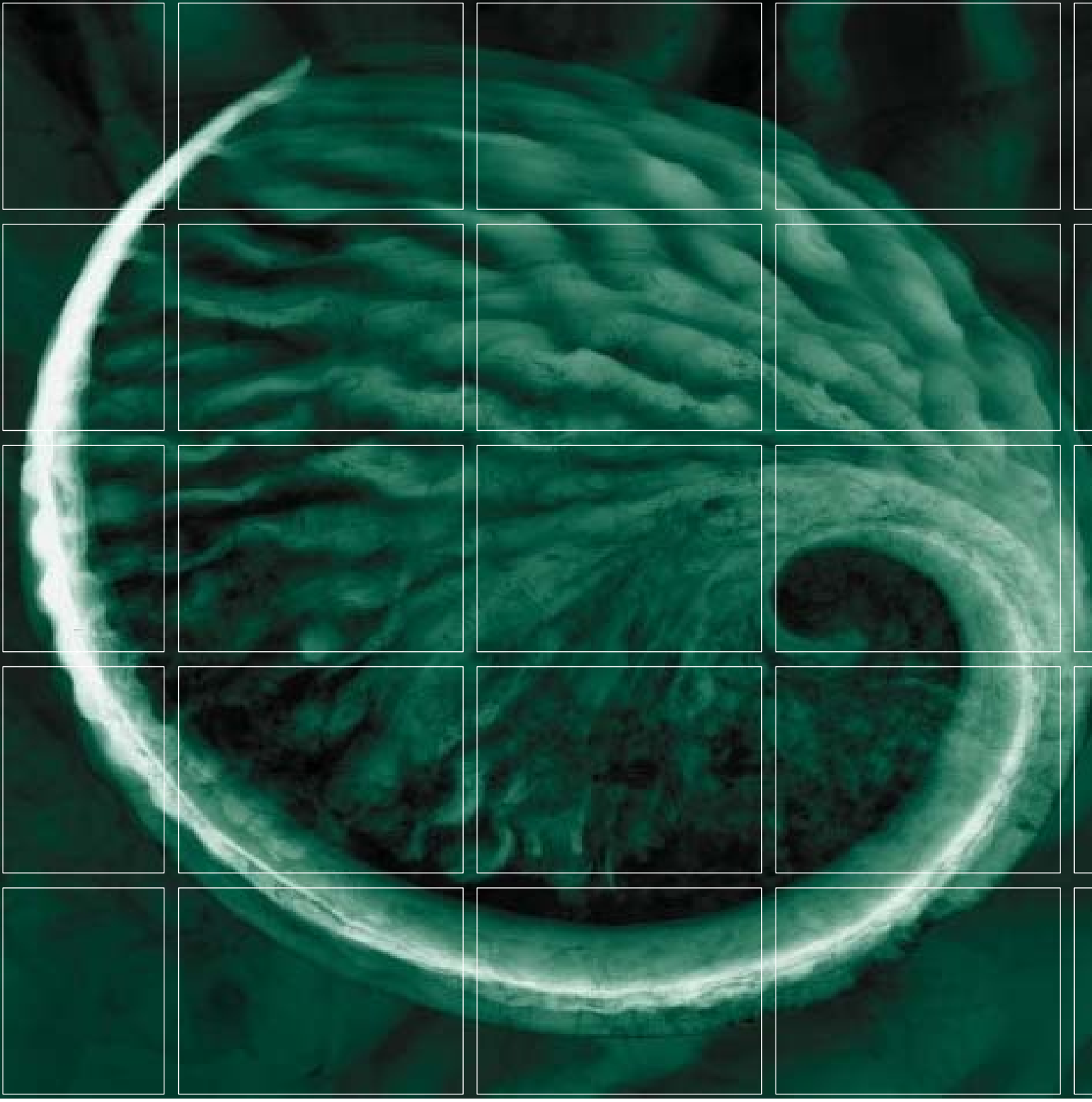

Longwall Panels A1 and A2
Flora and Fauna Assessment

Austar Coal Pty Ltd

April 2006

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Flora and Fauna Assessment

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Approved by:	*Julie Faux*
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Environmental Resources Management Australia Pty Ltd Quality System

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1 INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by Austar Coal Mine Pty Ltd to assess the potential impacts on flora and fauna by the extraction of longwall panels A1 and A2 and associated infrastructure at the mine (refer to *Figure 1.1*). The mine is an aggregate of old mines including Ellalong and Pelton Collieries.

The 'site' is defined as the proposed infrastructure sites and the land above longwall panels A1 and A2. The 'locality' is defined as a 10km radius around the infrastructure sites.

1.1 PURPOSE OF THE REPORT

The purpose of this assessment was to:

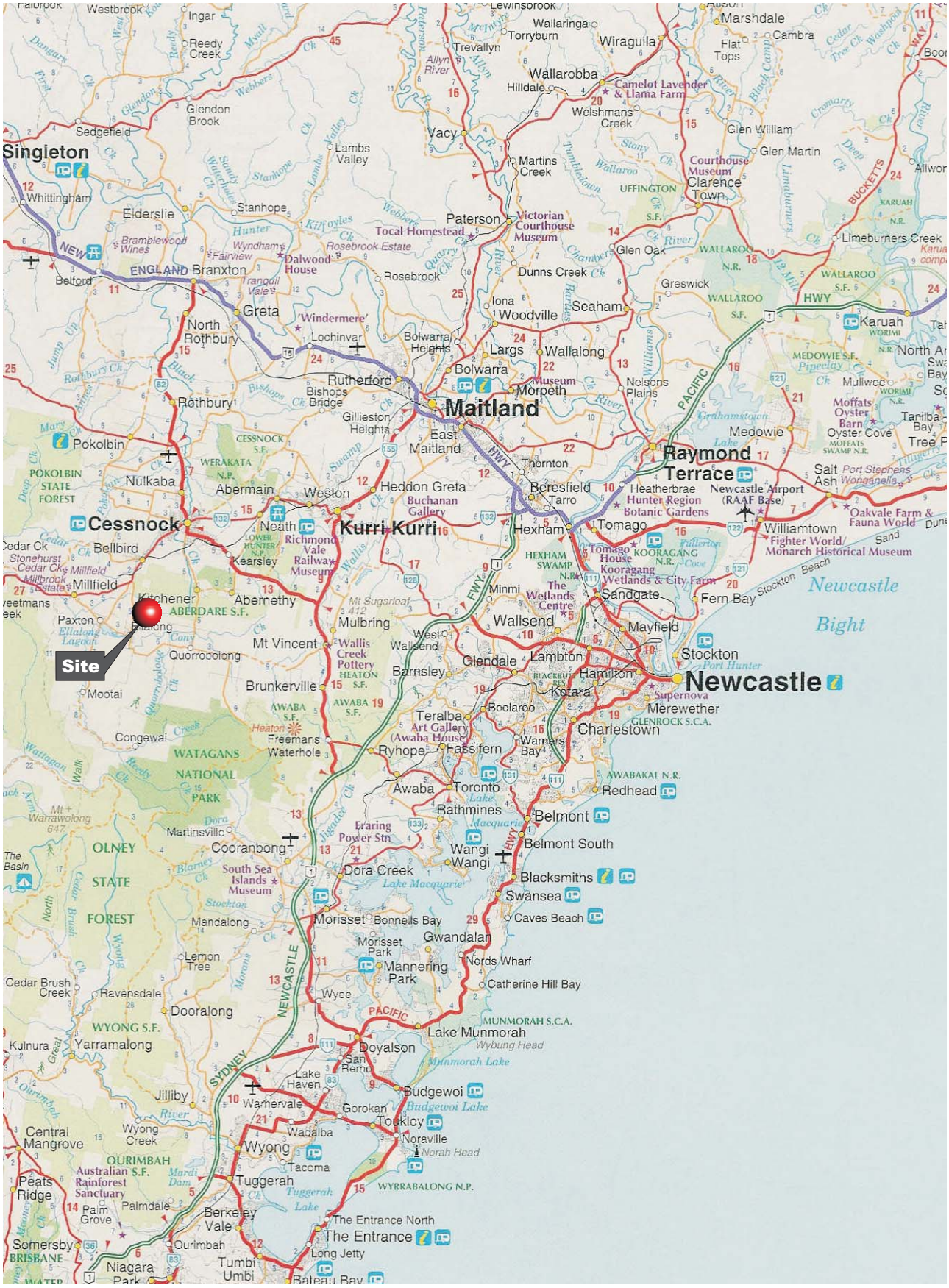
- identify and describe the conservation significance of vegetation communities and species;
- identify and describe the conservation significance of fauna habitats and species;
- assess the type and degree of impacts of mining on the flora and fauna on site and any threatened species, populations and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

1.2 DESCRIPTION OF THE SITE

The mine and proposed longwall panels are between the townships of Bellbird, Ellalong and Kitchener, approximately 10 kilometres southwest of Cessnock in the lower Hunter Valley. Pelton Road and a number of four-wheel drive tracks traverse the site.

The site is characterised by hilly topography within the Aberdare State Forest, Crown Land and mine-owned land, all of which form part of the Broken Back Range. The Broken Back Range divides the catchment of Black Creek flowing to the north and Quorrobolong Creek to the south. A number of well-defined ephemeral drainage lines overly the proposed longwall panels and are stabilised by intact riparian vegetation and open forest communities. No dams or streams are located above the longwall panels and Ellalong Lagoon is approximately three kilometres west of the proposed infrastructure sites.

The proposed infrastructure sites are adjacent to the existing clearings on the lower slopes of the range. The proposed pump station is adjacent to the constructed Kalingo dam, which is used as a collection basin.



Source: UBD

Figure 1.1 **Locality Plan**

Austar Coal Mine - Paxton, NSW

ERM

0 10km

Approximate only

Jobs/2005/0042723 /Ecology/Fg1.1 Locality Plan.cdr 16 01 2006 SP Environmental Resources Management Australia Pty Ltd

The soils on site are characterised by the Branxton and Aberdare soil landscapes as described by Kovac and Lawrie (1991). The Branxton soil landscape unit covers undulating low hills and rises with many small creek flats. These soils are derived from sandstone, mudstone, siltstone, shale, tuff, coal, conglomerate and limestone (Kovac and Lawrie, 1991). The Aberdare soil landscape unit covers rolling low hills to the south and south east of Cessnock and includes the Aberdare State Forest. Soils are derived from sandstone, conglomerate, siltstone and some tuff (Kovac and Lawrie, 1991).

The site overlying the longwall panels shows evidence of recent fire (blackened trunks and epicormic growth). The reported high frequency of fires may be a result of the numerous burnt out car bodies observed within the surrounding bushland.

1.3 DESCRIPTION OF THE PROPOSAL

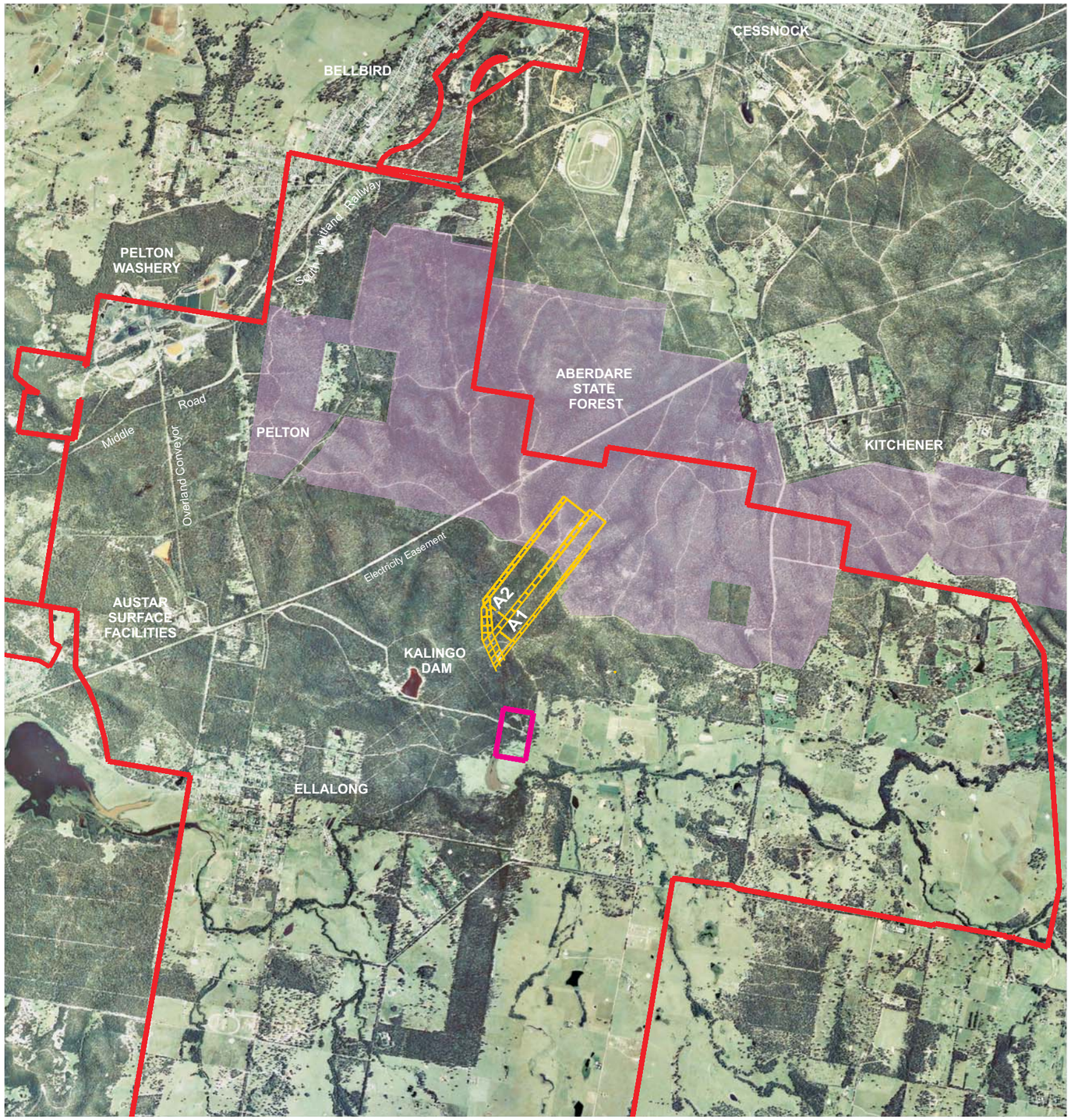
The proposed modification includes longwall panels A1 and A2, which are proposed to be mined using the longwall top caving method. Longwall panel A1 would be 147 metres wide and 1481 metres long with an extraction height of up to 6.5 metres. Longwall panel A2 would be 205 metres wide and 1,235 metres long also with an extraction height of up to 6.5 metres. The longwall panels would be accessed via underground workings extending from the North West (NW) mains (see *Figure 1.2*).

Other related infrastructure proposed to be upgraded is a ventilation fan, electricity substation, nitrogen inertisation plant and stabilisation of Kalingo Dam.

The new ventilation fan will be located within the existing No.3 upcast shaft compound at the southern end of the NW mains and will not require any vegetation clearance (*Photograph 1*). Bushfire asset protection zones around the existing compound will require some underscrubbing, with all mature trees to be retained.

A new 10MVA electricity substation is required to provide sufficient power supply to the new workings. The new 12 metres by 25 metres substation would be built adjacent to the existing substation, and will be restricted to already disturbed lands (*Photograph 2*). Minimal vegetation clearance is required around the new compound for bushfire protection purposes. This vegetation has been disturbed by previous clearing and edge effects.

A larger capacity 2000 cubic metres per hour nitrogen inertisation plant is required to ensure the supply of nitrogen to the sealed underground workings. The nitrogen is pumped into the sealed area to displace oxygen thereby preventing spontaneous combustion. The proposed nitrogen plant would be built adjacent to the existing nitrogen plant within an already cleared area (*Photograph 3*). The adjacent area of redgum forest will not be impacted.



Legend

- Colliery Holding
- Longwalls A1 & A2
- Infrastructure Upgrade

Source: Austar Mine

ERM

0 1km

Approximate

Figure 1.2 **Austar Coal Mine**

Austar Coal Mine - Paxton, NSW

Photograph 1

Existing ventilation fan.

Photograph 2

Proposed electricity substation.

Photograph 3

Proposed Nitrogen Inertisation Plant Site.

Photographs

Austar Coal Mine - Paxton, NSW

ERM

Approximately 0.001 hectares of vegetation may need to be cleared to stabilise the southern dam wall (*Photographs 4 and 5*). This small patch of vegetation is a transition zone between spotted gum-ironbark forest and redgum forest. The quality of this vegetation has been reduced by edge effects and weed invasion.

Photograph 4

Kalingo Dam.

Photograph 5

Vegetation to be removed to stabilise dam wall.

2 METHODOLOGY

2.1 LITERATURE REVIEW

Various sources of published information are available on flora and fauna within the site and locality. The following reports were reviewed in the preparation of this assessment:

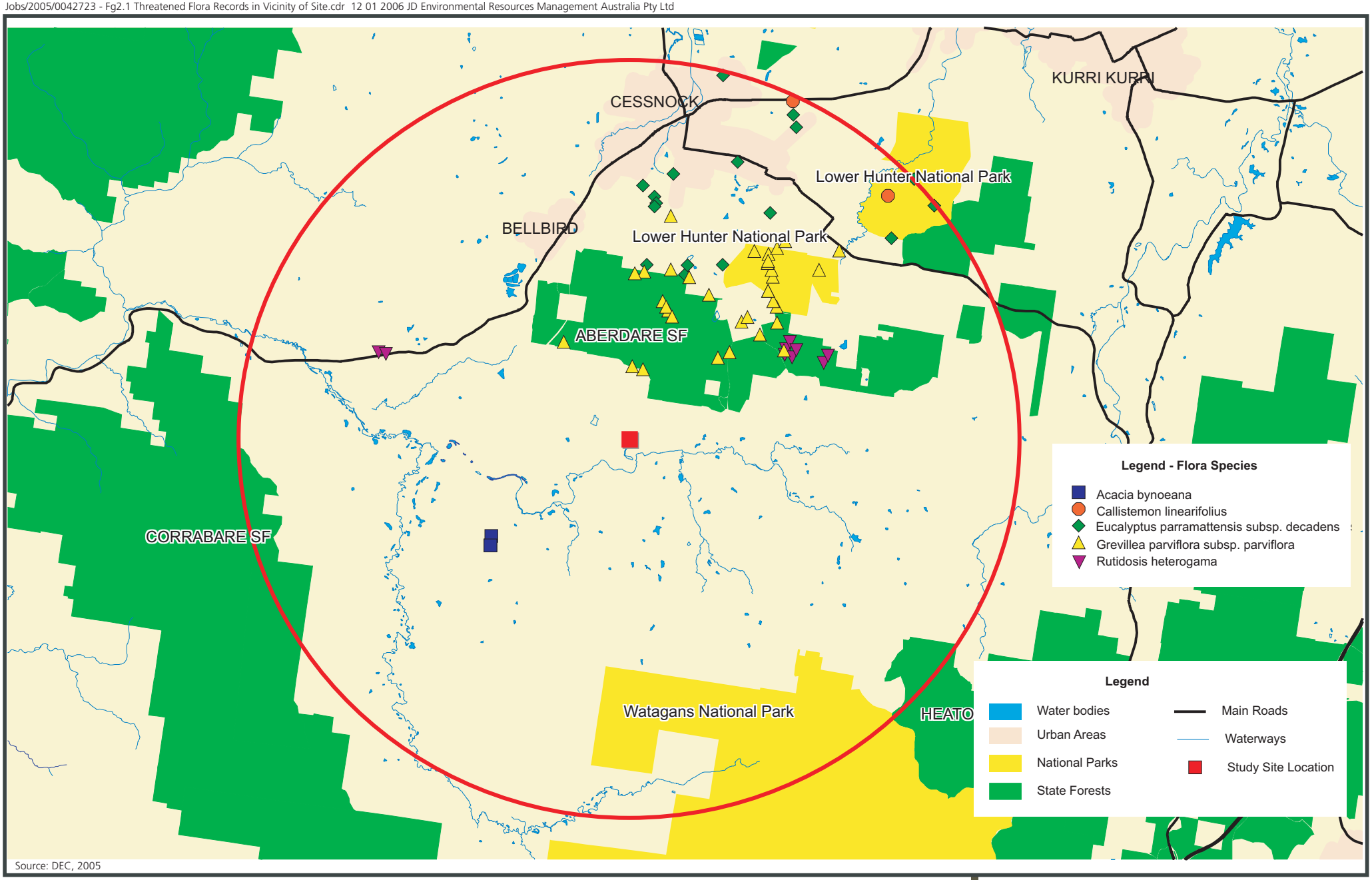
- HLA Envirosciences Pty Limited (1995a) Environmental Impact Statement Ellalong Colliery. Extension into Bellbird South;
- HLA Envirosciences Pty Limited (1995b) Flora and Fauna Survey for the proposed Ellalong Colliery extension near Cessnock, NSW. Prepared for the Newcastle Wallsend Coal Company Pty Ltd, August 1995; and
- International Environmental Consultants Pty Ltd (1999) Southland Colliery Ventilation Facilities – Review of Environmental Factors.

A search of the DEC Wildlife Atlas database was conducted for all recent records of threatened flora and fauna (see *Figures 2.1* and *2.2*) within the locality. A search of the on-line database maintained by the Commonwealth Department of the Environment and Heritage (DEH) identified 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 site. 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 occur within the site.

2.2 FLORA SURVEY METHODOLOGY

Broad vegetation communities within and adjacent to the site were identified and mapped using aerial photography and verified using random meander and vehicle based transects to sample vegetation. All vascular plants within ten metres of each transect were identified, and height and percentage cover of the dominant species within each structural layer recorded. Plant names follow Harden (1992, 1993, 2000 and 2002). The disturbance history was noted to determine the severity and timing of fire, grazing, logging/clearing, dumping and weeds.



ERM

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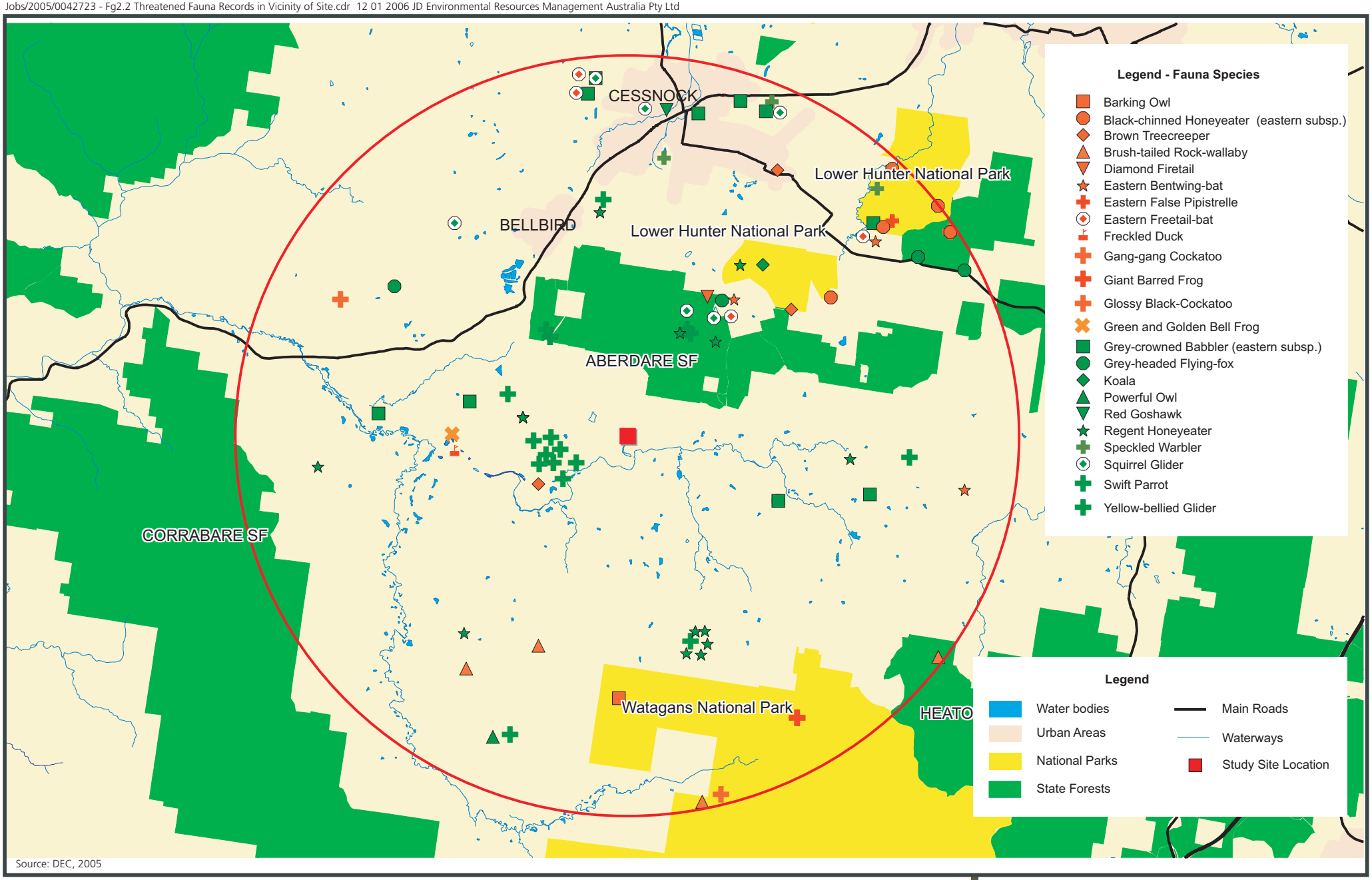
Approximate only

Figure 2.1 **Threatened Flora Records in Vicinity of Site**

Austar Coal Mine - Paxton, NSW



ERM

0 3km

Approximate only

Figure 2.2 **Threatened Fauna Records in Vicinity of Site**

Austar Coal Mine - Paxton, NSW

2.3 *FAUNA SURVEY METHODOLOGY*

An assessment of the diversity and general habitat value of the site was undertaken by appraising the extent of likely habitat, searching for secondary indications of threatened species and incidental observations. Considered in this assessment were the:

- area occupied by that habitat within the site;
- continuity with similar habitat adjacent to the site;
- density of nesting/shelter/basking sites such as tree hollows, leaf litter, ground exposures, rocks, logs, vegetation, caves, rock outcrops, overhangs and crevices;
- presence of fresh water aquatic habitats such as streams, swamps and pools;
- cover abundance of dominant canopy species; and
- the extent and nature of previous disturbance.

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 and other traces. Surveys were conducted opportunistically and included:

- searches for raptors nests;
- investigation of possible den sites for tiger quoll;
- searches for characteristics scats, tracks and diggings; and
- checking trees for scratches consistent with arboreal mammals.

3 RESULTS

3.1 FLORA SURVEYS

3.1.1 Vegetation Communities

The site has been disturbed by logging for mine supports, grazing and a relatively high frequency of fires (HLA Envirosciences, 1995). Three vegetation communities; lower Hunter spotted gum-ironbark forest, Hunter lowland redgum forest and mainly cleared have been mapped within the site as indicated within *Figure 3.1.*

Lower Hunter Spotted Gum-Ironbark Forest

Lower Hunter spotted gum – ironbark forest is widespread throughout the central to lower Hunter Valley. *Corymbia maculata* (spotted gum) and *Eucalyptus fibrosa* (broad-leaved ironbark) typically dominate the canopy. Within the site *Eucalyptus punctata* (grey gum) and *Eucalyptus crebra* (narrow-leaved ironbark) also co-dominate. On the ridge and upper slopes of the site, on either side of Pelton Road, *Corymbia eximia* (yellow bloodwood), *Syncarpia glomulifera* (turpentine) and *Eucalyptus capitellata* (brown stringybark) dominate the canopy and reflect a change in the soil (NPWS, 2000).

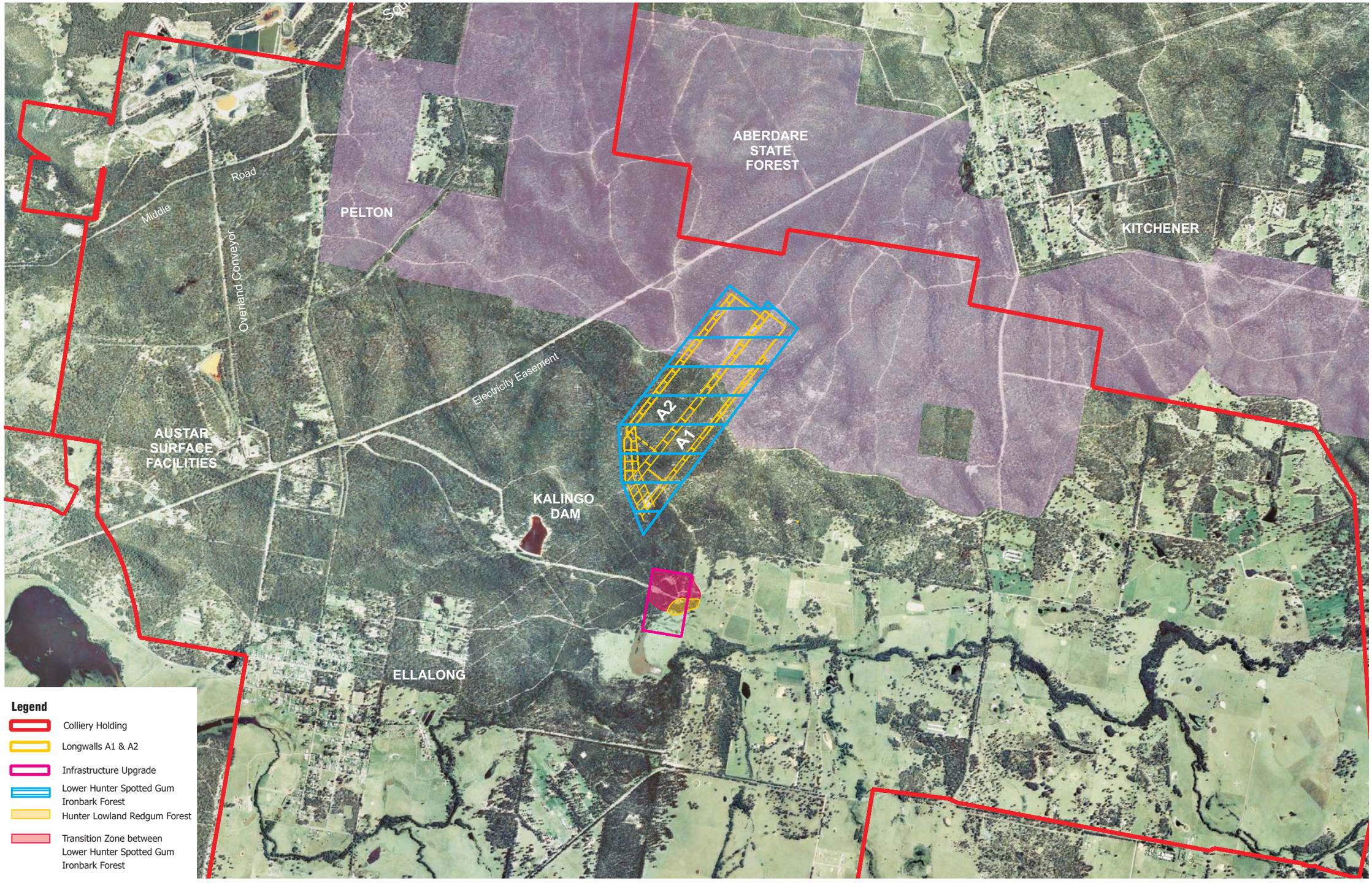
The understorey is characterised by *Daviesia ulicifolia, Acacia parvipinnula* and *Melaleuca nodosa*. The ground layer is very diverse and characterised by the frequent occurrence of *Cheilanthes sieberi* subsp. *sieberi*, *Entolasia stricta*, *Pomax umbellata*, *Pratia purpurascens*, *Xanthorrhoea media, Persoonia linearis, Themeda australis, Phyllanthus hirtellus, Callistemon linearis* and *Dianella* sp.

Macrozamia flexuosa and *Grevillea montana* were also identified within this community, on the steep slopes either side of Pelton Road. These species are recognised as rare according to the Briggs and Leigh criteria. Additional rare and threatened species reported to occur within this community are *Persoonia pauciflora* and *Eucalyptus fergusonii* subsp. *fergusonii* neither of which have been recorded within 10 kilometres of the site.

Hunter Lowlands Redgum Forest

Hunter lowlands redgum forest is an open forest that characterises simple open depressions and drainage flats on the Permian sediments of the Hunter Valley floor (NPWS, 2000). An array of eucalypts typically occur, with the most frequently recorded being *Eucalyptus tereticornis* (forest red gum) and *Eucalyptus punctata* (grey gum).

Within the site this community was dominated by mono-specific stands of *Eucalyptus tereticornis. Eucalyptus punctata, Angophora floribunda* (rough barked apple), *Eucalyptus crebra* (narrow-leaved ironbark), *Eucalyptus moluccana* (grey



Source: Austar Mine

ERM

0 1km

Approximate

Figure 3.1 **Vegetation Communities**

Austar Coal Mine - Paxton, NSW

box) and C*orymbia maculata* (spotted gum) were also noted where this community merged with the spotted gum-ironbark community. This community is also consistent with the central Hunter riparian forest as described by NPWS (2000) due to the noted presence of *Casuarina glauca* within the drainage lines. However, for the purpose of this assessment the community has been assessed as the endangered Hunter lowland redgum forest.

The mid-strata was generally open with a sparse cover of shrubs such as *Breynia oblongifolia*, *Leucopogon juniperinus*, *Exocarpos cupressiformis, Daviesia ulicifolia*, and *Jacksonia scoparia*. The dense grass layer included species as *Panicum* sp., *Pomax umbellata, Cymbopogon refractus*, *Echinopogon caespitosus*, *Cheilanthes sieberi* and *Pratia purpurascens.*

Cleared

The natural vegetation within the proposed infrastructure sites has been cleared and is characterised by common pasture and weed species such as *Cynodon dactylon* (common couch), *Cyperus polystachyos, Cyperus* sp. *Juncus* sp., *Dichelachne micrantha* (shorthair plumegrass), *Paspalum dilatatum* (paspalum), *Taraxacum officinale* (dandelion) and *Cirsium vulgare* (spear thistle).

Surrounding the relatively cleared infrastructure sites is a transitional zone between the lower Hunter spotted gum-ironbark forest and the Hunter lowland redgum forest.

3.1.2 Rare and Threatened Flora Species

No threatened flora have been recorded within the site although eight threatened flora species have been recorded within ten kilometres on the DEC and DEH databases as indicated within *Table 3.1*.

Table 3.1 Threatened Flora Species within 10km of the Site

Scientific Name	Common Name	TSC Act (1995)	EPBC Act (1999)
Acacia bynoeana	Bynoe's wattle	✓	✓
Angophora inopina	Charmhaven apple	✓	✓
Callistemon linearifolius	netted bottle brush	✓	-
Cryptostylis hunteriana	leafless tongue orchid	✓	✓
Eucalyptus glaucina	slaty red gum	✓	✓
Eucalyptus parramattensis subsp. *decadens*		✓	✓
Grevillea parviflora	small-flower grevillea	✓	✓
Rutidosis heterogama	heath wrinklewort	✓	-

Macrozamia flexuosa and *Grevillea montana* were recorded within the spotted gum-ironbark vegetation community and are rare in accordance with the Briggs and Leigh criteria.

Grevillea montana is ROTAP-coded 2KC- indicating that its geographic range is less than 100 kilometres and has at least one population within a conservation reserve, being Wollemi National Park (Briggs and Leigh, 1996). Populations are also known from Yengo NP and other Lower Hunter National Parks (Bell 2001).

Macrozamia flexuosa is ROTAP-coded 2K indicating that its geographic range is less than 100 kilometres. This species is known to occur in scattered populations within forests and woodlands on sandy or other siliceous soils from Bulahdelah to Lake Macquarie and as far west as the site.

These species were recorded within the subsidence impact zone and have been collectively assessed in *Chapter 4.1.*

3.2 ENDANGERED ECOLOGICAL COMMUNITIES

3.2.1 Lower Hunter Spotted Gum-Ironbark Forest

The lower Hunter spotted gum-ironbark forest was formerly widespread across the lower Hunter Valley, however due to clearing and modification, this community is now highly fragmented and restricted to a range of 35 kilometres by 65 kilometres in the Beresfield to Cessnock region (NPWS, 2005a). It is estimated that approximately 26 500 hectares of lower Hunter spotted gum-ironbark forest remains in the Lower Hunter and Central Coast Region (House, 2003). The community is poorly conserved with approximately 1,600 hectares in Werakata National Park, east of Cessnock (Bell, 2004).

This community has been mapped overlying the proposed longwall panels A1 and A2. This community also dominates the surrounding ridges and slopes. On the lower slopes the spotted gum-ironbark forest transgresses with the Hunter lowland redgum forest.

The proposed modification will not impact this community as discussed in *Chapter 4.1.*

3.2.2 Hunter Lowland Redgum Forest

The distribution of the Hunter lowland redgum forest extends from Muswellbrook to the Lower Hunter where it appears on gentle slopes arising from depressions. Seven hectares in Werakata National Park is the only stand within a conservation reserve in the Hunter region (Bell, 2004). Less than 500 hectares or about 27% of the community remains (DEC, 2005b).

The proposed modification will not impact this community as discussed in *Chapter 5*.

3.3 FAUNA SURVEY

3.3.1 Habitat Assessment

The site contains two broad habitat types being open forest and cleared grassland, both of which are well represented within the locality, including the Aberdare State Forest, Lower Hunter (Werakata) National Park and the Watagan National Park.

The myrtaceous tree species provide a seasonal foraging resource for nectivorous birds and mammals such as the squirrel glider and honeyeaters. The variety of tree species also provide suitable feeding/foraging resources for foliage dependent animals such as the common brushtail possum and insectivorous birds such as treecreepers.

The grasses and sedges across the entire site would provide seeds and stems for granivorous and herbivorous species.

The forested portions of the site have a moderate layer of leaf litter (up to five centimetres deep) that may provide shelter for reptiles and small ground-dwelling mammals. The moderate cover of fallen logs and rocks provides shelter for small ground-dwelling mammals and reptiles as well as a foraging substrate for the grey-crowned babbler.

The site contains mature eucalypt trees providing hollows and stags capable of providing shelter and breeding habitat for many bird, arboreal mammal and microchiropteran bat species. However, the history of logging has limited the number of mature trees. Kalingo Dam near the proposed pump station provides habitat for aquatic birds and amphibians although the high levels of iron may limit the quality.

3.3.2 Secondary Indications and Incidental Observations

Scratches noted on the boles of grey gum trees within the spotted gum-ironbark forest were consistent with *Varanus varius* (lace monitor).

Fox scats were noted on the ridge near Pelton Road and on the edges of the clearings.

Diggings in numerous ant nests across the site were consistent with *Tachyglossus aculeatus* (echidna).

3.3.3 Koala habitat

An assessment of 'potential' koala habitat was undertaken in accordance with SEPP 44 – Koala Habitat. *Eucalyptus tereticornis* (forest red gum), *Eucalyptus punctata* (grey gum) and *Eucalyptus microcorys* (tallowwood) were recorded within the site and are listed as preferred koala feed trees under SEPP 44.

Eucalyptus tereticornis (forest red gum) within the areas of Hunter lowland redgum forest constitutes greater than 15 percent of the canopy and is therefore potential koala habitat. As no scats or characteristic scratch marks were noted within the vicinity of the proposed infrastructure, these areas do not constitute core koala habitat.

The remaining feed trees did not constitute greater than 15 percent of the canopy. As such, the lower Hunter spotted gum-ironbark forest does not support potential koala habitat in accordance with SEPP 44.

Koalas are known to occur within the Werakata and Watagans National Parks, approximately six kilometres to the north east and south of the site respectively.

3.3.4 Threatened Fauna Species

No threatened fauna have been recorded within the site although thirty-one threatened fauna species have been previously recorded or considered likely to occur within ten kilometres of the site on the DEC and DEH databases as indicated within *Table 3.2*.

For the purpose of this assessment, it was assumed that all of the species except for the threatened reptiles, freckled duck, brushtail rock wallaby, red goshawk, long-nosed potoroo and Hastings river mouse are likely to use the resources within the site. Each of these species has been collectively assessed within *Chapters 4.2* and *5.0*.

Table 3.2 Likelihood of Threatened Species Occurring in the Site

Common/Scientific Name	Status TSC	Status EPBC	Preferred Habitat	Likelihood of Occurrence
Flora				
Acacia bynoeana	E	V	This species is found in central eastern NSW, from the Hunter district south to the Southern Highlands and west to the Blue Mountains. It occurs in heath or dry sclerophyll forest on sandy soils, and prefers open, disturbed sites such as trail margins, spoil mounds and in recently burnt patches.	Low to moderate.
Angophora inopina	V	V	Open dry sclerophyll woodland of *Eucalyptus haemastoma* and *Corymbia gummifera*, with a dense shrub understorey on deep white sandy soils over sandstone.	Low. No suitable habitat within the site
Callistemon linearifolius	V	-	Grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers spring – summer.	Moderate to high within the spotted gum-ironbark forest.
Cryptostylis hunteriana	V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland.	Low. No suitable habitat within the site.
Eucalyptus glaucina	V	V	Found only on the north coast of NSW and from Taree to Broke. Grows in grassy woodland and dry eucalypt forest on deep, moderately fertile and well-watered soils.	Low. No suitable habitat within the site.
Eucalyptus parramattensis subsp. *decadens*	V	V	Generally occupies deep, low-nutrient sands, often those subject to periodic inundation or where water tables are relatively high. It occurs in dry sclerophyll woodland with dry heath understorey. It also occurs as an emergent in dry or wet heathland.	Low. No suitable habitat within the site.

Common/Scientific Name	Status TSC	Status EPBC	Preferred Habitat	Likelihood of Occurrence
Grevillea parviflora	V	V	Grows in sandy or light clay soils usually over thin shales. Occurs in a range of vegetation types from heath and shrubby woodland to open forest.	Moderate to high within the spotted gum-ironbark forest.
Rutidosis heterogama	V	V	Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.	Low.
Frogs and Reptiles				
Heleioporus australiacus giant burrowing frog	V	V	Occurs from the NSW Central Coast to eastern Victoria, but is most common on the Sydney sandstone. It has been found from the coast to the Great Dividing Range. Generally lives in the heath or forest and will travel several hundred metres to creeks to breed.	Low to moderate likelihood based on absence of preferred habitat.
Litoria aurea green and golden bell frog	E	V	In NSW the species occupies disturbed habitats and breeds largely in ephemeral ponds.	Low to moderate likelihood based on absence of large ephemeral ponds. Potential habitat available in the nearby Ellalong Lagoon.
Litoria littlejohni Littlejohn's tree frog	V	V	Has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest. It occurs along permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops.	Low likelihood based on absence of preferred habitat.
Mixophyes balbus stuttering frog	E	V	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor.	Low to moderate likelihood based on absence of preferred habitat.

Common/Scientific Name	Status TSC	Status EPBC	Preferred Habitat	Likelihood of Occurrence
Mixophyes iteratus southern barred frog	V	V	Forage and live amongst deep, damp leave litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest at elevations below 1000 metres. Breeds around shallow, flowing rocky streams.	Low likelihood due to absence of flowing, rocky streams.
Hoplocephalus bungaroides broad headed snake	E	V	This species is largely confined to Triassic sandstones, including the Hawkesbury, Narellan and Shoalhaven formations, within the coast and ranges in an area within approximately 250 km of Sydney. It shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. In summer it shelters in hollows in large trees within 200 m of escarpments.	Low likelihood due to absence of rock crevices and exposed cliffs.
Birds				
Callocephalon fimbriatum gang-gang cockatoo	V	-	In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas.	Moderate.
Calyptorhynchus lathami glossy black-cockatoo	V	E	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly black she-oak (*Allocasuarina littoralis*), forest she-oak (*A. torulosa*) or drooping she-oak (*A. verticillata*) occur. Dependent on large hollow-bearing eucalypts for nest sites.	Moderate.
Climacteris picumnus brown treecreeper	V	-	Found in eucalypt woodlands and dry open forest of the inland slopes and plains dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey. Fallen timber is an important habitat component for foraging.	Moderate to high.

Common/Scientific Name	Status TSC	Status EPBC	Preferred Habitat	Likelihood of Occurrence
Erythrotriorchis radiatus 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.	Low to moderate likelihood based on lack of suitably sized water bodies.
Lathamus discolor swift parrot	E	E, M	Migratory species frequenting eucalypt forest and woodland, following winter flowering eucalypts (eg. swamp mahogany). Breeds in Tasmania.	Moderate to high likelihood of occurring on a seasonal basis.
Melithreptus gularis gularis black-chinned honeyeater	V	-	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially mugga ironbark (*Eucalyptus sideroxylon*), white box (*E. albens*), grey box (*E. microcarpa*), yellow box (*E. melliodora*) and forest red gum (*E. tereticornis*). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees.	Moderate.
Ninox connivens barking owl	V	-	Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. During the day they roost along creek lines, usually in tall understorey trees with dense foliage.	Moderate to high.
Ninox strenua powerful owl	V	-	The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as *Syncarpia glomulifera, Allocasuarina littoralis, Acacia melanoxylon, Angophora floribunda, Exocarpos cupressiformis* and a number of eucalypt species.	Moderate to high.
Pomatostomus temporalis grey-crowned babbler	V	-	Open woodlands dominated by mature eucalypts, with regenerating trees, tall shrubs and an intact cover of grass and forbs and along streams in cleared areas.	Moderate to high.

Common/Scientific Name	Status TSC	Status EPBC	Preferred Habitat	Likelihood of Occurrence
Pyrrholaemus sagittatus speckled warbler	V	-	Lives in a wide range of eucalypt dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	Moderate to high.
Stagonopleura guttata diamond firetail	V	-	Found in grassy eucalypt woodlands, open forest, mallee, natural temperate grassland, and in secondary grassland derived from other communities.	Moderate to high.
Stictonetta naevosa freckled duck	V	-	Prefer permanent freshwater swamps and creeks with heavy growth of cumbungi, lignum or tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	Low.
Xanthomyza phrygia regent honeyeater	E	E, M	Nomadic species following rich sources of nectar, primarily winter flowering species. The species inhabits dry open forest and woodland, particularly box-ironbark woodland, and riparian forests of river sheoak. Regent honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	Moderate to high likelihood of occurring on a seasonal basis. Known from locality.
mammals				
Dasyurus maculatus tiger quoll	V	E	Wide range of forested habitats including rainforest, open forest, coastal heath, riparian forest. Nests in caves, hollow logs or tree hollows.	High likelihood of foraging and denning.
Petaurus australis yellow-bellied glider	V	-	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.	Low.

Common/Scientific Name	Status TSC	Status EPBC	Preferred Habitat	Likelihood of Occurrence
Petaurus norfolcensis squirrel glider	V	-	Dry sclerophyll forest and remnant woodland containing mature or mixed aged stands with gum-barked and winter flowering trees, and mature *Acacia* species. Nests socially in tree hollows.	High likelihood of foraging and nesting.
Petrogale penicillata 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 due to lack of suitable habitat.
Phascolarctos cinereus koala	V	-	Forests typically on high nutrient soils characterised by presence of preferred feed trees.	Moderate likelihood based on presence of preferred feed trees.
Potorous tridactylus long-nosed potoroo	V	V	Generally restricted to areas with an annual rainfall greater than 760 mm where they inhabit dry and wet sclerophyll forests and woodland with a heathy understorey. Preferred habitat in north eastern NSW is dry and wet open shrubland.	Low to moderate.
Pseudomys oralis Hastings river mouse	V	-	Damp, dense fern or sedge understorey along drainage lines, but also utilises drier areas with grassy or heathy ground cover.	Low to moderate.
Chalinolobus dwyeri 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.	High likelihood of foraging. No roost sites expected.
Falsistrellus tasmaniensis eastern pipistrelle	V	-	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	Moderate.
Miniopterus schreibersii oceanensis eastern bentwing-bat	V	-	Roosts in caves, old mines, stormwater channels; forages above the forest canopy.	High likelihood of foraging. No roost sites expected.

Common/Scientific Name	Status TSC	Status EPBC	Preferred Habitat	Likelihood of Occurrence
Mormopterus norfolkensis eastern freetail-bat	V	-	Wide range of forested habitats including rainforest to dry open forest. Roosts in tree hollows and under loose bark.	High likelihood foraging and roosting.
Pteropus poliocephalus 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 likelihood of foraging.

Status in NSW as per Schedules 1 and 2 of TSC Act: E = Endangered; V = Vulnerable.

Status in Australia as per EPBC Act: E = Endangered; V = Vulnerable; M = Migratory.

4 POTENTIAL IMPACTS OF SUBSIDENCE

The most direct environmental impact of underground mining is subsidence, which causes changes in the level and slope of the ground surface. An assessment has been made against the following predicted mine subsidence generated movements.

Table 4.1 Subsidence Predictions

At completion of longwall panel	A1	A1 + A2
Subsidence (m)	0.2	3.9 – 4.2
Max. tensile strain (mm/m)	0.1	5
Max. compressive strain (mm/m)	0.2	10
Max. tilt (mm/m)	0.8	30

At the completion of longwall A1, subsidence is likely to be less than 200 mm and be imperceptible (SCT, 2006). At the completion of longwall A2, a broad subsidence trough centred on the longwalls is expected to have developed. An absolute maximum subsidence trough in the range of 3.9 to 4.2 metres has been used for this assessment.

The following section predicts impacts on flora and fauna from the proposed underground mining. Clearing associated with the proposed infrastructure sites has been assessed in *Chapter 5*.

4.1 FLORA

All of those threatened flora species likely to occur within the site as detailed in *Table 3.3* have been collectively referred to within this assessment of potential impacts.

4.1.1 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.

With a maximum predicted tilt of 30 mm per metre, a vertical 20 metre high tree on the side of a trough may lean by up to 600 mm. Numerous other mines have experienced similar magnitudes of subsidence induced tilts (for example South Bulga and Beltana). At these mines there has been no recorded regular or even occasional tree fall, even after some years of observation (David O'Brien -Xstrata, *pers comm.*). It is unlikely that subsidence will cause measurable tree fall at Austar, although the subsidence-induced loss of the occasional tree with a poor root system or particular

substrate cannot be ruled out. No significant damage to trees within the Lower Hunter spotted gum ironbark community is expected.

Tilt will not affect shrubs, herbs or grasses, as they are too short to exert significant leverage on root systems.

4.1.2 Strain

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. Tensile strains pull on structures commonly damaging inflexible material by stretching and rupturing.

Surface subsidence of 4.2 metres will cause maximum tensile strains of 5 mm per metre and maximum compressive strains of 10 mm per metre. Neither of these levels of predicted strain are expected to significantly impact on plant roots.

4.1.3 Ponding

No ponding is predicted to occur above the longwall panels (GeoTerra, 2006).

4.1.4 Lowering of the Watertable Beyond the Reach of Plants

There have been no groundwater dependent ecosystems identified on longwall panels A1 and A2 and any lowering of the water table would not significantly impact on the vegetation communities present.

4.1.5 Subsiding Vegetation into the Groundwater Zone

Based upon the surveys conducted in compiling this assessment it is not anticipated that plant communities would be subsided into the groundwater.

4.1.6 Clearing

SCT (2006) predicts that surface cracking over longwall panels A1 and A2 may be apparent on extensive bare surfaces such as access tracks. Such cracking is likely at the top of steep slopes but is unlikely to be perceptible for most practical purposes. No rectification works or consequent clearing are expected to be required above the longwall panels.

4.1.7 Cumulative Impacts

Farming and grazing, mining and logging have all cleared native vegetation. The minor impacts of the proposed modification will not significantly increase the effects of the surrounding native vegetation clearance and associated impacts beyond that which has been approved.

4.2 FAUNA

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

4.2.1 Vegetation Loss

Only minimal vegetation clearance is required. The proposed longwall mining is not likely to isolate or reduce the extent of the local vegetation communities present. The proposed modification will not remove fallen timber, which provides a foraging and shelter resource for native fauna.

4.2.2 Rock Shelters and Burrows

SCT (2006) predicts that surface cracking over longwall panels A1 and A2 may be apparent on extensive bare surfaces such as access tracks. Bats may roost in 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.

4.2.3 Aquatic Habitats

Mining within longwall panels A1 and A2 will cause little change to surface water regimes. No loss of stream flow or redistribution of surface flow to shallow groundwater or generation of new stream paths is anticipated (Geoterra, 2006).

4.2.4 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, no loss of stream flow or redistribution of surface flow is anticipated (Geoterra, 2006). No dams occur within the subsidence zone above longwall panels A1 and A2.

4.2.5 Cumulative Impacts

Farming, grazing, mining and logging have cleared native vegetation and disrupted associated habitat. The minor impacts of the proposed modification will not significantly increase the effects of the surrounding native vegetation clearance and associated impacts beyond that which has been approved.

4.3 SUMMARY OF PREDICTED IMPACTS

Predicted maximum subsidence of 4.2 metres is unlikely to significantly impact any threatened species or endangered ecological communities.

No other significant impacts are likely to occur as a result of the increased levels of subsidence. The impacts are substantially the same as those assessed and approved in the 1996 consent.

5 THREATENED SPECIES ASSESSMENT

5.1 ASSESSMENT OF SIGNIFICANCE

The assessment of significance addresses the potential impact of the proposed modification on threatened species, populations and ecological communities which have been recorded on site or have a moderate or high likelihood of occurring on site.

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.

The assessment of the threatened species is based on groups rather than individuals. The division into groups is based on species having similar ecological requirements, at risk from the same threats and likely to be impacted upon in similar ways by the proposed modification.

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.*

Flora

Acacia bynoeana, Angophora inopina, Callistemon linearifolius and *Grevillea parviflora* have not been recorded within the site. No potential habitat will be removed and the proposed modification is unlikely to impact on the lifecycle of these species such that a local extinction would occur.

Birds

Habitat is available for *Lathamus discolor* (swift parrot), *Melithreptus gularis* (black-chinned honeyeater), *Xanthomyza phrygia* (regent honeyeater), *Callocephalon fimbriatum* (gang-gang cockatoo), *Calyptorhynchus lathami* (glossy black-cockatoo), *Ninox connivens* (barking owl), *Ninox strenua* (powerful owl), *Climacteris picumnus* (brown treecreeper), *Stagonopleura guttata* (diamond firetail), *Pomatostomus temporalis* (grey-crowned babbler) and *Pyrrholaemus sagittata* (speckled warbler).

None of these species are likely to be dependent on the limited amount of resources present within the proposed infrastructure sites and no impact to the large areas of open forest within the remainder of the site is expected as a result of the predicted subsidence. The proposed modification is therefore unlikely to impact on the lifecycle of these threatened birds such that a local extinction would occur.

Terrestrial Mammals

Potential habitat for *Dasyurus maculatus* (tiger quoll) is available across the entire site and surrounding habitat. This species is unlikely to be dependent on the limited amount of resources in the proposed infrastructure sites and no impact to the large areas of open forest within the remainder of the site is expected as a result of the predicted subsidence.

Arboreal Mammals

Potential foraging and nesting habitat for *Petaurus norfolcensis* (squirrel glider) is available across the entire site and surrounding habitats. This species is unlikely to be dependent on the limited amount of resources in the proposed infrastructure sites and no significant impact to the large areas of open forest within the remainder of the site is expected as a result of subsidence. The proposed modification is therefore unlikely to impact on the lifecycle of this species such that a local extinction would occur.

Potential foraging habitat for *Phascolarctos cinereus* (koala) is available across much of the site and surrounding habitats due to the presence of feed trees *Eucalyptus tereticornis* (forest red gum), *Eucalyptus punctata* (grey gum) and *Eucalyptus microcorys* (tallowwood). This species is unlikely to be dependent on the limited amount of resources in the proposed infrastructure sites and no impact to the large areas of open forest within the remainder of the site is expected as a result of subsidence. The proposed modification is therefore unlikely to impact on the lifecycle of this species such that a local extinction would occur.

Microchiropteran Bats

The site provides limited hunting habitat only for the cave dependent *Chalinolobus dwyeri* (large pied bat) and *Miniopterus schreibersii oceanensis* (eastern bentwing-bat). *Mormopterus norfolkensis* (eastern freetail-bat) and *Falsistrellus tasmaniensis* (eastern pipistrelle) roost in tree hollows and the site provides both hunting and roosting habitat for these species. Given their generalist hunting requirements, and the low impact of subsidence on the habitat resources the proposed modification is unlikely to impact on the lifecycle of these species such that a local extinction would occur.

Megachiropteran Bats

Potential foraging and limited roosting habitat for *Pteropus poliocephalus* (grey-headed flying-fox) is available across the entire site and surrounding habitat. This species is unlikely to be dependent on the limited amount of resources present within the proposed infrastructure sites and no significant impact to the large areas of open forest within the remainder of the site is expected as a result of the likely predicted subsidence. The proposed modification is therefore unlikely to impact on the lifecycle of this species such that a local extinction would occur.

(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.

No endangered populations have been listed on site.

(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

The endangered ecological communities lower Hunter spotted gum-ironbark forest and the Hunter lowland redgum forest have been identified within the site. The proposed mining and associated subsidence will not impact on these vegetation communities.

The proposed dam wall stabilisation and bushfire asset protection zone around the electricity substation will result in the removal of less than 0.001 hectares of disturbed open forest. Given the large extent of these communities within the remainder of the site and surrounding lands, the proposed modification is unlikely to place these communities at risk of extinction. The remaining infrastructure (fan shaft, nitrogen inertisation plant and boreholes) will be generally restricted to the already cleared areas.

(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.

The proposed modification will not modify the composition of the lower Hunter spotted gum ironbark forest or Hunter lowland redgum forest such that their local occurrence will be placed at risk of extinction.

(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

Less that 0.001 hectares of habitat will be removed as a result of the proposed modification. This habitat removal is not significant on a local scale given that the vegetation within the remainder of the site will not be adversely impacted by vegetation clearance.

(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 site forms part of a vegetated corridor along the Broken Back Range and the Aberdare State Forest. This vegetated corridor will not be fragmented or isolated by the proposed modification.

(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.

Corridors are important for linking remnant areas of vegetation and for facilitating the many ecological processes required to sustain biodiversity. Corridors promote opportunities for fauna movement and the long-term viability of species as they reduce the effect of isolation of small remnant patches of vegetation. The proposed modification will not fragment or isolate currently interconnecting or proximate areas of habitat.

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

At present, there are no finalised recovery plans for the threatened species likely to occur within the site.

The property is monitored (general observations) for the presence of feral animals including the fox. If levels of activity are significant, DEC and the Rural Lands Protection Board will be contacted and the necessary control measures undertaken.

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 27 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 habitat following subsidence due to longwall mining	**Yes**
Alteration of natural flow regimes.	No
Bushrock removal.	No
Clearing of native vegetation.	**Yes**
Competition and grazing by the feral European rabbit (*Oryctolagus cuniculus*).	No
Competition and habitat degradation by feral goats.	No
Competition from feral honeybees *Apis mellifera*.	No
Death or injury to marine species following capture in shark control programs.	No
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments.	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.	**Yes**
Human caused climate change.	No
Importation of red 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 *Phytophthora cinnamomi*.	No
Introduction of the large earth bumblebee (*Bombus terrestris*)	No
Invasion of native plant communities by bitou bush and boneseed	No
Invasion of native plant communities by exotic perennial grasses.	**Yes**
Invasion by yellow crazy ants	No
Loss and/or degradation of sites used for hill-topping by butterflies.	No
Predation by mosquito fish (*Gambusia holbrooki*).	No
Predation by feral cat (*Felis cattus*).	No
Predation by fox (*Vulpes vulpes*).	**Yes**
Predation by ship rat (*Rattus rattus*) on Lord Howe Island.	No
Removal of dead wood and dead trees.	No

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. As indicated in *Section 4.0,* the proposed changes to longwall mining and predicted subsidence levels will not adversely impact any threatened species or their habitats.

- Clearing of native vegetation

The proposed modification involves the removal of less than 0.001 hectares of native vegetation for the dam wall stabilisation. Although the removal of this vegetation is a key threatening process, large areas of similar vegetation will remain within the site and will not be significantly impacted by the proposed modification. No additional vegetation will be removed and all machinery must be stored in the cleared areas.

- Invasion of native plant communities by exotic perennial grasses.

Exotic perennial grasses are present in disturbed areas, particularly where vegetation has been cleared and along tracks. There is a risk of their spread during the truck movements and maintenance works, however, this is unlikely to be at a scale that would significantly alter the composition of native plant communities.

- Predation by fox (*Vulpes vulpes*)

Indications of foxes were recorded within the site. The proposed longwall mining is unlikely to increase predation on fauna by the fox.

- High frequency fire

The proposed modification may increase fire sources in the immediate environs. However, hazard reduction measures included within the proposed modification such as asset protection zones and the upgraded fire fighting and water reticulation system will reduce the risk of fire from sources within 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 on or near the site. There are Commonwealth listed ecological communities, threatened species and migratory species recorded or likely to occur on the site.

One flora species and six fauna species listed as threatened in the EPBC Act have the potential to occur on site (see *Table 3.3*).

Provided the environs continue to function as a wildlife corridor and winter flowering resources are retained, the proposed modification is not expected to cause detrimental impacts upon the health of the remaining vegetation in the site. 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 site; 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 modification. Therefore, it is unnecessary to reassess the threatened species listed in the EPBC Act.

Seven migratory bird species have been identified as having the potential to occur within 10 kilometres of the site. Five 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 site and these species have not been included in this assessment.

The terrestrial migratory birds are:

- *Haliaetus leucogaster* (white-bellied sea-eagle);
- *Hirundapus caudacutus* (white-throated needletail);
- *Monarcha melanopsis* (black-faced monarch);
- *Myiagra cyanoleuca* (satin flycatcher); and
- *Rhipidura rufifrons* (rufous fantail).

These species may occasionally use the site as foraging habitat. However, as the distribution of vegetation communities is not confined to the site and as these species are wide-ranging with generalist habitat requirements, it is unlikely that the proposed modification 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 site; or

3. disrupt the life cycle of an ecologically significant proportion of a population of the species.

The proposed modification 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 modification will not impact on matters of national environmental significance, approval from the Commonwealth Minister for the Environment is not required.

6 *CONCLUSION*

The site contains three vegetation communities being, lower Hunter spotted gum-ironbark forest, Hunter lowlands redgum forest and mainly cleared. The site has been subjected to considerable past disturbance, such as logging for mine supports, grazing and a relatively high frequency of fires.

Lower Hunter spotted gum-ironbark forest and Hunter lowland redgum forest have been identified as endangered ecological communities. The lower Hunter spotted gum-ironbark forest was recorded overlying the proposed longwall panels A1 and A2. This community also dominates the surrounding ridges and slopes. On the lower slopes the spotted gum-ironbark forest mixes with the Hunter lowlands redgum forest, which occurs adjacent to the proposed infrastructure sites.

Subsidence has been assessed for the range of 3.9 to 4.2 metres, with associated strains up to 10mm per metre and tilts ranging to 30mm per metre. Based on observations at similar mines, it is unlikely that the predicted subsidence will cause measurable tree fall and no significant damage to trees within the Lower Hunter spotted gum ironbark community is expected.

The proposed dam wall stabilisation and bushfire asset protection zone around the electricity substation will result in the removal of less than 0.001 hectares of disturbed open forest. Given the large extent of lower Hunter spotted gum ironbark forest and Hunter lowland redgum forest within the remainder of the site and surrounding lands, the proposed modification is unlikely to place these communities at risk of extinction.

No threatened flora or fauna species were recorded within the site. Should any be present at other times of the year, they would be unlikely to be impacted by the proposed modification.

In conclusion, no significant impacts are likely to occur as a result of the proposed infrastructure sites and increased levels of subsidence. The impacts of the proposed modification are substantially the same as those approved in the 1996 consent.

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