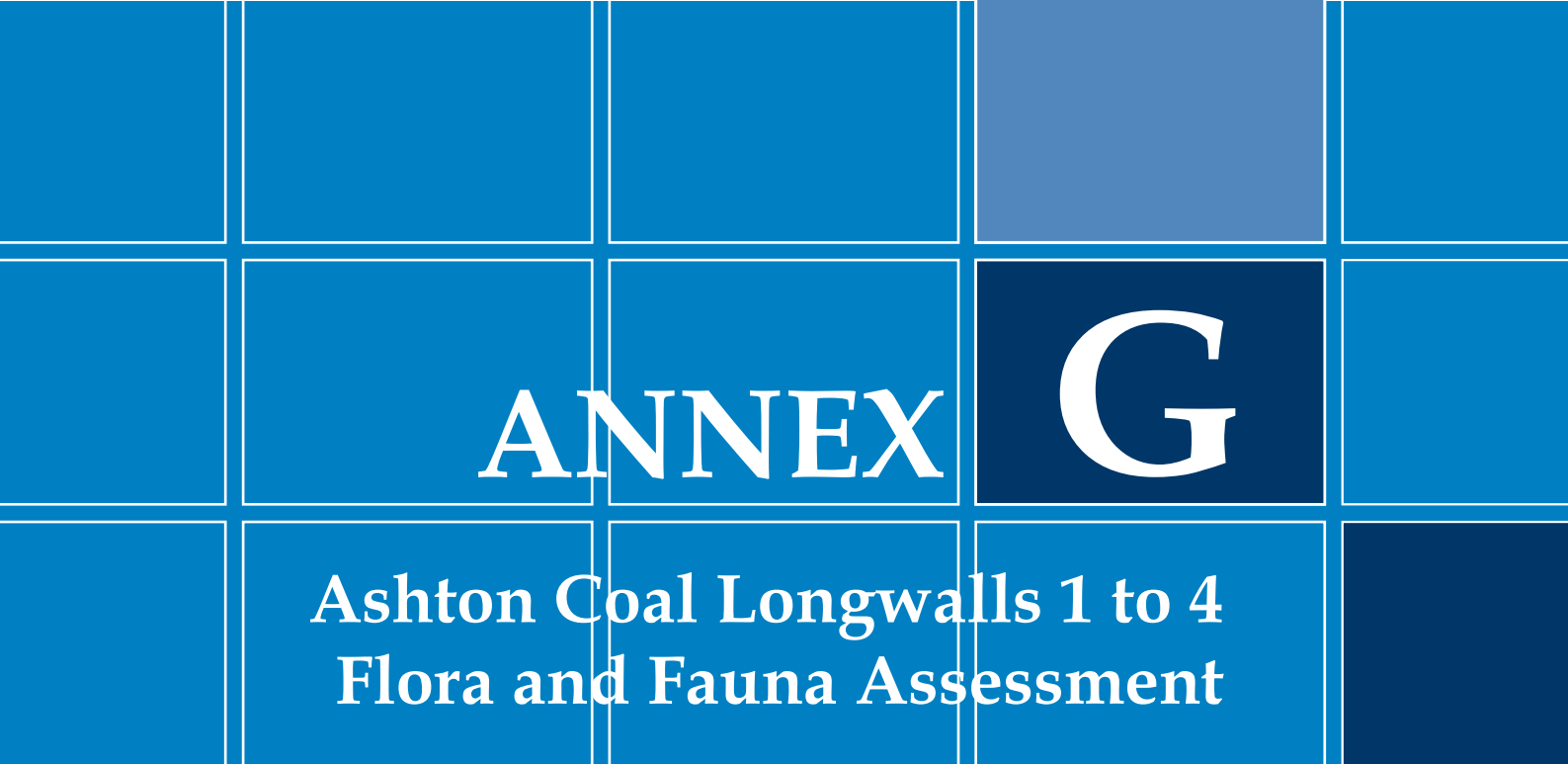
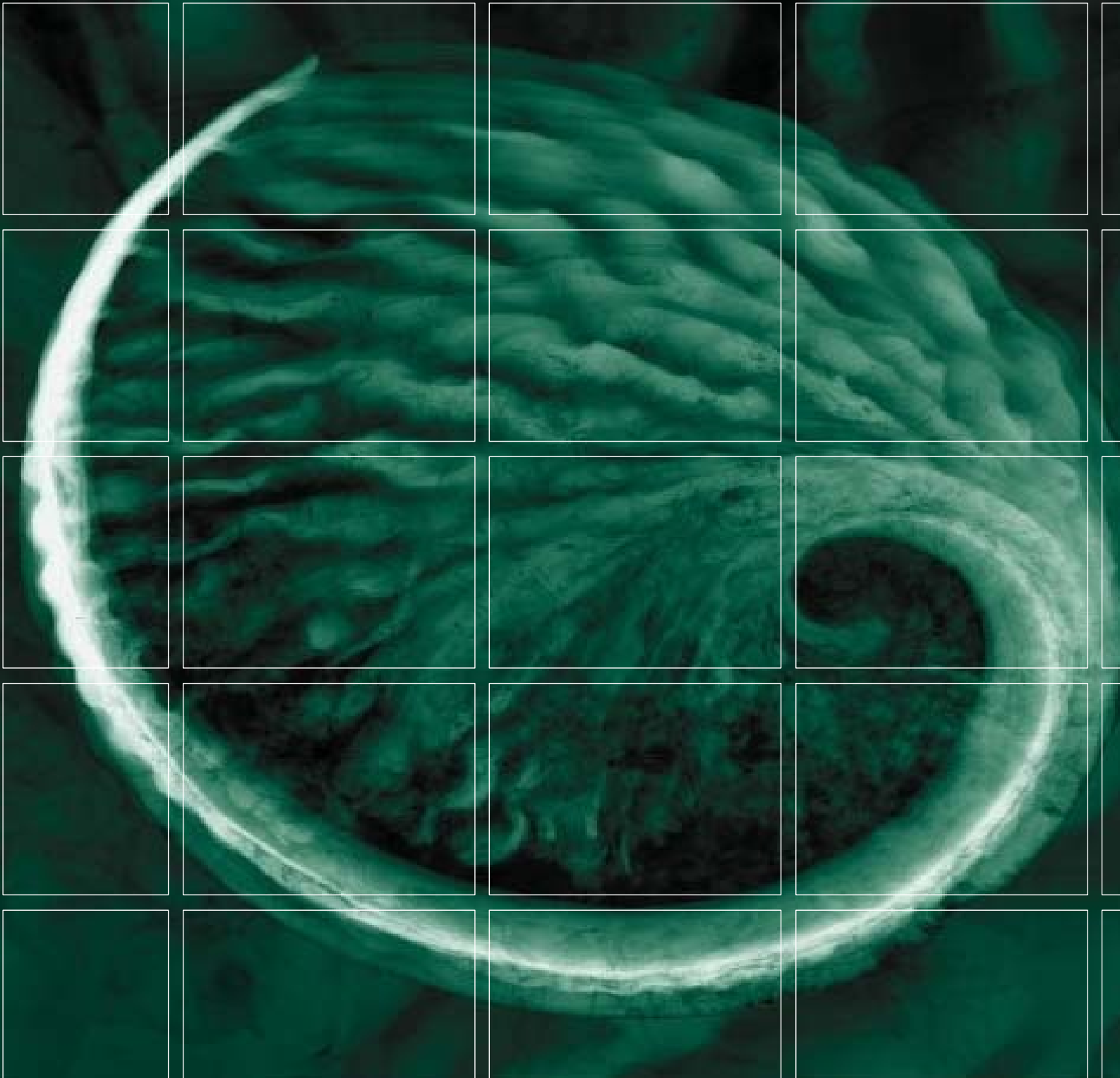


Subsidence Management Plan



**Ashton Coal
Longwall Panels 1 - 4**

Subsidence Management Plan
Written Report



Flora and Fauna Assessment
Ashton Coal Longwalls 1 to 4

Ashton Coal Operations Pty Ltd

October 2006

0048045 Final

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Delivering sustainable solutions in a more competitive world



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Date:	<u>26 October, 2006</u>

Environmental Resources Management Australia Pty Ltd Quality System

Flora and Fauna Assessment

Ashton Coal Longwalls 1 to 4

Ashton Coal Operations Pty Ltd

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This report has been prepared in accordance with the scope of services described in the contract or agreement between Environmental Resources Management Australia Pty Ltd ABN 12 002 773 248 (ERM) and the Client. The report relies upon data, surveys, measurements and results taken at or under the particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client. Furthermore, the report has been prepared solely for use by the Client and ERM accepts no responsibility for its use by other parties.

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INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by Ashton Coal Operations Pty Ltd Management to assess the potential flora and fauna impacts of the extraction of longwall panels 1 to 4. The assessment will accompany the Subsidence Management Plan for these longwalls and has been undertaken in order to satisfy the contents requirements set out in the *Guideline for Applications for Subsidence Management Approval* (NSW DMR, 2003).

The Application Area (or subsidence impact zone) is defined by the 'Guideline for Applications for Subsidence Management Approvals' (DMR, 2003) as the surface area that is likely to be affected by the proposed underground coal mining and is generally considered to be no less than the surface area defined by the cover depth, angle of draw of 26.5 and the limit of the proposed extraction area.

1.1

PURPOSE REPORT

The purpose of this assessment was to:

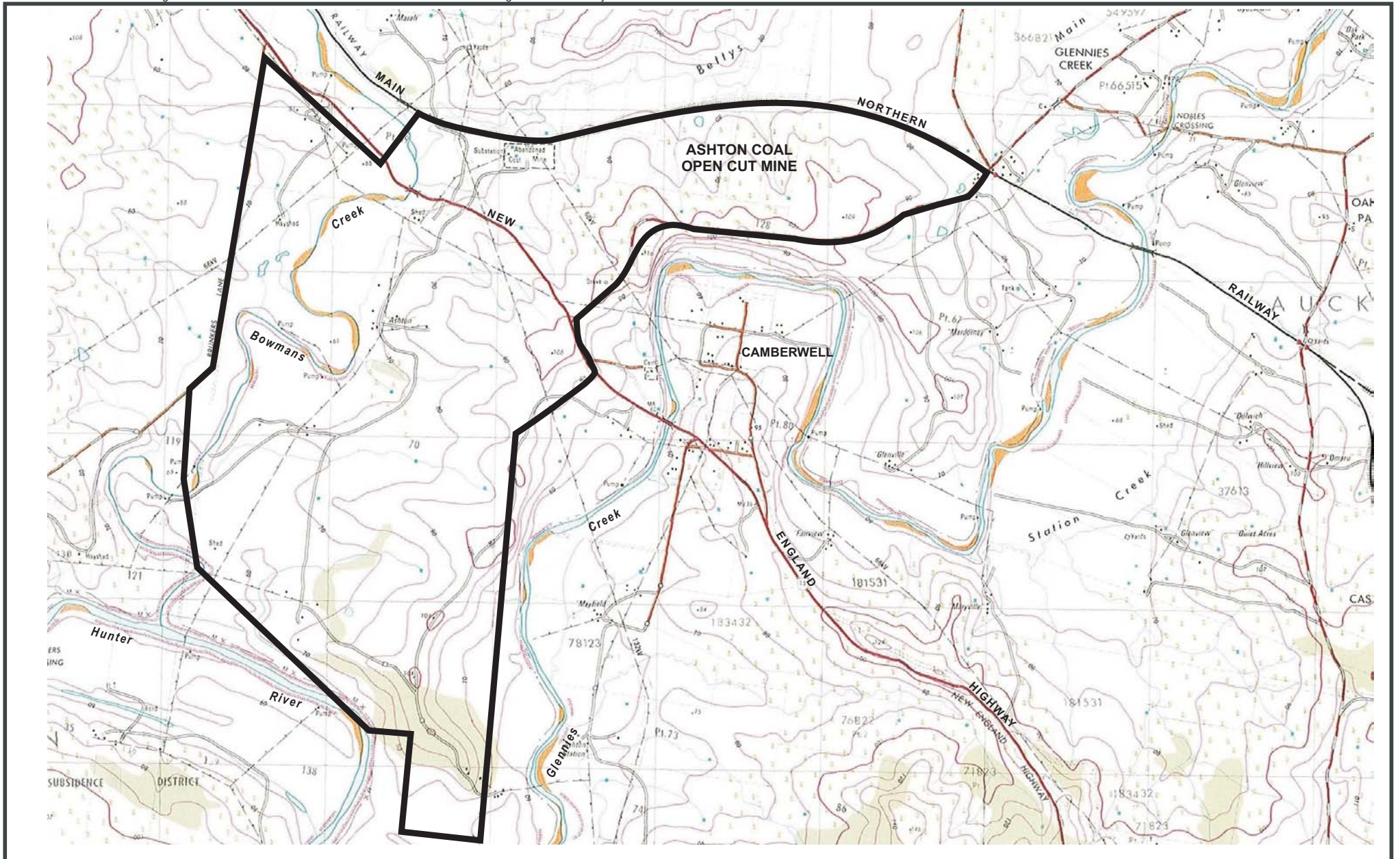
- identify and describe the conservation significance of vegetation communities and flora species;
- identify and describe the conservation significance of fauna habitats and fauna species;
- assess the type and degree of impacts of mining on the flora and fauna in the Application Area, any threatened species, populations and ecological communities likely to occur in the Application Area; and
- identify mitigation measures to avoid or minimise the extent of impacts of mining on flora and fauna.

1.2

APPLICATION AREA DESCRIPTION

The proposed Application Area is located approximately 14 kilometres (km) northwest of Singleton, near the village of Camberwell in the Hunter Valley region of New South Wales (*Figure 1.1*). The extent of longwall panels 1 to 4 is defined by a setback from the Hunter River alluvium to the south and by Glennies Creek to the east and Bowmans Creek to the west.

The soil is characterised by the Bayswater soil landscapes as described by Kovac and Lawrie (1991). The soil landscape is formed in situ from parent rock with alluvium in the drainage lines. The soil is characterised by sandy clay loam and loamy sand to sandy clay in alluvial soils. Moderate sheet and gully erosion is common in the slopes within this soil landscape.



0 500m
Approximate Only

Legend

 Mine Lease Boundary

Figure 1.1 **Locality Plan**

ACOL - Subsidence Management Plan, LW1- 4
Flora and Fauna Subsidence Management Plan

The Application Area lies within the downstream limits of the Bowmans Creek and Glennies Creek catchments. The land surface generally consists of undulating hills dominated by open grasslands and floodplains of the lower reaches of Bowmans Creek. Bowmans Creek lies to the west of the Application Area and is outside the area to be affected by subsidence.

There is an area of remnant woodland within the south eastern portion of the Application Area referred to as the southern woodland and has been established as a conservation area.

Land use is predominantly livestock grazing, with some irrigation and cultivation on the Hunter River floodplain. Since European settlement, the most commonly constructed surface features are fences and farm dams required for livestock grazing.

1.3

DESCRIPTION OF THE PROPOSAL

The layout of the mine is shown in *Figure 1.2* including the main roadways, current area of extraction and the proposed longwall panels.

The longwall panels are oriented in a north/south direction and cover a surface area of approximately 294 hectares. The longwalls are all planned to be 206 metres wide and range in length from 2286 to 2605 metres. The chain pillars separating the adjacent panels will be 25 metres rib to rib, with cut throughs nominally at 100 metre centres.

Overburden depths of the Pikes Gully Seam within the Application Area vary from 35 metres at the out-bye (northern) end of longwall 1 to 158 metres at the in-bye (southern) end of longwall 4. The mining section ranges from 2.4 to 2.7 metres thick.



Source: Ashton Coal Operations

Figure 1.2 Application Area



0 500m
Approximate only

2.1

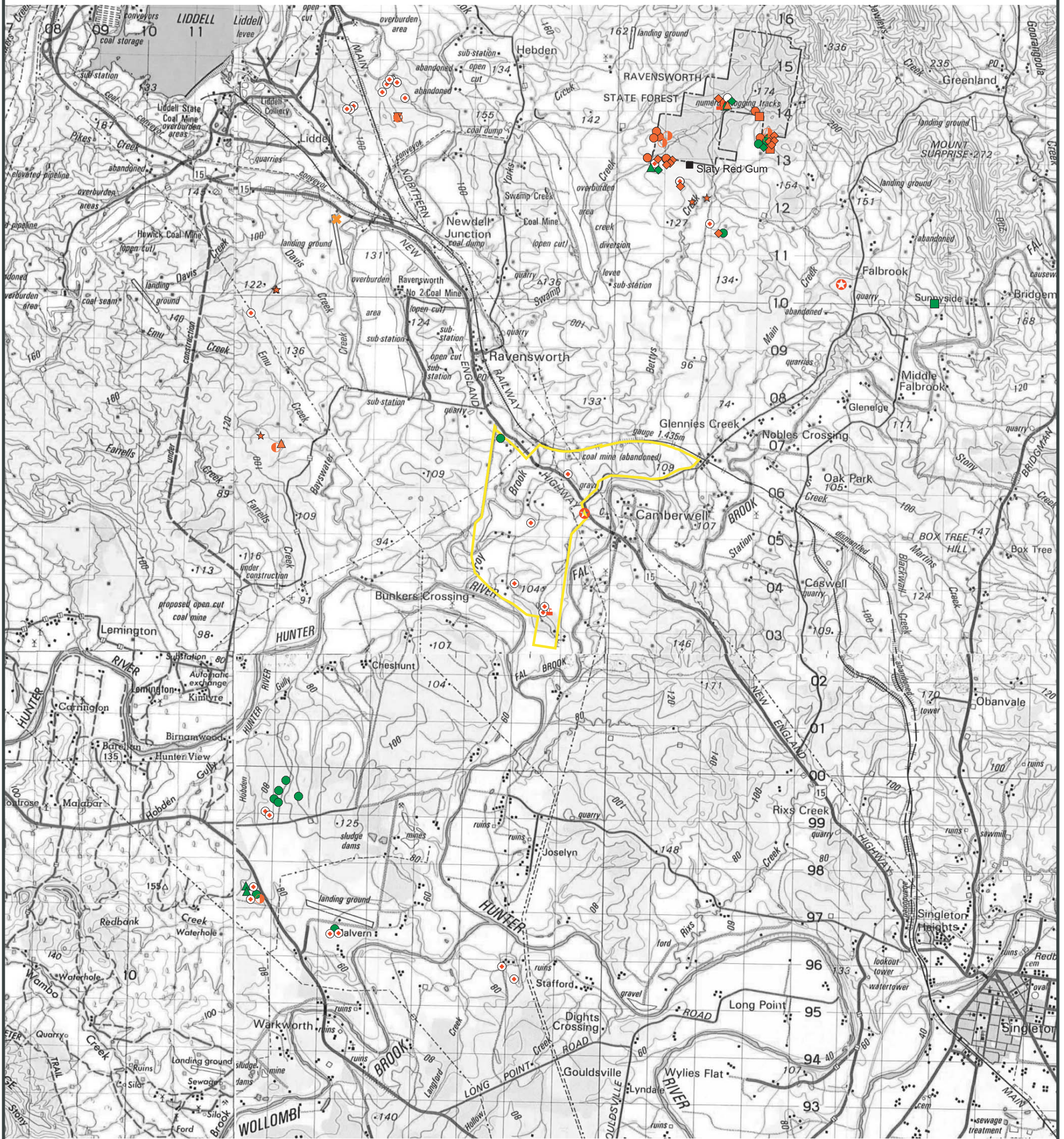
LITERATURE REVIEW

Various sources of published information are available on flora and fauna within the Application Area and surrounding areas. The following were reviewed in the preparation of this assessment.

- HLA-Envirosciences (2001) Environmental Impact Statement Ashton Coal Project Volume 1;
- ERM (2005) Final Ashton Coal Bi-annual Fauna Monitoring Autumn Census, September 2005;
- ERM (2006a) Final Flora and Fauna Baseline Monitoring Bowman's Creek, October 2006;
- ERM (2006b) Final Ashton Coal Bi-annual Fauna Monitoring Summer Census, September 2006;
- Parsons Brinckerhoff (2004a). Ashton Coal Project Pre-clearing Flora and Fauna Surveys – Combined Report;
- Parsons Brinckerhoff (2004b). Ashton Coal – Southern Woodland Preliminary Ecological Assessment; and
- Witter, D (2002) Ashton Coal Mining Project Environmental Impact Statement: Aboriginal Archaeology, June 2002.

A search of the DEC Wildlife Atlas database was conducted for all recent records of threatened flora and fauna (see *Figure 2.1*) within a 10-kilometre radius of the Application Area. A search of the on-line database maintained by the Commonwealth Department of the Environment and Heritage (DEH) was conducted in order to identify the likely presence of nationally listed threatened and migratory species in the locality.

All flora and fauna database records were analysed to determine the likelihood that threatened flora and fauna could occur within habitats on the Application Area. It should be noted that the DEH search is based on habitat requirements rather than actual records, and the assessment is based on those listed species likely to inhabit the Application Area.



Legend

- | | | |
|---|--|---|
| <ul style="list-style-type: none"> ■ Black-chinned Honeyeater (eastern subspecies) ● Brown Treecreeper ◆ Diamond Firetail ▲ Eastern Bentwing-bat ▼ Eastern Freetail-bat ★ Green and Golden Bell Frog ○ Grey-crowned Babbler (eastern subspecies) ■ Grey-headed Flying-fox | <ul style="list-style-type: none"> ○ Hooded Robin ★ Koala ○ Large-footed Myotis × Masked Owl ■ Red Goshawk ● Speckled Warbler ◆ Spotted-tailed Quoll ▲ Squirrel Glider | <ul style="list-style-type: none"> ■ Slaty Red Gum |
|---|--|---|

Source: DEC Atlas Data Search - Cessnock & Camberwell Sheets

Figure 2.1 Threatened Species Records within a 10km radius



2.2 *FLORA SURVEY METHODOLOGY*

Previous assessments conducted over the mine lease area and aerial photography were used to identify broad vegetation communities within and adjacent to the Application Area. The disturbance history was assessed from previous surveys, noting the occurrence of grazing, logging/clearing, rubbish dumping and weeds encroachment.

2.3 *FAUNA SURVEY METHODOLOGY*

An assessment of the diversity and general habitat value of the Application Area was undertaken by appraising the extent of likely habitat, searching for secondary indications of threatened species and incidental observations during previous surveys. The assessment considered the following:

- continuity with similar habitat adjacent to the Application Area, or connection with similar habitat outside the mine lease area;
- percentage cover of nesting/shelter/basking sites such as tree hollows, leaf litter, ground exposures, logs, vegetation and rock outcrops;
- presence of freshwater aquatic habitats such as streams, swamps and pools;
- cover abundance of dominant canopy species; and
- the extent and nature of previous disturbances.

The presence of flowering eucalypts and other plants were recorded as these may provide foraging resources for threatened species such as squirrel gliders and honeyeaters.

Habitat use by fauna was documented through analysis of tracks, scats, diggings, feathers and other evidence. Previous surveys were conducted opportunistically and included:

- searches for whitewash, prey remains and owl pellets;
- searches for obvious nests of raptors;
- investigation of any possible den sites for tiger quoll;
- searches for characteristic scats, tracks and diggings; and
- checking trees for scratches consistent with arboreal mammals.

3.1 FLORA SURVEYS

3.1.1 *Vegetation Communities*

The Application Area has been disturbed through grazing and clearing. Weed encroachment is most evident adjacent to roads and tracks (ie. prickly pear). Two vegetation communities were identified within the Application Area being grassland and open grassy woodland.

Open Grassy Woodland

This community is represented in the southern woodland with isolated pockets scattered in the southern section of the Application Area. The open grassy woodland is dominated by *Allocasuarina luehmannii* (bullock) and the sub-dominant species *Eucalyptus crebra* (narrow-leaved ironbark), *Eucalyptus melliodora* (yellow box) and *Eucalyptus moluccana* (grey box).

The understorey consists of juvenile specimens of the canopy species and a relatively sparse shrub layer dominated by *Acacia amblygona*, *Daviesia genistifolia*, *Acacia linifolia* (flax-leaved wattle), *Lycium ferocissimum* (African boxthorn) and *Eremophila deserti*.

The percentage cover of the ground layer varied being most dense within the open grassy areas (refer to *Photograph 1*) and least dense within the areas dominated by bull oak due to the dense layer of *Allocasuarina* needles (refer to *Photograph 2*). Ground cover species included *Aristida vagans*, *Cymbopogon refractus*, *Dichelachne rara*, *Microlaena stipoides*, *Lomandra glauca*, *Cheilanthes sieberi* and *Dichondra repens*.

Grassland

Two grassland sub-communities occur, namely dry pasture and pasture that has been improved in the past. Within the areas of dry pasture, isolated trees exist and some regeneration is occurring. Scattered trees noted include *Allocasuarina luehmannii*, *Eucalyptus crebra*, *Eucalyptus melliodora* and *Eucalyptus moluccana*. Scattered shrubs of *Maireana microphylla* (eastern cotton bush) and *Acacia amblygona* (fan wattle) occur. Exotic species such as the woody weed *Lycium ferocissimum* (African boxthorn) occur below the canopy of the isolated trees.

The improved pasture community is located on the alluvial creek flats. Many exotic herbaceous species are present. Species used to improve the pasture for grazing value include *Lolium sp.* (rye grass), *Chloris gayana* (rhodes grass), *Paspalum dilatatum* (paspalum), *Medicago sativa* (lucerne), *Trifolium repens*



Photograph 1

Open grassy woodland.



Photograph 2

Open grassy woodland dominated by Bullock.

Photographs

ACOL - Subsidence Management Plan, LW1- 4
Flora and Fauna Subsidence Management Plan

(white clover) and *Pennisetum clandestinum* (kikuyu). Additional common pasture species noted include *Aristida vagans*, *Cymbopogon refractus*, *Dichelachne rara*, *Microlaena stipoides* and *Lomandra glauca*. The percentage cover of the ground layer varies with grazing intensity.

3.1.2 *Threatened Flora Species*

No threatened flora species were recorded within the Application Area during the various surveys.

The DEC database search identified one threatened flora species within ten kilometres of the Application Area. Habitat for three threatened flora species has been recorded on the DEH database within ten kilometres of the Application Area being, *Diuris tricolor* (tricolour diuris), *Eucalyptus glauca* (slaty redgum) and *Thesium australe* (austral toadflax). Each species was assessed to their likelihood of occurrence.

The river red gum population in the Hunter Catchment listed as an endangered population under Part 2 Schedule 1 of the TSC Act 1995 was identified adjacent to Bowman's Creek to the west of the subsidence impact zone during previous investigations (ERM, 2006a). This population will not be impacted by the current proposal.

3.2 *FAUNA*

3.2.1 *Habitat Assessment*

The Application Area contains two broad habitat communities being open grassy woodland and grassland. The myrtaceous tree species in the canopy and the sparse shrub layers would provide a year-round seasonal foraging resource for nectivorous birds and mammals (*Eucalyptus paniculata* flowers May to January, *Eucalyptus melliodora* flowers September to February and *Eucalyptus moluccana* flowers January to May). The variety of tree species would provide suitable feeding/foraging resources for folivorous fauna such as the common brushtail possum and insectivorous birds such as treecreepers. The limited number mature eucalypt trees provide hollows capable of providing shelter and breeding habitat for a number of bird and arboreal mammal species.

The grasses and sedges provide seed and stem resources for granivorous and herbivorous species. The *Allocasuarina* species in the mid-storey and understorey strata may also provide a limited seasonal foraging resource for highly mobile granivorous fauna such as black-cockatoos. The *Allocasuarina* species and eucalypts also provide suitable nesting habitat for the grey-crowned babbler. Understorey species such as *Lycium ferocissimum* provide foraging resources for many species favouring fruits and berries.

This habitat type has a moderate layer of leaf litter (five centimetres deep), fallen logs and rock outcrops that provide sheltering resources for small ground-dwelling mammals and reptiles. The grassy understorey and fallen timber also provides a suitable foraging substrate for the grey-crowned babbler and speckled warbler.

Aquatic habitat is provided within the numerous farm dams, as well as within the adjacent Bowmans Creek, Glennies Creek and the Hunter River. These water resources provide permanent and ephemeral habitat for aquatic avifauna and amphibians as well as a drinking resource for many native species.

3.2.2 *Threatened Fauna Species*

Previous surveys conducted by ERM (ERM, 2005; ERM 2006b) identified the presence of two bird species and three microchiropteran bat species listed as vulnerable under the TSC Act 1995. A survey conducted by Parsons Brinckerhoff identified the presence of the grey-headed flying fox (Parsons Brinckerhoff, 2004b).

Three *Pyrrholaemus sagittatus* (speckled warbler) have been observed foraging in the southern woodland (ERM, 2006b). Speckled warblers prefer a range of eucalypt dominated communities supporting a grassy understorey within gullies or rocky ridges. Nests are built with a side entrance in areas of dense branches and other litter. Habitat ranges are up to 10 hectares.

Pomatostomus temporalis (grey-crowned babbler) have been commonly encountered within the southern woodland and near the Bowmans Creek oxbow. The family group occupying the southern woodland was reported to have increased from eight birds in September 2004 to twelve in January 2005 with the number of nests increasing from two to six respectively (Parsons Brinckerhoff, 2004b). The most recent survey (ERM, 2006b) reported that the number of grey-crowned babblers within the Application Area appeared to be stable at around eleven individuals, with a total of eleven nests identified.

Mormopterus norfolkensis (eastern freetail-bat), *Miniopterus schreibersii oceansis* (eastern bent-wing bat) and *Myotis adversus* (large-footed myotis) were recorded within the southern woodland during previous surveys (ERM, 2006b). The Application Area provides potential hunting and roosting habitat for *Mormopterus norfolkensis* and hunting habitat only for *Miniopterus schreibersii oceansis* and *Myotis adversus*.

Pteropus poliocephalus (grey headed flying fox) was recorded during previous investigations within the southern woodland (Parsons Brinckerhoff 2004b). The Application Area provides a seasonal foraging resource for this species in the form of flowering eucalypts. No suitable roost sites are available.

Marine mammals and shoreline birds were excluded from the threatened species assessment, as it is reasonable to assume they are not present or

dependent on habitats within the site. Those species identified as having a moderate to high likelihood of occurring within the Application Area (see *Table 3.1*) have been collectively assessed in the threatened species assessment in *Chapter 5*.

A full list of fauna species recorded on site during the various surveys has been included in *Annex A*.

Table 3.1 Likelihood of Threatened Fauna Occurring within the Application Area

Common/Scientific Name	TSC Act	EPBC Act	Preferred Habitat	Likelihood of Occurrence
Flora				
<i>Eucalyptus glaucina</i> slaty red gum	V	V	Prefers grassy woodland and dry eucalypt forest on deep moderately fertile soil.	Moderate. Potential habitat is available along the riparian corridors and within the southern woodland.
<i>Diuris tricolor</i> pink donkey orchid	V	V	Grows in sclerophyll forest among grass, often with native cypress pine. It is found in sandy soils, either on flats or small rises.	Low. Preferred sandy soils and vegetation associations are not available within the Application Area.
<i>Digitaria porrecta</i> finger panic grass	E	E	Found in native grassland, woodlands or open forest with a grassy understorey, on richer soils. In NSW it is found on the north west slopes and plains, from near Moree south to Tambar Springs and from Tamworth to Coonabarabran.	Moderate. Potential habitat is available although this species has not been recorded within the local area.
<i>Thesium australe</i> austral toadflax	V	V	Occurs in grassland or grassy woodland in association with kangaroo grass (<i>Themeda australis</i>).	Moderate. Potential habitat is available although this species has not been recorded within the local area.
Birds				
<i>Tyto novaehollandiae</i> masked owl	V	-	Dry sclerophyll forest and woodland with a low sparse understorey, foraging in open or partly cleared land. Roosting and nest sites in large tree hollows in sheltered aspects.	Moderate. Potential hunting habitat is available through the Application Area although suitable roosting hollows are limited.
<i>Ninox connivens</i> barking owl	V	-	Open woodlands and dry open forests, nesting in the crown of mature trees.	Moderate. Potential hunting habitat is available through the Application Area although suitable

Common/Scientific Name	TSC Act	EPBC Act	Preferred Habitat	Likelihood of Occurrence
<i>Melithreptus gularis gularis</i> black-chinned honeyeater	V	-	Dry forests and woodlands particularly along rivers.	roosting hollows are limited. Moderate to high. Potential habitat is available along the riparian corridors and within the southern woodland.
<i>Erythroriorchis radiatus</i> red goshawk	E	V	Prefers woodlands and forests with a mosaic of vegetation types that contain permanent water. Nests may be up to 1 km away from a permanent freshwater.	Moderate. Potential habitat is available within the southern woodland although it does not contain a mosaic of vegetation types preferred by this species. This species has not been recorded within the local area.
<i>Climacteris picumnus</i> brown treecreeper	V	-	Drier forests and woodlands particularly among fallen timber.	Moderate to high. Potential habitat is available within the southern woodland.
<i>Stagonopleura guttata</i> diamond firetail	V	-	Found in grassy eucalypt woodlands, including box-gum woodlands and snow gum woodlands. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.	Moderate to high. Potential habitat is available within the southern woodland.
<i>Pyrrholaemus sagittatus</i> speckled warbler	V	-	Lives in a wide range of eucalypt dominated communities that have a grassy understorey. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	High. Preferred habitat is available within the southern woodland. This species has been recorded within the Application Area.
<i>Lathamus discolor</i> swift parrot	E	E	Migratory species frequenting eucalypt forest and woodland, following winter flowering eucalypts (eg. swamp mahogany). Breeds in Tasmania.	Low to moderate. Preferred seasonal habitat is limited within the Application Area.

Common/Scientific Name	TSC Act	EPBC Act	Preferred Habitat	Likelihood of Occurrence
<i>Melanodryas cucullata cucullata</i> hooded robin	V	-	Prefers open woodland, acacia scrub, mallee or clearings.	Moderate to high. Potential habitat is available within the Application Area, particularly within the southern woodland.
<i>Pomatostomus temporalis</i> grey-crowned babbler	V	-	Open woodlands dominated by mature eucalypts, with regenerating trees, tall shrubs and an intact cover of grass and forbs. Also along streams in cleared areas.	High. This species has been recorded within the Application Area and is known to nest within the southern woodland.
<i>Xanthomyza phrygia</i> regent honeyeater	E	E,M	Nomadic species following rich sources of nectar, primarily winter flowering species.	Low to moderate. Preferred seasonal habitat is limited within the Application Area.
Mammals				
<i>Chalinolobus dwyeri</i> large-eared pied bat	V	V	Roosts in caves. Variety of habitat types including dry and wet sclerophyll forest and tall open eucalypt forest with a rainforest sub-canopy.	Moderate. Potential hunting habitat only is available within the southern woodland. Suitable roosting sites are not present.
<i>Dasyurus maculatus</i> spotted-tail quoll	V	E	Wide range of forested habitats including rainforest, open forest, coastal heath, riparian forest. Nests in caves, hollow logs or tree hollows.	Low to moderate. Potential habitat is available within the southern woodland although the high levels of surrounding disturbance and the open nature of the shrub layer may deter this species.
<i>Miniopterus australis</i> little bentwing-bat	V	-	Roosts in caves, old mines, stormwater channels; forages below the forest canopy.	Moderate to high. Potential hunting habitat only is available across the Application Area. Suitable roosting sites are not present.
<i>Miniopterus schreibersii oceanensis</i> eastern bentwing-bat	V	-	Roosts in caves, old mines, stormwater channels; forages above the forest canopy.	High. Potential hunting habitat only is available across the Application Area. Suitable roosting sites are not present. This species has been recorded within the southern woodland.

Common/Scientific Name	TSC Act	EPBC Act	Preferred Habitat	Likelihood of Occurrence
<i>Mormopterus norfolkensis</i> eastern freetail-bat	V	-	Wide range of forested habitats including rainforest to dry open forest. Roosts in tree hollows and under loose bark.	High. Potential hunting and roosting habitat is available across the Application Area. This species has been recorded within the southern woodland.
<i>Myotis adversus</i> large-footed myotis	V	-	Roosts in caves, tunnels, under bridges and in dense vegetation. Forages over nearby lakes, rivers, large streams.	High. Potential hunting habitat only is available across the Application Area. Suitable roosting sites are not present. This species has been recorded within the southern woodland.
<i>Nyctophilus timoriensis</i> greater long-eared bat	V	V	Inhabits a variety of vegetation types, including mallee, bullocke and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	Moderate to high. Potential hunting and roosting habitat is available across the Application Area.
<i>Scoteanax rueppellii</i> greater broad-nosed bat	V	-	Rivers and creeks within the ranges, roosting in tree hollows.	Moderate to high. Potential hunting and roosting habitat is available across the Application Area, particularly within the riparian corridors and the southern woodland.
<i>Petaurus norfolcensis</i> squirrel glider	V	-	Dry sclerophyll forest and remnant woodland containing mature or mixed aged stands with gum-barked and winter flowering trees, and mature <i>Acacia</i> species. Nests socially in tree hollows.	Moderate to high. Suitable foraging and nesting habitat is available within the southern woodland.

Common/Scientific Name	TSC Act	EPBC Act	Preferred Habitat	Likelihood of Occurrence
<i>Petaurus australis</i> yellow-bellied glider	V		Prefer areas of high rainfall in tall mature eucalypt forest, moist coastal gullies, creek flats and tall montane forest.	Low to moderate given the lack of suitable habitat. A tentative identification from an audible call was made (2001, White Mining EIS) however it is unlikely to occur in the Application Area due to lack of suitable habitat.
<i>Petrogale penicillata</i> brush-tailed rock-wallaby	E	V	Occupy north facing cliffs in dry eucalypt forest and woodland. They shelter in rock crevices, caves or overhangs during the day, feeding in grassy areas above and below the cliffs in the evening.	Low. No suitable habitat is available within the Application Area.
<i>Phascolarctos cinereus</i> koala	V	-	Forests typically on high nutrient soils characterised by presence of preferred feed trees.	Moderate. A koala was recorded in 1984 in the northeastern corner of the Application Area however no recent records or habitat use has been recorded since then. Koalas are not likely to utilise the habitat within the Application Area.
<i>Pseudomys oralis</i> hastings river mouse	V	-	Damp, dense fern or sedge understorey along drainage lines, but also utilises drier areas with grassy or heathy ground cover.	Moderate to high. Potential habitat is available across the Application Area.
<i>Pteropus poliocephalus</i> grey-headed flying-fox	V	V	Forages on fruits, blossoms and nectar of eucalypts. In early summer roosts in large groups (camps) in forests or mangroves.	High. Seasonal foraging habitat is available within the Application Area. No suitable roost sites were noted. This species has been recorded within the southern woodland.
Frogs <i>Litoria aurea</i> green and golden bell frog	V	V	In NSW the species occupies disturbed habitats and breeds largely in ephemeral ponds.	Moderate. This species has been recorded within the locality. The habitat present within the Application Area provides only marginal habitat due to the lack of emergent aquatic vegetation.

Common/Scientific Name	TSC Act	EPBC Act	Preferred Habitat	Likelihood of Occurrence
<i>Mixophyes iteratus</i> southern barred frog	V	V	Forage and live amongst deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest at elevations below 1000 m. Breeds around shallow, flowing rocky streams.	Low. No preferred habitat available within the Application Area.
Status in NSW as per Schedules 1 and 2 of TSC Act: E = Endangered; V = Vulnerable. Status as per EPBC Act: E = Endangered; V = Vulnerable; M = Migratory				

The most direct environmental impact of underground mining is subsidence, which causes changes in the level of the ground surface. Predicted maximum subsidence over longwalls 1 to 4 is shown in *Table 4.1*.

Table 4.1 Subsidence Predictions

Longwall Panels	Max. Vertical Subsidence (m)	Max. Tensile Strain (mm/m)	Max. Compressive Strain (mm/m)	Max. Tilt (mm/m)
North End of LW1	1.8	73	98	244
Remainder of LW1	1.7	42	56	141
LW2	1.6	30	41	102
LW3 and LW4	1.6	23	31	78

Source: SCT, 2006

SCT (2006) states that maximum tilts of 80-140 mm/m and horizontal strains of 20-40 mm/m in tension and 30-60 mm/m in compression are expected to develop over most of the Application Area as a result of the proposed mining. Localised high levels of strain and tilt are expected in areas where the overburden depth is less than 60m near the northern end of longwall 1 (SCT, 2006).

The following section predicts impacts on flora and fauna. These include tilt, strain, subsidence, clearing, noise and alterations to watertable levels and surface water flows.

4.1

FLORA

All of those threatened flora species likely to occur within the Application Area as detailed in *Table 3.1* have been collectively referred to within this impact assessment.

i. Tilt

Subsidence will cause a trough centred above each longwall panel. Subsidence troughs are formed through the vertical settlement of rock into the void created as the coal is removed between the chain pillars. As a trough is formed, the ground surface is subjected to certain tilts and strains depending on the geology, depth of cover, panel dimensions and position above the panel.

Surface cracking and tilting are expected to cause some groups of trees to lean permanently at tilts of up to 150mm/m. Some individual trees with roots directly impacted by surface cracks may fall over altogether (SCT, 2006). Conversely any trees leaning away from the subsidence induced tilt would be straightened. It is unlikely that any isolated falls that may occur would significantly alter the community composition.

Tilt will not affect shrubs, herbs or grasses, as they are too short to exert significant leverage on root systems. Tilting due to subsidence will not cause measurable short or long term damage to any threatened plants or endangered ecological communities within the Application Area.

ii. Strain

Tensile strains pull on structures commonly damaging inflexible material by stretching and rupturing. Over most of the Application Area predicted subsidence will cause maximum tensile strains of 20-40 mm/m and maximum compressive strains of 30-60 mm/m (SCT, 2006). Tension cracks reaching a maximum of several hundred millimetres and compression humps of 0.5m are predicted for the longwall panels 1 to 4 (SCT, 2006).

This will have little impact on plant roots due to their inherent flexibility. Compressive and tensile strains caused by subsidence act on plant roots much the same as a high wind. In windy weather, particularly on the leeward side of trees, roots are compressed as the trunk sways away from the wind. Roots on the windward side are placed under tension, although this alternates with compression as the trunk sways back and forth.

iii. Ponding

Temporary or permanent ponding of water in flat lying areas following heavy rain or flooding is a potential effect of vertical subsidence. Temporary ponding may occur in areas of water accumulation due to the progress of the longwall face, and will generally cease to be an issue once the face progresses. Permanent ponding may occur where a depression remains once the longwall face has passed.

Subsidence associated with longwall panel 4 in the vicinity of the flats along Bowmans Creek may result in localised ponding of surface runoff in these areas following rainfall. Ponding of water for an extended time may kill the submerged grasses in the area or result in a change in the vegetation composition.

iv. Lowering of the Watertable Beyond the Reach of Plants

There have been no groundwater dependent ecosystems identified over longwall panels 1 to 4, although a series of small dams supporting aquatic vegetation exist across the Application Area. Anecdotal evidence suggests that these dams are not groundwater fed and lowering of the water table will not directly impact any aquatic vegetation.

v. *Subsiding Vegetation into the Groundwater Zone*

Subsiding vegetation communities close to the water table could potentially affect individual plants. For example, subsiding a dry community into the water table could cause dieback and a transition to those species more suited to wet conditions. Subsiding a wet community further into the water table may extend or improve this community.

Given the nature and depth of the groundwater system it is not expected that plant communities would be subsided into the groundwater zone.

vi. *Clearing*

Cracking is likely to occur across the Application Area although it is not expected that clearing of vegetation associated with significant remediation works will be required. It may be more difficult to remediate surface cracking that occurs through the woodland areas, meaning that cattle would need to be restricted in these areas until such times as natural remediation had filled the cracks.

vii. *Cumulative Impacts*

Farming, grazing and the nearby open cut mines have resulted in native vegetation clearance. The minor impacts of the Ashton Coal longwall panels 1 to 4 will not significantly increase the effects of the surrounding native vegetation clearance and associated impacts.

4.2 FAUNA

All of those threatened fauna species likely to occur within the Application Area have been collectively referred to within this impact assessment.

i. *Vegetation Loss*

Minimal vegetation clearance is expected to occur, if any. The proposed longwall mining is not likely to isolate or reduce the extent of the local vegetation communities present. The proposal will not remove fallen timber, which provides a foraging resource for the grey-crowned babbler or reduce the grassy foraging habitat for the speckled warbler.

ii. *Rock Shelters and Burrows*

Bats may roost in existing rock cracks and a number of burrowing animals such as wombats are known to occur within the locality. Subsidence may widen or close these fissures and burrows. It is not possible to quantify the likelihood or number of crack closures or burrow collapses. Whilst subsidence could threaten roosting and shelter sites, similar habitat is common within the local area. In some cases, cracking may actually increase the total roosting and shelter habitat for threatened species within the Application Area.

iii. Aquatic Habitats

Bowmans Creek, Glennies Creek and the Hunter River are not expected to be directly impacted by the proposed mining activities and no perceptible impacts to channel morphology are anticipated directly from subsidence movements.

Subsidence will alter the topography within the Application Area, potentially impacting on surface catchment flow patterns and altering the minor drainage lines. It will cause a marginal decrease in the surface water inflow to Bowmans Creek although this is unlikely to impact on the quality of the aquatic habitats given the large seasonal and environmental variations already experienced within Bowmans Creek (ERM, 2006a).

iv. Aquatic Habitats (Drying of Springs, Soaks and Dams)

Subsidence may cause surface cracking and a consequent reduction in yield from soaks and springs. Whilst the loss of individual springs cannot be discounted, it is unlikely there will be significant changes to the way groundwater is released to receiving watercourses.

Dams across the Application Area do not need draining ahead of mining. The farm dams have relatively low aquatic habitat value and the Application Area is bordered by Bowmans Creek, Glennies Creek and the Hunter River, which provide an alternate water source for native fauna. Impacts from the underground mining of longwalls 1 to 4 are unlikely to significantly impact this habitat resource such that a local population of threatened species would be placed at risk.

v. Cumulative Impacts

Farming, grazing and the nearby open cut mines have resulted in native vegetation and associated habitat clearance. The minor impacts of the longwall panels 1 to 4 are unlikely to cumulatively increase the effects of the surrounding native vegetation clearance and subsequent habitat loss.

5.1 ASSESSMENT OF SIGNIFICANCE

The assessment of significance addresses the potential impact of longwall 1 to 4 on threatened species, populations and ecological communities which have been recorded on the Application Area or have a moderate or high likelihood of occurring on the Application Area.

The following assessment is based on the Assessment of Significance in Section 5A of the *EP&A Act* as amended by the *Threatened Species Amendment Act 2004*. These factors allow a determination of whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats.

- a) *In the case of threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*

Avifauna

The speckled warbler and grey-crowned babbler have been recorded within the Application Area. Other records with a moderate to high likelihood of occurrence within the Application Area include the brown treecreeper, black-chinned honeyeater, hooded robin and diamond firetail.

Pyrrholaemus sagittatus (speckled warbler)

The speckled warbler has been recorded foraging amongst leaf litter within the Application Area (ERM, 2006b). No nests were confirmed however the breeding range is approximately 10 hectares. Given the extent of the southern woodland, the conserved habitat should be large enough to sustain a viable population of this species provided that the necessary habitat resources (ie dense shrub and grass layer) are retained.

The proposed longwall mining will result in surface cracking and tilting causing some trees to lean permanently. It is not expected that clearing of vegetation associated with significant remediation works will be required. It may be more difficult to remediate surface cracking that occurs through the woodland areas, meaning that cattle would need to be restricted in these areas until such times as natural remediation had filled the cracks. The exclusion of cattle from the southern woodland would further benefit this species. The proposed mining is not likely to adversely affect the lifecycle of the speckled warbler population such that it is placed at risk of extinction.

Pomatostomus temporalis (grey-crowned babbler)

The home range of the grey-crowned babbler can reach 12 hectares (Frith, 1982). Previous surveys have identified a breeding population within the Application Area. A eleven nests are have been mapped within the southern

woodland. A separate population has been identified within the mine lease area on the northern side of the New England Highway.

The proposed longwall mining will result in surface cracking and tilting causing some trees to lean permanently. This is unlikely to alter the community composition or significantly reduce the extent of potential nest sites. It is not expected that clearing of vegetation associated with significant remediation works will be required. It may be more difficult to remediate surface cracking that occurs through the woodland areas, meaning that cattle would need to be restricted in these areas until such times as natural remediation had filled the cracks. The exclusion of cattle from the southern woodland would further benefit this species. The proposed mining is not likely to adversely affect the lifecycle of the grey-crowned babbler population such that it is placed at risk of extinction.

Melithreptus gularis gularis (black-chinned honeyeater)

The black-chinned honeyeater was not recorded on site during the various fauna monitoring events (ERM, 2005; ERM 2006b). The black-chinned honeyeater prefers dry forests and woodlands particularly along rivers. The proposed longwall mining will not result in significant impact to the woodland habitat within the Application Area and the proposal is not likely to adversely impact on potential nest sites. The proposal will not impact the lifecycle of any local population such that it is placed at risk of extinction.

Climacteris picumnus (brown treecreeper)

The brown treecreeper prefers drier forests and woodlands particularly among fallen timber. This species was not recorded on site during the various fauna monitoring events (ERM, 2005; ERM 2006b) although the southern woodland provides potential foraging and nesting habitat.

The proposed longwall mining will result in surface cracking and tilting causing some trees to lean permanently. This is unlikely to alter the community composition or significantly reduce the extent of potential nest sites. It is not expected that clearing of vegetation associated with significant remediation works will be required. No fallen timber will be removed during the proposed longwall mining and will be no significant impact to the foraging or breeding habitat of the brown treecreeper such that it is placed at risk of extinction.

Melanodryas cucullata cucullata (hooded robin)

The hooded robin prefers lightly wooded country, usually open eucalypt woodland, Acacia scrub and mallee, often in or near clearings or open areas. Preferred habitat is structurally diverse with four stratum present. The territories range from between 10 to 30 hectares during breeding and non-breeding seasons respectively. Breeding occurs between July and November. This species was not recorded on site during the various fauna monitoring

events (ERM, 2005; ERM 2006b) although the southern woodland provides potential foraging and nesting habitat.

The proposed longwall mining will result in surface cracking and tilting causing some trees to lean permanently. This is unlikely to alter the community composition or significantly reduce the extent of potential nest sites. It is not expected that clearing of vegetation associated with significant remediation works will be required. There will be no significant impact to the foraging or breeding habitat of the hooded robin such that it is placed at risk of extinction.

Stagonopleura guttata (diamond firetail)

The diamond firetail prefers grassy woodlands near riparian areas nesting in dense shrubs or higher up in globular shaped nests. The diamond firetail forages on seeds and stem resources of grasses, herbs and shrubs. This species was not recorded on site during the various fauna monitoring events (ERM, 2005; ERM 2006b) although the southern woodland provides potential foraging and nesting habitat.

The proposed longwall mining will result in surface cracking and tilting causing some trees to lean permanently. This is unlikely to alter the community composition or significantly reduce the extent of potential nest sites. It is not expected that clearing of vegetation associated with significant remediation works will be required. There will be no significant impact to the foraging or breeding habitat of the diamond firetail such that it is placed at risk of extinction.

Minimal disturbance to the resources within the Application Area is expected as a result of the predicted subsidence. No hollow bearing trees will be removed and riparian habitat will not be directly impacted as a result of the proposed extraction. The proposed longwall mining is therefore unlikely to affect the breeding cycle, roosting or foraging behaviour of the threatened bird species assessed.

Microchiropteran bats

Eastern freetail-bat, eastern bentwing-bat and large-footed myotis have been recorded on the Application Area. The little bentwing-bat, greater broad-nosed bat and greater long-eared bat have been assessed as having a moderate to high likelihood of occurring within the Application Area.

Mormopterus norfolkensis (eastern freetail-bat)

The eastern freetail-bat occurs within a wide range of forested habitats including rainforest to dry open forest. This species roosts in tree hollows and under loose bark. The proposed longwall mining will not result in the removal of any hollow bearing trees or reduce the extent of potential hunting habitat. The lifecycle of the eastern freetail-bat will not be impacted such that a viable population will be placed at risk of extinction.

Miniopterus schreibersii oceanensis (eastern bentwing-bat) and *Miniopterus australis* (little bentwing-bat)

The bentwing-bats roost in caves, old mines, stormwater channels and forage above and below the forest canopy. The eastern bentwing bat has been recorded within the Application Area and the little bentwing bat has a moderate to high likelihood of occurrence. The proposed longwall mining will may actually increase the roosting habitat available for the bentwing-bats and will not impact the availability or extent of suitable hunting habitat. The lifecycle of these species will not be impacted such that a viable population will be placed at risk of extinction.

Myotis adwersus (large footed myotis)

The large-footed myotis roosts in caves, tunnels, under bridges and in dense vegetation and forages over nearby rivers and large streams. This species is expected to utilise the Application Area for hunting purposes only. Subsidence induced cracking may result in the loss of some potential hunting habitat within the farm dams, although the adjacent Bowmans Creek, Glennies Creek and the Hunter River will not be impacted by the proposal and provide a superior habitat resource. Therefore, the proposed longwall mining will not impact the lifecycle of this species such that a local viable population would be placed at risk of extinction.

Scoteanax rueppellii (greater broad-nosed bat)

The greater broad-nosed bat prefers tall wet forest however it is also found in woodland to moist dry eucalypt forest. It roosts in tree hollows and buildings. Potential habitat is available within the riparian corridors and the southern woodland.

The proposed longwall mining will result in surface cracking and tilting causing some trees to lean permanently. This is unlikely to alter the community composition or significantly reduce the extent of hollow bearing trees. It is not expected that clearing of vegetation associated with significant remediation works will be required and no hollow bearing trees will be removed. Therefore the lifecycle of the greater broad-nosed bat will not be impacted such a viable population is placed at risk of extinction.

Nyctophilus timoriensis (greater long-eared bat)

The greater long-eared bat inhabits a variety of vegetation types, including mallee, bulloke and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation. This species roosts in tree hollows, crevices, and under loose bark.

The proposed longwall mining will result in surface cracking and tilting causing some trees to lean permanently. This is unlikely to alter the community composition or significantly reduce the extent of hollow bearing trees. It is not expected that clearing of vegetation associated with significant

remediation works will be required and no hollow bearing trees will be removed. Therefore the lifecycle of the greater long-eared bat will not be impacted such a viable population is placed at risk of extinction.

The proposed longwall mining will not disturb roosting or foraging habitat required for these bats nor will it disrupt the breeding cycle of these species. These microchiropteran bats will not be placed at risk of extinction by the proposed longwall mining activities.

Mammals

The grey-headed flying fox has been recorded on the Application Area and squirrel glider has been recorded within the locality. Habitat is also available for the Hastings river mouse.

Pteropus poliocephalus (grey-headed flying fox)

The grey headed flying-fox forages on fruits, blossoms and nectar of eucalypts. This species roosts in large groups (camps) in forests or mangroves in early summer. This species has been recorded within the Application during previous surveys (Parsons Brinckerhoff, 2004b). No suitable roost sites are located within the Application Area however seasonal foraging habitat is available within the southern woodland.

The proposed longwall mining will result in surface cracking and tilting causing some trees to lean permanently. This is unlikely to alter the community composition or significantly reduce the extent of potential foraging habitat. It is not expected that clearing of vegetation associated with significant remediation works will be required. There will be no significant impact to the foraging habitat of the grey-headed flying-fox and the site does not contain suitable roosting habitat. Therefore, the proposed mining activities will not impact the lifecycle of this species such that a local extinction would occur.

Petaurus norfolcensis (squirrel glider)

The squirrel glider prefers dry sclerophyll forest and remnant woodland supporting gum-barked and winter flowering trees and nests socially in tree hollows. Potential habitat for this species is available within the southern woodland.

No hollow-bearing trees will be removed from the Application Area and nesting habitat of the squirrel glider will not be impacted by the proposed longwall mining. The proposal will result in surface cracking and tilting causing some trees to lean permanently. This is unlikely to alter the community composition or significantly reduce the extent of potential habitat. It is not expected that clearing of vegetation associated with significant remediation works will be required. There will be no significant impact to the foraging or breeding habitat of the squirrel glider such that it is placed at risk of extinction.

Pseudomys oralis (Hastings river mouse)

The Hastings river mouse prefers damp, dense fern or sedge understorey along drainage lines, but also utilises drier areas with grassy groundcover. Nesting is generally within gully areas, ridges or slopes. The Application Area provides potential habitat for this species, particularly within the southern woodland and riparian corridors. This species has not been recorded on site.

The proposed longwall mining will result in surface cracking although this is unlikely to alter the community composition or significantly reduce the extent of potential habitat for this species. It is not expected that clearing of vegetation associated with significant remediation works will be required. There will be no significant impact to the areas of potential habitat such that a local population of this species would be placed at risk of extinction.

- (b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.*

The river red gum population in the Hunter Catchment listed as an endangered population under Part 2 Schedule 1 of the TSC Act 1995 was identified adjacent to Bowman's Creek to the west of the subsidence impact zone during previous investigations (ERM, 2006a). This population will not be impacted by the current proposal.

- (c) *In the case of a critically endangered or endangered ecological community, whether the action proposed:*
- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

No endangered ecological communities have been recorded on the Application Area.

(d) *in relation to the habitat of a threatened species, population or ecological community:*

(i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*

The predicted levels of subsidence are unlikely to significantly modify the structure or availability of the habitat resources provided within the Application Area. It is not expected that clearing of vegetation associated with significant remediation works will be required.

(ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

The proposed longwall mining may result in isolated disturbance to vegetated areas as a result of subsidence induced erosion or surface cracking although it is not expected that clearing of vegetation associated with significant remediation works will be required. The disturbance is not likely to further fragment or isolate the habitat available within the Application Area.

(iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.*

The open grassy woodland is relatively well represented within the locality, although it currently provides only tenuous links with the surrounding vegetation. The proposed longwall mining may result in isolated disturbance to vegetated areas as a result of subsidence induced erosion or surface cracking although it is not expected that clearing of vegetation associated with significant remediation works will be required. The minimal amount of disturbance will not fragment important areas of connecting habitat given the existing tenuous links to surrounding vegetation.

(e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).*

At present, there is no critical habitat listed in the locality.

(f) *whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.*

A draft recovery plan for the Hastings river mouse has been prepared. The preparation of a flora and fauna assessment for threatened species is consistent with the relevant objectives of the recovery plan that include increasing the understanding of the ecology of the Hastings river mouse, identifying populations of the mouse through surveys and identifying habitat corridors. This species has not been recorded within the Application Area.

The property is monitored (general observations) for the presence of feral animals including the fox. If levels of activity are significant, culling techniques are carried out within the Application Area. Relevant threat abatement plans include predation by red fox.

g) *whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

At present there are 29 key threatening processes listed on Schedule 3 of the TSC Act 1995, as detailed in Table 5.1.

Table 5.1 Key Threatening Processes Listed in Schedule 3 of the TSC Act

Threatening Process	Applicable to Project
Alteration of natural flow regimes.	Yes
Alteration of habitat following subsidence due to longwall mining.	Yes
Bushrock removal resulting in the removal and/or disturbance of habitat for native species that may find shelter in or under rocks, use rocks for basking, or which grow in rocky areas.	No
Cane toad	No
Clearing of native vegetation.	Yes
Competition and grazing by the feral European rabbit (<i>Oryctolagus cuniculus</i>).	Yes
Competition and habitat degradation by feral goats.	No
Competition from feral honeybees <i>Apis mellifera</i> .	No
Death or injury to marine species following capture in shark control programs on ocean beaches.	No
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments.	No
Exotic vines and scramblers	No
Feral pigs - predation, habitat degradation, competition and disease transmission.	No
Herbivory and environmental degradation caused by feral deer.	No
High frequency fire resulting in the disruption of life cycle processes in plants and animal and loss of vegetation structure and composition.	No
Human caused climate change.	No
Importation of red imported fire ants into NSW.	No
Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations).	No
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis.	No
Infection of native plants by <i>Phytophthora cinnamomi</i> .	No
Introduction of the large earth bumblebee (<i>Bombus terrestris</i>).	No
Invasion of native plant communities by bitou bush and boneseed.	No
Invasion of native plant communities by exotic perennial grasses.	Yes
Invasion of yellow crazy ant.	No
Loss and/or degradation of sites used for hill-topping by butterflies.	No
Predation by mosquito fish (<i>Gambusia holbrooki</i>).	No
Predation by feral cat (<i>Felis catus</i>).	No
Predation by fox (<i>Vulpes vulpes</i>).	Yes
Predation by ship rat (<i>Rattus rattus</i>) on Lord Howe Island.	No
Removal of dead wood and dead trees.	Yes

Threatening processes relevant to the proposed modification are discussed below.

Alteration of habitat following subsidence due to longwall mining

Species and ecological communities that depend on aquatic and semi-aquatic habitats are particularly susceptible to the impacts of subsidence. Subsidence can also cause decreased stability of slopes and escarpments; lead to the contamination of groundwater by acid drainage, increased sedimentation, bank instability, creation or alteration of riffle and pool sequences, changes to flood behaviour, increased rates of erosion and deterioration of water (DEC, 2005). The proposed longwall mining and predicted subsidence levels will not adversely impact any aquatic habitats or threatened species as detailed in *Chapter 4*.

Alteration of natural flow regimes

There are no groundwater dependent ecosystems supported within the Application Area. Subsidence will alter the topography, potentially impacting on surface catchment flow patterns and altering the minor drainage lines. It will cause a marginal decrease in the water inflow to Bowmans Creek and temporarily increase the percolation characteristics of the strata. Localised ponding of water could result in concentrated water flows and associated erosion. Monitoring for surface drainage impacts, such as ponding, will be carried out before, during and after mining, utilising visual monitoring, and existing topographic surveys. Given the proposed monitoring and management procedures, the alteration of natural flow regimes is unlikely to be of a significant scale.

Clearing of native vegetation

The proposed longwall mining may result in isolated disturbance to vegetated areas as a result of subsidence induced erosion or surface cracking although it is not expected that clearing of vegetation associated with significant remediation works will be required. The disturbance will not result in significant impact to the habitat available within the Application Area.

*Competition and grazing by the feral European rabbit (*Oryctolagus cuniculus*)*

The Application Area is already affected by a feral European rabbit population. The proposed longwall mining will not result in an increase of rabbits within the Application Area. The collapse of warrens due to subsidence may actually assist in culling this feral population.

Invasion of native plant communities by exotic perennial grasses.

The impacts from extraction of longwall panels 1 to 4 will not result in an increase of invasive exotic perennial grasses given the grazing history across the Application Area and minimal disturbance to vegetation.

Predation by Fox (Vulpes Vulpes).

The existing fox population will not be affected by the extraction of longwall panels 1 to 4.

Removal of dead wood and dead trees

Whilst subsidence may result in isolated tree fall, no hollow bearing trees or fallen timber will be removed from the site.

5.2

COMMONWEALTH THREATENED AND MIGRATORY SPECIES

The Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act 1999 requires approval for actions that may have a significant impact on matters of national environmental significance or Commonwealth land. There are no World Heritage properties, National Heritage Places, Ramsar wetlands, Commonwealth marine areas or nuclear actions in or near the Application Area. Commonwealth listed ecological communities, threatened species and migratory species recorded or likely to occur on the Application Area have been listed in the table below.

Two threatened flora species and four fauna species listed as threatened in the EPBC Act have the potential to occur on the Application Area (see *Table 5.1*).

Table 5.1 *Matters of National Environmental Significance*

Species	Status	Likelihood of occurrence
Threatened Ecological Community		
Grassy white box woodlands	E	Low. Preferred vegetation associations are not present within the Application Area.
Threatened Flora		
<i>Digitaria porrecta</i>	E	Moderate. Potential habitat is available although this species has not been recorded within the local area.
<i>Diuris tricolor</i>	V	Low. Preferred sandy soils and vegetation associations are not available within the Application Area.
<i>Eucalyptus glaucina</i>	V	Moderate. Potential habitat is available along the riparian corridors and within the southern woodland.
<i>Thesium australe</i>	V	Moderate. Potential habitat is available although this species has not been recorded within the local area.

Species	Status	Likelihood of occurrence
Threatened Fauna		
<i>Xanthomyza phrygia</i> (regent honeyeater)	E, M	Low to moderate. Preferred seasonal habitat is limited within the Application Area.
<i>Lathamus discolor</i> (swift parrot)	E	Low to moderate. Preferred seasonal habitat is limited within the Application Area.
<i>Rostratula australis</i> (Australian painted snipe)	V	Low. Preferred habitat is not available within the Application Area.
<i>Litoria aurea</i> (green and golden bell frog)	V	Moderate. This species has been recorded within the locality. The habitat present within the Application Area provides only marginal habitat due to the lack of emergent aquatic vegetation.
<i>Chalinolobus dwyeri</i> (large eared pied pat)	V	Moderate. Potential hunting habitat only is available within the southern woodland. Suitable roosting sites are not present.
<i>Nyctophilus timoriensis</i> (greater long eared bat)	V	Moderate to high. Potential hunting and roosting habitat is available across the Application Area.
<i>Dasyurus maculatus maculatus</i> (spotted-tailed quoll)	E	Moderate given the potential nest sites supported on the Application Area.
<i>Petrogale penicillata</i> (brush tailed rock wallaby)	V	Low. No suitable habitat is available within the Application Area.
<i>Pseudomys oralis</i> (Hastings river mouse)	E	Moderate to high. Potential habitat is available across the Application Area.
<i>Pteropus poliocephalus</i> (grey-headed flying fox)	V	High. Seasonal foraging habitat is available within the Application Area. No suitable roost sites were noted. This species has been recorded within the southern woodland.
Migratory Birds		
<i>Haliaeetus leucogaster</i> (white bellied sea eagle)	M	Moderate. Potential hunting habitat is available within the nearby Hunter River.
<i>Hirundapus caudacutus</i> (white throated needletail)	M	Moderate. May forage aerially over the site.
<i>Monarcha melanopsis</i> (black-faced monarch)	M	Low. Species prefers rainforest, wet sclerophyll and denser eucalypt forests, damp gullies, and mangroves.
<i>Myiagra cyanoleuca</i> (satin flycatcher)	M	Low. Species prefers forest, particularly thick gullies.
<i>Rhipidura rufifrons</i> (rufous fantail)	M	Low. Species prefers rainforest.
<i>Gallinago hardwickii</i> (latham's snipe)	M	Low. No foraging and nesting habitat present.
<i>Rostratula benghalensis s. lat</i> (painted snipe)	M	Low. No foraging and nesting habitat present.
M: Migratory	V: Vulnerable	E: Endangered

Provided the environs continue to function as a wildlife corridor and winter flowering resources are retained, the proposed extraction is not expected to cause detrimental impacts upon the health of the remaining vegetation in the Application Area. The assessment of significance considered whether the proposed modification would:

1. decrease the size of a population;
2. reduce the area of occupancy of the species;

3. fragment an existing population;
4. adversely affect critical habitat;
5. disrupt the breeding cycle of a population;
6. affect the availability or quality of habitat to the extent that the species is likely to decline;
7. result in harmful invasive species becoming established on the Application Area; or
8. interfere with the recovery of the species.

The assessment of significance under state legislation concludes that threatened species, communities and populations are not going to be placed at risk of extinction by the proposed longwall extraction. Therefore, it is unnecessary to reassess the threatened species listed in the EPBC Act.

Eight migratory bird species have been identified as having the potential to occur within 10 kilometres of the Application Area. Six of these are terrestrial birds and two are wetland birds. Habitat for the wetland birds (Latham's snipe and painted snipe) is not provided on the Application Area.

The terrestrial migratory birds may occasionally use the Application Area as foraging habitat. However, as these species are wide-ranging with generalist habitat requirements, it is unlikely that the proposed extraction will have a significant impact on these migratory species. Therefore, the proposed modification will not:

1. substantially modify, destroy or isolate an area of important habitat of the migratory species;
2. result in harmful invasive species becoming established in the Application Area; or
3. disrupt the life cycle of an ecologically significant proportion of a population of the species.

The proposed extraction is not expected to have a significant effect upon the health and viability of any threatened or migratory species listed under the provisions of the EPBC Act. Given the proposed extraction will not impact on matters of national environmental significance, approval from the Commonwealth Minister for the Environment is not required.

CONCLUSION

The Application Area is characterised by open grassy woodland and grassland. No threatened flora species have been identified within the Application Area.

The river red gum population in the Hunter Catchment listed as an endangered population under Part 2 Schedule 1 of the TSC Act 1995 was identified adjacent to Bowman's Creek to the west of the subsidence impact zone during previous investigations. This population will not be impacted by the current proposal.

Six threatened fauna species have been identified within the Application Area, *Pteropus poliocephalus* (grey headed flying fox), *Miniopterus schreibersii oceansis* (eastern bentwing-bat), *Mormopterus norfolkensis* (eastern freetail-bat), *Myotis adversus* (large-footed myotis), *Pyrrholaemus sagittatus* (speckled warbler) and a breeding population of *Pomatostomus temporalis* (grey-crowned babbler). With consideration given to the predicted subsidence levels, the proposed longwall mining will not significantly impact any of these threatened species, nor will it significantly alter their habitat resources on the site and surrounding lands.

An additional 9 threatened fauna species are likely to utilise the site and surrounding habitats. Although none were located in the Application Area during the survey period, should any be present at other times of the year, they would be unlikely to be significantly impacted directly by the proposed longwall mining operations or indirectly through significant alteration to the habitat resources on the site and surrounding lands.

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Annex A

Fauna Species Recorded Within the Application Area

FAUNA SPECIES RECORDED IN THE STUDY

The following list includes all species of birds, mammals, reptiles and frogs observed in the Application Area. These records are based on field observations and literature searches.

Scientific and Common Names

Scientific names for each fauna assemblage are in accordance with the following references:

- Birds Christidis and Boles (1994)
- Mammals Strahan (1995)
- Reptiles Cogger (1992)
- Amphibians Cogger (1992)
- Introduced species are indicated by an asterisk (*)

Conservation Status

Commonwealth conservation status is referenced according to the *Environment Protection and Biodiversity Conservation Act 1992*, as follows:

- E Endangered;
- X Presumed Extinct;
- V Vulnerable; and
- M Migratory

Conservation status is referenced according to the *Threatened Species Conservation Act 1995* as follows:

- E Endangered;
- X Presumed Extinct; and
- V Vulnerable.

FAMILY Scientific Name	Common Name	Conservation Status		White Mining EIS 2001	Parsens Brinckerhoff 2004	ERM Autumn 2005	ERM Summer 2006a	ERM Autumn 2006b
		EPBC	TSC					
<i>i. Birds</i>								
ACCIPITRIDAE								
<i>Circus assimilis</i>	spotted harrier			✓				
ALCEDINIDAE								
<i>Alcedo azurea</i>	azure kingfisher			✓			✓	
ANATIDAE								
<i>Chenonetta jubata</i>	Australian wood duck	M		✓	✓	✓		✓
<i>Biziura lobata</i>	musk duck			✓				
<i>Anas superciliosa</i>	pacific black duck	M				✓		
<i>Anas gracilis</i>	grey teal			✓				
<i>Aythya australis</i>	hardhead			✓				
<i>Cygnus atratus</i>	black swan	M		✓	✓			
<i>Tadorna tadornoides</i>	Australian shelduck			✓				
PODICIPEDIDAE								
<i>Tachybaptus novaehollandiae</i>	Australasian grebe			✓	✓			
PELECANIDAE								
<i>Pelecanus conspicillatus</i>	Australian pelican				✓			
ARDEIDAE								
<i>Ardea pacifica</i>	white-necked heron			✓				
<i>Egretta novaehollandiae</i>	white-faced heron			✓	✓			
<i>Ardea alba</i>	great egret					✓		✓
<i>Ardea ibis</i>	cattle egret			✓				
THRESKIORNITHIDAE								
<i>Threskiornis spinicollis</i>	straw-necked ibis			✓		✓		✓

FAMILY Scientific Name	Common Name	Conservation Status		White Mining EIS 2001	Parsens Brinckerhoff 2004	ERM Autumn 2005	ERM Summer 2006a	ERM Autumn 2006b
		EPBC	TSC					
<i>Platalea regia</i>	royal spoonbill					✓		
ACCIPITRIDAE								
<i>Haliastur sphenurus</i>	whistling kite				✓			
<i>Elanus axillaris</i>	black-shouldered kite			✓				
<i>Haliaeetus leucogaster</i>	white-bellied sea-eagle	M			✓			
<i>Accipiter novaehollandiae</i>	grey goshawk					✓		
<i>Accipiter cirrhocephalus</i>	collared sparrowhawk					✓	✓	✓
<i>Aquila audax</i>	wedge-tailed eagle	M		✓	✓	✓		
APOPIDAE								
<i>Hirundapus caudacutus</i>	White-throated needletail			✓				
FALCONIDAE								
<i>Falco berigora</i>	brown falcon			✓				
<i>Falco cenchroides</i>	nankeen kestrel	M		✓	✓	✓		
<i>Falco peregrinus</i>	peregrine falcon			✓				
TURNICIDAE								
<i>Turnix varia</i>	paintied button-quail				✓	✓		✓
<i>Coturnix ypsilophora</i>	brown quail			✓				
CHARADRIIDAE								
<i>Vanellus miles</i>	masked lapwing			✓		✓	✓	✓
COLUMBIDAE								
<i>Phaps chalcoptera</i>	common bronzewing			✓		✓		
<i>Ocyphaps lophotes</i>	crested pigeon				✓	✓	✓	
<i>Columbia livia</i>	rock dove			✓				

FAMILY Scientific Name	Common Name	Conservation Status		White Mining EIS 2001	Parsens Brinckerhoff 2004	ERM Autumn 2005	ERM Summer 2006a	ERM Autumn 2006b
		EPBC	TSC					
<i>Geopelia cuneata</i>	diamond dove					✓	✓	✓
CACATUIDAE								
<i>Allisterus scapularis</i>	Australian king-parrot			✓				
<i>Cacatua roseicapilla</i>	galah			✓	✓	✓	✓	✓
<i>Cacatua galerita</i>	sulphur-crested cockatoo					✓	✓	✓
PSITTACIDAE								
<i>Platycercus eximius</i>	eastern rosella			✓				
<i>Platycercus elegans</i>	crimson rosella				✓	✓	✓	✓
<i>Psephotus haematonotus</i>	red-rumped parrot			✓	✓			
CUCULIDAE								
<i>Cuculus pallidus</i>	pallid cuckoo					✓	✓	✓
<i>Chrysococcyx lucidus</i>	shining bronze cuckoo			✓				
STRIGIDAE								
<i>Ninox novaeseelandiae</i>	southern boobook					✓	✓	✓
TYTONIDAE								
<i>Tyto alba</i>	barn owl					✓	✓	
AEGOTHELIDAE								
<i>Aegotheles cristatus</i>	Australian owl-nightjar					✓	✓	✓
HALCYONIDAE								
<i>Dacelo novaeguineae</i>	laughing kookaburra			✓	✓	✓	✓	✓
MEROPIDAE								
<i>Merops ornatus</i>	rainbow bee-eater	M		✓				
MALURIDAE								

FAMILY Scientific Name	Common Name	Conservation Status		White Mining EIS 2001	Parsens Brinckerhoff 2004	ERM Autumn 2005	ERM Summer 2006a	ERM Autumn 2006b
		EPBC	TSC					
<i>Malurus cyaneus</i>	superb fairy-wren			✓	✓	✓	✓	✓
<i>Malurus lamberti</i>	variegated fairy-wren				✓	✓	✓	✓
PARDALOTIDAE					✓	✓	✓	✓
<i>Sericornis frontalis</i>	white-browed scrub wren							
<i>Chthonicola sagittata</i>	speckled warbler	V		✓			✓	✓
<i>Pardalotus punctatus</i>	spotted pardalote			✓				
<i>Pardalotus striatus</i>	striated pardalote			✓		✓		✓
<i>Smicrornis brevirostris</i>	weebill			✓		✓	✓	✓
<i>Acanthiza pusilla</i>	brown thornbill					✓	✓	
<i>Acanthiza lineata</i>	striated thornbill			✓		✓	✓	
<i>Acanthiza reguloides</i>	buff-rumped thornbill				✓			
<i>Acanthiza nana</i>	yellow thornbill			✓				
<i>Acanthiza chrysorrhoa</i>	yellow-rumped thornbill			✓		✓	✓	✓
<i>Gerygone mouki</i>	brown gerygone			✓				
PLOCEIDAE								
<i>Taeniopygia guttata</i>	zebra finch			✓				✓
<i>Taeniopygia bichenovii</i>	double-barred finch			✓	✓			
MELIPHAGIDAE								
<i>Anthochaera chrysoptera</i>	little wattlebird					✓		
<i>Philemon corniculatus</i>	noisy friarbird			✓	✓	✓	✓	

FAMILY Scientific Name	Common Name	Conservation Status		White Mining EIS 2001	Parsens Brinckerhoff 2004	ERM Autumn 2005	ERM Summer 2006a	ERM Autumn 2006b
		EPBC	TSC					
<i>Manorina melanocephala</i>	noisy miner			✓	✓	✓	✓	✓
<i>Lichenostomus penicillatus</i>	white-plumed honeyeater				✓			✓
PETROICIDAE								
<i>Microeca fascinans</i>	jacky winter					✓		✓
<i>Petroica multicolor</i>	scarlet robin					✓		
<i>Petroica goodenovii</i>	red-capped robin			✓		✓		✓
PHALACROCORACIDAE								
<i>Phalacrocorax melanoleucos</i>	little pied cormorant			✓				
POMATOSTOMIDAE								
<i>Pomatostomus temporalis</i>	grey-crowned babbler		V		✓	✓	✓	✓
PACHYCEPHALIDAE								
<i>Colluricincla harmonica</i>	grey shrike-thrush			✓				✓
<i>Pachycephala pectoralis</i>	golden whistler			✓	✓	✓		✓
<i>Pachycephala rufiventris</i>	rufous whistler			✓				
DICRURIDAE								
<i>Grallina cyanoleuca</i>	magpie-lark			✓	✓			✓
<i>Rhipidura fuliginosa</i>	grey fantail			✓	✓	✓	✓	✓
<i>Rhipidura leucophrys</i>	willie wagtail			✓		✓		
CAMPEPHAGIDAE								
<i>Coracina novaehollandiae</i>	black-faced cuckoo-shrike			✓	✓	✓	✓	
<i>Coracina papuensis</i>	White-bellied cuckoo-shrike							
ORIOOLIDAE								

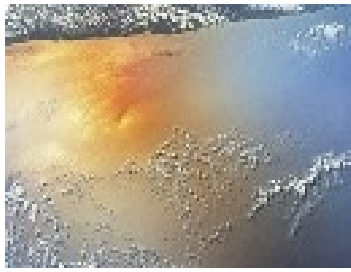
FAMILY Scientific Name	Common Name	Conservation Status		White Mining EIS 2001	Parsens Brinckerhoff 2004	ERM Autumn 2005	ERM Summer 2006a	ERM Autumn 2006b
		EPBC	TSC					
<i>Oriolus sagittatus</i>	olive-backed oriole					✓	✓	
ARTAMIDAE								
<i>Artamus personatus</i>	masked woodswallow					✓		
<i>Cracticus nigrogularis</i>	pied butcherbird			✓	✓	✓	✓	✓
<i>Cracticus torquatus</i>	grey butcherbird			✓				
<i>Gymnorhina tibicen</i>	Australian magpie			✓	✓	✓	✓	✓
<i>Strepera graculina</i>	pied currawong			✓		✓	✓	✓
CORVIDAE								
<i>Corvus coronoides</i>	Australian raven			✓	✓	✓	✓	✓
CORCORACIDAE								
<i>Eurystomus orientalis</i>	dollarbird				✓		✓	
<i>Corcorax melanorhamphos</i>	white-winged chough			✓	✓		✓	✓
MOTACILLIDAE								
<i>Anthus novaeseelandiae</i>	Richard's pipit			✓		✓	✓	
MUSCICAPIDAE								
<i>Cisticola exilis</i>	golden headed cisticola			✓				
PASSERIDAE								
<i>Taeniopygia bichenovii</i>	double-barred finch			✓	✓	✓	✓	✓
<i>Taeniopygia guttata</i>	zebra finch			✓				
<i>Neochemia temporalis</i>	red-browed finch			✓		✓		
DICAIEIDAE								
<i>Dicaeum hirundinaceum</i>	mistletoebird			✓		✓		
RALLIDAE								

FAMILY Scientific Name	Common Name	Conservation Status		White Mining EIS 2001	Parsens Brinckerhoff 2004	ERM Autumn 2005	ERM Summer 2006a	ERM Autumn 2006b
		EPBC	TSC					
<i>* Lepus capensis</i>	* brown hare			✓	✓	✓	✓	✓
<i>* Oryctolagus cuniculus</i>	* rabbit			✓	✓	✓	✓	✓
MACROPODIDAE								
<i>Macropus giganteus</i>	eastern grey kangaroo			✓	✓	✓	✓	✓
<i>Wallabia bicolor</i>	swamp wallaby						✓	
MURIDAE								
<i>Mus musculus</i>	house mouse			✓		✓	✓	✓
<i>Rattus rattus</i>	black rat					✓	✓	✓
<i>Hydromys chrysogaster</i>	water rat			✓				
PERAMELIDAE								
<i>Isoodon macrourus</i>	northern brown bandicoot			✓		✓	✓	✓
<i>Perameles nasuta</i>	long-nosed bandicoot			✓		✓	✓	✓
PETAURIDAE								
<i>Pseudocheirus peregrinus</i>	common ringtail possum			✓		✓	✓	✓
PHALANGERIDAE								
<i>Trichosurus vulpecula</i>	common brushtail possum			✓	✓	✓	✓	✓
PTEROPODIDAE								
<i>Pteropus poliocephalus</i>	grey-headed flying-fox	V	V		✓			
TACHYGLOSSIDAE								
<i>Tachyglossus aculeatus</i>	short-beaked echidna			✓				
ZOSTEROPIDAE								

FAMILY Scientific Name	Common Name	Conservation Status		White Mining EIS 2001	Parsens Brinckerhoff 2004	ERM Autumn 2005	ERM Summer 2006a	ERM Autumn 2006b
		EPBC	TSC					
<i>Pseudemoia trilineata</i>							✓	
<i>Tiliqua scincoides</i>	blue tongue lizard						✓	
<i>Egernia striolata</i>	tree skink			✓			✓	
AGAMIDAE								
<i>Physignathus lesuerii</i>	eastern water dragon			✓			✓	✓
<i>Pogona barbata</i>	bearded dragon			✓				
<i>Tympanocryptis diemensis</i>	mountain dragon			✓				
<i>Diporiphora australis</i>	tommy roundhead						✓	
CHELIDAE								
<i>Chelodina longicollis</i>	eastern long-necked turtle			✓				
GEKKONIDAE								
<i>Oedura lesueurii</i>	Lesueur's velvet gecko			✓				
TYPHLOPIDAE								
<i>Rhamphotyphlops wiedii</i>	blind worm snake						✓	
VARANIDAE								
<i>Varanus varius</i>	lace monitor			✓			✓	
VOMBATIDAE								
<i>Vombatus ursinus</i>	common wombat			✓				
<i>iv. Amphibians</i>								
MYOBATRACHIDAE								
<i>Crinia signifera</i>	common eastern froglet			✓			✓	✓
<i>Limnodynastes tasmaniensis</i>	spotted marsh frog			✓			✓	
<i>Uperoleia laevisgata</i>	smooth toadlet			✓		✓		

FAMILY Scientific Name	Common Name	Conservation Status		White	Parsens	ERM	ERM	ERM
		EPBC	TSC	Mining EIS 2001	Brinckerhoff 2004	Autumn 2005	Summer 2006a	Autumn 2006b
<i>HYLIDAE</i>								
<i>Litoria caerulea</i>	green tree frog			✓				
<i>Litoria fallax</i>	dwarf green tree frog			✓				
<i>Litoria latopalmata</i>				✓				
<i>Litoria peronii</i>	Peron's tree frog			✓				

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