Survey 2: Landscape, Flora and Fauna Survey of the Proposed Frances Creek Iron-ore Prospects, May 2006

Integrated with Survey 1 (November 2005)

Prepared for:

Territory Iron Pty. Ltd.
ACN: 100552118
Suite 4, 111 Colin st, West Perth, 6005
Phone: (08) 9483 5100
Fax: (08) 9483 5111

By:

Tom Reilly, Dr Bill Low and Dennis Matthews
LOW ECOLOGICAL SERVICES P/L
ABN: 55 064 311 502
PO Box 3130, Alice Springs, N.T. 0871
Phone: (08) 89 555 222
Fax: (08) 89 555 722
Email: lowecol@lowecol.com.au

June 2006

CONTENTS

Maps

Figures

Tables

Plates

Frontispiece: Frances Creek Survey Site (Site 8).

1 EXECUTIVE SUMMARY

An environmental survey of the Frances Creek project area was conducted after a good Wet season between May 17th and 21st 2006. This survey follows a late Dry season survey in November 2005 (Survey 1, Reilly *et al.* 2006). The surveys aim to identify flora and fauna inhabitating the project area and collect baseline information on land systems, land units, soils and water courses. Survey 2 included specific assessments focused on Gouldian Finches, aquatic fauna and the proposed haul road to a loading area on the Alice Springs – Darwin Railway.

The Frances Creek area is typical of the Wet – Dry Tropics. Annual rainfall for the region largely occurs within a distinct wet season (December to March) with little or no rain falling for the remainder of the year. The 2005/2006 wet season was reasonably wet with rainfall records at Pine Creek exceeding 1800mm compared to only 1100mm in the previous year. The distinct seasonality of the region causes significant temporal and spatial fluctuations in flora and fauna species abundance and apparent composition. Therefore, two surveys were conducted during different seasons to produce species lists that are representative of the project area. Additionally, to overcome the shortcomings of two surveys of short duration, the conservation value assessment of the area has been placed in a regional and temporal context through reference to several nearby studies in similar land systems and habitats during other seasons and years.

1.1 Existing Environment

Landscape: Land Systems for the Katherine – Darwin Region have been described and mapped by Christian and Stewart (1953). The Frances Creek project area is within the *Brocks Creek Ridge* Land System (LS) (Christian and Stewart 1953). The proposed haul road from Frances Creek mine to the Alice Springs – Darwin Railway crosses the *Brocks Creek Ridge* LS and the *Cullen* LS. No mining activity is proposed in the *Cullen* LS.

Six land unit were identified during the surveys. Land Units were generally based on landform and vegetation characteristics and terminology followed Christian and Stewart (1953). These land units are listed as follows:

1. Ridges Crests and Slopes
2. Low Hills
3. Small Alluvial Flats
4. Riparian
5. Granite Hills
6. Low Undulating Hills

Vegetation: The general vegetation cover across the Frances Creek project area is dominated by *Eucalyptus* woodland with *Sorghum* and *Heteropogon* grasses. Dominant vegetation communities for the Northern Territory have been described and mapped by Wilson *et al.* (1990), Figure 4-4. The vegetation type for the Frances Creek project area is classed as vegetation type 21, which is described as *Eucalyptus tintinans* with *Corymbia dichromophloia* and *E. miniata*, over a tall *Sorghum* grassland understorey (Wilson *et al.* 1990). *Eucalyptus tetrodonta* was also a common tree in several habitats across the mineral lease. *E. miniata* and *E. tetrodonta* commonly occur in the open tropical woodlands of the Northern Territory (Brock 1988). The vegetation type commonly encountered during the survey of the proposed haul road (mostly in the Cullen LS) was Vegetation type 15, *Eucalyptus tectifica* and *Corymbia latifolia* with Sorghum grasses (Wilson *et al.* 1990). Numerous ephemeral watercourses with frequent waterholes are present throughout the landscape, which support a range of water loving species such as *Pandanus spiralis, Melaleuca sp., Lophostemon grandiflorus* and aquatic species.

Fauna survey: Fauna of Frances Creek is typical of the Pine Creek region, however, several species recorded during the survey hold a level of conservation status (listed in section 1.2, Table 7-1, Table 7-2). The fauna list from the survey is presented in Appendices 11.2 and 11.3. Only a small proportion of fauna species expected to inhabit the area were recorded during the survey, which reflects seasonal variability, the limitations of a short survey period as well as possible loss of species due to Cane Toad invasion and long term climate change. The timing of this second survey was to produce a representative list of species that occur at the end of the wet season to complement the list of species present in the dry season survey of the previous November. The impact of cane toads, which arrived about 2002, three years before the survey, is also thought to have influenced the local fauna. Species either presently or potentially inhabiting the project area are listed in Appendices 11.5 (mammals), 11.6 (reptiles), 11.7 (frogs) and 11.8 (birds). These species lists were derived from several biological studies previously undertaken in the Pine Creek Region (Davidson 1985, Woinarski *et al.* 1989, NSR 1992, NSR 1993, Eldridge and Low 1994, Grattidge and Low 1995, Reilly *et al.* May 2005, Reilly *et al.* Dec 2005). Special concern has been expressed about the potential presence of Gouldian Finches and a targeted survey failed to find any during the favourable end of Wet season survey.

Impact Assessment: The mining operations will focus on hills with a high iron content sitting within a complex matrix of the northeastern edge of the Pine Creek Geosyncline. Clearing of vegetation for developing the iron ore mining operation at Frances Creek will result in localised habitat loss for flora and fauna, particularly for species residing on the *Ridge Crests and Slopes*

land unit. Mining will also indirectly impact the local fauna that resides in areas peripheral to mining areas through increased noise, vibration, dust, lights, roads, human activity and yearlong availability of water. Although these disturbances are likely to lead to loss of individual plants and animals from the Frances Creek project area (vegetation clearing estimates are provided in Map 6), the species still present are common and widespread throughout their range and their conservation status is unlikely to be affected. Permanent water availability in the rehabilated tailings storage facility, already a functioning wetland following mining that stopped in 1974, will result in water-based species continuing to reside in the area. Since it is not anticipated that the tailings dam will be used in the currently proposed mining operation, the existing wetlands habitat will not be greatly disturbed.

The proposed haul road from the Frances Creek mine site to the Alice Springs – Darwin Railway follows the decommissioned railway spurline that existed during iron ore mining in the 1960s and 1970s. The road path is already present apart from a 2km stretch on the southwestern end where the proposed haul road meets the railway. The proposed road passes through the Cullen LS and the Brocks Creek Ridge LS. Vegetation is widespread eucalyptus woodlands ranging in dominance from *Eucalyptus tetradonta, E. tintinans, E. tectifica, Corymbia dichromophloea* and *Brachychiton diversifolius*. No areas of significant vegetation were encountered during the survey. Watercourses were frequent and most culverts still exist in the spurline track. Three of 22 culverts have been partially washed out from large water flows and the spurline track was not passable by 4WD in these sections. Heritage value of some culvert areas may be of interest, however, their structural integrity will degrade overtime leaving an unsafe track. Appendix 11.9 provides information and photographs taken along the proposed haul road.

1.2 Conservation Considerations for the Frances Creek project area

- At least nine fauna species of conservation significance were identified during the two Frances Creek surveys, these were the Partridge Pigeon (*Geophaps smithii smithii*), Ghost Bat (*Macroderma gigas*), Bush Thicknee (*Burhinus grallarius*), Red-tailed Black Cockatoo (*Calytorhynchus banksii*), Western Chestnut Mouse (*Pseudomys nanus*), Pale Field-rat (*Rattus tunneyi*), Orange Horseshoe-bat (*Rhinonicteris aurantius*), Arnhem Sheathtail-bat (*Taphozous kapalgensis*) and Calaby's Pebble Mound Mouse (Pseudomys calabyi). These species are listed as Near Threatened mammals under *Territory Parks and Wildlife Conservation Act* (2000) for reasons including restricted distribution, diminishing populations over ther range and insufficient information to know what the status is. Some of these species may be locally common over their species range. Local vegetation clearing and

mining disturbance will unlikely affect most of these species, although, due to habitat loss and/or unfavorable conditions, some individuals may be displaced. Good environmental management of the iron ore mine will not likely lead to a detrimental affect on the status of these species.

- In the broader context of regional studies between 1989 and 2005, twenty-seven fauna species with Northern Territory conservation significance (*TPWC Act* 2000) have been identified in the region from fauna surveys Table 7-2.

- Two Partridge Pigeons (*Geophaps smithii smithii*) were observed during the May 2006 survey on the Mt Porter access road approximately 700m east of the proposed haul road. This species is nationally listed as vulnerable under the EPBC Act (1999).

- Five other fauna species listed under the *EPBC Act* (1999) could possibly occur within the local habitat but were not observed during the two surveys. These species are the Bare-rumped Sheathtail Bat (*Saccolaimus saccolaimus nudicluniatus*), Gouldian Finch (*Erythrura gouldiae*), Northern Quoll (*Dasyurus hallucatus*), Red Goshawk (*Erythrotriorchis radiatus*), Partridge Pigeon and Masked Owl (*Tyto novaehollandiae kimberli*). These species may be present either occasionally or seasonally. All species apart from the Bare-rumped Sheathtail Bat have been recorded from fauna surveys conducted in the Pine Creek region between 1985 and 2005, Table 7-2. While these species are potential inhabitants of the area, the proposed mining areas are not critical habitat for them. Evidence is accumulating that Northern Quolls have largely disappeared from areas since Cane Toads have invaded (our surveys, Beth Crase, *pers comm.* 2005). Gouldian Finches disappeared from large parts of their former range over the last 40 or more years but may currently be making a comeback due to changed fire management and although the valley bottoms in the lease area contain suitable grasslands, Gouldians were not sighted. Mining areas will not impact on the valley bottom grasslands, however, traffic speed on roads through the valleys may need to be managed in these areas if Gouldians are subsequently found in the area. Mining staff should be trained in identification of Gouldian Finches and management actions imposed if the finches are found during appropriate seasonal conditions.

- An isolated patch of Cycad (*Cycas armstrongii*) occurs on a footslope (GDA 94: E808807, N8498303) near the Ochre Hill and Millers road (Plate 12.20). *C. armstrongii* is listed as vulnerable in the N.T. (*TPWC Act* 2000). The Cycads are 50m away from the existing road and will not be disturbed during road upgrading.

- The *Riparian* land unit deserves protection and consideration during the development of the mining operation. *Riparian* habitat is environmentally sensitive, species rich and provides important refugia for the local fauna during the dry season. A healthy riparian habitat will

also provide a valuable source of flora and fauna for rehabilitation purposes (i.e. natural spread of seed and species from the *Riparian* zones into rehabilitated areas) as well as prevent erosion.

- Frances Creek does not represent an area of significant endemism, but does contain areas of pristine habitat where disturbance should not occur. The project area is typical of the widespread landscape and biota occurring within the Wet-Dry Tropics of the Pine Creek Region. It is recommended that disturbance of pristine habitat be minimised where possible. The southern section of the proposed mining area has experienced extensive iron ore mining with six pits active between 1966 and 1974. Rehabilitation of much of these areas disturbed by mining has been good, but the areas are not considered an environmental conservation issue. Low levels of grazing by feral or seldom managed stock including horses, donkeys, cattle and buffalo have had a minor impact on the area for 50 or more years, but it would be expected these animals would have grazed in preferred grasslands which are not present in the region.
- Seven introduced flora species (weeds) were recorded during the survey; Calopo (*Calopogonium mucunoides*), Hyptis (*Hyptis suaveolens*), African Feathergrass (*Pennisetum pedicellatum*), Ringworm Scrub (*Senna alata*), Red Natal Grass (*Melinis repens*), Stinking Passion Vine (*Passiflora foetida*), Common Sensitive Plant (*Mimosa pudica*) and Couch Grass (*Cynodon dactylon*). All species, apart from Hyptis and Stinking Passion Vine, appear to be confined to areas where previous disturbance has occurred and were mostly species that were used for revegetation during rehabilitation programs in the mined areas and tailings dam. The functioning wetland (tailings swamp) where the tailings storage facility was previously located contained all species. After 30 years, the species remain largely confined to the tailings dam area and it is not apparent whether the species are spreading beyond the disturbed areas or not and further monitoring would be useful. Weed control is important and efforts to reduce the chance of weed spread are encouraged. Any future rehabilitation programs should use local native species or simply replace top soil to the disturbed areas.

2 INTRODUCTION

2.1 Project Description

Territory Iron Ltd intends to resume iron ore mining and to develop additional iron resource areas within the Frances Creek project area, located approximately 200 kilometres south of Darwin. Territory Iron Ltd holds several exploration tenements over the area or has entered into agreements with other tenement holders. The proposed development involves expanding existing pits at Helene 5, Helene 6/7, Jasmine, Rosemary and Thelma Rosemary and mining undeveloped iron deposits at Marion, Ochre Hill and, at a later stage, Millers deposits (Figure 2.1). Exploration drilling has occurred over all proposed mining locations, which provided good quality access tracks to these sites. Other physical impacts are likely to include processing/sorting areas, deposition of waste materials (i.e. rock and tailings), and constructing and upgrading tracks sufficient for use by 20 tonne trucks.

The initial stages of mining are located to the south of Frances Creek (Helene, Thelma Rosemary, Marion, Rosemary and Jasmine deposits). The proposed mining area at Ochre Hill is located within the same area, but on the northern side of Frances Creek. The Miller deposit is located further to the north, in the lower range of hills between the McKinley River wetlands/blacksoil plain to the west and the Mary River plains to the east. This section of the north eastern edge of the Pine Creek geosyncline has lower relief than the Frances Creek/Ochre Hill deposits and drainage consists of seasonal gullies which flood-out into swamps.

A Public Environmental Report will be required for the Frances Creek project due to the known presence of nationally protected fauna species in the local area. Therefore, Territory Iron commissioned Low Ecological Services to conduct two baseline surveys focusing on the landscape, flora and fauna of the proposed mining locations within the project area. The first survey was conducted during the buildup to the wet season (November 2005) and the second survey was conducted post wet season (May 2006). The two surveys were conducted at different times of the year to survey temporal changes in apparent species presence and abundance.

2.2 History of site

Iron ore was mined from the old Frances Creek mining centre within the Frances Creek project area between 1966 and 1974. Over this period, the mine produced approximately eight million tones of iron ore grading 59% from thirteen open cut pits. In 1974, cyclone Tracy caused major

flooding and extensive damage to mining infrastructure at Frances Creek and the loading pads in Darwin. This subsequently led to the closure of the mine site.

The Frances Creek mining village housed approximately 2,000 people that included miners, workers and their families. The village was abandoned after mine closure and only old concrete footings and other scrapped materials are present. The old church and swimming pool still exist and appear to be in reasonable condition. The large dam on the western edge of the project area is used for recreational activities, including water-skiing, swimming and camping.

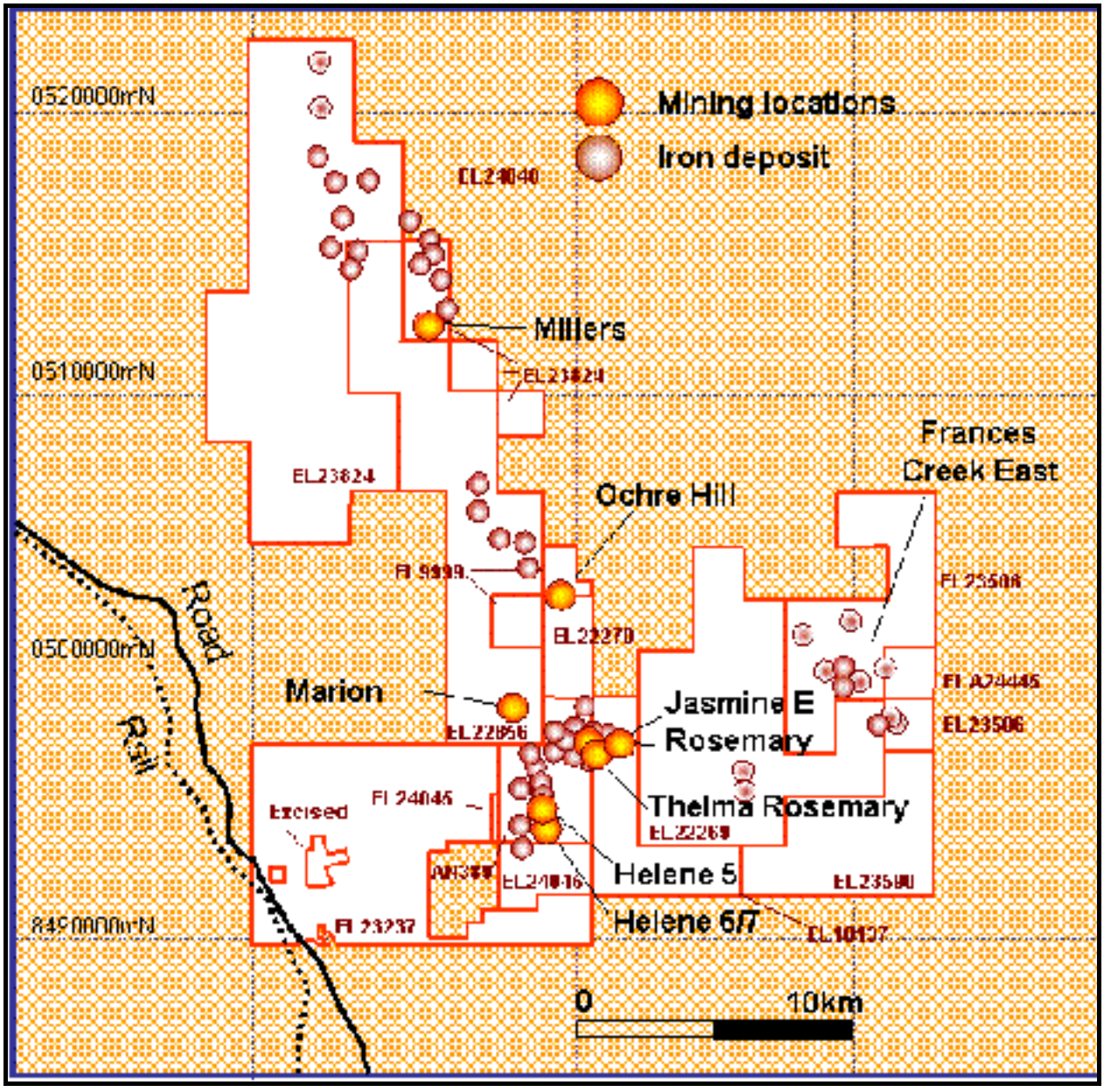


Figure 2-1: Frances Creek project area and potential locations of iron ore mining areas.
Source: MBS Environmental

3 SCOPE

Territory Iron requires the following tasks to be undertaken:

- Undertake Territory and National database searches to identify flora and fauna species of conservation significance and threatened ecological communities within or immediately adjacent to the mineral lease application ("project") area.
- Conduct two field surveys in different seasons to map the vegetation communities present within the project area with particular attention to potential mining areas at Thelma/Rosemary, Ochre Hill and Millers deposits.
- Determine the presence of flora species or vegetation communities of National and Territory conservation significance within the immediate project area.
- Determine the presence of vertebrate fauna species of National and Territory conservation significance within the immediate project area with particular attention to the potential mining areas at Thelma/Rosemary, Ochre Hill and Millers deposits.
- Identify the land systems and soil types located within the project area with particular attention to potential mining areas.
- In the May survey aquatic vertebrate and invertebrate netting in waterholes and targetted bird watching as described by Palmer (pers. comm., 2006) at locations typical of Gouldian Finch habitat were conducted.
- Assessment of the land units along the proposed haul road corridor along the old Frances Ck railway spurline and alternative Mt Wells road was also conducted.

Limitations of the Survey

Frances Creek is located in the far north of the Northern Territory where the climate is typically monsoonal with distinct wet and dry seasons. It is recognised that short-term surveys within an area exhibiting strong seasonality will not fully represent species diversity and their relative abundances. Consequently, this report assesses the conservation value of Frances Creek on a habitat basis using data obtained in the survey to validate presence of species, but enabling assessment of presence of other potential species that may occur in the area. Biological records held by the Parks & Wildlife Commission N.T., regional studies such as Woinarski *et al.* (1989), Flora and Fauna Assessments for nearby locations Mt Porter, Spring Hill, Union Reef and Brocks Creek by ourselves (Low Ecological Services) and others have been used to place the survey results of Frances Creek into a regional and temporal perspective.

4 SITE LOCATION AND REGIONAL DESCRIPTION

4.1 Location

The Frances Creek project area is located approximately 200 kilometres south of Darwin and 25 kilometres north of Pine Creek (Latitude 13^{o} 37' 00''S, Longitude 131^{o} 51' 06''E) (Figure 4.1). Frances Creek, Ochre Hill and Millers iron deposits are within Exploration License Areas 24045, 10137, 9999 & 23824 located on Ban Ban Springs and Mary River West (PPL815, NT Portion 1630) pastoral stations. A Mineral Lease Application for Frances Creek has been submitted for an area of 1,212 hectares.

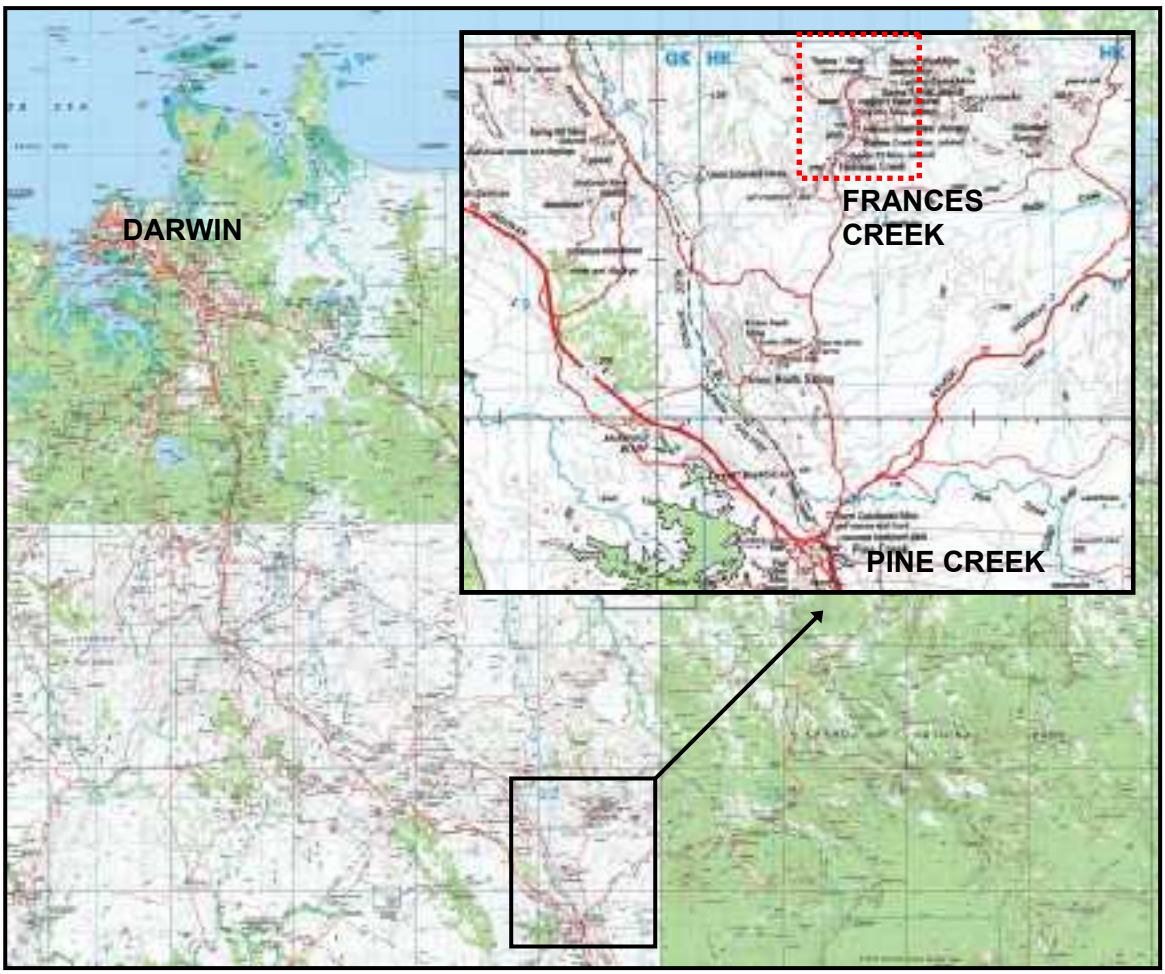


Figure 4-1: Location Map showing Frances Creek project area.

Scale: Grids are 20 x 20 km. Grid ticks are every 1 km.

Note: Map was taken from NATMAP Raster Mosaic 2003.

4.2 Climate

The climate of Frances Creek is typically monsoonal, characterised by a long dry season (May to October), and a short wet season (December to March) when 80 – 90% of the annual rainfall occurs (Woinarski *et al.* 1989). April and November are usually transitional months.

Pine Creek is the nearest location that has long-term weather records and the Pine Creek Post Office records date back to 1874. Rainfall is predictable in the region and averages between 1100 – 1200mm per year. The Pine Creek Post Office has recorded an average annual rainfall of ~1150mm since 1874. The period between October and March produces a significant part of the rainfall for the year due to the presence of sub-tropical NW monsoons and associated tropical low-pressure systems. June and August are the driest times of the year with little or no rain. The distinct seasonality greatly affects the region's flora and fauna, causing significant temporal and spatial fluctuation in species richness and abundance.

Air temperatures are relatively high and constant between years. During the coolest time of the year (June and July), the mean monthly temperature for Pine Creek ranges from a minimum of 10 – 13^{o}C to a maximum 20-32^{o}C. In the hottest part of the year (October to November), the mean monthly temperature ranges from a minimum of 24 – 27^{o}C to a maximum of 37 – 41^{o}C.

Humidity measured at Pine Creek averaged 49% in September 2004 and 79% in February 2005 (Bureau of Meteorology, 2005). Evaporation at Pine Creek is estimated at 3,360 millimetres per year. Therefore, evaporation exceeds rainfall by a factor of 2.9 (based on an average year for Pine Creek).

Rainfall and temperature data collected at the Pine Creek meteorological station for 12 months prior to the Frances Creek environmental survey is provided in Figure 4-2 (Bureau of Meteorology May 2006).

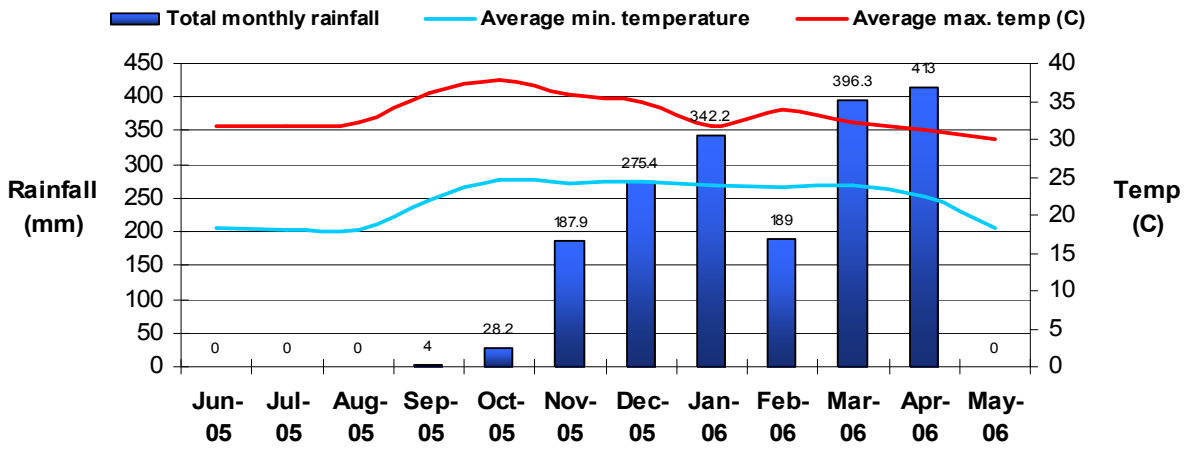


Figure 4-2: Total rainfall (mm) and average maximum temperatures for the previous 12 months. **Blue bars** represent rainfall data, and the **red line** represents average max. temperatures, and the **blue line** represents average min. temperatures. Information was extracted from Pine Creek climatic data on the Bureau of Meteorology website for June 05 to May 06.

4.3 Biological Records

No previous systematic wildlife surveys have been conducted for the Frances Creek project area (apart from Low Ecological Services in November 2005). However, several short-term environmental surveys have been conducted for a number of mines within the region of Frances Creek, including: Mt Porter (Reilly *et al.* 2005), Spring Hill (Grattidge and Low 1996), Brocks Creek (Eldridge and Low 1995), Union Reefs (NSR 1993), Pine Creek (Mitchell 1995), Cosmo Howley Mine (Davidson 1985) and Mt Todd Mine (NSR 1992). Woinarski *et al.* (1989) conducted a year long study of fauna distribution and density in nearby Kakadu National Park to examine changes in distribution of fauna in relation to wet and dry seasons.

4.4 Land System Description

The geomorphology and land systems of the Katherine – Darwin region were described and mapped by Christian and Stewart (1946). Frances Creek contains two land systems, 1) *Brocks Creek Ridge* Land System, which comprises approximately 90% of the project area, and 2) *Cullen* Land System, located on the southern southeastern and northeastern edges of the project area, Map 2: Land Systems within the Frances Creek Project Area. These two land systems fall into the broader geomorphological unit referred to as Elevated Backbone Country or eroding upland country. The proposed mining locations are within the *Brocks Creek Ridge* Land System. The proposed haul road plans to use the old railway (spurline) corridor from Frances Creek to the Alice Springs-Darwin Railway line, and this transect travels through the *Cullen* and *Brocks Creek Ridge* Land Systems.

4.5 Geology and Geomorphology

The *Brocks Creek Ridge* Land System is described as consisting of sharp, rocky, north/south ridges, and hills with steep slopes (up to 40 – 60%) to gentle crests that are dissected by watercourses. Erosion is active and there is little or no accumulation of soils on the steep slopes. The system is formed on strongly folded metamorphics of the Brocks Creek Group (i.e. slates, quartzites, sandstone, greywacke and siltstone). The steep rocky ridges are associated with lower convex hills, small alluvial flats and channels incised through sandy or loamy material (Christian and Stewart, 1946). Rocky ridges in the Frances Creek project area contain ironstone (up to 62% iron content) and siltstone outcrops and slopes. Sparse areas of quartzite and sandstone also occur within the area.

The *Cullen* Land System contains topography that varies from rough, rocky granite outcrops to gently undulating country with small areas of flat land. The base rock of this land system is Cullen Granite, which is known to commonly intrude rocks in the Brocks Creek Group from the *Brocks Creek Ridge* Land System. The granites within the *Cullen* land system differ in structure, mineral composition and resistance to erosion. In consequence, the topographic form of the *Cullen* land system can be quite variable (Christian and Stewart 1946).

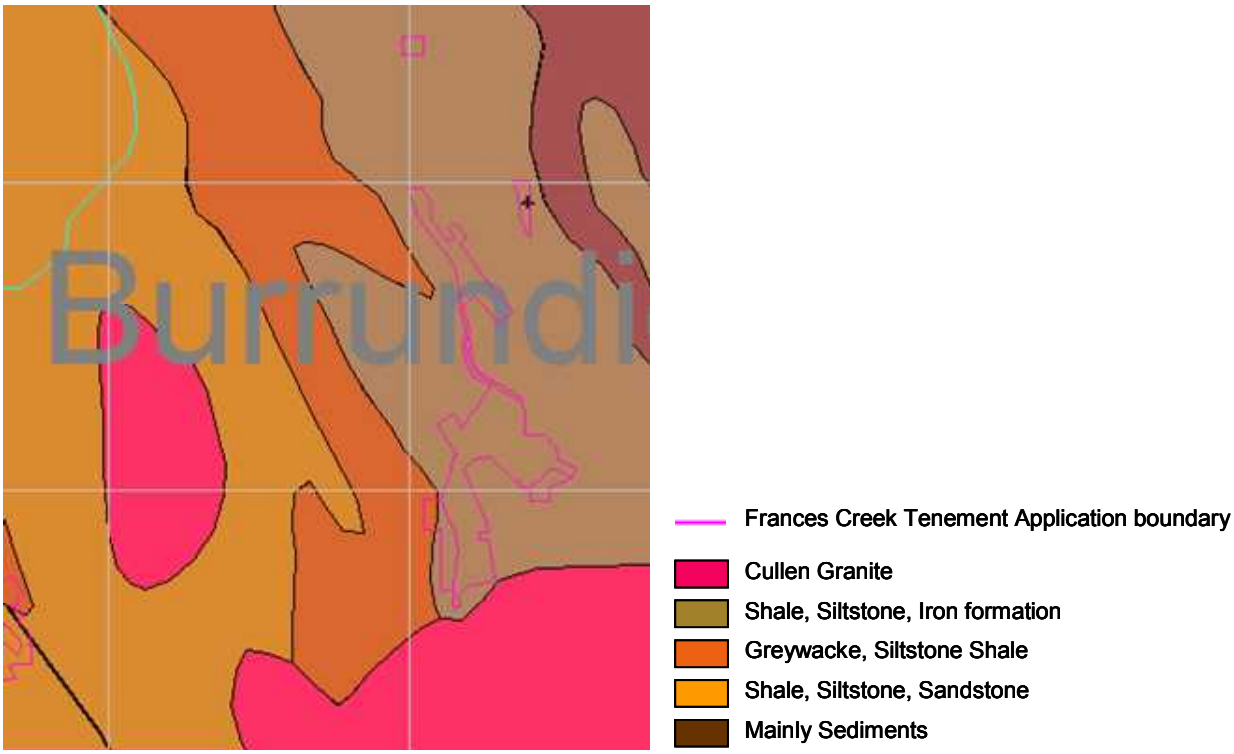


Figure 4-3: Geological Map of the Frances Creek project area and proposed haul road corridor.
Source: TIS geoset from the http://dmetis.nt.gov.au/tis/ Website.

4.6 Soils

Soils of the *Brocks Creek Ridge* Land System generally comprise of very gravelly sandy loam and skeletal soils formed on metamorphics of the Brocks Creek Group (Christian and Stewart, 1946). Alluvial flat areas contain heavier darker soils that contain higher levels of clay and silt, which are described as “Acid” Alluvial soils.

Soils within the steep topography of the *Cullen* Land System of large, rounded granite boulders are described as very gritty, sandy skeletal soils. The undulating country is generally comprised of granitic sandy yellow podsolic soils.

4.7 Fauna

Several fauna species of conservation significance (*EPBC Act* 1999; *TPWC Act* 2000) occur in the Pine Creek region and could potentially occur within the Frances Creek project area. Three species of special concern (nationally protected under the *EPBC Act*, 1999) are the Bare-rumped Sheathtail Bat (*Saccolaimus saccolaimus nudicluniatus*) (Critically Endangered), the Gouldian Finch (*Erythrura gouldiae*) (Endangered) and the Northern Quoll (*Dasyurus hallucatus*) (Endangered).

4.8 Vegetation

Dominant vegetation types of the Northern Territory are mapped and described by Wilson *et al.* (1990) (Figure 4.4). The vegetation community of Frances Creek is known as vegetation type 21, which is described as *Eucalyptus tintinans* with *Corymbia dichromophloia* and *E. miniata*, over a tall *Sorghum* grassland understorey (Wilson *et al.* 1990). *Eucalyptus tetrodonta* was found to be commonly associated with the vegetation community across the project area, especially in the lowland country in association with *E. miniata*. The surrounding vegetation community is vegetation type 15 - *Eucalyptus tectifica* and *Corymbia latifolia* with Sorghum Grasses (Wilson *et al.* 1990).

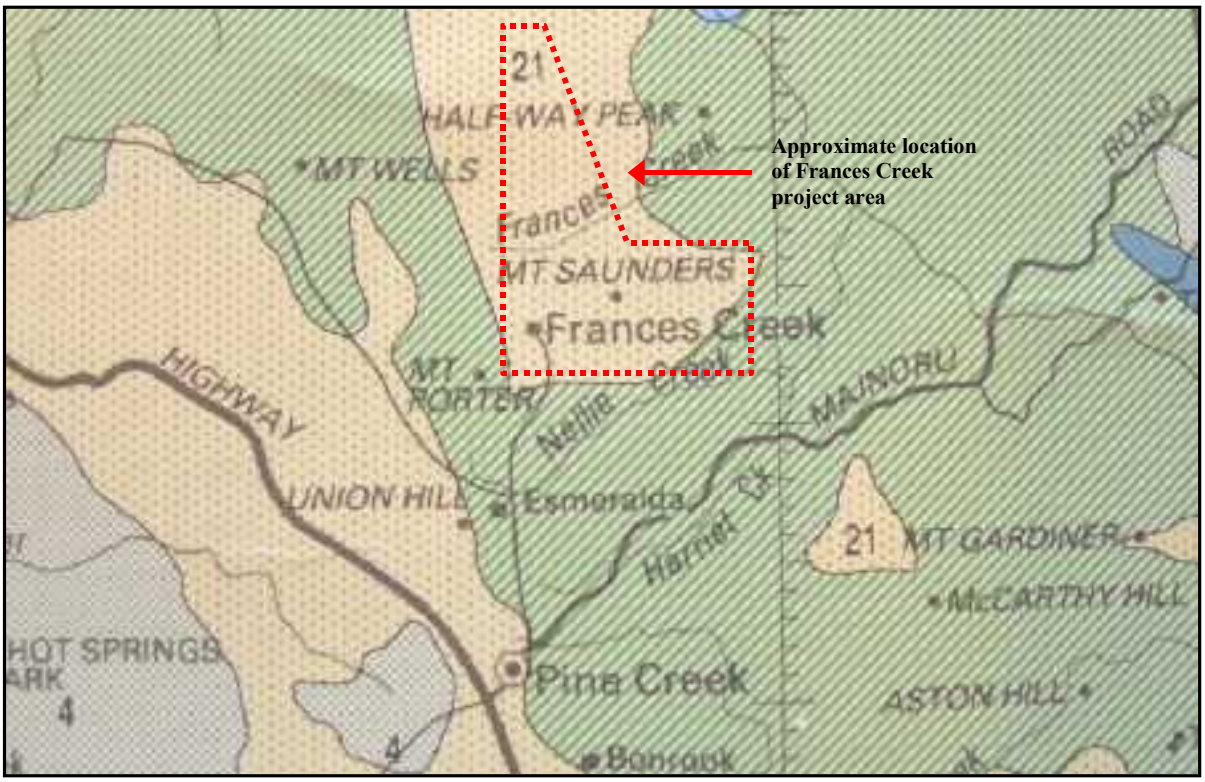


Figure 4-4: General Vegetation Type Map for the Frances Creek project area

Legend: Cream with green dots: Vegetation Type 21: *E. tintinans* associated with *Corymbia dichromophloia* and *E. miniata*, over a tall *Sorghum* grassland understorey

Green Stripes: Vegetation Type 15: *Eucalyptus tectifica* and *Corymbia latifolia* woodland with *Sorghum* grassland understorey

Source: Wilson *et al.* (1990) Vegetation Map of the Northern Territory.

5 SURVEY METHODS

The environmental survey for the Frances Creek project area was conducted between 17th and 21st May 2006, by Dr Bill Low and Tom Reilly of Low Ecological Services and bat specialist Dennis Matthews. This followed a similar survey in November, 2005. The survey included standard fauna survey techniques including animal trapping (Elliott and Pitfall traps), bird surveys and flora identification. In the May survey aquatic vertebrate and invertebrate netting in waterholes and targetted bird watching at locations typical of Gouldian Finch habitat as described by Palmer (pers. comm., 2006) were conducted. Assessment of the land units along the proposed haul road corridor along the old Frances Ck railway spurline and alternative Mt Wells road was also conducted.

Six land units are present within the Frances Creek project area and proposed haul road corridor. Land units within the project area and were identified and mapped during the November 2005 survey (Reilly *et al.* 2005) (refer to Updated Maps 1A and 1B).

Land Unit	Land System
Ridges Crests and Slopes	*Brocks Creek Ridge*
Low Hills	*Brocks Creek Ridge*
Small Alluvial Flats	*Brocks Creek Ridge*
Riparian	*Brocks Creek Ridge*, *Cullen*
Granite Hills	*Cullen*
Low Undulating Hills	*Cullen*

Note: Land units from the Cullen Land System were not assessed during the November 2005 survey as the proposed alignment of the haul road was not included.

Survey Sites: Survey sites were setup at the same locations chosen in November 2005, with the exception of the two Millers sites as access to the northern section of the project area was prevented due to boggy conditions. Therefore, additional sites were setup at Jasmine Ridge and Frances Creek. Traplines were set within different habitats to permit assessment of the species at each location. Survey sites are described in Table 5-1 and locations are shown in Proposed Haul Road Survey

- The proposed haul road follows the same alignment as the decommissioned spurline railway from Frances Creek minesite to the Alice Springs – Darwin Railway.
- The haul road survey begins from the proposed stockpile location on the Alice Springs – Darwin Railway

Description	Photograph
Distance: 0.00 km **Alice Springs – Darwin Railway** **GPS:** E799304 N8484796 **Land Unit:** Low Hills (Brocks Creek Ridge) **Vegetation:** *Eucalyptus tintinans, Eucalyptus tectifica, Acacia hemignosta, A. holosericea, Calytrix exstipulata, Sorghum plumosum, Corymbia dichromophloea, Triraphis mollis, Passiona foetida, Shizachyrium fragile, Melinis repens, Ptilotus fusiformis, Brachychiton diverifolius.*	
Distance: 0.00 km **Stockpile Laydown Site** **GPS:** E799355 N8484802 **Land Unit:** Low Hills (Brocks Creek Ridge) **Vegetation:** *Sorghum* grasses, *Eucalyptus tintinans* saplings **Notes:** A large section of the stockpile area is already cleared of vegetation.	
Distance: 0.00 km **Stockpile Laydown Site** **GPS:** E799321 N84844980 **Land Unit:** Low Hills (Brocks Creek Ridge) **Vegetation:** Similar to surrounding areas, *Corymbia foelscheana, Eucalyptus tintinans, E, tectifica, Panicum sp., Sorghum sp., Heteropogon contortus* **Notes:** Vertically stratified sedimentary area	

Distance: 0.10 km **GPS:** E799345 N8484970 **Land Unit:** Riparian/Low Hills (Brocks Creek Ridge) **Vegetation:** *Gardenia megasperma, Eucalyptus setifolia, Cymbopogon bombycinus, Themeda triandra, Chloris virgata, Eragrostis* sp.*, Corymbia dichromophloia* **Fauna:** Freshwater Crabs (*Holthuisiana transversa*) **Notes:** Culvert required	
Distance: 0.90 km **Road to Union Reef Mine** **GPS:** E799887 N8485588 **Land Unit:** Low Hills (Brocks Creek Ridge) **Notes:** Above ground power lines	**No Photo**
Distance: 1.00 km **GPS:** E799940 N8485660 **Land Units**: Low Hills (Brocks Creek Ridge) **Vegetation:** *Eucalyptus grandifolia, E. tintinans, Erythrophleum chlorostachyus, E. miniata, Corymbia dichromophloia, Sorghum* grasses. **Fauna:** Antilopine Wallaroo scats **Notes:** Avoid large trees where possible.	

Distance: 1.52 km Lady Alice Creek. **GPS:** E800210 N8485890 **Land Unit:** Riparian (Brocks Creek Ridge) **Vegetation:** *Gardenia megasperma, Cymbopogon bombycinus, Themeda triandra, Chloris virgata, Eragrostis* sp. **Notes:** Culvert required	
Distance: 1.55 km **GPS:** E800250 N8485915 **Land Unit:** Alluvial Flats (Brocks Creek Ridge) **Vegetation:** *Themeda triandra* grassland, *Eucalyptus tectifica, Corymbia dichomophloia, Brachychiton diversifolius, Cochlospermum fraseri*.	
Distance: 1.65 km **GPS:** E800326 N8485984 **Land Unit:** Drainage area (Brocks Creek Ridge) **Vegetation:** *Themeda triandra* dominates the drainage line. Peripheral species include *Eucalyptus tectifica, Corymbia dichomophloia, Brachychiton diversifolius, Cochlospermum fraseri* **Notes:** floodway or series of culverts required	

Distance: 1.75 km **View northwest from Mt Wells access road** **GPS:** E800374 N8486046 **Land Unit:** Low Hills (Brocks Creek Ridge) **Vegetation:** *Gardenia megasperma, Eucalyptus tectifica, Corymbia dichromophloia, Themeda triandra, Heteropogon contortus.*	
Distance: 1.88 km **GPS:** E800514 N8486082 **Land Unit:** Riparian (Brocks Creek Ridge) **Vegetation:** *Pandanus spiralis, Lophostemon grandifolius, Corymbia polycarpa.*	**No Photo**
Distance: 2.48 km **Spurline track** **Culvert 1** **GPS:** E801087 N8486259 **Land Unit:** Riparian (Brocks Creek Ridge) **Vegetation:** *Pandanus spiralis, Brachychiton diversifolius, Grevillea pteridifolia, Gardenia megasperma, Sorghum sp.*	
Distance: 2.72 km **Spurline track** **Culvert 2** **GPS:** E801345 N8486258 **Land Unit:** Riparian (Brocks Creek Ridge)	**No Photo**
Distance: 2.95 km **Spurline track** **Culvert 3** **GPS:** E801560 N8486290 **Land Unit:** Riparian (Brocks Creek Ridge)	**No Photo**

Distance: 3.30 km **Spurline track** **Culvert 4** **GPS:** E801900 N8486350 **Land Unit:** Riparian (Brocks Creek Ridge)	**No Photo**
Distance: 3.73 km **Spurline track** **Culvert 5** **GPS:** E802265 N8486505 **Land Unit:** Riparian (Brocks Creek Ridge)	**No Photo**
Distance: 4.63 km **Spurline track** **Culvert 6** **GPS:** E802910 N8487060 **Land Unit:** Low Hills (Cullen) **Vegetation:** Similar to surrounding vegetation. *Calytrix exstipulata, Eucalyptus tintinans, E. tetradonta, E. tectifica*	
Distance: 5.10 km **Spurline track** **GPS:** unknown **Land Unit:** Granite Hills (Cullen) **Vegetation:** *Eucalyptus tetradonta, Eucalyptus miniata, Brachychiton diverifolius, Sorghum plumosum, Gardenia megasperma, Cochlospermum fraseri*	
Distance: 5.50 km **Spurline track** **Culvert 7** **GPS:** E803660 N8487560 **Land Unit:** Riparian (Cullen)	**No Photo**
Distance: 5.85 km	**No Photo**

Spurline track **Culvert 8** **GPS:** E803990 N8487515 **Land Unit:** Riparian (Cullen)	
Distance: 6.40 km **Spurline track** **Culvert 9** **GPS:** E804430 N8487770 **Land Unit:** Riparian/Low Undulating Hills (Cullen) **Vegetation:** *Eucalyptus tetradonta, Lophostemon grandiflorus, Sorghum sp., Heteropogon sp., Brachychiton diversifolius,* **Fauna**: Water monitor (*Varanas mitchellii*) **Notes:** washing out under culverts.	
Distance: 7.60 km **Spurline track** **Culvert 10** **GPS:** E805434 N8488335 **Land Unit:** Riparian/Alluvial Flats (Cullen) **Vegetation:** *Eulalia aurea, Pandanus spiralis, Heteropogon contortus, Themeda triandra*	
Distance: 8.20 km **Spurline track** **Culvert 11** **GPS:** E805930 N8488740 **Land Unit:** Riparian (Cullen)	**No Photo**

Distance: 8.40 km **Spurline track** **GPS:** Unknown **Land Unit:** Low Undulating Hills (Cullen) **Vegetation:** Swampy habitat**,** *Pandanus spiralis, Eulalia sp., Chloris virgata, Eucalyptus tintinans, E. miniata, Brachychiton diversifolius,Sorghum* sp*., Heteropogon* sp*., Grevillea pteridifolia*	
Distance: 8.52 km **Spurline track** **Culvert 12** **GPS:** E806095 N8489005 **Land Unit:** Riparian (Cullen)	**No Photo**
Distance: 8.80 km **Spurline track** **Culvert 13** **GPS:** E806270 N8489280 **Land Unit:** Riparian/Low Undulating Hills (Cullen)	**No Photo**
Distance: 9.30 km **Spurline track** **Culvert 14** **GPS:** E806520 N8489685 **Land Unit:** Alluvial Flats (Cullen) **Vegetation:** *Eulalia aurea, Heteropogon contortus, Pandanus spiralis* **Notes:** The road could be widened by pushing out fill to a lower level.	

Distance: 9.50 km **Spurline track** **Culvert 15** **GPS:** E806610 N8489925 **Land Unit:** Riparian (Cullen) **Vegetation:** *Lophostemon grandiflorus, Pandanus spiralis, Livistona humilis, Eulalia sp., Chloris virgata, Brachychiton diversifolius,Sorghum* sp.*, Heteropogon* sp.*, Grevillea pteridifolia* **Notes:** 4 Culverts in good condition but may not handle loads from haul trucks	
Distance: 9.70 km **Spurline track** **GPS:** Unknown **Land Unit:** Low Undulating Hills (Cullen) **Vegetation:** *Eucalyptus tintinans, E. tetradonta, Calytrix exstipulata, Sorghum plumosum, Gardenia megasperma*	
Distance: 10.20 km **Spurline track:** **GPS:** Unknown **Land Unit:** Low Undulating Hills (Cullen) **Vegetation:** *Eucalyptus tetradonta, Brachychiton diversifolius, Cochlospermum fraseri, Erythrophleum chlorostachys, Hyptis suaveolens, Sorghum* sp.*, Heteropogon* sp. **Notes:** Erosion washout from sidewalls	

Distance: 10.40 km **Spurline track** **Culvert 16** **GPS:** E806780 N8490720 **Land Unit:** Low Undulating Hills (Cullen) **Vegetation:** *Brachychiton diversifolius, Cochlospermum fraseri, Gardenia fraseri, Sorghum plumosum, Erythrophleum chlorostachys*	
Distance: 10.50 km **Spurline track junction with Mt Porter rd** **GPS:** E806799, N8490821 **Land Unit:** Granite Hills (Cullen) **Vegetation:** *Eucalyptus tetradonta, E. tintinans, Brachychiton diversifolius, Grevillea decurrens, Erythrophleum chlorostachyus, Calytrix exstipulata, Sorghum plumosum, Heteropogon contortus*	
Distance: 11.10 km **Spurline track** **Culvert 17** **GPS:** E806915 N8491400 **Land Unit:** Riparian/Low Hills (Brocks Creek Ridge)	**No Photo**
Distance: 11.30 km **Spurline track** **Culvert 18** **GPS:** E806960 N8491550 **Land Unit:** Riparian/Low Hills (Brocks Creek Ridge)	**No Photo**
Distance: 11.80 km **Spurline track** **Culvert 19** **GPS:** E807155 N8492000 **Land Unit:** Riparian/Low Hills (Brocks Creek	**No Photo**

Ridge)	
Distance: 12.15 km **Spurline track** **Culvert 20** **GPS:** E807200 N8492350 **Land Unit:** Low Hills (Brocks Creek Ridge)	**No Photo**
Distance: 13.70 km **Spurline track** **Culvert 21** **GPS:** E807570 N8493575 **Land Unit:** Riparian (Brocks Creek Ridge) **Vegetation:** *Lophostemon grandiflorus, Sorghum sp., Livistona humilis, Erythrophleum chlorostachys, Ficus racemosa* **Notes:** Erosion has begun to wash out the road, culverts and trees	
Distance: 13.80 km **Spurline track** **Culvert 22** **GPS:** E807720 N8493630 **Land Unit:** Low Hills (Brocks Creek Ridge) **Vegetation:** *Lophostemon grandiflorus, Sorghum sp., Livistona humilis, Erythrophleum chlorostachys*	
Distance: 14.10 km **Spurline track junction with Frances Ck rd** **GPS:** E808000 8493740 **Land Unit:** Low Hills (Brocks Creek Ridge)	**No Photo**

Map 1, Map 2, Map 3 and Map 4.

Flora Assessment: At each site, a 100m^2 quadrat was examined to represent the typical habitat of the site. Two people then surveyed the quadrat to determine species composition and dominance, community structure, the presence and phenological state of trees, and the presence of significant vegetation. Incidental observations of species were also recorded in surrounding aeas. Plant species were identified in the field where possible and voucher specimens collected where identifications were uncertain or reference material was required. Specimens collected were identified by botanist Des Nelson (Alice Springs) and the NT Herbarium (Darwin).

Fauna Assessment: The general presence of small mammals and reptiles were surveyed at each location using Elliott and pitfall trap transects. Elliott traps were set with 10 to 15m spacings, and trap numbers varied between sites (this information is provided in Table 5-1). Bait for Elliott traps was made from rolled-oats, peanut butter, water and a few drops of fish oil. One pitfall trap with 10 drift fencing was installed at each site apart from Jasmine Ridge. Each site was trapped for three nights. Trapped fauna was identified, processed (i.e. noting sex, reproductive status, body length, tail length, snout-vent length etc.), photographed if warranted, then released close to the capture point.

Opportunistic sightings and sign of fauna (i.e. scats, tracks, nests etc.) were also recorded at each site (approximately 1 hour per day). Birds and their general abundance were recorded within trap sites as well as opportunistically by observation or call. Spotlighting sessions were conducted by walking the roads into the range of habitats available. Bat species were recorded using two ANABAT bat detectors with one recorder set for one night at three selected sites and the other run on all three nights on the high hill at the Frances Creek Village Church.

Permits were obtained from the Animal Ethics Committee and the Parks and Wildlife Commission for the fauna survey.

Table 5-1: Location description and assessment details of sites from the two surveys.

Survey 1: November 2005 (during the build up to the wet season)

Survey 2: May 2006 (post wet season)

GPS information was collected using WGS 84, Grid: UTM.

Note: Survey Site ID numbers have changed since Survey 1 (Reilly *et al.* 2005).

Survey Site ID (Survey 1 site number)	Site Location		Land Unit	Assessment Method
	Eastings	Northings		
Site 1 (Site 1a)	Tailings Rehabilitation		Riparian	**Survey 1:** 14 Elliott traps, 1 Pitfall trap, bat detector, bird survey, fauna sign search, flora assessment **Survey 2:** 25 Elliott traps, 1 Pitfall trap, bat detector, bird survey, fauna sign search, aquatic invertebrate survey, flora assessment.
	808439	8494425		
Site 2 (Site 1b)	Helene Slopes		Sedimentary Slopes	**Survey 1:** 11 Elliott traps, 1 Pitfall trap, bat detector, bird survey, fauna sign search, flora assessment **Survey 2:** 12 Elliott traps, 1 Pitfall trap, bat detector, bird survey, fauna sign search, flora assessment.
	808489	8493902		
Site 3 (Site 1c)	Jasmine Ridge		Rocky Ridges	**Survey 1:** Flora assessment, bird survey, fauna sign search. No animal trapping occurred **Survey 2:** 24 Elliott traps, bird survey, fauna sign search, flora assessment
	811238	8497500		
Site 4 (Site 2a)	Ochre Hill		Small Alluvial Flats	**Survey 1:** 10 Elliott traps, 1 Pitfall trap, bird survey, fauna sign search, flora assessment **Survey 2:** 12 Elliott traps, 1 Pitfall trap, bird survey, fauna sign search, flora assessment
	809008	8502992		
Site 5 (Site 2b)	Ochre Hill		Rocky Ridges	**Survey 1:** 14 Elliott traps, 1 Pitfall trap, bat detector, bird survey, fauna sign search, flora assessment **Survey 2:** 13 Elliott traps, 1 Pitfall trap, bat detector, bird survey, fauna sign search, flora assessment
	809555	8501921		
Site 6 (Site 3a)	Millers		Low Hills (flats)	**Survey 1:** 11 Elliott traps, 1 Pitfall trap, bird survey, fauna sign search, flora assessment **Survey 2:** not visited due to conditions
	804653	8512032		
Site 7 (Site 3b)	Millers		Low Hills (rocky)	**Survey 1:** 14 Elliott traps, 1 Pitfall trap, bat detector, bird survey, fauna sign search, flora assessment **Survey 2:** not visited due to conditions
	804698	8512073		
Site 8	Frances Creek		Riparian, Low Hills (slatey sedimentary rocks)	**Survey 1:** not surveyed **Survey 2:** 18 Elliott traps, 1 Pitfall trap, bat detector, bird survey, fauna sign search, aquatic invertebrate survey, flora assessment.
	809378	8498722		

Bat Identification: The bat survey was conducted by specialist Dennis Matthews. Bat calls were used to identify bat species in the area. Calls were recorded by two ANABAT Systems (version 6) (Chris Corben, Titley Electronics). Bats detectors were set-up at survey locations listed in Table 5-2 and Map 7.

Bat calls were stored on a memory card and then transferred to a computer for analysis. Poor calls and insect calls were deleted. Calls were identified from "Key to the calls of the Top End of the Northern Territory" by Damian Milne, Parks and Wildlife Commission of the Northern Territory. The ANABAT System (version 6) used this way does not provide reliable abundance data of species recorded because a single bat can pass the detector many times. Therefore, only a checklist of species is provided. However, the results can give an indication of the relative activity of different species at a particular location. Some species were not separated from other species due to constraints of this technique.

Table 5-2: Bat detector locations during the Frances Creek survey

Bat Detector Locations		Detector #	Eastings	Northings
Day 1	**Church**	1	807338	8492845
	Ochre Ridge – Site 5	2	809551	8501921
Day 2	**Church**	1	807338	8492845
	Ochre Flats – Site 4	2	809029	8502958
Day 3	**Church**	1	807338	8492845
	Helene Slopes – Site 2	2	808500	8493875
Day 4	**Church**	1	807338	8492845
	Tailings Swamp – Site 1	2	808553	8494469

Aquatic Invertebrate Sampling: Five sites were chosen for aquatic invertebrate sampling, Table 5-3, Map 7. Sites were inspected from the banks by three people and a 'throw-net' was used to catch aquatic invertebrates and fish if identification was unsure. A scoop net was also used by slowly walking through the water to catching aquatuc fauna. Sections of aquatic plant, *Myriophyllum* sp., were also collected and soaked in a bucket of water to capture invertebrate fauna feeding on its foliage. In water bodies where throw-netting wasn't effective, other methods were used such as throwing in small leaves and twigs that lured fish to the surface. Each site was surveyed for at least half an hour each day.

Table 5-3: Aquatic fauna survey sites

Site Location	Eastings	Northings	Survey Method
Frances Creek	809378	8498722	Throw netting, scoop netting, general observation, surface lures
Ochre Creek	807600	8504015	General observation, surface lures
Tailings Swamp	808488	8494577	General observation, surface lures
Tailings Creek	808506	8494396	General observation, surface lures
Helene 4 void	808819	8495397	General observation, surface lures

Gouldian Finch Survey: Potential Gouldian Finch habitat is located within the Frances Creek project area and was assessed at several locations, early morning and late afternoon, during the four day survey. This survey was conducted during the late wet season/early dry season when Gouldian Finches are known to nest and forage within the *Eucalyptus* and *Sorghum* Low Hills habitat, and drink at small waterholes that persist until the following wet season (C Palmer, Parks and Wildlife NT, pers comm. 2006). They are also known to occur around grassy flats associated with vegetation on watercourses (Pizzey and Night 2002). Therefore, the following locations were targeted during the survey:

- Low rocky hills dominated by *Corymbia dichromophloea*, *Eucalyptus tintinans* and tall *Sorghum* grasslands,
- Frances Creek and other smaller creeks,
- Tailings Swamp with abundant *Sorghum, Pennisetum* grasses,
- Alluvial areas domimated by tall *Eucalyptus* sp., *Melaleuca* sp., *Sorghum* and *Hyptis*.

Survey locations are marked in Map 6.

Any incidental locations where other types of finches were observed were also surveyed for Gouldian Finches.

The previous survey was conducted at the beginning of the wet season (late November 2005) when Gouldians start to migrate from the hills into lowland alluvial areas where they feed on seeds of native perennial grasses. No Gouldians were observed in Frances Creek during the late November 2005 survey.

Haul Road Survey: Habitat, vegetation and landscape was assessed along the proposed haul road from Frances Creek minesite to a stockpile siding at the Alice Springs – Darwin railway. Map 5 shows the alignment of the haul road in yellow. The majority of the proposed haul road follows the path of a decommissioned railway spurline that was used during iron ore mining in Frances Creek between the 1960s and 1970s. The spurline corridor still exists and the majority

of the track is suitable for driving a 4WD, with the exception of a few deep granitic sand erosional depositional areas (mainly in cuts) and culvert washouts where bypass roads were taken. A small section on the western end of the proposed spurline road, approximately 2km, leaves the spurline track and crosses the Mt Wells public road and heads SW to a proposed siding on the new Alice Springs – Darwin railway. The survey was driven along the spurline section and walked along the western section.

An alternative route for the haul road is along the existing Frances Creek access road to the Mt Wells Road where it turns west along the public road to the point 2 km east of the new railway line where a new road would be built to the railway siding location. Mixing public vehicles and mine haul trucks is not a preferred option.

The survey involved traveling (driving and walking) along the proposed road and stopping at appropriate locations along the way to obtain a representative view of the vegetation and landscape. Information on Land Systems, land units (habitat groups), dominant vegetation species, incidental fauna and general notes (i.e. erosion potential, status of road, culverts etc.) were selected at specific locations to record habitat value along the proposed area to be cleared for haul road construction. Culvert locations on the spurline track were recorded and mapped. Photographs were taken at specific points. Little time was spent on the Mt Wells road option other than to note creek crossings and potential need for upgrading of the road. Appendix 11.9 provides photos along with relevant information collected during the survey.

GPS and GIS Mapping: Two Garmin GPS units were used during the survey (one *Garmin E-Mapper*™ and a *Garmin GPSmap 76C*). Readings obtained were within an accuracy of 4.5 to 10 metres during the survey. Elevations were also obtained and these varied by a few metres between repeat visits although they usually matched within one to five metres of survey data on the geological map. Waypoints or eastings/northings were noted at each survey site or interest point. Other AMG coordinates were obtained from digital tracks produced in the GPS units.

Maps were produced using ArcMap. Satellite Imagery from Google Earth (May 2006) was georeferenced and used as background images for mapping the Frances Creek project area. Contour, watercourse and road information was sourced from NatMap Raster viewer (Geoscience Australia). Land Unit shapefiles have been updated since the November 2005 report (Reilly *et al.* 2005).

Criteria used in identifying notable species: This report draws attention to species of conservation significance inhabiting or potentially inhabiting the Frances Creek project area. The Commonwealth *EPBC Act* (amended 2004) and species listed in the *TPWC Act* (2000)

have been used to identify species of conservation significance, refer to Table 7-1 and Table 7-2 for coordinates and species search criteria. The status and conservation value for any notable species identified from Frances Creek have been confirmed through consultation with relevant experts.

6 RESULTS

6.1 Survey Conditions

The survey was conducted at the end of the 2005/2006 wet season. Climatic conditions during the survey were warm and slightly humid. There was no rainfall recorded in Pine Creek during the survey (25km south of Frances Creek). Records for Pine Creek show the maximum temperature was 32.3^{o}C, which occurred on Sunday 21st of May 2006. There was an average Relative Humidity of 70.2% (at 9am) and 41.2% (at 3pm) during the survey period. The winds were generally easterlies and ranged from calm to seven kilometres per hour (Bureau of Meteorology 2005).

Above average rainfall has occurred this year with 1803.8mm of rain being recorded at Pine Creek between November 2005 and May 2006. Pine Creek had received only 28.2mm of rain before the initial survey and this followed a rainfall of about 1100mm for the previous wet season. Major watercourses within the project area were still running during the survey, and signs of very high water flooding were common throughout the project area. Open cut pits in the area retained water to high levels. The swamp that has formed at the rehabilitated tailings storage facility is relatively full of water and dense vegetation growth that responded to the rainfall. The recreation dam on the west side of the project area was full of water.

Roads in the project area have minor erosion fesulting from runoff from the large rain falls especially at creek crossings, floodout areas and steep access tracks (i.e. Ochre Hill road). The main access road to the current exploration area (Helene 4 and 6/7) were generally in good condition especially after grading occurred midway through the survey.

6.2 Natural Landscape

The landforms within Frances Creek project area consist of steep ironstone ridges with several rocky cliff faces embedded in steep to low foothills, low convex hills, small alluvial flats and associated watercourses. Soils consisted of mostly shallow, skeletal sandy loams with depositional areas of clay or loamy clays. The vegetation consists of open *Eucalyptus* woodland with patches of Low *Eucalyptus* Forest associated with creeks, drainage depressions and some west facing slopes. Several areas have been recently burned and new growth and seedling emergence are occurring.

6.3 Frances Creek Land Unit Descriptions

Six land units (LU) are present within the survey area. Table 6-1 provides the approximate proportion of the land units within the project area, the representative site number and plate references. Map 3 defines the boundaries for each land unit. All land units are widespread throughout the project area and surrounding areas. Appendix 11.4 provides a list of plant species recorded at each site during the survey.

Table 6-1: Land Units of the Frances Creek project area, representative Survey Site and Plate Reference Number.

Land Unit	Representative Survey Site	Plate Number(s)
1. Ridge Crests and Slopes	Site 3, 5	3, 5
2. Low Hills	Site 2	2, 6
3. Riparian	Site 1, 8	1, 7
4. Small Alluvial Flats	Site 1, 4	1, 4, 6
5. Granite Hills	Incidental	Haul road table
6. Low Undulating Hills	Incidental	Haul road table

6.3.1 Ridge Crests and Slopes

Ridge crests and slopes are common within the lease area. It consists of rocky hill crests, steep rocky slopes (e.g. incline up to 60^{o}) associated with cliff faces and gullies. They are related to the Brocks Creek Ridge LS. Soils are shallow and skeletal with sandy loams in gully floors and other depressions. Surface rocks on the ridge crests in Frances Creek cover approximately 90% of the bare ground, and were predominantly ironstone outcrops with small amounts of metasiltstones, greywacke and quartzite pebbles on the ridges which will be mined.

The vegetation of Ridge Crests and Slopes LU can be broadly described as open forests and woodlands. Dominant trees are *Eucalyptus tetrodonta, E. miniata* and *Corymbia dichromophloia* (approximately 10 metres high) over mid to tall grasses (up to one metre high) and scattered forbs. Tree hollows are common on the ground and in the canopy. There is a sparse shrub/small-tree layer (approximately 2 to 4 metres high) that can consist of G*revillea decurrens, Gardenia megasperma, Petalostigma quadriloculare*, *Acacia aulacocarpa, Terminalia ferdinandiana* and *T. grandiflora*. There are slight differences in species richness and abundances between the crests and slopes. Grasses, herbs/forbs including *Tephrosia polyzyga* and small shrubs were more diverse and abundant during the post wet season survey.

During the May 2006 survey, Ridge Crests and Slopes were surveyed at sites 3 and 5 (Jasmine Ridge and Ochre Hill, respectively). All sites have been disturbed by mining exploration (i.e. drill holes, drill pads and particularly access roads). Ridge Crests and Slopes are targeted by mining activities due to the presence of economical ironstone deposits within the ridges.

6.3.2 Low Hills

Low Hills represent a relatively large proportion of the Frances Creek Project area and are associated with the Brocks Creek Ridge LS. Low Hills are distinguished from Ridge Crests and Slopes on the basis of topography and erosional characteristics. Soils are similar to those described in the Ridge Crests and Slopes land unit. The hills of this land unit are described as low gently rounded hills associated with alluvial washouts and channels that occasionally become inundated during the wet season. Sedimentary and slatey rock outcrops are common, and several areas have vertically aligned intrusions (e.g. the western section of the proposed haul road, Map 5). The hills generally have a local relief of less than 30 metres and an incline of less than 10^{o}. Soils comprise compacted sandy loams with clayey loams commonly appearing in depressions.

Low Hills are vegetated with Open Eucalypt Woodlands with a sparse understorey of grasses and forbs. *Corymbia dichromophloia, Erythrophleum chlorostachys* and *Eucalyptus miniata* were the common trees in the area (approximately 10 metres high). Shrubs were not common. Grasses and herbs to 1½ metres were widespread and dispersed, which included *Themeda triandra*, *Chrysopogon fallax*, *Sorghum plumosum*, *Glycine* sp. and *Ludwigia octovalvis*.

During the May 2006 survey, Low Hills were surveyed from Site 2 (Helene Slopes). Survey 1 in November 2005 included the additional Millers site which was not accessible during the May 2006 survey due to boggy conditions. Millers Hills are capped with dark ironstone outcrops and was rich in trees, vines, grasses and moss. Appendix 11.4 provides flora lists for all sites from November 2005 and May 2006.

6.3.3 Riparian

Riparian areas occur along perennial and seasonal drainage channels. Soils are clayey loams with loamy clays in larger depressions, and coarse to fine sands in dry creek beds. Frances Creek drains through the central part of the project area and is the main drainage channel in the local area. This riparian area was flowing (northeast) during the May 2006 survey and contained very fresh water (EC <100 ppm) with no turbidity. There are numerous smaller creeks and streams from the higher sections of the project area that supply water to Frances Creek during the wet season. Mary Creek to the northeast and Watts Creek to the northwest also drain

northern parts of the project area with smaller tributaries draining into the main rivers. During the wet season relatively large volumes of water flow through the creeks and drainage gullies, but the watercourses tend to dry out during the dry season. Several seasonal and some semi-permanent natural waterholes and soakages persist within the lease area.

The vegetation in riparian and riverine areas is distinct from surrounding vegetation communities. They typically form a narrow belt of characteristic vegetation in areas of prolonged water availability that creates thicker canopies and a higher degree of structural complexity and species diversity. Common species include *Pandanas spirilis, Lophostemon grandiflorus, Ficus virens, Melaleuca* spp. (mainly *M. viridiflora* along creeks and larger *Melalueca dealbata* in low lying swampy areas)*, Acacia auriculiformis* and *Eucalyptus camaldulensis*. The dominant aquatic plants identified included *Myriophyllum* sp. and the purple flower water lily *Nymphaea violacea*. Many other species are associated with the riparian habitat, but tend to occur beside long lasting waterholes, e.g. *Xanthostemon eucalyptoides, Syzygium armstrongii, Bambusa arnhemica* and several *Ficus* species.

6.3.4 Small Alluvial Flats

Small Alluvial Flats are associated with the Brocks Creek Ridge land system and are described by Christian and Stewart (1953) as relatively small areas that occur where watercoarses exit at the base of larger hills and slopes. Soils were generally light textured “acid” alluvial soil, however, several areas contained dark organic clay materials. The alluvial flats along Frances Creek had patchy open woodland vegetation with sorghum grasses. The dominant trees in the woodlands varied between sites including *Erythrophleum chlorostachys*, *Eucalyptus miniata, E. tetrodonta* and *E. alba*.

6.3.5 Low Undulating Plains

Low Undulating Plains land unit predominantly lies in the southern and eastern edges of the Frances Creek project area and along a large section of the proposed haul road. Low Undulating Plains are associated with the granitic Cullen land system. They consist of Open Eucalyptus Woodlands with a sparse understorey of medium grasses. The undulating country is dominated by *Eucalyptus* and *Corymbia* species, mainly *Eucalyptus tetradonta, E. tintinans, E. tectifica* and *Corymbia dichromophloia* (approximately 8 to 10 metres high). The understorey varies in species dominance from *Sorghum plumosum*, *Themeda australis* and *Heteropogon contortus* (up to 1½ metres).

6.3.6 Granite Hills

The Granite Hills are located in a small zone on the south and eastern edge of the project area and occur along the proposed haul road. The Granite Hills are characteristic of the Cullen Land System. The hills are scattered with boulders and fragments of granite. The low open woodland is dominated by *Corymbia dichromophloia* and *Eucalyptus tinitinans*, with a relatively high density of *Sorghum intrans* (1 to 1½ metres high grass). The tall shrubs and/or smaller trees *Brachychiton diversifolius*, *Cochlospermum fraseri*, *Gardenia megasperma* and *Owenia vernicosa* are common plants on the rocky hill tops and slopes. *Ficus platypoda* occurs in sheltered areas.

6.4 Survey Site Vegetation Descriptions: May 2006

6.4.1 Site 1: Old Tailings Swamp

The swampy environment of the rehabilitated tailings storage facility was dense with tall grasses, sedges, vines and shrub thickets. Grass height (Sorghum, Rice Grass) reached two metres in some areas and was clearly larger and more dense that it was in November 2005 (Survey 1). Comparative photos from the two surveys are provided in Plate 1. The site contains a very similar species composition between the two survey, however, species abundances and sizes have changed dramatically from pre-wet season conditions. The lower wetter areas still comprise weed species including *Calopogonium mucunoides, Passiflora foetida, Senna alata, Pennisetum pedicellatum, Senna alata, Cynodon dactylon* and *Paspalidium scrobiculatum*. Couch Grass (*Cynodon dactylon*) is present but has been overgrown by several other water loving species in the swamp. The large Ringworm Scrubs (*Senna alata*) in the centre of the swamp are in full bloom. Water Lilies (*Nymphoides indica* and *Nymphaea violacea*) occurred in areas of freestanding water. The native sedge *Cyperus digitatus* was also relatively common in the area.

The tailings swamp was filled during the wet season rainfall. The stagnant water of the swamp is now in the process of breaking down vegetation and leaf litter which has made the water appear murky with tannin and humis. The water is expected to have a relatively high humic acid measurement due to the high level of vegetation break down. A waxy film or sheen exists on the surface that also indicate the water is rich in decaying plant material. *Myriophyllum* sp., Bull rush and several water lily plants exist in the swamp water. Not many fish were observed, however, water birds including Jacanas and White faced Herons were observed feeding on aquatic fauna within the swamp.

The tailings storage facility wall on the southern edge of the wetland contained relatively dense vegetation cover with a variety of species including *Acacia auriculiformis, Grevillea mimosoides, Ficus opposita, Livistona humilis, Terminalia ferdinandiana, Schefflera actinophylla and Alstonia actinophylla* and numerous forbs, sedges (*Cyperus digitatus*) and grasses. The upstream area to the south of the tailings dam contains fresh water and fewer introduced species than the wetland area 200m north. The water quality appears similar to the swamp waters, but is somewhat clearer probably due to high water flow and flush rates in the area (i.e. humic levels were not as high in this area). Black-striped Rainbow Fish were abundant in the water, along with water lilies and *Panicum* sp. grass. This area becomes flooded after large rains which flattens Annual Sorghum grasses. The introduced shrub *Hyptis suaveolens* forms patchy thickets in some areas along many stream banks. The native Water Lily (*Nymphoides indica*) was present and flowering.

Species lists are provided in Appendix 11.4.

6.4.2 Site 2: Helene Siltstone Slopes

The survey site is near Helene 8 was a northeast-facing siltstone slope dominated by *Corymbia dichromophloia* (canopy cover of 65 – 70%). Shrubs and grasses were relatively sparse with approximately 30% ground cover. Christian and Stewart (1953) describe the slopes in the area as mixed woodlands, which is true for the Frances Creek project area due to the variation of dominant trees (i.e. *Corymbia dichromophloia, Eucalyptus miniata, E. tetrodonta, E. tintinans*). Other common species found on the ridge slopes are *Xanthostemon paradoxus, Brachychiton diversiflorum, Erythrophleum chlorostachys, Glycine tomentella, Cymbopogon bombycinus, Terminalia ferdinandiana* and *Sorghum intrans.* Vegetation composition and condition has not changed since the initial survey in November 2005.

Species lists are provided in Appendix 11.4.

6.4.3 Site 3: Jasmine Ridge

Site 3 focused on the ridge crest and upper slopes of the Jasmine iron ore deposit. Disturbed and undisturbed areas were surveyed for flora and fauna. The ridge crest contains a flatter undulating summit dominated *Eucalyptus tetradonta*. The slopes of Jasmine contain a mixture of rocky outcrop faces and slopes. The vegetation community is dominated by *Corymbia dichromophloia*, *Eucalyptus tetrodonta, E. miniata* and *E. brachyandra* (canopy cover of 75 – 90%). The ridge top is large and flat with a mix of trees and shrubs. Several broadly shaped gullies dominated by *Eucalyptus tetrodonta* incised ridge slopes to the north and south. Large Northern Cypress Pines (*Callitris intratropica*) are present along several Jasmine exploration

tracks. Other species recorded on the ridge top were *Callytrix extipulata, Acacia melleodora, Owenia vernicosa, Gardenia megasperma*, *Grevillea decurrens, Livistona humilis*, *Glycine sp., Aristida holothera, Sorghum plumosum* and *Themeda triandra*.

Species lists are provided in Appendix 11.4.

6.4.4 Site 4: Ochre Alluvial Flats

Site 4 occurs in a low-lying alluvial valley at the northwestern foot of Ochre Hill (E809029 N8502958). The vegetation varies from a closed to open woodland dominated by *Corymbia polycarpa* (up to 25 metres) and *Erythrophleum chlorostachys* associated with patchy grasses (mostly *Sorghum* sp.) and several dense stands of *Hyptis suaveolens*. Other trees present were *Eucalyptus miniata* and *Eucalyptus alba*. Low trees and shrubs were a small component of this habitat and ranged between 1 to 4 metres, these species included *Cochlospermum fraseri, Eucalyptus setosa*, *Brachychiton paradoxum* and several clusters of *Eucalyptus* suckers. Grasses were mostly *Sorghum* sp. and *Sehima nervosum*, with many other grasses beginning to emerge after recent fires. The introduced vine *Passiona foetida* is present across the site.

6.4.5 Site 5: Ochre Ridge

Site 5 (E809029 N8502958) shows a difference in species structure, richness and abundance depending on slope orientation (east and west slopes) and ridge crest for the Ochre Hill ridge top. The ridge crest consisted of shallow stony soils amongst ironstone outcrop. The relatively diverse species composition formed a canopy cover ranging from 30 to 70%. *Corymbia dichromophloia* (between 6 – 8 metres high) is dominant on the ridge crest with other common species such as *Livistona humilis, Owenia vernicosa, Corymbia papuana* and *Sorghum plumosum*. Figs (*Ficus acubata*) were common on the rocks. Grasses and herbs were a minor component of this habitat (10 - 15%) and were more rich and abundant during Survey 2 after the 2005/2006 wet season. *Livistona* seedlings have emerged in high numbers since the November 2005 survey.

Dense *Eucalyptus* woodland covers the west-facing slope where small trees (between 5 to 10 metres) formed closed canopy. The dominant tree for the west facing slopes is *Eucalyptus miniata* with scattered *Owenia vernicosa*, *Eucalyptus tintinans* and *Livistona humilis*. Open Eucalyptus woodlands are present on the east-facing slopes. *Corymbia dichromophloia* is the dominant tree with *Eucalyptus tintinans* and *Erythrophleum chlorostachys*. A low density of small shrubs and forbs are present on the eastern and western slopes (10 – 15%) of Ochre Hill. Grasses were more common on the slopes rather than the ridge crests.

Species lists are provided in Appdendix 11.4.

6.4.6 Site 6: Millers Alluvial Flats (from Survey 1)

Alluvial flats are extensive along the drainage valleys and low hills, frequently with rock outcrop, are scattered commonly in this region. The small alluvial flats of Site 6 consist of a slightly sloping open woodland/parkland dominated by *Eucalyptus latifolia*, *Eucalyptus tectifica* and *Erythrophleum chlorostachys* over mid to tall *Themeda* and *Sorghum* grasses. Soils vary from granitic sands with pebbles to loamy clays. Seasonal inundation is a feature of these lowland areas. The vegetation structure of the open woodland has trees ranging between 10 to 12 metres with a canopy cover of 60%, a minimal shrub layer restricted below 0.5 metres and a widespread grass layer up to one metre covering of 90 – 95% of the area. The shrub layer is dominantly *Erythrophleum* suckers with stunted *Brachychiton paradoxum* shrubs occurring infrequently.

Species lists are provided in Appdendix 11.4.

6.4.7 Site 7: Millers Hills (from Survey 1)

A Closed Forest occurs on the ironstone rocky outcrops of Site 7. The canopy cover becomes thicker towards the crest of the ridge and the *Sorghum* and *Themeda* grasses become sparse. The forest is dominated by *Erythrophleum chlorostachys* and *Xanthostemon paradoxus* (8 to 10 metres) with a variety of other common trees, shrubs and vines. The site consists of shallow iron rich soils, with ironstone outcrops covered with lichen and moss dominating the ridges. The vegetation structure of the forest has trees ranging between eight to ten metres with a thick canopy cover, a diverse and relatively tall shrub/small tree layer averaging three metres with 50 - 60% groundcover, and a small and low grass/herb layer. Although no flora species of conservation significance were found during the survey, the rock outcrop low hills are more biologically diverse than the flats.

The vegetation on the shallow slopes in the area are typical of Woodland plant community. Tall *Eucalyptus miniata* (8 to 12 metres) dominated the upper storey vegetation with a variety of mid to tall shrubs including *Grevillea mimosoides, Acacia holosericea* and *Livistona humilis* (2 to 4 metres) and *Themeda* grasses underlying the open tree canopy. The vegetation structure and composition is denser and more diverse than the alluvial flats, but not as dense or diverse as the rocky outcrop vegetation.

Species lists are provided in Appdendix 11.4.

6.4.8 Site 8: Frances Creek Riparian and lower Slopes

Riparian zones are common throughout the project area and comprise of characteristic flora species that are specific to this habitat, such as *Melaleuca* sp. (paperbarks) and *Pandanas* sp. (palms). Frances Creek is the most significant drainage line in the project area and it flows northeast into the larger Mary Creek river system approximately 100km to the north. Numerous tributaries originating from the ironstone ridges and escarpments feed into Frances Creek and other streams to create lines of riverine vegetation.

Frances Creek was flowing northeast during the May 2006 survey and was up to 2 metres deep in the pool at the survey site. Evidence of grass patterns and trapped leaf litter 2 to 3 m high in trees showed that flooding had occurred in the area since the previous survey in November 2005 (wet season rainfall exceeded 1000mm). Most river systems flood to some extent during the wet season (Brock 1988).

Riverine vegetation at Frances Creek that occurred in or directly adjacent the creek included *Lophostemon grandiflorus, Melaleuca viridiflora, Pandanus spiralis, Acacia auriculiformis, Ficus racemosa, Petalostigma pubescens* and *Xanthostemon eucalyptoides*. There were three main aquatic plants identified, including *Nymohaea violacea*, *Myriophyllum* sp. and *Nymohoides* spp. Water lilies were in bloom during the survey.

Vegetation on the rocky banks and slopes to the west of Frances Creek was dominated by *Eucalyptus* trees and *Sorghum* grasses. *Corymbia dichromophloea* became more dominant further up the slope. *Cochlospermum fraseri, Brachychiton diversiflorum* and *Gardenia megasperma* were very common small trees on the low hills adjacent to Frances Creek.

Species lists are provided in Appdendix 11.4.

6.4.9 Important Flora

Most plant species within the proposed project area are widely spread across the landscape in appropriate habitat. The only species noted of conservation significance identified is a isolated patch of Cycad (*Cycas armstrongii*) that was found within the low hills (E808807, N8498303) between Ochre Hill and Frances Creek. *C. armstrongii* is listed as vulnerable in the N.T. (*TPWC Act* 2000) and should not be cleared or disturbed by mine operations. This cycad is a deciduous species that can reach 4m in height and is used as bush tucker (nuts, flour) and medicine (antiseptic) by local aborginal people. They occur in open forests and woodlands and can form dense stands on sandy well-drained soils.

6.4.10 Weeds

Seven introduced species were recorded during the survey; Calopo (*Calopogonium mucunoides*), Hyptis (*Hyptis suaveolens*), African Feathergrass (*Pennisetum pedicellatum*), Ringworm Scrub (*Senna alata*), Stinking Passion Vine (*Passiflora foetida*), Common Sensitive Plant (*Mimosa pudica*) and Couch Grass (*Cynodon dactylon*). All species except Hyptis were mostly confined to areas where previous disturbance has occurred. The swampy environment where the old tailings storage facility was located contained all these species.

Calopogonium mucunoides is an annual vine with stems covered with yellow hairs. It produces pea-shaped, bluish-purple flowers that have yellow-green centres. It is native to tropical America and has been listed as a weed in the Philippines, Malaysia and Indonesia. In Australia, it exists in the Darwin and Gulf regions of the Northern Territory and in Cape York where it has been widely spread as an annual stock food and for supppression of Lantana and Hyptis (Reid, 1981). It has been reported as a weed in Kakadu National Park. It is common in the Darwin region and surrounding bushland, where it forms dense mats that smother native vegetation. Information was sourced from DEH website.

Hyptis suaveolens is an annual or perennial upright branched plant with a characteristic aromatic mintysmell, generally growing 1 to 1.5 metres high, but at times reach 2 metres. *Hyptis* is a native of South America. It is now widespread in the Darwin, Katherine, Gulf and Victoria River Districts, particularly in pastoral lands. This weed is continuing to invade through natural spread and is a contaminant in hay, on livestock, clothing, native animals and vehicles. It favours disturbed areas such as roadside and overgrazed areas around cattle yards and stream banks. It is resistant to fire.

Senna alata (formerly *Cassia alata*) is native to South America and has been recorded as a weed in Ghana, Nigeria, Cambodia, Puerto Rico, Indonesia and the Solomon Islands. It has naturalised in Queensland and the Northern Territory, where it exists as isolated infestations over large areas. It is declared noxious in the Northern Territory where it has formed dense thickets in disturbed/ overgrazed areas and riparian habitats in coastal and sub-coastal regions. It is particularly aggressive in areas where there is a high water table.

Pennisetum pedicellatum is an annual grass that infests grain sorghum crops and has been widely spread for stock feed. *Passiflora foetida* is *a* woody climber vine to 9 m high, and the flower emits an unpleasent smell (i.e. stinking passion flower). *Cynodon dactylon, Couch Grass,* is a robust perennial grass introduced to Australia and grows on a wide range of soils, but best in moist, relatively fertile and well-drained soils.

Mimosa pudica is a low, sprawling, perennial plant which usually grows about 15-45 cm high. It is a native of tropical America, introduced into Australia as a curiosity plant in gardens. It is a weed of disturbed and cultivated areas, such as roadsides, heavily grazed pastures, crops and lawns. It grows on a wide variety of soils, and can stand considerable shading. Seeds are mainly spread by clinging to clothing and animals and can remain viable for many years.

6.5 Fauna of the Frances Creek project area, May 2006

Fauna species identified during the two Frances Creek surveys are listed in Appendices 11.1, 11.2 and 11.3. In this survey (May 2006) there were 115 animal species identified, including 49 birds, 22 mammals, 13 reptiles, three amphibians and eight fish. Table 6-2 compares number of species caught between the November 2005 survey and this survey in May 2006.

Only a small proportion of the fauna expected to inhabit the Frances Creek project area were actually observed during the survey. This is a reflection of the short survey period, long grasses impeding opportunistic sighting of ground dwelling animals, seasonal variation in species composition and abundance, and possibly disappearance of carnivorous species due to arrival of the poisonous Cane Toad in 2003. Therefore, species lists are provided that integrate fauna records from surveys of 10 nearby locations (Appendices).

Table 6-2: Comparison of Total Species Counts for the two Frances Creek Surveys

	Survey 1 November 2005	Survey 2 May 2006	Total Species Count
Amphibians	6	4	6
Reptiles	17	13	22
Birds	67	49	83
Mammals	26	22	30
Fish and Crabs	1	8	8
Total Species	117	95	149

Trap Success: Trapping success was relatively low for the May 2006 survey with a trap success ranging from 2.6% to 18.1% between the six sites, Figure 6-1. The average trap success during the survey was 9.5%. This capture rate is 2.5% lower than the initial survey in November 2005 which produced a 12% trap success. Cooler weather and lower humidity during May 2006 are part of the reason for the reduced faunal acitivity, but rodents produce young

following seed drop and the November survey had a higher proportion of juveniles. Total species numbers were also lower during the May 2006 survey, Table 6-2. High rainfall during the wet season would also lead to a wider dispersal of animals due to increased numbers of water points in the area. This highlights the necessity of multiple faunal surveys in areas such as Northern Australia where climatic changes are highly seasonal.

The rocky ridge and slopes of Jasmine Ridge recorded the highest trap success with 18.1%. All animals trapped at this site were Common Rock Rats (*Zyzomys argurus*), with most of these being sub-adult to adult males. The rocky ridge habitat at Ochre Hill collected the second highest trap success of 11.9%, with the Common Rock Rat also comprising all Elliott trap captures (again being sub-adult to adult males).

Frances Creek (Site 8) was not surveyed in November 2005, thus we cannot compare between seasons for the site. However, it is clear that small mammal populations are not active during this period due to only reptiles and amphibians being trapped at most sites.

The tailings area (Site 1), Helene slopes (Site 2) and Ochre alluvial flats (Site 4) all recorded low trap successes with 6.4%, 2.6% and 2.6%, repectively. It appears that *Rattus tunneyi* were not as plentiful during the second survey and this was also reflected in the reduction of active les seen in Survey 2.

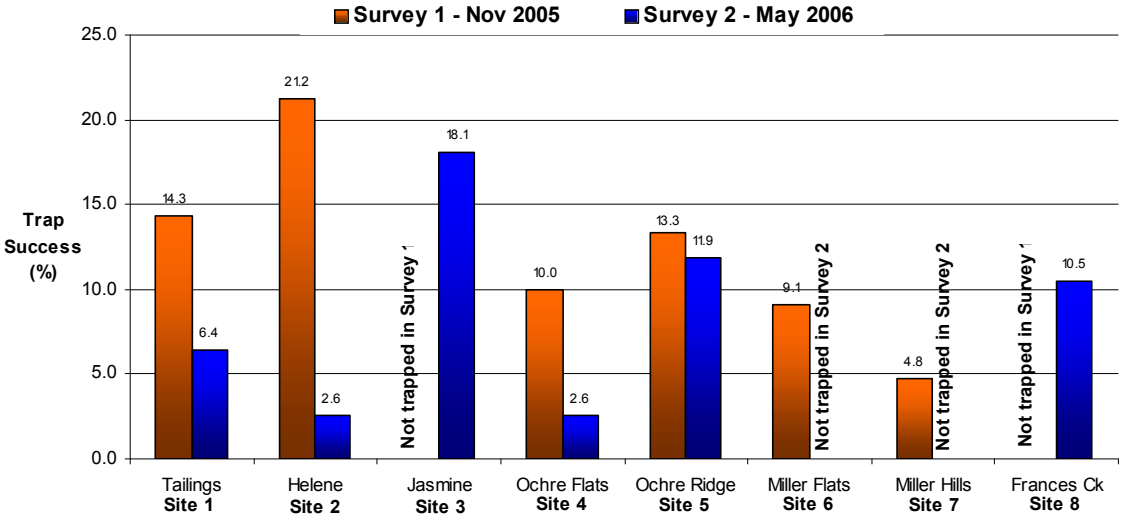


Figure 6-1: Trap success (%) for the two Frances Creek Surveys, November 2005 (orange) and May 2006 (blue).

Note: trapping included Elliott traps and Pitfall traps

Mammals identified in May 2006: Survey results identified a total of 19 native mammal species and three introduced species for the project area. Mammal numbers around the Frances Creek project area were lower during the May 2006 survey compared to the November 2005 survey. Mammal species recorded during the November 2005 and May 2006 surveys are listed in Appendix 11.2.

Four native rodent species were caught and identified during the survey Common Rock-rat (*Zyzomys argurus*), Pale Field Rat (*Rattus tunneyi tunneyi*), Western Chestnut Mouse (*Psuedomys nanus*) and Calaby's Pebble Mound Mouse (*Pseudomys calabyi*).

Common Rock Rats (*Z. argurus*) were the most common animal trapped during the May 2006 survey. Jasmine Ridge (Site 3) trapped 13 individuals on the rocky ridge and slopes, and Ochre Hill ridge top (Site 5) produced four captures. This species is endemic to Northern Australia and are found in a wide range of habitats that are always associated with rocky outcrops (Strahan 1983; Ride 1970). Sub-adult to adult males were most commonly caught in the Elliott traps. Several individuals had many scars and docked tails. Breeding reaches a peak during the end of the Wet Season (March to May) (Strahan 1983; Woinarski et al. 1992).

The Pale Field Rat (*R. tunneyi tunneyi*) was not as active during the May 2006 survey with only two captures (compared to 13 captures in November 2005). *R. t. tunneyi* typically live in tall grassland (i.e. *Sorghum* sp.) that is usually close to creeklines. Breeding appears to take place post autumn in the Northern Territory (Strahan 1983; Woinarski et al. 1992).

A Western Chestnut Mouse (*P. nanus*) was caught in the swampy tall grass area at Site 1 (tailings swamp). *P. nanus* is known to occur in a range of habitats that are associated with low eucalypt woodlands with a dense cover of tussock grasses. Breeding occurs at a very rapid rate and appears to be responsive to favorable conditions (i.e. rapid vegetation growth after fires, flooding and rains) (Strahan 1983; Woinarski *et al.* 1992).

An adult Calaby's Pebble-mound Mouse (*Pseudomys calabyi*) was caught in a pit trap set up on the siltstone slopes at Site 2. *P. calabyi* are known only from headwaters of South Alligator and Mary Rivers in south Kakadu and Litchfield NP, but they are expected to be more widespread due to low amount of trapping the region (Menkhorst and Knight 2004). Little is known about the behaviour of these small mice apart from it building burrow systems with entrances surrounded and blocked by small mound of pebbles on gravelly slopes with a tall grass understorey. No pebble mounds were found on this survey.

One macropod species was identified during the survey, the Euro (*Macropus robustus*). Scats and tracks were identified on rocky slopes and some alluvial flat areas.

Horses (*Equus caballus*), Donkeys (*Equus asinus*) and feral pigs (*Sus scrofa*) were commonly identified by tracks within the project area, mostly along watercourses and flatter areas.

The ANABAT System (bat detector) was setup to record bat calls over four nights. Assessment of the calls determined 11 different species with a further two other groups of calls that include at least two other species, but they could not be identified with confidence (Table 6-3; Appendix 11.2). The Frances Creek project area has a potential for 17 species of micro bats that could inhabit the area over a full cycle of seasons. Considering the short-term survey (i.e. four nights, four locations) this is a good result and shows that a range of bats are present in the area. Ghost bats were not detected using the ANABAT recorder due to their calls being very quiet (i.e. their other common name is the “whispering bat”. The Ghost Bat population of about 40 individuals was identified after disturbing them in an old conveyor tunnel within the Frances Creek stockpile area (E808748 N8494793). Little Red-flying Foxes (Fruit bats or blossom bats) were commonly observed flying over camp or feeding in trees during the night.

Three species of bats that are of conservation significance were observed during the survey, namely the:

1. Ghost Bat (*Macroderma gigas*): This is a vulnerable species that is patchily distributed in small colonies across Northern Australia. The bats require undisturbed roost caves or mine shafts/tunnels that usually have complex systems with several openings.
2. Orange Leaf-nosed Bat (*Rhinonycteris aurantius*): This species has very few known maternity sites. During the dry season the species is cave/mine dwelling. During the wet season they will disperse from caves/mines to forage and live in monsoon forests and open woodlands. Observations consisted of sparse calls high over the hill at the Church, possibly of a single individual.
3. White-Striped or Arnhem Sheathtail Bat (*Taphozous kapalgensis*): This is an unexpected recording of the uncommonly recorded plains dwelling bat. Recorded on one sequence on one night in one habitat. A number of fragmented calls could also have been this species, but were not complete enough to positively identify. This species is a tree dweller and the records are significant.

Mammals seen in Survey 1 and **not** in Survey 2: Common Planigale (*Planigale maculata maculata*), Agile Wallaby (*Macropus agilis*), Short-eared Rock Wallaby (*Petrogale brachyotis signata*) and Northern Brown Bandicoot (*Isoodon macrourus macrourus*). Descriptions of these animals are provided in the Survey 1 report (Reilly *et al.* 2005).

Table 6-3: Results recorded by the ANABAT system during the Frances Creek Survey, May 2006.
Note: All identifications were completed by Dennis Matthews.

Scientific Name	Church	Site 5 - Ochre Ridge	Site 4 - Ochre Flats	Site 2 - Helene Slopes	Site 1 - Tailings
Chaerephon jobensis	X	X	X		X
Chalinobulus gouldii	X		X		X
Mormopterus beccarii	X	X			
Nyctophilus sp. **	X		X		X
Nyctophilus walkeri	X	X	X		
Rhinonicterus aurantius	X				
Saccolaimus flaviventris	X		X		X
Scotorepens greyii / sanborni			X		
Taphozous georgianus	X		X		X
Taphozous kapalgensis	X				
Vespadelus caurinus	X		X		X
Sp. 1	X	X	X		
Sp. 2	X	X	X		

Sp. 1 = Scotorepens greyii / sanborni or Chalinolobus nigrogriseus
Sp. 2 = Pipistrellus westralis or Miniopterus schreibersii orianae
Nyctophilus sp. ** = Nyctophilus geoffroyi or N arnhemensis or N bifax

Reptiles: Thirteen reptile species were identified during the May 2006 survey, compared to 17 species in the warmer and more humid conditions during the November 2005 survey (Appendix 11.2). Overall, the two surveys have identified 22 reptile species in the project area. No reptile species of conservation significance were identified.

The cooler and drier conditions of Survey 2 resulted in lower reptile activity and species diversity throughout the survey area. Dragons (family: Agamidae) and skinks (family: Scincidae) were the most common lizards. Two water monitors were recorded; one larger specimen (likely *Varanas mertensii*) was found foraging around the tailing swamp and a smaller specimen (likely *Varanas mitchellii*) was observed under an old culvert along the proposed haul road. White-lipped Two-lined dragons (*Diporiphora albilabris*) were not as active during the survey and only juvenile individuals were found foraging in the rocky substrate. Gilberts Waterdragons (*Amphibolurus*

gilberti) were active in the low areas such as undulating plains, alluvial flats and riparian areas. Two-spined Rainbow Skinks (*Carlia amax*), Striped Rainbow Skinks (*C. munda*) and Smooth-scaled skinks (*Glaphyromorphus isolepis*) were commonly observed throughout the survey area. *C. munda* and *G. isolepis* preferred rocky habitats such as Ochre Hill and Jasmine Ridge, whereas *C. amax* appeared amongst leaf litter in open woodland country and riparian zones (Sites 1 and 8). Adult skinks *Ctenotus robustus* and *C. spaldingii* were identified across rocky areas with dense grasses, often associated with riparian zones.

Two snakes were identified during the survey, a Slatey-grey Snake (*Stegonotus cucullatus*) and a Common Tree Snake (*Dendrelaphis punctulata*). Both are commonly observed in the region.

Amphibians: Four amphibian species were identified during the May 2006 survey, compared to six species during the November 2005 survey. Frog activity was low during the survey. Cane Toad (*Bufo marinus*) were not as common during the May survey. The native frogs recorded from the surveys included *Cyclorana australis, C. longipes, Litoria personata, L. rothii* and *L. rubella*, which are all common species for the area and are represented in high number throughout the Kakadu National park (Matthews *pers. comm*. 2005). Frogs were present around most water bodies encountered during spotlighting sessions, such as the old tile lined concrete swimming pool at the abandoned village and the tailings wetland. Loud sessions of breeding calls from *C. australis* occurred during the November survey (male mating call is a loud “woark, woark”), and this activity was not encountered in May 2005.

The introduced Cane Toad (*Bufo marinus*) was abundant during the survey. It was encountered during spotlighting sessions and did not appear to be confined to areas where freestanding water existed. All large adults appeared lean but healthy. The cane toad first appeared in the area during 2003 (J. Goulevitch, *pers. comm.* 2005).

Birds: Eighty-three bird species were observed during the two surveys (Appendix 11.3). This includes sedentary, vagrant and migratory species. Many bird species are migratory and vagrants and their populations are known to fluctuate with seasonal and temporal variation of resources. Birds were more abundant and diverse during the November 2005 survey during the build up to the wet season when water was restricted to small locations, which reflected more concentrated bird populations.

Two Partridge Pigeons (*Geophaps smithii smithii*) were identified during the haul road survey in May 2006, and these birds are listed as Vulnerable under the *EPBC Act* (1999) (Australia) and Near Threatened under the *TPWC Act* (2000) (Northern Territory). Three birds listed under

"Other Matters Protected by the *EPBC Act* (1999)" were observed during the surveys, these are the White Egret (*Ardea alba*), Rainbow Bee-eater (*Merops ornatus*) and the Magpie Goose (*Anseranas semipalmata*). The Bush-stone Curlew (*Burhinus magnirostris*) and Red-tailed Black Cockatoo (*Calyptorhynchus banksii*) were common during the surveys and are listed as Near Threatened under the *TPWC Act* (2000).

All Birds of conservation significance are described in detail in Section 7.3.

Appendix 11.8 also includes species potentially occurring within the Frances Creek project area based on previous studies in the local area (Davidson 1985, Woinarski *et al.* 1989, NSR 1992, NSR 1993, Eldridge and Low 1994, Grattidge and Low 1996, Reilly, Low and Matthews 2005).

There are several substantial permanent water bodies located within the project area, which attracts higher diversities and abundances of birds, especially when water is scarce during the later months of the dry season. The wetland created by the rehabilitated tailings storage facility (Site 1) held the highest bird numbers and species compared to other survey sites. Water birds, vagrants, and sedentary and migratory birds were present. Frequently encountered species were the Sacred Ibis (*Threskiornis aethiopica),* Magpie Geese (*Anseranas semipalmata*), Red-winged Parrots (*Aprosmictus erythropterus*), White-faced Herons (*Ardea novaehollandiae*) Great Egrets (*Ardea alba*), Pied Stilts (*Himantopus himantopus*), Rainbow Bee-eaters (*Merops ornatus*), Crimson Finches (*Neochmia phaeton*), Magpie Larks (*Grallina cyanoleuca*), Royal Spoonbills (*Platalea regia*), Budgerigars (*Melopsittacus undulates*), Silver-crowned Friarbirds (*Philemon argenticep)* and Little Cuckoo-Shrikes (*Coracina papuensis*). Although specifically looked for, no Gouldian Finches were seen. This species is listed on the EPBC web site and is becoming critically endangered.

Aquatic Fauna: The aquatic environment within the project area includes creeks, drainage areas, freshwater ponds, dams, tailings wetland and voids. The dams, voids and tailings wetland have permanent water supplies. Most creeklines contained water and several were flowing during the May 2006 survey. Flooding had occurred in several locations during the high wet season rainfall (>1,800mm of rain), however all waters had receded in associated creek lines and streams by the survey in May. The aquatic survey included three creeks, the tailings wetland and the Helene 4 void. Each survey location was different in water clarity, aquatic vegetation and surrounding topographical features (i.e. catchment area, disturbed areas etc.).

Fish were the most abundant and diverse group of the aquatic fauna with eight species being identified from survey techniques (i.e. scoop netting, throw netting, opportunistic observation).

The identified species included Spangled Grunter, Barred Grunter, Bony Bream, Exquisite Rainbowfish, Black-striped Rainbowfish, Black Catfish, Hardyhead species and the Sail-fin Glassfish. All species are common and widespread in freshwater streams, rivers and lagoons across Northern Australia (Larson and Martin 1989). Species list with locations and scientific names are provided in

Table 6-4. Closeup photos of Spangled Grunter, Exquisite Rainbowfish and Sail-fin Glass fish are presented in Plate 15, Plate 16 and Plate 17.

Water striders (likely *Gerris australis*) were common on all survey locations, and abundant within the tailings swamp. Water striders are predaceous long-legged insects that skim across the surface of ponds, creeks and small dams and feed chiefly on other insects that occur on the water surface (Goode 1980).

The common freshwater crab, *Holthuisiana transversa*, was observed on a few occasions during the survey. Crabs were difficult to catch due to their discrete manner and rapid escape techniques. Dragonflies (including *Dipalcodes haematodes*) and mosquitoes were also common on the water surface within all sites, Plate 23.

Creeks had low to no freestanding water during the first survey (November 2005, wet season build up period). Watercourses in the area flow steadily in the wet season, ceasing in the mid dry season with water remaining in a few pools that act as refuge for freshwater fish, reptiles, amphibians and macroinvertebrates. It is expected that aquatic fauna inhabiting McKinlay River and Frances Creek also occur in tributaries in surrounding areas during the wet season.

Two juvenile Freshwater Crocodiles (*Crocodylus johnstonii*) were seen floating in Helene void 4, and tracks of a larger individual were also identified on the foreshore of the Helene 4 dam during the dry season survey. Macleay's Water Snake (*Enhydris polylepis*) was observed on several occasions during survey 1 at the tailings wetland. Five frog species were also found during spotlighting sessions at these areas.

Table 6-4: Aquatic fauna identified during the Frances Creek surveys

Legend: [11] November 2005 survey (Reilly *et al.* 2005)

[12] May 2006 survey (this survey, Reilly *et al.* 2006)

A = Abundant, C = Common, U = Uncommon, "blank" = not observed

Scientific Name	Common Name	Frances Creek	Ochre Creek	Tailings Wetland	Tailings Creek	Void - Helene 4
AMPHIBIANS						
Hylidae						
Cyclorana australis [11]	Giant Frog			C		
Cyclorana longipes [11]	Long-footed Frog			C		
Litoria rothii [11,12]	Roths Tree Frog	C		C		
Bufonidae						
*Bufo marinus**				C		
REPTILES						
Crocodylidae						
Crocodylus johnstoni [11]	Freshwater Crocodile					C
Varanidae						
Varanas mertensi [12]	Merten's Water Monitor			U		
CRUSTACEANS						
Sundathelphusidae						
Holthuisiana transversa [12]	Freshwater Crab		U			
FISH						
Ariidae						
Neosilurus hyrtllii [12]	Black Catfish	U				
Atherinidae						
Craterocephalus sp. [12]	Hardyhead	C				
Chandidae						
Ambassis agrammus [12]	Sail-fin Glassfish	A	C			
Megalopidae						
Nematalosa erebi [11,12]	Bony Bream	U				
Melanotaeniidae						
Melanotaenia exquisite [11, 12]	Exquisite Rainbow Fish	C				
Melanotaenia nigrans [11,12]	Black-striped Rainbow Fish	A	A	C	A	
Terapontidae						
Leipotherapon unicolor [11,12]	Spangled Grunter	C	C			U
Amniataba percoides [12]	Barred Grunter	C	C			
INSECTS						
Libellulidae						
Diplacodes haematodes [12]	Red Dragonfly	C	C	C	C	
Gerridae						
Gerris australis [12]	Water Strider	C	C	A	A	C

6.6 Haul Road Survey

The preferred option for the proposed haul road runs along the decommissioned railway spurline corridor that traveled from the old Frances Creek minesite to meet the Larrimah to Darwin North Australian Railway approximately 30 years ago. The rails and sleepers were pulled up after the mine closed in 1974 leaving the rail bed intact. At present, the spurline corridor is a single lane track (4 – 6 metres wide) that varies from good condition in some areas (mostly fill sites) to poor conditions in others (mostly in cuts where erosion of the granitic soils has resulted in loose fill). Territory Iron proposes to widen the existing 4m wide track bed by about 3 m to suit haul trucks driving from Frances Creek processing plant to a new siding on the new Alice Springs – Darwin Railway. This may require limited vegetation removal within a 25m corridor on either side of the current spurline track to allow use of existing or creation of new borrow pit sites and the construction of appropriate water control works (i.e. culverts, floodways, off-let drains, spoon drains etc.).

The proposed haul road travels through two Land Systems (LS), the Cullen LS and Brocks Creek Ridge LS, Map 5. Land Units recorded along the proposed road include granite hills, low undulating hills and swampy alluvial flats of the Cullen LS and low hills of the Brocks Creek Ridge LS. The proposed road mostly occurs in low undulating hills (Cullen LS) and low hills (Brocks Creek Ridge LS), Map 5. Culverts were built at 22 creekline locations along the old railway spurline and are shown in Map 5. Most culverts were still effectively managing water flow which has kept the track in good condition. However, signs of deterioration and erosion are significant in three culvert locations. Appendix 11.9 provides survey information on land units, culverts and vegetation for several locations along the proposed haul road.

Vegetation along the haul road is relatively homogeneous with the surrounding landscape, and no species of conservation significance were observed. The undulating granite country (Cullen LS) is dominated by *Eucalyptus* and *Corymbia* species, mainly *Eucalyptus tetradonta, E. tintinans, E. tectifica* and *Corymbia dichromophloia*. The understorey varies in species dominance from *Brachychiton diversifolius*, *Cochlospermum fraseri*, *Gardenia megasperma, Calytrix exstipulata, Sorghum plumosum*, *Themeda australis* and *Heteropogon contortus*. Vegetation within the Low Hills (Brocks Creek Ridge LS) is typically Open Eucalyptus Woodlands with a variable understorey of shrubs, grasses and forbs. *Corymbia dichromophloia, Erythrophleum chlorostachys*, *Eucalyptus tintinans* and *E. tetradonta* were common trees in the Low Hills. Riparian waterways supported a narrow belt of vegetation that creates higher and sometimes denser canopies with a higher degree of structural complexity and species diversity. Common riparian species included *Pandanus spiralis, Lophostemon grandiflorus* and *Themeda*

triandra. Many other species are associated with the riparian habitat, but tend to occur beside long lasting waterholes, e.g. *Xanthostemon eucalyptoides, Syzygium armstrongii* and several *Ficus* species.

Two Partridge Pigeons were observed foraging along the Mt Porter access track which was approximately 700m from the proposed haul road. This species is classed as "vulnerable" under the *EPBC Act* (1999) and "near threatened" in the Northern Territory. Information regarding this species is provided in section 7.3. No other significant fauna species were observed during the haul road survey.

There were no ecological issues along the road that would preclude using it as a haul road. Run-off water controls would be required to prevent erosion as well as minimizing the restriction of water flow so as not to prevent water getting to some of the wetland areas.

The alternative option is to use the Francis Creek access road south from the mine to its junction with the Mt Wells Road, west along the public Mt Wells Road to about 2km short of the new Alice Springs to Darwin railway crossing from whence a new road would cut SW across Lady Alice Ck to a new siding to be built on the rail line. This option is not preferred as it would have large haul trucks operating in the same space as public tourist traffic. There were no issues along either the Francis Creek Rd or the Mt Wells Rd which would prevent haul trucks using the road. Improved creek crossings would be required at numerous locations to reduce dips and rises with some minor modifications to the road alignment to remove sharp corners. The alignment is already wide enough for double lane traffic so no significant clearing of the common Woodland species would be required.

The proposed loading and sidetrack area adjacent to the Railway line is situated in a siltstone and granite area with Eucalypt Woodland and mid and tall grasses and requires a 50m wide corridor for clearing as a laydown area. A creek passes across the back of the site which would require minor realignment. There are no significant ecological issues with the site.

7 CONSERVATION VALUE OF THE FRANCES CREEK PROJECT AREA (REGIONAL CONTEXT)

7.1 Habitat

The tropical woodland community of the Frances Creek project area is known as vegetation type 21, which is *Eucalyptus tintinans* with *Corymbia dichromophloia* and *E. miniata*, over a tall

Sorghum grassland understorey (Wilson *et al.* 1990). *Eucalyptus tetrodonta* is also common and dominates a variety of slopes and undulating country. Vegetation type 21 covers hundreds of square kilometres in the Northern Territory (Wilson *et al.* 1990), and Frances Creek constitutes approximately 1,212 hectares of this community. On a regional scale the vegetation and landscape of Frances Creek is not considered to be threatened or significant, but it is poorly represented in National Parks and is subject to widespread mining development and exploration.

On a regional scale, physical disturbance associated with iron ore mining at Frances Creek is insignificant in terms of regional conservation values. The proposed mine will cause only localised loss of common habitat and alteration of the landscape.

The *Riparian* land unit within the project area has a higher conservation value and it is recommended that it be not disturbed during mining operations where it can be avoided. The local drainage network of the *Riparian* land unit contains ephemeral watercourses that can hold valuable surface waters throughout the wet and dry seasons. As a consequence, the species diversity of this land unit is relatively high and it provides important refuge for fauna through the dry season.

The rehabilitated tailings storage facility has created a well-utilised wetland environment for a diverse selection of birds, mammals, reptiles and vegetation. The mine will not require the Tailings Facility for the proposed mining operation as all of the crushed material will be shipped to market. It is recommended that efforts be made to retain this area in good quality, as the wetland will act as a refuge area for mobile species when mining operations begin.

7.2 Flora

An isolated patch of Cycad (*Cycas armstrongii*) was found on a hillslope (GDA 94: E808807, N8498303) on the Ochre Hill and Millers road (Plate 12.30). *C. armstrongii* is listed as vulnerable in the N.T. (*TPWC Act* 2000) and should not be cleared or disturbed by mine operations. This cycad is a deciduous species that can reach 4m in height and is used as bush tucker (nuts, flour) and medicine (antiseptic) by local aborginal people. The species occurs in open forests and woodlands, and can form dense stands on sandy well-drained soils.

7.3 Fauna

Vegetation clearing for Frances Creek mine development will result in habitat loss for local fauna living in the impact zones, particularly those living on the *Ridge Crest and Slopes* land

unit at mine sites. Mining will also indirectly impact on the local fauna through increased noise, vibration, dust, lights, roads, increased human activity, vehicle traffic and possible alteration of the natural drainage patterns. Although these disturbances are likely to locally impact populations, fauna known in the area are common and widespread throughout their range and their conservation status is unlikely to be affected by mining operations. Discussion of species of conservation significance that are known or may exist in the lease and the potential for impact by the mining operation is presented in the following paragraphs. Table 7-1 and Table 7-2 list species of conservation significance that may inhabit the Frances Creek project area. Map 6 shows locations of significant species found within the Frances Creek project area.

Mammals of conservation concern that were identified during the Frances Creek surveys include the Ghost Bat (*Macroderma gigas*), Calaby's Pebble Mound Mouse (Psuedomys calabyi), Western Chestnut Mouse (*Pseudomys nanus*), Pale Field-rat (*Rattus tunneyi*), Orange Horseshoe-bat (*Rhinonicterus aurantius*) and Arnhem Sheathtail bat (*Taphozous kapalgensis*) (Table 7.2). The Northern Brown Bandicoot (*Isoodon macrourus*) and the Short-eared Rock Wallaby (*Petrogale brachyotis*) are thought to have declining populations in the territory's top end, but do not retain any territory or national conservation status.

Pale Field-rats and Western Chestnut Mice are listed as Near Threatened in the Northern Territory (*TPWC Act* 2000). The Field-rats were relatively active during both surveys and are known to be relatively common in the region. They were caught in previously mined areas and pristine areas during the survey, suggesting that populations were not affected by previous iron ore mining at Frances Creek. The Western Chestnut Mouse was also found in previously disturbed and undisturbed areas. Populations appeared to be more active in less disturbed areas such as the woodland flats near Millers deposit.

Ghost Bats (*Macroderma gigas*) are listed as Near Threatened in the Northern Terrritory. They are classed as vulnerable under the Red Species List determined by the IUCN. A population of approximately 40 Ghost Bats was found within an old conveyor tunnel that was used for loading iron ore on to trains during mining between 1966 and 1974 (E808748 N8494793). The tunnel contains several roosting points including structural beams, overlap joints and large nuts on its corrugated iron roof. The current Ghost Bat population in Northern Australia is estimated somewhere between 4,000 and 6,000 (wikipedia website). Roosts can be found in caves, deep rock crevices, rock clefts and old mines. The bats mainly forage at night within 1-2 km of the roost site (IUCN website 2006). Ghost bats move between a number of caves seasonally or as dictated by weather conditions, and these sites are likely to be located within a range of 20 to 30 km (Dennis Matthews *pers. comm.* 2006). Although ghost bats prefer to roost in colonies they

currently only roost in small groups at best; this is due to a lack of roosting sites that support larger colonies. It is unusual for there to be a colony of more than 100 bats in one location. The ghost bat is the only carnivorous bat in Australia and is endemic to Australia. This species is vulnerable to disturbance in its roost sites. Cave tourism has been identified as a problem, but the most serious threat is from quarrying and reworking of old mine areas. In some cases, the collapse of disused mines may also be a threat (IUCN website 2006). Attempts to construct alternative shelters have been made (Australian Bat Society Newsletter, No. 18 June 2002) but success is not known. Obviously the culvert abandoned on site in 1974 has become a roost, but the time required for that to happen is not known. To ensure minimal damage to the local Ghost Bat population, the bats should be disturbed at dusk 2 – 3 days before any work is to be done in the immediate vicinity of the tunnels and checked to ascertain they have all vacated the premises (*pers comm*. Damian Milne). Moving the conveyor tunnel to an appropriate nearby location away from disturbance as a future roost site for bats including Ghost Bats could be a useful exercise (*pers comm*.. Dennis Matthews, Damian Milne). This site may not get used for years but the present structure shows the value of these structures.

The Orange Horseshoe Bat, *R. aurantius,* is classified as a Near Threatened species (N.T. Parks and Wildlife Commission 2005). The species is endemic to Australia and its distribution extends from the Pilbara to western Queensland, with most of the populations occurring in the Northern Territory (Churchill 1991). Churchill (1991) suggests the scarcity of *R. aurantius* is due to highly specialised roost requirements and low numbers of caves and mines with suitable microclimates. Although the mining operation will create considerable disturbance in the local area, such as increased noise, vibrations and dust, to which *R. aurantius* are sensitive, the lack of local roosting habitat implies there will be no significant impact on the population as the animals are likely flying in from nearby areas as indicated by the few recordings.

T. kapalgensis is a data deficient species and has only been recorded from the nearby Kapalga and Kakadu areas of the Northern Territory where it occupies the floodplains. It is a fast and direct flying species that forages in open areas well above treetop height in open woodlands and adjacent grassy plains, but also descends to lower levels where flight paths are not obstructed (McKean and Friend 1979). Potential threats to this species are not known.

Four **Bird species** observed on the lease are protected under the *EPBC Act* (1999): the Partridge Pigeon (*Geophaps smithii smithii*), White Egret (*Ardea alba*), Rainbow Bee-eater (*Merops ornatus*) and the Magpie Goose (*Anseranas semipalmata*). Mining development by Territory Iron Ltd is not considered likely to significantly reduce or disturb populations due to the birds preferring habitats that are not under threat from mine operations (Table 7.1). Since it is

not anticipated that the tailings dam will be used in the currently proposed mining operation, the existing wetlands habitat will not be greatly disturbed.

The Partridge Pigeon (subspecies *Geophaps smithii smithii*) is classified as vulnerable (*EPBC Act* 1999) and Near Threatened in the Northern Territorty. It has experienced considerable reduction in numbers and range in Northern Australia over the last 70 years (RAOU 1993). The species can be locally common, but is generally scarce (RAOU 1993). The decline of Partridge Pigeons has been attributed to the degradation of small waterholes by exotic animals and altered fire regimes (RAOU 1993). They are represented in regional National Parks and are more commonly observed in Open Woodlands of the *Low Undulating Hills* land unit within the Cullen Land System. Localised habitat loss within Frances Creek is unlikely to disturb habitat where the Partridge Pigeons may occur. However, the proposed Haul Rd passes through Eucalyptus woodlands which is typical habitat for the Pigeons. Two individuals were observed during the May 2006 survey on the Mt Porter access track near the proposed Frances Ck haul road (Plate 11). Care should be taken to avoid colliding with birds along access tracks and haul roads, and also to keep on top of feral cat populations. Partridge Pigeons have been recorded at Union Reef (NSR 1993), Kakadu National Park (Woinarski *et al.* 1989) and Pine Creek (NSR 1993) (Appendix 13.8) and are a relatively secretive bird.

The White Egret, Rainbow Bee-eater and Magpie Goose are protected under the *EPBC Act* (1999) as listed overfly marine species (*EPBC Act* generated report, June 9th 2006). These birds are common in the region at particular times of the year. Site 1 (tailings swamp) was popular location for all these species during the November 2005 survey. This area will be disturbed by mining activities and the current habitat will be altered. These three species are particularly mobile and commonly migrate to preffered feeding locations. Water bodies in the local and regional areas offer similar habitat to that provided by the tailings swamp (i.e. the large recreation pond to the west), and therefore bird populations and conservation status classifications should not be affected by Frances Creek mining operations.

Three (potentially 4) birds observed during the survey are listed as Near Threatened under conservation lists provided by the Northern Territory Parks and Wildlife Commission; the Partridge Pigeon (*Geophaps smithii smithii*), Bush Thicknee (*Burhinus grallarius*) and Red-tailed Black Cockatoo (*Calyptorhynchus banksii*). Two inactive holes thought to be a nest site of the Hooded Parrot (*Psephotus dissimilis*) were found in an old termite mound on the natural siltstone slopes at Site 2 (Helene Slopes), however, no individuals were observed during the surveys, Plate 14. These birds are lowland feeding birds and the iron ore operation is unlikely to disturb or destroy habitat for these species apart from road construction.

There are several other nationally listed bird species that may potentially occur within the project area: Gouldian Finch, Red Goshawk and Masked Owl (all discussed below).

The Gouldian Finch (*Erythrura gouldiae*) is an endangered species under the *EPBC Act* (1999) and the *TPWC Act* (2000) and could possibly occur within the project area, Table 7-1 and Table 7-2 (correspondence J. Woinarski, 2006). No Gouldian Finches were observed during targeted surveys of the Frances Creek area despite the presence of several other finch species and lengthy bird watching stints within Eucalyptus Woodlands and at water points and swampy flats with high Sorghum grass seed productivity. Other finches identified were the Long-tailed Finch, Double-barred Finch, Crimson Finch, Chestnut-beasted Mannikan and the Zebra Finch. Undulating Open Woodlands of *Eucalyptus* sp*.* and *Sorghum* grasses with associated creek lines provide appropriate habitat for Gouldian finches. Habitat selection changes from breeding areas in stoney hill woodland in the dry season to adjacent lowlands throughout much of the wet season (Dostine *et al.* 2001). Finches feed on annual grass seeds during the dry season until germination occurs in the wet season at which time they switch to ripening seeds of, particularly, perennial grasses. The species has experienced considerable decline in numbers over the past 50 years (Woinarski *et al.* 1989). Suggested threats and reasons of decline of populations are trapping for captive bird trade, changes in fire regime, grazing cattle and respiratory mites. There are few known breeding areas and few populations occurring in National Parks. Gouldian Finches have been recorded in Kakadu National Park (Woinarski *et al*. 1989), Pine Creek (NSR 1993) and Mt Todd (NSR 1992) (Appendix 13.8), thus may be found within the Frances Creek project area. Identification of the species should be taught to all employees during induction and if Gouldian Finches are detected during mining, a monitoring program should be established to determine movements of this species in order to assess whether populations could be impacted by mine development. It seems likely that if the species is found in the area, it will be along the valley bottoms in areas of high Sorghum grasses. Thus vehicle traffic on roads may be the main threat, and vehicle speed limits and sign postage (i.e. picture of Gouldians) where the species may occur along the roads may be an adequate solution.

Red Goshawk (*Erythrotriorchis radiatus*) is a vulnerable species according to the *EPBC Act* (1999) and the *Action Plan for Australian Birds* (2000). This bird occupies a range of habitats in northern and eastern Australia, including coastal and subcoastal tall open forests and woodlands. However, within these habitats Red Goshawks are sparsely distributed. Red Goshawks breeding requirements are very specific, for example they will only nest in trees taller than 20 metres and these must be within one kilometre of water (Birds Australia 2005). Most of the range contraction in this species has occurred in New South Wales and southern

Queensland where suitable habitat has been cleared. It is estimated that fewer than 1,000 Red Goshawks remain (Birds Australia 2005). No observations of the species have been made in the Frances Creek project area and there is not likely to be any impact on the species by the mining operation due to habitat preference. Red Goshawks have been recorded in Kakadu National Park (Woinarski *et al*. 1989) (Appendix 13.8).

Masked Owls (*Tyto novaehollandiae*) are classed as a vulnerable species under the *EPBC Act* (1999). They inhabit forests, woodlands, timbered waterways and open country on the fringe of these areas (Slater 1970). They require tall trees with suitable hollows for nesting and roosting and adjacent areas for foraging. The population range is a broad coastal band around most of mainland Australia and throughout Tasmania (i.e. no more than 300 kilometres from the coast). Population numbers of Masked Owls are low on the mainland. While the loss of several large trees in the pit area will occur, there is no evidence that the species has occurred in the area or in surrounding surveys (Appendix 13.8).

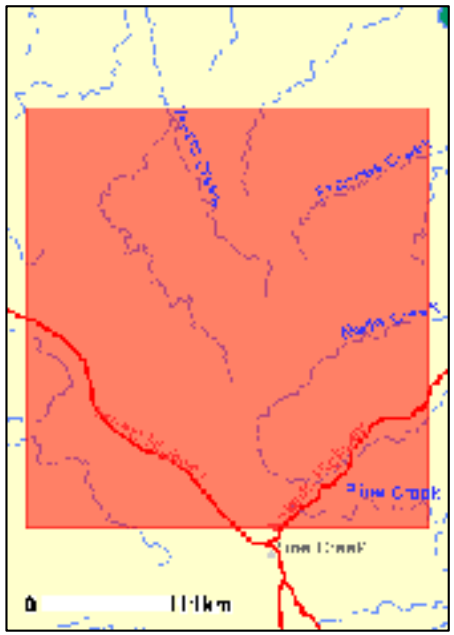
The **reptiles** identified during the Frances Creek environmental survey are common and widespread and mining operations are unlikely to change the status of these species. Freshwater Crocodiles (*Crocodylus johnstonii*) are protected under the *EPBC Act* (1999). If they are encountered during void dewatering they should be relocated using appropriate measures advised by NT Parks and Wildlife Section.

All frogs (**amphibian**) listed as occurring or potentially occurring within the Frances Creek project area are common species. Localised habitat loss is unlikely to significantly affect the status of any frog species found during the survey. The Cane Toad is abundant in the area and is a nationally listed pest that needs to be eradicated or controlled.

No **fish or other aquatic fauna** identified during the survey are protected under the *EPBC Act* (1999) and *TPWC Act* (2000). Nonetheless, waterways that provide habitat for these species are important and should not be disturbed by mining if possible. Fish provide a good source of prey for birds, reptiles and aquatic species.

Table 7-1: Species of Conservation Significance that occur or could possibly occur within the Frances Creek project area.

A search of the Environmental Protection and Biodiversity Conservation Act (1999) (*EPBC Act* (1999)) list of species of conservation significance consisted of a rectangle search with a centre point of 13° 37" 00'S, 131° 51" 06'E on the 9th of June 2006. The map on the right shows the area searched. The following list of fauna species protected under the (*EPBC Act* (1999)) could potentially be found within the Frances Creek project.



Species are also listed in Table 7.2 if they are listed under the *Territory Parks and Wildlife Conservation Act* (2000) (*TPWC Act (*2000)).

EPBC Act website for database of significant species: http://www.deh.gov.au/erin/ert/epbc/imap/map.html

Species Name and Status	Common Name	Source	Presence during the Survey	Preferred habitat
CRITICALLY ENDANGERED				
Mammals				
Saccolaimus saccolaimus nudicluniatus	Bare-rumped Sheathtail Bat	*EPBC Act* (1999)	Not recorded	Woodland communities
ENDANGERED				
Birds				
Erythrura gouldiae	Gouldian Finch	*EPBC Act* (1999),	Not recorded	Open woodlands and

Species Name and Status	Common Name	Source	Presence during the Survey	Preferred habitat
		TPWC Act (2000)		grasslands
Dasyurus hallucatus	Northern Quoll	*EPBC Act* (1999), and also listed as vulnerable *TPWC Act* (2000).	Not recorded	Generalist that dens in tree hollows, rock crevices and caves
VULNERABLE				
Birds				
Erythrotriorchis radiatus	Red Goshawk	*EPBC Act* (1999)	Not recorded	Open Woodlands
Geophaps smithii smithii	Partridge Pigeon (eastern)	*EPBC Act* (1999)	Recorded	Open Woodlands, creeklines
Tyto novaehollandiae kimberli	Masked Owl (northern)	*EPBC Act* (1999)	Not recorded	Forests and Woodlands
Sharks				
Pristis microdon	Freshwater Sawfish	*EPBC Act* (1999)	Not recorded	
MIGRATORY				
Migratory Terrestrial Species - Birds				
Coracina tenuirostris melvillensis	Melville Cicadabird	*EPBC Act* (1999)	Not recorded	Around Water bodies
Erythrura gouldiae	Gouldian Finch	*EPBC Act* (1999)	Not recorded	Open woodlands and grasslands
Haliaetus leucogaster	White-bellied Sea-Eagle	*EPBC Act* (1999)	Not recorded	Around Water bodies
Poecilodryas superciliosa cerviniventris	White-browed Robin	*EPBC Act* (1999)	Not recorded	Woodlands, creeklines

Species Name and Status	Common Name	Source	Presence during the Survey	Preferred habitat
Rhipidura rufifrons	Rufous Fantail	*EPBC Act* (1999)	Not recorded	Around Water bodies
Migratory Wetland Species - Birds				
Charadrius veredus	Oriental Plover	*EPBC Act* (1999)	Not recorded	Timbered Habitats
Glareola maldivarum	Oriental Pratincole	*EPBC Act* (1999)	Not recorded	Creeklines
Numenius minutus	Little Curlew	*EPBC Act* (1999)	Not recorded	Generalist
Migratory Marine Species				
Crocodylus porosus	Salt-water Crocodile	*EPBC Act* (1999)	Not recorded	Ocean, watercourses
OTHER MATTERS PROTECTED BY THE EPBC ACT				
Birds				
Anseranas semipalmata	Magpie Goose	*EPBC Act* (1999)	Recorded	Subcoastal wetlands
Apus pacificus	Fork-tailed Swift	*EPBC Act* (1999)	Not recorded	
Ardea alba	Great Egret, White Egret	*EPBC Act* (1999)	Recorded	Wetlands
Ardea ibis	Cattle Egret	*EPBC Act* (1999)	Not recorded	Subcoastal, near water
Charadrius veredus	Oriental Plover	*EPBC Act* (1999)	Not recorded	Dryfloodplains, paddocks
Glareola maldivarum	Oriental Pratincole	*EPBC Act* (1999)	Not recorded	Dry open plains
Haliaeetus leucogaster	White-bellied Sea-Eagle	*EPBC Act* (1999)	Not recorded	Coast, rivers, dams
Merops ornatus	Rainbow Bee-eater	*EPBC Act* (1999)	Recorded	Woodlands and timbered plains
Numinius minutus	Little Curlew	*EPBC Act* (1999)	Not recorded	Tussock grassland
Rhipidura rufifrons	Rufous Fantail	*EPBC Act* (1999)	Not recorded	Rainforest and forests

Species Name and Status	Common Name	Source	Presence during the Survey	Preferred habitat
Reptiles				
Crocodylus johnstonii	Freshwater Crocodile	*EPBC Act* (1999)	Recorded	Fresh watercourses
Crocodylus porosus	Salt-water Crocodile	*EPBC Act* (1999)	Not Recorded	Ocean, watercourses

Flora and Fauna surveys in the local region between 1989 and 2006 have identified 26 species of conservation significance for the Northern Territory (*TPWC Act* 2000) (Table 7.2). Only six species were found during the Frances Creek survey. However, previous surveys in the region suggest the possibility species of conservation significance could occur within the project area.

Table 7-2: Fauna identified from surveys in the local Pine Creek Region that are listed as Threatened Species in the Northern Territory

* EPBC Act (1999) listed species

Surveys include: Davidson 1985, Woinarski *et al.* 1989, NSR 1992, NSR 1993, Eldridge and Low 1994, Grattidge and Low 1995, Reilly *et al.* 2005

Scientific Name	Common Name	Frances Creek Survey	Prefered Habitat
ENDANGERED			
Birds			
Erythrura gouldiae	Gouldian Finch *	No	Open woodlands and grasslands
VULNERABLE			
Mammals			
Dasyurus hallucatus	Northern Quoll *	No	Generalist that dens in tree hollows, rock crevices and caves
Phascogale tapoatafa pirata	Brush-tailed Phascogale	No	Tall Eucalypt woodlands, particularly stream lines
Birds			
Dromaius novaehollandiae	Emu	No	Wide ranging lowlands
Erythrotriorchis radiatus	Red Goshawk *	No	Tall Riparian vegetation
Rostratula benghalensis	Painted Snipe	No	wetlands
Reptiles			
Morelia oenpelliensis	Oenpelli Python	No	outcrops
NEAR THREATENED			
Birds			
Burhinus grallarius	Bush Thicknee	Yes	Lowland woodlands
Calyptorhynchus banksii samueli	Red-tailed Black-Cockatoo (centralian Australian subspecies)	Yes	Open woodlands

Scientific Name	Common Name	Frances Creek Survey	Prefered Habitat
Geophaps smithii	Partridge Pigeon *	Yes	Lowland near watercourses
Heteromunia pectoralis	Pictorella Mannikin	No	Euc. Woodland near water
Lonchura flaviprymna	Yellow-rumped Mannikin	No	Euc. Woodland near water
Lophoictinia isura	Square-tailed Kite	No	Open woodland
Neochmia ruficauda clarescens	Star Finch	Yes	Euc. Woodland near water
Poecilodryas superciliosa	White-browed Robin	No	Shrubby woodland areas
Psephotus dissimilis	Hooded Parrot	Inactive Holes	Woodland plains with Termite mounds
Tyto novaehollandiae kimberli	Masked Owl *	No	Woodlands and adjacent open country
Mammals			
Hipposideros stenotis	Lesser Wart-nosed Horseshoe-bat	No	Tall open woodland, cave roosts
Onychogalea unguifera	Northern Nailtail Wallaby	No	Rock outcrops
Pseudomys nanus nanus	Western Chestnut Mouse	Yes	Alluvial slopes, hills
Rattus tunneyi	Pale Field-rat	Yes	Valleys, alluvial slopes open woodland
Rhinonicteris aurantius	Orange Horseshoe-bat	Yes	Deep humid caves, tall woodland
Taphozous kapalgensis	Arnhem Sheathtail Bat	Yes	Open plains
Reptiles			
Acanthophis praelongus	Northern Death Adder	No	Dry sclerophyl woodland
Chelosania brunnea	Chameleon Dragon	No	Savannah woodland
Varanus panoptes	Yellow-spotted Monitor	No	woodlands

7.4 Landscape of the Frances Creek Project Area

The Frances Creek project area lies within the *Brocks Creek Ridge* and the *Cullen* land systems (Christian *et al.* 1953). Iron ore mining occurred at Frances Creek that operated between 1966 and 1974, and consequently the southern section of the project area is relatively disturbed with several open voids, rehabilated waste dumps and old settling pond (tailing dam) that is now a relatively unique wetland in the local area that is attracts migratory birds. Rehabilitation of the Eucalyptus woodlands is excellent in most cases and is difficult to distinguish from the natural tropical woodlands. The project area is on pastoral land which has experienced minimal

stocking due to difficult terrain, low carrying capacity of vegetation and few permanent waters. The Pine Creek region is subject to several other mining operations (proposed, in operation or closed) such as Spring Hill, Brocks Creek, Mt Porter, Pine Creek, Mt Todd, Mt Wells and Union Reef.

A general biogeographical feature of northern Australia is that animals living within the tropical woodlands and open forests are relatively homogenous across an extensive longitudinal arc from the Gulf of Carpentaria region to the southwest of the Kimberly (Woinarski *et al.* 1989).

The ecological survey of Frances Creek mineral lease area and haul road option suggests it is representative of the widespread landscape, as it contains species commonly found in the northern Wet-Dry tropics. All species recorded in the two surveys are represented in nearby Kakadu National Park or other reserves in the region. Thus from an environmental perspective, Frances Creek does not represent an area of outstanding conservation significance that may lead to population decline or extinction of threatened species. However, it is encouraged that any development (mining associated or otherwise) should attempt to minimise environmental disturbance to ensure residential species either have time to vacate the area to adjust to operations.

8 ACKNOWLEDGEMENTS

The following people were appreciated for there efforts or involvement with the Frances Creek Environmental Report:

- Carl Parks (Territory Iron Ltd) for a brief description of the proposed mine site.
- Earl Gano (Pine Creek resident) provided information on early exploration in the Pine Creek area.
- MBS Environmental staff Michael Dufty, Amanda Rukuwai and Kristy Sell for providing information and comments on draft reports and facilitating coordination of surveys and reporting.
- Ben Kaethner (Low Ecological Services) helped with GIS map production for the final report. Jeff Cole (Parks and Wildlife) let us borrow his ANABAT bat detector for the field trip.
- Des Nelson (Alice Springs botantist) and the NT herbarium (Darwin) helped with vegetation identification.
- Photos in the report were taken by Tom Reilly or Bill Low unless otherwise indicated.

9 REFERENCES

- **Birds Australia (2005).** Website: http://www.birdsaustralia.com.au/
- **Brock, J.** (1988). *Top End Native Plants*. Published by John Brock, Winnellie, Darwin, N.T.
- **Christian CS and Stewart GA (1953).** *General Report on Survey of Katherine-Darwin region 1946.* Land Research Series No. 1, CSIRO Melbourne.
- **Churchill, SK (1991).** *Distribution, Abundance and Roost Selection of the Orange Horseshoe-bat Rhinonycteris aurantius, a Tropical Cave Dweller*. Australian Wildlife Research 18: 343 – 353.
- **Churchill, S. (1998).** *Australian Bats*. New Holland Publishers (Australia) Pty Ltd.
- **Corben, C. (2004)** *Anabat6*. Bat call analysis software.
- **Davidson EA. (1985).** *Cosmo Howley Project: Flora and Fauna Survey*. Unpublished report prepared by Arnhem Environmental Impact Assessors (AEIA) for Negri River Corporation, Melbourne.
- **Dostine, PL, Johnson, GC, Franklin, DC, Zhang,Y, Hempel, C (2001).** *Seasonal use of savanna landscapes by the Gouldian finch, Erythrura gouldiae, in the Yinberrie Hills area, Northern Territory.* Wildlife Research, 2001, 28: 445-458. (publish.csiro.au)
- **Duncan, A., Baker, G.B. and Montgomery, N. (eds) (1999).** *The Action Plan for Australian Bats*. (Environment Australia: Canberra.)
- ***EPBC Act* (1999)** - Department of the Environment and Heritage (DEH) website: http://www.deh.gov.au/index.html
- **ERA (1993)** *Terrestrial Vertebrates of the Union Reefs Project Area*. NSR environmental Consultants, Melbourne.
- **Elderidge SR and Low WA. (1995).** *Landscape, Flora and Fauna Survey of the Proposed Brocks Creek Mineral Lease (MLN 1139)*. Component of a DEIS for Solomon Pacific Resources NL.
- **Garnett ST and Crowley GM. (2000).** The Action Plan for Australian Birds 2000. Environment Australia 2000. Website: http://www.deh.gov.au/biodiversity/threatened/action/birds2000/
- **Goode J (1980).** *Insects of Australia*. Angus & Roberton Publishers, Australia.
- **Grattidge A and Low WA (1996).** *Environmental Survey of Landscape, Flora and Fauna of the Proposed Spring Hill Project Area*. Prepared for Ross Mining NL by Low Ecological Services in April 1996.
- **Larson HK and Martin KC (1989)**. *Freshwater Fishes of the Northern Territory*. Northern Territory Government Printing Office.

- **Law L (1992).** Erosion control strategies on areas disturbed by mining. ***In*** *The Goldfields Land Rehabilitation of Arid and Semi-Arid Areas 14 – 15th May 1992*. The Chamber of Mines and Energy Western Australia Inc.
- **McKean JL and Friend GR (1979).** *Taphozous kapalgensis, a new species of Sheat-tailed bat from the Northern Territory, Australia. Vic. Nat.* Vol. **96:** 239-241.
- **Mitchell S. (1995).** *A Management Plan for Historic Chinese Mining Sites in the Pine Creek District, NT.* A report to the National Trust of Australia.
- **Mott JJ and Andrew MH (1985).** The effect of fire on population dynamics of native grasses of northwest Australia. In Ridpath MG, Corbett LK (1985). Proc. Of a Joint Symposium of Ecology of the wet-Dry Tropics. Darwin, May 15: pp 1 – 17, 1983. *Proc. Ecol. Soc. Australia*.
- **NSR (1992).** *Mount Todd Gold Project: Draft Environmental Impact Statement.* NSR Environmental Consultants Pty. Ltd. For Zapopan NL.
- **NSR (1993).** *Union Reefs Project: Draft Environmental Impact Statement.* NSR Environmental Consultants Pty. Ltd. For Shell Company of Australia Ltd.
- **Pennay, M., Law, B. and Reinhold, L. (2004)** *Bat calls of New South Wales*. NSW Department of Environment and Conservation, Hurstville.
- **Preece N, Latz P, O'Bryrne D, Portlock H, and Waithman J (1989).** *Fire Management Manual: For Central Australian Parks and Reserves*. Conservation Commission of the Northern Territory, Alice Springs.
- **RAOU (1993).** *Threatened and Extinct Birds of Australia.* RAOU Report No. 82.
- **Reid, RL, Ed, 1981.** A Manual of Australian Agriculture. Heinemann, Melbourne.
- **Reilly TE, Low WA, and Matthews D (2005).** *Environmental Survey of the Landscape, Flora and Fauna of the Proposed Mt Porter Project Area (ML(A) 23839*). Prepared for Arafura Resources NL by Low Ecological Services (completed July 2005).
- **Reilly TE, Low WA, and Matthews D (2005).** *Environmental Survey of Landscape, Flora and Fauna of the Proposed Frances Creek Project Area, November 2005.* Preparfed for Territory Iron Pty. Ltd by Low Ecological Services (completed December 2005).
- **Ride W.L.D. (1970).** *A Guide to the Native Mammals of Australia.* Oxford University Press, Melbourne.
- **Slater P. (1970).** A Field Guide to Australian Birds: Passerines and Non-Passerines. Rigby Limited.
- **Strahan R. (1983).** *Complete Book of Australian Mammals.* The Australian Museum. Angus and Robertson Publishers.
- **Thomson, B., (1989).** *A Field Guide to Bats of the Northern Territory*. Government Printer of the Northern Territory.

- ***TPWC Act* (2000)** - Parks and Wildlife Commission Northern Territory (PWCNT) website: http://www.nt.gov.au/ipe/pwcnt
- **Wilson BA, Brocklehurst PS, Clark MJ, and Dickinson KJM. (1990).** *Vegetation Survey of the Northern Territory, Australia.* Technical Report No. 49. Conservation Commission of the Northern Territory, Darwin.
- **Woinarski, J.C.Z., Braithwaite, R.W., Menkhorst, K.A., Griffin, S., Fisher, A., and Preece, N. (1992).** Gradient analysis of the distribution of mammals in Stage III of Kakadu National Park, with a review of the distribution patterns of mammals across north-western Australia. *Wildlife Research* **19**:233-262.
- **Woinarski, J.C.Z., Gambold, N., Menkhorst, K. and Braithwaite, R.W. (1989).** *Wildlife of Kakadu National Park Stage III*. Unpublished report prepared by CSIRO Division of Wildlife and Ecology for Australian National Parks & Wildlife Service.
- **Woinarski J, and Milne D (Feb 2002).** Arnhem Sheathtail Bat *Taphozous kapalgensis*. *Threatened Species of the Northern Territory Fact Sheet*. Prepared for the Northern Territory Parks and Wildlife Commission.
- ***Woinarski, JCZ and Tidemann, S* (1992).** Survivorship and Some Population Parameters for the Endangered Gouldian Finch *Erythrura gouldiae* and Two Other Finch Species at Two Sites in Tropical Northern Australia. *EMU* 92(1) 33 - 38 Abstract. "A capture-recapture study of Gouldian Finch *Erythrura gouldiae*, Masked Finch *Poephila personata* and Long-tailed Finch *P. acuticauda* at two sites in the Northern Territory (extending over 22-24 months) showed a disappearance of banded Gouldian Finches from populatiop at both study sites. The lack of recaptures of banded Gouldian Finches is due either to much higher mortality or to greater rates of emigration, or to both, relative to Masked and Longtailed Finches. Some evidence is presented for each explanation but the data do not adequately discriminate the alternatives (or define the relative contributions of both)." Full text doi:10.1071/MU9920033

10 PLATES

10.1 Survey Sites – Comparisons between Nov 2005 and May 2006

Plate 1: Survey Site 1 – Tailing Swamp. A Functioning Wetland attractive to a wide range of birds including Magpie Geese, Great Egrets and Rainbow Bee-eaters.

Plate 2: Survey Site 2 - Helene Hills Habitat. Hooded Parrot holes were found in an old termite mound at this site. Calaby's Pebble Mound Mouse was also caught in a Pitfall trap.

Plate 3: Survey Site 3 - Jasmine Ridge. View of Elliott trap line location. The red line shows the Elliott trap line.

Plate 4: Survey Site 4 - Ochre Hill alluvial Flats

Plate 5: Survey Site 5 - Ochre Ridge.

Plate 6: Millers. Not surveyed during May 2006, hard to access due to boggy conditions.

Plate 7: Survey Site 8 – Frances Creek. Throw netting. Eight fish species were identified at this site.

10.2 Fauna

Plate 8: Ghost Bat (*Macroderma gigas*).
Photo Dennis Matthews

This species is classed as Near Threatened in the Northern Territory (*TPWC Act* 2000)

A population of approximately 40 ghost bats were found in a conveyor tunnel within the old mining area at Frances Creek. The photo of this specimen was taken by Dennis Matthews at Kakadu National Park. Information about this species is provided in the Conservation Value Section 7.3.

Plate 9: The conveyor tunnel where the Ghost Bats were found.
The tunnel contains larger nuts and overlapping joints in the iron for bats to roost from.

Plate 10: A Western Chestnut Mouse (*Pseudomys nanus*) caught by Elliott trapping at Site 2 (Tailings Swamp).

Plate 11: Two Partridge Pigeons (*Geophaps smithii smithii*) were observed foraging in the Low Undulating Hills along the Mt Porter track near the proposed haul road (E807374, N8490748).

Partridge Pigeons are listed as Vulnerable under the EPBC Act (1999).

Plate 12: A Greater Bower Bird Bower with entrances heavily decorated with snails. Bower birds are common in the valleys and hills.

	**Plate 13: Two small Crimson Finches perched on palm fronds of *Panadanas spiralis*.** This site (E808500, N8501290) was along an access road in a low lying alluvial flats that contained large sorghum grasses and Hyptis. Several species of Finch were observed at this site (Long-tailed, Crimson, Double-barred, Chestnut-breasted Mannikan, Pictorella) and there is a potential for this location to be appropriate Gouldian habitat.
	**Plate 14: Two inactive holes thought to be made by Hooded Parrots.** Hooded Parrots are rarely observed and are classed as Near Threatened in the Northern Territory.
	**Plate 15: Spangled Grunters (*Leipotherapon unicolor*) were common in most creeks and other water bodies in the Frances Creek Project area.**

Plate 16: Exquisite Rainbow Fish (*Melanotaenia expuista*) were commonly caught and observed during the aquatic fauna survey.
This specimen was caught using a scoop net at Site 8 (Frances Creek).

Plate 17: Sail-fin Glassfish (*Ambassis agrammus*) were abundant during the aquatic survey.
This specimen was caught using a scoop net at Site 8 (Frances Creek).

Plate 18: Two-spined Rainbow Skinks (*Carlia amax*) were commonly observed foraging in leaf litter amongst the *Eucalyptus* Woodlands.

Plate 19: Juvenile *Diporiphera albilabris* were relatively common within the rocky slopes and ridges with grass substrate.

	**Plate 20: Several juvenile Gilberts Water Dragons (*Amphibolurus gilberti*) were recorded near riparian zones within the Frances Creek area.** Two Gilberts Water Dragons were caught in Elliott Traps at Site 2 and Site 8.
	**Plate 21: *Ctenotus robustus* arecommon on low rocky slopes associated with sorghum grass understorey.** Two individuals were caught using Elliott traps during the survey in May 2006.
	**Plate 22: *Ctenotus spaldingi* was caught in a pitfall trap at Site 8 (Frances Creek).** These lizards are common in the region, especially in Eucalyptus Woodlands associated with riparian zones.

Plate 23: Dragonflies were abundant during the survey and ranged in colour from red, brown to blue but were dominated by ephemeral species.

10.3 Flora

Plate 24: *Melaleuca veridiflora* within Frances Creek (Survey Site 8).

Plate 25: A close-up shot of flowers from *Calytrix exstipulata*. *C. exstipulata* was in full bloom during the May 2006 survey.

Photo: Tom Reilly

	**Plate 26: *Gomphrena canescens* was common around the Frances Creek project area.**
	**Plate 27: Aquatic plants within Frances Creek.** The purple flowered Water Lily (*Nymphaea violacea*) was a common water lily in creeks and other water bodies in the local area. *Myriophyllum* sp. (aquatic plant in the foreground) was also common.
	**Plate 28: A close-up shot of the purple flower of *Nymphaea violacea*.**

Plate 29: Ringworm Scrub (*Senna alata*) is a large shrubby introduced species found in the tailing swamp area.

There are also some other individuals along creek lines to the south of the tailing area but distribution is restricted to wet land areas.

11 APPENDICES

11.1 Trap capture results from the fauna survey within the Frances Creek project area, November 2005

Survey Period: November 11th to 15th, 2005.

Legend: **Red** underlined digits represent Pitfall trap captures

Black digits represent Elliott trap captures

***** Introduced species,

Species Name	Common Name	Site 1		Site 2		Site 3	Site 4		Site 5		Site 6	Site 7	Site 8
		Tailings Swamp		Helene Slopes		Jasmine Ridge	Ochre Alluvial Flats		Ochre Ridge		Millers Flats	Millers Ridge	Frances Creek
		Nov-05	May-06	Nov-05	May-06	May-06	Nov-05	May-06	Nov-05	May-06	Nov-05	Nov-05	May-05
AMPHIBIANS													
Bufonidae													
*Bufo marinus**	Cane Toad	1	1	1				1		1			2
Hylidae													
Cyclorana longipes	Long-footed Frog	1		2									
Cyclorana sp. (juv.)		2											
Litorea rothii	Roths Tree Frog												1
REPTILES													
Scincidae (skinks)		1											
Carlia amax	Two-spined Rainbow Skink	1							1				
Carlia munda	Rainbow Skink												
Carlia sp.	Rainbow Skink												

Species Name	Common Name	Site 1		Site 2		Site 3	Site 4		Site 5		Site 6	Site 7	Site 8
		Tailings Swamp		Helene Slopes		Jasmine Ridge	Ochre Alluvial Flats		Ochre Ridge		Millers Flats	Millers Ridge	Frances Creek
		Nov-05	May-06	Nov-05	May-06	May-06	Nov-05	May-06	Nov-05	May-06	Nov-05	Nov-05	May-05
Ctenotus inornatus	Ctenotus								1				
Ctenotus robustus	Robust Ctenotus												1
Ctenotus spaldingi	Spaldings Ctenotus												1
Glaphyromorphus isolepis									1				
Menetia greyii				1							1		
Agamidae (dragons)													
Amphibolurus gilberti	Gilbert's Waterdragon		1										1
MAMMALS													
Dasyuridae													
Planigale maculata	Common Planigale	1							1				
Rodentia													
Rattus tunneyi	Pale Field Rat	4	2	6			2		1				
Zyzomys argurus	Common Rock-rat			1		13			3	4		2	
Psuedomys calabyi	Calaby's Pebble-mound Mouse				1								
Psuedomys nanus	Western Chestnut Mouse	1	1								3		
Total Captures		**12**	**5**	**11**	**1**	**13**	**2**	**1**	**8**	**5**	**4**	**2**	**6**

11.2 All mammals, reptiles, amphibians, fish and invertebrates identified from the Frances Creek survey, November 2005

Survey Periods: Survey 1: November 11th to 15th, 2005. Survey 2: May 17th to 21st, 2006.

General abundance during Survey: Scarce (S) , Uncommon (U), Common (C), Abundant (A), Present (P)

Land Unit: Animals identified were split into the land unit/habitat where they were identified

Observation Type: Fauna were identified on the field trip using Elliott traps (E), Pitfall traps (Pt), animal sign (S), incidental sightings (I), spotlighting (SP), ANABAT records (ANA), Fish netting (F).

Note: ANABAT Bat identifications only indicate presence of species and not abundance.

Bird identifications are listed in a separate appendix.

* Introduced species

Species Name		Common Name	Aust./N.T. Status	Land Unit														Incidental		Obs. type
				Ridges and Slopes		Low Hills		Riparian		Undulating Plains		Small Alluvial Flats		Granite Hills		Tailings Swamp				
				S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	
CLASS: AMPHIBIA																				
Salientia (frogs)																				
Hylidae (tree frogs)																				
	Cyclorana australis	Giant Frog																A	U	I, SP
	Cyclorana longipes	Long-footed Frog														C		A	U	E, I
	Litoria personata	Masked Frog																C		I
	Litoria rothii	Roths Tree Frog							C									C	U	I
	Litoria rubella	Red Tree Frog																C		I
Bufonidae (toads)																				
	*Bufo marinus**	Cane Toad	Pest		U	A	C	A	C	A		A	C			A	C	A	C	E, I
CLASS: REPTILIA																				
Crocodilia (crocodiles)																				
Crocodylidae																				
	Crocodylus johnstoni	Freshwater Crocodile																C		I

Species Name		Common Name	Aust./N.T. Status	Land Unit														Incidental		Obs. type
				Ridges and Slopes		Low Hills		Riparian		Undulating Plains		Small Alluvial Flats		Granite Hills		Tailings Swamp				
				S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	
Squamata sauria (lizards)																				
Gekkonidae (gecko's)																				
	Heteronotia binoei	Bynoe's Gecko				C												C	U	SP
Agamidae (dragons)																				
	Chlamydosaurus kingii	Frill-necked Dragon				U						C								I
	Ctenophorus caudicinctus	Ring-tailed Dragon																		I
	Diporiphera albilabris sobria	White-lipped Dragon		A	C		C													I
	Diporiphera sp.					C														I
	Amphibolurus gilberti	Gilbert's Waterdragon						C	C			C					C			I
Varanidae (monitors)																				
	Varanas mertensi	Merten's Water Monitor															U			I
	Varanas mitchelli	Mitchell's Water Monitor							U											I
Scincidae (skinks)																				
	Carlia amax	Two-spined Rainbow Skink		U		C	C		C			C	C							E, I
	Carlia munda	Rainbow Skink		A	C	C	C					U								E, I
	Ctenotus inornatus	Ctenotus		S																E
	Ctenotus robustus	Robust Ctenotus				S	S		C								S			I
	Ctenotus spaldingi						U		U											Pt
	Glaphyromorphus isolepis			C	U													U		E, I
	Menetia greyii											C				C				Pt

Species Name		Common Name	Aust./N.T. Status	Land Unit														Incidental		Obs. type
				Ridges and Slopes		Low Hills		Riparian		Undulating Plains		Small Alluvial Flats		Granite Hills		Tailings Swamp				
				S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	
	Morethia ruficauda	Fire-Tail Skink		U		U	U											U	U	I
Squamata serpentes (snakes)																				
Boidae (boas and pythons)																				
	Antaresia childreni	Childrens Python				S														SP
Colubridae (snakes)																				
	Dendrelaphis punctulata	Common Tree Snake					U													I
	Enhydris polylephis	Macleay's Water Snake				C		C												I
	Stegonotus cucullatus	Slatey-grey Snake					S													I
Elapidae (venomous snakes)																				
	Demansia olivacea	Marble-headed Whipsnake				S														I
CLASS: MAMMALIA																				
Dasyuromorphia (carnivorous marsupials)																				
Dasyuridae (dasyurids)																				
	Planigale maculata	Common Planigale										U				U				E
Peramelemorphia (bandicoots and bilbies)																				
Peramelidae (bandicoots)																				
	Isoodon macrourus	Bandicoot, Northern Brown				U				C										I, S
Diprotodontia (macropods)																				
Macropodaidea (kangaroos, wallabies)						U														
	Macropus agilis	Agile Wallaby				C	C			C										I

Species Name		Common Name	Aust./N.T. Status	Land Unit														Incidental		Obs. type
				Ridges and Slopes		Low Hills		Riparian		Undulating Plains		Small Alluvial Flats		Granite Hills		Tailings Swamp				
				S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	
	Macropus robustus	Euro			C								C	U						I
	Petrogale brachyotis	Rock Wallaby, Short-eared		S																S
Chiroptera (bats)																				
Pteropodidae																				
	Pteropus scapulatus	Little Red Flying Fox				P	P						P			P	P	P	P	ANA
Megadermatidae																				
	Macroderma gigas	Ghost Bat	Near Threatened																	I
Hipposideridae																				
	Rhinonicterus aurantius	Orange Horseshoe Bat	Near Threatened			P	P											P		ANA
Emballonuridae																				
	Saccolaimus flaviventris	Yellow Bellied Sheathtail Bat				P							P			P		P		ANA
	Taphozous georgianus	Common Sheathtail Bat				P	P						P			P	P	P		ANA
	Taphozous kapalgensis	White-striped Sheathtail Bat	Near Threatened				P									P				ANA
Molossidae																				
	Mormopterus beccarii	Beccarii's Mastiff Bat			P		P									P		P		ANA
	Chaerephon jobensis	Northern Mastiff Bat		P	P	P	P						P			P	P			ANA
Vespertilionidae																				
	Chalinobulus gouldii	Goulds Wattled Bat		P			P						P			P	P	P	P	ANA
	*Nyctophilus sp. **	Bat			P	P							P			P	P	P	P	ANA

Species Name		Common Name	Aust./N.T. Status	Land Unit														Incidental		Obs. type
				Ridges and Slopes		Low Hills		Riparian		Undulating Plains		Small Alluvial Flats		Granite Hills		Tailings Swamp				
				S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	
	Nyctophilus walkeri	Pigmy Long-eared Bat			P	P	P						P					P		ANA
	Vespadelus caurinus	Northern Cave Bat		P		P	P						P			P	P	P		ANA
	Scotorepens greyii / sanborni	Bat														P		P		ANA
	Species 1	Bat			P	P	P						P			P		P		ANA
	Species 2	Bat		P	P		P						P			P		P		ANA
Rodentia (rodents)																				
Muridae (rats and mice)																				
	Psuedomys calabyi	Calaby's Pebble-mound Mouse	Near Threatened		S															Pt
	Psuedomys nanus	Western Chestnut Mouse	Near Threatened						U			C				U				E
	Rattus tunneyi	Pale Field Rat	Near Threatened	U		A						C				C				E, SP
	Zyzomys argurus	Common Rock-rat		A		U														E
Carnivora (carnivorous eutherians)																				
Canidae (dogs and foxes)																				
	Canis familiaris	Dingo					U						U							I
Felidae																				
	Felis catus	Feral Cat	Pest			U												U		SP, S
Perissodactyla (odd-toed ungulates)																				
Equidae (horses)																				
	Equus asinus	Donkey	Pest							C			C				C			I
	Equus caballus	Feral Horse	Pest			C				C							C			I
Artiodactyla (even-toed ungulates)																				

Species Name		Common Name	Aust./N.T. Status	Land Unit														Incidental		Obs. type
				Ridges and Slopes		Low Hills		Riparian		Undulating Plains		Small Alluvial Flats		Granite Hills		Tailings Swamp				
				S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	
Suidae																				
	Sus scrofa	Feral Pig	Pest					C					C			C	C			S
CRUSTACEAN																				
Sundathelphusidae																				
	Holthuisiana transversa	Freshwater Crab							U											I
FISH																				
Ariidae																				
	Neosilurus hyrtllii	Black Catfish							S											I
Atherinidae																				
	Craterocephalus sp.	Hardyhead							C											I
Chandidae																				
	Ambassis agrammus	Sail-fin Glassfish							A											F
Megalopidae																				
	Nematalosa erebi	Bony Bream							U											I
Melanotaeniidae																				
	Melanotaenia exquisita	Exquisite Rainbow Fish							C											F
	Melanotaenia nigrans	Black-striped Rainbow Fish						A	A								A			F
Terapontidae																				
	Leipotherapon unicolor	Spangled Grunter						A	A									A	U	I
	Amniataba percoides	Barred Grunter							A											I

11.3 Bird species recorded within the Frances Creek project area during November 2005 and May 2006 surveys.

Survey Period: Survey 1: November 11th to 15th, 2005. Survey 2: May 17th to 21st, 2006.

species is listed in the *EPBC Act* (1999) or *TPWC Act* (2000)

* Introduced species

Common Name	Scientific Name	Site 1		Site 2		Site 3	Site 4		Site 5		Site 6	Site 7	Site 8	Haul Road	Incidentals	
		Tailings swamp		Helene Slopes		Jasmine Ridge	Ochre Flats		Ochre Ridge		Millers Flats	Millers Hills	Frances Creek			
		Nov 05	May 06	Nov 05	May 06	May 06	Nov 05	May 06	Nov 05	May 06	Nov 05	Nov 05	May 06	May 06	Nov 05	May 06
Babbler, Grey-crowned	*Pomatostomus temporalis*	1	6				1								1	8
Bee-eater, Rainbow	*Merops ornatus*	1	8	1	26	2				2				4		30
Bowerbird, Greater	*Chlamydera nuchalis*	1	4	3	1		1			2		1			4	6
Budgerigar	*Melopsittacus undulatus*						10								1	
Butcherbird, Grey	*Cracticus torquatus*						1								1	
Butcherbird, Pied	*Cracticus nigrogularis*													6	1	3
Cockatoo, Red-tailed Black	*Calyptorhynchus banksii*	1					2					2	4			
Cockatoo, Sulfur-crested	*Cacatua galerita*		3												5	
Corella, Little	*Cacatua sanguinea*		3		2											6
Cormorant, Little-black	*Phalacrocorax sulcirostris*	2														
Coucal, Pheasant	*Centropus phasianuinus*		2		2		1								1	6
Crow, Torresian	*Corvus orru*		3													8
Cuckoo Shrike, Black-faced	*Coracina novaehollandiae*		1					2		2			2			3
Cuckoo Shrike, Little	*Coracina papuensis*	1	4	1	3		1	1	1					2	1	4
Darter	*Anhinga melanogaster*	1														
Dollarbird	*Eurystomus orientalis*														2	
Dove, Bar-shouldered	*Geopelia humeralis*		3		3	2	1			6		2	1	7		7
Dove, Collared	*Streptopelia decaocto*															
Dove, Peacefull	*Geopelia striata*		7	1	2	5	2			5			6	10	1	21
Drongo, Spangled	*Dicrurus hottentottus*														2	
Duck, Burdekin	*Tadorna radjah*	4														

Common Name	Scientific Name	Site 1		Site 2		Site 3	Site 4		Site 5		Site 6	Site 7	Site 8	Haul Road	Incidentals	
		Tailings swamp		Helene Slopes		Jasmine Ridge	Ochre Flats		Ochre Ridge		Millers Flats	Millers Hills	Frances Creek			
		Nov 05	May 06	Nov 05	May 06	May 06	Nov 05	May 06	Nov 05	May 06	Nov 05	Nov 05	May 06	May 06	Nov 05	May 06
Eagle, Wedge-tailed	*Aquila audax*											1				2
Egret, Great	*Egretta sp.*	1	1													
Fairy Wren, Red-backed	*Malurus melanocephalus*		37		12					4			3	10		30
Fairy Wren, Varigated	*Malurus lamberti*			1											2	
Falcon, Brown	*Falco berigora*											1				2
Fantail, Grey	*Rhipidura fuliginosa*			1						3	1					5
Figbird	*Sphecotheres viridis*		3													
Finch, Crimson	*Neochmia phaeton*	1	9												1	8
Finch, Double-barred	*Poephila bichenovii*		6											6	1	6
Finch, Longtailed	*Poephila acuticauda*		14	1										4		6
Finch, Star	*Neochmia ruficauda*		3												1	1
Flycatcher, Leaded	*Myiagra rubecula*									1			1			
Friarbird, Helmeted	*Philemon buceroides*						1									
Friarbird, Silver-crowned	*Philemon argenticeps*	1					1					2			1	
Frogmouth, Tawny	*Podargus strigoides*														1	1
Galah	*Cacatua roseicapilla*		4		8	5	1					1	1		1	
Gerygone, White-throated	*Gerygone olivacea*					8				3						
Goose, Magpie	*Anseranas semipalmata*	1														
Grebe, Hoary-headed	*Poliocephalus poliocephalus*	2														
Heron, Pied	*Ardea picata*	1														
Heron, Rufous Night	*Nycticorax caledonicus*														1	
Heron, White-faced	*Ardea novaehollandiae*	1														
Heron, White-necked	*Ardea pacifica*															1
Honeyeater, Blue-faced	*Entomyzon cyanotis*		6													
Honeyeater, Brown	*Lichmera indistincta*		4	1						2		1		1		4
Honeyeater, Red-headed	*Myzomela erythrocephala*														1	
Honeyeater, White-gaped	*Lichenostomus unicolor*		13	3									5			2
Ibis, Glossy	*Plegadis falcinellus*	1														

Common Name	Scientific Name	Site 1		Site 2		Site 3	Site 4		Site 5		Site 6	Site 7	Site 8	Haul Road	Incidentals	
		Tailings swamp		Helene Slopes		Jasmine Ridge	Ochre Flats		Ochre Ridge		Millers Flats	Millers Hills	Frances Creek			
		Nov 05	May 06	Nov 05	May 06	May 06	Nov 05	May 06	Nov 05	May 06	Nov 05	Nov 05	May 06	May 06	Nov 05	May 06
Ibis, Sacred	*Threskiornis aethiopica*	1														
Ibis, Straw-necked	*Threskiornis spinicollis*	1														
Kingfisher, Sacred	*Todiramphus sanctus*	1					1									
Kookaburra, Blue-winged	*Dacelo leachii*			1			1	1	1	1		1		3	1	6
Lapwing, Masked	*Vanellus miles*	1	2													1
Lorikeet, Rainbow	*Trichoglossus haematodus*	1					1								1	
Lorikeet, Varied	*Psitteuteles versicolor*	1		1	6										10	
LotusBird (or Comb-crested Jacana)	*Irediparra gallinacea*	4	2													
Magpie Lark, Australian	*Grallina cyanoleuca*	1	6				1							2	1	8
Mannikin, Chestnut-crested	*Lonchura castaneothorax*												3			6
Mannikin, Pictorella	*Heteromunia pectoralis*															2
Miner, Yellow-throated	*Manorina flavigula*		8				1							4		
Oriole, Yellow	*Oriolus flavocinctus*			1												
Owl, Southern boo-book	*Ninox novaeseelandiae*														1	1
Parrot, Red-winged	*Aprosmictus erythropterus*	1	3	1	5										2	11
Pigeon, Partridge	*Geophaps smithii*													2		
Pigeon, Torresian Imperial	*Ducula spilorrhoa*						2								1	
Quail, Brown	*Coturnix ypsilophora*									4						2
Robin, Hooded	*Melanodryas cucullata*															1
Rosella, Northern	*Platycercus venustus*	1														
Shrike-thrush, Grey	*Colluricincla harmonica*									2		1				
Sparrow-hawk, Collared	*Accipiter cirrhocephalus*		2			1					1	1			3	3
Spoonbill, Royal	*Platalea regia*	1														
Stilt, Pied	*Himantopus himantopus*	2														
Thicknee, Bush	*Burhinus magnirostris*	1	2		1											5
Treecreeper, black-tailed	*Climacteris melanura*						1									
Wagtail, Willy	*Rhipidura leucophrys*	1	3	2				1		2		1	1		2	4

Common Name	Scientific Name	Site 1		Site 2		Site 3	Site 4		Site 5		Site 6	Site 7	Site 8	Haul Road	Incidentals	
		Tailings swamp		Helene Slopes		Jasmine Ridge	Ochre Flats		Ochre Ridge		Millers Flats	Millers Hills	Frances Creek			
		Nov 05	May 06	Nov 05	May 06	May 06	Nov 05	May 06	Nov 05	May 06	Nov 05	Nov 05	May 06	May 06	Nov 05	May 06
Wedgebill, Chiming	*Psophodes occidentalis*						1									
Whistler, Rufous	*Pachycephala rufiventris*	1	4	7		12	1	5	2	16			11	5	2	11
Woodswallow, Black-faced	*Artamus cinereus*						2									
Woodswallow, Little	*Artamus minor*	1				2							3	6		7
Woodswallow, Masked	*Artamus personatus*														1	
Woodswallow, White-breasted	*Artamus leucorhynchus*	1														
Woodswallow, White-browed	*Artamus superciliosus*		3													

11.4 Vegetation Records from the Frances Creek flora survey, and other nearby flora surveys

Legend: The digit '1' indicates a species is present at the site.

References: Wheeler *et al.* 1992; Brock 1988; Strong 1987; Petheram and Kok 1983.

[10]Flora species recorded during the Mt Porter Survey (Low Ecological Services, 2005)

[11]Flora species recorded during the Mt Porter Survey (ERA environmental, 1993)

NOTE: List is Incomplete - Waiting on IDs from Darwin herbarium

Species Name	Common Name	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	Site 7	Site 8	Haul Rd	Incidental recordings
		Tailings swamp		Helene Slopes		Jasmine Ridge		Ochre Alluvial flats		Ochre Ridge		Millers Alluvial Flats	Millers Low Ridge	Frances Creek		
		S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S1	S1	S2	S1 & S2
GRASSES & SEDGES																
Adiantaceae																
Cheilanthes sp.	Fern															
Cyperaceae																
Cyperus digitatus	Sedge	√	√				√									
Fimbristylis dichotoma	Sedge	√	√													
Fimbristylis cinnamonetonum	Sedge		√	√	√											
Scleria sphacelata	Sedge		√													
Poaceae																
Aristida holothera	Erect Keronsene Grass					√				√						√
Arundinella nepalensis	Reed Grass		√							√						
*Chloris virgata**	Feathertop Rhodes Grass		√								√				√	
Chrysopogon fallax	Goldern Beardgrass				√					√	√					√
Cymbopogon bombycinus	Silky Oilgrass		√	√	√						√				√	√
Cynodon dactylon	Couch Grass		√													
Eragrostis speciosa	Handsome Lovegrass		√													

Species Name	Common Name	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	Site 7	Site 8	Haul Rd	Incidental recordings
		Tailings swamp		Helene Slopes		Jasmine Ridge		Ochre Alluvial flats		Ochre Ridge		Millers Alluvial Flats	Millers Low Ridge	Frances Creek		
		S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S1	S1	S2	S1 & S2
Eragrostis sp.																
Eriachne armitii	Longawn Wanderrie															
Eulalia mackinlayi			√												√	√
Heteropogon contortus	Bunch Speargrass				√				√						√	√
Heteropogon triticeus	Giant Speargrass															√
Panicum sp.			√		√		√				√			√	√	
Paspalum scrobiculatum		√														
*Pennisetum pedicellatum**	Mission Grass	√	√													√
Schizachyrium fragile	Small Redleaf														√	
Sorghum plumosum	Plume Grass Sorghum	√	√			√		√	√			√	√	√	√	√
Sorghum intrans	Annual Sorghum	√			√		√			√	√	√	√		√	√
Themeda triandra	Kangaroo Grass					√						√	√		√	√
HERBS, FORBS, VINES, FERNS & EPIPHYTES																
Acanthaceae																
Rostellularia adscendens																
Amaranthaceae																
Gomphrena canescens											√				√	
Apocynaceae																
Parsonia velutina													√			
Aizoaceae																
*Mimosa pudica**	Common Sensitive Plant											√				√
Asteracea																
Pterocaulon serrulatum			√		√		√								√	
Pterocaulon sp.															√	
Cartonemataceae																
Cartonema parviflorum					√											
Caryophyllaceae																
Polycarpaea longiflora																
Convolvulaceae																

Species Name	Common Name	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	Site 7	Site 8	Haul Rd	Incidental recordings
		Tailings swamp		Helene Slopes		Jasmine Ridge		Ochre Alluvial flats		Ochre Ridge		Millers Alluvial Flats	Millers Low Ridge	Frances Creek		
		S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S1	S1	S2	S1 & S2
Evolvulus numularis		√														
Merremia quinata																
Cucurbitaceae																
Mukia sp.	Milk Vine						√							√	√	
Dilleniaceae																
Pachynema complanatum				√												
Pachynema dilatatum					√		√									
Euphorbiaceae																
Euphorbia heterophylla	Painted Spurge															
Euphorbia hirta		√	√													
Euphorbia vachellii												√				√
Euphorbia wheeleri	Wheeler's Spurge															
Goodeniaceae																
Goodenia sp.			√		√										√	
Halagoraceae																
Myriophyllum sp.	Water weed		√											√		
Lythraceae																
Rotala sp.																
Menyanthaceae																
Nymphoides indica	Water Lily	√	√													
Nymphoides violacea	Water Lily		√											√		
Orchidaceae																
Cymbidium canaliculatum															√	√
Papilionaceae																
*Calopogonium mucunoides**	Calopo	√	√													
Cajanus acutifolius										√						
*Crotalaria goreensis**	Gambia Pea															
Crotalaria medicaginea	Trefoil Rattlepod		√						√						√	
Crotalaria montana																

Species Name	Common Name	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	Site 7	Site 8	Haul Rd	Incidental recordings
		Tailings swamp		Helene Slopes		Jasmine Ridge		Ochre Alluvial flats		Ochre Ridge		Millers Alluvial Flats	Millers Low Ridge	Frances Creek		
		S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S1	S1	S2	S1 & S2
Glycine tomentosa				√	√	√				√						√
Indigofera saxicola				√	√											
Tephrosia polyzyga				√	√				√							
Tephrosia sp.										√						
Passifloraceae																
Passiflora foetida	Stinking Passion Vine	√	√					√	√						√	√
Polygalaceae																
Polygala sp.																
Scrophulariaceae																
Buchnera linearis																
Smilacaeae																
Smilax australis	Austral Smilax															
Spermacoce																
Spermacoce leptoloba																
Spermacoce occultisefa																
Sterculiaceae																
Helicteres sp.				√		√										
Stylidiaceae																
Stylidium sp.																
Thymelaeaceae																
Thecanthes punicea																
Tinospora																
Tinospora smilacina	Snake Vine															
Typhaceae																
Typha sp.	Bull Rush Reed		√													
Vitaceae																
Cayratia trifolia													√			
Ampelocissus acetosa	Wild Grape															
TREES & SHRUBS																

Species Name	Common Name	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	Site 7	Site 8	Haul Rd	Incidental recordings
		Tailings swamp		Helene Slopes		Jasmine Ridge		Ochre Alluvial flats		Ochre Ridge		Millers Alluvial Flats	Millers Low Ridge	Frances Creek		
		S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S1	S1	S2	S1 & S2
Anacardiaceae																
Buchanania obovata	Wild Mango															
Apocynaceae																
Alstonia actinophylla	Milkwood	√														
Alyxia tropica										√						
Wrightia saligna	Milk Bush															
Araliaceae																
Schefflera actinophylla	Umbrella Tree											√				√
Arecaceae																
Livistona humilis	Sand Palm	√	√	√	√	√	√			√	√	√	√	√	√	√
Bignoniaceae																
Dolichandrone filiformis																
Bixaceae																
Cochlospermum fraseri	Yellow Kapok			√	√			√	√	√				√	√	√
Combretaceae																
Terminalia ferdinandiana		√		√		√									√	√
Caesalpiniaceae																
Erythrophleum chlorostachys	Ironwood			√	√	√		√	√			√	√	√	√	√
Senna alata		√	√													
Cupressaceae																
Callitris intratropica	Northern Cypress Pine					√										√
Cycadaceae																
Cycas armstrongii	Cycad															√
Euphorbiaceae																
Antidesma glaesembilla													√			
Antidesma parvifolium										√						
Croton arnhemicus										√						
Flueggea virosa			√													
Petalostigma pubescens	Downy Cracker Bush						√								√	

Species Name	Common Name	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	Site 7	Site 8	Haul Rd	Incidental recordings
		Tailings swamp		Helene Slopes		Jasmine Ridge		Ochre Alluvial flats		Ochre Ridge		Millers Alluvial Flats	Millers Low Ridge	Frances Creek		
		S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S1	S1	S2	S1 & S2
Petalostigma quadriloculare	Quinine Bush			√			√			√	√		√	√	√	√
Fabaceae																
Erythrina variegata	Batswing Coral Tree															
Lamiaceae																
Hyptis suaveolens	Hyptis	√	√					√				√			√	√
Lauraceae																
Litsea glutinosa																
Lecythidaceae																
Planchonia careya								√					√			
Malvaceae																
Abelmoschus moschatrus																
Meliaceae																
Owenia vernicosa	Emu Apple					√	√			√	√	√	√			√
Mimosaceae																
Acacia aulacocarpa	Hickory Wattle															
Acacia auriculiformis	Earpod Watle	√	√												√	
Acacia bidwillii	Corkwood Wattle													√	√	√
Acacia cowleana	Hall's Creek Wattle															
Acacia difficilis																
Acacia dimidiata	Swamp Wattle		√													
Acacia hemignosta									√						√	
Acacia holosericea	Candelabra Wattle								√	√		√			√	√
Acacia lamprocarpa										√						
Acacia leptocarpa																
Acacia oncinocarpa																
Acacia pachyphloia																
Acacia pachyphylla																
Acacia platycarpa	Ghost Wattle															
Acacia torulosa	Torulosa Wattle															

Species Name	Common Name	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	Site 7	Site 8	Haul Rd	Incidental recordings
		Tailings swamp		Helene Slopes		Jasmine Ridge		Ochre Alluvial flats		Ochre Ridge		Millers Alluvial Flats	Millers Low Ridge	Frances Creek		
		S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S1	S1	S2	S1 & S2
Acacia umbellata						√	√									
Moraceae																
Ficus acubata													√			
Ficus opposita	Sandpaper Fig	√	√				√									√
Ficus platypoda	Native Fig							√	√							
Ficus racemosa														√		
Ficus scobina																
Ficus virens	Banyan															√
Myrtaceae																
Calytrix achaeta			√													
Calytrix existipulata	Kimberly Heather	√	√			√									√	√
Corymbia aparrerinja	Northern Ghost Gum								√							
Corymbia dichromophloia	Variable Barked Bloodwood	√	√	√	√	√	√			√	√			√	√	√
Corymbia disjuncta								√								
Corymbia latifolia	Round-leafed Bloodwood														√	
Corymbia polysciada																
Corymbia polycarpa	Long-fruited Bloodwood							√	√							
Eucalyptus alba								√	√					√		√
Eucalyptus bigalerita	Northern Salmon Gum															
Eucalyptus brachyandra							√									
Eucalyptus clavigera	Apple Gum															
Eucalyptus grandifloris									√					√	√	
Eucalyptus kombolgiensis							√							√	√	
Eucalyptus miniata	Darwin Woollybutt						√	√		√	√	√			√	√
Eucalyptus phoenicea	Scarlet Gum															
Eucalyptus setosa	Rough-leafed Bloodwood							√	√						√	√
Eucalyptus tectifica	Darwin Box											√			√	
Eucalyptus tetrodonta	Darwin Stringybark	√	√	√	√	√	√								√	√
Eucalyptus tintinnans	Salmon Gum									√	√				√	√

Species Name	Common Name	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	Site 7	Site 8	Haul Rd	Incidental recordings
		Tailings swamp		Helene Slopes		Jasmine Ridge		Ochre Alluvial flats		Ochre Ridge		Millers Alluvial Flats	Millers Low Ridge	Frances Creek		
		S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S1	S1	S2	S1 & S2
Lophostemon grandiflorus	Northern Swamp Box		√											√	√	√
Melaleuca dealbata (?)	Blue-leafed Paperbark															√
Melaleuca viridiflora														√		√
Xanthostemon paradoxus	Bridal Tree			√												√
Olacaceae																
Olax perdulina													√			
Onagraceae																
Ludwigia octovalvis	Willow Primrose	√			√										√	
Pandanaceae																
Panadanus spiralis	Screw Palm														√	√
Pittosporaceae																
Pittosporum melanospermum	Goldern Pittosporum															
Proteaceae																
Grevillea decurrens		√	√			√	√		√		√		√			√
Grevillea dimidiata																
Grevillea mimosoides			√						√	√		√	√			√
Grevillea pteridifolia	Fern-leaved Grevillea														√	
Hakea arborescences																
Rhamnaceae																
Alphitonia excelsa	Red Ash							√								
Rhizophoraceae																
Carallia brachiata	Carallia Wood															
Rubiaceae																
Gardenia megasperma					√	√	√			√				√	√	√
Ixora sp.																
Sapindaceae																
Allophylus cobbe													√			
Sapotaceae																
Pouteria sericea													√			

Species Name	Common Name	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	Site 7	Site 8	Haul Rd	Incidental recordings
		Tailings swamp		Helene Slopes		Jasmine Ridge		Ochre Alluvial flats		Ochre Ridge		Millers Alluvial Flats	Millers Low Ridge	Frances Creek		
		S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S1	S1	S2	S1 & S2
Santalaceae																
Exocarpos latifolius	Native Cherry									√						
Solonaceae																
Solanum echinatum	Wild Tomato	√					√								√	
Sterculiaceae																
Brachychiton paradoxum	Red-flowered Kurrajong			√	√		√		√					√	√	√
Brachychiton diversifolius	Kurrajong							√	√			√	√		√	√
Sterculia quadrifida	Peanut Tree															
Tiliaceae																
Grewia retusifolia	Emu Berries															
Verbenaceae																
Vitex glabrata										√						

11.5 Mammals presently or potentially inhabiting the Frances Creek project area.

This table includes species recorded during the environmental surveys of the proposed Frances Creek project area (marked in **bold** text) and species recorded from other nearby environmental surveys.

Survey Legend:

[1]Brocks Creek (Source: Brocks Creek EIS, Eldridge and Low 1994)

[2]Unions Reef (Source: Unions Reef DEIS, NSR 1993)

[3]Cosmo Howley (Source: Cosmo Howley Project Flora and Fauna Survey; Davison 1985)

[4]Kakadu National Park Stage III Wildlife Survey (Source: Woinarski *et al.* 1989)

[5]Pine Creek (Source: Union Reefs DEIS, NSR 1993)

[6]Mt Todd (Source: Union Reefs DEIS, NSR 1993)

[7]Woodcutters (Source: Unions Reefs DEIS, NSR 1993)

[8]PAWCNT (Source: Biological Records bound by $131^{o}30^{E}$ – $132^{o}00^{W}$ and $13^{o}30^{N}$ – $13^{o}55^{S}$)

[9]Spring Hill (Source: Spring Hill EIS, Grattidge and Low 1995)

[10]Mt Porter (Source: Reilly *et al*. April 2005)

[11]Frances Creek (Source: Reilly *et al.* November 2005)

[12]Frances Creek (this report Reilly *et al.* May 2006)

GROUP	SCIENTIFIC NAME	COMMON NAME	STATUS	RANGE	PREFERRED HABITAT
Prototheria					
Tachyglossidae	*Tachyglossus aculeatus* [2, 4, 9]	Short-beaked Echidna	Common	Australia wide	Lowlands and drainage depressions
Marsupialia					
Dasyuridae	*Antechinus bellus* [4]	Fawn Antichinus	Common, limited disturbution	Far Northern Territory	Woodlands and open forests

GROUP	SCIENTIFIC NAME	COMMON NAME	STATUS	RANGE	PREFERRED HABITAT
	Dasyurus hallucatus [2,3,4,8,9]	Northern Quoll	Vulnerable*	Northern Aust.	generalist
	Parantechinus bilarni [4]	Sandstone Antechinus	Restricted distribution	Western Arnhemland	
	Phascogale tapoatafa [4]	Brush-tailed Phascogale	Vulnerable* distribution limited	Coastal Aust	Arboreal, prefers rocky ridges and hills
	Planigale maculata [4,5,8,11,12]	**Common Planigale**	**Common**	**Far North and east coastal Australia**	**Various habitat types**
	Sminthopsis sp. [4,6]	Kakadu Dunnart	Unknown range	Western Arnhemland	Woodland on stony hills
	Sminthopsis virginae [2,4,10]	Red-cheeked Dunnart	Common in limited range	Far Northern Australia	Woodland habitats
Peramelomorphia	***Isoodon macrourus*** [1,2,4,8,9,11,12]	**Northern Brown Bandicoot**	**Common to abundant**	**Northern and east coastal Australia**	**Generalist, anywhere where ground cover is lows**
Phalangeroidea	*Petaurus breviceps* [4,6,10]	Sugar Glider	Common	North and south east Australia	Woodland habitats
	Pseudocheirus dahli [4]	Rock Ringtail Possum	Common but limited distribution	North NT and WA	*Eucalyptus miniat*a woodland around rocky outcrops
	Trichosurus arnhemensis [4,5]	Northern Brushtail Possum	Common over a limited range	Far northern Australia	In frequently burnt Eucalypt woodland (*E. miniata*).
Macropodaidae	*Macropus agilis* [1,2,4,5,6,8,9,11]	Agile Wallaby	Abundant	Tropical Coastal Australia	Lowlands and drainage depressions
	Macropus antilopinus [3,4,5,6,12]	**Antilopine Wallaroo**	**Common**	**Far Northern Australia**	**Eucalypt woodlands with a perennial grass understorey**

GROUP	SCIENTIFIC NAME	COMMON NAME	STATUS	RANGE	PREFERRED HABITAT
	Macropus robustus [2,4,5,6,9,11,12]	**Euro**	**Abundant**	**Australia wide**	**Rocky hills and escarpments**
	Onychogalea unguifera [4]	Northern Nailtail Wallaby	Near Threatened*	Northern Australia	Open long-grass woodland and riverine areas
	Peradorcas concinna [4]	Nabarlek, Little Rock-wallaby	Rare, limited	Far north NT and WA	Rocky slopes
	Petrogale brachyotis [4,5,10]	Shorteared Rock Wallaby	Abundant, but locally rare	Far North-west Austalia	Low rocky hills and savannah grassland
Eutheria					
Molossidae (bats)	***Mormopterus beccarii*** [4,8,10,11,12]	**Beccari's Mastiff-bat**	**Common, widespread**	**North-east Australia**	**Closed forest to woodland**
	Mormopterus loriae[10]				
	Chaerophon jobensis [4, 10,11,12]	**Northern Mastiff Bat**	**Common**	**Northern Tropical Aust.**	**Open forest, roosts in hollow trees**
Emballonuridae (bats)	***Saccolaimus flaviventris***[10,11,12]				
	Taphozous georgianus [1,3,4,10,11,12]	**Common Sheathtail-bat**	**Common**	**Tropical and subtropical Australia**	**Required deep caves and small fissures in rocks**
	Taphozous flaviventris [4]	Yellow-bellied Sheathtail bat	Widespread and common	North to south-eastern Aust.	Tree hollows, Mallee or Open woodland
	Taphozous kapalgensis[10,11,12]	**Arnhem Sheathtail bat**	**Near Threatened***		
	Taphozous saccolaimus [4]	Naked-rumped Sheathtail bat	Rare, scattered	Far North Qld	Dry woodland to dense rainforest
Megadermatidae (bats)	***Macroderma gigas*** [1, 4,8,12]	**Ghost Bat**	**Rare**	**Patchy distribution in**	**Caves and disused mine shafts, tunnels**

GROUP	SCIENTIFIC NAME	COMMON NAME	STATUS	RANGE	PREFERRED HABITAT
				tropical and arid Australia	
Vespertilionidae (bats)	***Chalinolobus gouldii*** **[1,4,10,11,12]**	**Gould's Wattled Bat**	**Widespread and common**	**Aust. wide**	**Open forests and riverine areas**
	Chalinolobus nigrogriseus [4]	Hoary Bat	Relatively common	Northern Aust.	Wide range of habitats
	Eptescicus causrinus [1,4]	Northern Brown Bat	Common	Far north Aust.	Various habitats
	Eptescicus finlaysoni [4]	Little Cave Eptescicus	Abundant	WA, NT and coastal Qld	Wide range of habitats
	Miniopterus schreibersii [4,10]	Common Bent-wing Bat	Abundant	Coastal Australia	Caves and disused mine adits
	Myotis macropus[10]				
	Nyctophilus arnhemensis [4]	Arnhem Land Long-eared Bat	Common	Northern Australia	Open forests and river fringes
	Nyctophilus bifax [4]	North Queensland Long-eared Bat	Common	Northern Australia	Rainforest, dry sclerophyll woodland and riverine vege.
	Nyctophilis geoffroyi [1,4]	Lesser Long-eared Bat	Widespread and common	Northern Tropical Australia	Woodland and riverine areas
	Nyctophilis walkeri[10,12]				
	Nyctophillis sp.[10,11,12]				
	Pipistrellus adamsi[10]				
	Scotorepens balstoni [8]	Western Broad-nosed bat	Common	Most of Australia	Riverine areas with tree hollows and open water
	****Scotorepens greyii*** **[4,8,10,11,12]**	**Little Broad-nosed Bat**	**Common**	**Most of Australia**	**Open woodland and forested areas**
	****Scotorepens sanborni***[10,11,12]				
	Vespadelus caurinus[11,12]				
	Vespadelus pumilus [8]	Eastern Forest bat			

GROUP	SCIENTIFIC NAME	COMMON NAME	STATUS	RANGE	PREFERRED HABITAT
	Species 1[10,11,12]				
	Species 2[10,11,12]				
Hipposideridae (bats)	*Hipposideros ater* [4,8]	Dusky Horseshoe bat	Locally common		Caves and disused mine shafts
	Hipposideros diadema [4]	Diadem Horseshoe bat	Limited, sparse to common	Far north NT and Qld	Warm humid climate, roosts in forests
	Hipposideros stenotus [4]	Lesser Wart-nosed Horseshoe-bat	Near Threatened*	Far northern Australia	Caves, disused mine shafts and rock crevices
	Rhinonicterus aurantius [4,9,10,11,12]	**Orange Horseshoe-bat**	**Near Threatened***	**Far Northern Australia**	**Requires warm humid caves near open Eucalypt woodland**
Pteropodidae (bats)	*Pteropus alecto* [7,8]	Black Flying Fox	Common	Coastal Australia	Mangrove forests or similarly dense vegetation
	Pteropus scapulatus [4,11,12]	**Little Red Flying Fox**	**Widespread and common**	**Coastal Australia**	**Eucalypt woodland and forest**
	Macroglossus minimus [4]	Northern Blossom Bat	Common, limited	Far Northern Australia	Woodland, especially *Melaleuca* woodland
Rodentia (mice and rats)	*Leggadina foresti* [4,5,6]	Forrest's Mouse	Sparse	Arid to Semi Aird Central Australia and Kimberly	Tussock grasslands and low shrublands
	Mesembrionys gouldii [4,5,6]	Black-footed tree Rat	Common in Arnhemland, rare elsewhere	Far North Qld	Monsoonal woodland and open forest with grass understory
	Mus musculus [5]	House Mouse	Abundant	Australia wide	Generalist
	Pseudomys nanus [3,4,5,6,12]	**Western Chestnut Mouse**	**Near Threatened***	**Northern Australia**	**Variety of habitat, with dense tussock grasses**
	Pseudomys deliculatus	Delicate Mouse	Sparsely scattered, seasonal	Northern Australia	Patchy distribution in sclerophyll forest and woodland

GROUP	SCIENTIFIC NAME	COMMON NAME	STATUS	RANGE	PREFERRED HABITAT
			fluctuations		
	Pseudomys sp. [4,12]	**Calaby's Mouse**	**Rare**	**Western Arnhemland**	**Open forest with stony substrate.**
	Rattus colletti [4,8]	Dusky Rat	Common	Northern NT	Grassy alluvial floodplains
	Rattus tunneyi [1,4,6,12]	**Pale Field-rat**	**Near Threatened***	**North-west and eastern Australia**	**Tall grassland, typically associated with a watercourse**
	Zyzomys argurus [1,2,4,6,8,9,12]	**Common Rock Rat**	**Common**	**Northern and Western Aust.**	**Rocky outcrops and sandstone formations**
	Zyzomys woodwardi [4]	Large Rock Rat	Rare, scattered	Far Northern Territory and Kimberly	Rugged rocky habitat, Eucalypt woodland with thick leaf litter and little understorey
Carnivora	***Canis familiaris*** [1,2,3,4,5,6,7,8,9,12]	**Dingo**	**Common**	**Australia wide**	**Various**
Felidae	***Felis Catus*** [1,2,3,4,5,6,7]	**Feral Cat**	**Common**	**Australia wide**	**Various**
Bovidae	*Bos Taurus* [4,8]	Feral Cattle	Common	Australia wide	Various
	Bubalus bubalis [1,3,4,5,6,8]	Water Buffalo	Common	Far Northern Australia	Lowlands, depressions and creeklines
Perissodactyla	***Equus asinus*** [2,3,4,5,6,12]	**Ferak Donkey**	**Abundant**	**Most of Aust.**	**Various**
Equidae	***Equus caballus*** [1,4,5,6,12]	**Feral Horse**	**Common**	**Most of Aust.**	**Various**
Suidae	***Sus scrofa*** [1,2,4,5,6,12]	**Feral Pig**	**Rare**	**North and east Australia**	**Lowlands, depressions and creeklines**

11.6 Reptiles presently or potentially inhabiting the Frances Creek project area.

This table includes species recorded during the environmental survey of the proposed Frances Creek project area (marked in **bold** text) and species recorded from other nearby environmental surveys.

Survey Legend:

[1]Brocks Creek (Source: Brocks Creek EIS, Eldridge and Low 1994)

[2]Unions Reef (Source: Unions Reef DEIS, NSR 1993)

[3]Cosmo Howley (Source: Cosmo Howley Project Flora and Fauna Survey; Davison 1985)

[4]Kakadu National Park Stage III Wildlife Survey (Source: Woinarski *et al.* 1989)

[5]Pine Creek (Source: Union Reefs DEIS, NSR 1993)

[6]Mt Todd (Source: Union Reefs DEIS, NSR 1993)

[7]Woodcutters (Source: Unions Reefs DEIS, NSR 1993)

[8]PAWCNT (Source: Biological Records bound by $131^{o}30^{E}$ – $132^{o}00^{W}$ and $13^{o}30^{N}$ – $13^{o}55^{S}$)

[9]Spring Hill (Source: Spring Hill EIS, Grattidge and Low 1995)

[10]Mt Porter (Source: Reilly *et al.* 2005)

[11]Frances Creek (Source: Reilly *et al.* November 2005)

[12]Frances Creek (this report Reilly *et al.* May 2006)

FAMILY	SPECIES NAME	COMMON NAME	STATUS Aust/NT*	RANGE	PREFERRED HABITAT
Agamidae	***Amphibolurus gilberti*** ***[1,2,3,6,8,9,10,11,12]***	**Gilbert's Waterdragon**	**Common**	**Widely distributed**	**Arboreal species, savanna woodland and stream and swamp edges**
	Amphibolurus temporalis [5,6,7]			Northern Australia	
	Chelosania brunnea [4,6]	Chameleon Dragon	Near Threatened*	Far Northern Qld	Savanna woodland

FAMILY	SPECIES NAME	COMMON NAME	STATUS Aust/NT*	RANGE	PREFERRED HABITAT
	Chlamydosaurus kingii [2,4,5,6,7,9,10,11]	**Frill-necked Dragon**	**Common**	**Northern and Eastern Australia**	**Dry Sclerophyll forests and woodlands**
	Ctenophorus caudicinctus [2,4,5,6,7,9,11]	**Ring-tailed Dragon**	**Common**	**Central and Western Australia**	**Open, rocky slopes and ridges**
	Diporiphera albilabris [6,7,11,12]			**Scattered over Northern N.T. and W.A.**	**Stony hills and escarpments with grass substrate**
	Diporiphora bennettii [1,3]			Northwestern Aust.	Tropical woodlands associated with ridges
	Diporiphora bilineata [3,4,5,11]	**Two-lined dragon**		**Northeastern Australia**	**Terrestrial generalist**
	Diporiphora magna [4]			Northern WA and NT	Eucalypt forest and mixed woodland
Acrochordus	*Acrochordus arafurea*[4]	Arafura File Snake	Common	Coastal north Aust.	Permanent Freshwater
Boidae	*Aspidites melanocephalus* [4,6]	Black-headed Python		Northern Australia	Seasonally dry tropical woodlands
	Dendrelaphis punctulata [9,12]	**Common Tree Snake**		**Coastal NW to SE Aust.**	
	Antaresia childreni [2,4,5,6,11]	**Stimsons Python**	**Common**	**Central and Northern Australia**	**Outcrops, escarpments and woodlands**
	Antaresia fuscus [5]	Water Python		Northern Aust	Margines of waterways
	Antaresia olivaceus [5,6,8]	Olive Python		Northern Aust	Rocky hills and ranges
	Morelia oenpelliensis [4]	Oenpelli Python	Vulnerable*	Western Arnhemland	Seasonally dry tropical woodlands
	Morelia spilota [6]	Carpet Python		Continental Aust. except arid areas	

FAMILY	SPECIES NAME	COMMON NAME	STATUS Aust/NT*	RANGE	PREFERRED HABITAT
Chelidae	*Chelodina rugosa* [7,8]	Northern Snake-necked Turtle		Northern Aust	Swamps, billabongs and waterholes
Colubridae	*Boiga irregularis* [2,4,5,6]	Brown Tree Snake		Northern and Eastern Australia	Generalist
	Enhydris polylephis [10,11]	**Macleay's Water Snake**	**Common**	**Northern Australia**	**Freshwater lagoons, swamps and creeks**
	Stegonotus cucullatus [4,5,12]	**Slaty-grey Snake**		**Northern and Eastern Australia**	
	Styporhynchus mairii [4]	Keel Back Snake	Common		
	Tropidonophis mairii [5,6,7]	Freshwater Snake		Northern and Eastern Australia	Semi-aquatic, found near creeks or swamps
Crocodylidae	***Crocodylus johnstoni*** [11]	**Freshwater Crocodile**	**Common**	**Northern Australia**	**Freshwater rivers and billabongs**
Elapidae	*Acanthopis praelongus* [4,6]	Northern Death Adder	Near Threatened*	Northern Australia	Generalist
	Demansia atra [4,5,7,8]	Black Whip Snake		Northern and Eastern Australia	Drier Woodlands
	Demansia olivacea [4,11]	**Olive Whipsnake**		**NW Australia**	**Savanna woodland**
	Demansia papuensis [4]	Whipsnake		Far northern and eastern Australia	
	Denisonia punctata [4]	Little Spotted Snake		Inland and western parts of north Aust	Nocturnal
	Furina ornata [2,4,5,6,8]	Orange-naped Snake		NW and Central Aust	Savanna woodlands and river flood plains

FAMILY	SPECIES NAME	COMMON NAME	STATUS Aust/NT*	RANGE	PREFERRED HABITAT
	Oxyuranus scutellatus [1,4]	Tiapan		Northern and Eastern Australia	Open savanna woodland
	Pseudechis australis [1,4,5,6,7,8,9,10]	Mulga, King Brown Snake		Aust wide	Generalist
	Pseudonaja nuchalis [4,5,6,7,8,9,10]	Western Brown Snake		Aust wide, except south east	Generalist
	Rhinoplocephalus palliceps [4]			Northern NT	Nocturnal, cryptic
	Simoselaps semifasciatus [4]	Half-girdled Snake		WA, NT, west SA and North Qld	Burrowing
	Vermicella multifaciata [5,6]	Northern Bandy-bandy		Northwest NT and WA	Seasonally dry tropical woodlands
Gekkonidae	*Diplodactylus ciliaris* [4,5,10]	Spiny-tailed Gecko		Northwest and central Aust	Generalist
	Diplodactylus stenodactylus [4,10]	Painted Gecko	Common	Northwest and central Aust	Generalist
	Gehyra australis [1,2,4,5,6]	Northern Dtella		Northern Aust	Arboreal, woodlands
	Gehyra nana [4,5,6]			Northern Aust	Rocky hills and ranges
	Gehyra Pamela [4,5]			Far North NT	Rocky escarpments
	Hemidactylis frenatus [4,5,7,8]	House Gecko		Far North of NT and Qld	Almost entirely living in human settlements
	Heteronotia binoei [2,4,6,10,11]	**Bynoe's Gecko**	**Widely distributed**	**Aust. Wide**	**Terrestrial generalist**
	Heteronotia spelea [2]	Desert Cave Gecko		Central NW Aust	Inhabits caves and mineshafts

FAMILY	SPECIES NAME	COMMON NAME	STATUS Aust/NT*	RANGE	PREFERRED HABITAT
	Nephrurus amyae [4]		Common	North WA to west Qld	Rocky hills and ranges
	Oedura gemmata [4]		Common	Western escarpment of Arhemland	Rocky habitat
	Oedura marmorata [4,5,6]	Marbled Velvet Gecko	Widely distributed	Northern and Central Aust	Savanna woodlands
	Oedura rhombifer [4,5]			Northern Aust	Tropical woodlands
	Psuedothecadactylus lindneri [4]	Giant Cave gecko		Patches north of NT and WA	tropical woodland and closed monsoonal forest
	Rhynchoedura ornate [6]	Beaked Gecko		Central Australia	Open savanna woodland and grasslands
Pygopodidae	*Delma borea* [4,5]			Northern Aust	Generalist
	Delma tincta [3,4]			Northern Aust.	Generalist found in ground debris
	Lialis burtonis [2,4,5,6,7,10]	Burton's snake-lizard	Widely distributed	Aust wide	Terrestrial in low vegetation
Pygopus	*Pygopus nigriceps* [4]	Hooded Scaley Foot Legless Lizard		Most of Aust	Generalist]
Scincidae	***Carlia amax*** [2,4,5,6,8,10,11,12]	**Two spined Rainbow Skink**	**Common**	**Far-northern Aust**	**Forages in leaf litter, associated with stoney ridges**
	Carlia gracilis [2,4,6,7,8]	Slender Rainbow Skink	Common	Northern WA and NT	Creek and river margins
	Carlia munda [2,4,5,6,11,12]	**Striped Rainbow Skink**	**Common**	**Northern and Central Aust**	**Dry woodlands**
	Carlia tricantha [6]	Three Spined Rainbow Skink	Common	NW and Central Aust	Seasonally dry tropical woodlands

FAMILY	SPECIES NAME	COMMON NAME	STATUS Aust/NT*	RANGE	PREFERRED HABITAT
	Cryptoblepharus carnabyi [8]	Carnaby's Snake-eyed Skink	Common	Northern, Western and Central Aust	Sclerophyll forests and woodlands and rocky hills and screes
	Cryptoblepharus megastictus [4]			North NT and WA	Stony hills and escarpments
	Cryptoblepharus plagiocephalus [2,4,5,6]	Aboreal Snake-eyed Skink	Common	North and Western Aust	Arboreal, tropical woodlands and eucalypt forests
	Ctenotus coggeri [4,6]	Coggers Ctenotus	Moderately Common, restricted range	Far north of NT	Open woodland and sandstone outcrops
	Ctenotus decaneurus [2,4,6]	Ten-lined Ctenotus	Locally common	Far north of NT	Stony hills and escarpments
	Ctenotus essingtonii [4,6]	Port Essingtons Ctenotus	Common	North Qld and NT	Seasonally dry tropical woodlands
	Ctenotus inornatus [2,4,5,6,11]	**Plain Ctenotus**	**Common**	**Northern Australia**	**Sandstone hills and grassy flats**
	Ctenotus robustus [1,2,4,6,7,9,10,11,12]	**Robust Ctenotus**	**Common, widely distributed**	**Northern, eastern and southeastern Aust.**	**Various habitats but prefers dry areas with thick ground cover**
	Ctenotus saxatilis [4]			North WA and west NT	Rocky outcrops
	Ctenotus spaldingi [4,10,12]			**North NT and Qld**	**Sclerophyll forests**
	Ctenotus storii [3]	Storrs Ctenotus	Common	Northwestern NT	Open forest and woodland with grassy understorey

FAMILY	SPECIES NAME	COMMON NAME	STATUS Aust/NT*	RANGE	PREFERRED HABITAT
	Ctenotus vertebralis [4]			Western edge of Arnhemland	Woodland and rocky outcrops
	Glaphyromorphus darwinensis [4]			North NT	Seasonally dry woodland and forest
	Glaphyromorphus douglasi [4]			Far north NT	Seasonally dry woodlands
	Glaphyromorphus isolepis [4,11,12]	**Smooth-scaled Skink**	**Common**	**Coastal NT and WA**	**Seasonally dry woodlands**
	Lerista karlschnidti [4]			North NT and Qld	Forest and gorge vegetation
	Menetia greyii [1,6]	**Grey's Menetia**	**Common**	**Aust wide**	**Temperate and tropical woodlands with grassy understory**
	Menetia maini [1,2,4,5,6]	Main's Menetia	Moderately Common	Northwestern and Central Australia	Various habitats but prefers rocky areas
	Morethia ruficauda [2,4,6,11,12]	**Red-tailed Snake-eyed Skink**	**Common**	**Northwestern and Central Australia**	**Rocky outcrops and stony hills**
	Morethia storri [4]			Northern coastal NT and WA	Grassland and woodland of stony hills and scarps
	Notoscincus ornatus [4,5,8]	Ornate Snake-eyed Skink	Moderately Common	Northern Aust	Various habitats with substantial groundcover
	Proablepharus tenuis [4]			Northern Aust	Woodland habitats, cryptic
	Tiliqua scincoides [2,4,5,6,9]	Eastern Blue-tongued Lizard	Common	Northern and Eastern Australia	Various habitats, perfers a dry climate
Thyplopidae	*Ramphotyhlops ligatus* [4]	Blind Snake	Common	Eastern Aust. And patches of Northwest Aust.	Burrowing

FAMILY	SPECIES NAME	COMMON NAME	STATUS Aust/NT*	RANGE	PREFERRED HABITAT
	Ramphotyhlops unguirostris [4]	Blind Snake	Common	Northeast Aust	Generalist
	Ramphotyhlops wiedii [4]	Blind Snake	Common	Scattered north and east Aust.	Generalist
Varanidae	*Varanas acanthurus insulanicus* [5,10]	Ridge-Tailed Monitor	Common	Arid and semi-arid Northern Aust	Rocky outcrops and ridges
	Varanas baritji [4,10]			Northern NT	Rocky outcrops
	Varanas glebopalma [4]	Long-tailed Rock Monitor		North NT and WA	Rocky outcrops
	Varanas gouldii [1,4,5,6,8]	Gould's Goanna		Aust wide	Terrestrial generalist
	Varanas mertensi [1,2,4,6,7,12]	**Merten's Water Monitor**		**Northern Aust**	**Coastal and Inland lagoons**
	Varanas mitchelli [2,6,12]	**Mitchell's Water Monitor**		**Northern Aust**	**Margines of waterways**
	Varanas panoptes [2,4,6,8]	Yellow Spotted Monitor	Near Threatened*	Northern and Western Aust.	Terrestrial
	Varanas scalaris [4,5,6]	Spotted Tree Monitor		Northern Aust	Arboreal
	Varanas tristis [4,5,7,8]			Northern and Central Aust	Arboreal but sometimes lives in rocky crevices
	Varanas primordius [4,5,6,9]	Pygmy Goanna	Rare	Far Northern NT, Pine Creek region	Rocky places

11.7 Frogs, fish and inverts presently or potentially inhabiting the Frances Creek project area

This table includes species recorded during the environmental survey of the proposed Frances Creek project area (marked in **bold** text) and species recorded from other nearby environmental surveys.

Survey Legend:

[1]Brocks Creek (Source: Brocks Creek EIS, Eldridge and Low 1994)

[2]Unions Reef (Source: Unions Reef DEIS, NSR 1993)

[3]Cosmo Howley (Source: Cosmo Howley Project Flora and Fauna Survey; Davison 1985)

[4]Kakadu National Park Stage III Wildlife Survey (Source: Woinarski *et al.* 1989)

[5]Pine Creek (Source: Union Reefs DEIS, NSR 1993)

[6]Mt Todd (Source: Union Reefs DEIS, NSR 1993)

[7]Woodcutters (Source: Unions Reefs DEIS, NSR 1993)

[8]PAWCNT (Source: Biological Records bound by $131^{o}30^{E}$ – $132^{o}00^{W}$ and $13^{o}30^{N}$ – $13^{o}55^{S}$)

[9]Spring Hill (Source: Spring Hill EIS, Grattidge and Low 1996)

[10]Mt Porter (Source: Reilly *et al.* 2005)

[11]Frances Creek (Source: Reilly *et al.* November 2005)

[12]Frances Creek (this report Reilly *et al.* May 2006)

FAMILY	SPECIES NAME	COMMON NAME	STATUS	RANGE	PREFERRED HABITAT
Bufonidae	***Bufo marinus*[10,11,12]**	**Cane Toad**	**Pest**	**Northern NT and Qld**	**Wet lands**
Hylidae	***Cyclorana australis*[2,4,5,11,12]**		**Common**	**Northern half of the NT**	**Shallow temporary pools in Woodland and open vegetation**

FAMILY	SPECIES NAME	COMMON NAME	STATUS	RANGE	PREFERRED HABITAT
	Cyclorana longipes [11,12]		**Common**	**Top end of NT**	**Shallow temporary pools in Woodland and open vegetation**
	Litoria bicolor [2,4,5,6,7,8]	Northern Dwarf Tree Frog		Northern Aust	Various habitat types
	Litoria caerulea [1,4,5,6,9]	Green Tree Frog		Northern and eastern Aust	Human inhabitation and semi-permanent water
	Litoria coplandi [4,5,6]	Saxicoline Tree Frog		Northwestern Aust	Rocky hills, gorges and creek beds
	Litoria inermis [3,4,5,6,7]	Unarmed Tree Frog		Northern and eastern Aust	Savanna woodlands
	Litoria meiriana [4,6]			Northwestern Aust	Creeks and waterholes of rocky gorges and escarpments
	Litoria nasuta [4,5,6,8]	Rocket Frog		Northern and eastern Aust	Forested edges of permanent or semi-permanent waterholes
	Litoria pallida [4,5,6]	Grey Tree Frog		Northern Aust	Woodlands
	Litoria personata [11]			**Only found in eastern edge of the Arnhem land escarp.**	
	Litoria rubella [2,4,5,6,9,11]	**Desert Tree Frog**		**Northern and eastern Aust**	**Various habitats close to drainage lines and permanent water**
	Litoria rothii [1,2,4,5,6,7,8,11,12]	**Roths Tree Frog**		**Northern Aust**	**Associated with river systems**
	Litoria tornieri [4,5,6,7,10]	Torniers Tree Frog		Northern NT and WA	Woodlands
	Litoria watjulumensis [4,5,6,10]	Watjulum Frog		Northern Aust	Dry Sclerophyll

FAMILY	SPECIES NAME	COMMON NAME	STATUS	RANGE	PREFERRED HABITAT
Myobatrachidae	*Crinia bilingua* [5,6]			Northern Aust	Generalist
	Limnodynastes convexiusculus [2,4,5]	Marbled Frog		Northern Aust	Savanna woodlands
	Limnodynastes ornatus [2,4,6]	Ornate Burrowing Frog		Northern and eastern Aust	Generalist

FAMILY	SPECIES NAME	COMMON NAME	STATUS
FISH			
Ariidae	***Neosilurus hyrtllii*** [12]	**Black Catfish**	**Common**
Atherinidae	***Craterocephalus sp.*** [12]	**Hardyhead**	**Common**
Chandidae	***Ambassis agrammus*** [12]	**Sail-fin Glassfish**	**Common**
Megalopidae	***Nemataosa erebi*** [11,12]	**Bony Bream**	**Common**
Melanotaeniidae	***Melanotaenia expuista*** [11,12]	**Exquisite Rainbow Fish**	**Common**
	Melanotaenia nigrans [11,12]	**Black-striped Rainbow fish**	**Common**
Terapontidae	***Leipotherapon unicolor*** [11,12]	**Spangled Grunter**	**Common**
	Amniataba percoides [12]	**Barred Grunter**	**Common**
MACROINVERTEBRATES			
	SPECIES NAME	**COMMON NAME**	**STATUS**
	Macrobrachium rosenbergii	Freshwater prawn	Common
	Holthusiana transversa [12]	**Freshwater crab**	**Common**

11.8 Birds presently or potentially inhabiting the Frances Creek project area

This table includes species recorded during the environmental survey of the proposed Frances Creek project area (marked in **bold** text) and species recorded from other nearby environmental surveys.

Survey Legend:

[1]Brocks Creek (Source: Brocks Creek EIS, Eldridge and Low 1994)

[2]Unions Reef (Source: Unions Reef DEIS, NSR 1993)

[3]Cosmo Howley (Source: Cosmo Howley Project Flora and Fauna Survey; Davison 1985)

[4]Kakadu National Park Stage III Wildlife Survey (Source: Woinarski *et al.* 1989)

[5]Pine Creek (Source: Union Reefs DEIS, NSR 1993)

[6]Mt Todd (Source: Union Reefs DEIS, NSR 1993)

[7]Woodcutters (Source: Unions Reefs DEIS, NSR 1993)

[8]PAWCNT (Source: Biological Records bound by $131^{o}30^{E}$ – $132^{o}00^{W}$ and $13^{o}30^{N}$ – $13^{o}55^{S}$)

[9]Spring Hill (Source: Spring Hill EIS, Grattidge and Low 1996)

[10]Mt Porter (Source: Reilly *et al.* 2005)

COMMON NAME	SCIENTIFIC NAME	NATIONAL OR NT* STATUS	RANGE
Babbler, Grey-crowned [1,2,3,4,5,6,10]	***Pomatostomus temporalis***	**Widespread nomad**	**Northern, central and southeast Aust**
Baza, Pacific [4]	*Aviceda subcristata*	Moderately common	North and east coastal Aust
Bee-eater, Rainbow [1,2,3,4,5,6,7,8,9,10]	***Merops ornatus***	**Migratory Bird (*EPBC Act*), Common nomad**	
Bittern, Black[2,4,6,9]	*Dupetor flavicollis*	Uncommon	Coastal Australia
Boobook, Southern [2,3,4,5,6,9,10]	***Ninox novaeseelandiae***	**Common nomad**	**Australia wide**
Bowerbird, Greater[2,3,4,5,6,7,8,9,10]	***Chlamydera nuchalis***	**Patchily common**	

COMMON NAME	SCIENTIFIC NAME	NATIONAL OR NT* STATUS	RANGE
Brolga[4,5]	*Grus rubicundus*	Common nomad	
Bronze-cuckoo, Horsfield's [2,4,5,6,9]	*Chrysococcyx basalis*	Relatively Common nomad	
Bronze-cuckoo, Little [4,7,9]	*Chrysococcyx malayanus*	Common nomad	
Bronzewing, Common [1,2,4,5,6]	*Phaps chalcoptera*	Common	Aust wide except Cape York
Budgerigar[2,4,5,9]	***Melopsittacus undulatus***	**Common**	**Inland Australia**
Bushlark, Singing [4]	*Mirafra javanica*	Common nomad	Australia wide
Bustard, Australia [4,5,6]	*Ardeotis australis*	Vulnerable*	Arid and Northern Australia
Butcherbird, Grey [2,4,5,6,7,10]	***Cracticus torquatus***	**Moderatley common nomad**	**Northwestern and Southern Australia**
Butcherbird, Pied [1,2,4,5,6,8,9,10]	***Cracticus nigrogularis***	**Moderately common nomad**	**Australia wide**
Button Quail, Buff-banded [4,9]	*Turnix oliveri*	Common, sedentry	Coastal Australia
Button Quail, Chestnut-backed [4,5,6]	*Turnix castwnota*	Uncommon	Two populations; Northwestern Aust, and CapeYork Peninsula
Button Quail, Little [4]	*Turnix velox*	Common, vagrant	Most of Australia
Button Quail, Red-backed [4,6]	*Turnix msculosa*	Widespread in dry season	Northern Australia
Button Quail, Red-chested	*Turnix pyrrhothorax*	Common nomad	
Buzzard, Black-breasted [4,5,8]	*Hamirostra melanosternon*	Common nomad	Northern interior Aust
Cicada Bird [4]	*Coracina tenuirostris*	Common nomad	Coastal Australia
Cisticola, Goldern-headed [2,4,5,6,9]	*Cisticola exilis*	Uncommon	North-western, Northern, Eastern and South-eastern Aust.
Cockatiel [4,5,6,8,9]	*Nymphicus hollandicus*	Common	Inland Australia
Cockatoo, Red-tailed Black [1,4,5,6,7,8,10]	***Calyptorhynchus banksii***	**Near Threatened* common nomad**	**Australia wide**
Cockatoo, Sulphur-crested [1,2,3,4,5,6,7,8,10]	***Cacatua galerita***	**moderately common nomad**	**Northern and Eastern Australia**
Coot, Eurasian [4]	*Fulica atra*	Common nomad	Common, vagrant

COMMON NAME	SCIENTIFIC NAME	NATIONAL OR NT* STATUS	RANGE
Corella, Little [2,4,6]	*Cacatua sanguinea*	Common nomad	Arid Australia
Cormorant, Little-black	***Phalacrocorax sulcirostris***		
Cormorant, Little Pied [1,4,5,6,7]	*Phalacrocorax melanoleucos*	Common resident	
Coucal, Pheasant [1,2,4,5,10]	***Centropus phasianuinus***	**Common nomad or resident**	**Northern and Eastern Australia**
Crow, Little	*Corvus bennetti*	Common	Inland Australia
Crow, Torresian [1,2,3,4,5,6,7,8,9]	*Corvus orru*	Uncommon resident	Northern Australia
Cuckoo, Black-eared [6,9]	*Chrysococcyx osculans*	Common, vagrant	Inland Australia
Cuckoo, Brush [2,4,5,6,7]	*Cuculus variolosus*	Moderately uncommon resident or nomad	Northern and Eastern Australia
Cuckoo, Channel-billed [4,6]	*Scythrops novaehollandiae*	Moderately common resident	NE Australia
Cuckoo, Pallid [2,3,4,5,6]	*Cuculus pallidus*	Common resident or nomad	Australia wide
Cuckoo-shrike, Black-faced [1,2,3,4,5,6,7,8,10]	*Coracina novaehollandiae*	Common	Australia wide
Cuckoo-shrike, Little [2,5,6,7,8,9]	***Coracina papuensis***	**Common**	**Northern and Eastern Australia**
Cuckoo-shrike, White-bellied [4]	*Coracina papuensis*	Common vagrant	Coastal Aust
Curlew, Little [5]	*Numenius minutus*	Common resident or migrant	Coastal Australia
Darter [2,4,5,7]	***Anhinga melanogaster***	**Rare**	**Australia wide**
Dollarbird [1,2,4,5,6,7]	***Eurystomus orientalis***	**Common summer migrant**	**N and E Aust**
Dotterel, Red-kneed [1,4]	*Erythrogonys cinctus*	Common resident or nomad	Inland Australia
Dove, Bar-shouldered [1,2,4,5,6,7,8,10]	***Geopelia humeralis***	**Uncommon resident or nomad**	**Northern and Eastern Australia**
Dove, Collared[10]	***Streptopelia decaocto***		
Dove, Diamond [4,5,6,8]	*Geopelia cuneata*	Uncommon resident or nomad	Arid and semi-arid Australia
Dove, Peaceful [1,2,3,4,5,6,7,8,10]	***Geopelia striata***	**Common**	**North-western and eastern Aust.**
Dove, Rose-crowned Fruit [4,7,9]	*Ptilinopus regina*	Uncommon to rare nomad	

COMMON NAME	SCIENTIFIC NAME	NATIONAL OR NT* STATUS	RANGE
Drongo, Spangled [2,4,7,8]	***Dicrurus hottentottus***	**Common resident**	**N and E Australia**
Duck, Grey Teal [4,5,6]	*Anas gracilis*	Common, vagrant	Australia wide
Duck, Pacific Black [4,5,6,7,9]	*Anas superciliosa*	Common migrant	Australia wide
Duck, Pink-eared [1,4,9]	*Malacorhynchus membranaceus*	Common, vagrant	Australia wide
Duck, Plumed Whistling [4,8]	*Dendrocygna eytoni*	Uncommon to rare	Northern and Eastern Australia
Duck, Wandering Whistling [4,8,9]	*Dendrocygna arcuata*	Common, vagrant	Northern and Eastern Australia
Eagle, Little [2,4,5,6]	*Hieraaetus morphnoides*	Uncommon	Australia wide
Eagle, Wedge-tailed [4,5,7,9,10]	***Aquila audax***	**Uncommon**	
Eagle, White-bellied Sea [4,8,9]	*Haliaeetus leucogaster*	Common, sedentary or vagrant	Coastal Aust.
Egret, Cattle [4]	*Ardea ibis*	Uncommon	Northern coastal Aust
Egret, Great [4,5,6,7]	***Egretta sp***	**Common resident**	**Australia wide**
Egret, Intermediate [4,6,7]	*Ardea intermedia*	Moderately uncommon resident	North and eastern Australia
Egret, Little [4]	*.Egretta garzetta*	Patchy	Coastal Australia
Emu [4,5]	*Dromaius novaehollandiae*	Vulnerable*	Australia wide
Fairy-wren, Red-backed [1,2,4,5,6,8,10]	*Malurus melanocephalus*	Generally rare nomad	N and E Australia
Fairy-wren, Varigated[10]	***Malurus lamberti***		
Falcon, Black [4,5]	*Falco subniger*	Common resident or nomad	Central Australia
Falcon, Brown [1,2,4,5,6,10]	***Falco berigora***	**Common**	**Australia wide**
Falcon, Peregrine [4]	*Falco pereginus*	Uncommon to rare nomad	Australia wide
Fantail, Grey [2,4,6,10]	***Rhipidura fuliginosa***	**Patchily common**	**Aust wide, except central Aust**
Fantail, Northern [2,4,5,6,7,8,10]	*Rhipidura rufiventris*	Common Summer migrant	Northern Aust
Fantail, Rufous [3,4,5,7]	*Rhipidura rufifrons*	Common	N and E Australia
Figbird [7,9]	*Sphecotheres viridis*	Common	Northern and Eastern Australia

COMMON NAME	SCIENTIFIC NAME	NATIONAL OR NT* STATUS	RANGE
Finch, Crimson [2,4,5,6,7,8]	***Neochmia phaeton***	**Common resident or nomad**	**Northern Aust**
Finch, Double-barred [1,2,3,4,5,6,7,8,9,10]	***Poephila bichenovii***	**Common nomad**	**Northern and Eastern Australia**
Finch, Gouldian [4,5,6]	*Erythrura gouldiae*	Rare and Endangered* Summer migrant	Northern Australia
Finch, Long-tailed [2,4,5,6,7,8,10]	***Poephila acuticauda***	**Common Summer migrant**	**Northern Australia**
Finch, Masked [1,2,3,5,6,8,9]	*Poephila personata*	Common Summer migrant	Northern Australia
Finch, Star [4]	*Neochmia ruficauda*	Near Threatened*	North Coastal Aust
Finch, Zebra [4]	*Taeniopygia guttata*	Common Summer migrant	Australia wide
Firebird, Painted			
Flycatcher, Leaden [1,2,3,4,5,6,7,8,9,10]	*Myiagra rubecula*	Common nomad	N and E Australia
Flycatcher, Lemon-bellied [4,5,6,8]	*Microeca flavigaster*	Uncommon nomad	Far Northern Aust
Flycatcher, Restless [4,5,6]	*Myiagra inquieta*	Common nomad	N, E, SW Australia
Flycatcher, Shining [3,4,7,8]	*Myiagra alecto*	Common resident	N and NE Australia
Friarbird, Little [1,2,4,5,6,7,8]	*Philemon citreogularis*	Common	Northern and Eastern Australia
Friarbird, Silver-crowned [1,2,3,4,5,6,7,8]	***Philemon argenticeps***	**Common resident**	**Northern Aust**
Friarbird, Helmeted [4,6,9,10]	***Philemon buceroides***	**Common nomad**	**N and NE Australia**
Frogmouth, Tawny [2,3,4,5,6]	***Podargus strigoides***	**Common resident**	**Australia wide**
Galah [1,2,3,4,5,6,7,8,10]	***Cacatua roseicapilla***	**Uncommon resident**	**Australia wide**
Gerygone, Large-billed [7,9]	*Gerygone magnirostris*	Common	Coastal Northern and North-eastern Aust.
Gerygone, White-throated [4,9]	*Gerygone olivacea*	Moderately Common	Coastal Australia
Goose, Green Pygmy [4,6,7]	*Nettapus pulchellus*	Uncommon, vagrant	Northern Australia
Goose, Magpie	***Anseranas semipalmata***	Common resident	
Goshawk, Brown [2,4,5,6,8]	*Accipter fasciatus*	Common sedentary or vagrant	Australia wide

COMMON NAME	SCIENTIFIC NAME	NATIONAL OR NT* STATUS	RANGE
Goshawk, Grey [4,5,6,8]	*Accipter novaehollandiae*	Uncommon, sedentary	Coastal Northern and Eastern Aust
Goshawk, Red [4]	*Erythrotriorchis radiatus*	Rare and Vulnerable*	North coastal NT and Qld
Grassbird, Tawny [4,5,9]	*Megalurus timoriensis*	Common	Northern and Eastern Australia
Grebe, Australsian [2,4,6,7,9]	*Tachybaptus navaeollandiae*	Common, vagrant	
Grebe, Hoary-headed [4,6,7]	***Poliocephalus poliocephalus***	**Common**	**Mostly southern Aust**
Greenshank, Common [4,5,9]	*Tringa nebularia*	Common Summer migrant	Coastal Australia
Hardhead [6,7,9]	*Aythya australis*	Common, vagrant	Australia wide
Harrier, Marsh [4,5,9]	*Circus approximans*	Common, vagrant	Australia wide
Harrier, Spotted [4,9]	*Circus assimilis*	Common	Australia wide
Heron, Great-billed [4,8]	*Ardeea sumatrana*	Uncommon	Northern coastal Aust
Heron, Pacific [1,2,4,5,6]	*Ardea pacifica*	Common	Australia wide
Heron, Pied [4,5]	***Ardea picata***	**Relatively common, nomad**	**Northern coastal Aust**
Heron, Rufous Night	***Nycticorax caledonicus***		
Heron, White-faced [2,4,6,8]	***Ardea novaehollandiae***	**Common nomad**	**Australia wide**
Hobby, Australian [4,5]	*Falco longipennis*	Relatively common nomad	Australia wide
Honeyeater, Banded [1,4,5,6]	*Certhionyx pectoralis*	Common	Northern Australia
Honeyeater, Bar-breasted [4,5,6,8]	*Ramsayornis fasciatus*	Uncommon resident	Northern Australia
Honeyeater, Black-chinned [6]	*Melithreptus gularis*	Uncommon resident	N and NE Australia
Honeyeater, Blue-faced [1,2,4,5,6,7,8]	*Entomyzon cyanotis*	Common Summer migrant	N and E Australia
Honeyeater, Brown [1,2,4,5,6,8,10]	***Lichmera indistincta***	**Common resident**	**Australia wide**
Honeyeater, Dusky [1,2,3,4,5,6,8]	*Myzomela obscura*	Common Summer migrant	N and NE Australia
Honeyeater, Grey-fronted [6]	*Lichenostomus plumulus*	Common	Inland Australia
Honeyeater, Red-headed	***Myzomela erythrocephala***		

COMMON NAME	SCIENTIFIC NAME	NATIONAL OR NT* STATUS	RANGE
Honeyeater, Rufous-throated [5,6]	*Conopophila rufogularis*	Common	Northern Australia
Honeyeater, Singing [4,5,6]	*Lichenostomus virescens*	Common nomad or resident	Australia wide
Honeyeater, White-gaped [1,4,5,6,7,8]	*Lichenostomus unicolor*	Common Summer migrant	N and NE Australia
Honeyeater, White-throated [1,2,4,5,6,8]	*Melithreptus albogularis*	Rare resident	N and NE Australia
Honeyeater, Yellow-tinted [5]	*Lichenostomus flavescens*	Common resident	
Ibis, Glossy [4]	***Plegadis falcinellus***	**Common resident**	**Northern Australia**
Ibis, Sacred	***Threskiornis aethiopica***		
Ibis, Straw-necked [4,5,6]	***Threskiornis spinicollis***	**Uncommon to rare resident**	**Australia wide**
Jabiru (Black-necked Stalk) [4,5,7,9]	*Ephippiorhynchus asiaticus*	Common, vagrant	Northern and Eastern Australia
Winter, Jacky [4,5,6]	*Microeca fascinans*	Common nomad	N, E, and S Australia
Jacana, Comb-crested [4,7,9]	*Irediparra gallinacean*	Common	Northern and Eastern Australia
Kestrel, Australia [4,5,6]	*Falco cenchroides*	Uncommon to rare resident	Australia wide
Kingfisher, Azure [2,4,6,8]	*Slcedo azurea*	Common resident	SE, E, and N Aust
Kingfisher, Forest [2,4,6,7,8]	*Todiramphus macleayii*	Common resident	N and E Australia
Kingfisher, Red-backed [2,4,5,6,7]	*Todiramphus pyrrhopygia*	Common resident	Inland Australia
Kingfisher, Sacred [1,2,4,5,6,7]	***Todiramphus sanctus***	**Moderately common migrant**	**Australia wide, not central Aust.**
Kite, Black [1,2,3,4,5,6,7,8,9,10]	*Milcus maigans*	Common resident	Australia wide
Kite, Black-shouldered [4]	*Elanus axillaries*	Common migrant	Australia wide
Kite, Square-tailed [4]	*Lophoictinia isura*	Near Threatened*	Mainly coastal Aust
Kite, Whistling [1,2,4,5,6,7,8,10]	*Haliastur sphenurus*	Uncommon resident	Australia wide
Koel, Common [1,2,4,5,6,7]	*Eudynamys scolopacea*	Common resident or migrant	Northern and Eastern Australia
Kookaburra, Blue-winged [1,2,4,5,6,7,8,10]	***Dacelo leachii***	**Common, migratory**	**Northern Australia**
Lapwing, Masked [4]	***Vanellus miles***	**Common Summer migrant**	**Mainly coastal Aust but extending inland**

COMMON NAME	SCIENTIFIC NAME	NATIONAL OR NT* STATUS	RANGE
Lorikeet, Red-collared [1,2,3,4,5,6,7,8,10]	*Trichoglossus haematodus*	Common nomad or migrant	North Western Australia
Lorikeet, Varied [1,2,4,5,6,7,8]	***Psitteuteles versicolor***	**Moderately common partial migrant**	**Northern Australia**
Magpie, Australian [3,8,10]	*Gymnorhina tibicen*	Common	Australia wide
Magpie-Lark, Australian [1,2,3,4,5,6,10]	***Grallina cyanoleuca***	**Common nomad or resident**	**Australia wide**
Mannikin, Chestnut-breasted [4,5,6]	*Lonchura castaneothorax*	Common Summer migrant	Northern Australia
Mannikin, Pictorella	*Heteromunia pectoralis*	Near Threatened*	
Mannikin, Yellow-rumped [4,6]	*Lonchura flaviprymna*	Near Threatened*	Northern Australia
Martin, Fairy [4,5]	*Hirundo ariel*	Uncommon nomad	Australia wide
Martin, Tree [4,5,8]	*Hirundo nigricans*	Common resident	Australia wide
Miner, Yellow-throated [1,2,3,4,5]	***Manorina flavigula***	**Uncommon**	**Western and Central Australia**
Mistletoe Bird [2,4,5,6,8]	*Dicaeum hirundinaceum*	Common resident	Australia wide
Night-heron, Rufous [4,6,7,8]	*Nycticorax caledonicus*	Common resident	Australia wide
Nightjar, Australia Owlet [1,4,5,6]	*Aegotheles cristatus*	Common resident	Australia wide
Nightjar, Large-tailed [4,6,9]	*Caprimulgus macrurus*	Common	Coastal Northern Australia and North-eastern Aust.
Nightjar, Spotted [4,5,6]	*Eurostopodus argus*	Moderately common resident	Inland Australia
Oriole, Olive-backed [2,4,5,6,7,8]	*Oriolus sagattatus*	Common	N and E Australia
Oriole, Yellow [4,6,7,8]	***Oriolus flavocinctus***	**Locally Common resident**	**Northern Australia**
Owl, Barking [2,4,5,6,7]	*Niox connivens*	Uncommon resident or nomad	Eastern, Northern and South western Aust.
Owl, Barn [1,4,5,6]	*Tyto alba*	Common Summer migrant	Australia wide
Owl, Masked	*Tyto novaehollandiae*	Near Threatened* migrant, nomad or resident	
Owl, Rufous [4,6]	*Ninox strenua*	Common resident	Northern Aust, and NE and central Qld

COMMON NAME	SCIENTIFIC NAME	NATIONAL OR NT* STATUS	RANGE
Pardalote, Red-browed [6,9]	*Pardalotus rubricatus*	Common	Arid mainland Australia
Pardalote, Striated [1,2,4,5,6,7,8,9]	*Pardalotus striatus*	Common, sedentary	Australia wide
Parrot, Hooded [2,4,5,6,8]	*Psephotus dissimilis*	Near Threatened*	North-eastern NT
Parrot, Red-winged [1,2,3,4,5,6,8,10]	***Aprosmictus erythropterus***	**Common resident**	**NW Australia**
Pelican, Australia [4]	*Pelecanus conspicillatus*	Moderately common resident	Australia wide
Pigeon, Crested [2,4,5,9]	*Ocyphaps lophotes*	Common	Inland Australia
Pigeon, Flock	*Phaps histrionica*	Common	
Pigeon, Partridge [2,4,5]	*Geophaps smithii*	Near Threatened*	Far Northern Australia
Pigeon, Torresian Imperial [4,7,9]	***Ducula spilorrhoa***	**Common migrant**	**Northern Australia**
Pipit, Richard's [2]	*Anthus novaeseelandiae*	Common resident or nomad	Australia wide
Plover, Black-fronted	*Elseyornis melanops*	Common	
Plover, Large Sand [5,9]	*Charadrius leschenaultia*	Uncommon migrant	Coastal Australia
Plover, Oriental [5]	*Charadrius veredus*	Common summer migrant	Northern Australia
Pratincole, Australia	*Stiltia Isabella*	Locall common resident	
Pratincole, Oriental	*Glareola maldivarum*	Moderately common	
Quail, Brown [1,2,3,4,5,6,7]	*Coturnix ypsilophora*	Common resident	Coastal Australia
Quail, King [4,9]	*Coturnix chinensis*	Common, probably sedentary	Coastal Australia
Rail, Buff-banded	*Gallirallus philippensis*	Common resident or nomad	
Robin, Hooded [4,6,9]	*Melanodryas cucullata*	Common, but scattered	Australia wide
Robin, Mangrove [6,9]	*Eopsaltria pulverulenta*	Common	Coastal Northern Australia
Robin, White-browed [4]	*Eopsaltria cucullata*	Near Threatened* nomad or migrant	Northern coastal Australia
Rosella, Northern [1,2,3,4,5,6,8]	***Platycercus venustus***	**Common nomad**	**North-western Aust**
Sandpiper, Common [2,4,5]	*Actitis hypoleucos*	Common summer migrant	Coastal Australia

COMMON NAME	SCIENTIFIC NAME	NATIONAL OR NT* STATUS	RANGE
Sandpiper, Marsh	*Tringa stagnatilis*	Common resident	
Sandpiper, Sharp-tailed	*Calidris acuminate*	Uncommon nomad or resident	
Sandpiper, Wood [4,5,9]	*Tringa glareola*	Patchy summer migrant	Patchy throughout Aust.
Shelduck, Rajah [4]	***Tadorna radjah***	**Common resident**	**North NT and Qld**
Shrike-thrush, Grey [1,2,4,5,6,7]	***Colluricincla harmonica***	**Common nomad**	**Australia wide**
Shrike-thrush, Little [9]	*Colluricincla megarhyncha*	Moderately common, sedentary	Northern coastal Aust.
Shrike-thrush, Sandstone [4,9]	*Colluricincla woodwardi*	Relatively common	North-western Aust.
Sittella, Varied [2,4,5,6]	*Daphoenositta chrysoptera*	Common resident	Australia wide
Snipe, Painted	*Rostratula benghalensis*	Vulnerable*	
Sparrowhawk, Collared [1,2,4,5,6,9]	***Accipiter cirrhocephalus***	**Common resident**	**Australia wide**
Spoonbill, Royal [1,4,5,6]	***Platalea regia***	**Common resident**	**Australia wide**
Spoonbill, Yellow-billed [4,5]	*Platalea flavipes*	Locally common	Australia wide
Stlit, Pied [4]	***Himantopus himantopus***	Common resident or nomad	Australia wide
Swamphen, Purple	*Porphyrio porphyrio*	Common resident	
Swift, Fork-tailed [4,6]	*Apus pacificus*	Common nomad	Australia wide
Teal, Grey	*Amas gracilis*	Locally common nomad	
Tern, Gull-billed	*Sterna nilotica*	Common resident or nomad	
Tern, Whiskered	*Chlidonias hybrida*	Scarce nomad	
Thick-knee, Bush [2,4,5,6,9]	***Burhinus magnirostris***	**Near Threatened* nomad**	**Australia wide**
Treecreeper, Black-tailed [2,4,5,6]	***Climacteris melanura***	**Common nomad**	**NW and W Australia**
Triller, Varied [4,6,7,8]	*Lalage leucomela*	Common resident, nomad or migrant	N and NE Australia
Triller, White-winged [2,3,4,5,6,8]	*Lalage sueurii*	Relatively common resident	Australia wide
Wagtail, Willie [1,2,3,4,5,6,7,8]	***Rhipidura leucophrys***	**Common resident**	**Australia wide**

COMMON NAME	SCIENTIFIC NAME	NATIONAL OR NT* STATUS	RANGE
Warbler, White-throated [5,6]		Common resident	N and E Australia
Wedgebill, Chiming	***Psophodes occidentalis***		
Weebill [2,3,4,5,6,7,9]	*Smicrornis brevirostris*	Common	Australia wide
Whistler, Rufous [2,3,4,5,6,8]	***Pachycephala rufiventris***	**Uncommon resident, nomad or migrant**	**Australia wide**
Woodswallow, Black-faced [1,2,4,5,6,8]	***Artamus cinereus***	**Common nomad**	**Australia wide**
Woodswallow, Little [2,4,5,6,8]	***Artamus minor***	**Common resident**	**Northern and Central Australia**
Woodswallow, Masked [1,4]	***Artamus personatus***	**Common resident**	**Australia wide**
Woodswallow, White-breasted [5,10]	***Artamus leucorhynchus***	**Moderately common**	**Australia wide**
Woodswallow, White-browed [1,4,6]	*Artamus supercilicosus*	Common resident	Australia wide

11.9 Proposed Haul Road Survey

- The proposed haul road follows the same alignment as the decommissioned spurline railway from Frances Creek minesite to the Alice Springs – Darwin Railway.
- The haul road survey begins from the proposed stockpile location on the Alice Springs – Darwin Railway

Description	Photograph
Distance: 0.00 km **Alice Springs – Darwin Railway** **GPS:** E799304 N8484796 **Land Unit:** Low Hills (Brocks Creek Ridge) **Vegetation:** *Eucalyptus tintinans, Eucalyptus tectifica, Acacia hemignosta, A. holosericea, Calytrix exstipulata, Sorghum plumosum, Corymbia dichromophloea, Triraphis mollis, Passiona foetida, Shizachyrium fragile, Melinis repens, Ptilotus fusiformis, Brachychiton diverifolius.*	
Distance: 0.00 km **Stockpile Laydown Site** **GPS:** E799355 N8484802 **Land Unit:** Low Hills (Brocks Creek Ridge) **Vegetation:** *Sorghum* grasses, *Eucalyptus tintinans* saplings **Notes:** A large section of the stockpile area is already cleared of vegetation.	

Distance: 0.00 km **Stockpile Laydown Site** **GPS:** E799321 N84844980 **Land Unit:** Low Hills (Brocks Creek Ridge) **Vegetation:** Similar to surrounding areas, *Corymbia foelscheana, Eucalyptus tintinans, E, tectifica, Panicum sp., Sorghum sp., Heteropogon contortus* **Notes:** Vertically stratified sedimentary area	
Distance: 0.10 km **GPS:** E799345 N8484970 **Land Unit:** Riparian/Low Hills (Brocks Creek Ridge) **Vegetation:** *Gardenia megasperma, Eucalyptus setifolia, Cymbopogon bombycinus, Themeda triandra, Chloris virgata, Eragrostis* sp*., Corymbia dichromophloia* **Fauna:** Freshwater Crabs (*Holthuisiana transversa*) **Notes:** Culvert required	
Distance: 0.90 km **Road to Union Reef Mine** **GPS:** E799887 N8485588 **Land Unit:** Low Hills (Brocks Creek Ridge) **Notes:** Above ground power lines	**No Photo**

Distance: 1.00 km **GPS:** E799940 N8485660 **Land Units**: Low Hills (Brocks Creek Ridge) **Vegetation:** *Eucalyptus grandifolia, E. tintinans, Erythrophleum chlorostachyus, E. miniata, Corymbia dichromophloia, Sorghum* grasses. **Fauna:** Antilopine Wallaroo scats **Notes:** Avoid large trees where possible.	
Distance: 1.52 km Lady Alice Creek. **GPS:** E800210 N8485890 **Land Unit:** Riparian (Brocks Creek Ridge) **Vegetation:** *Gardenia megasperma, Cymbopogon bombycinus, Themeda triandra, Chloris virgata, Eragrostis* sp. **Notes:** Culvert required	
Distance: 1.55 km **GPS:** E800250 N8485915 **Land Unit:** Alluvial Flats (Brocks Creek Ridge) **Vegetation:** *Themeda triandra* grassland, *Eucalyptus tectifica, Corymbia dichomophloia, Brachychiton diversifolius, Cochlospermum fraseri*.	

Distance: 1.65 km **GPS:** E800326 N8485984 **Land Unit:** Drainage area (Brocks Creek Ridge) **Vegetation:** *Themeda triandra* dominates the drainage line. Peripheral species include *Eucalyptus tectifica, Corymbia dichomophloia, Brachychiton diversifolius, Cochlospermum fraseri* **Notes:** floodway or series of culverts required	
Distance: 1.75 km **View northwest from Mt Wells access road** **GPS:** E800374 N8486046 **Land Unit:** Low Hills (Brocks Creek Ridge) **Vegetation:** *Gardenia megasperma, Eucalyptus tectifica, Corymbia dichromophloia, Themeda triandra, Heteropogon contortus.*	
Distance: 1.88 km **GPS:** E800514 N8486082 **Land Unit:** Riparian (Brocks Creek Ridge) **Vegetation:** *Pandanus spiralis, Lophostemon grandifolius, Corymbia polycarpa.*	**No Photo**
Distance: 2.48 km **Spurline track** **Culvert 1** **GPS:** E801087 N8486259 **Land Unit:** Riparian (Brocks Creek Ridge) **Vegetation:** *Pandanus spiralis, Brachychiton diversifolius, Grevillea pteridifolia, Gardenia megasperma, Sorghum sp.*	

Distance: 2.72 km **Spurline track** **Culvert 2** **GPS:** E801345 N8486258 **Land Unit:** Riparian (Brocks Creek Ridge)	**No Photo**
Distance: 2.95 km **Spurline track** **Culvert 3** **GPS:** E801560 N8486290 **Land Unit:** Riparian (Brocks Creek Ridge)	**No Photo**
Distance: 3.30 km **Spurline track** **Culvert 4** **GPS:** E801900 N8486350 **Land Unit:** Riparian (Brocks Creek Ridge)	**No Photo**
Distance: 3.73 km **Spurline track** **Culvert 5** **GPS:** E802265 N8486505 **Land Unit:** Riparian (Brocks Creek Ridge)	**No Photo**
Distance: 4.63 km **Spurline track** **Culvert 6** **GPS:** E802910 N8487060 **Land Unit:** Low Hills (Cullen) **Vegetation:** Similar to surrounding vegetation. *Calytrix exstipulata, Eucalyptus tintinans, E. tetradonta, E. tectifica*	

Distance: 5.10 km **Spurline track** **GPS:** unknown **Land Unit:** Granite Hills (Cullen) **Vegetation:** *Eucalyptus tetradonta, Eucalyptus miniata, Brachychiton diverifolius, Sorghum plumosum, Gardenia megasperma, Cochlospermum fraseri*	
Distance: 5.50 km **Spurline track** **Culvert 7** **GPS:** E803660 N8487560 **Land Unit:** Riparian (Cullen)	**No Photo**
Distance: 5.85 km **Spurline track** **Culvert 8** **GPS:** E803990 N8487515 **Land Unit:** Riparian (Cullen)	**No Photo**
Distance: 6.40 km **Spurline track** **Culvert 9** **GPS:** E804430 N8487770 **Land Unit:** Riparian/Low Undulating Hills (Cullen) **Vegetation:** *Eucalyptus tetradonta, Lophostemon grandiflorus, Sorghum sp., Heteropogon sp., Brachychiton diversifolius,* **Fauna**: Water monitor (*Varanas mitchellii*) **Notes:** washing out under culverts.	

Distance: 7.60 km **Spurline track** **Culvert 10** **GPS:** E805434 N8488335 **Land Unit:** Riparian/Alluvial Flats (Cullen) **Vegetation:** *Eulalia aurea, Pandanus spiralis, Heteropogon contortus, Themeda triandra*	
Distance: 8.20 km **Spurline track** **Culvert 11** **GPS:** E805930 N8488740 **Land Unit:** Riparian (Cullen)	**No Photo**
Distance: 8.40 km **Spurline track** **GPS:** Unknown **Land Unit:** Low Undulating Hills (Cullen) **Vegetation:** Swampy habitat**,** *Pandanus spiralis, Eulalia sp., Chloris virgata, Eucalyptus tintinans, E. miniata, Brachychiton diversifolius,Sorghum* sp*., Heteropogon* sp*., Grevillea pteridifolia*	
Distance: 8.52 km **Spurline track** **Culvert 12** **GPS:** E806095 N8489005 **Land Unit:** Riparian (Cullen)	**No Photo**
Distance: 8.80 km **Spurline track** **Culvert 13** **GPS:** E806270 N8489280 **Land Unit:** Riparian/Low Undulating Hills (Cullen)	**No Photo**

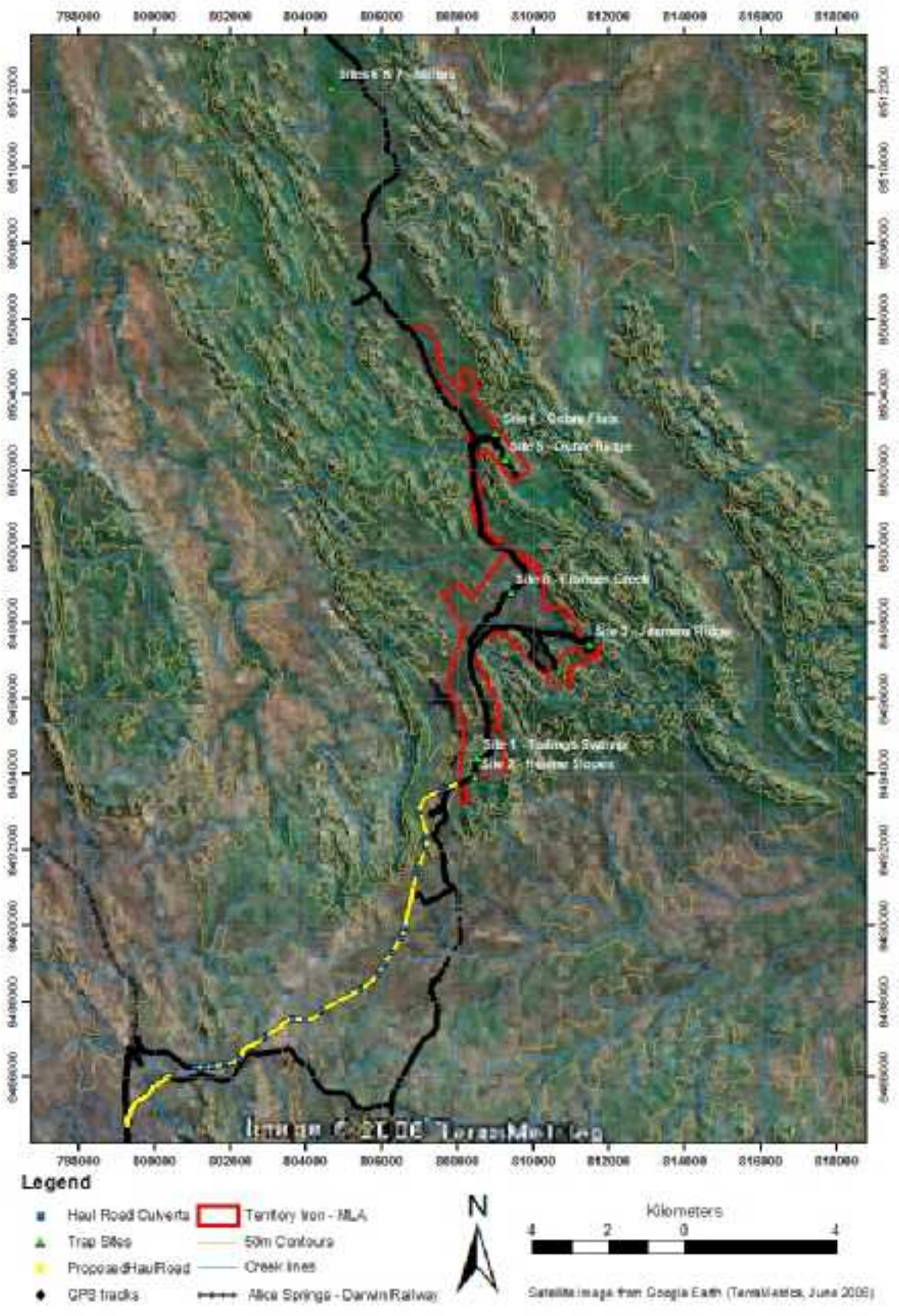
Distance: 9.30 km **Spurline track** **Culvert 14** **GPS:** E806520 N8489685 **Land Unit:** Alluvial Flats (Cullen) **Vegetation:** *Eulalia aurea, Heteropogon contortus, Pandanus spiralis* **Notes:** The road could be widened by pushing out fill to a lower level.	
Distance: 9.50 km **Spurline track** **Culvert 15** **GPS:** E806610 N8489925 **Land Unit:** Riparian (Cullen) **Vegetation:** *Lophostemon grandiflorus, Pandanus spiralis, Livistona humilis, Eulalia sp., Chloris virgata, Brachychiton diversifolius,Sorghum* sp.*, Heteropogon* sp.*, Grevillea pteridifolia* **Notes:** 4 Culverts in good condition but may not handle loads from haul trucks	
Distance: 9.70 km **Spurline track** **GPS:** Unknown **Land Unit:** Low Undulating Hills (Cullen) **Vegetation:** *Eucalyptus tintinans, E. tetradonta, Calytrix exstipulata, Sorghum plumosum, Gardenia megasperma*	

Distance: 10.20 km **Spurline track:** **GPS:** Unknown **Land Unit:** Low Undulating Hills (Cullen) **Vegetation:** *Eucalyptus tetradonta, Brachychiton diversifolius, Cochlospermum fraseri, Erythrophleum chlorostachys, Hyptis suaveolens, Sorghum* sp.*, Heteropogon* sp. **Notes:** Erosion washout from sidewalls	
Distance: 10.40 km **Spurline track** **Culvert 16** **GPS:** E806780 N8490720 **Land Unit:** Low Undulating Hills (Cullen) **Vegetation:** *Brachychiton diversifolius, Cochlospermum fraseri, Gardenia fraseri, Sorghum plumosum, Erythrophleum chlorostachys*	
Distance: 10.50 km **Spurline track junction with Mt Porter rd** **GPS:** E806799, N8490821 **Land Unit:** Granite Hills (Cullen) **Vegetation:** *Eucalyptus tetradonta, E. tintinans, Brachychiton diversifolius, Grevillea decurrens, Erythrophleum chlorostachyus, Calytrix exstipulata, Sorghum plumosum, Heteropogon contortus*	
Distance: 11.10 km **Spurline track** **Culvert 17** **GPS:** E806915 N8491400 **Land Unit:** Riparian/Low Hills (Brocks Creek Ridge)	**No Photo**

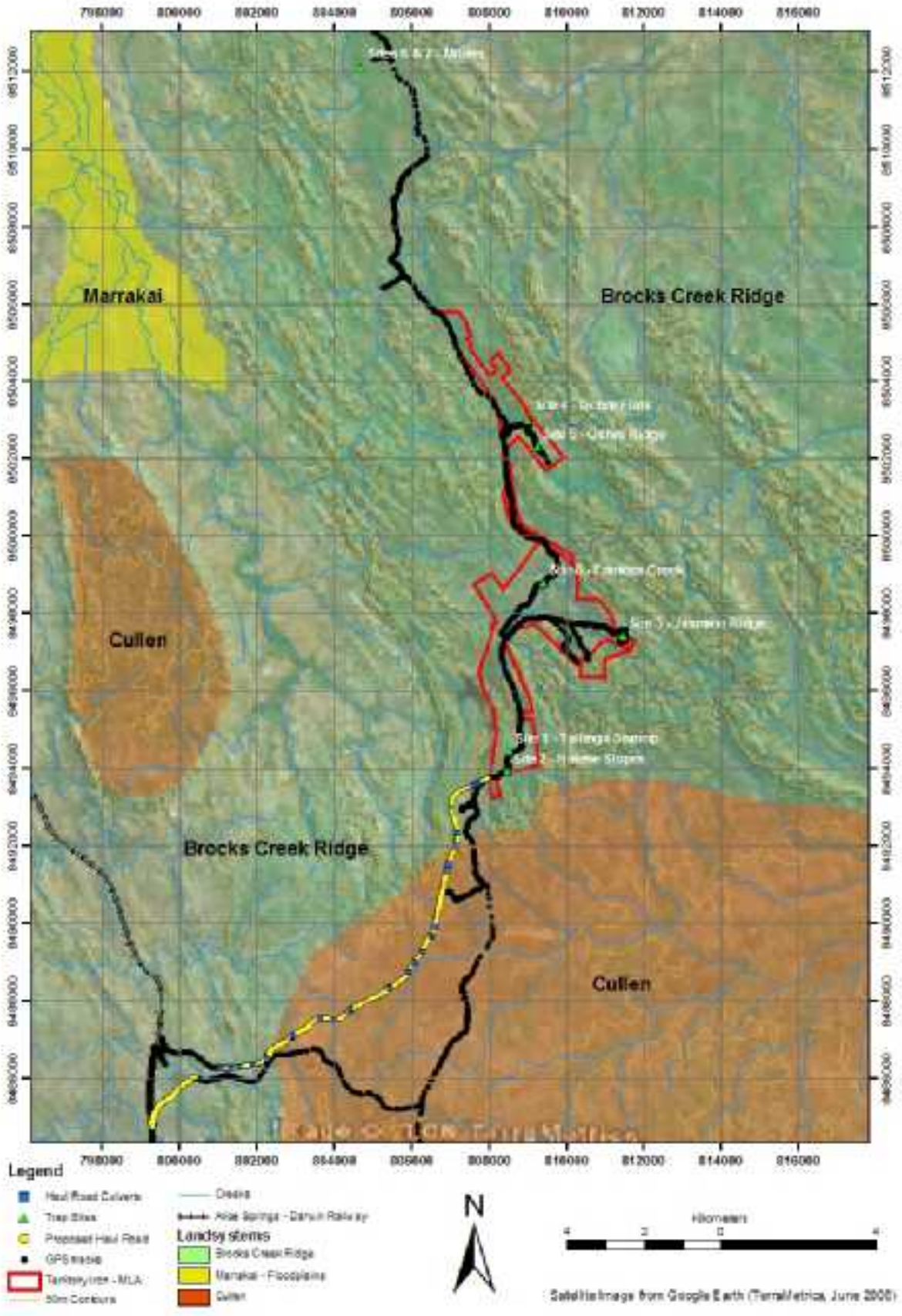
Distance: 11.30 km **Spurline track** **Culvert 18** **GPS:** E806960 N8491550 **Land Unit:** Riparian/Low Hills (Brocks Creek Ridge)	**No Photo**
Distance: 11.80 km **Spurline track** **Culvert 19** **GPS:** E807155 N8492000 **Land Unit:** Riparian/Low Hills (Brocks Creek Ridge)	**No Photo**
Distance: 12.15 km **Spurline track** **Culvert 20** **GPS:** E807200 N8492350 **Land Unit:** Low Hills (Brocks Creek Ridge)	**No Photo**
Distance: 13.70 km **Spurline track** **Culvert 21** **GPS:** E807570 N8493575 **Land Unit:** Riparian (Brocks Creek Ridge) **Vegetation:** *Lophostemon grandiflorus, Sorghum sp., Livistona humilis, Erythrophleum chlorostachys, Ficus racemosa* **Notes:** Erosion has begun to wash out the road, culverts and trees	
Distance: 13.80 km **Spurline track** **Culvert 22** **GPS:** E807720 N8493630 **Land Unit:** Low Hills (Brocks Creek Ridge) **Vegetation:** *Lophostemon grandiflorus, Sorghum sp., Livistona humilis, Erythrophleum chlorostachys*	

Distance: 14.10 km **Spurline track junction with Frances Ck rd** **GPS:** E808000 8493740 **Land Unit:** Low Hills (Brocks Creek Ridge)	**No Photo**

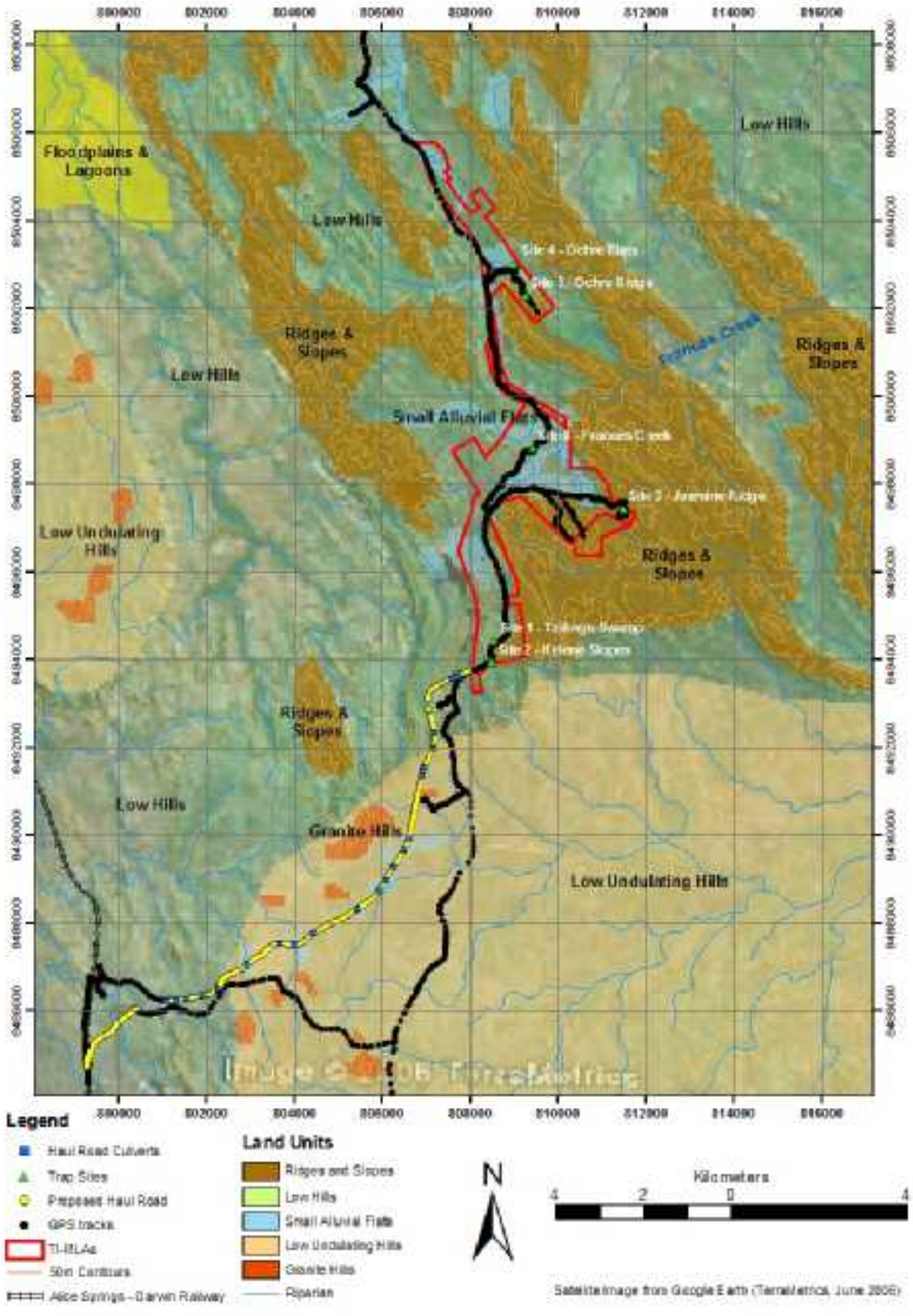
Map 1: Satellite Image of the Frances Creek Project Area



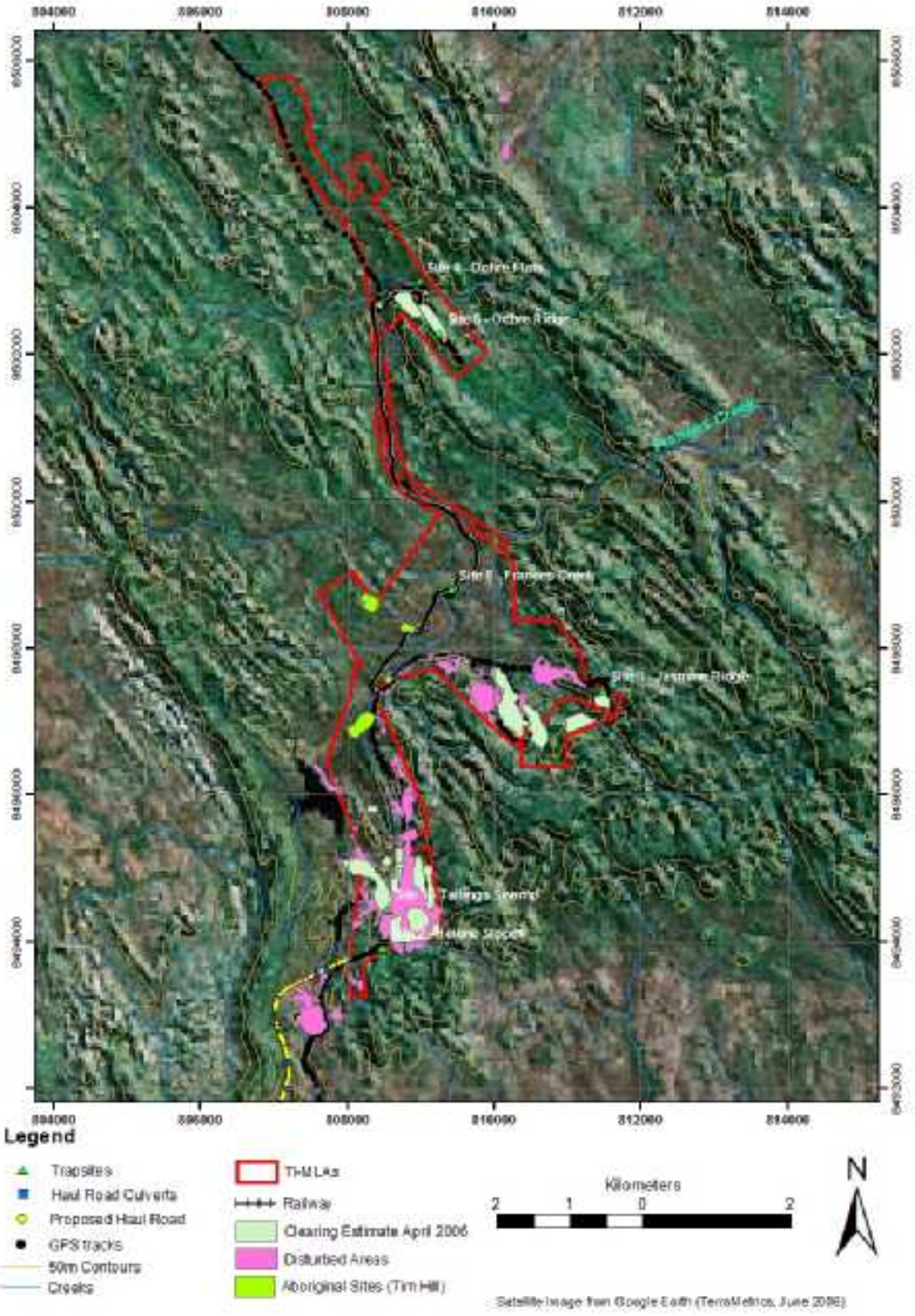
Map 2: Land Systems within the Frances Creek Project Area



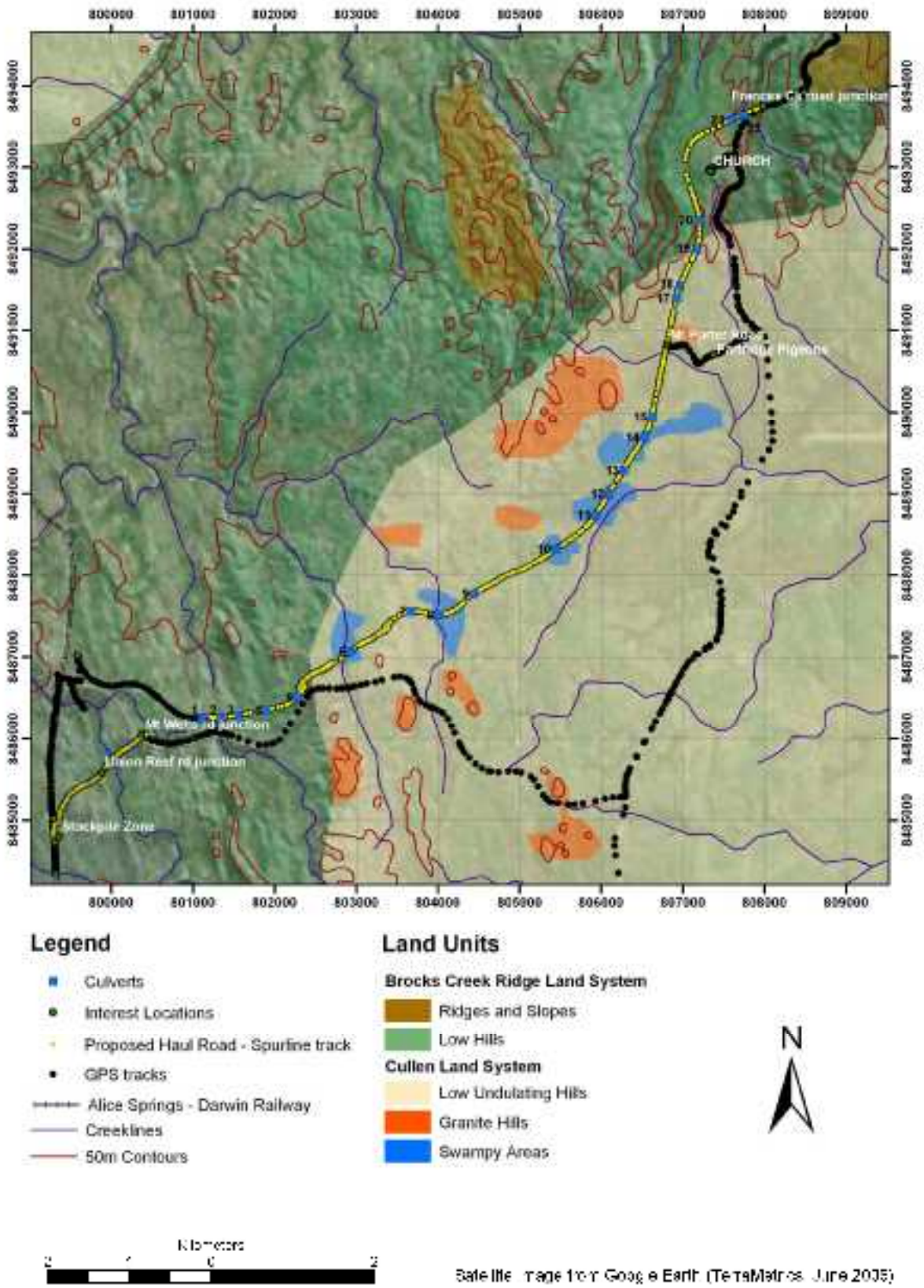
Map 3: Land Units within the Frances Creek Project Area



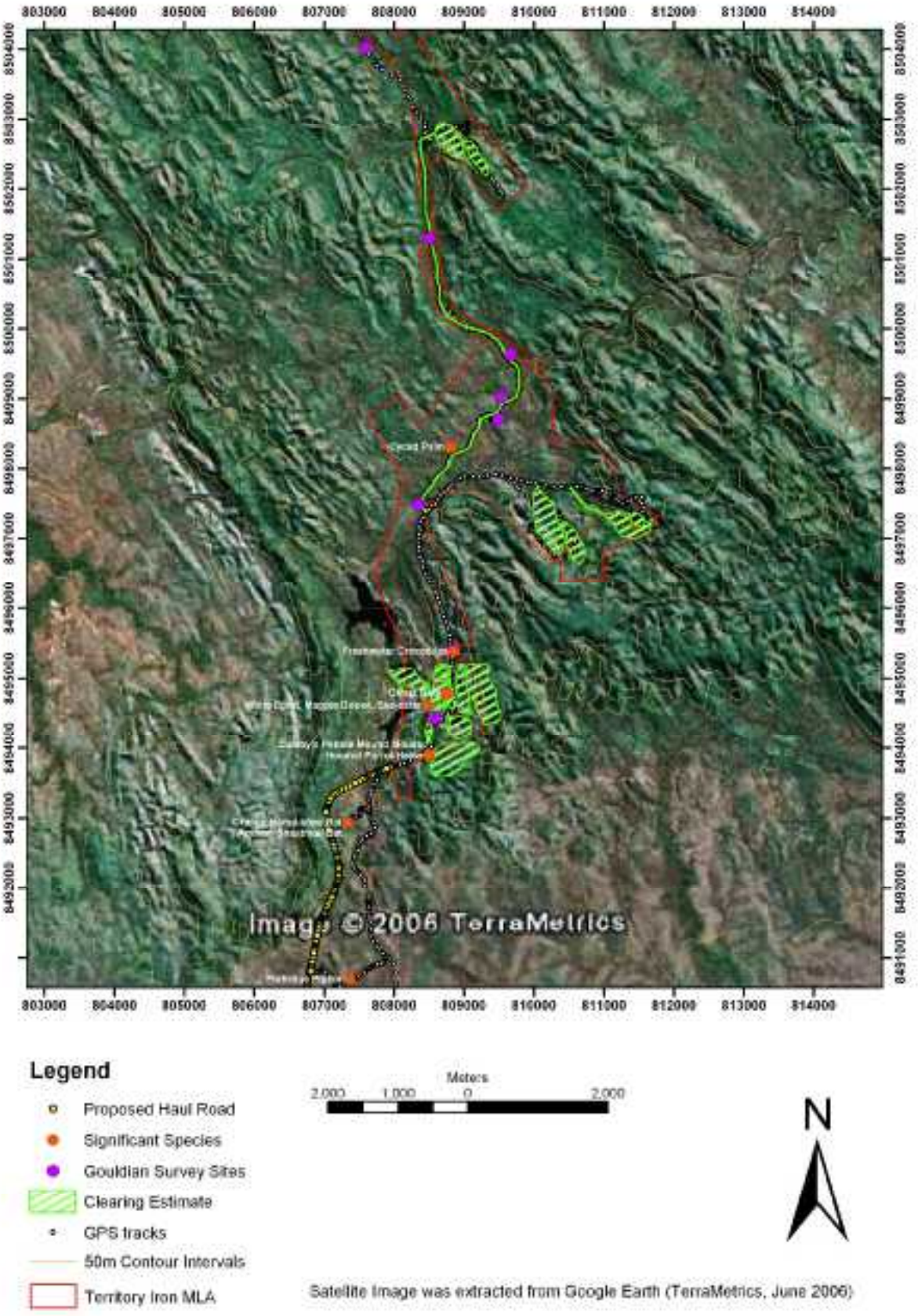
Map 4: Tenement Application area with vegetation clearance estimates, disturbed areas and aboriginal sites.



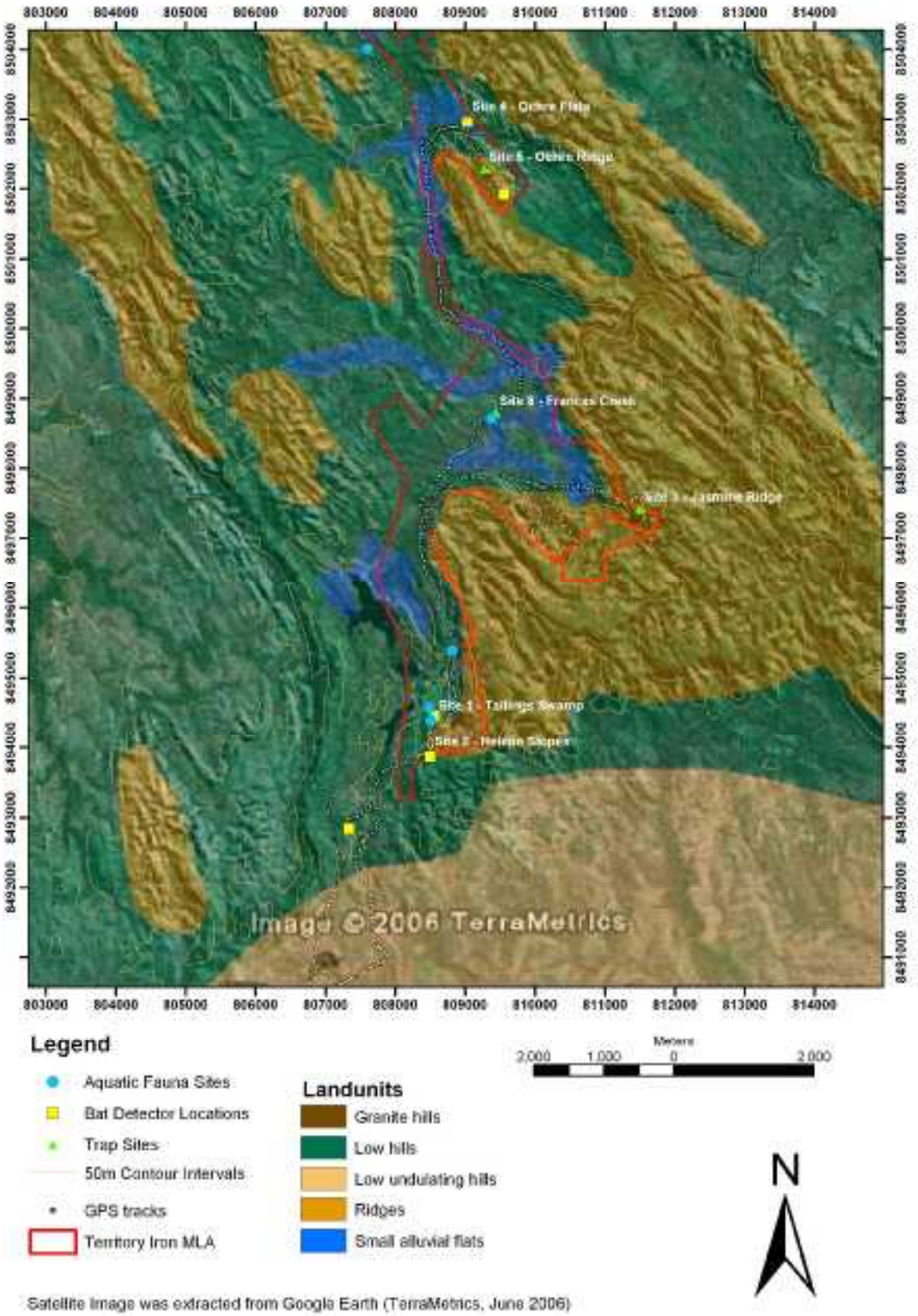
Map 5: Proposed Haul Road alignment along the decommissioned railway line



Map 6: Conservation species locations and Gouldian Finch Survey Sites within the Frances Creek Project area.



Map 7: Bat Detector Locations and Aquatic Survey Sites with Land Units



Satellite image was extracted from Google Earth (TerraMetrics, June 2006)