

Mt Piper Power Station Extension Environmental Assessment

ECOLOGICAL IMPACT ASSESSMENT

- August 2009



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Contents

1.	Introduction	1
1.1.	Project Description	1
1.2.	Flora and Fauna Assessment	1
2.	Review of Existing Knowledge	3
2.1.	Previous Investigations	3
2.2.	Wildlife Databases	5
2.2.1.	Threatened Flora	5
2.2.2.	Threatened Fauna	6
2.2.3.	Endangered Ecological Communities	7
3.	Site Assessment	10
3.1.	Methods	10
3.2.	Vegetation Communities	12
3.3.	Floristic Diversity / Condition	19
3.4.	Threatened Flora	19
3.5.	Fauna Habitats	20
3.6.	Fauna Species	23
3.7.	Threatened Fauna	24
4.	Impact Assessment	25
4.1.	General Impacts	25
4.1.1.	Vegetation Clearance	25
4.1.2.	Fauna Habitat	25
4.2.	Threatened Species Conservation Act, 1995	26
4.2.1.	Critical habitat	26
4.2.2.	Endangered Ecological Communities	26
4.2.3.	National Park Estate	26
4.2.4.	Threatened Species	26
4.3.	Environment Protection and Biodiversity Conservation Act, 1999	30
5.	Avoidance and Mitigation Measures	34
5.1.	Avoidance	34
5.2.	Mitigation	34
5.2.1.	Weed and Pathogen Management	34
5.2.2.	Fauna Habitat	35
5.2.3.	Induction of construction personnel	35
6.	Conclusion	36



7. References	37
Appendix A Flora of the Investigation Area	38
Appendix B Fauna of the Investigation Area	41



1. Introduction

1.1. Project Description

Delta Electricity operates the existing Mt Piper Power Station which has a generating capacity of approximately 1,400 MW. The proposed Mt Piper Power Station Extension project would comprise the installation and operation of up to 2,000 MW of new generating capacity. This new capacity would be either additional coal-fired steam turbine generators or new combined cycle gas turbines.

The project site is located in the Central West region of NSW, approximately 17 km north-west of Lithgow. The nearest townships are Portland, located approximately 4 km to the west, Blackmans Flat approximately 3 km to the east and Wallerawang, approximately 6 km to the south-east. Mt Piper Power Station is located at the intersection of Castlereagh Highway, the main transport corridor to the site, and Boulder Road.

The new plant would be located to the west of the existing plant, generally in the area previously prepared for the extension when Units 1 and 2 were constructed. The site mainly comprises planted and landscaped areas and remnant woodland / open forest and is surrounded by undulating topography. It is surrounded predominantly by State Forest (Ben Bullen State Forest located north east and south east of Mt Piper Power Station), mines (Ivanhoe Colliery located north and west of the site) and power generation facilities (Wallerawang Power Station located approximately 6km to the south-east).

1.2. Flora and Fauna Assessment

Approval for the project is being sought under the provisions of Part 3A of the *Environmental Planning and Assessment Act, 1979*. This flora and fauna assessment has been prepared as part of the environmental assessment (EA) which supports the application for the proposed extension.

The information presented in the report has utilised a review of available data and field investigations to assess the potential impacts of the proposal in relation to relevant environmental and threatened species legislation. Mt Piper Power Station occurs within the Sydney Basin Bioregion.



■ **Figure 1 Locality Plan**

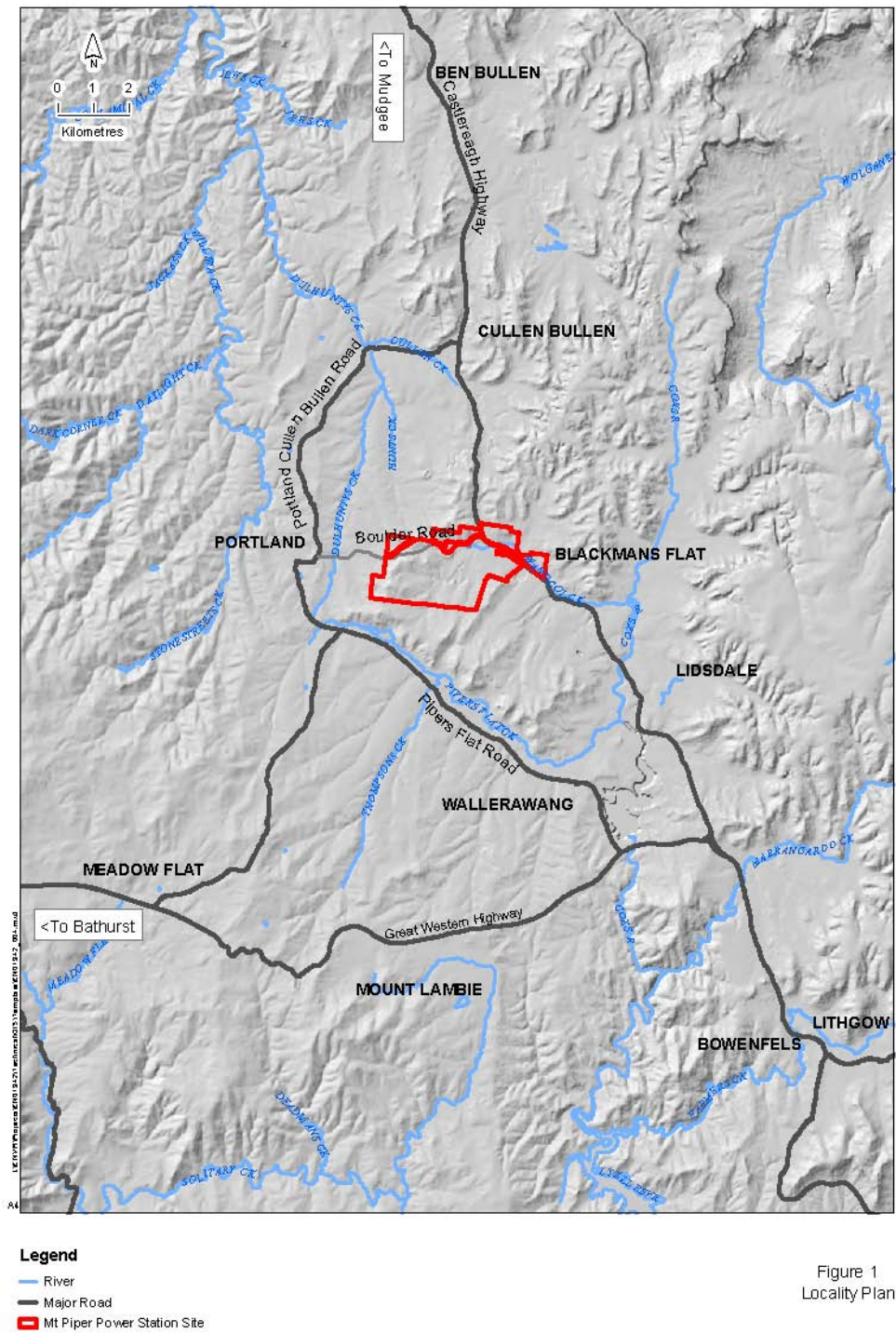


Figure 1
Locality Plan



2. Review of Existing Knowledge

2.1. Previous Investigations

A previous assessment reported on the terrestrial flora and fauna issues occupying the Mt Piper Power Station perimeter lands and the nearby Thompsons Creek Dam (Ecotone Ecological Consultants 1996). The data presented in the Ecotone report documents the results of comprehensive seasonal surveys and has been reviewed for this assessment.

The previous surveys were concentrated within the naturally vegetated perimeter lands of the power station including some former mining and state forest lands although avoided existing disturbed and regenerating lands adjacent to plant infrastructure. The Ecotone (1996) study covered a broader range of topography and habitat types and a considerably larger area than the surveys for this assessment and included steeper forested lands to the east, south and west of the proposed extension area.

Surveys for terrestrial flora and fauna were undertaken over four seasons from autumn 1995 to the summer of 1995/1996. These surveys involved the identification and mapping of vegetation communities, transect and quadrat surveys for flora and targeted surveys for threatened plant species. Fauna surveys included live-trapping using Elliott, cage and pit traps as well as mist nests and harp traps for microchiropteran bats. Additional techniques included spotlighting, ultrasonic bat detectors, owl call playback, scat collection and analysis and searches for scratch-marks, tracks and other signs.

Flora Assemblage

A total of over 200 plant species were recorded for the perimeter lands. The vegetation communities identified are typical of those expected in the wider region and primarily linked to local geology and soil. The eight mapped vegetation communities of the perimeter lands are following:

Geology

Triassic Sandstone

Permian Sediment (Illawarra Coal Measures)

Vegetation communities of the perimeter lands

Silvertop ash open Forest

Sydney Peppermint Open forest

Brown Stringybark Open Forest

Scribbly Gum Open Woodland / Forest

Thin-leaved Stringybark Open Forest

Brittle Gum/ Red Stringybark/ Scribbly Gum Open Woodland

Snow Gum Grassy Open Woodland

Ribbon Gum/ Apple Box / Snow Gum Open Woodland



The Ecotone (1996) surveys identified the presence of one vulnerable plant species the Capertee Stringybark *Eucalyptus cannonii* scheduled under the *Threatened Species Conservation Act*, 1995 and found within the perimeter lands. An additional species listed as a Rare or Threatened Australian Plants (ROTAP) in Briggs and Leigh (1996), namely *Pterostylis longicurva*, was possibly recorded in the study area, but could not be confirmed.

Ecology field surveys were also undertaken for the proposed coal unloader to the south and east of the Mt Piper power station site (SKM 2007). In that study a total of 109 flora species was recorded within the two vegetation communities occurring in this area, including *Eucalyptus cannonii* which was recorded in relatively high abundance.

Fauna Assemblage

A considerable amount of information is available in relation to the vertebrate fauna of the perimeter lands and nearby Thompsons Creek dam, based on the seasonal surveys reported in Ecotone (1996). The results indicate a high species richness comprising:

- 11 amphibians;
- 26 reptiles;
- 104 birds; and
- 34 mammals (3 arboreal, 8 terrestrial, 14 bat species and 9 introduced species).

This high diversity is a reflection of the size and diversity of habitat types present within the perimeter lands and represents considerably greater species richness than would be expected to occur within the proposed power station extension area subject to the EA.

Seven fauna species listed under the *Threatened Species Conservation Act* 1995 have been positively recorded within the Mt Piper power station perimeter lands including the Spotted-tailed Quoll *Dasyurus maculata*, Eastern False Pipistrelle *Falsistrellus tasmaniensis*, Eastern Bent-wing Bat *Miniopterus schreibersii*, Gang Gang Cockatoo *Callocephalon fimbriatum*, Painted Honeyeater *Grantiella picta*, Brown Treecreeper *Climacteris picumnus* and Glossy Black Cockatoo *Calyptorhynchus lathami*. An additional two species were tentatively identified including the Greater Broad-nosed Bat *Scoteanax rueppellii* and Powerful Owl *Ninox strenua*.

Ecology field surveys were also undertaken for the proposed coal unloader to the south and east of the Mt Piper power station site (SKM 2007). In this study a total of 45 fauna species were recorded, comprising 31 bird species, 13 mammal species and 2 frogs.

2.2. Wildlife Databases

Additional data sources used in this review included the:

- DECC Atlas of NSW Wildlife Database (2009);
- NPWS (1999) Threatened Species Management Guidelines;
- Database of the Royal Botanic Gardens PlantNET and Australian Museum FaunaNET
- Records published in scientific journals, reports and general flora and fauna distribution texts including Stanger et al (1998), Specht et al (1994), Churchill (1998), Cogger (1993), Garrett (1992), Readers Digest (1997), Simpson and Day (1996);
- Results of local environmental studies, including the studies prepared by Ecotone Ecological Consultants (1996), SKM (2007; 2008);
- Rare or Threatened Australian Plants database (Briggs and Leigh 1996);
- Other relevant databases including the National Herbarium, Environment Australia (nationally threatened species, EPBC Act), records published in the Birds Australia database.

All of the threatened flora and fauna species, endangered populations and ecological communities known to occur within the study locality have been tabulated. This information was utilised in the preparation of lists of threatened species deemed potential inhabitants of the study area (ie potential subject species).

2.2.1. Threatened Flora

Twenty-three threatened flora species have potential to occur in the study area based on the species distribution and habitat requirements, of these 4 have previously been recorded in the wider locality (**Figure 2a**) of the Mt Piper power station site (DECC 2009). The presence of these species was targeted during field surveys carried out within the proposed extension area.

■ Table 1 Threatened flora previously recorded or potentially occurring in the locality

Threatened Flora	Status			Recorded in the locality (10 km radius)
	Cwlth	NSW	RoTAP	
<i>Acacia baueri</i> subsp. <i>aspera</i>	-	V	2RC	
<i>Acacia clunies-rossiae</i>	-	V	2RC-t	
<i>Acacia flocktoniae</i>	V	V	2VC-	
<i>Calotis glandulosa</i>	V	V	3VC-	
<i>Darwinia peduncularis</i>	-	V	3RCi	
<i>Dillwynia tenuifolia</i>	V	V	2RCa	
<i>Derwentia blakelyi</i>	-	V	2K	✓
<i>Diuris aequalis</i>	E	V	3VC-	
<i>Eucalyptus cannonii</i>	V	V	2VCi	✓
<i>Eucalyptus pulverulenta</i>	V	V	3V	✓
<i>Grevillea evansiana</i>	V	V	2VC	

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Threatened Flora	Status			Recorded in the locality (10 km radius)
	Cwlth	NSW	RoTAP	
<i>Grevillea obtusifolia</i>	E	E	-	
<i>Hibbertia puberula</i>	-	E	-	
<i>Lepidium hyssopifolium</i>	E	E	3ECi+	
<i>Persoonia acerosa</i>	V	V	2VC-	
<i>Persoonia hindii</i>	-	E	2V	
<i>Persoonia hirsute</i>	E	E	3KCi	
<i>Persoonia marginata</i>	V	V	2V	✓
<i>Prostanthera stricta</i>	V	V	2V	
<i>Pultenaea glabra</i>	V	V	3VCa	
<i>Thesium austral</i>	V	V	3VCi+	
<i>Zieria citriodora</i>	V	E	-	
<i>Zieria murphyi</i>	V	V	2VC-	

E= Endangered; V= Vulnerable

2.2.2. Threatened Fauna

Thirty-five threatened fauna species have potential occur in the study area based on the distribution and habitat requirements of the species, of these 18 have been recorded in the wider locality (**Figure 2b**) of the Mt Piper power station site (DECC 2009). These species with records within 10 km of the Mt Piper power station site have been identified in **Table 2**.

■ **Table 2 Threatened fauna previously recorded in the locality**

Common name	Species	Status		Recorded in the locality (10 km radius)
		C'wlth	NSW	
Brush-tailed Rock Wallaby	<i>Petrogale penicillata</i>	E	E	
Regent Honeyeater	<i>Xanthomyza phrygia</i>	E	E	
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V	V	✓
Green and Golden Bell Frog	<i>Litoria aurea</i>	V	E	
Bathurst Copper Butterfly	<i>Paralucia spinifera</i>	V	E	✓
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	V	✓
Blue Mountains Water Skink	<i>Eulamprus leuraensis</i>		E	
Giant Dragonfly	<i>Petalura gigantea</i>		E	✓
Stuttering Frog	<i>Mixophyes balbus</i>		E	
Booroolong Frog	<i>Litoria booroolongensis</i>		E	
Little John's Tree Frog	<i>Litoria littlejohni</i>	V	V	
Broad-headed Snake	<i>Hoplocephalus bungaroides</i>	V	E	
Koala	<i>Phascolarctos cinereus</i>		V	✓
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>		V	✓



Common name	Species	Status		Recorded in the locality (10 km radius)
		C'wlth	NSW	
Painted Honeyeater	<i>Grantiella picta</i>		V	✓
Powerful Owl	<i>Ninox strenua</i>		V	✓
Eastern Bent-wing Bat	<i>Miniopterus schreibersii</i>		V	✓
Glossy Black-Cockatoo	<i>Calyptrorhynchus lathamii</i>		V	✓
Yellow-bellied Glider	<i>Petaurus australis</i>		V	
Brown Treecreeper	<i>Climacteris picumnus</i>		V	✓
Grey-crowned Babbler	<i>Pomatostomus temporalis temporalis</i>		V	
Eastern Free-tail Bat	<i>Mormopterus norfolkensis</i>		V	✓
Black-chinned Honeyeater	<i>Melithreptus gularis gularis</i>		V	✓
Hooded Robin	<i>Melanodryas cucullata</i>		V	
Eastern Long-eared Bat	<i>Nyctophilus timoriensis</i>	V	V	
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>		V	✓
Barking Owl	<i>Ninox connivens</i>		V	✓
Diamond Firetail	<i>Stagonopleura guttata</i>		V	✓
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>		V	✓
Squirrel Glider	<i>Petaurus norfolcensis</i>		V	
Square-tailed Kite	<i>Lophoictinia isura</i>		V	
Speckled Warbler	<i>Pyrrholaemus sagittata</i>		V	✓
Pink-tailed Legless Lizard	<i>Aprasia parapulchella</i>		V	
Swift Parrot	<i>Lathamus discolor</i>	E	E	
Turquoise Parrot	<i>Neophema pulchella</i>		V	

E= Endangered; V= Vulnerable

2.2.3. Endangered Ecological Communities

Of the eight vegetation communities identified from the Mt Piper power station perimeter lands in Ecotone (1996), none of these is currently listed as an endangered ecological community under the schedules of the Commonwealth *EPBC Act* or NSW *TSC Act*.

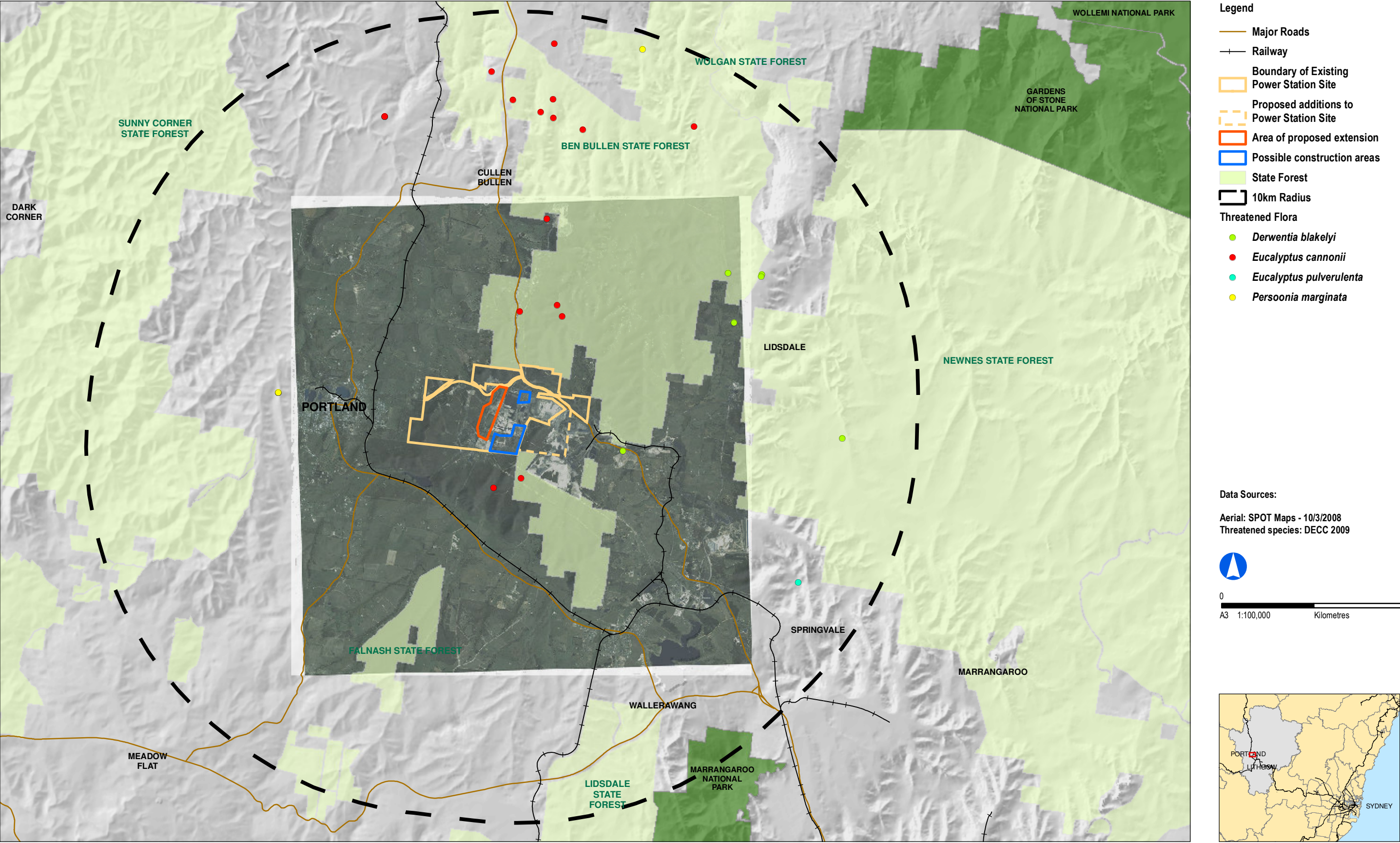


Figure 2a: Threatened Flora Records

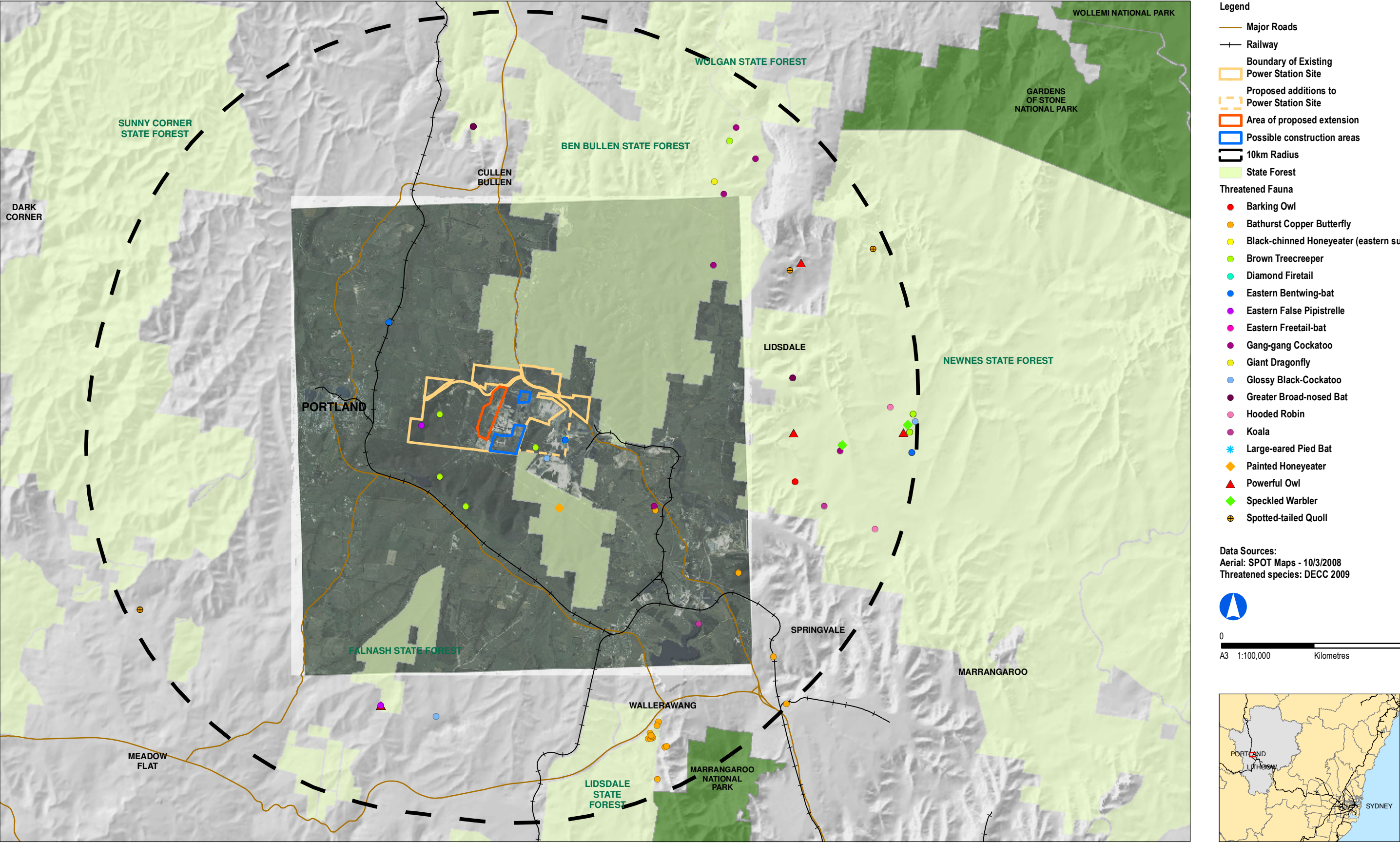


Figure 2b: Threatened Fauna Records

3. Site Assessment

The following section documents the results of a site assessment to record the vegetation, fauna habitats and species diversity present within the proposed plant extension area and potentially impacted by the proposal. The large majority of the land proposed for the extension area has been previously cleared of natural vegetation and currently comprises maintained grass, highly disturbed areas, regenerating native vegetation, and planted and landscaped gardens. For the purposes of this discussion, the proposed extension lands are described as five separate areas (refer to **Figure 3**) and the vegetation and fauna habitat values in each area is discussed.

3.1. Methods

The flora survey involved identification of the floristics and structure of the vegetation within the proposed extension area and the type and distribution of any plant communities. Field surveys were conducted as numerous traverses and transects across the entire extension area. An assessment of the presence of endangered ecological communities as listed in the TSC Act and EPBC Act was undertaken. The overall condition of the site vegetation was noted, including the extent of modification and weed invasion. A search was made for any threatened flora species (**Table 1**) and any additional rare or significant plant species (Briggs and Leigh 1996).

The fauna field survey included a threatened species habitat assessment and fauna census. Surveys were conducted for threatened and common fauna species as well as an investigation of the presence of critical habitat requirements for threatened species listed in **Table 2**. Given the relatively small area of the proposed extension and the lack of fauna habitat attributes, a detailed investigation using the full range of survey techniques was not considered necessary. Information on the fauna assemblage previously recorded from Mt Piper power station perimeter lands was sourced from Ecotone (1996).

The field surveys were based on precautionary habitat assessment and the adoption of protective strategies for features deemed likely to be critical habitat for threatened fauna species recorded by Ecotone (1996) and known from the proximal area. During the survey, all opportunistic sightings of fauna species were recorded. Herpetofauna was targeted by hand searches in appropriate habitat and listening for characteristic calls of frog species. Ground debris, such as fallen logs, rocks and leaf-litter was inspected for sheltering reptiles and frogs. Frog census involved call identification and searches around wet habitat. Birds were identified on the basis of observations and by characteristic call. Investigations for evidence of the presence of faunal species were also conducted. This involved inspections for droppings, tracks, owl pellets and other evidence that could be attributable to individual species. Spotlighting was conducted within the site area on two occasions for a total of four person hours.



Legend

- Boundary of Existing Power Station Site
- Proposed additions to Power Station Site
- Area of proposed extension
- Possible construction areas
- Site Assessment Areas

Data Sources:

Aerial: SPOT Maps - 10/3/2008

0 1
A3 1:20,000 Kilometres



3.2. Vegetation Communities

The quality of the vegetation communities present within and adjacent to the proposed extension areas is limited by the extent of previous clearing, as well as by the current maintenance techniques (ie mowing, slashing, etc.) utilised in large sections of the area. These maintenance practices are particularly obvious in the areas immediately adjacent to the existing power station.

Primarily, the vegetation of the study area comprised of either maintained grassland; planted and landscaped areas; and remnant woodland / open forest. For the purposes of this discussion, the proposed extension lands were divided into five separate areas (refer to **Figure 3**) and the vegetation in each area is discussed below.

Area 1

Area 1 consists of a cleared paddock / field covering approximately 3ha, located adjacent to the existing power station. This area is regularly maintained, being mown to a low level. As a result of this maintenance regime, there are no trees or shrubs present, and the vegetation community consists of grasses and small herbs, which are primarily non-native. There is an overall coverage of the field of introduced and native species in the vicinity of 50-80%, with native species representing less than 10% of cover. There are also some areas of bare earth present. The dominant species present in this area include *Cynodon dactylon* (Common Couch), *Pennisetum clandestinum* (Kikuyu), *Plantago lanceolata* (Plantain), *Hypochaeris radicata* (Cat's ear), *Gnaphalium* sp. (A Cudweed), *Cassinia arcuata* (Chinese Shrub) and *Austrodanthonia tenuior* (A Wallaby Grass).

Surrounding the maintained grassland area there are also landscaped and planted native gardens surrounding the perimeter of the maintained field discussed above. These landscaped grounds consist of a mix of locally indigenous and other native flora species, with a tree canopy layer of 6-10m and foliage coverage of around 30%, additionally a shrub layer up to 3m, with an approximate coverage of 45% is also present. These landscaped / garden areas, which are well maintained, are up to 20m wide and extend around north, west and southern perimeters of the maintained grassland area.

There are a number of tree species located in these planted areas, including *Eucalyptus radiata* (Narrow-leaved Peppermint), *Eucalyptus polyanthemus* (Red Box), *Eucalyptus bridgesiana* (Apple Box), *Eucalyptus rubida* subsp. *rubida* (Candlebark), *Eucalyptus globulus* (Southern Blue Gum) and *Eucalyptus viminalis* (Ribbon Gum). The shrub layer includes *Acacia rubida* (Red-stemmed Wattle), *Acacia cultriformis* (Knife-leaved Wattle), *Acacia dealbata* (Silver Wattle), *Cassinia arcuata* (Chinese Bush) and *Callistemon citrinus* (Crimson Bottlebrush).

As in the maintained grassland area, *Cynodon dactylon* (Couch), *Plantago lanceolata* (Plantain), *Austrodanthonia tenuior* (A Wallaby Grass) and *Microlaena stipoides* subsp. *stipoides* (Weeping



Grass) are present. Also present are clumps of the noxious weed species *Hypericum perforatum* (St John's Wort). There are also several planted deciduous trees that are present along the fence line including *Acer* sp. (Maple trees).

Area 2

This area is highly disturbed and in an ecologically poor condition having been cleared in the past. There is some scattered regrowth of native trees and shrubs over these areas, but with coverage of less than 5% of the total area. Regrowth includes *Eucalyptus bridgesiana* (Apple Box), *Eucalyptus rubida* subsp. *rubida* (Candlebark), *Cassinia arcuata* (Chinese Bush), *Acacia rubida* (Red-stemmed Wattle), *Acacia cultriformis* (Knife-leaved Wattle), *Acacia dealbata* (Silver Wattle) and *Astroloma pinifolium* (Native Cranberry).

The coverage of the groundcover layer varies, ranging from 25%-85%. It consists primarily of a diversity of introduced species, including, but not limited to, the noxious weed species *Hypericum perforatum* (St John's Wort), *Conyza* sp. (Fleabane), *Eragrostis curvula* (African Lovegrass), *Plantago lanceolata* (Plantain), *Cirsium vulgare* (Spear Thistle), *Rubus fruticosus* (Blackberry) and *Hypochaeris radicata* (Cat's Ear). Some native groundcovers are present including *Poa* (*Poa* sp.) and Speargrass (*Austrostipa* sp.).

The majority of the vegetation along the drainage line, which runs adjacent to the main access road, is derived from stock linked to a revegetation program, and comprises both tree and shrub species which are native, but not necessarily locally indigenous. The trees in this area vary from 5-12 metres, with foliage coverage of around 35%. The overall composition is similar to the planted community of Area 1.

Tree species along the drain area include *Eucalyptus radiata* (Narrow-leaved Peppermint), *Eucalyptus polyanthemos* (Red Box), *Eucalyptus bridgesiana* (Apple Box), *Eucalyptus rubida* subsp. *rubida* (Candlebark), *Eucalyptus globulus* (Southern Blue Gum) and *Eucalyptus viminalis* (Ribbon Gum). The shrub layer varies from 0.3-3m in height, with coverage of 45%, and consists of a number of species including *Acacia rubida* (Red-stemmed Wattle), *Acacia decurrens* (Black Wattle), *Acacia dealbata* (Silver Wattle) and *Cassinia arcuata* (Chinese Bush).

Groundcover in this area is a diverse mix of primarily introduced species, with natives comprising less than 10% of all groundcovers. Introduced species cover around of 40% of the area, with various species from the adjacent cleared area present. Additionally, sections of bare earth are also exposed. Groundcover species in this area include, but are not limited to, *Plantago lanceolata* (Plantain), the Noxious *Hypericum perforatum* (St John's Wort), *Eragrostis curvula* (African Lovegrass), *Cynodon dactylon* (Couch), *Paspalum dilatatum* (Paspalum), *Centaureum spicatum* (Common Centaury), *Trifolium repens* (White Clover), *Conyza* sp. (Fleabane), *Lomandra*



longifolia (Spiny-headed Mat-rush), *Juncus bufonius* (Toad Rush), *Cyperus* sp. (A sedge), *Austrodanthonia tenuior* (A Wallaby Grass) and *Typha domingensis* (Cumbungi).



Area 1. Open mown grass



Area 1. Planted gardens surrounding mown field



Area 2. Disturbed area with regenerating shrubs and trees



Area 2 Drain (concrete channel) with planted vegetation on embankments



Area 3. Highly disturbed areas



Area 3. Planted mound

Area 3

This area is highly disturbed having been cleared and used for various activities in the past. There is some scattered regrowth of native trees and shrubs, but with coverage of less than 5% of the total area. The main patches of native vegetation include the planted mounds including similar species to planted vegetation in Areas 1 and 2.

Relatively intact patches of native forest are present along the northern border of Area 3 including a canopy dominated by *Eucalyptus rubida* subsp. *rubida* (Candlebark), *Eucalyptus bridgesiana* (Apple Box) and *Eucalyptus rossii* (Scribbly Gum). The understorey has been partially disturbed and is currently highly grazed by Eastern Grey-Kangaroos (*Macropus giganteus*) and Rabbits (*Oryctolagus cuniculus*) which are abundant in this area. Dominant species in understorey include *Cassinia arcuata* (Chinese Bush), *Austrostipa* spp. (Speargrass) and *Austrodanthonia* spp. (Wallaby Grass).

Area 4

This area is relatively disturbed having been cleared and used for various activities in the past, with the most disturbed lands occurring within an actively used site at the northern end of Area 4 supporting very little native vegetation. However the majority of Area 4 supports a dense cover (40-70%) of regenerating shrubs and trees, including a mix of natural regeneration and plantings.

Regenerating native trees and shrubs include *Eucalyptus rubida* subsp. *rubida* (Candlebark), *Eucalyptus mannifera* (Brittle Gum), Thin-leaved Stringybark (*Eucalyptus eugenioides*), *Eucalyptus bridgesiana* (Apple Box), *Cassinia arcuata* (Chinese Bush), *Acacia rubida* (Red-stemmed Wattle), *Acacia cultriformis* (Knife-leaved Wattle), *Acacia dealbata* (Silver Wattle) and *Acacia decurrens* (Black Wattle). The groundcover is dominated by exotic species including *Plantago lanceolata* (Plantain), the Noxious *Hypericum perforatum* (St John's Wort), *Conyza* sp. (Fleabane) and *Hypochaeris radicata* (Cat's Ear).

There are several patches of planted trees and shrubs in Area 4 including artificially created mounds throughout the regenerating areas and older plantings of various *Eucalyptus* sp. near the access gate along the south-western border. These planted trees include a mix of indigenous and non-indigenous tree species.

The threatened flora species, *Eucalyptus cannonii* (Capertee Stringybark) is present along the southern boundary of this area in moderate abundance and is mapped in **Figure 4**. These trees mostly comprise regenerating juvenile trees however some mature and medium sized trees are also present. No individuals were found within the regenerating vegetation of this area, and *Eucalyptus cannonii* is restricted to southern boundary of Area 4 adjoining remnant vegetation where this species is abundant.

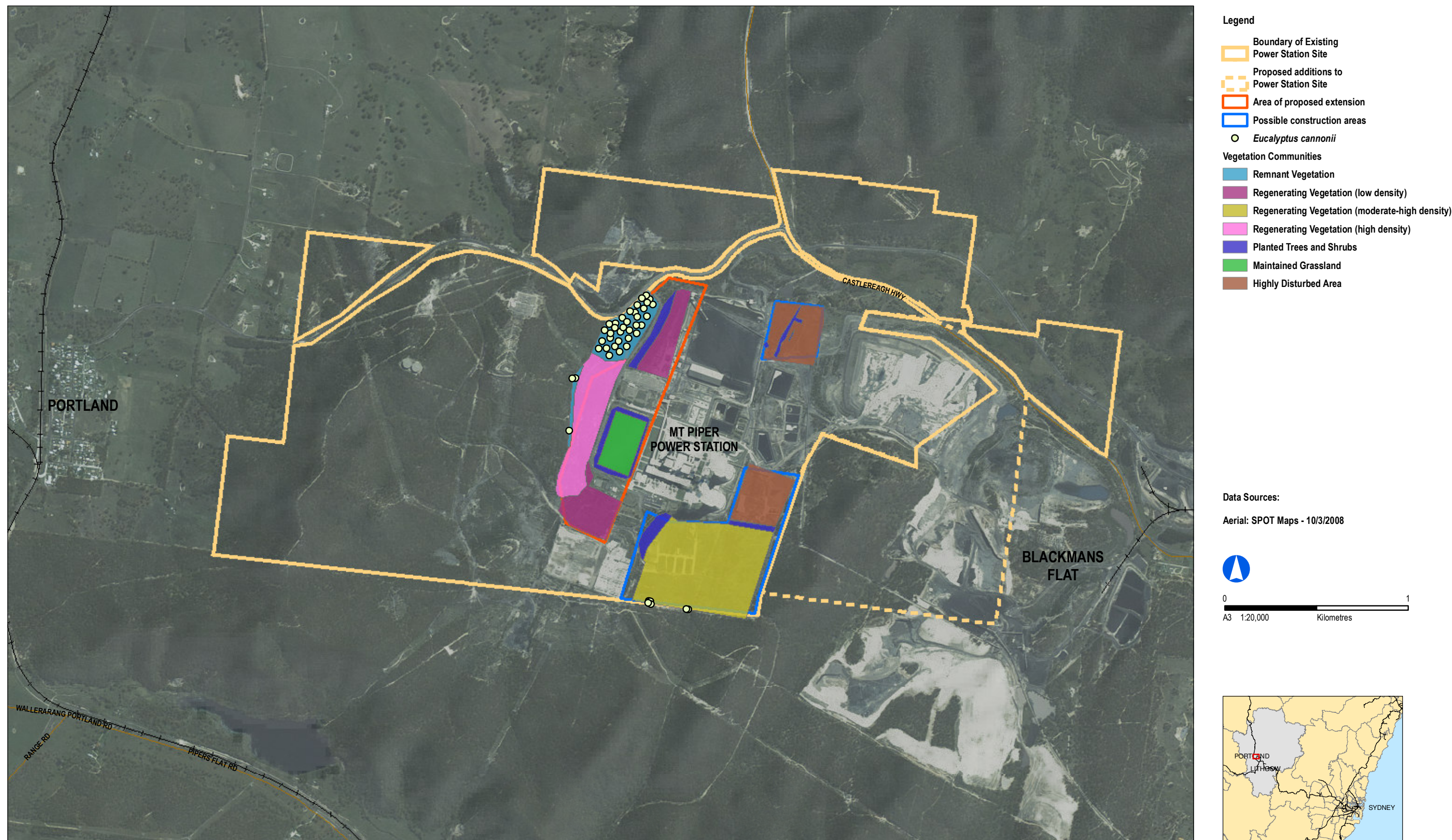


Figure 4: Vegetation Communities and Threatened Flora

Delta Electricity

Version 1



Area 4. Regenerating shrubs and trees



Area 4. Highly disturbed areas to north



Area 4. Intact vegetation along the southern edge, supporting *Eucalyptus cannonii*



Area 5. Intact forest areas at northern end supporting *Eucalyptus cannonii*



Area 5. Regenerating vegetation



Area 5. Southern end showing open cleared areas

Area 5

This area comprises regenerating and remnant patches of vegetation on the western side of the access road to the power station. Intact patches of remnant forest are restricted to the sloping land at the northern end of this area and undisturbed slope along the western border of Area 5. The remaining land comprises regenerating shrubs and trees of various densities including natural regeneration and plantings. Land at the southern end of Area 5 is more open, supporting grassland and a low density of regenerating shrubs and trees.

Patches of intact forest support mature trees with an undisturbed understorey of native shrubs and groundcovers. The canopy is dominated by a mix of species including *Eucalyptus mannifera* (Brittle Gum), *Eucalyptus cannonii* (Capertee Stringybark), *Eucalyptus rubida* subsp. *rubida* (Candlebark), *Eucalyptus bridgesiana* (Apple Box) and *Eucalyptus pauciflora* (Snow Gum). Understorey species include a diversity of shrubs and groundcovers including *Dillwynia sericea* (Showy Parrot-pea), *Acacia rubida* (Red-stemmed Wattle), *Derwentia perfoliata* (Diggers Speedwell), *Acacia dealbata* (Silver Wattle), *Lomandra filiformis* (Wattle Mat-rush) and Speargrass (*Austrostipa* sp.).

Regenerating vegetation comprises a moderate to dense cover (50-80%) of shrubs and trees which are more advanced than other areas. These sites are dominated by *Acacia rubida* (Red-stemmed Wattle), *Acacia dealbata* (Silver Wattle), *Acacia cultriformis* (Knife-leaved wattle) and *Acacia decurrens* (Black Wattle) 3-6 m high. Tree species are also present including *Eucalyptus radiata* (Narrow-leaved Peppermint), *Eucalyptus polyanthemus* (Red Box), *Eucalyptus bridgesiana* (Apple Box) and *Eucalyptus rubida* subsp. *rubida* (Candlebark). The ground layer supports a mix of native and exotic species such as *Plantago lanceolata* (Plantain), the Noxious *Hypericum perforatum* (St John's Wort), *Eragrostis curvula* (African Lovegrass), *Cynodon dactylon* (Couch), and the native grass species including *Poa* sp. and *Austrostipa* sp.

The threatened flora species, *Eucalyptus cannonii* (Capertee Stringybark) is present within the remnant forest at the northern end of Area 5 and on the slopes along the western edge (**Figure 4**). *Eucalyptus cannonii* occurs as a co-dominant species within the remnant vegetation, although the closely related *Eucalyptus macrorhyncha* (Red Stringybark) was also recorded and it is likely there is some hybridisation between the two species. No individuals were found within the regenerating zones of Area 5, being restricted to the northern and western boundary of this area adjoining patches of remnant vegetation where *Eucalyptus cannonii* is abundant. Considering the presence of a relatively undisturbed understorey in these areas there is potential for other threatened flora species to be present such as *Diuris aequalis* (Buttercup Doubletail).

3.3. Floristic Diversity / Condition

In total, 84 different plant taxa from 31 families were represented. This total comprised 19 species of monocotyledons and 63 species of dicotyledons. Of this total, 13 introduced species are present, comprising 15% of the total species recorded. Of the introduced species 5 species declared as Noxious were recorded, with St John's Wort being the most prevalent. A list of all flora species recorded on the site is presented in **Appendix A**.

The majority of vegetation of the proposed extension area is of a disturbed nature consisting of existing formed roads, dirt tracks, modified and maintained areas, landscaped areas and the constructed drains. Patches of remnant vegetation are present at the northern end of Area 5 which are in good condition supporting a high diversity of flora species.

3.4. Threatened Flora

Eucalyptus cannonii (Capertee Stringybark) was recorded in Area 4 and 5, within or adjacent to areas of remnant vegetation (**Figure 4**). This species was not recorded in any areas of regenerating vegetation. It occurs in relatively high abundance within areas of remnant vegetation (density up to 150 per hectare) being a co-dominant with other eucalypt species. However the closely related *Eucalyptus macrorhyncha* (Red Stringybark) is also present in the study area and it is likely there is some hybridisation between the two species in the study area.

The southern boundary of Area 4 supports several regenerating (12), medium (10) and mature individuals (2) of *Eucalyptus cannonii*. Impacts to these individuals could be avoided considering they are on the edge of this area and there are large areas of disturbed and regenerating areas which can be utilised. *Eucalyptus cannonii* is abundant to the south in areas of remnant forest adjoining this area.

The threatened flora species, *Eucalyptus cannonii* (Capertee Stringybark) is present within the remnant forest areas on elevated areas at the northern end of this area, and on the slopes along the western edge (**Figure 4**). Considering the presence of a relatively undisturbed understorey in these areas there is potential for other threatened flora species to be present such as *Diuris aequalis* (Buttercup Doubletail).

It occurs in relatively high abundance within areas of remnant vegetation (density up to 150 per hectare) being a co-dominant with other eucalypt species. It is estimated that up to are present at the northern end of Area 5. Considering the relatively large areas of disturbed, maintained, landscaped and regenerating vegetation in the study area, these patches of high value vegetation could be avoided.



Previous studies undertaken by SKM (2007) and Ecotone (1996) noted the widespread distribution of this species throughout the Mt Piper perimeter lands and in the wider local area. During field surveys for the proposed coal unloader to the south and east of the Mt Piper power station site (SKM 2007) a high abundance of this species was recorded. Additionally field investigations for several other options for a coal conveyor for Mt Piper power station between Baal Bone (to the north of the study area) and Mt Piper, and *Eucalyptus cannonii* was found to be relatively abundant within Ben Bullen State Forest (SKM 2008).

3.5. Fauna Habitats

Habitat for fauna within the proposed extension areas is limited by the extent of previous clearing undertaken for the power station infrastructure, including roads, drains and fences. For the purposes of this discussion, the proposed extension lands were divided into five separate areas (refer **Figure 3**) and the habitat values of each area discussed below.

Given the extent of modification present in the majority of the study area comprising disturbed and regenerating vegetation, these habitat types are of a reduced value for native fauna and are unlikely to represent important habitat for the life-cycle of any fauna in particular threatened fauna species known from the locality. Areas of high-value habitat are present in remnant vegetation areas in surrounding lands and at the northern end of Area 5, supporting hollow bearing trees, fallen timber and a diversity of native flora species including shrub and ground covers.

Area 1

Area 1 is a cleared open field of grass approximately 3ha in size surrounded by a chain wire security fence. There is no tree or shrub cover in area 1 and subsequently fauna occurring in this area are restricted to transient species using the field for temporary foraging, basking and resting. This includes mostly birds, including insectivores such as the Australian Magpie, Magpie Lark and Masked Lapwing, and granivores such as the Eastern Rosella and aerial foragers such as the Welcome Swallow and Fairy Martin. Evidence of grazing by Rabbits and Hares was noted. The perimeter fence restricts access by Eastern Grey Kangaroos. However, evidence of foraging was noted from grass areas outside the fence within Area 2.

Area 1 also includes landscaped and planted native gardens around the perimeter of the enclosed open field. This landscaping includes garden strips up to 20m wide and comprising a mix of locally indigenous and other native flora. All trees are planted and current up to a height of 12 m, with shrubs around 1.5m and forming a dense understorey that is uncharacteristic of the typical surrounding natural bushland. The dense nature of the vegetation favours some smaller passerine bird species including the Yellow-rumped Thornbill and the presence of flowering shrubs providing a food resource for honeyeaters including the Red Wattlebird and White-eared Honeyeater.



Area 2

This area has been previously cleared of vegetation and replanted and seeded in an attempt to regenerate the land with native plant species. Given the shallow nature and poor quality of the soil, regeneration has been largely unsuccessful and most of these areas consist of stunted Wattle species (*Acacia* sp.), open bare soil, exotic grasses and weeds as described previously. Several areas of open rocky soil occur along with some larger boulders providing habitat for common reptile species. There is evidence of rabbits, wombats and kangaroos using the disturbed habitats within Area 2 for grazing.

The majority of the vegetation along the drainage line, which runs adjacent to the main access road, is derived from stock linked to a revegetation program, and comprises both tree and shrub species which are native, but not necessarily locally indigenous. The trees in this area vary from 5-12 metres, with foliage coverage of around 35%. A natural creek flows into the drain to the north of Area 3. The slopes of the concrete drains are steep and comprise disturbed grass and weed species and bare soil and rock. Where vegetation is present it comprises predominately dense areas of planted and regrowth Wattle (*Acacia* spp.) as well patches of eucalypts and some exotic pines. Dense cover is created by the regenerating Wattle and is favoured by smaller birds such as thornbills, fairy wrens and finches. Whilst artificially created the drains provide habitat for frogs and some reptiles. Some persistent pools occur and areas of natural sedges and rushes. The habitat is suitable to common frog species which are tolerant to modified habitats as well as several bird species which favour shallow swamps and creeks in open areas.

Area 3

This area is highly disturbed having been cleared and used for various activities in the past. There is some scattered regrowth of native trees and shrubs over these areas, but with coverage of less than 5% of the total area. The main areas of native vegetation include the planted mound including similar species to planted areas in Areas 1 and 2. These planted and open disturbed areas provide some habitat for common bird species. Eastern Grey Kangaroos and Rabbits are relatively abundant in this area being somewhat fenced into this area and a high level of grazing was observed. Areas of high-quality fauna habitats are present to the north of this area within areas of remnant vegetation.

Given the extent of modification present in this area comprising disturbed and regenerating vegetation, these habitat types are of a reduced value for native fauna and are unlikely to represent important habitat for the life-cycle of any fauna in particular threatened fauna species known from the locality.



Area 4

This area is relatively disturbed having been cleared and used for various activities in the past, with the most disturbed areas within an actively used area at the northern end of Area 4 supporting very little native vegetation. However the majority of Area 4 supports a moderate-dense cover (40-70%) of regenerating shrubs and trees, including a mix of natural regeneration and plantings. Dense areas of shrubs provide habitat for smaller bird species such as thornbills, fairy wrens and finches. There is evidence of rabbits and kangaroos using these disturbed habitats within Area 4 for grazing.

There are several areas of planted trees and shrubs in this area including mounded areas throughout the regenerating areas and older plantings of various *Eucalyptus* sp. near the access gate along the south-western border of this area. These planted trees include a mix of indigenous and non-indigenous tree species. These areas are likely to be utilised by local bird species particularly foraging for nectivorous birds when these trees are flowering. No hollow-bearing trees were recorded in this area.

Area 5

This area comprises regenerating and remnant patches of vegetation on the western side of the access road to the power station. Intact remnant forest is restricted to the sloping land at the northern end of Area 5 and the undisturbed slope along the western border of this area. The remaining lands comprise regenerating shrubs and trees of various densities including natural regeneration and plantings. Land at the southern end of this area is more open, supporting grassland and a lower abundance of regenerating shrubs and trees.

Dense areas of regenerating shrubs and trees provide habitat for smaller bird species such as thornbills, fairy wrens and finches, and open bare and grassed areas provide some habitat for common bird species such as Magpies and Eastern Rosellas. There is evidence of rabbits, wombats and kangaroos using these regenerating habitats within Area 5 for grazing.

The intact remnant forest in Area 5 provides the highest value fauna habitats in the study area being more structurally and biologically diverse, and supporting important habitat attributes such as hollow trees and fallen timber. Hollow-bearing trees are relatively abundant in the areas of remnant vegetation. These hollows are suitable for a range of fauna species to roost and nest in including threatened species, such as arboreal mammals, tree-dwelling microbat species and woodland birds which may utilise these hollows as nest sites. Fallen timber is also abundant in these areas and provides important habitat for a range of fauna species. These areas of remnant vegetation support the highest value habitats for threatened flora and fauna species in the study area.



3.6. Fauna Species

A total of 26 terrestrial fauna species were recorded within the proposed plant extension areas, in addition to 1 crustacean (refer to **Appendix B**). This list comprised 20 bird species, 5 mammal species and 1 frog species. This total represents approximately 20% of the fauna species known from the Mt Piper power station perimeter lands (refer Ecotone 1996) and is expectably low diversity reflecting the lack of natural vegetation in the proposed extension areas, the proximity to the power station infrastructure and associated noise and lights and the relatively small size of the proposal area compared to the extensive naturally vegetated buffer lands surrounding the power station.

The majority of bird species present were common species of urban and modified landscapes with the most abundant including the Magpie (*Gymnorhina tibicen*), Magpie Lark (*Grallina cyanoleuca*), Crimson Rosella (*Platycercus elegans*) and Galah (*Cacatua roseicapilla*). These species are adapted to cleared and modified landscapes and frequent open grassy habitats as is present in Areas 1, 2 and 3. The diversity of species is limited by the lack of forested habitat and consequently common forest and tree dwelling species were found to be absent, with the exception of the Superb Blue Fairy Wren (*Malurus cyaneus*) and Willy Wagtail (*Rhipidura leucophrys*) which utilised the screening planted vegetation and dense regrowth along the drainage areas. Other species utilising the cover along drains included the Brown Thornbill and White-eared Honeyeater. Several additional bird species were observed utilising habitats within the remnant forest areas including White-throated Treecreeper (*Cormobates leucophaeus*), Common Bronzewing (*Phaps chalcoptera*) and a pair of Wood Ducks (*Chenonetta jubata*) was observed nesting in a hollow-tree.

The most common mammals observed to use the disturbed habitats were the introduced Rabbit (*Oryctolagus cuniculus*), Brown Hare (*Lepus capensis*) and Eastern Grey Kangaroo (*Macropus giganteus*). Tracks and dung of the Wombat and Fox were also observed and these species appear to utilise grassed areas within disturbed and regenerating areas of vegetation. Numerous Wombat burrows are present within the area of remnant vegetation at the northern end of Area 5 and there is potential for native arboreal mammals such gliders and possums to be present in these areas considering the presence of hollow trees and connectivity to relatively large areas of habitat. Arboreal mammal species are not expected in the regenerating and disturbed areas of the proposed extension areas due to a lack of tree cover.

Surveys for insectivorous bats were not carried out and a number of species may occur in the area (Ecotone 1996). The habitat within all areas including regenerating, planted and landscaped vegetation, open disturbed areas and along the artificial drains would be used by insectivorous bats for foraging only. Hollow-bearing trees at the northern end of Area 5 potentially provide roosting habitat for tree-dwelling microbat species. One native small mammal species was recorded in the power station perimeter lands by Ecotone (1996), namely the Brown Antechinus (*Antechinus*



stuartii). This species is not expected to occur in the regenerating and disturbed habitats of the proposed extension area due to a lack of natural understorey and logs, however there is an abundance of habitats in remnant vegetation areas surrounding the study area and at the northern end of Area 5.

One frog species was identified from calls from the artificial drainage area along the eastern side of the entry road to the power station, namely the Red-groined Toadlet (*Uperoleia laevis*). The cold nightly temperatures experienced during the survey would have influenced frog species presence. Additional species recorded by Ecotone (1996) would also be expected to utilise the artificial drain habitats in the works area including *Crinia signifera*, *Limnodynastes peroni* and *Litoria verreauxii*. These species are relatively tolerant of degraded and modified habitats.

3.7. Threatened Fauna

No threatened fauna species (TSC Act or EPBC Act) were identified from the field surveys, although several species are known from the Mt Piper power station perimeter lands (Ecotone 1996) and may occasionally utilise the site. Further discussion on threatened species is provided in Section 4 of the report.



4. Impact Assessment

4.1. General Impacts

The proposed extension would occupy a large area on the existing site. Considering the large areas of disturbed land in the study area, including regenerating shrubs and trees and open bare and grassed areas, the areas of high-conservation value remnant vegetation which occur at the northern end of Area 5 should be avoided.

4.1.1. Vegetation Clearance

Native vegetation clearance within the site construction areas is limited to planted gardens and native regrowth. No remnant natural vegetation will need to be directly cleared to accommodate the proposed extension works. Planted and regrowth Eucalypts and Acacias present along landscaped gardens and flanking the artificial drains occur outside the footprint of the proposed infrastructure.

Areas of remnant vegetation at the northern end of Area 5 will be avoided and it has been assumed in the assessment of significance that these areas of remnant vegetation will not be impacted upon. To allow for appropriate avoidance and mitigation, however, additional targeted surveys may, during the detailed design phase, need to be undertaken in the remnant vegetation areas along the edge of Area 4 to ensure these areas are avoided.

4.1.2. Fauna Habitat

Habitat value for fauna within the proposed extension areas is limited by the extent of previous clearing undertaken for the power station infrastructure, including roads, drains and fences. There is only one area of high value for fauna located at the northern end of Area 5, which will not be impacted on by the proposal. Impacts to potential fauna habitat will be restricted to small isolated patches of planted and regrowth Eucalypts and Acacias. The majority of the proposed extension area comprises cleared and modified lands having very little conservation value for fauna species.

Besides the area of remnant vegetation at the northern end of Area 5, the site provides minimal habitat value to a small diversity of native fauna adapted to cleared and modified habitats as evidenced by the findings of this study. This includes a range of common birds, reptiles and frogs, kangaroos and wombats. Such habitat occurs widely throughout the locality including the perimeter lands and is not restricted to the proposed extension area. Impacts on local populations of these species will not be significant or lead to an increased risk of extinction.



4.2. Threatened Species Conservation Act, 1995

4.2.1. Critical habitat

Critical habitat is defined as an area that is critical to the survival of an endangered species, population or ecological community. The proposal will not impact on critical habitat declared under the TSC Act.

4.2.2. Endangered Ecological Communities

The proposed extension areas do not contain remnant or regrowth vegetation that is considered characteristic of an endangered ecological community listed under the TSC Act.

4.2.3. National Park Estate

There will be no direct impacts on national parks or conservation reserves in the region as a result of the proposed extension works. The potential indirect impacts on national parks contained within the Blue Mountains World Heritage area are discussed in Section 4.3.

4.2.4. Threatened Species

One plant species listed as threatened under both the TSC Act and the EPBC Act, *Eucalyptus cannonii* (Capertee Stringybark) was observed in areas of remnant vegetation at the northern end and along the western boundary of Area 5 and along the southern boundary of Area 4 (**Figure 4**). This species occurs in relatively high abundance surrounding the power station outside of the proposed extension areas. The previous study undertaken by Ecotone (1996) also recorded the presence of this species in the perimeter lands, and noted its widespread distribution. *Eucalyptus cannonii* was also recorded to the south and east of the project site in relatively high abundance during surveys for the proposed coal unloader (SKM 2007).

All individuals of *Eucalyptus cannonii* will be avoided as there are adequately large areas of disturbed lands which can be utilised for the proposal. This species was not recorded in the regenerating vegetation in the study area which would be affected by the proposal. As such an assessment of significance under Section 5A of the Environmental Planning and Assessment Act is not required.

Targeted surveys conducted for this assessment indicate the absence of regional threatened flora species, as listed in Section 2, from the proposed extension areas. There is, however, potential for cryptic flora species such as threatened orchids to be present within the un-disturbed understorey of the areas of remnant vegetation.

The list of threatened fauna species recorded from the Mt Piper power station perimeter lands and the surrounding study area is provided in Section 2. Through an analysis of the known habitat

requirements of these threatened species, in relation to the diversity of habitats present within the proposed extension area, a list of potential subject species has been compiled. Potential subject species are defined as those threatened species considered likely to occur in the habitats present within the study area (NPWS 1996).

■ **Table 3 Assessment of the potential for threatened fauna species to occur within the habitats present in the extension area**

Common name	Species	Habitat requirements	Likely presence in the extension area
Brush-tailed Rock Wallaby	<i>Petrogale penicillata</i>	Open forest habitats with exposed rocks, rock overhangs and steep topography	Not expected
Regent Honeyeater	<i>Xanthomyza phrygia</i>	A nomadic species typically associated with forest and woodland habitats with the presence of suitable foraging species such as Yellow Box and Red Ironbark	Not expected
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	Open and closed forest habitats, requires large expansive areas of habitat to sustain territory size	Low, the habitat is not suitable for this species
Green and Golden Bell Frog	<i>Litoria aurea</i>	Ephemeral creeks, dams, ponds with adjacent grassy areas	Not expected
Bathurst Copper Butterfly	<i>Paralucia spinifera</i>	Inhabits open forest / woodland areas above 900m in elevation and prefers sites that receive full all-day sun. Also requires the presence of the Native Blackthorn (<i>Bursaria spinosa ssp lasiophylla</i>) in the understorey an important host plant critical for larvae.	Not expected. There are no previous records of the species surrounding the Mt Piper power station and the habitat is not suitable
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	Open forest and woodland habitats, a cave roosting species which favours sandstone escarpment areas for roosting	Potential foraging area, no roosting habitat present
Painted Honeyeater	<i>Grantiella picta</i>	Dry open forests and woodlands, and is strongly associated with mistletoe.	Small area of potential foraging habitat in Area 5, not impacted by the proposal
Broad-headed Snake	<i>Hoplocephalus bungaroides</i>	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in hollows in large trees within 200 m of escarpments in summer.	Not expected
Blue Mountains Water Skink	<i>Eulamprus leuraensis</i>	Sedge swamps, hanging swamps in the upper Blue mountains area	Not expected
Giant Dragonfly	<i>Petalura gigantea</i>	Sedge swamps, freshwater wetlands and peat bogs	Not expected
Little John's Tree Frog	<i>Litoria littlejohni</i>	It occurs along permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops.	Not expected
Stuttering Frog	<i>Mixophyes balbus</i>	Permanent streams in moist and wet sclerophyll forests	Not expected
Booroolong Frog	<i>Litoria booroolongensis</i>	A highland species (200 – 1000m asl) associated with western-flowing rocky streams on the slopes and tablelands of the Great Dividing Range. Streams are slow-	Not expected

Common name	Species	Habitat requirements	Likely presence in the extension area
		flowing and bordered by grassy vegetation.	
Koala	<i>Phascolarctos cinereus</i>	Open forests and woodlands with favoured food tree species	Not expected
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	Moist and tall open forests, particularly in steep topographic areas	Not expected
Powerful Owl	<i>Ninox strenua</i>	Open forests with dense wet gullies and creek areas, requires large mature trees with hollows for breeding and dense areas of vegetation for prey and roosting	Not expected
Eastern Bent-wing Bat	<i>Miniopterus schreibersii</i>	Forages in a variety of habitat types including cleared and modified environments, a cave roosting species	May forage for insects in all areas, although no cave-roosting sites represented.
Glossy Black-Cockatoo	<i>Calyptrorhynchus lathami</i>	Open forest habitats with She-oak species (<i>Allocasuarina</i> sp) required for food.	Not expected, no food trees identified from the works area
Yellow-bellied Glider	<i>Petaurus australis</i>	Tall open forest habitats, favours mature wet sclerophyll forest and dense gullies.	Not expected
Brown Treecreeper	<i>Climacteris picumnus</i>	Woodland bird species, favour dry sclerophyll forests and woodlands, generally with a sparse understorey, grassy areas and logs.	Not expected
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>		
Black-chinned Honeyeater	<i>Melithreptus gularis gularis</i>		
Hooded Robin	<i>Melanodryas cucullata</i>		
Diamond Firetail	<i>Stagonopleura guttata</i>		
Speckled Warbler	<i>Pyrrholaemus sagittata</i>		
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	Occurs in a variety of open forest and woodland habitats, with hollow-bearing trees required for roosting, may forage in younger regrowth and modified environments	May forage for insects in all areas, no potential roost sites present.
Eastern Free-tail Bat	<i>Mormopterus norfolkensis</i>		
Eastern Long-eared Bat	<i>Nyctophilus timoriensis</i>		
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>		
Barking Owl	<i>Ninox connivens</i>	Forest and woodland habitats, particularly drier western slopes and riverine areas, hunts for birds and small mammals.	Not expected
Squirrel Glider	<i>Petaurus norfolcensis</i>	Forest and woodland habitats, particularly areas with a diversity of eucalypt species in the canopy.	Not expected. No habitat present in the extension area. Not recorded from the Mt Piper perimeter lands despite intensive four seasonal trapping survey (Ecotone 1996).
Square-tailed Kite	<i>Lophoictinia isura</i>	Occurs in a variety of open forest and woodland habitats, particularly riverine woodlands	Not expected
Pink-tailed Legless Lizard	<i>Aprasia parapulchella</i>	In general, occurs in open grassland habitats that have a substantial cover of small rocks, a population is known from the	Not expected

Common name	Species	Habitat requirements	Likely presence in the extension area
		Bathurst area	
Swift Parrot	<i>Lathamus discolor</i>	Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> .	Unlikely, limited favoured feed trees present
Turquoise Parrot	<i>Neophema pulchella</i>	Open forest and woodlands	Not expected

No threatened fauna species (TSC Act or EPBC Act) were identified on the site during the field surveys. Indeed, the results of the field survey and habitat assessment indicate that the large majority of habitat is not suitable for threatened fauna species that are known to occur in the area. This conclusion is based on the lack of natural vegetation and degree of modification and impacts from surrounding infrastructure. The small area of remnant vegetation present at the northern end of Area 5 (**Figure 4**) may provide potential habitat for threatened fauna including foraging habitats for microbats, arboreal mammals and woodland bird species. However this habitat will not be affected by the proposal. An assessment of significance under Section 5A of the EP&A Act is not required.

The open nature of the site and presence of natural open forest and woodland habitat in the surrounding areas provides some habitat value to a small diversity of native fauna species as evidenced by the findings of this study. This includes a range of common birds, reptiles and frogs.

The drainage habitats also support a variety of insect life and this in turn provides prey for several insectivorous bat species which can be encountered in disturbed landscapes. A number of such species are listed as threatened on the TSC Act and include the cave-roosting Large Bentwing-bat *Miniopterus schreibersii*, and the tree-roosting species; Greater Broad-nosed Bat *Scoteanax rueppellii*, and Eastern False Pipistrelle *Falsistrellus tasmaniensis*. Each of these species could potentially forage over land within the proposed extension areas. These microchiropteran bats are aerial foragers which are capable of hunting for insects over a very wide range of natural and modified landscapes including urban and industrial areas. Aspects of their life-cycle most at risk from development include the removal of trees containing hollow cavities suitable for roosting and hibernation. The impacts on potentially foraging habitat are not considered critical to the life-cycle of regional populations of bats and continued foraging throughout the area can be expected following the extension and development of the site. The area of remnant vegetation in Area 5 support hollow-trees suitable for threatened fauna species and are critical for the survival of hollow-dependant fauna species, therefore this area needs to be avoided.



4.3. Environment Protection and Biodiversity Conservation Act, 1999

Actions that have the potential to significantly impact on matters of national environmental significance (NES) need to be subject to rigorous assessment and approval under the provisions of this Act. The matters of NES identified in the Act that trigger the Commonwealth assessment and approval regime are:

- World Heritage Properties;
- Ramsar wetlands;
- Nationally threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

This assessment deals specifically with the significance of impacts from the proposed extension of Mt Piper power station on nationally threatened species and endangered ecological communities in addition to commonwealth migratory species and world heritage properties. Discussion on the matters of NES in relation to the proposal is presented in **Table 4**.

■ Table 4 Assessment of Matters of NES with regard to the proposal

Matters of NES	Comments relevant to the Proposal
Nationally threatened species and ecological communities	A review of the DEH environmental reporting tool (http://www.deh.gov.au/erin/ert/imap/map.html) indicates that there are 16 nationally threatened species that have distributional ranges that cover the study area and therefore may potentially occur. These are: ■ Bathurst Copper Butterfly ■ Australian Painted Snipe ■ Regent Honeyeater ■ Swift Parrot ■ Large-eared Pied Bat ■ Spotted-tail Quoll ■ Eastern Long-eared Bat ■ Littlejohn's Tree Frog ■ Brush-tailed Rock-wallaby ■ Long-nosed Potoroo ■ Grey-headed Flying-fox ■ Broad-headed Snake ■ <i>Eucalyptus cannonii</i> ■ <i>Eucalyptus pulverulenta</i> ■ <i>Pultenaea glabra</i> ■ <i>Thesium australe</i> Of these species, the Bathurst Copper Butterfly and Grey-headed Flying-fox are considered to potentially occur in the power station perimeter lands although would not occur in the proposed extension area which has been cleared of suitable habitat. Similarly <i>Eucalyptus cannonii</i> was recorded in Area 4 and 5 generally on the edges of the proposal area and it is anticipated that these individuals will be avoided and

Matters of NES	Comments relevant to the Proposal
	would not be impacted upon by the proposal. The habitat potentially affected by the proposal is not suitable to the remainder of these listed threatened species and none is expected to occur and as a result are unlikely to be impacted by the proposal. Potential habitat for threatened species and threatened flora species is present in areas of remnant vegetation in Area 5, although this area will not be impacted upon. The guidelines within the EPBC Act were reviewed in terms of assessing the potential impacts on the Bathurst Copper Butterfly, Grey-headed Flying-fox and <i>Eucalyptus cannonii</i>, based on the proposed impacted areas. The assessment considers whether the action is likely to have a significant impact on a threatened species if it is likely to:
	1. Lead to a long-term decrease in the size of an important population of a species. There is no evidence to suggest that the study area contains an important population of either of these threatened species. To date there are no records of the Bathurst Copper Butterfly from Mt Piper Power Station. Populations of this species are dispersed over 29 known localities (Hunter and White 1999; NPWS 2001) which does not include the power station perimeter lands. The proposed extension would occupy cleared and modified land which does not comprise the host plant species Native Blackthorn (<i>Bursaria spinosa</i> ssp <i>lasiophylla</i>), an important host food plant for the butterfly and larvae. Given that the site has not been recognised as important for populations of this species within the species recovery plan, it is unlikely to constitute significant habitat. However, the important host food plant Native Blackthorn (<i>Bursaria spinosa</i> ssp <i>lasiophylla</i>) was recorded within the area of remnant vegetation at the northern end of Area 5, however this area will not be impacted. Foraging resources for the Grey-headed Flying-fox occur throughout all naturally vegetated areas of the Mt Piper power station perimeter lands. The proposal would not remove important food resources nor impact on a roosting colony of this species. <i>Eucalyptus cannonii</i> was recorded in Areas 4 and 5, comprising a low abundance of mostly regenerating individuals along the southern boundary of Area 4 and a high abundance within areas of remnant vegetation at the northern end of Area 5. The species is relatively widespread in remnant vegetation surrounding the power station and across the region and therefore is likely to constitute an important population. An estimated 20,000 plants are located in 4 dedicated conservation areas.
	2. Reduce the area of occupancy of an important population The proposal will not remove native remnant vegetation and would not result in the loss of an area currently occupied by a nationally threatened species.
	3. Fragment an existing important population into two or more populations There is no evidence to suggest that an important fauna population exists at the site, however the population of <i>Eucalyptus cannonii</i> is regarded as important. The proposal involves development to be constructed completely within cleared, modified and regenerating areas and adjoining existing infrastructure or roads and would not further fragment habitat for these species.
	4. Adversely affect habitat critical to the survival of a species No critical habitat areas relate to the study area.
	5. Disrupt the breeding cycle of an important population There is no evidence to suggest that an important fauna population occurs in the study area, the grey-headed flying-fox is widespread and there are no roosting colonies within proximity to the proposed extension area. The proposal area is within cleared and modified land that does not does comprise the Native Blackthorn (<i>Bursaria spinosa</i> ssp <i>lasiophylla</i>), an important host food plant for the butterfly and larvae. Given that the site has not been recognised as important for populations of this species within the

Matters of NES	Comments relevant to the Proposal
	species recovery plan, it is unlikely to constitute significant habitat and would therefore not disrupt the breeding cycle of the species. As indicated the proposal will not directly or indirectly impact on <i>Eucalyptus cannonii</i> and as indicated previously the species is well represented in conservation areas and other native vegetation in the locality. Therefore, no disruption is expected to the reproductive cycle of this species.
	<i>6. Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</i> Preferred and better quality habitat for the Grey-headed Flying-fox, Bathurst Copper Butterfly and <i>Eucalyptus cannonii</i> occurs through the Mt Piper power station perimeter lands and indeed throughout the wider Bathurst and Lithgow area. The proposed works are not considered to modify, destroy, remove or isolate any significant area of habitat for these species. <i>Eucalyptus cannonii</i> is known to occur in "several localities at Mt Piper" (Ecotone 1996).
	<i>7. Result in invasive species that are harmful to a vulnerable species becoming established in the threatened species habitat</i> The Bathurst Copper Butterfly is documented to be threatened by weed invasion, however a commonality between all known sites recorded for this species is the high proportion of weed species. The overabundance of weeds would pose a threat to the host plant species (<i>Bursaria spinosa ssp lasiophylla</i>). Weed species are prevalent in existing cleared and disturbed parts of the proposed extension areas of the plant. Landscape plantings have been used locations are the plant infrastructure to minimise colonisation by weeds. This is recommended for areas that will be adjacent to the extension area. Disturbed and degraded edges present an ideal location for weed growth and establishment and the proposal could potentially result in future colonisation of disturbed areas, and needs to be managed.
	<i>8. Interferes substantially with the recovery of the species</i> The small scale of the proposal and minimal disturbance required for future infrastructure in the designated areas is unlikely to interfere with the recovery of these threatened species on a national scale. The proposal is not likely to result in any impacts on nationally threatened species and no further provisions of this Act apply to the proposal in relation to threatened species. No nationally threatened ecological communities exist on the site.
Migratory species	There are 13 migratory species potentially occurring within the study area. ■ White-bellied Sea-Eagle (<i>Haliaeetus leucogaster</i>) ■ White-throated Needletail (<i>Hirundapus caudacutus</i>) ■ Rainbow Bee-eater (<i>Merops ornatus</i>) ■ Black-faced Monarch (<i>Monarcha melanopsis</i>) ■ Satin Flycatcher (<i>Myiagra cyanoleuca</i>) ■ Rufous Fantail (<i>Rhipidura rufifrons</i>) ■ Latham's Snipe (<i>Gallinago hardwickii</i>) ■ Regent Honeyeater (<i>Xanthomyza phrygia</i>) ■ Painted Snipe (<i>Rostratula benghalensis</i>) ■ Great Egret (<i>Ardea alba</i>) ■ Cattle Egret (<i>Ardea ibis</i>) ■ Painted Snipe (<i>Rostratula australis</i>) ■ Swift Parrot (<i>Lathamus discolor</i>) The proposal would not create any direct or indirect impacts on migratory species, their prey species nor their habitat and current population sizes and visitation rates of migratory species in the locality are likely to be maintained post construction.
World Heritage	The Greater Blue Mountains Area was inscribed on the World Heritage list in 2000.



Matters of NES	Comments relevant to the Proposal
Areas	The total area consists of 1.03 million hectares of mostly forested landscape which includes eight conservation reserves, the Blue Mountains, Wollemi, Yengo, Nattai, Kanangra-Boyd, Gardens of Stone and Thirlmere Lakes National Parks and the Jenolan Caves Karst Conservation Reserve. This large area preserves a diversity of forests including tall forests at the margins of rainforest in deep valleys, through open forests and woodlands, to shrublands of stunted mallees on the exposed tablelands. At its nearest point Mt Piper power station is located approximately 18km to the southwest of the Greater Blue Mountains Area (Gardens of Stone NP) and 30km west of the Blue Mountains NP and Wollemi NP. There will be no direct impacts on World Heritage areas as a result of the proposed new infrastructure for the power plant extension.

The *Administrative Guidelines for determining whether an action has, will have, or is likely to have a significant impact on a matter of national environmental significance under the EPBC Act 1999*, was consulted and reviewed in relation to the findings of this study. This has enabled determination as to whether the project requires a referral to the Commonwealth Environment Minister.

This assessment indicates that listed matters of NES (in this instance nationally threatened species and Migratory species and World Heritage Areas) would not be significantly disrupted or affected as a result of the proposed works.



5. Avoidance and Mitigation Measures

5.1. Avoidance

The majority of the proposed extension infrastructure would occur within cleared and modified lands with some areas supporting regenerating vegetation. It is appropriate to consider the retention and conservation of high quality remnant vegetation which is present throughout the Mt Piper power station perimeter lands and at the northern end of Area 5. The following avoidance measures will be implemented with the proposal:

- Protection of remnant vegetation at the northern end of Area 5 is highly important to avoid impacts to critical habitat features for threatened fauna species and *Eucalyptus cannonii* present in this area. Any actions that require clearing of vegetation in this area would require additional targeted surveys to be undertaken to determine the presence of threatened flora and fauna species, the significance of impacts associated with the action and the provision of appropriate avoidance and mitigation measures;
- The specimens of *Eucalyptus cannonii* along the southern boundary of Area 4 can be avoided as this species generally occurs on the edges of the proposed impact area;
- Where possible regenerating and planted vegetation should be retained within the proposal area with pruning of branches preferred over full removal.

5.2. Mitigation

5.2.1. Weed and Pathogen Management

Weed species are prevalent throughout the study area and weed management should be implemented during the construction phase of the Proposal to limit the spread of exotic weed species particularly the noxious species *Hypericum perforatum* (St Johns Wort). This should include:

- All construction machinery should be thoroughly washed down and sterilised to ensure weed propagules are removed from equipment.
- The appropriate disposal of any exotic species cleared during construction.



5.2.2. Fauna Habitat

To mitigate impacts to local fauna species the following measures are recommended:

- The loss of dense shrub cover in regenerating areas should be minimised and ameliorated by the retention of felled vegetation in adjacent areas to augment some of the habitat being removed.
- Any fallen logs encountered within the works area should be pushed aside and retained in their natural state where possible. Any timber felled for clearing should be retained on the ground as cover for terrestrial fauna in areas adjacent to the proposal.

5.2.3. Induction of construction personnel

All construction personnel should be inducted and be aware of their environmental responsibilities. Construction personnel should inspect the trunk, foliage and limbs of any trees that require removal to prevent fauna mortality. If fauna species are present, these should be given the opportunity to move away from the construction zone prior to felling. Any animal injured during construction should be appropriately handled and transported to an animal care authority for attention. A stewardship should be encouraged over all fauna encountered, including poisonous snakes and no mortality of fauna should result knowingly from the construction.



6. Conclusion

The information presented in this report has utilised field investigations and a review of available data to assess the potential impacts of the proposed Mt Piper power station extension in relation to relevant environmental and threatened species legislation. The assessment has concluded the following:

- The proposed extension of the Mt Piper power station into formerly cleared areas supporting disturbed and regenerating vegetation is unlikely to impose a ‘significant impact’ on local populations of threatened species, endangered communities or their habitats. This conclusion is based on the absence of native remnant vegetation and the modified nature and low quality of the cleared and regrowth habitats present and in consideration of the extent of comparable habitat available to local populations of the threatened species.
- Areas of remnant vegetation at the northern end of Area 5 will not be impacted on from the proposal and this area will be protected during construction activities.
- The threatened species *Eucalyptus cannonii* is present within the study area although occurs on the edges of the proposed impact area such that direct clearing of trees can be avoided.
- The proposal would not impact significantly on nationally threatened species or International migratory species or World Heritage Areas as listed under the EPBC Act.



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Appendix A Flora of the Investigation Area

Classification / Scientific name	Common Name	
Ferns		
ADIANTACEAE		
<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	Slender Cloak-fern	
Conifers		
PINACEAE		
<i>Pinus radiata</i>	Monterey Pine	i
Flowering Plants - Dicotyledons		
ASTERACEAE		
<i>Cassinia aculeata</i>	Dollybush	
<i>Cassinia arcuata</i>	Sifton Bush	
<i>Cirsium vulgare</i>	Scotch Thistle	i
<i>Gnaphalium</i> sp.	A Cudweed	i
<i>Hypochoeris radicata</i>	Flatweed	i
<i>Sonchus aspera</i>	Toothed Sow-thistle	
<i>Vittadenia cuneata</i>	Fuzzweed	
BORAGINACEAE		
<i>Cynoglossum australe</i>		
<i>Echium plantagineum</i>	Patterns Curse	nx
CARYOPHYLLACEAE		
<i>Stellaria pungens</i>	Prickly Starwort	
CLUSIACEAE		
<i>Hypericum gramineum</i>	Narrow-leaf St. Johns Wort	
<i>Hypericum perforatum</i>	St. Johns Wort	nx
CONVOLVULACEAE		
<i>Dichondra repens</i>	Kidney Weed	
CRASSULACEAE		
<i>Crassula sieberiana</i>	Australian Stonecrop	
DILLENIACEAE		
<i>Hibbertia obtusifolia</i>	Blunt-leaf Guinea-flower	
ERICACEAE		
<i>Astroloma humifusum</i>	Prickly Pine Heath	
<i>Brachyloma daphnoides</i>	Daphne Heath	
<i>Lissanthe strigosa</i>	Peach Heath	
FABACEAE		
FABOIDEAE		
<i>Bossiaea prostrata</i>		
<i>Dillwynia sericea</i>		
<i>Dillwynia phyllicoides</i>		
<i>Glycine clandestina</i> agg.	Twining Glycine	
<i>Hardenbergia violacea</i>	Purple Twining-pea	
<i>Podolobium scandens</i>	Netted Shaggy-pea	
<i>Trifolium repens</i>	White Clover	i
MIMOSOIDEAE		
<i>Acacia amblygona</i>	Fan Wattle	
<i>Acacia buxifolia</i>	Box-leaf Wattle	

<i>Acacia cultriformis</i>	Knife-leaved Wattle	
<i>Acacia dealbata</i> subsp. <i>dealbata</i>	Silver Wattle	
<i>Acacia decurrens</i>	Black Wattle	
<i>Acacia rubida</i>	Red-stemmed Wattle	
<i>Acacia ulicifolia</i>	Prickly Moses	
GERANIACEAE		
<i>Geranium solanderi</i> var. <i>solanderi</i>	Native Cranesbill	
HALORAGACEAE		
<i>Gonocarpus tetragynus</i>	Poverty Raspwort	
LAMIACEAE		
<i>Ajuga australis</i>	Austral Bugle	
LORANTHACEAE		
<i>Amyena miquelii</i>	Drooping Mistletoe	
MYRTACEAE		
<i>Eucalyptus bridgesiana</i>	Apple Box	
<i>Eucalyptus cannonii</i>	Capertee Stringybark	t
<i>Eucalyptus dives</i>	Broad-leaved Peppermint	
<i>Eucalyptus eugenoides</i>	Thin-leaved Stringybark	
<i>Eucalyptus macrorhyncha</i>	Red Stringybark	
<i>Eucalyptus mannifera</i>	Brittle Gum	
<i>Eucalyptus pauciflora</i>	Snow Gum	
<i>Eucalyptus polyanthemus</i>	Red Box	
<i>Eucalyptus radiata</i>	Narrow-leaved peppermint	
<i>Eucalyptus rossii</i>	Tableland Scribbly Gum	
<i>Eucalyptus rubida</i> subsp. <i>rubida</i>	Candlebark	
<i>Eucalyptus viminalis</i>	Ribbon Gum	
<i>Kunzea ambigua</i>	Tick Bush	
PITTOSPORACEAE		
<i>Bursaria longisepala</i> var. <i>pilosa</i>		
PLANTAGINACEAE		
<i>Plantago lanceolata</i>	Plantain	i
<i>Plantago varia</i>		
POLYGONACEAE		
<i>Rumex brownii</i>	Swamp Dock	
RHAMNACEAE		
<i>Cryptandra amara</i>	Cryptandra	
ROSACEAE		
<i>Acaena novae-zelandiae</i>	Bidgy-widgy	
<i>Rosa rubiginosa</i>	Sweet Briar	nx
<i>Rubus fruticosus</i> agg.	Blackberry	nx
RUBIACEAE		
<i>Galium gaudichaudii</i>		
<i>Galium propinquum</i>	Maori Bedstraw	
SANTALACEAE		
<i>Exocarpos cupressiformis</i>	Cherry Ballart	
SCROPHULARIACEAE		
<i>Derwentia perfoliata</i>	Diggers Speedwell	
<i>Veronica pleblia</i>	Trailing Speedwell	
VIOLACEAE		
<i>Viola betonicifolia</i>	Showy Violet	
Flowering Plants - Monocotyledons		
CYPERACEAE		
<i>Cyperus</i> sp.		
<i>Lepidosperma laterale</i>	Variable Sword-sedge	

JUNCACEAE		
<i>Juncus bufonis</i>	Toad Rush	
LOMANDRACEAE		
<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	Wattle Mat-rush	
PHORMIACEAE		
<i>Dianella revoluta</i> var. <i>revoluta</i>	Black-anther Flax Lily	
POACEAE		
<i>Aristida ramosa</i>	Three-awned Spear Grass	
<i>Austranthionia tenuior</i>	Wallaby Grass	
<i>Austrostipa</i> spp	Spear Grass	
<i>Cortaderia selloana</i>	Pampas Grass	nx
<i>Dactylis glomerata</i>	Cocksfoot	i
<i>Dichelachne micrantha</i>	Short-hair Plume Grass	
<i>Echinopogon ovatus</i>	Hedgehog Grass	
<i>Joycea pallida</i>	Red-anthered Wallaby Grass	
<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass	
<i>Phalaris aquatica</i>	Canary Grass	i
<i>Poa</i> spp.	Snow Grass	
<i>Poa siebriana</i>	Snowgrass	
<i>Themeda australis</i>	Kangaroo Grass	
TYPHACEAE		
<i>Typha orientalis</i>	Broad-leaf Cumbungi	
TOTALS		
<i>Total Flora Species</i>		84
<i>Total Number of Families</i>		31
<i>Total Monocotyledons</i>		19
<i>Total Dicotyledons</i>		63
<i>Total Fern Species</i>		1
<i>Total Conifer & Cycad Species</i>		1
<i>Total Exotic Species</i>		13
<i>Total Threatened Species</i>		1
ABBREVIATIONS:		
i = introduced (i.e. not indigenous to Australia)		
n = native Australian species not considered to be indigenous to the site		
c = cultivated (i.e. planted on the site)		
t = listed as a threatened species under State and/or Commonwealth legislation		
spp. = several species of the one genus (sometimes occurring as a hybrid swarm)		
sp. = unidentified species ⁴		
sp. aff. = unidentified species with characteristics similar to the indicated species or genus ³		
? = unconfirmed species ⁴		
var. = variety		
subsp. = subspecies		
cv. = cultivar (i.e. a anthropogenic form of the species)		
nx = noxious species		
agg. = an aggregate of several yet to be defined species		
NOTES:		
A sample flora assemblage obtained from a short term survey, such as the present one, cannot be considered to be comprehensive, but rather indicative of the actual flora assemblage. It can take many years of flora surveys to record all of the plant species occurring within any area, especially species that are only apparent in some seasons.		
Not all species can be accurately identified in a 'snapshot' survey due to absence of flowering or fruiting material, etc.		

Appendix B Fauna of the Investigation Area

The following list includes fauna species recorded during the current survey, and also includes the total number of species recorded in the Mt Piper power station perimeter lands during a comprehensive four seasonal survey (Ecotone 1996).

V = Vulnerable Species (NSW Threatened Species Conservation Act, 1995)

M = Migratory Species (Commonwealth Environment Protection and Biodiversity Conservation Act, 1999)

* exotic species

FAMILY/Scientific Name	Common Name	Current Survey	Ecotone (1996)
MAMMALS			
TACHYGLOSSIDAE			
<i>Tachyglossus aculeatus</i>	Short-beaked Echidna		x
DASYURIDAE			
<i>Antechinus stuartii</i>	Brown Antechinus		x
VOMBATIDAE			
<i>Vombatus ursinus</i>	Common Wombat	*	x
PETAURIDAE			
<i>Petaurus breviceps</i>	Sugar Glider		x
PSEUDOCHEIRIDAE			
<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum		x
PHALANGERIDAE			
<i>Trichosurus vulpecula</i>	Common Brushtail Possum		x
MACROPODIDAE			
<i>Macropus giganteus</i>	Eastern Grey Kangaroo	*	x
<i>Macropus robustus</i>	Common Wallaroo		x
<i>Macropus rufogriseus</i>	Red-necked Wallaby		x
<i>Wallabia bicolor</i>	Swamp Wallaby		x
MURIDAE			
<i>Rattus fuscipes</i>	Bush Rat		x
<i>Mus musculus</i> *	House Mouse		x
CANIDAE			
<i>Canis familiaris</i> *	Dog		x
<i>Vulpes vulpes</i> *	Fox	x	x
FELIDAE			
<i>Felis catus</i> *	Feral Cat		x
LEPORIDAE			
<i>Lepus capensis</i> *	Brown Hare	*	x
<i>Oryctolagus cuniculus</i> *	Rabbit	x	x
BOVIDAE			
<i>Bos taurus</i> *	Cattle		x
EQUIDAE			



FAMILY/Scientific Name	Common Name	Current Survey	Ecotone (1996)
<i>Equus caballus</i> *	Horse		x
SUIDAE			
<i>Sus scrofa</i> *	Feral Pig		x
RHINOLOPHIDAE			
<i>Rhinolophus megaphyllus</i>	Eastern Horseshoe Bat		x
MOLOSSIDAE			
<i>Nyctinomus australis</i>	White-striped Freetail-bat		x
VESPERTILIONIDAE			
<i>Miniopterus schreibersii</i>	Large Bent-wing Bat (V)		x
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat		x
<i>Nyctophilus gouldi</i>	Gould's Long-eared Bat		x
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat		x
<i>Chalinolobus morio</i>	Chocolate Wattled Bat		x
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle		x
<i>Scotorepens greyii</i>	Little Broad-nosed Bat		x
<i>Scotorepens orion</i>	Eastern Broad-nosed Bat		x
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat		?
<i>Vespadelus darlingtoni</i>	Large Forest Bat		x
<i>Vespadelus regulus</i>	Southern Forest Bat		x
<i>Vespadelus vulturinus</i>	Little Forest Bat		x
REPTILES			
CHELIDAE			
<i>Chelodina longicollis</i>	Eastern Long-necked Tortoise		x
<i>Emydura macquarii</i>	Macquarie Tortoise		x
GECKKONIDAE			
<i>Diplodactylus vittatus</i>	Wood Gecko		x
AGAMIDAE			
<i>Amphibolourus muricatus</i>	Jacky Lizard		x
<i>Physignathus lesuerii</i>	Eastern Water Dragon		x
<i>Pogona barbata</i>	Bearded Dragon		x
<i>Tympanocryptis diemensis</i>	Mountain Dragon		x
SCINCIDAE			
<i>Calypotis ruficauda</i>	Red-tailed Calypotis		
<i>Cryptoblepharus virgatus</i>	Fence Skink		x
<i>Ctenotus robustus</i>	Robust Skink		x
<i>Ctenotus taeniolatus</i>	Copper-tailed Skink		x
<i>Egernia striolata</i>	Tree Skink		x
<i>Egernia whitii</i>	White's Skink		x
<i>Eulamprus heatwolei</i>	Heatwole's Skink		x
<i>Eulamprus quoyii</i>	Eastern Water Skink		x
<i>Hemiergis decresiensis</i>	Burrowing Skink		x
<i>Lampropholis delicata</i>	Delicate Skink		x

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FAMILY/Scientific Name	Common Name	Current Survey	Ecotone (1996)
<i>Lampropholis guichenoti</i>	Grass Skink		x
<i>Pseudemoia entrecasteauxii</i>	Entrecasteauxii's Skink		x
<i>Pseudemoia platynota</i>	Red-throated Skink		x
<i>Saiphos equalis</i>	Three-toed Skink		x
<i>Saproscincus mustelinus</i>	Weasel Skink		x
<i>Tiliqua nigrolutea</i>	Blotched Blue-tongue		x
<i>Tiliqua scincoides</i>	Eastern Blue-tongued Lizard		x
ELAPIDAE			
<i>Austrelaps superbus</i>	Copperhead		x
<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake		x
<i>Pseudonaja textilis</i>	Eastern Brown Snake		x
<i>Rhinoplocephalus nigrescens</i>	Eastern Small-eyed Snake		x
<i>Suta spectabilis</i>	Eastern Curl Snake		x
AMPHIBIANS			
MYOBATRACHIDAE			
<i>Crinia signifera</i>	Common Eastern Froglet		x
<i>Limnodynastes dumerillii insularis</i>	Eastern Banjo Frog		x
<i>Limnodynastes peronii</i>	Striped Marsh Frog		x
<i>Limnodynastes tasmaniensis</i>	Spotted Grass Frog		x
<i>Pseudophryne bibronii</i>	Brown Toadlet		x
<i>Uperoleia laevisgata</i>	Red-groined Toadlet	x	x
<i>Uperoleia rugosa</i>	Red-thighed Toadlet		x
HYLIDAE			
<i>Litoria dentata</i>	Bleating Tree Frog		x
<i>Litoria ewingii</i>	Brown Tree Frog		x
<i>Litoria peronii</i>	Peron's Tree Frog		x
<i>Litoria verreauxii</i>	Verreaux's Tree Frog		x
BIRDS			
ANATIDAE			
<i>Chenonetta jubata</i>	Australian Wood Duck	*	x
<i>Cygnus atratus</i>	Black Swan		x
<i>Anas superciliosa</i>	Pacific Black Duck		x
<i>Aythya australis</i>	Hardhead		x
<i>Stictonetta naevosa</i>	Freckled Duck		?
PODICIOEDIDAE			
<i>Poliocephalus poliocephalus</i>	Hoary-headed Grebe		x
<i>Tachybaptus novaehollandiae</i>	Australasian Grebe		x
PHALACROCORACIDAE			
<i>Phalacrocorax melanoleucos</i>	Little Pied Cormorant		x
ARDEIDAE			
<i>Egretta novaehollandiae</i>	White-faced Heron		x
ACCIPITRIDAE			

SINCLAIR KNIGHT MERZ

FAMILY/Scientific Name	Common Name	Current Survey	Ecotone (1996)
<i>Elanus notatus</i>	Black-shouldered Kite		x
<i>Accipiter fasciatus</i>	Brown Goshawk		x
<i>Aquila audax</i>	Wedge-tailed Eagle		x
<i>Hieraeetus morphnoides</i>	Little Eagle		x
FALCONIDAE			
<i>Falco cenchroides</i>	Nankeen Kestrel		x
RALLIDAE			
<i>Fulica atra</i>	Eurasian Coot		x
<i>Gallinula tenebrosa</i>	Dusky Moorhen		x
CHARADRIIDAE			
<i>Vanellus miles</i>	Masked Lapwing	*	x
COLUMBIDAE			
<i>Phaps chalcoptera</i>	Common Bronzewing	x	
<i>Ocyphaps lophotes</i>	Crested Pigeon		x
CACATUIDAE			
<i>Calyptorhynchus lathami</i>	Glossy Black Cockatoo		x
<i>Calyptorhynchus funereus</i>	Yellow-tailed Black Cockatoo		x
<i>Callocephalon fimbriatum</i>	Gang-Gang Cockatoo		x
<i>Cacatua roseicapilla</i>	Galah	*	
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo		x
PSITTACIDAE			
<i>Platyercus elegans</i>	Crimson Rosella	x	x
<i>Platyercus eximius</i>	Eastern Rosella		x
<i>Psephotus haematonotus</i>	Red-rumped Parrot		x
CUCULIDAE			
<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo		x
<i>Chrysococcyx basalis</i>	Horsefield's Bronze-cuckoo		x
<i>Chrysococcyx lucidus</i>	Shining Bronze-cuckoo		x
<i>Cuculus pallidus</i>	Pallid Cuckoo		x
<i>Eudynamys scolopacea</i>	Common Koel		x
STRIGIDAE			
<i>Ninox novaeseelandiae</i>	Southern Boobook		x
<i>Ninox strenua</i>	Powerful Owl		x
PODARGIDAE			
<i>Podargus strigoides</i>	Tawny Frogmouth		x
APODIDAE			
<i>Hirundapus caudacutus</i>	White-throated Needletail		x
ALCEDINIDAE			
<i>Alcedo azurea</i>	Azure Kingfisher		
HALCYONIDAE			
<i>Dacelo novaeguineae</i>	Laughing Kookaburra		x
<i>Todiramphus sanctus</i>	Sacred Kingfisher		x

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CORACIIDAE			
<i>Eurystomus orientalis</i>	Dollarbird		x
CLIMACTERIDAE			
<i>Cormobates erythrops</i>	Red-browed Treecreeper		x
<i>Cormobates leucophaeus</i>	White-throated Treecreeper	x	x
<i>Cormobates picumnus</i>	Brown Treecreeper		x
MALURIDAE			
<i>Malurus cyaneus</i>	Superb Fairy-wren	x	x
<i>Malurus lamberti</i>	Variegated Fairy-wren		x
<i>Stipiturus malachurus</i>	Southern Emu-wren		x
PARDALOTIDAE			
<i>Origma solitaria</i>	Origma		x
<i>Pardalotus punctatus</i>	Spotted Pardalote		x
<i>Pardalotus striatus</i>	Striated Pardalote		x
<i>Sericornis frontalis</i>	White-browed Scrub-wren	x	x
<i>Gerygone mouki</i>	Brown Gerygone		x
<i>Gerygone olivacea</i>	White-throated Gerygone		x
<i>Acanthiza pusilla</i>	Brown Thornbill	x	x
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	x	x
<i>Acanthiza lineata</i>	Striated Thornbill		x
<i>Acanthiza nana</i>	Yellow Thornbill	x	x
<i>Acanthiza reguloides</i>	Buff-rumped Thornbill		x
MELIPHAGIDAE			
<i>Anthochaera carunculata</i>	Red Wattlebird	x	x
<i>Philemon corniculatus</i>	Noisy Friarbird		x
<i>Manorina melanocephala</i>	Noisy Miner		x
<i>Meliphaga lewinii</i>	Lewin's Honeyeater		x
<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater		x
<i>Lichenostomus leucotis</i>	White-eared Honeyeater	x	x
<i>Melithreptus lunatus</i>	White-naped Honeyeater		x
<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill		x
PETROICIDAE			
<i>Microeca leucophaea</i>	Jacky Winter		x
<i>Eopsaltria australis</i>	Eastern Yellow Robin		x
<i>Petroica multicolor</i>	Scarlet Robin		x
PSOPHODIDAE			
<i>Cinclosoma punctatum</i>	Spotted Quail-thrush		x
NEOSITTIDAE			
<i>Daphoenositta chrysoptera</i>	Varied Sitella		x
PACHYCEPHALIDAE			
<i>Falcunculus frontatus</i>	Crested Shrike-tit		x
<i>Pachycephala pectoralis</i>	Golden Whistler		x
<i>Pachycephala rufiventris</i>	Rufous Whistler		x

SINCLAIR KNIGHT MERZ

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<i>Colluricincla harmonica</i>	Grey Shrike-thrush		x
DICRURIDAE			
<i>Monarcha melanopsis</i>	Black-faced Monarch		x
<i>Myiagra rubecula</i>	Leaden Flycatcher		x
<i>Rhipidura leucophrys</i>	Willie Wagtail	*	x
<i>Rhipidura fuliginosa</i>	Grey Fantail	x	x
<i>Grallina cyanoleuca</i>	Magpie-lark	*	
CAMPEPHAGIDAE			
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		x
ORIOLOIDAE			
<i>Oriolus sagittatus</i>	Olive-backed Oriole		x
ARTAMIDAE			
<i>Artamus cyanopterus</i>	Dusky Woodswallow		x
<i>Gymnorhina tibicen</i>	Australian Magpie	*	x
<i>Strepera graculina</i>	Pied Currawong		x
<i>Strepera versicolor</i>	Grey Currawong		x
CORVIDAE			
<i>Corvus coronoides</i>	Australian Raven		x
CORCORACIDAE			
<i>Corcorax melanorhamphos</i>	White-winged Cough		x
PASSERIDAE			
<i>Passer domesticus</i> *	House Sparrow		x
<i>Taeniopygia bichenovii</i>	Double-barred Finch		x
<i>Neochmia temporalis</i>	Red-browed Firetail	x	x
FRINGILLIDAE			
<i>Carduelis chloris</i> *	European Goldfinch		x
DICAEIDAE			
<i>Dicaeum hirundinaceum</i>	Mistletoebird		x
HIRUNDINIDAE			
<i>Hirundo neoxena</i>	Welcome Swallow	*	x
<i>Hirundo ariel</i>	Fairy Martin	*	
ZOSTEROPIDAE			
<i>Zosterops lateralis</i>	Silvereye		x
MUSCICAPIDAE			
<i>Turdus merula</i> *	Common Blackbird		x
STURNIDAE			
<i>Sturnus vulgaris</i> *	Common Starling	*	x
CRUSTACEAN			
PARASTICIDAE			
<i>Cherax destructor</i>	Freshwater Yabby	x	