CAMBA and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). Of the species listed under these agreements, one potentially occurs in the project area and one was recorded:

##### *Recorded*

##### Rainbow Bee-eater *Merops ornatus*

The Rainbow Bee-eater is listed as a migratory species under the *Environment Protection and Biodiversity Act 1999*. The Rainbow Bee-eater burrows into sandy ground to create a nest tunnel which may be up to a metre in length. Rainbow Bee-eaters were observed on two occasions along the pipeline route. An individual was seen at KP011.9 flying over the alignment. Two individuals were seen at KP76.17 on the edge of the De Grey River on the sand bars near the bridge. No burrows were observed along the alignment therefore this species is unlikely to be significantly impacted by the development.

##### *Potentially Occur*

##### Fork-tailed Swift *Apus pacificus*

The Fork-tailed Swift may potentially occur anywhere within the project area, however due to its predominantly aerial nature it is not commonly recorded under standard sampling conditions. Many records of this species come from periods of inclement weather, particularly cyclones, when the birds tend to fly at lower altitudes (Blakers, *et al.*, 1984). The Fork-tailed Swift was not recorded along the alignment.

#### 3.2 Commonwealth EPBC Act

Schedule 1 of the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* contains a list of species that are considered Critically Endangered, Endangered, Vulnerable, Extinct, Extinct in the wild and Conservation Dependent.

Classification of species under the EPBC Act is as follows:

Critically Endangered	The species is facing an extremely high risk of extinction in the wild in the immediate future.
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Endangered	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate; or its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Extinct	A species is presumed extinct if it has not been located in the last 50 years, or it has not been located in the last 10 years despite thorough searching.
Extinct in the wild	The species is only known to survive in cultivation, in captivity or as a naturalised population well outside its past range or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a timeframe appropriate to its life cycle and form.
Conservation Dependent	The species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

### 3.2.1 Endangered

#### Ampurta *Dasyercus hillieri*

The Ampurta and Mulgara were treated as two subspecies up until recently. However, recent work at the South Australian Museum has confirmed that they should be recognised as two separate species (Maxwell *et al.* 1996). Due to the confusion between the two species, the Ampurta's distribution is largely unknown. Little is understood about the Ampurta's current range or status in Western Australia (Maxwell *et al.* 1996). Due to the extreme similarity between the Ampurta and the Mulgara, secondary evidence such as tracks, burrows and scats is not sufficient to distinguish between the two species. Secondary evidence recorded from either species is referred to under the Mulgara (Section 4.2.2).

#### Marsupial Mole *Notoryctes caurinus*

The Marsupial Mole is blind due to the reduction of its eyes to vestigial subcutaneous lenses (Strahan 1995). It lives almost entirely underground coming to the surface usually only after rain (Strahan 1995). In Western Australia, the distribution of *Notoryctes caurinus* extends from sandy arid areas from the east Pilbara south to Warburton. Little is known about *N. caurinus* in comparison to *N. typhlops* and as a result there is much scientific interest in this species at present. The Marsupial Mole *N. caurinus* was not recorded along the transport corridor route.

### 3.2.2 Vulnerable

#### Mulgara *Dasyercus cristicauda*

The Mulgara is a small Dasyurid which has a wide distribution, occupying habitat in the arid sandy regions of the Northern Territory, Western Australia, South Australia, and the south-west corner of Queensland (Woolley, 1995). Although once widespread and abundant, the Mulgara has suffered severe

range reductions and is currently reduced to isolated populations in most parts of its range (Burbidge *et al.*, 1988).

There were many scattered areas along the pipeline corridor that were potentially suitable for the Mulgara. Previous studies of Mulgara have indicated that a combination of soil type, Spinifex type and drainage will determine whether an area will be suitable for Mulgara. Clayey sand and sandy loam soils with hummock grasses (primarily *Triodia basedowii*) under the influence of paleodrainage or surface drainage system have been described as the broad habitat requirements for the Mulgara (Masters 1993; Baker, Masters and Johnson 1995; Baker 1996; *ecologia* 1996, Baker and Johnson 2001). Trees and shrubs may also be present. A study by *ecologia* (1996) found that the majority of Mulgara activity was centred on laterite slopes with small patches of almost pure *Triodia basedowii* with no Mulgara activity recorded on stony substrates. The amount of Spinifex cover also seems to play an important role in habitat selection by Mulgara. Studies have indicated that the cover of Spinifex within habitats known to support Mulgara is between 10-60% (Masters 1993) although most populations seem to favour 40-60% Spinifex cover (Baker and Johnson 2001).

The areas that were most likely to hold Mulgara along the pipeline corridor were;

- KP176 – 180
- KP186 – 190
- KP204 – 207
- KP210.6 (100m corridor, running north-south across the pipeline)
- KP225 – 233
- KP235 – 246
- KP265 – 268
- KP354.47 – KP344.28
- areas between dune systems KP334.46 – KP310.16 and KP279.6 – KP270.7

Despite the abundance of suitable habitat no signs of Mulgara activity in the form of tracks, scats or burrows were observed in any of these areas apart from a single disused burrow entrance between KP176 and KP177 (Plate 3.1).



**Plate 3.1: Mulgara burrow entrance at 0206793; 7738260.**

Bilby *Macrotis lagotis*

The Bilby is an omnivorous, nocturnally active marsupial (Southgate 1990). Occurring in a wide variety of habitat types (Southgate 1990), the Bilby lives in burrows up to 3m long and 1.8m deep (Strahan 1995). Bilbys have a burrow that is quite distinct from other fauna burrows. It is characterised by a small circular mound of soil outside the circular or slightly oval entrance to the burrow. Burrow entrances are about 15cm in diameter and are commonly hidden by Spinifex, tussock grass, juvenile Mulga plants or fallen logs (Smyth and Philpott 1967). It is thought that the Western Australian distribution of the Bilby consists of several discrete areas of occurrence, in the Gibson Desert, in the inland Pilbara and along the southern edge of the Kimberley and the northern Great Sandy Desert (Friend 1990), in habitat dominated by loamy soils and *Triodia basedowii* (Smyth and Philpott 1967).

A number of areas along the pipeline route were identified as suitable for Bilby occupation, between KP219 to KP221, KP228 to KP233, KP235 to KP239 and an area to the West of the major dune systems between KP310.16 and KP289.47. These areas were searched thoroughly for signs of burrow excavation, diggings and scats. Bilby activity was confirmed in the area to the West of the major dune systems between KP310.16 and KP289.47 where there were alternating sections of rocky substrate and mixed shrubland over *Triodia* sp. on soft sandy loam. In the sandy areas there were characteristic Bilby diggings (Plate 3.2) and a recently used burrow located at KP295.75 on the centre line of the pipeline corridor (Plates 3.3a and b). Bilby diggings are shallow cylindrical pits 5-20cm deep, and 5-15cm wide, where the soil is piled up in the direction of the mouths (Smyth and Philpott 1967).



**Plate 3.2: Bilby diggings observed along the pipeline corridor alignment.**



**Plate 3.3a: Bilby burrow at KP295.75 on the centre line of the pipeline corridor.**



**Plate 3.3b: Close-up photo of Bilby burrow at KP295.75 on the centre line of the pipeline corridor.**

### **3.3 WA Wildlife Conservation Act**

Classification of Rare and endangered fauna under the WA Wildlife Conservation (Specially Protected Fauna) Notice 1999, recognises four distinct schedules;

- Schedule 1 - "fauna which are Rare or likely to become extinct, are declared to be fauna that is in need of special protection";
- Schedule 2 - "fauna which are presumed to be extinct, are declared to be fauna that is in need of special protection";
- Schedule 3 - "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, are declared to be fauna that is in need of special protection"; and
- Schedule 4 - "declared to be fauna that is in need of special protection, otherwise than for the reasons mentioned in paragraphs (a), (b) and (c)."

Scheduled species recorded or likely to occur in the proposed transport corridor are detailed in the following sections.

#### **3.3.1 Schedule 1 Species**

##### Night Parrot *Pezoporus occidentalis*

The Night Parrot is a small nocturnal parrot (Frith 1976). Little is known about its feeding and reproductive behaviour as this species has not been sighted in the wild by any living ornithologist. The Night Parrot was once distributed extensively across the interior of Australia. While a large portion of

its range has contracted, it is reasonable to assume that it may still survive amongst Spinifex dominated vegetation. The Night Parrot was not recorded along the pipeline corridor alignment.

Mulgara *Dasyercus cristicauda*

See Section 4.2.2

Ampurta *Dasyercus hillieri*

See Section 4.2.1

Bilby *Macrotis lagotis*

See Section 4.2.2

Marsupial Mole *Notoryctes caurinus*

See Section 4.2.1

### 3.3.3 Schedule 3 Species

One Schedule 3 species, the Fork-tailed Swift *Apus pacificus*, is likely to occur sporadically and seasonally in the project area. The Fork-tailed Swift is discussed in Section 4.1.

### 3.3.4 Schedule 4 Species

Three Schedule 4 species, the Peregrine Falcon *Falco peregrinus*, Pink Cockatoo *Cacatua leadbeateri* and Woma *Aspidites ramsayi* occur or potentially occur in the project area.

Peregrine Falcon *Falco peregrinus*

The Peregrine Falcon is widely distributed throughout Australia. It is nomadic, sedentary or partly so, and prefers coastal or inland cliffs and gorges, timbered watercourses, plains and open woodlands. Its status is considered to be "generally uncommon, probably declining in settled regions; still well established in remote areas" (Pizzey, 1983). Blakers *et al.* (1984) consider that Australia is one of the strongholds of the species, since it has declined in many other parts of the world. An individual was observed in a tree along the pipeline route where it runs parallel to the Telfer Road. The Peregrine Falcon occurs at low densities throughout Australia, but requires rocky ranges and upland areas for inaccessible cliff nesting sites. As the pipeline alignment avoids such areas it is unlikely that the Peregrine Falcon will be significantly impacted by the development.

Pink Cockatoo *Cacatua leadbeateri*

The Pink or Major Mitchell's Cockatoo is widely but patchily distributed throughout Australia. Its status is considered to be "widespread but usually much less abundant than other white cockatoos" (Pizzey, 1997). The species is either sedentary or nomadic, often occurring near timbered watercourses. The Pink Cockatoo was not recorded along the pipeline corridor alignment.

Woma *Aspidites ramsayi*

The Woma *Aspidites ramsayi* generally inhabits arid sandy areas where it feeds on small mammals, ground birds and reptiles. It is thought to have once been common, however recent records in areas other than the sandy deserts comprise only old adults (Bush *et al.*, 1995). Feral predation is thought to have had a significant effect on juveniles. Large scale clearing for agriculture has severely reduced available habitat. Storr *et al.* (1986) suggest that this species was formerly common but is now very Rare although individuals may potentially exist along the proposed pipeline corridor.

### 3.4 DCLM Priority Fauna

Species on the DCLM Priority Fauna list include those removed from the scheduled fauna list and other species known from only a few populations or in need of monitoring. Four Priority Codes are recognised:

- Priority One** Taxa with few, poorly known populations on threatened lands.
- Taxa which are known from few specimens or sight records from one or a few localities, on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
- Priority Two** Taxa with few, poorly known populations on conservation lands.
- Taxa which are known from few specimens or sight records from one or a few localities, on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
- 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 if present circumstances change. These taxa are usually represented on conservation lands.

The details of Priority Fauna likely to be found in the project area are outlined below.

#### Bush Stone-curlew *Burhinus grallarius*

Bush Stone-curlews generally inhabit open woodland areas with a leaf litter layer that provides them with camouflage which they rely on for predator avoidance. This species is Rare to uncommon in the southern parts of Western Australia and it is thought to be locally extinct in some areas due to predation by foxes (Johnstone & Storr, 1998). Bush Stone-curlew tracks were observed in the Oakover riverbed during the current survey. The construction of the pipeline is unlikely to significantly impact this species.

#### Grey Falcon *Falco hypoleucos*

Grey Falcons are predominantly found in the lightly timbered plains of mainland Australia. They breed between July – November and raise 1-4 chicks in an old hawk or crow nest (Frith 1976). The Grey

Falcon is widespread but sparse, with its distribution centred on inland drainage systems. Overgrazing in the arid zone is thought to influence prey abundance, and therefore Grey Falcon numbers. The Grey Falcon was not recorded along the pipeline corridor alignment.

Australian Bustard *Ardeotis australis*

The Australian Bustard is listed as a Priority 4 species. It is thought that alteration of its grassland habitats by grazing sheep and rabbits and predation by the fox has led to a decline in its number and range. Australian Bustard tracks were seen the entire length of the proposed pipeline route (Plate 3.5). The construction of the pipeline will not significantly impact this species.



**Plate 3.5: Bustard tracks near KP179.**

Flock Bronzewing *Phaps histiconica*

The Flock Bronzewing is the most gregarious of all Australian pigeons (Frith 1976). In the past flock numbers were in the thousands, however in recent years flocks seldom number more than a few hundred individuals. The introduction of sheep has led to the destruction of soft grasses, the seed of which provides the Flock Bronzewing with food (Frith 1976). The Flock Bronzewing was not recorded along the pipeline corridor alignment.

Alexandra's Parrot *Polytelis alexandrae*

The Rare and highly nomadic Alexandra's Parrot inhabits the arid interior of Australia (Frith 1976). Occurring in flocks of less than 20 individuals they spend most of the day on or near the ground, feeding on the seeds of grasses (especially *Triodia* sp.) and herbs. Alexandra's Parrot nests in riverine eucalypt habitat (Frith 1976). The Alexandra's Parrot was not recorded along the pipeline corridor alignment.

Long-tailed Dunnart *Smithopsis longicaudatus*

The Long-tailed Dunnart is restricted to rocky outcrops in the western arid zone. Only three specimens of the Long-tailed Dunnart were held in museums prior to 1975. Since this time however a number of animals have been recorded from widely scattered localities, including the Gibson Desert, Murchison, North-eastern Golfields, Pilbara and Asburton (Strahan 1995). The Long tailed Dunnart was not recorded along the pipeline corridor alignment.

Spectacled Hare-wallaby *Lagorchestes conspicillatus*

The Spectacled Hare-wallaby inhabits tropical grasslands predominantly in the Kimberley region of Western Australia. Once widespread in the Pilbara its distribution has declined drastically. It is thought that frequent fires in the Spinifex grassland has minimised the number of large hummocks that are required for shelter (Strahan 1995). The Spectacled Hare-wallaby was not recorded along the pipeline corridor alignment.

Ghost Bat *Macroderma gigas*

The carnivorous Ghost Bat is the largest microchiroptera bat in Australia (Churchill 1998). The Ghost Bat was once distributed across much of inland and northern Australia but is now restricted to the tropical north and Pilbara. Occurring in a wide variety of habitats, Ghost Bats roost in a variety of sandstone caves along cliff lines, under boulder piles in limestone caves and in abandoned mines (Churchill 1998). The Ghost Bat was not recorded along the pipeline corridor alignment.

Western Pebble-mound Mouse *Pseudomys chapmani*

The Western Pebble-mound Mouse lives in mounds that are approximately 0.5-0.9 m<sup>2</sup> in size (Strahan 1995). These mounds are characterised by volcano-like craters which are the entrances to the underlying burrow system. Populations of the Western Pebble-mound Mouse are widespread but appear to be patchily distributed in the Pilbara (Strahan 1995). “The persistence of abandoned mounds in the adjacent Gascoyne and Murchison regions as well as on small, isolated and coastal ranges in the Pilbara, indicate a considerable recent decline in distribution” (Strahan 1995). The Western Pebble-mound Mouse was not recorded along the pipeline corridor alignment.

Rare and Priority Fauna species discussed in this Section include those that occur or potentially occur in the project area. The majority of these species were not recorded during the current survey.

## 4.0 FLORA

### 4.1 FLORA SURVEY RESULTS

A total of 348 species from 59 families and 150 genera were recorded during the survey (Appendix A). The most commonly recorded families were Papilionaceae (45 taxa), Poaceae (37 taxa) and Mimosaceae (27 taxa), whilst the most commonly recorded genera were *Acacia* (23 taxa), *Tephrosia* (15 taxa) and *Ptilotus*, *Sida* and *Triodia* (all with 10 taxa). Included in this inventory are 22 collections which could not be identified beyond genus level and five collections that could not be identified beyond family. It is pertinent to note that as the focus of the survey was to record taxa of potential conservation significance, rather than to record a complete floristic inventory of the proposed pipeline, some more common species may have been excluded from collection or notation.

The vegetation communities present along the alignment are varied and are too detailed to present here in adequate detail. For more detailed descriptions of the vegetation please refer to Hart, Simpson and Associates (2001). However in a general sense the vegetation consisted of open mixed *Acacia* shrublands over *Triodia pungens* and various fire opportunistic shrubs; open mixed grasslands of *Cenchrus ciliaris* and *Triodia pungens* with scattered various *Corymbia* and *Eucalyptus* trees; *Triodia* dominated grasslands; pindan type sandplains typical of the Northern Botanical Province; sand dune vegetation dominated by various grass/ low shrub species; and interdunal sandy loam plains typically dominated by *Acacia*, *Jacksonia*, *Grevillea* and/or Bloodwood spp (*Corymbia*) over spinifex (*Triodia*)/ *Aristida* grasslands.

### 4.2 FLORA OF CONSERVATION SIGNIFICANCE

#### 4.2.1 Environment Protection and Biodiversity Conservation Act

At a National level, flora are protected under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Act contains a list of species that are considered Critically Endangered, Endangered, Vulnerable, Conservation Dependent, Extinct or Extinct in the Wild (Table 4.1).

**Table 4.1 Definition of categories described under the EPBC Act.**

Conservation Category	Description
Extinct	A species is extinct if there is no reasonable doubt that the last member of the species has died.
Extinct in the wild	A species is categorized as extinct in the wild if it is only known to survive in cultivation, in captivity or as a naturalized population well outside its past range; or if it has not been recorded in its known/expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered	The species is facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate; or its numbers have been reduced to such a critical level,

	or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Conservation Dependent	The species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

No species listed under the EPBC Act were collected or recorded in the project area.

#### 4.2.2 Wildlife Conservation Act

Rare Flora are also protected under the *Western Australian Wildlife Conservation (Rare Flora) Notice 2003* of the *Wildlife Conservation Act 1950*. The notice lists protected flora taxa that are extant and considered likely to become extinct or Rare. Generally speaking, species of flora are considered as being of Declared Rare Flora (DRF) or Priority conservation status where their populations are restricted geographically or threatened by local processes. DCLM maintains a list of all DRF and Priority Flora taxa within Western Australia (Atkins, 2003). Definitions of categories of DRF and Priority Flora are provided in Table 4.2. Priority Flora are either poorly known, believed to be uncommon, Rare or under threat but have not been designated as DRF and thereby legally protected because the detailed survey work to justify this has not been carried out. Priority species are maintained on a “Reserve List” and assigned to one of four Priority categories (Atkins, 2003).

**Table 4.2: Definition of Declared Rare and Priority Categories**

Code	Definition
DRF	Declared Rare Flora - Extant Taxa. Taxa which have been adequately searched for and are deemed to be in the wild either Rare, in danger of extinction, or otherwise in need of special protection.
1: Priority One	Poorly Known Taxa. Taxa which are known from one or a few (generally <5) populations which are under threat.
2: Priority Two	Poorly Known Taxa. Taxa which are known from one or a few (generally <5) population, at least some of which are not believed to be under immediate threat.
3: Priority Three	Poorly Known Taxa. Taxa which are known from several populations, at least some of which are not believed to be under immediate threat.
4: Priority Four	Rare Taxa. Taxa which are considered to have been adequately surveyed and which whilst being Rare, are not currently threatened by any identifiable factors.

(From Atkins, K.J., Declared Rare and Priority Flora List April 2003, DCLM)

### 4.2.3 Rare and Priority Flora recorded on the alignment

Six Priority flora species were identified along the proposed alignment during the survey (Figure 5.1, Appendix B). A description of their locations and proposed impact from the pipeline is included below.

#### *Goodiana hartiana* (Priority 2)

*Goodiana hartiana* occurs sporadically in medium density through the alignment between chainages KP177 and KP373, but is likely to occur elsewhere. It primarily occurs at the base of dunes and across interdunal sandy loam plains of the Great Sandy Desert and Telfer Road section of the route (Plate 4.2, 4.5). This species is not common and may be mistaken for the related and superficially similar *Goodenia azurea* in the habitats investigated, which occurs at a higher frequency in similar habitats. The *G. hartiana* specimens collected during the survey are currently being assessed by a Goodeniaceae specialist for confirmation of identification and the results will be added as an addendum to this report at a later date. The impact from the construction of the gas pipeline will be negligible on the populations of *Goodenia hartiana* due to a low proportion of individuals within the zone of clearance.

#### *Dampiera atriplicina* (Priority 2)

*Dampiera atriplicina* occurs between chainages 212 and 441 and is located at the base, sides and crests of red sand dunes and sandplains of the Great Sandy Desert section of the alignment. It is a conspicuous species on the sand dunes due to its grey white foliage, small red-purple flowers and the high density of plants observed (from 3-50 plants/10m<sup>2</sup>) (Plate 4.3, 4.4). Impacts to these populations by construction of the pipeline are unlikely to be significant, given the widespread occurrence of dune systems throughout the region, and the low area of proposed impact. In areas of natural disturbance (e.g. after fire or near dune 'blowouts') a high degree of natural recolonisation by *Dampiera atriplicina* was observed, therefore it is likely that this species will recover quickly if disturbed by clearance operations.

#### *Euphorbia clementii* (Priority 2)

*Euphorbia clementii* was observed and collected at one general location between chainages 97 and 98.5 along the route, but is likely to occur in similar habitats in the surrounding area (Plate 4.6, 4.8). This species was observed at low densities on rocky scree slopes adjacent to the Goldsworthy railway access road, and will not be impacted by construction activities. It is recommended that the alignment is restricted to the minimum width at these locations.

#### *Abutilon trudgenii* (Priority 3)

*Abutilon trudgenii* occurs sporadically at low densities between chainages 95 and 98, primarily along road verges, but is present on the alignment at chainages 98.1 and 98.27 near the Goldsworthy railway access road. This is an opportunistic species that is widespread throughout the Pilbara but has not been frequently documented (Plate 4.7, 4.8). It is likely to be more common than current location information indicates, especially on road verges and disturbed areas. Impact to this population will be negligible due to the small proportion of individuals on the alignment.

*Acacia glaucocaesia* (Priority 3)

*Acacia glaucocaesia* (Priority 3) occurs between chainages 82 and 94 on the loam floodplain flats of the Strelley and De Grey rivers (Plate 4.9, 4.10). Due to the widespread distribution of this species in the northern Pilbara and the high density of plants and widespread occurrence of this species across the floodplain, impact on these populations from construction activities will be insignificant. There will be no requirement to alter the width of clearance due to this species, although this region contains large stands of the weed, Buffel Grass (*Cenchrus ciliaris*), and clearance may need to be minimised to reduce the potential for weed invasions and dispersal.

*Comesperma pallidum* (Priority 3)

*Comesperma pallidum* occurs at chainages KP255.9, 265 and 347.81 on the sandy loam inter-dunal plains of the Great Sandy Desert section of the route. It is a tall spindly shrub with small yellow flowers clustered at the end of terminal spikes. It occurs at low densities at all three locations. The impact to the species is unlikely to be significant given the widespread distribution over the Great Sandy and Little Sandy Deserts (Florabase, 2003), although it is recommended that construction activities are limited to the minimum width as per the management plans in the Flora and Fauna Management Plan (Newcrest, 2003).

Insert Figure 4.1: Location of Priority Flora



Plate 4.1 *Comesperma pallidum* (P3)

*ecologia*

*ecologia*



Plate 4.2 *Goodenia hartiana* (P2)

*ecologia*

*ecologia*



Plate 4.3: Habit and habitat of *Dampiera atriplicina* (round grey bushes) at the base of a sand dune (KP400.58).



Plate 4.5: Habit and habitat of *Goodenia hartiana* (green shiny bushes in the foreground) (KP307.53).



Plate 4.4: Flowers and foliage of *Dampiera atriplicina* (KP417.95).



Plate 4.6: *Euphorbia clementii* (KP98).



Plate 4.7: *Abutilon trudgenii* (KP 95).



Plate 4.9: *Acacia glaucocaesia* (KP91).

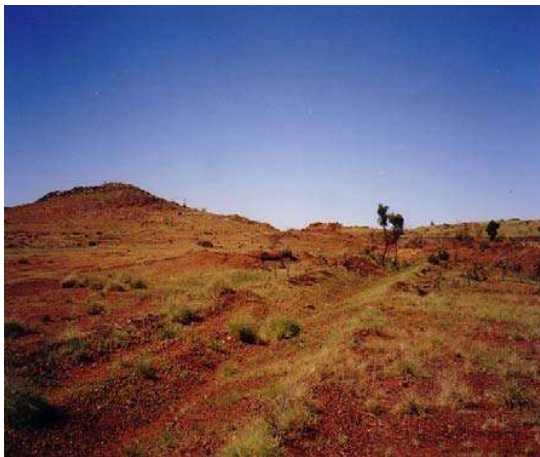


Plate 4.8: Habitat of *Abutilon trudgenii* and *Euphorbia clementii* (KP 98.25). The hill in the background is the first encountered along the route heading eastward from the Goldsworthy Rd/Great Northern Highway turnoff.



Plate 4.10: Habitat of *Acacia glaucocaesia* (KP 91.1).



Plate 4.11: Riverine habitat of De Grey River (KP 76.17), where the species *\*Argemone ochroleuca*, *\*Cenchrus ciliaris*, *\*Cynodon dactylon*, *\*Parkinsonia aculeata* and *\*Indigofera oblongifolia* occur amongst the *Eucalyptus victrix* woodlands.



Plate 4.13: Habitat of *\*Cenchrus ciliaris* (KP 97) adjacent to shallow loam creekline.

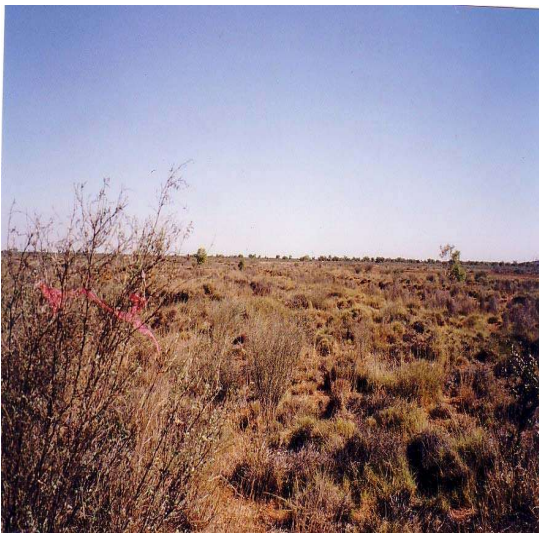


Plate 4.12: Habitat of *\*Indigofera oblongifolia* (KP 75.83). The species can be seen as a medium sized grey shrub. In this view an individual is flagged by pink tape and is of medium density in the background.

#### 4.2.4 Flora of potential conservation significance

One taxon of potential Priority significance was recorded during the survey at KP 58; an undescribed *Calandrinia* species (*Calandrinia* sp. Nov). This specimen has been lodged with the Western Australian Herbarium for further study. As this taxon has not been previously described, its distribution and abundance has not been studied or documented. Consequently, there is a possibility that this species will be placed on the Department of Conservation and Land Management's Rare and Priority Flora List. Until confirmation of this species' taxonomic and conservation status has been received, it should be regarded as a significant plant species and managed in accordance with the relevant sections of the Flora and Fauna Management Plan.

#### 4.2.5 Priority species previously recorded in the vicinity of the alignment

During the survey particular attention was paid to genera from which taxa of Priority significance are known to potentially occur or which were collected along the ecological survey in September – October 2001 (Hart, Simpson and Associates, 2001). These taxa are recorded in Table 4.3 below.

*Stemodia linophylla* was listed as a Priority species in this survey, but has since been removed from the April 2003 Priority flora list (Atkins, 2003).

*Goodenia lyrata* and *Fuirena incrassata* were both previously recorded by Hart, Simpson and Associates (2001), however they were not recorded during the recent survey. *Fimbristylis* sp. Shay Gap (Newbey 10293) and *Bulbostylis burbridgeae*, which were listed as potentially occurring along the alignment, were also not recorded during the current survey.

**Table 4.3: Location information of Priority species previously found along the alignment (adapted from Hart, Simpson and Associates Pty Ltd, 2001).**

Species	Priority	Location	Comment
<i>Goodenia lyrata</i>	1	Low-lying areas around the Telfer Road where the western route option joins the road	Prior to 2001, it has not previously been collected in the Great Sandy Desert, with the few previous records being in the Gibson Desert and the Newman-Laverton area to the west and south. Recorded during 2001 survey but not the 2003 survey.
<i>Stemodia linophylla</i> **	1  ** (no longer a Priority species)	Low-lying areas along the Telfer Road It was found to occur around the road where the western route option joins the road, scattered over at least 23km north-west from the road along the eastern route option, and to occur along the road for at least 11km east of the eastern route option. It was not seen between the two route options but may well occur off the road. Within this area it appeared to have a preferred habitat of low-lying swales prone to flooding, and the largest plants occurred in areas with a clayey soil and prone to flooding, but smaller plants occur on more sandy soils right to the foot of the nearby dunes.	Until recently it had been collected only four times from “between the Ashburton River and the Alfred and Marie Range” in 1875, north of the Gregory Range in 1947, “Canning Well” in 1991, and on Savory Creek in 1997 (Barker pers. comm.), and twice by Hart, Simpson and Associates to the south along Coolbro Creek in 1998 and a single plant at the Telfer mine site in 1999 (Hart, Simpson and Associates 1999).  Recorded during 2001 survey and the 2003 survey.  **NB. This species has been taken off the Rare Flora Notice list (Atkins, 2003), therefore it now has no conservation status.
<i>Goodenia hartiana</i> ms	2	East of Mt Cecelia and scattered along the Telfer Road, in swales.	It is a recently recognised species with few specimens in the W.A. Herbarium, and not yet published. It is poorly collected but well known around Telfer and further south towards the Rudall River. The occurrence near Mt Cecelia is a major range extension by approximately 100km.  Recorded during 2001 and 2003 surveys.
<i>Fuirena incrassata</i>	3	In a low-lying site on the Telfer Road near the eastern route option	This species is widespread in the Kimberleys and Pilbara, with a specimen known from the Oakover River, and it also occurs in northern areas in other states. Recorded during the 2001 survey but not the 2003 survey.
<i>Fimbristylis</i> sp. Shay Gap (Newbey 10293)	1	Not recorded during Sept-Oct 2001 Survey (Hart, Simpson and Associates Pty Ltd 2001). But known to occur nearby or within the general area.	Known from near Shay Gap. Previously recorded or likely to occur in the wider Pilbara/Great Sandy Desert Region, however it was not recorded during 2001 or 2003 surveys.

Species	Priority	Location	Comment
<i>Dampiera atriplicina</i>	2	Not recorded during Sept-Oct 2001 Survey (Hart, Simpson and Associates Pty Ltd 2001), but known to occur nearby or within the general area.	Known from the dune desert south of the Telfer Road. . Previously recorded or likely to occur in the wider Pilbara/Great Sandy Desert Region, however it was not recorded during 2001.  It was recorded during the 2003 survey.
<i>Euphorbia clementii</i>	2	Not recorded during Sept-Oct 2001 Survey (Hart, Simpson and Associates Pty Ltd 2001). But known to occur nearby or within the general area.	Known from the Great Northern Highway east of the De Grey River. Previously recorded or likely to occur in the wider Pilbara/Great Sandy Desert Region.  It was recorded during the 2003 survey.
<i>Abutilon trudgenii</i>	3	Not recorded during Sept-Oct 2001 Survey (Hart, Simpson and Associates Pty Ltd 2001). But known to occur nearby or within the general area.	Known from the Goldsworthy mine. Previously recorded or likely to occur in the wider Pilbara/Great Sandy Desert Region  It was recorded during the 2003 survey.
<i>Acacia glaucocaesia</i>	3	Not recorded during Sept-Oct 2001 Survey (Hart, Simpson and Associates Pty Ltd 2001). But known to occur nearby or within the general area.	Known from several sites including near the Goldsworthy turn off. Previously recorded or likely to occur in the wider Pilbara/Great Sandy Desert Region  It was recorded during the 2003 survey.
<i>Bulbostylis burbidgeae</i>	3	Not recorded during Sept-Oct 2001 Survey (Hart, Simpson and Associates Pty Ltd 2001). But known to occur nearby or within the general area.	Known from a granite rock near the Goldsworthy railway. . Previously recorded or likely to occur in the wider Pilbara/Great Sandy Desert Region  It was not recorded during the 2001 and 2003 surveys.

## 5.0 INTRODUCED SPECIES

### 5.1 FERAL FAUNA

Four species of feral fauna were recorded along the proposed pipeline corridor during the course of the survey; these include the Dingo *Canis lupis dingo*, Camel *Camelus dromedaries*, Fox *Vulpes vulpes* and Cat *Felis catus*. These species were recorded in numerous locations along the proposed pipeline corridor in a variety of different habitats (Table 5.1). Camel tracks were numerous along the corridor between KP176 to KP270, but were relatively low density and there was little sign of trampling or overgrazing. Conversely there were numerous signs of feral predators (fox, dingo and cat). The Feral Cat *Felis catus* was the most widespread and abundant mammal in the project area, tracks were in high density along the entire length of the alignment. It is not known when the feral cat arrived in Australia, however studies have indicated that they have influenced the decline of many species of arid zone marsupials.

**Table 5.1: Feral animal records along the proposed gas pipeline alignment.**

Species	Location	Evidence
Camel	KP374.079 (359969; 7630974)	Tracks
Feral Cat	KP374.079 (359969; 7630974)	Tracks
Feral Cat	KP334.46	Tracks
Fox	KP 316.38 (322033; 7671840)	Tracks
Cat	Telfer Road Section	Tracks scattered throughout entire section
Dingo	Telfer Road Section	Tracks scattered throughout entire section, dingo sighted on road (Plate 7.1)
Cat	KP178-KP179	Tracks
Fox	KP179-KP181	Tracks
Fox	KP198	Tracks
Cat	KP209.5	Tracks
Camel	KP210.6	Tracks
Camel	KP221	Tracks
Cat	Oakover River	Tracks
Dingo	Oakover River	Tracks
Cat	KP233.4	Tracks - numerous



**Plate 5.1 Dingo observed on side of Telfer Road.**

The Dingo *Canis lupis dingo* has a unique status amongst Australian mammals in that it may be considered as a native species, a naturalised species, or simply as introduced. It is thought to have arrived with traders from Indonesia (Moluccas), and may have been in Australia for as little as 4000 years (Strahan, 1995). Since that time it has spread, partially in the company of Aborigines, throughout the continent, but has not reached Tasmania. Some recent authors have attributed the extinction of certain large prehistoric mammals to the arrival of the Dingo, since there appeared to be few predators of animals such as kangaroos in recent (Holocene) times.

Further discussion of the potential environmental impacts of feral fauna is detailed in Section 9.2.5 and proposed Environmental Management Strategies are included in Section 10.

## 5.2 INTRODUCED FLORA

Some high Priority weeds that are, or have the potential to become, pests to agriculture can be formally declared under the *Agriculture and Related Resources Protection Act, 1976*. Weeds listed under the *Agriculture and Related Resources Protection Act, 1976* are listed with a coded definition of the requirements for control. There are five Priority groupings, and more than one Priority may be placed on a weed species. Details of these codes are included in Table 5.2 below.

**Table 5.2 Standard Control Codes for Declared Weeds as stated in the *Agriculture and Related Resources Protection Act, 1976***

Priority	Requirements
<p style="text-align: center;"><b>P1</b></p> <p style="text-align: center;">Prohibits movement</p>	<p>The movement of plants or their seeds is prohibited within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder.</p>
<p style="text-align: center;"><b>P2</b></p> <p style="text-align: center;">Aim is to eradicate infestation</p>	<p>Treat all plants to destroy and prevent propagation each year until no plants remain. The infested area must be managed in such a way that prevents the spread of seed or plant parts on or in livestock, fodder, grain, vehicles and/or machinery.</p>
<p style="text-align: center;"><b>P3</b></p> <p style="text-align: center;">Aims to control infestation by reducing area and/or density of infestation</p>	<p>The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery.</p> <p>Treat to destroy and prevent seed set all plants:-</p> <ul style="list-style-type: none"> <li>• Within 100 metres inside of the boundaries of the infestation.</li> <li>• within 50 metres of roads and highwater mark on waterways.</li> <li>• within 50 metres of sheds, stock yards and houses.</li> </ul> <p>Treatment must be done prior to seed set each year.</p> <p>Of the remaining infested area:-</p> <ul style="list-style-type: none"> <li>• Where plant density is 1-10 per hectare treat 100% of infestation.</li> <li>• Where plant density is 11-100 per hectare treat 50% of infestation.</li> <li>• Where plant density is 101-1000 per hectare treat 10% of infestation.</li> </ul> <p>Properties with less than 2 hectares of infestation must treat the entire infestation.</p> <p>Additional areas may be ordered to be treated.</p>

Priority	Requirements
<p style="text-align: center;"><b>P4</b></p> <p style="text-align: center;">Aims to prevent infestation spreading beyond existing boundaries of infestation</p>	<p>The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery.</p> <p>Treat to destroy and prevent seed set all plants:-</p> <ul style="list-style-type: none"> <li>• within 100 metres inside of the boundaries of the infested property</li> <li>• within 50 metres of roads and highwater mark on waterways</li> <li>• within 50 metres of sheds, stock yards and houses</li> </ul> <p>Treatment must be done prior to seed set each year. Properties with less than 2 hectares of infestation must treat the entire infestation.</p> <p>Additional areas may be ordered to be treated.</p> <p>Special considerations In the case of P4 infestations where they continue across property boundaries there is no requirement to treat the relevant part of the property boundaries as long as the boundaries of the infestation as a whole are treated. There must be agreement between neighbours in relation to the treatment of these areas.</p>
<p style="text-align: center;"><b>P5</b></p>	<p>Infestations on public lands must be controlled</p>

Seven species of introduced flora were recorded within the gas pipeline infrastructure corridor; *\*Parkinsonia aculeata*, *\*Aerva javanica*, *\*Argemone ochroleuca*, *\*Cenchrus ciliaris*, *\*Cynodon dactylon*, *\*Indigofera oblongifolia* and *\*Stylosanthes hamata* (Figure 5.1). A description of each of these species is included below and their locations are included as Appendix C. However as the focus of the survey was Rare and Priority taxa rather than a complete species inventory, it is likely that additional introduced species are also present. Hart, Simpson and Associates (2001) recorded additional species such as *\*Cenchrus setiger*, *\*Citrullus lanatus*, *\*Malvastrum americanum*, *\*Ricinus communis* and *\*Typha orientalis* which were not observed or collected in the recent survey. *\*Typha orientalis* was observed during the current survey in a creek bed, but was deemed to be outside the proposed impact zone.

Species collected during the 2003 survey:

*\*Parkinsonia aculeata* is listed as a P1 and P2 pest species north of the 26<sup>th</sup> parallel under the *Agriculture and Related Resources Protection Act, 1976*. *\*P. aculeata*, commonly referred to as Parkinsonia, is a small spiny tree with pinnate leaves and spikes of yellow flowers in the leaf axils. This species originates in warm temperate and tropical America and was introduced to Australia for shade

and ornamental purposes. It is well established in tropical Queensland, the Northern Territory and parts of Western Australia, infesting hundreds of kilometres of the banks of Lake Argyle, Christmas Creek and the Ord, De Grey, Maitland and Ashburton rivers. It forms dense, virtually impenetrable thickets, mainly along water courses.

\**Aerva javanica* (Family: Amaranthaceae), commonly known as Kapok Bush, is a perennial herb which grows up to 1m. It was introduced from Africa and Asia, where it was originally used as stuffing for camel saddles and consequently aided seed dispersal. \**Aerva javanica* invades disturbed areas and often displaces native species.

\**Argemone ochroleuca* (Family: Papaveraceae), commonly called Mexican Poppy, is a prickly, robust annual native to America. The leaves are greyish, very prickly and deeply divided, with cream to pale yellow flowers which are produced in spring. This species is listed as a Declared Pest in southern Western Australia.

\**Cenchrus ciliaris* (Family: Poaceae) commonly referred to as Buffel Grass, is a tufted perennial grass (Paczkowska and Chapman 2000) which was introduced from the Middle East as a fodder species by pastoralists. It grows in dense tufts up to 1 m and occurs in monospecific stands on loamy plains and creeklines, especially where cattle frequent. It is not listed as a Declared Weed under the Agriculture and Related Resources Protection Act 1979 due to its importance to the pastoral industry; however, it is an aggressive colonizer and has become a widespread weed of roadsides, creeklines, river edges and most vegetation types in the Pilbara, Gascoyne and Murchison and is continuing to spread in the south-west (Hussey *et al.*, 1997). This species was observed to be the most widespread weed species, distributed from Port Hedland to the Goldsworthy end of the proposed pipeline, with isolated patches found further in creeklines where cattle have frequented. *Cenchrus ciliaris* is found all along the highway section of the route (KP 0-105), especially in loamy disturbed sections (eg near roads, where cattle move, along streams and floodplains).

\**Cynodon dactylon* (Family: Poaceae) also known as Common Couch, is a perennial grass. It is commonly planted as a lawn grass in gardens and often invades wetlands and river edges, both in rural and urban environments. This species is native to the Kimberley and the tropics worldwide.

\**Indigofera oblongifolia* is an upright, greyish-green shrub belonging to the pea family (Family: Papilionaceae). It grows to 1.3 m and produces racemes of small pink flowers in April. Originally from North Africa and India, this species is abundant on roadsides in Port Hedland, where it is thought to have spread from, and near Mandora. \**Indigofera oblongifolia* was observed to be found along the alignment from KP 71-82 in varying densities but usually in conspicuous stands on the floodplains of the Strelley and De Grey Rivers (Plate 4.10). In this area, it is a medium sized grey shrub, approximately 0.8-1.5m in height, and has oblong grey leaves about 2cm in length.

\**Stylosanthes hamata* (Family: Papilionaceae) is a softly-haired perennial pea growing to greater than 1.5 m. It produces long yellow flower spikes between April and August. Originating in the West Indies and Central South America, this species has now become naturalised in the Kimberley region of Western Australia.

Although not recorded during the current survey, \**Acetosa vesicaria* (Ruby Dock) is common throughout the Pilbara, especially in disturbed areas, and is likely to be abundant in some locations. Ruby Dock is a highly aggressive and prolific colonizer, particularly of disturbed areas and should be included in all weed management programmes within the Pilbara.

**Figure 5.1: Locations of weed species**

## 6.0 CONSERVATION SIGNIFICANCE AND POTENTIAL IMPACTS

### 6.1 FAUNA

#### 6.1.1 Conservation Significance

The significance of the fauna of the project area has been assessed at four spatial scales; international / national, state, regional and local.

##### *International/National Significance*

Fauna species whose conservation is dependent, because of their migration patterns, on the action of other nations as well as Australia's, are of international significance. Such considerations are recognised by State legislation (Schedule 3 fauna under the WA Wildlife Conservation Act), Federal Legislation (EPBC Act) and also international treaties between nations (CAMBA, JAMBA). In addition endangered animals are listed and their conservation status reviewed by the International Union for the Conservation of Nature (IUCN).

National significance refers to those features of the environment which are recognised under legislation as being of importance to the Australian community. Species scheduled under the Commonwealth EPBC Act are regarded as nationally significant. The Mulgara *Dasyercus cristicauda* and Bilby *Macrotis lagotis* are of national significance having been recorded in the project area. They are listed under the EPBC Act.

The Fork-tailed Swift *Apus pacificus*, a migratory bird listed under CAMBA and JAMBA, is the only species of international significance that is likely to occur in the project area. As the Fork-tailed Swift does not breed in Australia the project will have a negligible impact on this species (Frith 1976).

There are no habitats of national or international significance within the study area that are likely to be impacted by the proposed development.

##### *State Significance*

State significance refers to those features of the environment that are recognised under state legislation as of importance to the Western Australian community; in particular species scheduled under the Wildlife Conservation Act. Fauna that are regarded as "Rare and/or endangered" or habitats which are site or type specific and possess high ecological value are of State significance. Habitats which exhibit such a level of significance will contain either specific, habitat dependent fauna or high biodiversity and are poorly represented elsewhere. If a species or habitat is poorly represented in conservation reserves its conservation significance is increased. Below is a list of species of State Significance.

- Peregrine Falcon *Falco peregrinus*
- Pink Cockatoo *Cacatua leadbeateri*
- Woma *Aspidites ramsayi*
- Night Parrot *Pezoporus occidentalis*

The significance of the area to populations of these species is quite variable. The Peregrine Falcon occurs at low densities throughout Australia, but requires rocky ranges and upland areas for inaccessible

cliff nesting sites. As the project area is largely restricted to the lowlands, construction of the pipeline is unlikely to impact on this species. The Pink Cockatoo is composed of several, apparently isolated populations within Western Australia. Pink Cockatoos were not recorded during the survey and as the pipeline will only impact a small proportion of woodlands the impact to the Pink Cockatoo will be negligible. Similarly, the Night Parrot which has not been sighted in the wild by any living ornithologist, is unlikely to be impacted by the construction of the pipeline.

The Woma occurs at low densities and is infrequently encountered. Any records of the Woma in particular would be significant since this species is now very uncommon in the southern interior. The Woma was not recorded during the survey, but is likely to occur in project area.

No threatened ecological communities are known from the pipeline corridor.

### *Regional Significance*

Regional significance addresses the representation of species and habitats at a biogeographic regional level, *i.e.* within the Pilbara or Great Sandy Desert Bioregion. Species or habitat types that are endemic to the Pilbara or Great Sandy Desert and whose known distribution is limited or unknown are considered regionally significant. The project area encompasses habitats and vegetation associations which are widespread throughout the region. Some of the species listed in the DCLM Priority list are considered regionally significant because of limited knowledge about their distribution, restricted distribution and/or poor representation within existing conservation reserves.

Fauna species of regional significance include the following:

- Bush Stone-curlew *Burhinus grallarius*
- Grey Falcon *Falco hypoleucos*
- Australian Bustard *Ardeotis australis*
- Flock Bronzewing *Phaps hisionica*
- Alexandra's Parrot *Polytelis alexandrae*
- Long-tailed Dunnart *Smithopsis longicaudatus*
- Spectacled Hare-wallaby *Lagorchestes conspicillatus*
- Ghost Bat *Macroderma gigas*
- Western Pebble-mound Mouse *Pseudomys chapmani*

Only the Bush Stone-curlew *Burhinus grallarius* and Australian Bustard *Ardeotis australis* were recorded along the proposed pipeline corridor alignment. These species are likely to only be impacted by extensive land clearing in the region. The construction of the pipeline corridor will have a negligible impact on all Priority species.

### *Local Significance*

Species are of local significance when their presence is confined to a specialised habitat type that is not common within the local area and whose disturbance or removal may lead to local extinction. No Rare or Priority fauna recorded or expected to occur in the project area is of local significance.

## 6.1.2 Environmental Impacts

The proposed pipeline corridor development will have direct and secondary impacts on Rare fauna and fauna habitat. These potential impacts are:

### Direct Impacts

- Loss of habitat through clearing of native vegetation;
- Potential loss of individuals during clearing for construction; and
- Deaths due to entrapment within open trench during excavation.

### Secondary Impacts

- Increased risk of wildfire associated with movement of employees and machinery;
- Degradation of fauna habitat due to invasion of weeds; and
- Increased movement of feral fauna in the area.

The EPA objective for terrestrial fauna is to maintain the abundance, species diversity and geographic distribution of terrestrial fauna and protect specially protected (threatened) fauna consistent with the provisions of the Wildlife Conservation Act 1950. If management procedures proposed in Section 9.0 are adopted then the impact to terrestrial fauna and the conservation status of specially protected and significant species should be minimised.

### 6.1.2.1 DIRECT FAUNA IMPACTS

#### Habitat Loss

The pipeline corridor will impact upon a range of habitats. Habitat loss will specifically affect those species dependent on the habitat. For example, the Mulgara and Bilby is dependent on habitat dominated by loamy soils and *Triodia basedowii* for shelter, feeding and breeding. The proposed route for the pipeline passes through areas of habitat which is suitable for Mulgara and Bilby.

#### Fauna Loss

During the clearing of the alignment there will be an initial mortality of fauna. The greatest loss of animals will be the smaller less mobile mammal species, reptiles and burrowing animals. Daytime tree hollow dwellers, such as bats and some nocturnal birds may also be lost.

### 6.1.2.2 SECONDARY FAUNA IMPACTS

#### Fire

Increased human activity is often associated with a change in fire regimes, leading to degradation of natural ecosystems. Movement of vehicles and human influences have the potential to increase the frequency of spot fires. Fauna such as the Mulgara are very habitat specific and loss of habitat through fire can have a significant influence on the success of a resident population.

#### Introduced Weed Species

Introduced plant species successfully and rapidly invade areas cleared of native vegetation or otherwise disturbed by humans, thereby altering the nature of fauna habitats. This may include the area cleared for

construction of the pipeline. Exposed areas of soil are rapidly colonised by exotic weed species, often at the expense of native plants.

Introduced plant species may replace native species that provide shelter or foraging areas for native fauna. Major changes to the structure of the vegetation will alter the fauna habitat and consequently may influence fauna species composition.

## **Introduced Fauna**

An increase in human activity is often associated with an increase in the abundance of introduced species such as the Feral Cat *Felis catus* and Fox *Vulpes vulpes*.

The Fox and Cat are known to predate upon and compete against native species, severely disrupting the natural balance. In many situations in south-western Australia and Australia in general, loss of native species, particularly mammals, has been attributed in great part to the spread of feral predators, particularly the Fox and Cat (Kinnear, 1993). Cats are also known to take a variety of other prey, including birds and reptiles (Bamford, 2000). Both the Cat and Fox are likely to consume native species of reptiles, birds and small mammals in the area, hence it is important to ensure that populations of these feral predators do not increase.

## **6.2 FLORA**

### **6.2.1 Conservation Significance**

In general the vegetation along the route is in excellent condition, particularly in the more remote western sections of the alignment between Goldsworthy and Telfer (approx KP 100 - 440), where the impacts of grazing and human actions are minor. The excellent condition of the vegetation, combined with the presence of varied topography and significant dune systems means that this area has a high conservation value both in the context of preserving biodiversity and for aesthetic reasons. However given that the corridor to be cleared by the power line is extremely narrow and bypasses areas of major relief wherever possible (e.g. the mesa country near KP 200), it is considered that the significance of the construction to the vegetation and environment in general is low. The most significant potential impact is to flora of particular conservation significance as detailed below.

The vegetation along the route from KP0-105 is a mixture of degraded floodplains, recently burnt shrublands and low stony rises and is of low conservation significance compared with the more remote sections of the route.

### **6.2.2 Flora of particular conservation significance**

Six Priority flora were recorded during the current survey as discussed in detail in Section 4.2.4. The impact to all these species is regarded as minimal due to the small width of clearance (approx. 30m) over the alignment, however some precautions are recommended for some of these species.

The potential for impact to the Priority taxa *Goodiana hartiana*, *Euphorbia clementii*, *Abutilon trudgenii* and *Comesperma pallidum* is considered to be some conservation significance despite their widespread distribution in the Pilbara and Little Sandy Desert regions. Little is known of these species and not many collections have been made, but it is likely that they are more common than current information suggests. Although the impact from the construction of the gas pipeline will be negligible on the

populations of these species due to the thin width of construction activities and a low proportion of individuals within the zone of clearance, it is recommended that minimum clearing restrictions apply to these specific sites as per the Flora and Fauna Management Plan (Newcrest, 2003).

*Dampiera atriplicina* occurs between chainages 212 and 441 and is located at the base, sides and crests of red sand dunes and sandplains of the Great Sandy Desert section of the alignment. This species is of low conservation significance due to there being a large density of individuals present on dune ecosystems and the extensive availability of habitat in the Great Sandy Desert regions. In areas of natural disturbance (e.g. after fire or near dune 'blowouts') a high degree of natural recolonisation by *Dampiera atriplicina* was observed.

*Acacia glaucocaesia* (Priority 3) occurs between chainages 82 and 94 on the loam floodplain flats of the Strelley and De Grey rivers and is considered of low conservation significance due to its widespread distribution in the north Pilbara as well as its high frequency on the floodplain.

### 6.2.3 Transmission of introduced flora

The spread of weeds as a result of the gas pipeline construction is a potential impact with severe environmental consequences, particularly given the extended distance which the pipeline traverses, from several areas where weeds are prevalent to portions of the alignment in pristine or near pristine condition.

The presence of Buffel grass *\*Cenchrus ciliaris*, Kapok Bush *\*Aerva javanica* and *\*Indigofera oblongifolia* at a number of locations along the alignment means that the spread of these weeds during construction is highly likely unless suitable precautions are taken. Although there is no legal imperative to remove these populations, their proximity to native vegetation in good condition suggests that a control programme to prevent spread is desirable. It is recommended that construction personnel be alerted to the existence and appearance of these species and that vehicles should be decontaminated prior to leaving infested areas and prior to entering areas of pristine vegetation.

*Indigofera oblongifolia* is an introduced weed that has recently invaded the floodplains of the Strelley and De Grey Rivers and has the potential to invade further areas of similar habitat. It is unsure of how this species is dispersed, but it is likely that transmission of seeds would occur via mud from cattle and vehicle movements. It is recommended that the Dept of Agriculture at Karratha is further consulted with regards to the best methods of control.

It must be highlighted that the locations of weeds documented in this report are a general guideline to the distribution and there is the likelihood that more populations exist along the alignment. It is recommended that contractors are aware of weed species and take the necessary precautions to avoid the spread of all exotic weed species as per the weed management plan in the Flora and Fauna Management Plan (Newcrest, 2003).

## STUDY TEAM

The Rare and Priority Fauna and Flora Survey described in this document was planned, coordinated and executed by:

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### PERMITS

The Rare and Priority Fauna and Flora Survey was conducted under the authorisation of the following licence issued by the Department of Conservation and Land Management to:

J. Bull, *ecologia* Environmental Consultants  
“Licence for scientific or other prescribed purposes”  
Licence Number: SL006522, valid to 17<sup>th</sup> June 2004.

### ACKNOWLEDGEMENTS

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Fauna and Flora Protection Acts and Agreements cited in text:

CAMBA: China-Australia Migratory Bird Agreement (Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment.)

JAMBA: Japan-Australia Migratory Bird Agreement (Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment.)

Bonn Convention: Convention on the Conservation of Migratory Species of Wild Animals

Western Australian *Wildlife Conservation Act 1950*

*Wildlife Conservation (Specially Protected Fauna) Notice 1999*

*Wildlife Conservation (Rare Flora) Notice 2003*

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

*Agriculture and Related Resources Protection Act 1976*

## **Appendix A**

### **Flora species recorded during Survey**

**Appendix A: List of flora species collected along the proposed Telfer Gas Pipeline**

Classification and nomenclature according to the Western Australian Herbarium and R.J. Hnatiuk (1990), Census of Australian Vascular Plants. Australian Government Publishing Service.

Key: \* = introduced species

§ = taxa that could not be fully identified due to a lack of material

☐ = Priority taxa.

FAMILY	SPECIES
POACEAE	<i>Amhipogon caricinus</i>
	<i>Aristida contorta</i>
	<i>Aristida holathera</i>
	<i>Aristida hygrometrica</i>
	<i>Aristida inaequiglumis</i>
	<i>Aristida pruinosa</i>
	* <i>Cenchrus ciliaris</i>
	<i>Chrysopogon fallax</i>
	<i>Digitaria brownii</i>
	<i>Enneapogon ?polyphyllus</i>
	<i>Enneapogon caeruleascens</i>
	<i>Eragrostis ? xerophyllum</i>
	<i>Eragrostis setifolia</i>
	§ <i>Eragrostis</i> sp.
	<i>Eragrostis speciosa</i>
	<i>Eragrostis tenella</i>
	<i>Eriachne aristida</i>
	<i>Eriachne flaccida</i>
	<i>Eriachne lanata</i>
	<i>Eriachne obtusa</i>
	<i>Eriachne pulchella</i> subsp <i>dominii</i>
	§ <i>Eriachne</i> sp
	<i>Paraneurachne ?muelleri</i>
	§POACEAE sp
	<i>Sorghum plumosum</i>
	<i>Sporobolus australasicus</i>
	<i>Triodia angustata</i>
	<i>Triodia basedowii</i>
	<i>Triodia epactia</i>
	<i>Triodia intermedia</i>
	<i>Triodia lanigera</i>
	<i>Triodia melvillei</i>
	<i>Triodia pungens</i>
	<i>Triodia schinzii</i>
§ <i>Triodia</i> sp	
<i>Triodia wiseana</i>	
<i>Xerochloa laniflora</i>	
CYPERACEAE	<i>Bulbostylis barbata</i>
	<i>Cyperus cunninghamii</i> subsp <i>cunninghamii</i>

FAMILY	SPECIES
	<i>Cyperus hesperius</i> <i>Cyperus vaginatus</i> <i>Cyperus viscidulus</i> <i>Fimbristylis dichotoma</i> <i>Fimbristylis neilsonii</i> <i>Fimbristylis oxytrachya</i> <i>Fimbristylis simulans</i>
ANTHERICACEAE	<i>Corynotheca micrantha</i> <i>Corynotheca micrantha</i> subsp <i>micrantha</i> <i>Tricoryne trudgeniana</i>
MORACEAE	<i>Ficus brachypoda</i>
PROTEACEAE	<i>Grevillea eriostachya</i> <i>Grevillea pyramidalis</i> subsp <i>leucadendron</i> <i>Grevillea refracta</i> <i>Grevillea stenobotrya</i> <i>Grevillea wickhamii</i> <i>Hakea divaricata</i> <i>Hakea lorea</i> <i>Hakea lorea</i> subsp <i>lorea</i> <i>Hakea macrocarpa</i>
SANTALACEAE	<i>Anthobolus leptomeriodes</i> <i>Exocarpos sparteus</i> <i>Santalum lanceolatum</i>
LORANTHACEAE	<i>Lysiana spathulata</i>
LYTHRACEAE	<i>Ammannia baccifera</i>
CHENOPODIACEAE	<i>Chenopodium melanocarpum</i> forma <i>leucocarpum</i> <i>Rhagodia eremaea</i> <i>Salsola tragus</i> <i>Sclerolaena costata</i>
AMARANTHACEAE	<i>Alternanthera angustifolia</i> <i>Alternanthera nana</i> <i>Gomphrena canescens</i> <i>Ptilotus astrolasius</i> <i>Ptilotus astrolasius</i> var. <i>astrolasius</i> <i>Ptilotus axillaris</i> <i>Ptilotus calostachyus</i> <i>Ptilotus exaltatus</i> <i>Ptilotus macrocephala</i> <i>Ptilotus obovatus</i> <i>Ptilotus polystachyus</i> var <i>arthrotrichus</i>

FAMILY	SPECIES
	<i>Ptilotus schwartzii</i> var <i>schwartzii</i> <i>Ptilotus stipitatus</i>
NYCTAGINACEAE	§ <i>Boerhavia</i> sp
GYROSTEMONACEAE	<i>Codonocarpus cotinifolius</i> <i>Gyrostemon tepperi</i>
AIZOACEAE	<i>Trianthema pilosa</i> <i>Trianthema rhynchocalyptra</i> <i>Trianthema triquetra</i>
PORTULACACEAE	<i>Calandrinia affin primulifera</i> <i>Calandrinia</i> sp. Nov <i>Calandrinia stagnensis</i> <i>Calandrinia strophiolata</i> <i>Mollugo molluginensis</i> <i>Portulaca oleracea</i>
CARYOPHYLLACEAE	<i>Polycarpaea corymbosa</i> <i>Polycarpaea longiflora</i>
LAURACEAE	<i>Cassytha capillaris</i>
PAPAVERACEAE	<i>Argemone ochroleuca</i>
CAPPARACEAE	<i>Cleome uncifera</i> <i>Cleome viscosa</i>
DROSERACEAE	<i>Drosera indica</i>
BYBLIDACEAE	<i>Byblis filifolia</i>
SURIANACEAE	<i>Stylobasium spathulatum</i>
MIMOSACEAE	<i>Acacia acradenia</i> <i>Acacia adoxa</i> var <i>adoxo</i> <i>Acacia adoxa</i> var <i>subglabra</i> <i>Acacia ancistrocarpa</i> <i>Acacia bivenosa</i> <i>Acacia colei</i> <i>Acacia coriacea</i> subsp <i>sericophylla</i> <i>Acacia dictylophleba</i> <i>Acacia drepanocarpa</i> subsp. <i>latifolia</i> <i>Acacia eriopoda</i> ‡ <i>Acacia glaucocaesia</i> <i>Acacia hilliana</i> <i>Acacia maitlandii</i>

FAMILY	SPECIES
	<i>Acacia monticola</i>
	<i>Acacia orthocarpa</i>
	<i>Acacia sclerosperma</i>
	<i>Acacia sphaerostachya</i>
	<i>Acacia stellaticeps</i>
	<i>Acacia stipuligera</i>
	<i>Acacia synchronicia</i>
	<i>Acacia trachycarpa</i>
	<i>Acacia tumida</i>
	<i>Acacia victoriae</i>
	<i>Neptunia dimorphantha</i>
	<i>Sesbania cannabina</i>
CAESALPINIACEAE	<i>Chamaecrista symonii</i>
	<i>Dichrostachys spicata</i>
	<i>Erythrophleum chlorostachys</i>
	<i>Lysiphyllum cunninghamii</i>
	<i>Parkinsonia aculeata</i>
	<i>Petalostylis cassioides</i>
	<i>Petalostylis labicheoides</i>
	<i>Senna artemisioides</i> subsp <i>helmsii</i>
	<i>Senna artemisioides</i> subsp <i>oligophylla</i>
	<i>Senna artemisioides</i> subsp <i>sturtii</i>
	<i>Senna glutinosa</i> subsp <i>X lueri</i>
	<i>Senna venusta</i>
PAPILIONACEAE	<i>Aenictophyton reconditum</i>
	<i>Aeschynomene indica</i>
	<i>Cajanus cinereus</i>
	<i>Cajanus marmoratus</i>
	<i>Crotalaria cunninghamii</i>
	<i>Crotalaria medicaginea</i>
	<i>Crotalaria ramosissima</i>
	<i>Crotalaria ? crispata</i>
	<sup>§</sup> <i>Cullen</i> sp
	<i>Gompholobium polyzyga</i>
	<i>Indigofera ?rosea</i>
	<i>Indigofera boviparda</i> subsp <i>boviparda</i>
	<i>Indigofera colutea</i>
	<i>Indigofera georgei</i>
	<i>Indigofera linifolia</i>
	<i>Indigofera monophylla</i>
	<i>Indigofera oblongifolia</i>
	<i>Indigofera rugosa</i>
	<i>Isotropis atropurpurea</i>
	<i>Isotropis forrestii</i>
	<i>Jacksonia aculeata</i>
	<i>Leptosema anomala</i>

FAMILY	SPECIES
	<i>Mirbelia viminalis</i> <i>Otton simplicifolium</i> <i>Psoraliea martinii</i> <i>Rhynchosia minima</i> <i>Stylosanthes hamata</i> <sup>§</sup> <i>Swainsona</i> sp <i>Tephrosia ?supina</i> <i>Tephrosia affin bidwillii</i> <i>Tephrosia arenicola</i> <i>Tephrosia flammea</i> <i>Tephrosia indigofera</i> <i>Tephrosia met11601</i> <i>Tephrosia rosea</i> <i>Tephrosia rosea subsp glabrior</i> <sup>§</sup> <i>Tephrosia</i> sp <i>Tephrosia</i> sp Bungaroo Creek <i>Tephrosia stipuligera</i> <i>Tephrosia supina</i> <i>Tephrosia virens</i> <i>Thinicola incana</i> <i>Zornia chaetophora</i> <i>Zornia muelleriana subsp congesta</i>
ZYGOPHYLLACEAE	<i>Tribulus hirsutus</i> <i>Tribulus occidentalis</i>
MELIACEAE	<i>Owenia reticulata</i>
POLYGALACEAE	<sup>⊠</sup> <i>Comesperma pallidum</i>
EUPHORBIACEAE	<i>Euphorbia australis</i> <i>Euphorbia biconvexa</i> <sup>⊠</sup> <i>Euphorbia clementii</i> <i>Euphorbia coghlanii</i> <i>Euphorbia myrtoides</i> <sup>§</sup> <i>Euphorbia</i> sp <i>Euphorbia tannensis</i> <i>Phyllanthus maderaspatensis</i> <i>Sebastiania chamaelea</i>
STACKHOUSIACEAE	<i>Macgregoria racemigera</i> <i>Stackhousia affin intermedia</i>
SAPINDACEAE	<i>Diplopeltis stuartii</i> <i>Dodonaea coriacea</i>

FAMILY	SPECIES
TILIACEAE	<i>Corchorus ?pumilio</i> <i>Corchorus crozophorifolius</i> <i>Corchorus parviflorus</i> <i>Corchorus sidoides</i> <i>Corchorus sidoides</i> subsp <i>sidoides</i> <i>Corchorus sidoides</i> subsp <i>vermicularis</i> <sup>§</sup> <i>Corchorus</i> sp <i>Corchorus</i> sp Hamersley Range (S van Leeuwin 3586) <i>Triumfetta chaetocarpa</i> <i>Triumfetta clementii</i> <i>Triumfetta maconochieana</i>
MALVACEAE	<sup>¶</sup> <i>Abutilon trudgenii</i> ms <i>Gossypium australe</i> <i>Hibiscus coatesii</i> <i>Hibiscus panduriformis</i> var <i>australis</i> <sup>§</sup> MALVACEAE sp <i>Sida ?echinata</i> <i>Sida ?platycalyx</i> <i>Sida atrovirens</i> <i>Sida cardiophylla</i> <i>Sida clementii</i> <i>Sida echinocarpa</i> <i>Sida excedentifolia</i> <i>Sida pilbarensis</i> <i>Sida rohlena</i> <i>Sida rohlena</i> subsp <i>rohlena</i> <sup>§</sup> <i>Sida</i> sp
STERCULIACEAE	<i>Keraudrenia nephrosperma</i> <i>Keraudrenia velutina</i> <i>Rulingia ?loxophylla</i> <i>Waltheria indica</i> <i>Waltheria virgata</i>
FRANKENIACEAE	<i>Frankenia ambita</i>
VIOLACEAE	<i>Hybanthus aurantiacus</i>
THYMELAEACEAE	<i>Pimelea ammochaeris</i>
COMBRETACEAE	<i>Terminalia canescens</i>
MYRTACEAE	<i>Aluta maisonneuvei</i> <i>Calytrix carinata</i> <i>Corymbia aspera</i> <i>Corymbia deserticola</i>

FAMILY	SPECIES
	<i>Corymbia hamersleyana</i>
	<i>Corymbia opaca</i>
	§ <i>Corymbia</i> sp
	<i>Corymbia zygophyllum</i>
	<i>Eucalyptus ?victrix</i>
	<i>Eucalyptus gamophylla</i>
	<i>Eucalyptus kingsmillii</i>
	<i>Eucalyptus odontocarpa</i>
	<i>Eucalyptus victrix</i>
	<i>Melaleuca glomerata</i>
	<i>Melaleuca lasiandra</i>
	<i>Melaleuca leucadendra</i>
	§MYRTACEAE sp
HALORAGACEAE	§ <i>Gonocarpus</i> sp.
	<i>Haloragis gossei</i>
APIACEAE	<i>Trachymene oleracea</i> subsp <i>oleracea</i>
OLEACEAE	<i>Jasminum didymum</i>
APOCYNACEAE	<i>Carissa lanceolata</i>
ASCLEPIADACEAE	<i>Cynanchum floribundum</i>
MENISPERMACEAE	<i>Tinospora smilacina</i>
CONVOLVULACEAE	<i>Bonamia linearis</i>
	<i>Bonamia media</i>
	<i>Bonamia rosea</i>
	<i>Evolvulus alsinoides</i>
	<i>Ipomaea ?plebia</i>
	<i>Ipomoea coptica</i>
	<i>Polymeria ambigua</i>
	<i>Porana sericea</i>
BORAGINACEAE	<i>Ehretia saligna</i> var <i>saligna</i>
	<i>Ehretia saligna</i>
	<i>Halgania solanacea</i>
	<i>Halgania solanacea</i> var <i>solanacea</i>
	<i>Heliotropium ? pachyphyllum</i>
	<i>Heliotropium ? transforme</i>
	<i>Heliotropium affin glabellum</i>
	<i>Heliotropium affin transforme</i>
	<i>Heliotropium glanduliferum</i>
	<i>Heliotropium ovalifolium</i>
	<i>Heliotropium pachyphyllum</i>
	<i>Heliotropium parviantrum</i>

FAMILY	SPECIES
	<i>§Heliotropium</i> sp <i>Heliotropium vestitum</i>
VERBENACEAE	<i>§Clerodendrum</i> sp <i>Clerodendrum</i> sp K Newbey 10150 <i>Clerodendrum tomentosum</i> subsp <i>tomentosum</i>
LAMIACEAE	<i>Cyanostegia cyanocalyx</i> <i>Dicrastylis ?cordifolia</i> <i>Dicrastylis cordifolia</i> var <i>purpurea</i> <i>Dicrastylis doranii</i> <i>Dicrastylis georgei</i> <i>§Dicrastylis</i> sp <i>Newcastelia cladotricha</i>
SOLANACEAE	<i>Duboisia hopwoodii</i> <i>Nicotiana benthamiana</i> <i>Solanum cunninghamii</i> <i>Solanum dioicum</i> <i>Solanum diversiflorum</i> <i>Solanum lasiophyllum</i>
SCROPHULARIACEAE	<i>Mimulus</i> sp <i>§?Stemodia</i> sp <i>Stemodia affin lathraia</i> <i>Stemodia grossa</i> <i>Stemodia linophylla</i> <i>Stemodia viscosa</i> <i>Striga curviflora</i>
SAPINDACEAE	<i>Atalaya hemiglauca</i>
BIGNONIACEAE	<i>Dolichandrone heterophylla</i>
MYOPORACEAE	<i>Eremophila latrobei</i> <i>§Eremophila</i> sp
RUBIACEAE	<i>Dentella minutissima</i> <i>Gardenia ?resinosa</i> <i>Oldenlandia crouchiana</i> <i>Spermococe auriculata</i>
CUCURBITACEAE	<i>Mukia maderaspatensis</i>
CAMPANULACEAE	<i>Wahlenbergia tumidifructa</i>
RUBIACEAE	<i>Oldenlandia pterospora</i>

FAMILY	SPECIES
GOODENIACEAE	§ <i>Brunonia</i> sp
	/Dampiera atriplicina
	Dampiera candicans
	Goodenia eremophila
	/Goodenia hartiana ms
	Goodenia lamprosperma
	Goodenia microptera
	Goodenia muelleriana
	§Goodenia sp
	Goodenia stobbsiana
	§GOODENIACEAE sp
	Scaevola amblyanthera
	Scaevola browniana subsp browniana
	Scaevola parvifolia subsp parvifolia
	Scaevola parvifolia subsp pilbarae
	Scaevola parvifolia var parvifolia
	Velleia connata
STYLIDIACEAE	§Stylidiaceae sp
ASTERACEAE	Centipeda minima
	Centipeda minima subsp macrocephala
	Centipeda nidiformis
	Chrysocephalum apiculatum
	Pluchea dunlopii
	Pluchea ferdinand-muelleri
	Pluchea rubelliflora
	Pluchea tetranthera
	Pterocaulon serrulatum
	Pterocaulon sphaeranthoides
	Streptoglossa ?liatroides
	Streptoglossa macrocephala
	Streptoglossa odora
	Vittadenia virgata

## **Appendix B**

### **Priority flora species recorded during Survey**

Appendix B Priority Flora locations 29/08/2003							
Species name	Waypoint	Density	Height range (m)	Priority	Family	Family #	Batch No.
<i>Abutilon trudgenii</i>	kp98.25	uncommon	0.7	3	MALVACEAE	221	1 collected
<i>Abutilon trudgenii</i>	wp179	2-5 plants	0.4	3	MALVACEAE	221	1 collected
<i>Abutilon trudgenii</i>	wp178	2-5 plants	0.1-0.5	3	MALVACEAE	221	1 collected
<i>Acacia glaucocaesia</i>	kp91.1	2-5 plants	1-2	3	MIMOSACEAE	163	1 collected
<i>Comesperma pallidum</i>	347.81-140mE	uncommon	1.6	3	POLYGALACEAE	183	5 collected
<i>Comesperma pallidum</i>	255.9	2-5 plants	0.4	3	POLYGALACEAE	183	3 collected
<i>Comesperma pallidum</i>	265	2-5 plants	0.2-0.35	3	POLYGALACEAE	183	3 collected
<i>Comesperma pallidum</i>	265	uncommon	2	3	POLYGALACEAE	183	3 collected
<i>Dampiera atriplicina</i>	396.18	2-5 plants	0.2-0.7	2	GOODENIACEAE	341	2 collected
<i>Dampiera atriplicina</i>	267.45	2-5 plants	0.3	2	GOODENIACEAE	341	4 collected
<i>Dampiera atriplicina</i>	wp19, gps 12	2-5 plants	1	2	GOODENIACEAE	341	4 collected
<i>Dampiera atriplicina</i>	373.67	2-5 plants	0.4-0.6	2	GOODENIACEAE	341	5 collected
<i>Dampiera atriplicina</i>	wp19	2	0.2-0.5	2	GOODENIACEAE	341	4 collected
<i>Euphorbia clementii</i>	kp98	2-5 plants	0.3-0.4	2	EUPHORBIACEAE	185	1 collected
<i>Euphorbia clementii</i>	kp97	2-5 plants	0.2	2	EUPHORBIACEAE	185	1 collected
<i>Goodenia hartiana</i>	wp14, kp204	2-5 plants	0.4	2	GOODENIACEAE	341	2 collected
<i>Goodenia hartiana</i>	177.5, wp6	uncommon	0.3-0.4	2	GOODENIACEAE	341	3 collected
<i>Goodenia hartiana</i>	307.53 - 70m S	2	0.3-0.4	2	GOODENIACEAE	341	3 collected
<i>Goodenia hartiana</i>	wp2, nr 373	2	0.3-0.5	2	GOODENIACEAE	341	5 collected
<i>Goodenia hartiana</i>	344.82+90mW	uncommon	0.5	2	GOODENIACEAE	341	5 collected
PRIORITY SPECIES FOUND ALONG ROUTE BUT NOT COLLECTED							
Species name	Waypoint						
<i>Abutilon trudgenii</i>	95.6						recorded
<i>Abutilon trudgenii</i>	98.1						recorded
<i>Abutilon trudgenii</i>	98.27						recorded
<i>Acacia glaucocaesia</i>	82						recorded
<i>Acacia glaucocaesia</i>	82.6						recorded
<i>Acacia glaucocaesia</i>	88.3						recorded
<i>Acacia glaucocaesia</i>	90.1						recorded
<i>Acacia glaucocaesia</i>	91						recorded

Species name	Waypoint							
<i>Acacia glaucocaesia</i>	93							recorded
<i>Acacia glaucocaesia</i>	93.5							recorded
<i>Dampiera atriplicina</i>	212							recorded
<i>Dampiera atriplicina</i>	213							recorded
<i>Dampiera atriplicina</i>	240							recorded
<i>Dampiera atriplicina</i>	307.85							recorded
<i>Dampiera atriplicina</i>	316.96							recorded
<i>Dampiera atriplicina</i>	317.79							recorded
<i>Dampiera atriplicina</i>	325.3							recorded
<i>Dampiera atriplicina</i>	395.16							recorded
<i>Dampiera atriplicina</i>	408							recorded
<i>Dampiera atriplicina</i>	417.85							recorded
<i>Dampiera atriplicina</i>	wp4, 224.6							recorded
<i>Dampiera atriplicina</i>	242-242.2							recorded
<i>Dampiera atriplicina</i>	268.8-269.15							recorded
<i>Dampiera atriplicina</i>	310.71-310.59							recorded
<i>Dampiera atriplicina</i>	330.85-330.61							recorded
<i>Dampiera atriplicina</i>	397-403							recorded
<i>Dampiera atriplicina</i>	440.35-440.88							recorded
<i>Dampiera atriplicina</i>	wp19, 239.8							recorded
<i>Euphorbia clementii</i>	98.5							recorded
<i>Goodenia hartiana</i>	wp6, 177							recorded
<i>Goodenia hartiana</i>	307.95-304							recorded
<i>Goodenia hartiana</i>	346-331							recorded
<i>Goodenia hartiana</i>	wp14, kp204							recorded
<i>Goodenia hartiana</i>	wp2, nr 373							recorded

## **Appendix C**

### **Weed species recorded during Survey**

KP waypoint	Weed species	Habitat Information	Source
11	Aerva javanica (Kapok Bush)	recently burnt A. coleii shrubland	
15	Cenchrus ciliaris (Buffel Grass)	low A stellaticeps/Tri pungens shrubland	
015-014	Cenchrus ciliaris		<b>from ids</b>
53	Cenchrus ciliaris	shallow drainage line, patchy	
54	Aerva javanica	occurs along roadsides here, therefore there is potential for introduction along tracks	
59-200mW	Aerva javanica	ironstone ridge, which has been disturbed in the past; a drainage point has been created on the west side	
59	Cenchrus ciliaris	rocky undulating plain	
61	Cenchrus ciliaris	surrounding drainage ditch next to road	
67	Cenchrus ciliaris	under Corymbia tree where cattle rest	
71	Indigofera oblongifolia	edge of Strelley River	
71.2-71.5	Indigofera oblongifolia	Strelley floodplain. Open Euc with Indigofera oblongifolia understorey	
72	Indigofera oblongifolia	Indigofera oblongifolia dominant shrub over Spinifex/Chrysopogon	
72	Cenchrus ciliaris	near Strelley River floodplain, area degraded by stock	
72-73	Indigofera oblongifolia	Degraded plain, dominated by Indigofera oblongifolia and spinifex	
72-73	Cenchrus ciliaris	floodplain and river, species spread throughout	
73	Indigofera oblongifolia	Degraded plain, dominated by Indigofera oblongifolia and spinifex	
73	Cenchrus ciliaris	lumpy drainage plain	
74	Cenchrus ciliaris	degraded by stock, floodplain	
74-74.5	Indigofera oblongifolia	Degraded and eroded floodplain with thickets of Indigofera oblongifolia and	
74-76	Cenchrus ciliaris	patchy Euc. Victrix, high density of stock in area present throughout on floodplain	
75.83	Indigofera oblongifolia	Degraded and eroded floodplain with thickets of Indigofera oblongifolia and patchy	
		Euc. Victrix, high density of stock in area, on floodplain between Strelley and De Grey rivers	
75.98	Indigofera oblongifolia	Degraded and eroded floodplain with thickets of Indigofera oblongifolia and patchy	
		Euc. Victrix, high density of stock in area	
76	Indigofera oblongifolia	Dense Euc. victrix over Indigofera oblongifolia and Buffel Grass, many weed species	<b>from ids</b>
76	Cenchrus ciliaris	in Eucalyptus victrix woodland on edge of De Grey	<b>from ids</b>
76	Cynodon dactylo (Couch)	in Eucalyptus victrix woodland on edge of De Grey	
76	Argemone ochroleuca (Mexican Poppy)	in Eucalyptus victrix woodland on edge of De Grey	
76.1	Parkinsonia aculeata	only one seen in this area of alignment, 6m tall, pinnate leaves, west bank of De grey	<b>from ids</b>

KP waypoint	Weed species	Habitat Information	Source
76.6	<i>Cenchrus ciliaris</i>	west bank of De Grey	
76.6	<i>Cynodon dactylodon</i>	west bank of De Grey	
76.6	<i>Argemone ochroleuca</i>	west bank of De Grey	
76.74	<i>Indigofera oblongifolia</i>	east side of De Grey river, open <i>Lysiphyllum</i> woodland on Buffel Grass	
76.74	<i>Cenchrus ciliaris</i>	loam floodplain	
78	<i>Indigofera oblongifolia</i>	Degraded floodplain of <i>Indigofera oblongifolia</i> over spinifex and herbs	
78.25	<i>Indigofera oblongifolia</i>	adjacent to table drain next to GNH	
78.25	<i>Cenchrus ciliaris</i>	on southern bank of large human made channel running parallel to highway	
80	<i>Indigofera oblongifolia</i>	scattered here on floodplain	
80	<i>Cenchrus ciliaris</i>	loam floodplain	
80.4	<i>Indigofera oblongifolia</i>	scattered here in grassland	
82	<i>Indigofera oblongifolia</i>	Degraded plain, scattered plants of <i>Indigofera oblongifolia</i> with buffel grass	
82	<i>Cenchrus ciliaris</i>	degraded plain	
82.6	<i>Indigofera oblongifolia</i>	Stock affected mixed grassland with scattered shrubs	
82.6	<i>Cenchrus ciliaris</i>	degraded loam plain	
bw 82.6 & 85, wp176	<i>Cenchrus ciliaris</i>	patchy <i>Lysiphyllum cunninghamii</i> woodland on floodplain	
85	<i>Cenchrus ciliaris</i>	heavily degraded plain next to channel	
85	<i>Stylosanthes hamata</i>	also present along route in patches	
88	<i>Cenchrus ciliaris</i>	combined with <i>Triodia pungens</i>	
88.3	<i>Cenchrus ciliaris</i>	in mixed grassland	
90	<i>Cenchrus ciliaris</i>	in mixed grassland	
91	<i>Cenchrus ciliaris</i>	degraded by cattle, adjacent to channel all along here	
93.3	<i>Cenchrus ciliaris</i>	along drainage line in patches	
97	<i>Cenchrus ciliaris</i>	recently burnt	
98.35	<i>Cenchrus ciliaris</i>	stony loam valley	
99	<i>Cenchrus ciliaris</i>	Open <i>Corymbia</i> wld	
99.1	<i>Cenchrus ciliaris</i>	in <i>A. tumida</i> shrubland	
100.65	<i>Cenchrus ciliaris</i>	in <i>A. stellaticeps</i> shrubland	
101.2	<i>Cenchrus ciliaris</i>	mixed degraded grasslands	
102.73	<i>Cenchrus ciliaris</i>	major creekline with <i>E. victrix</i>	
102.73	<i>Cynodon dactylodon</i>	major creekline with <i>E. victrix</i>	
227.3	<i>Cenchrus ciliaris</i>	creebank (Callawa Creek), gritty sand, on low velocity side of river, probably on floodplain patchily	

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<b>KP waypoint</b>	<b>Weed species</b>	<b>Habitat Information</b>	<b>Source</b>
bw 243 & 244, wp23	Aerva javanica	isolated patches of Kapok Bush, small patches probably a few metres across at most.	
bw 264 & 264.7	Cenchrus ciliaris	infestation in creekline, recently burnt, shallow and vegetated	