PRELIMINARY ASSESSMENT OF POTENTIAL IMPACTS UPON THE BAT FAUNA EXPECTED AT THE PROPOSED CAPITAL WIND FARM, NSW

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For Connell Wagner Pty Ltd, March 2005

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[1] This is a requirement of the consultant's insurance company.

1.0 EXECUTIVE SUMMARY

Greg Richards and Associates Pty Ltd was commissioned by Connell Wagner Pty Ltd to conduct a 'desktop' assessment of the bat fauna likely to occur at the proposed Capital Wind Farm, NSW, and the potential for impact on these species by the proposal.

Searches of databases and other sources were conducted to generate a list of species recorded within 50km of the project area. This list was then refined to be applicable to the project area, based on ecological requirements of the regional bat fauna, habitats available at the site (based on a site inspection), and records from other windfarm projects in the region.

It was concluded that 12 species could be expected to occur, including the Yellow-bellied Sheathtail Bat and Large Bentwing Bat, both of which are listed as Vulnerable in the NSW Threatened Species Conservation Act. No species listed in the Commonwealth Environment Protection and Biodiversity Conservation Act could be expected in the project area.

Potential impacts upon the Yellow-bellied Sheathtail Bat, may include loss of roost sites via tree clearance during the construction phase, and collision with the blades of the wind turbines during operation. Estimation of the probability of collision indicated that there was a low likelihood of the latter, and the viability of the local population of this high flying species is unlikely to be adversely affected by the proposed windfarm. Factors that led to this conclusion included the lack of rotation of turbine blades on still nights, and the assumed cessation of bat activity on windy nights.

The only potential impacts likely to occur upon the Large Bentwing Bat is collision with turbine blades during annual migrations to a "dispersal stopover" cave [about 1 km south of Mount Fairy in the southeast of the site and more than 2 km from the nearest turbine site. Occupation of this cave occurs from (approximately) mid-February to mid-March each year, when bats are *en route* from a maternity site at Wee Jasper to caves in the coast and ranges.

Collision impact is likely when bats roost in caves near the turbines, and forage nearby or commute past them. No methods are currently known for reducing collision impact when potentially affected bats are present, apart from complete shutdown of turbines.

No Eight-Part Test has been conducted until further investigations on the above issues are conducted.

Recommendations have been made for a field study to assess species present at the site and for preparation of eight part tests based on results of the survey and assessment of potential impacts for key threatened species.

1.0 INTRODUCTION

The consultant was commissioned by Connell Wagner Pty Ltd to conduct an assessment of the bat fauna likely to occur at the proposed Capital Wind Farm, and to establish whether during its construction and operation there would be any impact upon threatened species.

The project took the form of a desktop assessment after a site inspection during November 2004. For the desktop assessment, a bat species list was generated from databases, and impacts upon threatened species and any high-flying species were assessed. A *Protected Matters Search Report* (for the area shown on Figure 1) was generated from the Commonwealth Department of Environment and Heritage website to identify any matters of national environmental significance, including any threatened bat species listed in the Environmental Protection and Biodiversity Conservation Act.

2.0 PROJECT AREA & PROJECT DESCRIPTION

The proposed windfarm is located about 10 km south and southwest of the village of Tarago and approximately 15 km north of Bungendore, NSW (Figure 1), and is described in detail in other reports related to the EIS for the project.

The project area is primarily cleared open grazing land, with a number of woodland remnants and tracts of forest that may provide habitat resources such as potential roost hollows and foraging areas. The wind farm is also located to the east of the mostly dry plain that encompasses the ephemeral Lake George, an area that is devoid of trees.

It is proposed that the project area will have up to 69 turbines located in rows on approximately 4 major ridges and several small hills, and also includes a 330 kV substation, associated access tracks, and underground cables. A section of overhead powerline will also be included to connect the north-western and western Groups of turbines to the substation. The project area was inspected on 1st November 2004, and ridges where turbines were planned to be located were visually assessed for potential bat habitat.

3.0 METHODS

3.1 Background information

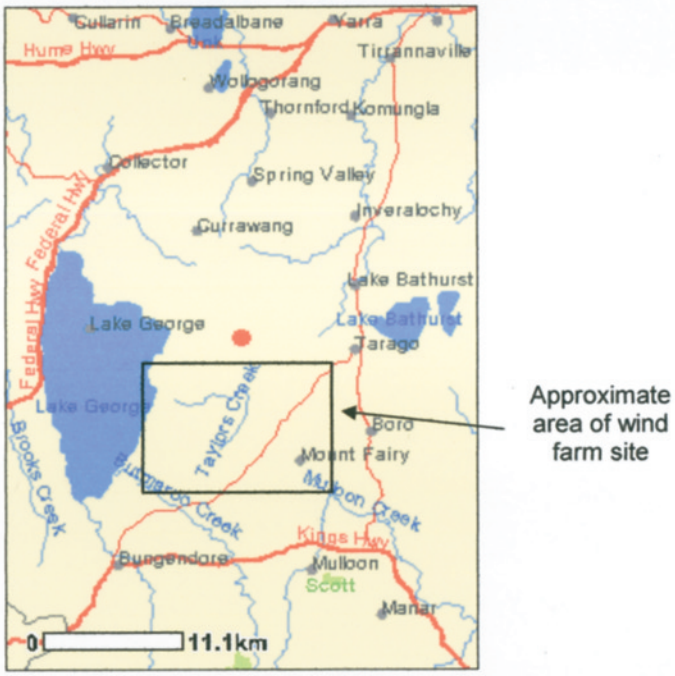
A search of the consultant's database of bat distribution records was conducted to generate a list of species that could be expected in the study area. The database included records from museums and fauna agencies, field records and relevant literature, and has been compiled over the last three decades. The search area was a 50 x 50 km block centred upon the project area, and had boundaries approximately 149°22'30"E to 149°56'20"E by 34°49'30"S to 35°17'40"S.

Other background information included field guides (Hall and Richards 1979; Churchill 1998) and reports from the author's previous studies conducted at the

Crookwell and Blayney wind farms, and the proposed Gunning, Taralga, Bannister and Woodlawn wind farms (Richards 1997, 1999, 2003, 2004). The Woodlawn project is located adjacent the project area of the proposed Capital Wind Farm, and the others (except Blayney) are in the Southern Tableland region and within 50km distant.

A *Protected Matters Search Report* was generated from the Environment Australia website, centred upon a point between the village of Tarago and Lake George. A report area buffer of 20 km was used (Figure 1).

Figure 1: Areas surrounding the proposed Capital Wind Farm that were covered by a *Protected Matters Search Report*. A point centred between Lake George and the village of Tarago was used to locate the search, and a buffer zone of 20 km was assessed.



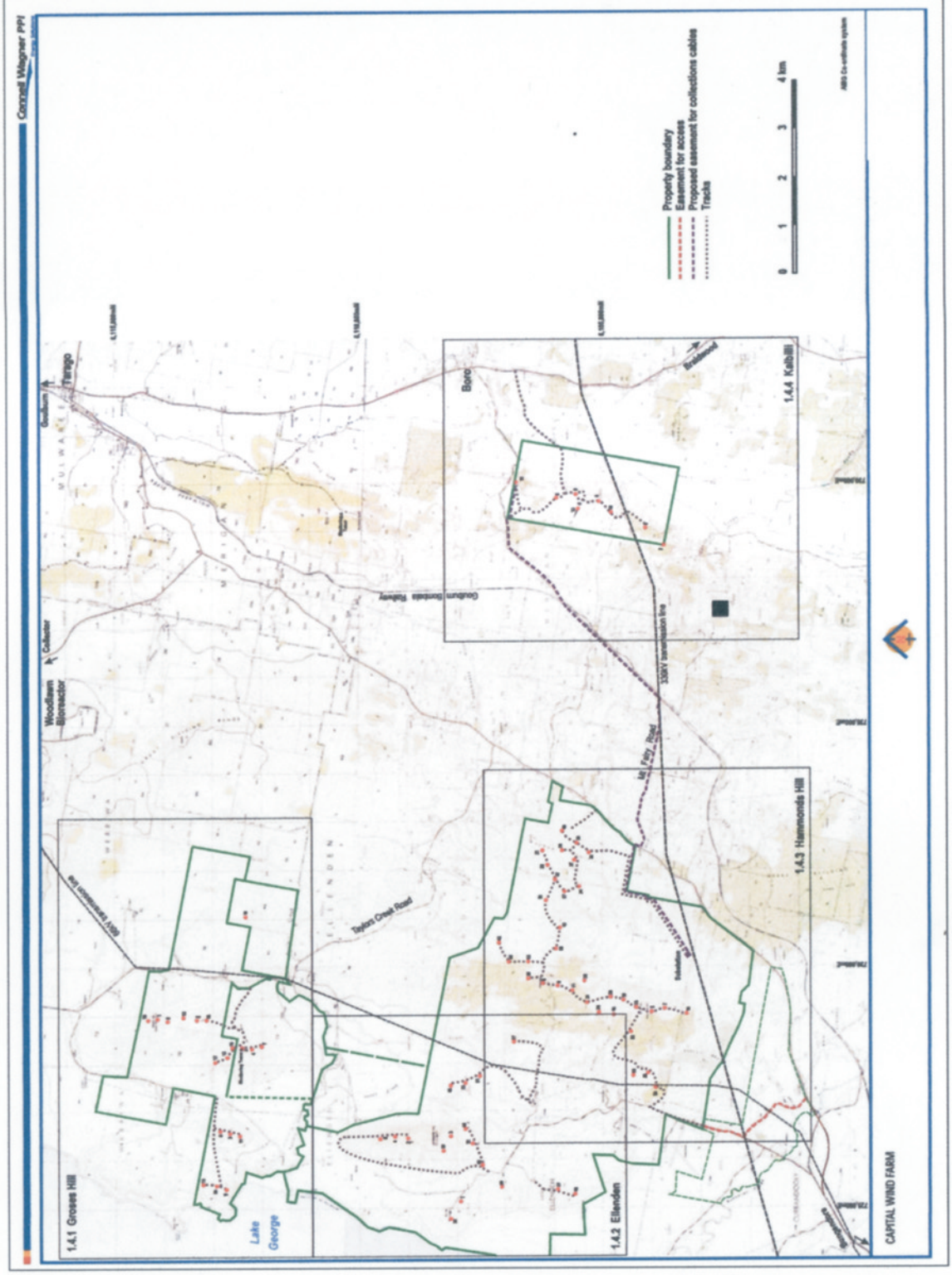
4.0 RESULTS AND DISCUSSION

A list of species recorded from the region is shown in Table 1, which includes five species that are listed as threatened in State and Commonwealth legislation. Because the database search area included several karst areas, including Bungonia Gorge, several threatened cave-dwelling species were placed into the regional list. Records of Large Bentwing Bats (*Miniopterus schreibersii*) at a cave at Mount Fairy, within the study area, were also noted.

Table 1: Systematic list of species expected in the study area, based on searches of databases for records within approximately 50 km of the proposed Capital Wind Farm. Records from surveys conducted at the Crookwell wind farm, and the proposed Gunning, Bannister,Taralga and Woodlawn wind farms, are included in this Table. Species listed in the Commonwealth Environment Protection and Biodiversity Act and the NSW Threatened Species Conservation Act are shown, and all are listed as Vulnerable. The search area encompassed several karst areas which placed several cave-dwelling species (the Eastern Horseshoe Bat, the Large-eared Pied Bat and the Large Bentwing Bat) into the regional list.

Common name	Scientific name	Listed in EPBC Act	Listed in TSC Act
Flying foxes (Pteropodidae)			
Grey-headed Flying Fox	*Pteropus poliocephalus*	•	•
Little Red Flying Fox	*Pteropus scapulatus*		
Sheathtail Bats (Emballonuridae)			
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*		•
Horseshoe bats (Rhinolophidae)			
Eastern Horseshoe Bat	*Rhinolophus megaphyllus*		
Ordinary bats (Vespertilionidae)			
Large-eared Pied Bat	*Chalinolobus dwyeri*	•	•
Gould's Wattled Bat	*Chalinolobus gouldii*		
Chocolate Wattled Bat	*Chalinolobus morio*		
Large Bentwing Bat	*Miniopterus schreibersii*		•
Lesser Longeared Bat	*Nyctophilus geoffroyi*		
Gould's Longeared Bat	*Nyctophilus gouldi*		
Greater Longeared Bat (SE form)	*Nyctophilus timoriensis*	•	•
Eastern Broadnosed Bat	*Scotorepens orion*		
Large Forest Bat	*Vespadelus darlingtoni*		
Southern Forest Bat	*Vespadelus regulus*		
Little Forest Bat	*Vespadelus vulturnus*		
Freetail bats (Molossidae)			
White-striped Freetail Bat	*Tadarida australis*		
Eastern Freetail Bat	*Mormopterus* sp.2		

Figure 2: Map of the proposed Capital Wind Farm project area and environs, showing features relevant to the bat fauna assessment and location of ridges where turbine rows will be placed. Vegetated ridges are shown in brown shading. The approximate location of a 'dispersal stopover' cave roost for the Large Bentwing Bat (*Miniopterus schreibersii*) is located about 1 km south of Mt Fairy is indicated by a solid square.



4.1 Habitat resources for the bat fauna

The majority of the project area is open and cleared agricultural land (Figure 2). Most of the ridges where rows of turbines are planned to be located were totally cleared, but parts of some had potential bat habitat ranging from small woodland remnants to a large tract of forest, as follows:

Groses Hill Group of turbines

The turbine sites within this north-western Group are located on ridges that have been totally cleared and close to Lake George. The ridges are exposed areas that will experience strong winds.

Ellenden Group (Red Hill and Governors Hill)

This western Group is located on ridges adjacent to the broad treeless plain that is Lake George. Red Hill is mostly cleared apart from several pine trees. The Governors Hill ridgeline is mostly cleared of trees. Some areas of trees are present on the slopes. These ridges will experience strong winds at times.

Hammond and Big Hill Group

The central Hammond Hill/Big Hill Group of turbines is located in areas of grassland and open woodland. The ridgelines east of Hammonds Hill are almost totally devoid of trees. The Hammond Hill area contains some areas of remnant woodland that will require further survey to establish whether the Yellow-bellied Sheathtail Bat utilises the habitat. Due to grazing by livestock, the habitat may not be preferred by this species. There is some likelihood that the Large Bentwing Bat may also utilise this area during the period that the Mount Fairy cave is occupied.

Turbines on the Hammond Hill/Big Hill Ridgeline may create issues and some assessment of species present and potential impacts is recommended.

Kalbilli Group of turbines

Much of this south-eastern Group is on cleared ridgetop land. The southern area comprises relatively dense open woodland close to the two southernmost turbines. A survey will be required to establish whether the Yellow-bellied Sheathtail Bat utilises the area covered by the turbine row. As the site has been grazed by livestock, it would doubtfully be utilised by this species. There is some likelihood that the Large Bentwing Bat may also utilise this area during the period that the Mount Fairy cave is occupied (February-March each year).

4.2 Potential for Presence of Threatened Species

Grey-headed Flying Fox (*Pteropus poliocephalus*)

This species is a very rare visitor to the Southern Tablelands region and would be infrequently expected in the project area due to the low availability of primary food resources (eucalypt blossom) and the relatively large distance to nearest known roost sites, which are generally coastal (Hall and Richards 2000).

Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*)

This species is generally rare but widespread throughout NSW and Australia. It appears to live in small colonies that occupy tree hollows, and forages by feeding above the tree canopy (Churchill 1998, Richards 2002). Recent studies in the Cadia Valley (Orange, NSW) indicate that presence of this species may be dictated by extensive high quality habitat with a shrub understorey, in tracts of several hundred hectares (Richards, unpublished). No such habitat appears to be present in the project area in sufficient size.

Large-eared Pied Bat (*Chalinolobus dwyeri*)

This species is highly unlikely to be present in the project area. It was not recorded at the Crookwell, Bannister and Gunning windfarm sites. It is primarily a subterranean roosting species and the nearest known colony is at Bungonia Gorge in the Goulburn area, 60km distant. In the southern latitudes of its range, it appears to be dependent upon the presence of large tracts of sclerophyll forest within the vicinity of a roost site (Churchill 1998; Richards unpublished). It is unlikely that individuals from Bungonia Gorge would commute to forage in woodland remnants and forest in the project area.

Large Bentwing Bat (*Miniopterus schreibersii*)

The Large Bentwing Bat is known to occupy a cave roost in the project area, in the vicinity of Mount Fairy (Figure 2). This cave is used as a 'dispersal stopover' point during annual migrations from a maternity roost at Wee Jasper (Hall and Richards 2004) to caves in the coast and ranges, which appear to be during the period mid-February to mid-March each year.

Greater Longeared Bat (Southeast form) (*Nyctophilus timoriensis*)

Longeared Bats typically roost in tree hollows or under exfoliating bark, and are short-range foragers that glean prey from substrates such as foliage and bark (Hosken 1996; Hosken *et al* 1994; Lumsden 1994; Lumsden and Bennett 1995a, 1995b; Lumsden and Bennett 1997; Lunney *et al* 1988; Parnaby 1995; Richards 1983a). Many of these authors consider that this species is primarily a semi-arid species, with preferred foraging in mallee,

dry open woodlands and River Red Gum habitats. There does not appear to be suitable habitat present in the project area.

4.3 Ecological Characteristics of Expected Species

The ecological characteristics of bat species that could be expected in the proposed Capital Wind Farm and environs were assessed to identify the array of flight and foraging niches of the community in the project area. The list that was compiled from database searches and a *Protected Matters Search Report* (Table 1) was modified to exclude species of doubtful occurrence, based on the distribution and known habitat utilisation patterns outlined in the previous section. All cave-dwelling species, apart from the Large Bentwing Bat, known from permanent roosts in large caves in the Bungonia area were excluded from this analysis on the lack of prior records for these species in this general locality and on the basis of similar roost sites apparently being absent in the area.

Generalised foraging modes and strata were based upon Richards (2002 and unpublished). Primary foraging strata were identified but may also include open or grassland habitat, especially if individuals commute between woodland remnants across cleared agricultural land. This assessment is shown in Table 2.

Table 2: Ecological characteristics of insectivorous bat species expected in the proposed Capital Wind Farm and environs. All cave-dwelling species have also been excluded on the basis of suitable roost sites being absent in the area. Generalised foraging modes and strata are based upon Richards (2002). Foraging strata may also include open or grassland habitat, especially if individuals commute between woodland remnants.

Primary foraging stratum	**Primary foraging mode**	**Species**
Above canopy	Prey intercept	Yellow-bellied Sheathtail Bat
		White-striped Freetail Bat
Around/within canopy	Prey pursuit	Gould's Wattled Bat
		Chocolate Wattled Bat
		Eastern Broadnosed Bat
		Large Bentwing Bat
		Large Forest Bat
		Southern Forest Bat
		Little Forest Bat
		Eastern Freetail Bat
Below canopy	Prey gleaning	Lesser Longeared Bat
		Gould's Longeared Bat

5. IMPACT ASSESSMENT

5.1 Potential impacts

Two impacts upon the local bat community are likely to occur during the construction and operational phases. These impacts would include some loss of roost sites via tree clearance during the construction phase, and collision with the blades of the wind turbines during operation.

With regard to ridges that have woodland or forest in the vicinity of turbine rows, not all turbines in the row would be likely to produce collision impact, and not all wooded ridge habitats would be expected to support threatened species due to lowered habitat quality through grazing of understorey and due to higher wind speeds at these locations.

5.1.1 Habitat loss

All species expected in the project area would be impacted by varying extent to the loss of roost sites. A number of these species are known to have several separate tree roosts throughout the landscape that they utilise (Richards, unpublished studies at Cadia Gold Mine, Orange and Cowal Gold Project, West Wyalong). In general, the project will avoid clearing of woodland for placement of turbines and access. Minimising the extent of clearing will reduce the potential for habitat loss.

5.1.2 Collision Impact

The two species in the above canopy – prey intercept assemblage (Table 2), the Yellow-bellied Sheathtail Bat and the White-striped Freetail Bat, have some potential for collision because their ecological niche includes the airspace swept by turbine blades. Other species, such as those in the around-canopy and below-canopy assemblage (Table 2), are likely to have a much lower potential for collision.

Very little is known about the extent of collision by Australian bats with wind turbines, and very little research appears to have been conducted on this subject. Global data varies extensively, ranging from very high numbers of migrating bats reported killed at several sites in the United States, to very low numbers at sites in Victoria.

Brett Lane and Associates (2003) stated that there would be very little collision impact on the White-striped Freetail Bat at the six turbine Wonthaggi windfarm (Victoria) because it was to be located in primarily cleared agricultural land. At the 84 turbine Bald Hills windfarm (Victoria), because it was located in similar sub-optimal habitat, it was concluded that the mortality level would be less than one bat per turbine per year, with the White-striped Freetail Bat being at the greatest risk (Anon 2003).

Data provided on the Environment Victoria website suggested a low risk to White-striped Freetail Bat populations. Monitoring surveys conducted between 2000 –

2003 at the Codrington Windfarm (14 turbines) recorded only two individuals killed by collision, and at the Toora (12 turbines) six White-striped Freetail Bats and one Chocolate Wattled Bat were killed. This equates to 0.04 and 0.14 bat deaths/turbine/year at Codrington and Toora respectively.

However, nothing is known about the likelihood of an individual bat to not visualise a turbine blade, and there appears to be no scientific information on this subject. Given the large profile of a blade and the obvious fact that bats can detect large objects (for example, tree branches, moving vehicles, walls of buildings) and small fast moving objects (insects) then one would assume that the probability of a bat not perceiving or distinguishing a blade in the open air would be very low. However, there may be other unknown issues, such as suction effects.

Nevertheless, the placement of turbines in primary bat habitat could initially lead to an increased risk to high flying bats that feed above the forest canopy, and should be of concern for the conservation of the Large Bentwing Bat in the southeast of the site. Further information is required on the presence of this and other bat species at the site.

5.2 Impact mitigation

5.2.1 Habitat loss

Renewable Power Ventures has advised that as far as possible, clearing of trees, dead or alive, will be avoided.

Should clearing be necessary, the impact of loss of tree hollow roost sites during vegetation clearance can be reduced or offset if pre-clearing surveys are conducted to determine if roosts are present. If bat roosts are recorded in trees to be removed, then several strategies can be incorporated. In the case of common species that have multiple roosts in their landscape, monitoring at dusk over several days will reveal when the roost has been vacated and the tree can then be felled. The assumption is made that species with roost flexibility will adapt to the loss of one roost, as they would if the roost was lost naturally through bushfire or tree senescence.

For species that may be fixed to a single unique roost type, such as the Yellow-bellied Sheathtail Bat, there is potential to relocate the roost itself to a location where no clearance impacts would occur. There are several examples where this action has been successfully carried out (Rhodes and Hall 1997; Richards, unpublished data; Dr L.S. Hall, University of Queensland (ret.), pers. comm.).

5.2.2 Collision impacts

The mitigation of collision impacts is far more difficult to resolve. Many suggestions proffered in publications and on websites (particularly those based in the USA) are impractical and of doubtful effectiveness. There is an apparent dearth of information on successful strategies that are based on formal trials. Most suggestions are untested and are applied to entire windfarms. Further

information on species presence is required to clarify the risk posed by the wind farm.

6.0 CONCLUSIONS AND RECOMMENDATIONS

It appears that for most of the wind farm there would be minor impacts and issues to address, apart from the Kalbilli Group of turbines. Suggested actions are listed below:

1. A field study is required during Summer to ascertain whether the Yellow-bellied Sheathtail Bat is present in the area and at the same time to confirm the presence of other bat species.

2. The Large Bentwing Bat is assumed to be present for a short time each year, and further investigations are required on this issue before an Eight-Part Test can be carried out. Monitoring should be undertaken at an 'appropriate' time to assess the presence of the Large Bentwing Bat. The timing should be in February/March and based, if possible, on knowledge of movements of this species between Wee Jasper and coastal areas.

3. Following the monitoring, a collision risk model[2] should be developed and eight part tests completed for relevant species identified from the survey results.

[2] See *Best Practice Guidelines for Implementation of Wind Energy Projects in Australia* (Australian Wind Energy Association, 2002, in collaboration with the Australian Greenhouse Office)

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