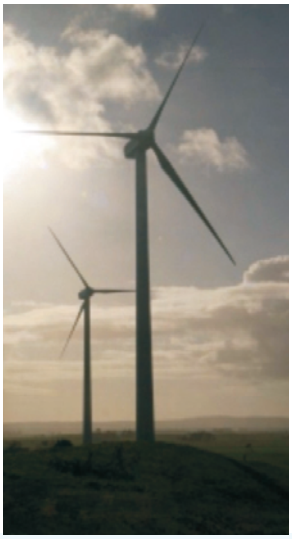
Woodlawn Wind Farm



Flora and Fauna

Appendix E

FLORA AND FAUNA ASSESSMENT

PROPOSED 33 kV OVERHEAD TRANSMISSION LINE WOODLAWN - CAPITAL WIND FARMS SOUTHERN TABLELANDS, NSW

prepared by

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as trustee for Kevin Mills & Associates Trust

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Cover Photograph: Overview of the route of the transmission line, looking from the most northern point towards Capital Wind Farm, the turbine towers visible on the horizon.

Contents

1. Introduction

Renewable Power ventures are preparing an application to vary the development consent for the approved Woodlawn Wind Farm, west of Tarago on the Southern Tablelands of New South Wales. That site is close to the northern end of the recently constructed Capital Wind Farm. Kevin Mills & Associates were engaged by Renewable Power Ventures to prepare a Flora and Fauna Assessment Report covering a proposed new transmission line to accompany the application to the Department of Planning.

The proposed transmission line is about eight kilometres in length, linking the Woodlawn Wind Farm in the north to the newly constructed electrical substation on the south-eastern corner of the Capital Wind Farm site; see Figure 1.

The purpose of this report is to assess the impact of the proposed transmission line on flora and fauna. The report contains:

1. a description of the vegetation and fauna habitats along the route of the line;
2. an assessment of the potential impact of the access tracks on flora and fauna, including:
   - species, populations and communities listed under the New South Wales *Threatened Species Conservation Act 1995;*
   - matters of national environmental significance listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*; and
   - Koala habitat, as required under *State Environmental Planning Policy No.44 - Koala Habitat Protection*; and
3. a discussion of what measures could be taken to avoid or minimise the impact of the proposal on flora and fauna.

2. The Study Area

The Bungendore - Tarago area has had a long history of sheep grazing, commencing well before 1850. The land has generally been cleared of woodland and much has been pasture improved, seeded with pasture species and fertilised. Remnant woodland is restricted to small patches here and there across the grazing land. Paddock trees, i.e. isolated mature trees, occur here and there but are no very common.

The proposed route of the transmission line is about eight kilometres in length, extending south from proposed tower W11 on the approved Woodlawn Wind Farm site to the Capital Wind Farm. The route traverses the Woodlawn land, then the property *Nardoo*, crossing Taylors Creek Road to the north of the existing towers on Capital Wind Farm. The route then heads directly south to the east of Hammonds Ridge and then down the broad valley to the north of the electrical substation to enter the substation near the existing lines from the Capital Wind Farm. For completeness, the whole route to the substation has been studied.

The study area is the route of the transmission line and the immediately surrounding land. The route was not marked on the ground at the time of the survey, but the available maps indicated where the route was located.

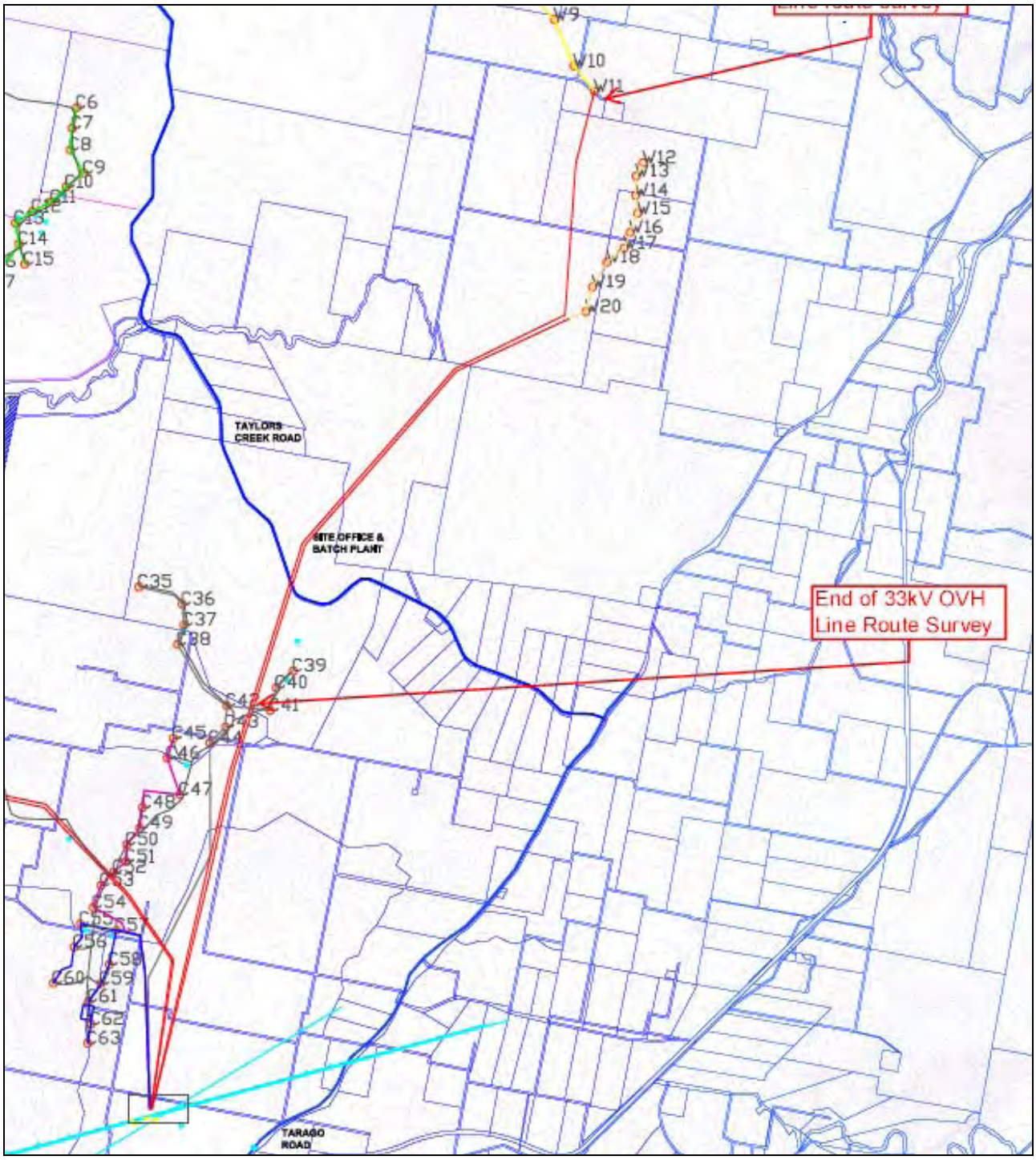


Figure 1. Route of the Proposed Transmission Line,
the red line shows the route of the transmission line investigated.

3. Survey Methods

3.1 Flora Survey Methods

The route of the transmission line was traversed by Kevin Mills & Associates on 6 and 7 October 2009, prior to the preparation of this report. The purpose of the survey was to classify and describe the vegetation along the route, and to assess the potential for threatened species to occur there.

Date of Survey

The study area at Ginninderra was investigated in terms of its flora and fauna during visits on 22 and 23 September and 6 October 2009. In the field, bearings were taken from colour aerial photographs showing the extent of the study area, the existing quarry and proposed quarry extension and nearby features.

Purpose

The main purpose of the flora survey was to classify and describe the vegetation, to map the distribution of the plant communities, to record as many as possible of the plant species present, and to search for and identify potential habitat for threatened plant species.

Survey Techniques

The vegetation survey techniques combined multiple traverses of the study area with disciplined vegetation sampling on specific sites. The traverses, which were undertaken on foot and by motor vehicle, were targeted to cover the full topographic variation of the site, the full range of plant communities and potential habitat for threatened plant species. The traverses were also random because of their exploratory purpose.

Plant species were searched for throughout the study area during the current investigation, with particular searches being carried out wherever indigenous (native) plants were likely to be found. Both indigenous and exotic (weed) species were identified and recorded.

Vegetation survey plots were temporarily established on sites in patches of native plants; a 20 metre by 20 metre plot (400 m^2) was set out using a cord. The plots were selected to demonstrate variation within the vegetation. A *pro forma* or standard survey sheet was completed on each plot to record the following data:

Plot data:

- plot identification number
- date of survey
- plot size
- plot location (including GPS reading at centre of plot)
- land tenure
- landform, geology and soil type
- slope (gentle, moderate, steep, very steep), aspect, altitude

Floristic data:

- height and proportional coverage (% of each layer or stratum (tree canopy, middle storey, shrub understorey, ground cover)
- species present in each stratum
- abundance score for each species, as set out below
- if treeless, the closest tree species to the plot.

Floristic data for each species within each plot was gathered using a subjective abundance score based upon the following range of cover scores:

r <5% foliage cover and solitary (<4 individuals)
+ <5% foliage cover and few (5-15 individuals)
1 <5% foliage cover and numerous/scattered
2 5% - 25% foliage cover
3 26% – 50% foliage cover
4 51% - 75% foliage cover
5 >75% foliage cover.

Notes were made on the structure and condition of the vegetation, and the height and proportional coverage of each layer. The general description of each plant community is based on the data collected during these vegetation sampling surveys and the traverses of the study area.

Vegetation Mapping

The native vegetation occurring in an area is determined largely by biophysical attributes such as landform, elevation, aspect, geology and soil type. Most vegetation is affected to some extent by human activity. These variables strongly influence the structure and floristic composition of the vegetation and, usually with the aid of a topographic map and aerial photograph, enable the vegetation communities to be mapped.

Using this approach, a vegetation map for the study area can be prepared by marking the boundaries of the various communities directly onto an aerial photograph during the field study.

The boundaries of vegetation communities are reasonably accurate, but it should be kept in mind that there is usually an ecotone or transition zone between communities, in which the vegetation changes gradually from one type to another.

Vegetation Classification

The vegetation communities on the study area were classified on the basis of their structure and the name(s) of the dominant species in the tallest stratum, using the structural classification system devised by Walker and Hopkins (1990). The various vegetation classes within the system; these include closed forest (rainforest), open forest, woodland, open woodland, isolated trees, shrubland, heathland, grassland, sedgeland and fernland, etc., depending on the growth form of the plants in the tallest stratum and the crown separation between the plants in the tallest stratum (whether touching, overlapping, separated, isolated, etc.).

The following definitions used in this report are widely accepted in the botanical literature; most of those relating to grasslands are from the report by Rehwinkel (1997).

Forest: a community of relatively closely spaced trees (projective foliage cover >30%) growing taller than 10 metres.

Woodland: a community of well spaced trees (projective foliage cover 10-30%) growing to a height of 4 to 30 metres.

Open Woodland: a community of scattered trees (projective foliage cover <10% growing to a height of 4 to 30 metres.

Grassland: vegetation dominated by grasses and forbs, with <10% tree and/or shrub cover.

Native Grassland: grassland with >50% of vegetation cover composed of indigenous species, >50% of all species are native, and the minimum vegetation cover, alive or dead, is >10%.

Natural Grassland: native grassland considered to have had <10% tree and/or shrub cover at the time of European settlement.

Secondary Grassland: a native grassland remaining after the removal or dieback of previously occurring trees and/or shrubs, where these occupied >10% cover.

Native Pastures: containing native and introduced species, where introduced species occupy >50%, but <75% of both cover and species present, where pasture species have often been mechanically sown.

Exotic Grassland: where >75% of species and cover are composed of introduced plants.

Sown Pasture: where the dominant plants are sown exotic species (>75% cover), usually fertilised land used for grazing (e.g. Ryegrass and Clover).

Cropland: a species that is sown, usually following ploughing, for commercial harvest (e.g. Wheat) or stock feed.

Natural Temperate Grassland: a threatened grassland community listed under the Commonwealth *Environment Protection and Biodiversity Conservation* Act. The Recovery Plan for Natural Temperate Grassland (Environment ACT 2006) provides the following information:

> "*The community is dominated by moderately tall (25-50cm) to tall (50cm – 1.0m), dense to open tussock grasses with up to 70% of the species being forbs. The community may be treeless or contain up to 10% cover of trees, shrubs or sedges. In the Southern Tablelands, Natural Temperate Grasslands are located at altitudes between 560 and 1200 metres in valleys influenced by cold air drainage and in broad plains. The community occurs within the geographical region of the Southern Tablelands of NSW and ACT, which extends southwards from the Abercrombie River to the Victorian Border, from Boorowa and Jindabyne to the west and Goulburn to Braidwood and Bombala to the east."*
> *"Natural Temperate Grassland is a native ecological community that is dominated by native species of perennial tussock grasses. The dominant grasses are Themeda triandra [australis], Austrodanthonia species, Bothriochloa macra and Poa species. The upper canopy stratum generally varies in height from mid-high (0.25-0.5m) to tall (0.5-1.0m). There is also a diversity of native herbaceous plants (forbs), which may comprise up to 70% of species present. The community is naturally treeless or has less than 10% projective foliage cover of trees or shrubs in its tallest stratum. The ecological community that makes up NTG-ST [Natural Temperate Grassland – Southern Tablelands] is defined by the vegetation structure thought to have been present at the time of European settlement.*"

Nomenclature

The plant species names in this report are the current names published by the National Herbarium of New South Wales in the *Flora of New South Wales* (Harden 1992-2002). Most of the common names are from the *Flora of New South Wales* (op. cit.), *Australian Plant Genera* by Baines (1981) and *Weeds of the South-east* by Richardson, Richardson and Shepherd (2006). A useful reference is the book by Eddy *et al*. (1998), *Grassland Flora. A field guide for the Southern Tablelands.*

3.2 Fauna Survey Methods

Date of Survey

Fauna surveys were conducted on the same days as the flora surveys; i.e. 6 and 7 October 2009. The field survey concentrated on mammals, birds, reptiles and amphibians, with the aim of detecting as many as possible of the species present. The survey results indicate which fauna species were found, but should not be regarded as a full inventory of the species that would occur there; this could be obtained only during a long study spanning all seasons.

Techniques

Mammals were identified by sight and by interpreting their distinctive calls. The mammal survey also involved a ground search for scats, tracks and diggings. Because of an almost complete lack of trees within the footprint of the proposed quarry, neither spotlighting surveys nor bat surveys were undertaken.

The birds on the study area and nearby were also identified by sight and by interpreting their calls. Surveys concentrated on early morning and late afternoon periods to maximise the number of species recorded.

A search for reptiles was conducted primarily using the technique of 'rock rolling'. Potential basking sites were also investigated, especially near water and on bare surfaces, and general vigilance was maintained for reptiles during all other survey work.

The frogs in the study area were identified by interpreting their distinctive calls. A search was conducted for frogs in moist areas and habitat niches, especially under rocks, wood and debris near dams.

To supplement the information obtained during the field surveys, records of fauna from the locality were obtained from other sources, such as the NSW Wildlife Atlas.

Nomenclature

The fauna species nomenclature in this report is based on the Australian Museum's *The Mammals of Australia* (Strahan 1995), *Australian Bats* (Churchill 1998), *Systematics and Taxonomy of Australian Birds* (Christidis & Boles 2008) and *Reptiles and Amphibians of Australia* (Cogger 1992).

3.3 Targeted Surveys

In addition to general flora and fauna surveys in the study area, the study included targeted surveys for threatened species and communities. Following interrogation of the NSW Wildlife Atlas and the Environment ACT website, assessment of the habitat in the study area and the consultant's experience in the locality, the following species were selected for targeted field surveys and/or habitat assessment.

Plants

Diuris aequalis	Buttercup Double-tail
Dodonaea procumbens	Creeping Hopbush
Swainsona sericea	Silky Swainson-pea

Communities

Yellow Box - Blakely's Red Gum Woodland
Natural Temperate Grassland (listed only by the Commonwealth)

Reptiles

Pink-tailed Worm Lizard	*Aprasia parapulchella*
Striped Legless Lizard	*Delma impar*
Grassland Earless Dragon	*Tympanocryptis pinguicolla*
Rosenberg's Monitor	*Varanus rosenbergi*

Birds

Brown Treecreeper	*Climacteris picumnus*
Diamond Firetail	*Stagonopleura guttata*
Flame Robin (p)	*Petroica phoenicea*
Gang-gang Cockatoo	*Callocephalon fimbriatum*
Hooded Robin	*Melanodryas cucullata*
Little Eagle (p)	*Hieraaetus morphnoides*

Painted Honeyeater	*Grantiella picta*
Regent Honeyeater	*Anthochaera phyrgia*
Scarlet Robin (p)	*Petroica boodang*
Speckled Warbler	*Chthonicola sagittata*
Superb Parrot	*Polytelis swainsonii*
Varied Sittella (p)	*Daphoenositta chrysoptera*
White-browed Woodswallow (p)	*Artamus superciliosus*

(p – these species have received a preliminary determination as at 6 October 2009.)

Mammals

Koala	*Phascolarctos cinereus*

On inspection of the study area and consideration of the habitats present in relation to the above species, the only species likely to be found within the study area are listed threatened woodland birds under the TSC Act 1995 and listed migratory species under the EPBC Act 1999.

4. Results

4.1 The Vegetation

Original Vegetation Patterns

The original vegetation patterns can be interpreted through observations of remnant woodland and trees that still occur in the area. The majority of the vegetation appears to have been a grassy woodland dominated by Inland Scribbly Gum *Eucalyptus rossii*, Broad-leaved Peppermint *Eucalyptus dives* and Red Stringybark *Eucalyptus macrorhyncha.* Less common trees were Blackwood *Acacia melanoxylon*, Hickory Wattle *Acacia implexa* and Black She-oak *Allocasuarina littoralis*. The understorey was apparently grassy with occasional shrubs. In sheltered places Narrow-leaved Peppermint *Eucalyptus radiata* occurred. On the valley floors, a woodland of Yellow Box *Eucalyptus melliodora* occurred with a grassy understorey and probably welll-spaced trees. In a few exposed locations, Snow Gum *Eucalyptus pauciflora* grew in a woodland community again with a grassy understorey. The broad valley north of the substation on Capital Wind Farm land probably supported mainly Yellow Box *Eucalyptus melliodora* and Blakely's Red Gum *Eucalyptus blakelyi* grassy woodland.

The grassland understorey changed from place to place depending on topography, geology and exposure. The ridges would have contained a significant shrub component, while the broad valley had few if any shrubs. Poorly drained flats supported a tussock grassland dominated by River Tussock *Poa labillardieri*.

Vegetation in the Area today

The route of the transmission line was surveyed from north to south and notes made on the vegetation observed on and near the route. A series of photographs were taken along the route, and these are provided in **Appendix 1**. Vegetation survey plots were recorded at two locations exhibiting the most diverse native ground cover diversity; these are presented in **Appendix 2**.

The treed vegetation on the land within the Woodlawn Wind Farm site is characterised by small patches of woodland, planted copses of mostly local tree species and scattered, individual paddock trees.

The woodland patch below the high ridge at the far northern end of the route is dominated by Narrow-leaved Peppermint *Eucalyptus radiata*, with Blackwood *Acacia melanoxylon*, Black Wattle *Acacia mearnsii* and Black She-oak *Allocasuarina littoralis*. This area is shown in photograph 1 in **Appendix 1**. The understorey to this patch is exotic, although Bracken *Pteridium esculentum* is common. As can be seen in the above photograph, the route heading to the south is virtually treeless. Some of the grassland in that area is native

pasture to native grassland; this is secondary grassland, it was previously the understorey to an Inland Scribbly Gum *Eucalyptus rossii* woodland. This grassland was sampled at plot number one; see **Appendix 2**.

On the southern edge of the Woodland Wind Farm land there is a woodland of Inland Scribbly Gum *Eucalyptus rossii*, with Broad-leaved Peppermint *Eucalyptus dives* and a few Yellow Box *Eucalyptus melliodora*. Some of the woodland is fenced, excluding grazing stock. Within the fenced areas, the grassy understorey is quite diverse and grows quite high, in comparison to the remainder of the paddock. Typical species in the fenced areas include Kangaroo Grass *Themeda australis*, Spreading Flax-lily *Dianella revoluta* and Bulbine Lily *Bulbine bulbosa* .

South of the Woodlawn land, on the *Nardoo* property, there are no trees and the paddocks are mostly exotic with patches of Poa Tussock *Poa sieberiana*. Native species diversity is very low. The Capital Wind Farm land south of Taylors Creek Road is pasture improved, being sown with exotic pasture grasses. This area is treeless. The undulating land east of Hammonds Hill is almost totally cleared of trees; there are only scattered paddock trees, including Black Wattle *Acacia mearnsii*. The grassland there is mostly exotic or native pasture.

The broad valley north of the new substation is virtually treeless; see Photographs 11 and 12 in **Appendix 1**. Some of the grassland is native grassland; see Plot 2 in **Appendix 2**, although native species diversity is not very high.

4.2 The Fauna

The fauna of the study area is typical of the rural environment of the region. The species are generally wetland species found on farm dams, woodland species in remnant patches of woodland and robust species associated with cleared farmland. The list at **Appendix 3** contains the names of the species previously recorded in the locality (Kevin Mills & Associates 2005) and those species observed during this investigation in October 2009.

5. Potential for Threatened Species, Populations and Communities, etc., to occur on the Subject Sites

5.1 Threatened Species

Threatened species in New South Wales are listed on schedules under the New South Wales *Threatened Species Conservation Act 1995* (TSC Act), where they are classified "endangered" (Schedule 1, Part 1), "vulnerable" (Schedule 2) or "presumed extinct" (Schedule 1, Part 4). Nationally threatened species are listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as "extinct", "critically endangered", "endangered", "vulnerable" or "conservation dependent".

Threatened species with potential to occur in the district were identified during the previous study from the following sources of information (Kevin Mills & Associates 2005).

- correspondence dated 7 September 2004 from the Department of Environment and Conservation (DEC), now the Department of Environment and Climate Change (DECC);
- the NSW Wildlife Atlas (NSW NPWS) and available on line; and
- from previous studies, referred to in our previous report.

The resulting list appears below, in Table 2.

No threatened species were recorded in the study area during this survey.

Threatened waterbird species, e.g. the Freckled Duck, could occasionally occur in Lake George to the west; however, since Lake George is usually dry, this would be a rare event. The occurrence of threatened bat species on the subject sites would be incidental, because the sites are treeless.

Table 1
Threatened species occurring in the local area

Species	TSC Act[+]	EPBC Act[+]	Potential to occur on the subject land
Plants			
Diurus aequalis Buttercup Double-tail	E	V	This small ground orchid occurs in woodland and forest with a grassy understorey. It would not occur on the subject sites; there is no suitable habitat.
Dodonaea procumbens Creeping Hop Bush	V	V	A prostrate shrub, *D. procumbens* grows in woodland on sandy soils. There is no suitable habitat on the subject land.
Swainsona sericea Silky Swainson-pea	V	-	*S. sericea* is a small herb that occurs in native grassland. There is a small patch of native grassland in the north of the area; however, the species was not found.
Mammals			
Koala *Phascolarctos cinereus*	V	-	Koalas would not occur on the subject land; there is no woodland or forest in the vicinity of the site.
Birds			
Brown Treecreeper *Climacteris picumnus*	V	-	These three woodland bird species would not occur on the subject sites. There is no woodland/forest habitat on the sites to attract them.
Hooded Robin *Melanodryas cucullata*	V	-	
Speckled Warbler *Chthonicola sagittata*	V	-	
Diamond Firetail *Stagonopleura guttatai*	V	-	There is some potential for the Diamond Firetail to occur in grassland without trees, including exotic grassland.
Regent Honeyeater *Xanthomyza phrygia*	E	E	There are no preferred food trees, such as Yellow Box, in the area.
Freckled Duck *Stictonetta naevosa*	V	-	Freckled Ducks occasionally occur on Lake George and Lake Bathurst. Lake George is immediately west of the subject land.
Glossy Black-Cockatoo *Calyptorhynchus lathami*	V	-	Glossy Black-Cockatoos would not occur on the subject land. There is no suitable habitat.
Magpie Goose *Anseranas semipalmate*	V	-	Magpie Geese are not expected to occur on the subject land, although the species has been recorded at Lake Bathurst.
Flame Robin *Petroica phoenicea*	P	-	

Scarlet Robin *Petroica boodang*	P	-	
Little Eagle *Hieraaetus morphnoides*	P	-	
Varied Sittella *Daphoenositta chrysoptera*	P	-	
White-browed Woodswallow *Artamus superciliosus*	P	-	
Reptiles			
Little Whip Snake *Suta flagellum*	V	-	Little Whip Snakes are not expected to occur on the subject sites, as they are unlikely to be in highly modified grassland.
Striped Legless Lizard *Delmar impar*	V	V	There is no suitable habitat on the subject land for Striped Legless Lizards; they occur in natural temperate grassland.
Pink-tailed Worm-lizard *Aprasia parapuchella*	V	V	Pink-tailed Worm-lizards would not occur on the subject land. The species does not occur in highly modified grassland.
Grassland Earless Dragon *Tympanocryptus lineata pinguicolla*	E	E	This species would not occur on the subject land. There is no suitable habitat. It occurs in natural temperate grassland.
Frogs			
Green and Golden Bell Frog *Litoria aurea*	E	V	This species would not occur on the subject land. There are no wetlands.
Invertebrates			
Golden Sun Moth *Synemon plana*	E	CE	Golden Sun Moths occur in natural temperate grassland, not exotic grassland. They would be unlikely to occur on the subject Sites because of the poor quality of the grassland and general absence of tussocks of *Austrodanthonia*.

[+] V = vulnerable; E = endangered; CE = critically endangered; - = not listed; P – preliminary listing, 8 October 2009.

5.2 Migratory Species

In addition to threatened species, the EPBC Act allows for the listing of internationally protected migratory species, i.e. species listed under the Japan - Australia Migratory Bird Agreement (JAMBA), the China - Australia Migratory Bird Agreement (CAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Various internationally protected migratory species occur have been recorded in the vicinity of Capital Wind Farm, species such as the Australian Wood Duck, Australian Shelduck, Pacific Black Duck, Nankeen Kestrel, Brown Falcon and Wedge-tailed Eagle. However, there is no important habitat on the subject land for such species and the habitat on the site is not likely to support an ecologically important proportion of a population of such species.

5.3 Endangered Populations

Endangered populations in New South Wales are listed under the TSC Act (Schedule 1, Part 2). There are no provisions under the EPBC Act for the listing of endangered populations. No endangered populations have been declared on the subject sites.

5.4 Endangered Ecological Communities

Endangered ecological communities in New South Wales are listed under the TSC Act (Schedule 1, Part 3). Nationally threatened ecological communities are listed under the EPBC Act. Several endangered ecological communities and nationally threatened ecological communities occur on the Southern Tablelands of New South Wales; i.e. White Box Yellow Box Blakely's Red Gum Woodland, Natural Temperate Grassland of the Southern Tablelands and Montane Bogs and Fens. Much of the low-lying country in the vicinity of the sites investigated once supported Yellow Box Blakely's Red Gum or, on broad valley floors near Lake George, native grassland with few if any trees (i.e. natural temperate grassland). Very few remnants of these communities remain, although many paddocks support a native pasture where some native perennial grasses are common.

The native grassland on the Woodland land is secondary grassland originally an understorey to a *Eucalyptus rossii – Eucalyptus dives* woodland. That community is not a listed endangered ecological community. Some native grassland patches in the valley north of eh substation is probably secondary grassland originating from a Yellow Box – Blakely's Red Gum Woodland, which is a listed endangered ecological community; see Plot 2 in **Appendix 2**.

Figure 2 shows the locations of the Endangered Ecological Communities for the project site.

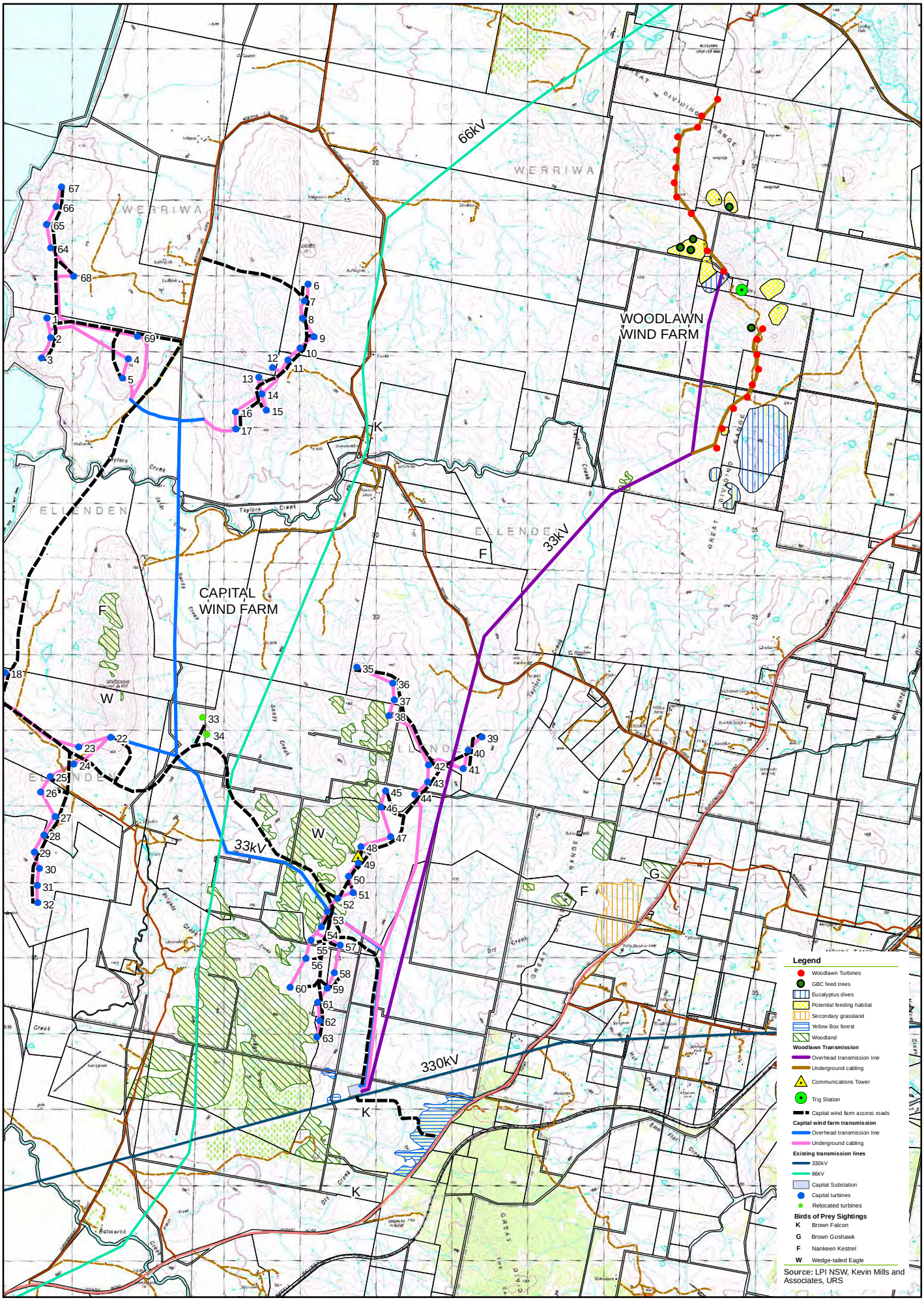
6. Impact Assessment

6.1 Overview

The construction of the proposed transmission line will have virtually no significant impact on native flora and fauna. The proposed route almost totally traverses totally treeless land with a cover of native pasture, exotic grassland and improved pasture.

An assessment of the quality of native grassland in the area was undertaken using the method developed and described by Rehwinkel (2007); see **Appendix 2**. That method provides a "floristic value score" that determines the quality of a grassland patch. The scores obtained by the two plots are 2 and 5. Rehwinkel (2007) states that 'if the score derived using this method is 4 or above, then the site has moderate to high floristic value". Observations in the study area and the quality scores obtained in this study indicate that the grassland in the area is of low quality, with occasional moderate quality patches (e.g. Plot 2).

Several patches of woodland, not part of a listed endangered ecological community, occur on the Woodlawn land. These can and should be avoided as they are of local habitat value to native flora and fauna. Elsewhere, there are occasional scattered paddock trees; these also should be avoided wherever practical for there habitat and landscape values. Other habitat features such as watercourses and rock outcrops are generally minor in the area and will not be significantly affected.



SCALE 1:65,000 @ A4

0 1 2km

Projection: MGA

Woodlawn Wind Farm

FIGURE 2: Location of Endangered Communities

6.2 *Impact on Threatened Species, Populations and Communities*

6.2.1 Legislative Context

Threatened Species Conservation Act 1995

Under the provisions of the *Threatened Species Conservation Act 1995,* the impact of a proposed action, development or activity on species, populations and communities (and their habitats) is assessed by applying various factors set out under Section 5A of the New South Wales *Environmental Planning and Assessment Act 1979* (EPA Act). Commonly referred to as the "seven part test", these factors assist the proponent and the determining authority to decide whether the impact is likely to be significant and whether a Species Impact Statement (SIS) should be prepared.

The TSC Amendment Act allows the Minister for the Environment to issue assessment guidelines to assist proponents to determine whether an action is likely to significantly affect threatened species, populations or ecological communities, or their habitats. The Department of Environment and Conservation has not yet published any guidelines, although a draft document was prepared in August 2005.

Environment Protection and Biodiversity Conservation Act 1999

The impact of a proposed action on matters of national environmental significance is assessed under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Matters of national environmental significance are World Heritage properties, National Heritage places, wetlands of international importance (RAMSAR wetlands), threatened species and ecological communities listed under the EPBC Act, migratory species listed under the EPBC Act, Commonwealth marine environment, and nuclear actions (including uranium mining).

An "action" is a project, a development, an undertaking, an activity or a series of activities, and an alteration of any of the above. An action can be on Commonwealth land, State land council land, private land, or water.

Approval is required from the Commonwealth Environment Minister for actions that are likely to have a significant impact on a matter of national environmental significance; these are called "controlled actions". A proposed action is a "controlled action" if:

- is likely to have a significant impact on a matter of national environmental significance,
- is likely to have a significant impact on the environment of Commonwealth land,
- is to be undertaken on Commonwealth land and is likely to have a significant impact on the environment anywhere, and
- is an action to be taken by the Commonwealth that is likely to have a significant impact on the environment anywhere.

Only the Commonwealth can advise definitively whether a proposed action is a controlled action; however, the Department of the Environment and Heritage has prepared guidelines to facilitate a self-assessment process to help proponents decide whether an action is likely be a controlled action that should be referred to the Minister for assessment and approval. The *Significant Impact Guidelines: Matters of National Environmental Significance* (DEH May 2006) replaced the *EPBC Act Administrative Guidelines on Significance* (Environment Australia 2000).

The Bilateral Agreement

The Agreement between the Commonwealth of Australia and the State of New South Wales relating to environmental impact assessment (Australian Government 2007), referred to as the Bilateral Agreement, accredits the assessment regimes under Part 3A, Part 4 and Part 5 of the EP&A Act for assessment purposes under the EPBC Act. The Bilateral Agreement applies to "controlled actions" in relation to matters of national environmental significance, with the exception of nuclear actions.

The following implications of the agreement for environmental impact assessment processes in New South Wales have been set out by the NSW Department of Planning in their Guide to Implementation in NSW (NSW Department of Planning 2007).

> "Prior to the Bilateral Agreement, the NSW assessment process was accredited by the Commonwealth on a project by project basis when a full assessment was required under the EPBC Act. This avoided the need to assess the developments under both Acts. Now under the Bilateral Agreement, project by project accreditation of the process is no longer required.
>
> Following the assessment and determination under the EPA Act, the Assessment Report and determination including approval conditions (if approved) is forwarded to the Department of the Environment and Water Resources. This means that there is no longer a need for parallel assessments by the Commonwealth and the NSW government for controlled actions, and that projects which require approval from both the State and Commonwealth would only be assessed once – by a State agency or a council. The same assessment is then used by both the State and the Commonwealth to determine whether to approve the proposal.
>
> The Bilateral Agreement will only apply to projects that are determined to be controlled actions by the Commonwealth. These projects may be assessed under the Bilateral Agreement if Part 3A, Part 4 and Part 5 of the EPA Act apply. . . The Bilateral Agreement does not apply to developments that affect Commonwealth land or developments undertaken by Commonwealth agencies. Such developments will need to be assessed separately by the Commonwealth and NSW State governments.
>
> The Bilateral Agreement only provides for accreditation of the specified state assessment processes to meet the assessment requirements of the EPBC Act. The Commonwealth will still need to issue a separate approval for the development (based on the state assessment and approval conditions)."

SEPP No.44 - Koala Habitat Protection

State Environmental Planning Policy No.44 - Koala Habitat Protection (SEPP 44) (New South Wales 1995) encourages the conservation and management of natural vegetation providing habitat for Koalas, to ensure a permanent free-living population over the species' present range and to reverse the current trend of Koala population decline. SEPP 44 applies in the local government areas listed under Appendix 1 of the policy.

SEPP 44 helps to identify "potential Koala habitat", i.e. "areas of native vegetation where the trees of the types listed in Schedule 2 [of SEPP 44] constitute at least 15% of the total number of trees in the upper or lower strata of the tree component". If no Schedule 2 tree species are present or if they constitute less than 15% of the total number of trees present, then no further provisions of the Policy apply.

If more than 15% of the trees in the area are Schedule 2 tree species, then an assessment must be made by a qualified person to determine whether the area contains "core Koala habitat", a term applied to "an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population".

6.2.2 Assessment under the TSC Act

The "seven part test" set out under Section 5A of the EPA Act has been applied, below, to assist in determining whether the proposed development is likely to have a significant effect on species, populations and ecological communities (and their habitats) listed under the TSC Act.

(a) in the case of a 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

The transmission line is not likely to have an adverse effect on the life cycle of any threatened species to the extent that a viable local population of the species is likely to be placed at risk of extinction. No threatened species were recorded in the study area. Although a few threatened woodland birds probably occur in the general area, these will not be impacted by a transmission line that traverses cleared land.

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

The transmission line is not likely to have an adverse effect on the life cycle of any endangered population. No endangered populations have been declared on, or adjacent to, the subject land.

(c) in the case of an endangered ecological community or critically 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
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its occurrence is likely to be placed at risk of extinction

The transmission line will not have an adverse effect on any endangered ecological communities; there are none in the study area, because the sites are dominated by native pasture and exotic grassland that, at most, are very poor examples of the listed White Box - Yellow Box Blakely's Red Gum Woodland. Small areas of native grassland north of the substation may be secondary grassland form this community, but their quality is not very high (see results of plot 2).

(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
(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
(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

No habitat for threatened species, populations or ecological communities will be removed or modified, or will become fragmented or isolated in order to construct the transmission line.

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

Critical habitat refers only to those areas of land listed in the Registers of Critical Habitat. No critical habitat has been declared in the study area.

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

The proposal is not inconsistent with any recovery plan or threat abatement plan.

(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.

Key threatening processes in New South Wales are listed under the TSC Act and *Fisheries Management Act 1994* (FMA Act). The proposed action would involve the clearing of native vegetation, but only to a negligible extent.

Conclusion, TSC Act
In our opinion, the transmission line is not likely to have a significant effect on any threatened species, populations or communities listed under the *Threatened Species Conservation Act 1995*, or their habitats, and the preparation of a Species Impact Statement (SIS) is not warranted.

6.2.3 Assessment under the EPBC Act

The following questions in the *Significant Impact Guidelines* (DEWR May 2006) must be addressed when deciding whether or not to refer a proposed action to the Commonwealth Minister for the Environment:

1. *Are there any matters of national environmental significance located in the area of the proposed action (noting that 'the area of the proposed action' is broader than the immediate location where the action is undertaken; consider also whether there are any matters of national environmental significance adjacent to or downstream from the immediate location that may potentially be impacted)?*
Response: Various internationally protected migratory species occur in the general area, e.g. Australian Wood Duck, Australian Shelduck, Pacific Black Duck, Nankeen Kestrel, Brown Falcon and Wedge-tailed Eagle. The small patches of native (secondary) grassland north of the substation are not a part of the listed White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland community (Box Gum Woodland) listed threatened ecological community as it does not meet the minimum criteria for that community.

2. Considering the proposed action at its broadest scope (that is, considering all stages and components of the action, and all related activities and infrastructure), is there potential for impacts, including indirect impacts, on matters of national environmental significance?
Response: The potential for the proposed transmission line to impact on internationally protected migratory species is expected to be negligible, given the type and small amount of habitat involved.

3. Are there any proposed measures to avoid or reduce impacts on matters of national environmental significance (and if so, is the effectiveness of these measures certain enough to reduce the level of impact below the 'significant impact' threshold)?
Response: There is no necessity to undertake such measures as there are no matters of national environmental significance in the area.

4. Are any impacts of the proposed action on matters of national environmental significance likely to be significant impacts (important, notable, or of consequence, having regard to their context or intensity)?
Response: No; the potential impact is expected to be negligible.

Assessment
An action must be referred to the Commonwealth Minister if it has, will have, or is likely to have a significant impact on matters of national environmental significance. The impact of the proposed transmission line on internationally protected migratory species has been assessed below, by applying the significant impact criteria for migratory species. No nationally endangered communities occur there and no nationally threatened species are likely to occur there.

Significant Impact Criteria for Critically Endangered and Endangered Ecological Communities
An action is likely to have a significant impact on a critically endangered or endangered community if there is a real chance or possibility that it will:

- reduce the extent of an ecological community;
- fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;
- adversely affect habitat critical to the survival of an ecological community;
- modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;
- cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;
- cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
  - assisting invasive species, that are harmful to the listed ecological community, to become established;

or

  - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; or
  interfere with the recovery of an ecological community.

There are no endangered ecological communities (EEC) along the proposed transmission line. There are a few patches of native grassland in the valley north of the capital Wind farm substation that are probably secondary grassland from a Yellow Box-Red Gum Woodland that is part of the Box Gum Woodland community complex listed under the act. However, these areas do not meet the minimum criteria for the community set by the Commonwealth.

Significant Impact Criteria for Listed Migratory Species
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

An area of "important habitat" for a migratory species is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- habitat that is of critical importance to the species at particular life-cycle stages; and/or
- habitat utilised by a migratory species which is at the limit of the species range; and/or
- habitat within an area where the species is declining.

In relation to migratory species, "population" means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.

The proposed transmission line is not likely to have a significant impact on listed migratory species. There is no "important habitat" on the land traversed for such species and the habitat in the area is not likely to support an "ecologically important proportion of a population" of such species.

Conclusion, EPBC Act

In our opinion, the construction of the proposed transmission line is not likely to have a significant impact on matters of national environmental significance listed under the *Environment Protection and Biodiversity Conservation Act*. Referral to the Commonwealth Minister for the Environment for assessment and approval is therefore not warranted. The proposal is not likely to constitute a "controlled action" because is it not "likely to have a significant impact on a matter of national environmental significance". The Bilateral Agreement, which applies only to projects determined to be "controlled actions", does not apply.

6.2.4 Assessment under SEPP 44

State Environmental Planning Policy No.44 - Koala Habitat Protection (SEPP 44) applies in this area, but there are no Schedule 2 Koala food trees were recorded on the subject land. The area is therefore not "potential Koala habitat" and no further provisions of the Policy apply.

7. Conclusion and Recommendations

The construction of the proposed transmission line from the Woodlawn Wind Farm to the substation on the Capital Wind Farm

The transmission line is not likely to have a significant impact on threatened species, populations or ecological communities listed under the *Threatened Species Conservation Act 1995* and on matters of national environmental significance listed under the *Environment Protection and Biodiversity Conservation Act*. The preparation of a Species Impact Statement (SIS) and referral to the Commonwealth Minister for the Environment for assessment and approval are therefore not warranted.

The following recommendations are made to avoid and minimise the impact of the proposed transmission line on flora and fauna. The recommendations are listed from the start of the line in the north to the substation in the south.

- When constructing the access tracks, care should be taken to ensure that the construction activities do not cause excessive erosion. Permanent tracks should be stabilised and temporary tracks rehabilitated.

- There is a stand of *Eucalyptus radiata* woodland directly below the hill at the beginning of the line. The line should be strung above this so that the woodland does not need to be cleared. Given the height and steepness of the hill, this should be achievable.

- The route north of the angle at the southern end of the Woodlawn property is across almost totally treeless land. There are patches of woodland to the east and west of the route and these should be avoided.

- At the boundary of the Woodlawn land, there is a broad patch of woodland, some of this is fenced and exhibits a diverse native understorey. This woodland should be avoided by the line, either by going around it to the north or east. There is so much cleared, treeless land and so little woodland that clearing woodland remnants cannot be justified.

- The *Nardoo* property is almost treeless and the grassland is of low importance as habitat for native species. Scattered granite outcrops occur in the paddock north of Taylors Creek Road; these have some local value as reptile habitat. The rock outcrops should be avoided where possible.

- Weed control on the properties traversed is not the responsibility of the operator or contractors associated with the project; however measures need to be taken to ensure that the construction of the line does not exacerbate the weed problem on the properties involved. This is particularly important in regard to the spreading of invasive weeds to new locations.

- The valley north of the substation contains some native grassland, albeit of low to moderate quality. Disturbance there should be kept to a minimum.

8. References

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APPENDIX 1
PHOTOGRAPHS OF THE PROPOSED TRANSMISSION LINE ROUTE

	1. Looking south from near tower W11 on the Woodlawn Wind Farm site. Note stand of woodland directly below the hill, and the almost treeless land beyond.
	2. Looking north from about half way towards the Woodlawn site boundary. The hill in the above photograph can be seen in the distant background.
	3. Looking south from the above point. The first angle in the line is on the high point in the far distance.

	4. Looking southwest from the angle in the line on the Woodlawn land. The woodland in distance is on the boundary with the property *Nardoo*, to the south. See photograph of this woodland below.
	5. Part of the fenced section of the above woodland patch; note the diverse native understorey, the result of excluding grazing.
	6. The line route across he property *Nardoo*, note treeless character of this land and the intensively managed paddock. The existing Capital Wind Farm towers can be seen in the distance.

	7. Looking along the route of the line across *Nardoo*, south from Taylors Creek Road.
	8. The beginning of the route on the Capital Wind Farm site south from Taylors Creek Road. The route is located between the towers to the left and right in the photograph. This paddock is pasture improved.
	9. Looking north towards Taylors Creek Road from near the most northern towers on the Capital Wind Farm site.

	10. Looking south from the above point. The route of the line traverses the land through the towers on the Capital Wind Farm.
	11. Looking north up the northern part of the broad valley above the substation of the Capital Wind Farm. This valley is almost treeless but contains patches of native grassland.
	12. The most southern part of the proposed line route towards the substation, seen in the far distance.

APPENDIX 2
GRASSLAND SURVEY SHEET
(after the method developed of Rehwinkel 2007)

Site name: Woodlawn Transmission Line			**Plot ID:** WL01		**Date:** 6/10/09	
Community: *Danthonia – Aristida* Native Grassland (Secondary) **Land Tenure:** Freehold						
Soil: rocky, clayey	**Aspect:** North **Alt.** 800m	**Geology**: Ordovician sediments.			**Slope:** Level	
GPS (centre): 55 0734200 6112205			**Topography:** Low ridge crest			
Species Name (native species only)	**Braun-Blanquet Score**	**Species Type Code**	**Indicator Species level 2**	**Indicator Species level 2 with the exception of those with scores of 'r'**	**Indicator Species (level 1 & 2)**	**Indicator Species levels 1 & 2 with the exception of those with scores of 'r'**
Ref. in Rehwinkel (2007).	See p.9	Appendices	Table C	Table D	Table E	Table F
Aristida ramosa	4	C				
Austrodanthonia carphoides	4	C				
Austrostipa scabra	2	C				
Carex inversa	+	C				
Crassula sieberiana	3	C				
Cymbonotus sp.	1	C				
Lomandra filiformis	1	1		1	1	1
Poa sieberiana	1	C				
Scleranthus biflorus	r	2	r		2	
Solenogyne dominii	+	C				
Triptilodiscus pygmaeus	2	1		2	2	2
Exotics						
**Acetosella vulgaris*	2					
**Aira cupaniana*	1					
**Aira elegans*	2					
**Hypochaeris radicata*	2					
**Moenchia erecta*	2					
**Paronychia brasiliensis*	1					
**Trifolium subterraneum*	1					
TALLY:			1	2		2
					SITE'S FLORISTIC VALUE SCORE:	

Tally: count, do not total, the number of entries in the required columns: *Indicator species level 2* (count all entries), Indicator species level 2 with the exception of those with scores of "r" (count entries with scores greater than "r"). Indicator species levels 1 & 2 with the exception of those with scores of "r" (count entries with scores greater than "r)

To derive a **floristic value score** for a site, **total** the three tally numbers along the base of the table.

Site name: Woodlawn Transmission Line			**Plot ID:** CWF 02		**Date:** 6/10/09	
Community: *Poa sieberiana* grassland **Land Tenure:** Freehold						
Soil: Sandy.	**Aspect:** North **Alt.** 760m	**Geology**: Devonian granite.			**Slope:** Level	
GPS (centre): 55 0730087 6104728			**Topography:** Broad valley floor			
Species Name (native species only)	**Braun-Blanquet Score**	**Species Type Code**	**Indicator Species level 2**	**Indicator Species level 2 with the exception of those with scores of 'r'**	**Indicator Species (level 1 & 2)**	**Indicator Species levels 1 & 2 with the exception of those with scores of 'r'**
Ref. in Rehwinkel (2007).	See p.9	Appendices	Table C	Table D	Table E	Table F
Asperula conferta	1	1			1	1
Austrodanthonia carphoides	3	C				
Bothriochloa macra	1	C				
Convolvulus erubescens	1	C				
Crassula sieberiana	2	C				
Cymbonotus sp.	1	C				
Dichondra repens	+	C				
Lomandra filiformis	1	1			1	1
Ophioglossum lusitanicum	+	2	+	+	2	2
Panicum effusum	1	C				
Poa sieberiana	5	C				
Solenogyne dominii	1	C				
Triptilodiscus pygmaeus	1	1			1	1
Wurmbea dioica	+	2	+	+	2	2
Exotics						
**Aira elegans*	2					
**Carthamus lanatus*	2					
**Erodium* sp.	1					
**Gamochaeta americana*	1					
**Hypochaeris radicata*	1					
**Lolium* sp.	1					
**Nassella trichotoma*	1					
**Poa bulbosa*	1					
**Trifolium subterraneum*	1					
TALLY:			2	2		5
					SITE'S FLORISTIC VALUE SCORE:	

Tally: count, do not total, the number of entries in the required columns: *Indicator species level 2* (count all entries), Indicator species level 2 with the exception of those with scores of "r" (count entries with scores greater than "r"). Indicator species levels 1 & 2 with the exception of those with scores of "r" (count entries with scores greater than "r)

To derive a **floristic value score** for a site, **total** the three tally numbers along the base of the table.

APPENDIX 3
LIST OF PLANT SPECIES FOR THE STUDY AREA

PTERIDOPHYTA (Ferns)

Dennstaedticeae	
Pteridium esculentum	Bracken

GYMNOSPERMAE (CONIFERS)

Pinaceae	
**Pinus radiata*	Radiata Pine

ANGIOSPERMAE (FLOWERING PLANTS)

Apiaceae	
Hydrocotyle laxiflora	Stinking Pennywort
Asphodelaceae	
Bulbine bulbosa	Bulbine Lily
Asteraceae	
Chrysocephalum apiculatum	Common Everlasting
Cotula australis	Common Cotula
Cymbonotus sp.	Cymbonotus
Solenogyne dominii	Smooth Solenogyne
Triptilodiscus pygmaeus	Austral Sunray
**Arctotheca calendula*	Capeweed
**Carthamus lanatus*	Saffron Thistle
**Cirsium vulgare*	Spear Thistle
**Gamochaeta americana*	American Cudweed
**Hypochaeris radicata*	Flatweed
**Onopordium acanthium*	Scotch Thistle
Caryophyllaceae	
Scleranthus biflorus	Twin-flowered Knawel
Spergularia rubra	Sandspurry
Stellaria pungens	Prickly Starwort
**Cerastium fontanum*	Mouse-ear Chickweed
**Moenchia erecta*	Erect Chickweed
**Paronychia brasiliensis*	Chilean Whitlow Wort
**Petrorhagia nanteuilii*	Proliferous Pink
**Stellaria media*	Chickweed
Casuarinaceae	
Allocasuarina littoralis	Black She-oak
Chenopodiaceae	
Einadia nutans	Nodding Saltbush
Colchicaceae	
Wurmbea dioica	Early Nancy
Convolvulaceae	
Convolvulus erubescens	Australian Bindweed
Dichondra repens	Kidney Weed

Crassulaceae	
Crassula sieberiana	Stonecrop
Cyperaceae	
Carex appressa	Tall Sedge
Carex inversa	Knob Sedge
Epacridaceae	
Brachyloma daphnoides	Daphne Heath
Fabaceae	
Faboideae (subfamily)	
Indigofera australis	Austral Indigo
**Genista monspessulana*	Montpellier Broom
**Trifolium subterraneum*	Subterranean Clover
Mimosoideae (subfamily)	
Acacia dealbata	Silver Wattle
Acacia implexa	Hickory Wattle
Acacia mearnsii	Black Wattle
Acacia melanoxylon	Blackwood
Geraniaceae	
**Erodium* sp.	Stork's-bill
Haloragaceae	
**Myriophyllum* sp.	Water-milfoil
Iridaceae	
**Romulea rosea*	Onion Grass
Juncaceae	
Juncus australis	Austral Rush
Lamiaceae	
**Marrubium vulgare*	Horehound
Lomandraceae	
Lomandra filiformis	Wattle Mat-rush
Lomandra multiflora	Many-flowered Mat-rush
Myrtaceae	
Eucalyptus dives	Broad-leaved Peppermint
Eucalyptus macrorhyncha	Red Stringybark
Eucalyptus melliodora	Yellow Box
Eucalyptus pauciflora	Snow Gum
Eucalyptus radiata	Narrow-leaved Peppermint
Eucalyptus rossii	Inland Scribbly Gum
Ophioglossaceae	
Ophioglossum lusitanicum	Adder's Tongue
Oxalidaceae	
Oxalis sp.	Wood Sorrel
Phormiaceae	
Dianella revoluta	Spreading Flax-lily

Poaceae	
Aristida ramosa	Three-awned Speargrass
Austrodanthonia carphoides	Short Wallaby Grass
Austrodanthonia sp.	Wallaby Grass
Austrostipa bigeniculata	Tall Speargrass
Austrostipa scabra	Corkscrew
Bothriochloa macra	Red-leg Grass
Cynodon dactylon	Couch Grass
Enneapogon nigricans	Nineawn Grass
Joycea pallida	Silvertop Wallaby Grass
Panicum effusum	Hairy Panic
Poa labillardieri	River Tussock
Poa sieberiana	Poa Tussock
Themeda australis	Kangaroo Grass
**Aira elegans*	Delicate Hair-grass
**Aira cupaniana*	Hair-grass
**Avena* sp.	Oats
**Bromus cartharticus*	Prairie Grass
**Bromus hordeaceus*	Soft Brome
**Holcus lanatus*	Yorkshire Fog
**Hordeum* sp.	Barley Grasses
**Lolium* sp.	Ryegrass
**Nassella trichotoma*	Serrated Tussock
**Pentaschistis airoides*	False Hairgrass
**Phalaris* sp.	Phalaris
**Poa bulbosa*	Bulbous Bluegrass
Polygonaceae	
**Acetosella vulgaris*	Sheep Sorrel
Proteaceae	
Banksia marginata	Silver Banksia
Rubiaceae	
Asperula conferta	Common Woodruff
Salicaceae	
**Populus nigra*	Lombardy Poplar
Typhaceae	
Typha orientalis	Cumbungi

APPENDIX 4
LIST OF ANIMAL SPECIES FOR THE STUDY AREA

Notes:
a. Source of record.
   1. Recorded previously in the near vicinity, including NSW Wildlife Atlas (P)
   2. Recorded in the project area in 2009 (S)
b. Introduced bird species are indicated by an asterisk (*).

MAMMAL SPECIES

FAMILY Species		Previous Study	This Study
TACHYGLOSSIDAE			
Short-beaked Echidna	*Tachyglossus aculeatus*	P	
PHASCOLARCTIDAE			
Koala	*Phascolarctos cinereus*	P	
VOMBATIDAE			
Common Wombat	*Vombatus ursinus*	P	S
PSEUDOCHEIRIDAE			
Common Ringtail Possum	*Pseudocheirus peregrinus*	P	
PHALANGERIDAE			
Common Brushtail Possum	*Trichosurus vulpecula*	P	
MACROPODIDAE			
Eastern Grey Kangaroo	*Macropus giganteus*	P	S
Common Wallaroo	*Macropus robustus*	P	
Red-necked Wallaby	*Macropus rufogriseus*	P	
Swamp Wallaby	*Wallabia bicolor*	P	
MURIDAE			
Black Rat*	*Rattus rattus*	P	
CANIDAE			
European Red Fox*	*Vulpes vulpes*	P	
LEPORIDAE			
Rabbit*	*Oryctolagus cuniculus*	P	
Brown Hare*	*Lepus capensis*	P	S
EQUIDAE			
Horse*	*Equus caballus*	P	
BOVIDAE			
Domestic Cattle*	*Bos taurus*		S
BOVIDAE			
Domestic Sheep*	*Ovis aries*	P	S
CERVIDAE			
Sambar Deer*	*Cervus unicolor*	P	
Fallow Deer*	*Dama dama*	P	

BIRD SPECIES

FAMILY Species		Previous Nearby Atlas	This Study
CASUARIIDAE			
Emu	*Dromaius novaehollandiae*	P	
PHASIANIDAE			
Stubble Quail	*Coturnix pectoralis*	P	
ANATIDAE			
Blue-billed Duck	*Oxyura australis*	P	
*Greylag Goose	*Anser* sp.	P	
Musk Duck	*Biziura lobata*	P	
Black Swan	*Cygnus atratus*	P	S
Australian Shelduck	*Tadorna tadornoides*	P	
Australian Wood Duck	*Chenonetta jubata*	P	S
Freckled Duck	*Stictonetta naevosa*	P	
Pacific Black Duck	*Anas superciliosa*	P	S
Magpie-Goose	*Anseranas semipalmata*	P	
Pink-eared Duck	*Malacorhynchus membranaceus*	P	
Australian Shoveler	*Anas rhynchotis*	P	
Grey Teal	*Anas gracilis*	P	S
Chestnut Teal	*Anas castanea*	P	
Hardhead	*Aythya australis*	P	
PODICIPEDIDAE			
Australasian Grebe	*Tachybaptus novaehollandiae*	P	S
Hoary-headed Grebe	*Poliocephalus poliocephalus*	P	
PHALACROCORACIDAE			
Little Pied Cormorant	*Microcarbo melanoleucos*	P	S
ARDEIDAE			
White-faced Heron	*Egretta novaehollandiae*	P	
White-necked Heron	*Ardea pacifica*	P	
Intermediate Egret	*Ardea intermedia*	P	
THRESKIORNITHIDAE			
Australian White Ibis	*Threskiornis molucca*	P	
Straw-necked Ibis	*Threskiornis spinicollis*	P	
ACCIPITRIDAE			
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	P	
Brown Goshawk	*Accipiter fasciatus*	P	
Collared Sparrowhawk	*Accipiter cirrhocep*	P	
Wedge-tailed Eagle	*Aquila audax*	P	
Little Eagle	*Hieraaetus morphnoides*	P	
FALCONIDAE			
Brown Falcon	*Falco berigora*	P	S
Peregrine Falcon	*Falco peregrinus*	P	
Nankeen Kestrel	*Falco cenchroides*	P	
RALLIDAE			
Spotted Crake	*Porzana tabuensis*	P	

Purple Swamphen	*Porphyrio porphyrio*	P	
Eurasian Coot	*Fulica atra*	P	
SCOLOPACIDAE			
Marsh Sandpiper	*Tringa stagnatilis*	P	
Pectoral Sandpiper	*Calidris melanotos*	P	
Common Greenshank	*Tringa nebularia*	P	
Ruddy Turnstone	*Arenaria interpres*	P	
Curlew Sandpiper	*Calidris ferruginea*	P	
RECURVIROSTRIDAE			
Banded Stilt	*Caldorhynchus leucocephalus*	P	
Red-necked Avocet	*Recurvirostra novaehollandiae*	P	
CHARADRIIDAE			
Red-capped Plover	*Charadrius ruficapillus*	P	
Double-banded Plover	*Charadrius bicinctus*	P	
Grey Plover	*Pluvialis squatarola*	P	
Pacific Golden Plover	*Pluvialis fulva*	P	
Red-kneed Dotterel	*Erythrogonys cinctus*	P	
Banded Lapwing	*Vanellus tricolor*	P	
Masked Lapwing	*Vanellus miles*	P	
LARIDAE			
Silver Gull	*Chroicocephalus novaehollandiae*	P	
COLUMBIDAE			
Rock Dove*	*Columba livia*	P	
Common Bronzewing	*Phaps chalcoptera*	P	S
Crested Pigeon	*Ocyphaps lophotes*	P	S
CACATUIDAE			
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	P	
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	P	
Galah	*Eolophus roseicapillus*	P	S
Sulphur-crested Cockatoo	*Cacatua galerita*	P	S
PSITTACIDAE			
Crimson Rosella	*Platycercus elegans*	P	S
Eastern Rosella	*Platycercus eximius*	P	S
Red-rumped Parrot	*Psephotus haematonotus*	P	S
CUCULIDAE			
Pallid Cuckoo	*Cacomantis pallidus*	P	
PODARGIDAE			
Tawny Frogmouth	*Podargus strigoides*	P	
HALCYONIDAE			
Laughing Kookaburra	*Dacelo novaeguineae*	P	
Sacred Kingfisher	*Todiramphus sanctus*	P	
MEROPIDAE			
Rainbow Bee-eater	*Merops ornatus*	P	
CLIMACTERIDAE			
White-throated Treecreeper	*Cormobates leucophaea*	P	

MALURIDAE			
Superb Fairy-wren	*Malurus cyaneus*	P	S
PARDALOTIDAE			
Spotted Pardalote	*Pardalotus punctatus*	P	
Striated Pardalote	*Pardalotus striatus*	P	S
White-browed Scrubwren	*Sericornis frontalis*	P	
Weebill	*Smicrornis brevirostris*	P	
White-throated Gerygone	*Gerygone albogularis*	P	
Brown Thornbill	*Acanthiza pusilla*	P	
Buff-rumped Thornbill	*Acanthiza reguloides*	P	
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	P	S
Yellow Thornbill	*Acanthiza nana*	P	
Striated Thornbill	*Acanthiza lineata*	P	
Southern Whiteface	*Aphelocephala leucopsis*	P	
MELIPHAGIDAE			
Red Wattlebird	*Anthochaera carunculata*	P	S
Noisy Friarbird	*Philemon corniculatus*	P	
Noisy Miner	*Manorina melanocephala*	P	
Yellow-faced Honeyeater	*Lichenostomus chrysops*	P	
White-eared Honeyeater	*Lichenostomus leucotis*	P	
White-plumed Honeyeater	*Lichenostomus penicillatus*	P	
Brown-headed Honeyeater	*Melithreptus brevirostris*	P	
White-naped Honeyeater	*Melithreptus lunatus*	P	
Eastern Spinebill	*Acanthorhynchus tenuirostris*	P	
White-fronted Chat	*Epthianura albifrons*	P	
PETROICIDAE			
Scarlet Robin	*Petroica boodang*	P	
NEOSITTIDAE			
Varied Sittella	*Daphoenositta chrysoptera*	P	
PACHYCEPHALIDAE			
Golden Whistler	*Pachycephala pectoralis*	P	
Rufous Whistler	*Pachycephala rufiventris*	P	
Grey Shrike-thrush	*Colluricincla harmonica*	P	S
DICRURIDAE			
Satin Flycatcher	*Myiagra cyanoleuca*	P	
Restless Flycatcher	*Myiagra inquieta*	P	
Magpie-lark	*Grallina cyanoleuca*	P	S
Rufous Fantail	*Rhipidura rufifrons*	P	
Grey Fantail	*Rhipidura albiscapa*	P	
Willie Wagtail	*Rhipidura leucophrys*	P	S
Spangled Drongo	*Dicrurus bracteatus*	P	
CAMPEPHAGIDAE			
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	P	S
White-winged Triller	*Lalage sueurii*	P	
ORIOLIDAE			
Olive-backed Oriole	*Oriolus sagittatus*	P	
ARTAMIDAE			
Dusky Woodswallow	*Artamus cyanopterus*	P	
Grey Butcherbird	*Cracticus torquatus*	P	S

Australian Magpie	*Cracticus tibicen*	P	S
Pied Currawong	*Strepera graculina*	P	
Grey Currawong	*Strepera versicolor*	P	
CORVIDAE			
Australian Raven	*Corvus coronoides*	P	S
Little Raven	*Corvus mellori*	P	
CORCORACIDAE			
White-winged Chough	*Corcorax melanorhamphos*	P	S
ALAUDIDAE			
Eurasian Skylark*	*Alauda arvensis*	P	
MOTACILLIDAE			
Australasian Pipit	*Anthus novaeseelandiae*	P	S
PASSERIDAE			
House Sparrow*	*Passer domesticus*	P	
Red-browed Finch	*Neochmia temporalis*	P	
FRINGILLIDAE			
European Goldfinch*	*Carduelis carduelis*	P	
HIRUNDINIDAE			
Welcome Swallow	*Hirundo neoxena*	P	S
Tree Martin	*Petrochelidon nigricans*	P	
ZOSTEROPIDAE			
Silvereye	*Zosterops lateralis*	P	
MUSCICAPIDAE			
Bassian Thrush	*Zoothera lunulata*	P	
Common Blackbird*	*Turdus merula*	P	
STURNIDAE			
Common Starling*	*Sturnus vulgaris*	P	S

FROGS

FAMILY Species		Previous Nearby	This Study
MYOBATRACHIDAE			
Common Eastern Froglet	*Crinia signifera*	P	S
Eastern Banjo Frog	*Limnodynastes dumerilii*	P	
Spotted Grass Frog	*Limnodynastes tasmaniensis*	P	S
Smooth Toadlet	*Uperoleia laevigata*	P	
HYLIDAE			
Green and Golden Bell Frog	*Litoria aurea*	P	
Verreaux's Tree Frog	*Litoria verreauxii*	P	S

REPTILES

FAMILY	Previous Study	This Study
CHELIDAE		

Long-necked Tortoise	*Chelodina longicollis*	P	
AGAMIDAE			
Jacky Lizard	*Amphibolurus muricatus*	P	
SCINCIDAE			
Copper-tailed Skink	*Ctenotus taeniolatus*	P	
Cunningham's Skink	*Egernia cunninghami*	P	
Three-toed Skink	*Saiphos equalis*	P	S
Eastern Blue-tongued Lizard	*Tiliqua scincoides*	P	S
Blotched Blue-tongued Lizard	*Tiliqua nigrolutea*	P	
ELAPIDAE			
Eastern Tiger Snake	*Notechis scutatus*	P	
Eastern Brown Snake	*Pseudonaja textilis*	P	
Little Whip snake	*Suta flagellum*	P	