

7. Flora and Fauna

This chapter of the EA provides:

- a description of the existing ecological characteristics of the Capital Wind Farm locality
- the potential impacts of the project on the flora and fauna
- the controls to be integrated in the project to mitigate the potential impacts

7.1 Introduction

The potential ecological impacts of the wind farm development relate to the construction activities associated with clearing native vegetation and habitat disturbance and the operational impacts that are predominantly associated with potential for avifauna to strike the rotating turbine blades. The assessment of the potential for these impacts and the significance of any impacts requires the input of relevant specialists.

Accordingly, ecology specialists were engaged to assess the potential impact of the project on the ecosystems of the area and to provide relevant background information to enable informed planning decisions to be made. The specialists were chosen on the basis of their knowledge of the region and advanced standing in their specialty field.

Kevin Mills and Associates was engaged to assess the flora and fauna, excluding bat fauna. A comprehensive field survey was conducted by Kevin Mills during late October and early November, 2004 and relevant databases and literature were also reviewed. A follow-up site visit was undertaken on 6th October, 2005 to review changes in the project layout.

Greg Richards and Associates was engaged to assess bat species. Greg Richards initially undertook a desktop assessment for the site based on his considerable local knowledge of bat species and recent survey work at nearby sites. The desktop assessment included a review of habitat of the site. He has also undertaken on-site monitoring for bat species in February, 2005, when temperatures were suitable for bat species to be active.

In conjunction with inspections of the site, both ecologists have related their findings to relevant databases and the observed ecological features of the site. Each specialist completed an assessment report and these are attached as Appendices F & G. The assessments both included the Kalbilli Group of turbines which has been subsequently deleted from the project. Reference to the Kalbilli Group is still included in Appendices F & G. Mills, 2005 also surveyed Governors Hill, which apart from the southern extent, has now also been deleted from the project.

The findings of the assessment reports are summarised in the following sections.

The assessment by Mills was undertaken in accordance with the NSW *Threatened Species Conservation Act 1995* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and in both cases, Mills concluded that:

"there would not be a significant impact on listed threatened species, populations or communities and that the preparation of a Species Impact Statement (SIS) or referral to the Commonwealth Minister for the Environment were not warranted."

The report of Mills, 2005, contains a set of recommendations that are aimed at avoiding and limiting the impact on the natural environment. These are especially aimed at protecting the remnant woodland and other important habitats found in the project area. The set of recommendations is provided at the end of the Chapter and have been incorporated in a compilation of mitigation measures listed in Chapter 15.

Following the February, 2005 survey of bat species, Richards, 2005 concluded that:

“It appears that for the most of the wind farm there would be minor impacts and issues to address.”

The report of Richards, 2005 contains recommendations to ensure that any potential impacts on bats are mitigated. It is noted that the current project area has lower numbers of bat species than were detected at the Kalbilli site.

7.2 Flora

Large tracts of land throughout the project area were cleared many years ago, particularly on the lowlands of the broad valleys. As a result, most of the woodland remaining in the area is on steep, hilly terrain, and the remnants are separated by vast areas of cleared land grazed by sheep.

A database review and floristic survey was undertaken for the project area and its surrounds during October/November 2004 to identify as many as possible of the native plant species present. The resulting list of species (Appendix 1 of Appendix F) is comprehensive and includes 195 native plant species and 81 introduced species. Floristic diversity in the project area is considered to have been significantly reduced due to extensive grazing. Nearby locations that have been subject to less grazing such as the rail easement passing through the area, retain a greater diversity due to exclusion of grazing.

Seven vegetation communities have been distinguished within the project area, as shown in Table 7.1. These include four types of woodland, secondary grassland, native pasture and exotic grassland.

Table 7.1 - Vegetation Communities of the Project Area

Community	Key Species	Distribution
Yellow Box Woodland	<i>Eucalyptus melliodora</i> <i>Eucalyptus bridgesiana</i>	Valley floors and adjoining lower slopes.
Scribbly Gum – Peppermint Woodland	<i>Eucalyptus rossii</i> <i>Eucalyptus dives</i> <i>Eucalyptus mannifera</i>	On ridges and steep slopes.
Manna Gum Forest Woodland	<i>Eucalyptus viminalis</i> <i>Eucalyptus pauciflora</i>	On deep sand, on the floor of the valleys.
Snow Gum Woodland	<i>Eucalyptus pauciflora</i>	Exposed ridges and slopes, and in some places on the valley floors.
Secondary Grassland	<i>Chrysocephalum apiculatum</i> <i>Themeda australis</i> <i>Leptorhynchos squamatus</i>	Small patches here and there, mainly where the paddocks have not been intensively grazed.
Native Pasture	<i>Stipa scabra</i> <i>Danthonia carphoides</i>	On gentle topography; ie. on the sides of the valleys and on some ridges.
Exotic Grassland	<i>Hordeum* spp</i> <i>Phalaris aquatica</i> <i>Trifolium subterraneum *</i>	* In most of the valleys, where pasture improved and fertilised

The remnant native vegetation in the project area suggests that, prior to large scale clearing, Yellow Box *Eucalyptus melliodora* Woodland covered the floor of the valleys and the adjoining lower slopes, with Scribbly Gum *Eucalyptus rossii* - Peppermint *Eucalyptus dives* Woodland on the steep slopes and ridges. These are still the main communities in the project area.

Other communities are present, but have always had a more restricted distribution, with Snow Gum *Eucalyptus pauciflora* Woodland on exposed slopes and here and there on the valley floors, and Manna Gum *Eucalyptus viminalis* Woodland/Forest on deep sand in the valleys and in sheltered gullies on higher ground. Apple Box *Eucalyptus bridgesiana* occurs in the woodlands along creeks, drainage lines and the gullies. Patches of treeless temperate grassland may have occurred in some of the broad valleys, especially near Bungendore.

Now, however, exotic grassland covers most of the valley floors. Large areas have been pasture improved, ie. sown with introduced grasses and other herbaceous plants, and/or ploughed and fertilised. Most of the cleared ridge crests support exotic grassland and native pasture. Secondary grassland occurs in a few places in the valleys; this was originally the understorey to Yellow Box Woodland. Good quality native grassland is rare in this district.

The vegetation present for each of the wind turbine groups, the substation site and cable and overhead line routes is described in the following sections.

7.2.1 Hammonds Hill Group

The Hammonds Hill Group extends along the top of the Great Dividing Range from Taylors Creek Road in the north and including the peaks of Hammonds Hill and Big Hill.

The area covered by the Group is close to several stands of woodland. Figure 7.1 shows the location of the woodland relative to the Hammonds Hill Group. There is minimal clearing of woodland required for the wind farm development.

Hammonds Hill – Big Hill

Most of the vegetation on the ridge is native pasture or secondary grassland, a relict of the woodland that once occurred on the ridge. The ground is strewn with small granite boulders and outcrops. Short Wallaby Grass *Danthonia carphoides*, Hairy Panic *Panicum effusum*, Wattle Mat-rush *Lomandra filiformis*, Fuzzy New Holland Daisy *Vittadinia cuneata*, Stinking Pennywort *Hydrocotyle laxiflora*, Flatweed *Hypochaeris radiata**, Subterranean Clover *Trifolium subterraneum** and Capeweed *Arctotheca calendula** are common here.

The woodland on the upper slopes of the ridge, especially on the western fall of the main ridge, is dominated by Scribbly Gum *Eucalyptus rossii* and Broad-leaved Peppermint *Eucalyptus dives*, with occasional Hickory Wattle *Acacia implexa*, Broad-leaved Hickory *Acacia falciformis*, Black Wattle *Acacia mearnsii* and Snow Gum *Eucalyptus pauciflora*. Black She-oak *Allocasuarina littoralis* is occasional. Clearing of limited areas of Scribbly Gum is likely to be required.

East of Hammonds Hill Group

There is a stand of modified Yellow Box Woodland and a patch of secondary grassland adjacent to the Tarago to Bungendore Road, and a stand of Scribbly Gum - Peppermint Woodland to the north, in the north-eastern corner of the site; see Figure 7.1. Around the woodland, there are stands of Black Wattle *Acacia mearnsii*. The Yellow Box Woodland contains several large old Yellow Box *Eucalyptus melliodora* trees and secondary grassland with fairly high native species diversity. Due to recent changes to access, the Yellow Box Woodland will be avoided.

The turbine sites are covered by exotic grassland, with patches of native pasture. There are stands of Snow Gum *Eucalyptus pauciflora* Woodland to the west, but these are well away from the turbine sites.

Ecological Constraints – Hammonds Hill Group

Hammonds Hill – Big Hill

The presence of good quality woodland is an ecological constraint. While most turbine sites are on exotic pasture some are near or within woodland. The proposed turbine sites and access have been reviewed in October 2005 with an ecologist and confirmed as suitable.

Tarago to Bungendore Road (East of Hammonds Hill Group)

Preliminary planning considered access off Tarago to Bungendore Road to the Hammonds Hill Group that would have involved passing through Yellow Box Woodland (mainly secondary grassland), an endangered ecological community. Were that to have been used, the access route would have been fenced for the first 300 metres from the road. The current project design does not include this access route.

7.2.2 Ellenden Group

The Ellenden Group is located in the vicinity of Governors Hill and Red Hill and within 0.5 to 2 kilometres of Lake George.

Figure 7.1 shows the location of the woodland present within the project area.

Governors Hill – Red Hill

This area is virtually treeless and the Red Hill area is dominated by exotic pasture species.

There are stands of woodland on the slopes of Governors Hill ridge; see Figure 7.1. This woodland is dominated by Scribbly Gum *Eucalyptus rossii* and Broad-leaved Peppermint *Eucalyptus dives*, and contains occasional Hickory Acacia *implexa*. Patches of native plants grow among the rocks in the understorey and on the treeless ridge crest, species such as Silvertop Wallaby Grass *Chionochloa pallida*, Spiny-headed Mat-rush *Lomandra longifolia*, Mulga Fern *Cheilanthes sieberi*, Stinking Pennywort *Hydrocotyle laxiflora*, Poverty Raspwort *Gonocarpus tetragynus* and Prickly Starwort *Stellaria pungens*.

Ecological Constraints – Ellenden Group

The large granite outcrops in this area are mostly on the top of Governors Hill and have a very high habitat value for reptiles. This is the main area of fauna habitat on this part of the site; in the surrounding area, there is little to attract native fauna. The proposed layout avoids most of the areas of rock habitat. In the case of any of this material being disturbed, it can be relocated to nearby sites where the habitat potential can be retained.

7.2.3 Gores Hill Group

The turbine sites for the Gores Hill Group are on exposed ridges used for grazing. Most of the paddocks have been pasture improved. There are no stands of native trees, other than a few Snow Gums *Eucalyptus pauciflora* and a Broad-leaved Peppermint *Eucalyptus dives* growing on the low knoll at the eastern end of the Limon property. Rows of pines and some native trees have been planted in a few places.

Patches of native pasture occur here and there, but native plants are generally scarce or altogether absent. The species observed in the paddocks include Barley Grass *Hordeum** sp., Subterranean Clover *Trifolium subterraneum**, Capeweed *Arctotheca calendula**, Sheep Sorell *Acetosella vulgaris** and Scotch Thistle *Onopordum acanthium**. The native grassland species in some places on the western parts of the properties include Common Everlasting *Chryscephalum apiculatum*,

Short Wallaby Grass *Danthonia carphoides*, Tall Speargrass *Stipa bigeniculata* and Swamp Dock *Rumex brownii*.

Ecological Constraints - Grose Hill Group

No ecological constraints were identified. There is no vegetation or habitat of particular conservation value on or near the turbine sites.

7.2.4 Vegetation of the Substation Site

The proposed substation site is located near the existing 330,000 volt transmission line, in a valley about 1.3 km south-east of Big Hill (Osborne Trig Station). The site supports treeless grassland, a mixture of exotic grassland and native pasture grazed low to the ground. Most of the natives in the grassland are species that commonly occur in grazing pastures. The site was probably originally covered by woodland. The access to the substation passes through woodland which will be fenced off for the life of the project to prevent degradation by grazing stock.

Ecological Constraints

No ecological constraints were identified for the substation site; the conservation value of the grassland is low. As mentioned above, access will be limited to the existing track through the woodland. A few trees may need to be cleared to upgrade the access track, but the clearing will be limited to pruning where feasible and strictly controlled.

7.2.5 Vegetation of the Cable Routes

There are numerous cables within the turbine groups to interconnect the turbines. In addition underground cables and a single overhead line are used to connect the turbine groups to the substation. In most cases, these routes are across grazing paddocks and where feasible will be located alongside the access roads to the turbines. To ensure that no inadvertent environmental impact occurs, the ecologist inspected the site in October 2005 as part of confirming the route selection process.

7.2.6 Vegetation of the access routes

The routes of access tracks have been selected to avoid vegetation of high conservation status and to minimise clearing of remnant woodland.

Ecological constraints – access tracks

The access along the ridge from Hammonds Hill to Big Hill requires clearing of a small section of woodland. The access through this woodland will be chosen to ensure that clearing is minimised. The route through this woodland has been reviewed by an ecologist.

The access to the substation site passes through woodland of high conservation status and it has been agreed with the landowner that this land be fenced off for the duration of the project.

7.3 Fauna

Fauna surveys (excluding bats) were undertaken by Kevin Mills and Associates over six days in late October/early November, 2004 when animals are active and most of the migratory species have arrived. The survey methods are described in Appendix F and summarised below.

Bat fauna were assessed separately by Greg Richards and Associates with a desktop fauna assessment undertaken in late 2004 and a survey of bat species present at the site in February, 2005. The survey provided a comprehensive record of bats, Richards, 2005.

7.3.1. Summary of Fauna Survey Methods

The fauna surveys concentrated on the vertebrate fauna; ie. mammals, birds, frogs and reptiles.

Mammals were identified by sight, as well as by interpreting any distinctive calls and other conclusive evidence of their presence. The survey techniques included incidental sightings, a ground search for scats, tracks, diggings and other signs of mammal presence and a spotlight was used to detect nocturnal fauna, particularly arboreal mammals.

Birds were identified by sight and by interpreting calls. Observations were made throughout the whole study period, and all habitat types were investigated. Reptile searches were conducted at the turbine sites, particularly in rocky locations. Amphibians were usually identified by interpreting their characteristic calls. Moist areas and habitat niches were also searched, especially under rocks, wood and debris.

Potential for Bats was assessed by a review of available habitat and bat activity was assessed by monitoring of echolocation calls.

A literature review was also undertaken, in an attempt to locate all relevant information on the fauna of the area. This included published environmental studies and the NSW Wildlife Atlas maintained by the Department of Environment and Conservation (DEC).

Targeted surveys and investigations were undertaken for the groups of animals listed above and included the following methods.

- Woodland Bird Surveys (surveys in woodland and on ridges)
- Birds of Prey (sightings recorded are shown on 7.1)
- Waterfowl (records kept of observed waterfowl in the project area)
- Other Flock Birds (records kept, particularly for high flying species)
- Threatened Species (searches undertaken and habitat assessed)

7.3.2 Fauna Species

The vertebrate fauna species recorded during the surveys have been listed in Appendices F and G. This section provides a summary of findings of the assessments.

7.3.3 Fauna Habitat

The habitats within the project area are typical of the grazing country on the Southern Tablelands of New South Wales. Most of the woodland that once occurred on the lowlands has been cleared, so the lowlands now support grasslands; these range from exotic grassland to native pasture and, in some places, secondary grassland. There are remnant stands of trees and isolated old trees, but few large stands of lowland woodland.

Most of the woodland in the project area is on the steep, hilly land to the east of the project area and within the project area on the western slopes of the Hammonds Hill/Bill Hill ridge line. The woodland on the ridges is quite different from the woodland of the lowlands.

Due to the general lack of woodland habitats in the project area, the design and implementation of the project has minimised impact on such areas. Where these areas may be impacted an appropriately qualified ecologist has reviewed the sites and routes to ensure that the woodland habitat is not significantly impacted.

The riparian habitats and farm dams in the project area, which are mostly on the valley floors, provide small areas of wetland habitat. Wetlands are not a major habitat type in the project area, although Lake George, when full of water, is a major regional wetland. Lake George is also a wetland of national significance. Erosion and sediment control measures will be incorporated to avoid impact on the wetland habitat.

Some of the wind farm sites contain rock outcrops. The larger rocky areas provide good quality habitat for reptiles but are mostly avoided by the project. It is intended that any disturbed rock habitat be relocated nearby in a manner to recreate the reptile habitat.

7.3.4 Survey Results; Targeted Surveys

The fauna survey program included targeted surveys of several sites and fauna groups, mainly birds that may be particularly prone to turbine blade-strike. The results of these surveys have been provided below.

Woodland Bird Surveys at Selected Turbine Sites

Table 7.2 summarises the results of the bird surveys in the vicinity of the project area. Seventy-nine (79%) percent of the birds observed were active less than 10 metres from ground level and 90% were seen below 20 metres. Only 10 percent were above 20 metres and few were observed over 50 metres above the ground. This suggests that about 10% of birds use the air space around the turbine blades; at their lowest point, the blades are 35 metres above the ground.

Table 7.2 - Summary of Bird Surveys for the Locality

Locality Survey Group	Number of Birds Observed					
	<5m	5-10m	10-20m	20-50m	>50m	
All Sites	90 (42%)	80 (37%)	25 (11%)	15 (7%)	6 (3%)	216 (100%)

Most of the 10% of the birds recorded above 20 metres were the Australian Raven, Sulphur-crested Cockatoo, Australian Magpie and birds of prey (see below).

Woodland Bird Surveys in Good Quality Yellow Box Woodland

Two sites to the east of the Hammonds Hill Group near the Tarago to Bungendore Road were surveyed to identify the bird species occurring in what is probably the best quality woodland in the project area. The survey results suggest that intact lowland woodland, i.e. the habitat to the south-east of the Hammonds Hill Group of turbines, supports a diverse range of birds and is of high conservation value.

Broad Scale Surveys of Birds of Prey

During the survey, five species of diurnal birds of prey were observed in the project area (Figure 7.1). Another three species have previously been recorded in the project area. The species recorded have been listed in Table 7.3.

No real patterns of occurrence can be identified, although the Wedge-tailed Eagle was observed only around the high ridges, such as Governors Hill. Large stick nests were found in several treed locations. Breeding by the above species was not confirmed, although it may occur in the local area.

Table 7.3 – Sightings of Birds of Prey

Common Name	Taxonomic Name
Brown Falcon	<i>Falco berigora</i>
Brown Goshawk	<i>Accipiter fasciatus</i>
Collared Sparrowhawk	<i>Accipiter cirrhocephalus</i>
Little Eagle	<i>Hieraetus morphnoides</i>
Nankeen Kestrel	<i>Falco cenchroides</i>
Peregrine Falcon	<i>Falco peregrinus</i>
Wedge-tailed Eagle	<i>Aquila audax</i>
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>

Surveys of Local Wetlands for Waterfowl

Except for the large dam on the Woodlawn Mine site, the wetlands in the project area are small. Lake George is nearby, to the west, but is seldom filled with water. Observations of waterfowl in the project area were largely restricted to small numbers of common and widespread ducks on farm dams, such as the Pacific Black Duck, Grey Teal and Australian Wood Duck. The largest number of waterfowl observed was a flock of 24 Australian Shelducks on a medium sized farm dam, to the west of Governors Hill.

It has been suggested that there are waterfowl flight paths between Lake George and Lake Bathurst. This would be the case only when both lakes hold water, which is a rare event. The EIS for the Woodlawn Mine (URS 2004) contained a map showing supposed waterfowl flight paths between the above lakes along the valleys to the north of the project area. There is also potential for some waterfowls to follow a path along Taylors Creek between the Groses Hill Group and the Hammonds Hill and Ellenden Groups of turbines. The spacing between those Groups is sufficient to allow for an unaffected flightpath.

Other Birds that Flock

Yellow-tailed Black-Cockatoos, Sulphur-crested Cockatoos, Australian Ravens and Little Ravens were also seen in flocks. The occurrence of the flocks was random, except that the Yellow-tailed Black-Cockatoos were mainly seen in and around pine plantations.

At certain times of year, large flocks of migrating honeyeaters move northwards (autumn) and southwards (spring), and White-throated Needletails visit the region in summer. Honeyeaters move through the tree canopy or just above the trees, although night-time movements are little known. Needletails fly above the tree canopy, often well above the canopy.

Bats

A survey of Bats potentially present in the project area was undertaken in February, 2005 using echolocation monitoring devices. Table 7.4 summarises the species potentially present and their conservation status. Those that were detected in the project area during the February 2005 survey are also indicated in Table 7.4.

Table 7.4 - List of Bat Species Potentially Present and Recorded in the Study Area.

Common name	Scientific name	Listed in EPBC Act	Listed in TSC Act	Present in area *
Flying foxes (Pteropodidae)				
Grey-headed Flying Fox	<i>Pteropus poliocephalus</i>	•	•	No
Little Red Flying Fox	<i>Pteropus scapulatus</i>			No
Sheathtail Bats (Emballonuridae)				
Yellow-bellied Sheathtail Bat	<i>Saccopteryx flaviventris</i>		•	1 No
Horseshoe bats (Rhinolophidae)				
Eastern Horseshoe Bat	<i>Rhinolophus megaphyllus</i>			No
Ordinary bats (Vespertilionidae)				
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	•	•	No
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>			Yes
Chocolate Wattled Bat	<i>Chalinolobus morio</i>			Yes
Eastern Bentwing Bat	<i>Miniopterus schreibersii</i>		•	No
Lesser Longeared Bat	<i>Nyctophilus geoffroyi</i>			Yes
Gould's Longeared Bat	<i>Nyctophilus gouldi</i>			Yes
Greater Longeared Bat (SE form)	<i>Nyctophilus timoriensis</i>	•	•	No
Eastern Broadnosed Bat	<i>Scotorepens orion</i>			No
Large Forest Bat	<i>Vespadelus darlingtoni</i>			Yes
Southern Forest Bat	<i>Vespadelus regulus</i>			Yes
Little Forest Bat	<i>Vespadelus vulturinus</i>			Yes
Freetail bats (Molossidae)				
White-striped Freetail Bat	<i>Tadarida australis</i>			Yes
Eastern Freetail Bat	<i>Mormopterus sp.2</i>			Yes

Note: * denotes species was recorded within project area during February, 2005 survey

Reptile Searches

Searches for reptiles were undertaken mainly in rocky terrain on the turbine sites. Roadkills were also inspected, to identify species that otherwise may not have been found. The results of the reptile surveys have been presented below, in Table 7.5. Species previously recorded in the project area have been included in the list in Appendix 3.

Table 7.5 - Results of Reptile Surveys

Species Common Name	Taxonomic Name	Method of recording
Blotched Blue-tongued Lizard	<i>Tiliqua nigrolutea</i>	Observed; roadkill
Copper-tailed Skink	<i>Ctenotus taeniatus</i>	Observed
Eastern Blue-tongued Lizard	<i>Tiliqua scincoides</i>	Observed
Eastern Brown Snake	<i>Pseudonaja textilis</i>	Observed; roadkill.
Jacky Lizard	<i>Amphibolurus muricatus</i>	Observed.
Long-necked Tortoise	<i>Chelodina longicollis</i>	Observed; roadkill.
Three-toed Skink	<i>Hemiergis decresiensis</i>	Observed.

7.4 Assessment of Conservation Values

The species recorded at the site or potentially present have been reviewed by Mills (Appendix F) and Richards, (Appendix G) against various conservation listings under the Threatened Species Conservation Act, 1995 (TSC Act) and the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The following sections review the relevance of the listings of threatened flora and fauna, endangered populations and communities and migratory species for the proposed development.

7.4.1 Threatened Flora

Threatened plant species are listed on schedules under the New South Wales *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Under the TSC Act, they are classified either as “endangered” (Schedule 1, Part 1), “vulnerable” (Schedule 2) or “presumed extinct” (Schedule 1, Part 4). Under the EPBC Act, they are classified as “extinct”, “critically endangered”, “endangered” or “vulnerable”.

Based on information obtained from the NSW Wildlife Atlas and correspondence from the DEC, a list of threatened plant species with potential to occur in the project area was prepared and is provided in Table 7.6.

Table 7.6 - List of Threatened Plant Species for the Project Area

Species	Growth Habit	Habitat	TSC Act	EPBC Act
<i>Diurus aequalis</i> Buttercup Double-tail	Ground orchid	Woodland/forest, grass understorey	E	V
<i>Dodonaea procumbens</i> Creeping Hop Bush	Prostrate Shrub	Woodland sandy soils	V	V
<i>Swainsona sericea</i> Silky Swainson-pea	Small herb	Native grassland	V	

+ V = vulnerable, E = endangered, - = not listed.

No threatened plant species were found in the project area. None are likely to occur on cleared sites and in areas that have been heavily grazed and/or pasture improved, but the occurrence of threatened species in stands of good quality woodland or native grassland cannot be ruled out on the basis of a single survey.

7.4.2 Threatened Fauna

Threatened fauna species are listed under the TSC Act and EPBC Act. Information on the occurrence of threatened fauna species in the local area was obtained from the NSW Wildlife Atlas, previous environmental studies in the area, the DEC's correspondence and reference to *A Planning Framework for Natural Ecosystems of the Act and NSW Southern Tablelands* (Falding 2002).

Based on these sources of information, a list of the threatened fauna species was prepared for the project area; see Table 7.7. The potential for these species to occur in the project area has also been assessed below, in the table. Species recorded in the project area or likely to occur there have been discussed below the table. The list does not include the threatened wetland species that occasionally occur on Lake George and Lake Bathurst when they are holding water as none of the project works will impact those areas.

Table 7. 7 – List of Threatened Fauna Species for the Project Area or Nearby

Species	TSC Act	EPBC Act	Potential to occur in the Project Area (Low, Medium, High, Recorded)
Mammals (See Mills, 2005)			
Koala <i>Phascolarctos cinereus</i>	V	-	Recorded , the Wildlife Atlas contains records from near the project area. Manna Gum food source to be avoided.
Bats (See Richards, 2005)			
Grey-headed Flying Fox <i>Pteropus poliocephalus</i>	V	V	Low – Infrequently expected in the project area due to low availability of food sources & distance to nearest roost sites. Not recorded during February 2005 field survey.
Yellow-bellied sheathtail <i>Saccopteryx flaviventris</i>	V	-	Low – Low potential in project area due to no habitat of sufficient size. Not recorded in the project area during survey in February 2005.
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	V	Low – The nearest record to the project area is from Bungonia Gorge some 60 km distant. Also is associated with large tracts of sclerophyll forest and unlikely to be present at the site. None recorded.
Eastern Bentwing Bat <i>Miniopterus schreibersii</i>	V	-	Mod to High – The species requires subterranean roosts. Abandoned mines to the south east of the project area are a known stopover for the species in February/March. Recorded about 6 km to the south east of the project area in February 2005. None recorded on-site.
Greater Longeared Bat <i>Nyctophilus timoriensis</i>	V	V	Low – The species appears to require woodland with understorey elements which are not present in the project area (possibly due to grazing). It is considered to be a semi-arid species and the nearest records are more than 100 kilometres away.
Birds (See Mills, 2005)			
Brown Tree creeper <i>Climacteris picumnus</i>	V	-	Medium . The woodlands in the project area provide potential habitat, although there are no local records; the species has become very rare in this region.
Diamond Firetail <i>Stagonopleura guttata</i>	V	-	High . Diamond Firetails probably occur in the area; there are records from Bungendore.
Freckled Duck <i>Stictonetta naevosa</i>	V	-	Recorded . Occasionally recorded on Lake George and Lake Bathurst
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	V	-	Recorded . Evidence of the species was found on Kalbilli site, and the species was recently recorded on the Woodlawn Mine land.
Hooded Robin <i>Melanodryas cucullata</i>	V	-	High . Hooded Robins probably occur in the woodlands of the project area, although there have been no local sightings.

Species	TSC Act	EPBC Act	Potential to occur in the Project Area (Low, Medium, High, Recorded)
Magpie Goose <i>Anseranas semipalmata</i>	V	-	Low. There is a record from Lake Bathurst, but Magpie Geese are very rare in this area.
Regent Honeyeater <i>Xanthomyza phrygia</i>	E	E	Medium. Regent Honeyeaters could occur in the project area when the eucalypts are flowering, particularly the Yellow Box trees. They are rare in this region.
Speckled Warbler <i>Chthonicola sagittata</i>	V	-	High. Speckled Warblers probably occur in the woodlands of the project area, although there have apparently been no local records.
Reptiles (See Mills, 2005)			
Little Whip Snake <i>Suta flagellum</i>	V	-	Recorded. The Wildlife Atlas contains records from the project area and areas nearby.
Striped Legless Lizard <i>Delmar impar</i>	V	V	Low. There is no natural temperate grassland for this species on the development sites.
Pink-tailed Worm-lizard <i>Aprasia parapulchella</i>	V	V	Moderate. Suitable habitat appears to be present, but there are no records from the local area.
Grassland Earless Dragon <i>Tympanocryptus lineata pinguicolla</i>	E	E	Low. There is no natural temperate grassland for this species on the development sites.
Amphibians (See Mills, 2005)			
Green and Golden Bell Frog <i>Litoria aurea</i>	E	V	Recorded. The Wildlife Atlas contains a record dated 1985. The species has virtually disappeared from this region since the 1980s.
Invertebrates (See Mills, 2005)			
Golden Sun Moth <i>Synemon plana</i>	E	CE	Low. There is no natural temperate grassland on the development sites.

+ V = vulnerable, E = endangered, CE = critically endangered, - = not listed.

Species Recorded in or near the Project Area or expected to be present

The following provides summary details of species that have been recorded in or near the project area or that may be expected to be present. Additional details are provided in Appendices F & G.

Koala - *Phascolarctos cinereus*

The Wildlife Atlas contains records from nearby sites between Tarago and Woodlawn Mine. The Koala inhabits eucalypt forest and woodland, preferring stands occurring on higher nutrient soils that contain preferred food tree species. Koalas now live in marginal habitat because so much prime habitat has been cleared. There are stands of Manna Gum *Eucalyptus viminalis* in the vicinity of the project area, as well as other known Koala food trees. Clearing of these species can be avoided by the project.

Bats

None of the threatened bat species potentially present in the project area were recorded during the February 2005 survey.

Glossy Black-Cockatoo - *Calyptorhynchus lathami*

Glossy Black-Cockatoos have been recorded on the Woodlawn Mine site (URS 2004) and evidence in the form of chewed cones was found about seven kilometres to the east of the project area, where there are large stands of Black She-oak *Allocasuarina littoralis*. The Glossy Black-Cockatoo would be unlikely to fly far above the tree canopy.

Glossy Black-Cockatoos live in mature eucalypt forest and woodland containing stands of mature casuarinas, which are their primary source of food. The species prefers mature forest, because only mature forest contains tall old eucalypts with hollows for nesting and casuarina fruit in sufficient quantities to sustain whole populations of Cockatoos. Glossy Black-Cockatoos feed almost exclusively on the seeds of casuarina trees, particularly Black She-oak *Allocasuarina littoralis*.

Little Whip Snake - *Suta flagellum*

The Wildlife Atlas contains records from sites to the east of Bungendore and from near Mount Fairy. The Little Whip Snake inhabits "grassland and woodland on well drained hillsides" (NPWS 1999) where they are usually found under rocks and logs.

Brown Treecreeper - *Climacteris picumnus*

This species occurs in woodland and forest, particularly where there is abundant dead timber on the ground. The species is mainly a ground dweller and unlikely to be active above the tree canopy. The woodlands in the project area provide potential habitat for the species but there are apparently no local records; it has become very rare in this area.

Diamond Firetail - *Stagonopleura guttata*

The Diamond Firetail inhabits "eucalypt woodland, forest and mallee where there is a grassy understorey" (NSW Scientific Committee 2001).

There are records from Bungendore and other sites in the region; in some places, it is relatively common. While the species has not been recorded in the project area, the Diamond Firetails probably occurs there. This species is a ground bird and would not be likely to be active above the tree canopy.

Hooded Robin - *Melanodryas cucullata*

Species occupies "a wide range of Eucalypt woodlands, Acacia shrublands and open forests. In temperate woodlands, the species favours open areas adjoining large woodland blocks, with areas of dead timber and sparse shrub cover".

There are apparently no local records from the local area, although the species has been recorded, south of Queanbeyan. There have been no sightings in the project area, but the species is expected to occur in lowland woodlands. This species is a ground bird and would not be likely to be active above the tree canopy.

Regent Honeyeater - *Xanthomyza phrygia*

The Regent Honeyeater is highly nomadic. It mainly occurs in "temperate eucalypt woodland and open forest, including forest edges, wooded farmland and urban areas with mature trees" (Garnett 1992). According to Webster and Menkhorst (1992), its favoured trees are Red Ironbark *Eucalyptus*

sideroxylon, White Box *Eucalyptus albens* and Yellow Box *Eucalyptus melliodora*, and the birds prefer areas with large trees, many flowering trees and a tall shrub layer.

There are records of the Regent Honeyeater from the region although there are apparently no local records. This honeyeater could turn up in any patch of trees in the project area. The stands of Yellow Box *Eucalyptus melliodora* when they are flowering are the most likely location. This species forages in the tree canopy; it would not be likely to be active well above the tree canopy.

Speckled Warbler - Chthonicola sagittata

Speckled Warblers inhabit woodlands with a grassy understorey, often on ridges or gullies. The species is sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches" (NSW Scientific Committee 2001).

This species is relatively common in the region although there are apparently no local records. Speckled Warblers probably occur in woodlands in the project area, even though there have apparently been no local records. This species is a ground bird and would not be likely to be active above the tree canopy.

7.4.3 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).

Many common Australian bird species have been listed as internationally protected migratory species under the EPBC Act, including all waders, ducks and diurnal birds of prey. Many bird species recorded in and/or adjacent to the project area are internationally protected migratory species, including the Australian Wood Duck, Pacific Black Duck, Australian Shelduck, Nankeen Kestrel, Brown Falcon and Wedge-tailed Eagle.

7.4.4 Endangered Populations

Endangered populations are listed under the TSC Act (Schedule 1, Part 2). No endangered populations have been declared in or near the project area.

7.4.5 Endangered Ecological Communities

Endangered ecological communities are listed under the TSC Act (Schedule 1, Part 3) and the EPBC Act. Yellow Box Woodland is the only such community in the project area.

Natural Temperate Grassland, the nationally threatened community, was not found in any of the proposed development areas.

Yellow Box Woodland

This woodland is a part of the White Box - Yellow Box - Blakely's Red Gum Woodland complex that has been listed as an endangered ecological community under the TSC Act. This community has also been listed under the EPBC Act, as part of the Grassy White Box Woodlands complex.

Appendix F provides a copy of the NSW Scientific Committee's Final Determination to list White Box - Yellow Box – Blakely's Red Gum Woodland as an endangered ecological community; the Final Determination defines the community under the Act. Some sites that are treeless or almost treeless still form part of this endangered community, a point made clear in Clause 4 of the Final Determination. Where trees are absent and only the understorey remains, the community is called "secondary grassland".

Clearing, grazing and pasture improvement have lead to the demise of Yellow Box Woodland which once occurred extensively on the valley floors and lower slopes in this district. Most of it has disappeared from the project area, but there are some good examples of the woodland in some places and many areas of secondary grassland.

The primary study areas were investigated for examples of the Yellow Box Woodland community, and an assessment was made of the condition of the remnants; these have been briefly discussed below.

Yellow Box Woodland near Tarago to Bungendore Road

This woodland near the substation entrance from the Tarago to Bungendore Road is in very good condition; it contains many old trees, sapling growth, a good native grassland understorey and few weeds. Figure 7.1 shows the location of this woodland. Most of the stand is dominated by Yellow Box *Eucalyptus melliodora* and Snow Gum *Eucalyptus pauciflora* and Manna Gum *Eucalyptus viminalis* are common in some places. Apple Box *Eucalyptus bridgesiana* occurs here and there, usually near drainage lines. This woodland remnant will not be adversely impacted and Renewable Power Ventures has reached agreement with the landowner for this area to be fenced off for the duration of the project to avoid grazing impact on the community.

Secondary Grassland, North-eastern corner of the Osborne Property

This area supports secondary grassland and scattered Yellow Box and other native trees. The grassland is quite rich in native species. This is a reasonably good example of secondary grassland which is part of the endangered ecological community. The location of this area is shown on Figure 7.1. The preliminary design considered an access route to the Hammonds Hill Group through this area but that route has now be omitted from the project design and an alternative route identified that does not affect areas of ecological sensitivity.

Natural Temperate Grassland

Natural Temperate Grassland on the Southern Tablelands of NSW and the Australian Capital Territory is listed as an endangered ecological community under the EPBC Act, but not the TSC Act.

No Natural Temperate Grassland was found in the project area; although the community may have once occurred on the lower valley floors, mainly in the southern part of the project area towards Bungendore and Lake George. The grassland in these areas today does not satisfy the definition of native grassland, at least not on the proposed development sites surveyed.

Other Plant Communities of Concern

The Department of Environment and Conservation (DEC) suggested that Snow Gum *Eucalyptus pauciflora* - Peppermint *Eucalyptus dives* - Ribbon Gum *Eucalyptus viminalis* Woodland may occur in the area. The DEC noted that this is a "regionally declining vegetation community" that is being considered for inclusion in the *Threatened Species Conservation Act 1995* as an endangered ecological community. As at December 2004, the community had not received a Preliminary Determination from the NSW Scientific Community.

Stands of *Eucalyptus pauciflora*, with *Eucalyptus dives* and/or *Eucalyptus viminalis*, occur in the south-eastern part of the Hammonds Hill site, amongst the Yellow Box Woodland mapped on Figure 7.1. As this area will be fenced off during the life of the project it will be protected from the impact of grazing and not affected by the project development.

7.5 Impact of the Proposal on Flora and Fauna

7.5.1 Summary of potential impact on Native Vegetation and Fauna Habitat

Many of the proposed turbine sites, the substation site and the majority of the proposed cable routes are on cleared land with a long history of grazing. However, some of the turbine sites are in or near woodland, and this places constraints on developments in some areas.

Limited clearing could be required to install some of the turbines, and to link them together with cables and access roads. The impact on the woodland of the proposed layout was reviewed by ecologist, Kevin Mills in October, 2005 and found to be suitable.

The ecological impact of the wind farm for each turbine group has been summarised below, in Table 7.8; the impact assessment is based on the assumption that the recommendations contained in Appendix F are adopted; see Section 7.6.

Table 7.8 - Summary of Impact on Fauna Habitat

Turbine Group	Groups	Woodland to be cleared	Disturbance to Major Rock Outcrops	Potential ³ for Significant Impact
Ellenden	Governors Hill ¹ - Red Hill	No	Yes ¹	Yes
Hammonds Hill	Hammonds Hill - Big Hill	Yes	No	Yes ²
Hammonds Hill	Near Tarago Road	No	No	No
Groses Hill	All sites	No	No	No
NA	Substation Site	No	No	No
Various	Cable Routes	No	No	No

Notes:

1. Governors Hill that included extensive rock outcrop has now been excluded from project.
2. More information required re possible lopping of woodland near turbines.
3. Potential for Significant Impact is assessed without consideration of mitigation measures.

7.5.2 Impact of Blade-Strike on Birds

Investigations of wind farms in Australia and overseas have identified various bird species and groups of birds as potential "at risk" from turbine blade-strike. The birds potentially at most risk from blade-strike are:

- wetland birds that form large flocks
- birds of prey
- species that flock and fly above the tree canopy.

All of these groups are represented in the vicinity of the project area. An overview of these groups was provided in Section 7.3.4.

The incidence of turbine blade-strike on birds and bats is often cited as a potential impact of wind farms. Until recently most of the available literature relating to this issue has been based on overseas studies. However, the principles and findings of those can be applicable to Australian conditions, although the Australian data has not been assembled to validate this.

The overseas studies have found that the magnitude of the impact on birds is strongly influenced by the physical characteristics of the site, particularly the type of habitat on the site and in the surrounding area (Appendix F).

The greatest impact seems to occur near large wetlands and at sites on important migration routes, locations where large flocks of birds are regularly present. One such location was in California, where birds of prey were affected in a mountain pass where they congregated. An early study also found that an impact on birds of prey was at least partly due to the lattice framework construction of the towers, which provided perching sites for the birds. Modern towers, however, are enclosed and have no perching sites. It should also be appreciated that wind farms in America, with up to 5,000 turbines, are much larger than those currently being considered in Australia.

So far, the Australian data suggest that wind farms have little impact on native birds. No dead or injured birds were found during surveys at selected turbine sites at the Crookwell Wind Farm (PPI Environmental Services 1999); nor did bat population studies before and after installation of the wind farm indicate that any bats had been killed by blade-strike (Richards 1999). No carcasses were found below the turbines during a monitoring study between August 1998 and January 1999. A study at the Woolnorth Wind Farm in Tasmania found that 20 birds were killed by collision with turbines during the first 14 months of operation (Appendix F). Auswind (2002) cited several studies that found mortality from wind farms in Australia to be very low.

The following points are worth considering:

- The location of the wind turbines in relation to key habitat areas for birds in the "at risk" groups.
- Wind turbines are likely to have a greater impact on flocking birds if they are near large wetlands or in locations where migrating birds are concentrated, eg. in gaps through mountain ranges.
- Threatened bird species are affected only occasionally, eg. when the turbines are near wetlands or raptor breeding areas.
- Some studies suggest that birds soon adapt to the presence of the wind turbines and actively avoid flying into them.
- Significantly fewer birds are likely to be killed by blade-strike than by collision with motor vehicles on the roads surrounding the wind farm. Studies overseas have found that power lines are responsible for killing far more birds than wind farms.

In summary, the impact of wind turbines on birds has been found to be low in Australia.

Wedge-tailed eagles, Brown Falcons and Brown Goshawk have been observed within the project area. Governors Hill provides an attractive feature for such raptors. It does not form part of the development, except for the extreme southern end of the feature (one wind turbine).

Wetland birds are known to flock between Lake Bathurst and Lake George, but are indicated to follow routes using the valleys rather than over the ridgetops, where the turbines will be located. The main route appears to be to the north of the wind farm, but it is possible that some will follow Taylors Creek (See Appendix F3).

Toward the completion of this assessment, the Australian Wind Energy Association (Auswind) released its "Wind Farms and Birds - Interim Standards for Risk Assessment". While this has been produced following the site assessment, it provides guidance on available methodologies for any studies that may be required following commissioning of the wind farm.

7.5.3 Impact of Blade Strike on Bats

There is limited knowledge about the extent of collision by Australian bats with wind turbines, however the preliminary information indicates that impact levels are low. Carcass surveys for the Crookwell and Blayney wind farms did not identify any incidences of blade strike for bats. Bat species population studies (Richards, 1998/99) undertaken before and after the installation of the Crookwell Wind Farm did not identify any adverse impact on bat populations in the vicinity of the wind farm.

Victorian studies have only show low levels of incidence. Monitoring surveys conducted between 2000 and 2003 at the Codrington Wind Farm (14 turbines) recorded only two individuals killed by collision and at the Toora Wind Farm (12 turbines), six White-striped Freetail Bats and one Chocolate Wattled Bat were killed. This equates to 0.04 and 0.14 bat deaths per turbine per year at Codrington and Toora respectively.

Monitoring of bat species activity at the site using echolocation monitoring indicated low levels of bat activity. This was considered to be consistent with the generally cleared landscape and the exposed and often windy nature of the turbine sites.

As no threatened bat species were recorded in the project area, the impact on them would be considered to be low.

7.5.4 Threatened Species Conservation Act

The *Threatened Species Conservation Act 1995* requires that the specific matters be taken into account when considering whether a proposal is likely to have a significant effect on threatened species, populations or ecological communities, and whether a Species Impact Statement (SIS) is required. This process, commonly referred to as the "eight part test", has been applied to relevant species for the proposed wind farm. The results are outlined in Appendices F and summarised in (a) to (h) below. An eight part test was not done for bats as no threatened bat species were detected at the site.

- (a) *in the case of threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction*

Mills, 2005 concluded that there are unlikely to be any threatened plants on the turbine sites or other locations where developments are being placed.

Threatened fauna do occur in the project area, most notably woodland birds, the Koala, Little Whip Snake, Glossy Black-Cockatoo. Assuming the location of the turbines avoids a requirement for significant clearing of woodland and that rocky habitats are avoided or re-created after construction, there is unlikely to be disruption to any of these species such that a local population would be placed at risk of extinction. Measures to protect key habitats, such as woodland, Koala food trees and stands of Black She-oak and ensure that the impact on threatened species is negligible will be incorporated in the project.

- (b) *in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised*

There are no endangered populations in the project area.

- (c) *in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed*

Yellow Box Woodland

The stands of Yellow Box woodland and secondary grassland that was once an understorey to this woodland can be avoided. The wind farm will not modify or remove a significant area of habitat for the Yellow Box community.

Threatened Plants

It is unlikely that there are any threatened plant species in the project area as the development is mostly in cleared areas that have been heavily grazed and/or pasture improved.

Threatened Animals

The important habitats for the group of threatened species that are known or most likely to occur in the project area are woodland, native grassland, rocky outcrops and stands of Black She-oak. These habitats will be avoided by the developments associated with the wind farm, through careful siting of facilities and the involvement of an ecologist during detailed siting and route selection. Provided the wind farm is developed in accordance with the ecologist's recommendations (Appendix F and G), it is not likely to modify or remove a significant area of known habitat for threatened animal species.

- (d) *whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community*

Yellow Box Woodland

The stands of this woodland and the associated native grassland are already highly fragmented. The proposed wind farm avoids these areas and will not result in any further isolation or fragmentation of this vegetation.

Threatened Plants

No threatened plants are known to occur in the project area. Those habitats most likely to support such species, particularly good quality woodland and native grassland, will not be affected by the wind farm.

Threatened Animals

The wind farm project does have the potential to fragment and further isolate some habitats utilised by threatened fauna, such as woodland and stands of Black She-oak. However, such habitats can readily be avoided by the development. An ecologist reviewed the detailed design by site inspection in October 2005.

- (e) *whether critical habitat will be affected*

There is no critical habitat declared within the project area.

- (f) *whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or similar protected areas) in the region*

Yellow Box Woodland

The Yellow Box - Blakely's Red Gum community is not adequately reserved in the region; very little is within conservation reserves. Renewable Power Ventures has reached

agreement with a landowner for an area to be fenced off near the entrance to the substation to assist conservation of an identified remnant.

Threatened Plants

Not relevant; no threatened plants are known from the project area.

Threatened Animals

None of the threatened animals mentioned in this report is adequately represented within conservation reserves in the region.

- (g) *whether the development or activity is of a class of development or activity that is recognised as a threatening process*

A “threatening process” is “a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities”. To date, the NSW Scientific Committee has listed 22 “key threatening processes” under Schedule 3 of the Act, the main threats to the biota of New South Wales, and is a reasonable list of threatening processes for consideration under this section of the “eight-part test”. The threatening processes relevant to the development proposal have been summarised below. Further details are provided in Appendix F1.

Table 7.9 – Relevant Key Threatening Processes

Relevant Key Threatening Process	Relevance to Proposal
Anthropogenic Climate Change	The project will have a minor but positive effect.
Bushrock removal	Minor impact, but reduced impact due to exclusion of former Governors Hill turbine sites.
Clearing of native vegetation	Minor clearing will occur guided by an ecologist's advice. An offset is proposed.
Loss and/or degradation of sites used for hill-topping by butterflies	May be relevant.
Removal of dead wood and dead trees	Minor impact. Beneficial to remove dead trees over a small area near turbines to prevent birds roosting on them and increasing the risk of blade strike. Dead timber will be relocated within the project area.

The project’s contribution to the identified processes need not have a significant impact if care is taken in designing and constructing the wind farm. The most important criteria are considered to involve limiting the clearing of woodland and other native vegetation and in the case of major rock outcrops to limit disturbance or incorporate the relocation of the rock to a nearby location.

- (h) *whether any threatened species, population or ecological community is at the limit of its known distribution*

None of the species or communities discussed in this report would be at its limit of distribution in the project area.

Conclusion, Threatened Species Conservation Act

The assessments of Mills, 2005 and Richards, 2005 support the conclusion that the development of the wind farm is not likely to have a significant effect on any threatened species, populations or ecological communities listed under the *Threatened Species Conservation Act*, or their habitats. The preparation of a Species Impact Statement is therefore not warranted.

7.5.4 Environment Protection and Biodiversity Conservation Act

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) specifies that approval is required from the Commonwealth Minister for the Environment for actions that have, will have or are likely to have a significant impact on a matter of “national environmental significance”.

The Act identifies seven matters of national environmental significance. Environment Australia has published 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 (Environment Australia 2000). Applications of the Guidelines assists proponents to decide whether a proposed action should be referred to the Minister for assessment and approval.

Mills, 2005 has assessed of the potential for the proposed Capital Wind Farm to have a significant impact on the listed species and ecological communities relative to the criteria in the Commonwealth's *Administrative Guidelines* (Environment Australia 2000) and has concluded that:

“The development of the Capital Wind Farm is not likely to have a significant effect on any species or ecological communities listed under the Environment Protection and Biodiversity Conservation Act, or their habitats. Referral of the matter to the Commonwealth Minister for the Environment for assessment and approval is therefore not warranted.”

Richards, 2005 in his assessment of the impacts of the Capital Wind Farm on bats concluded that:

“no species listed under the EPBC Act were recorded in the project area, and on this basis it is not necessary to refer the project.”

7.5.5 Fisheries Management Act

The NSW *Fisheries Management Act 1994*, as amended by the *Fisheries Management Amendment Act 1997*, provides for the listing of threatened species, communities and populations, the designation of habitat as "critical", and the preparation and implementation of recovery and threat abatement plans. Threatened species are listed on schedules attached to the Act.

Six key threatening processes have been listed under the Act; none of these apply to the proposed wind farm development. The proposed turbine sites are high on ridges, and the access roads and cable routes are away from all but minor and ephemeral watercourses, that are unlikely to support threatened species.

Although the various components of the wind farm will not encroach on any watercourses, there is potential for sediment resulting from uncontrolled construction work to enter watercourses nearby. Accordingly, measures will be taken to mitigate this potential impact and implemented throughout the Project Environmental Management Plan.

7.5.6 Koala Habitat Protection

The recently restructured Palerang Shire covering the project area is not listed under SEPP No. 44, but the previous Shire names covering the project area do appear on Schedule 1 of *State Environmental Planning Policy No. 44 - Koala Habitat Protection* (SEPP 44) (New South Wales 1995), so that the Policy does apply to the new Shire. SEPP 44 encourages the conservation and management of natural vegetation that provides 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.

One of the eucalyptus species present in the area, Manna Gum *Eucalyptus viminalis*, is listed on Schedule 2 of the SEPP 44 as a Koala food tree. Stands of Manna Gum occur in several places in the project area, for example to the east of and in the southern parts of the Hammond Hill site. These were investigated for signs of Koalas, such as claw marks on tree trunks and faecal pellets below the trees, but none were found. While these stands of trees are "potential Koala habitat", they are not directly affected by the proposed wind farm.

Most of the trees to be cleared are Inland Scribbly Gum *Eucalyptus rossii*, Broad-leaved Peppermint *Eucalyptus dives* and Silvertop Ash *Eucalyptus sieberi*. *Eucalyptus dives* is a secondary Koala food tree, but is very common in the area so clearing small patches, if necessary, is not likely to have a significant impact on koalas.

7.5.7 Land Dedicated for Conservation Purposes

There are no reserves managed by the NSW National Parks and Wildlife Service in or near the project area. A Crown reserve, known as Sweeneys Reserve, is located east of the Tarago to Bungendore Road south-east of the substation site. This reserve contains a good quality example of Yellow Box woodland. This reserve is outside the project area and will not be affected. In order to protect a remnant area of Yellow Box Woodland on the western side of the Tarago to Bungendore Road near the entrance to the substation it is proposed to establish a reserve for its conservation by fencing off the remnant for the duration of the project.

The Pylara Wildlife Refuge and its extension occur on the Collex land to the north and east of the project area. No part of the project area abuts this wildlife refuge and there is no potential for the Capital Wind Farm to impact on the wildlife refuge.

7.6 Mitigation Measures

The project has been designed to primarily utilise cleared grazing land that generally has little remnant native vegetation. Nevertheless some parts of the project do involve clearing and potential habitat disturbance and require a range of mitigation measures to be incorporated in the project Environmental Management Plan.

Having regard to the recommendations of Mills (2005) and Richards (2005), it is proposed to adopt the following measures to protect the few remaining traces of native vegetation and significant habitat and to assess potential impacts on aerial fauna:

7.6.1 *Turbine Sites*

- Clearing woodland will be avoided wherever possible. Where avoidance is not possible, clearing and lopping will be kept to the bare minimum to maximise conservation of the woodland.
- Large rock outcrops have been avoided, because they provide valuable habitat for reptiles and other native animals. In a cleared landscape, rock outcrops are sometimes the only habitat available for reptiles. However, where turbines are located on areas of rock outcrops, the excavated rock will be deposited nearby in a "natural" formation to re-create habitat.
- Construction activities on narrow ridge crests and knolls with potential for erosion and impacts on habitats down slope will incorporate appropriate erosion control measures.
- To protect potential Bat habitat, Dr Richards has recommended a pre-clearance survey of trees to be cleared to identify any potential roosts and that where applicable, the clearing be undertaken to lay trees down with potential roosts facing skywards to enable bats or other fauna to depart at a later time.

7.6.2 *Access Roads and Tracks*

- The access tracks will as far as possible be located to avoid clearing woodland and utilise existing tracks and cleared areas where feasible. Where clearing of any woodland has been required for access tracks, the advice of an ecologist has been sought for the route selection to minimise impacts on the woodland values.
- When constructing the access tracks, care will be taken to ensure that the construction activities do not cause excessive erosion. Permanent tracks will be stabilised and temporary tracks rehabilitated to the satisfaction of the Departments of Planning and Natural Resources.
- The access track to the substation site passes through the stand of the endangered Yellow Box Woodland that will be fenced off. The access will use an existing track and will not be used by the large vehicles to transport turbine parts to the turbine sites. Due to the restriction on the size of vehicles using this access track, access can be gained by removal of only three trees and thinning of several others.

7.6.3 *Cabling – General*

Many kilometres of buried cable will be installed throughout out the project area to link the turbines together. The following general measures will be applied to the installation of the cables.

- Disturbance will be minimised and rehabilitation undertaken as soon as possible after back-filling of trench.
- Care will be taken on steep slopes to ensure that erosion does not occur. Any problems should be rectified immediately.
- The on-site maintenance crew will be responsible for regularly checking the cable routes for erosion until the routes have been revegetated.
- The cable routes will avoid the areas identified in this report as having special conservation importance. An ecologist has reviewed and advised on route selection through sensitive areas.

Burying the cables reduces visual impact but trenching can have a greater impact on native vegetation than overhead lines. The use of an overhead line is proposed between Grose Hill and the substation as this line can be installed with very low visual impact and minimises disturbance along its length.

7.6.4 The Substation

The substation site comprises native pasture and exotic grassland of little conservation value. However, earthworks will include measures to protect the nearby drainage line.

7.6.5 Impact on Birds of Prey

Measures will be taken to reduce the chance that birds of prey will fall victim to blade-strike:

- the turbine towers will have no perching sites
- dead animals (eg. sheep carcasses) will be removed as soon as possible within 200 metres of the turbines
- lambing will not occur in proximity to turbines
- an annual rabbit control program will be implemented for the wind farm site
- the turbines and other facilities will not have lights, other than safety lights for aircraft, because they may attract owls and bats
- tall dead trees that could provide perching opportunities within 200 metres of turbines will, after assessment for absence of resident fauna, be removed.

7.6.6 Impact on Other Species

No Manna Gum *Eucalyptus viminalis* will be cleared as these represent important Koala food trees. These trees are mainly on the south eastern boundary of the project area and south west of the Hammonds Hill site. An ecologist has reviewed the layout to ensure that the wind farm infrastructure does not impinge upon stands of Manna Gum.

7.6.7 General

- As a general rule, large trees, dead or alive, will not be removed, large trees often have a high habitat value. Large, isolated native trees will be removed only if absolutely necessary. Removing tall dead trees near the turbines, as described in 7.6, is acceptable.
- If trees are to be planted around the substation and/or near other facilities, eg. for screening purposes, then only local native tree species should be selected.
- A soil and water management plan should be prepared for the project, this should be developed in consultation with the Department of Planning and the Department of Natural Resources.
- Measures will be incorporated in the project to minimise the introduction and establishment of invasive species at the site. Earthmoving vehicles will be washed down before being brought onto site and prior to departure. Weeds will be monitored on disturbed sites and controlled if necessary.

7.6.8 Compensation Measures

Because woodland on some of the properties may be cleared, the following compensation measures are proposed.

- The high value Yellow Box Woodland and secondary grassland to the south-east of the Hammond Hill site (see Figure 7.1) will be fenced to exclude stock. A similar area to the

east of the Hammonds Hill Group will be avoided by the project. The management of these areas will be discussed with the Department of Environment and Conservation.

- Several areas of tree planting have also been planned on neighbourhood properties.

7.6.9 *Monitoring*

- An environmental officer will be appointed for the construction phase of the project, whose role will be to implement the above measures.
- The Australian Wind Energy Association (Auswind) has developed a set of interim guidelines for surveying wind farms for victims of blade-strike. A monitoring program for birds and bats will be developed for the Capital Wind Farm project, based on the Auswind document.
- Renewable Power Ventures will conduct performance audits of the construction stages to ensure that the identified mitigation measures are rigorously pursued by the site works contractor.
- In the event of bird or bat strike becoming a significant issue, installation of deterrent devices on the turbines will be considered. Should the proposed monitoring reveal substantial evidence of bird or bat strike, Renewable Power Ventures will pursue this option.