



AN ASSESSMENT OF THE BAT FAUNA AT THE PROPOSED CAPITAL II WIND FARM, NSW

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for Infigen Energy Pty Ltd, September 2010

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¹ This is a requirement of the consultant’s insurance company.

EXECUTIVE SUMMARY

The consultant was commissioned by Infigen Energy to conduct a desktop assessment of the potential impacts upon the bat fauna of the Capital II Wind Farm. The proposed facility is located north of Bungendore, and lies between the eastern shore of Lake George, NSW and the original Capital Wind Farm which is now operational. The project area is primarily grazed pasture with some tracts of woodland. A number of bat fauna assessments of the project area have been already conducted, including a preliminary desktop assessment, the development of an operational bat management plan and an extensive field assessment.

A 2010 field study showed that during 90 detector-nights of sampling, which generated a total of 2882 identifiable bat calls, ten species were present in the project area (Table 1). Five species contributed to just under 90% of the activity around the operational wind farm and the majority of these species were common throughout the region and not considered in any threat category, with the exception of the Eastern Bentwing Bat. This species is listed in the NSW Threatened Species Conservation Act

Most of the turbines that are proposed for the Capital Wind II Farm will be placed in areas where the habitat is open pasture, and for this reason a coarse analysis of the bat activity in this was compared with that in woodland. Both overall activity, as well as species richness, was far less in open pasture habitats when compared with woodland sites.

The Eastern Bentwing Bat has become a focus species at wind farms in Southeastern Australia, with a major concern being its migration behavior when dispersal from the maternity site to staging caves and wintering roosts occurs during the period February to April each year. Of relevance to the Capital II Wind Farm is that there is the potential for groups of Eastern Bentwing Bat to migrate across the project area when it disperses from its breeding cave at Wee Jasper.

Some insight into the potential migration patterns was gleaned from late summer 2010 survey data, which was timed for the dispersal period of March-April. The Eastern Bentwing Bat was recorded in very low numbers compared with most other species. Hence, during the migration period, it appears that at least in 2010, very few Eastern Bentwing Bats passed through the wind farm site.

The turbine areas at the Capital II Wind Farm are mainly two groups in open pasture, so it can be expected that there would not be a high level of bat activity throughout the year in this area. A 7-part test of significance of potential impacts of the proposal revealed that no local population of the threatened species recorded in the project area would be impacted by the proposal.

It was concluded that:

1. Capital Wind Farm II will be constructed in habitat (tree-less open pasture) that is renowned as being very poor for bat foraging and provides no roost sites for tree dwelling or cave roosting bats.

2. The low level of Eastern Bentwing Bat activity at the adjacent operational Capital Wind Farm, especially in open habitats there, suggests that this species is unlikely to regularly use the Capital Wind Farm II area.
3. Conclusion 2 was supported by extrapolating data to build a “worse-case” scenario, which indicated that less than 10 Eastern Bentwing Bats per year could be killed by all 53 turbines in the proposal.

Monitoring is already being carried out at the existing wind farm facility, and it was recommended that the survey area be extended so that additional sites are monitored in the Capital Wind Farm II project area.

INTRODUCTION

The consultant was commissioned by Infigen Energy to conduct a desktop assessment of the potential impacts upon the bat fauna of the proposed Capital II Wind Farm. The facility is located north of Bungendore, and lies between the eastern shore of Lake George, NSW and the original Capital Wind Farm which is now operational. Habitat in the project area is grazed pasture. The assessment area is shown in Figure 1a and 1b.

A number of bat fauna assessments of the project area have been already conducted, including a preliminary desktop assessment (Greg Richards and Associates Pty Ltd, 2005), the development of an operational bat management plan (Greg Richards and Associates Pty Ltd and Brett Lane and Associates Pty Ltd, 2009), and an extensive field assessment (Greg Richards and Associates Pty Ltd, 2010).

All of the bat fauna assessments were designed to target bat fauna species listed in the Schedules of the NSW *Threatened Species Conservation Act, 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

BAT SPECIES RECORDED IN THE PROJECT AREA

The 2010 field study showed that during 90 detector-nights of sampling, which generated a total of 2882 identifiable bat calls, ten species were present in the project area (Table 1).

Table 1: Species recorded during March (9 nights) and April 2010 (10 nights) surveys at the Capital II Wind Farm.				
Species		Total calls	Percentage of total	Cumulative proportion
Southern Forest Bat	<i>Vespadelus regulus</i>	836	29.0	29.0
Southern Freetail Bat	<i>Mormopterus</i> sp.	779	27.0	56.0
White-striped Freetail Bat	<i>Austronomus australis</i>	412	14.3	70.3
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>	325	11.3	81.6
Longeared Bats	<i>Nyctophilus</i> sp.	226	7.8	89.4
Chocolate Wattled Bat	<i>Chalinolobus morio</i>	114	4.0	93.4
Large Forest Bat	<i>Vespadelus darlingtoni</i>	92	3.2	96.6
Little Forest Bat	<i>Vespadelus vulturnus</i>	47	1.6	98.2
Eastern Broad-nosed Bat	<i>Scotorepens orion</i>	25	0.9	99.1
Eastern Bentwing Bat (EBB)	<i>Miniopterus shreibersii</i>	12	0.4	100.0
Potential EBB		14	0.5	99.6
Total calls		2882		

Figure 1a: Northern section of the project area, showing turbines that are currently operational (green symbols), and those that are proposed in the Capital II Wind Farm (mauve symbols).

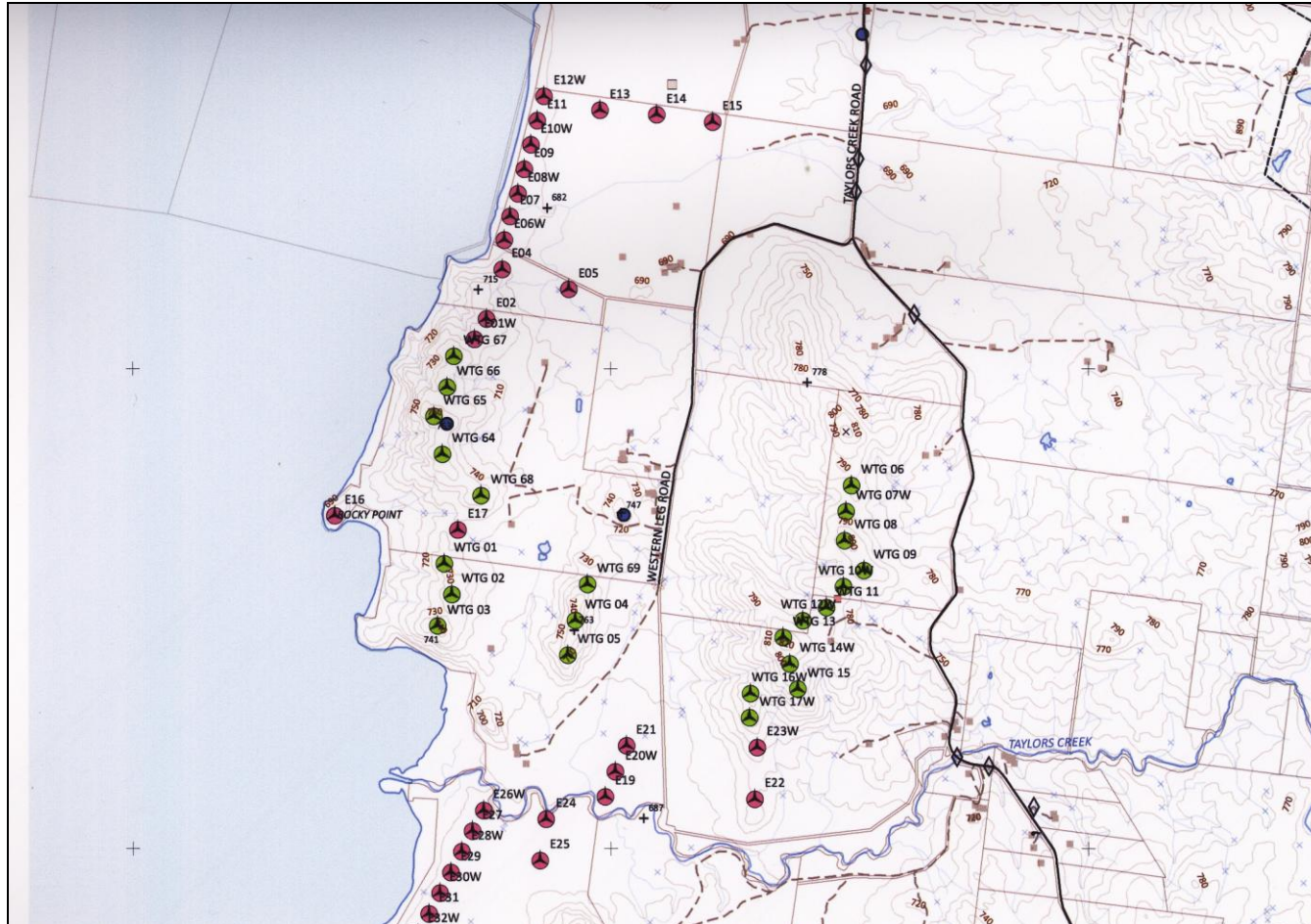
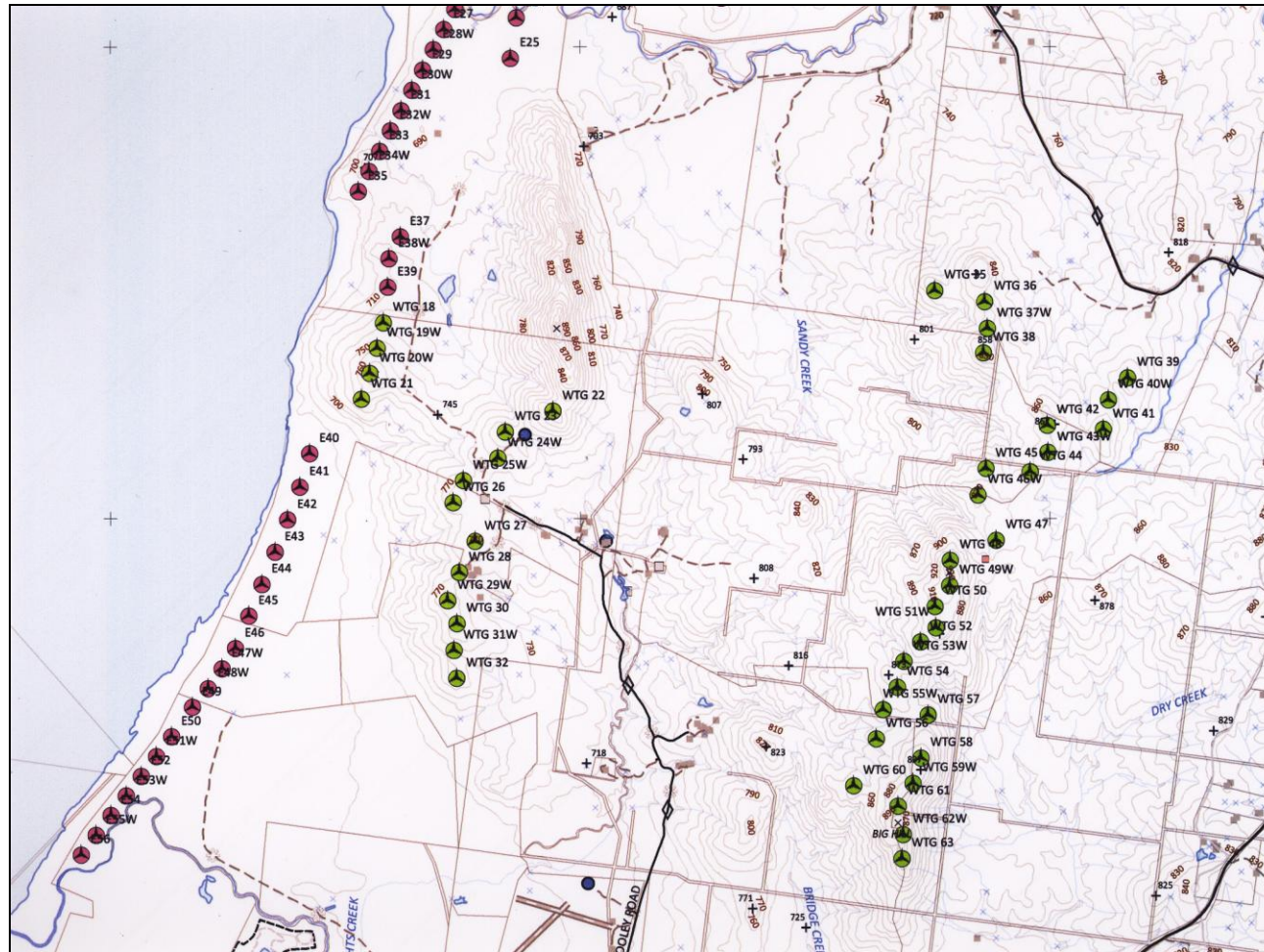


Figure 1b: Southern section of the project area, showing turbines that are currently operational (green symbols), and those that are proposed in the Capital II Wind Farm (mauve symbols).



Five species contributed to just under 90% of the activity around the operational wind farm (Table 1), including the Southern Forest Bat, the Southern Freetail Bat, the White-striped Freetail Bat, Gould's Wattled Bat and the two Longeared Bats (Lesser and Gould's) that are known from the area but are inseparable to identify by their calls.

The majority of species were common throughout the region and not considered in any threat category, with the exception of the Eastern Bentwing Bat. This species is listed in the NSW Threatened Species Conservation Act

HABITAT ASSESSMENT

Most of the turbines that are proposed for the Capital II Wind Farm will be placed in areas where the habitat is open pasture, and for this reason a coarse analysis of the bat activity in this was compared with that in woodland.

Nineteen night of survey were conducted in March (9 nights) and April 2010 (10 nights). The average number of calls per night in open areas ranged from 8.6 to 28.4 (4 sites) compared with a range of 25.4 to 56.7 (6 sites) at sites with woodland, mainly in the Hammond Hill area. This is a pattern similar to other areas in southern Australia, where open pasture is relatively poor habitat for bats. Combined with less activity, there were also less species present when compared with woodland sites (Table 2).

Table 2: Location of baseline monitoring sites at the Capital II Wind Farm.

Site	Commencement date	Latitude	Longitude	Turbine nearby
1	9-Mar-10	-35°09.711	149°30.829	
2	9-Mar-10	-35°09.733	149°31.260	
3	9-Mar-10	-35°10.181	149°30.957	55
4	9-Mar-10	-35°10.536	149°30.787	60
5	9-Mar-10	-35°10.702	149°30.962	
6	31-Mar-10	-35°10.307	149°30.925	56
7	31-Mar-10	-35°10.807	149°31.054	63
8	31-Mar-10	-35°10.632	149°30.935	
9	31-Mar-10	-35°09.511	149°31.369	48
10	31-Mar-10	-35°09.641	149°30.689	

THREATENED SPECIES

The Eastern Bentwing Bat has become a focus species at wind farms in Southeastern Australia, with a major concern being its migration behavior when dispersal from the maternity site to staging caves and wintering roosts occurs during the period February to April each year. Of relevance to the Capital II Wind Farm is that there is the potential for groups of Eastern Bentwing Bat to migrate across the project area when it disperses from its breeding cave at Wee Jasper (where up to 30,000 of them can be present) to wintering caves in the Great Dividing Range or South Coast NSW. The Wee Jasper cave is approximately 70 km west of the wind farm, and Mount Fairy is approximately 10km to the east (Figure 2).

Figure 2: Approximate location of the Eastern Bentwing Bat breeding cave at Wee Jasper (red dot) and a staging or overwintering cave at Mount Fairy (yellow dot) in relation to the Capital II Wind Farm on the eastern edge of Lake George.



Until recently, it has not been known whether migration occurs in large groups or whether small numbers of individuals leave each night over a longer period, but there is some indication (based on around 7000 departing in a one week period²) that large groups leave in roughly the same time period.

² Dr D. Mills, pers. comm.

The Wee Jasper population occupies numerous caves in winter, so not all of the breeding colony would pass through the wind farm. Some insight into the potential patterns can be gleaned from the late summer 2010 survey data mentioned above, which was timed for the dispersal period of March-April. The Eastern Bentwing Bat was recorded in very low numbers compared with most other species. A total of 11 positively identified calls were recorded during the March 2010 sampling, or 23 if all of the 12 calls that could not be separated between it and the Large Forest Bat are included. By April, only one call was positively identified, or three if two inseparable calls were included. Hence, during the migration period, it appears that at least in 2010, very few Eastern Bentwing Bats passed through the wind farm site.

POTENTIAL IMPACTS OF THE PROPOSAL

The major turbine areas at the Capital II Wind Farm comprises two groups, one of about 10 and another of about 18, in roughly a north-south alignment along the shore of Lake George (Figure 1b). The habitat in this area is open pasture, the nearest woodland is at Hammonds Hill (Figure 3). From the coarse analysis above, it can be expected that there would not be a high level of bat activity throughout the year in this area.

However, if the turbines are viewed as an “obstruction” of sorts to large numbers of migrating Eastern Bentwing Bats, should groups opt to travel directly to Mount Fairy, then this may be of concern in the conservation of this threatened species.

Consequently, it would be prudent to monitor the area where the two large turbine groups will be constructed, at the relevant time of the year when bats are dispersing to wintering caves. Monitoring is already being carried out at the existing wind farm facility, and it was recommended that the survey area be extended so that additional sites are monitored in the Capital Wind Farm II project area.

Figure 3: Southern portion of the Capital Wind Farm project area, showing the tract of woodland on Hammonds Hill surrounded by cleared open pasture. A new area of turbines that may be of concern is also highlighted.



DIRECTOR-GENERAL AND OTHER AGENCY REQUIREMENTS

Documents from consent and advisory agencies require the following points to be addressed in relation to the bat fauna at the proposed wind farm. These include:

- A complete bat fauna survey
- A survey of hollow-bearing trees in the impact areas
- An assessment of the potential loss of foraging habitat for Eastern Bentwing Bats
- Address any potential issues with the following threatened species ("subject species"):

Eastern Falsistrelle (*Falsistrellus tasmaniensis*)

Eastern Bentwing Bat (*Miniopterus schreibersii*)

Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*)

Greater Long-eared Bat (*Nyctophilus (timoriensis)* now *N. corbeni*)

Large-footed Myotis (*Myotis macropus*)

Greater Broad-nosed Bat (*Scoteanax rueppellii*)

- Potential for blade strike or barotrauma³
- Factors of Assessment (7-Part Test of Significance)

IMPACT ASSESSMENT

Bat Fauna Survey

A number of bat fauna assessments of the project area have been already conducted, including a preliminary desktop assessment (Greg Richards and Associates Pty Ltd, 2005), the development of an operational bat management plan (Greg Richards and Associates Pty Ltd and Brett Lane and Associates Pty Ltd, 2009), and an extensive field assessment (Greg Richards and Associates Pty Ltd, 2010).

The 2010 field study showed that during 90 detector-nights of sampling, which generated a total of 2882 identifiable bat calls, ten species were present in the project area (Table 1). Only one of the subject species, the Eastern Bentwing Bat, was recorded in the project area, but activity was very low in comparison to other species. Only 12 calls (or 26 if those that were not distinguishable from Forest bats are also included) were recorded. Further, the survey was deliberately timed for March-April 2010 to coincide with the time that this species disperses from the breeding cave at Wee Jasper, NSW. That the project area is poor bat habitat, being

³ "... impact of the project on birds and bats from blade strikes, low air pressure zones at the blade tips, and alteration to movement patterns resulting from the turbines must be assessed, including demonstration of how the project has been sited to avoid and/or minimize such impacts" (DECCW)

relatively barren with just a small tract of woodland, explains why the bat community is depauperate in threatened species.

Potential Issues with Threatened Species (“Subject Species”)

Only one species listed in the NSW Threatened Species Conservation Act was recorded on the site. An assessment of all threatened species considered to have the potential to be present in the project area is shown in Table 3.

Table 3: An assessment of threatened species considered to have the potential to be present in the project area.		
Subject species	Site activity (proportion of the 2882 calls recorded in detector survey)	Comments and Assessment
Eastern Falsistrelle	0.0	No suitable habitat is present in the project area, species requires tracts of forest for foraging and tree hollows for roosting
Eastern Bentwing Bat (EBB)	0.4 (0.9 if potential EBB calls are included)	No suitable habitat is present in the project area, but there is some potential for part of the breeding colony at Church Cave (70 km to the west) to pass through the project area if it takes a direct flight to a staging cave at Mount Fairy (10 km to the east of the site). This did not appear to occur during the 2010 dispersal period.
Yellow-bellied Sheathtail Bat	0.0	No suitable habitat is present in the project area, species requires large tracts of forest for foraging and tree hollows for roosting
Greater Longeared Bat	0.0	No suitable habitat is present in the project area, which may also not be within its distribution range. “Overall, the distribution ... coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species ⁴ . Further, foraging habitat is considered to be primarily woodland and mallee.
Large-footed Myotis	0.0	Suitable habitat likely to be present in the project area when Lake George is fully inundated, when this species may forage along the shoreline. However, because preferred habitat is water bodies with edge vegetation, the open nature of the shoreline may no be suitable.
Greater Broadnosed Bat	0.0	No suitable habitat is present in project area, species requires tracts of forest for foraging and tree hollows for roosting

⁴ <http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10568> (accessed 24 September 2010)

Survey of Hollow-Bearing Trees in the Impact Areas

The area destined for turbines is completely open pasture land, devoid of any trees at all (Figure 4).

Figure 4: General landscape of the Capital Wind Farm II project area, showing the lack of bat habitat.



An Assessment of Foraging Habitat for Eastern Bentwing Bats

In the project area there is only poor foraging habitat for this species. Foraging habitat for this species is generally recognised to be primarily forest or woodland, though Hoyer and Hall (2008) consider it to be “open areas and above tree canopy, as well as along watercourses” and Churchill (2008) also includes grasslands, “where flight may be within a few metres of the ground”.

Potential for Blade Strike or Barotrauma⁵

The assessment of potential blade strike is difficult because it is well recognised that many bats are aware of turbine blades as they fly near them (Kunz). However, the high speed of blades at their tip appears to cause problems to such small (10-20g) flying animals that become trapped in the vortices and the vacuum within them. Many of the carcasses that have been collected during regular search programs do not have visible injuries (Dr Khalid Al

⁵ “... impact of the project on birds and bats from blade strikes, low air pressure zones at the blade tips, and alteration to movement patterns resulting from the turbines must be assessed, including demonstration of how the project has been sited to avoid and/or minimize such impacts” (DECCW)

Dabbagh, Brett Lane and Associates Pty Ltd, pers. comm.), indicating that they have probably suffered from decompression. Others carcasses though definitely show indications of collision (tissue damage, broken wings, etc) (Kunz 2007; G. Richards, pers. obsns.).

Horn *et al* (2008) studied bat activity around wind turbines at a facility in Virginia USA, where hundreds of migrating bats had collided with turbines. The turbines are located along a forested ridge, and activity was monitored with thermal imaging cameras. Out of 998 bat observations of bats interacting with turbines, 41 avoidances (4.108%) were observed and five collisions (0.501%) were recorded. In the remaining 952 observations, bats flew around the blades or investigated them. Whether or not these figures would apply to an Australian situation is unknown, an extrapolation of the US activity may give the only possible indication of the potential for fatalities at the Capital II project.

A “worst-case” scenario for Eastern Bentwing Bat Collisions

One way to gain an insight into the potential fatalities of Eastern Bentwing Bats through collision with turbines in the project area, is to extrapolate data from several sources. The level of activity in open or partly wooded habitat at the adjacent Capital Wind farm was known from monitoring conducted in March (9 nights) - April 2010 (10 nights). Four sites were in this habitat category, but EBB were only recorded from two of them. As mentioned above, it is at times difficult to separate EBB calls from forest bat calls, so for the purposes of this analysis, such calls were included in the data from the four open habitat sites.

The collision rate of 0.5% was taken from the thermal imaging study of bat interactions with turbines conducted by Horn *et al* (2008) at a forested wind farm site in the USA. The potential for interaction with turbines was extrapolated by using the total number that have been proposed for Capital Wind Farm II (53, see Figures 1 a and b), but it is doubtful that each turbine would be approached by bats every night. The total number has been used for a “worse-case” analysis but is likely to produce an over-estimate. The number of nights that bats could be active (273) have been calculated for the period from early Spring (September) to late Autumn (May) each year but does not account for nights when bats would be inactive through rain or strong winds. This would also produce an over-estimate. Calculations and extrapolations are shown in Table 4.

Table 4: A “worse-case”-scenario for potential collisions of Eastern Bentwing Bats with turbines in the project area. Call data was taken from open habitats or those with scattered trees sampled in March – April 2010. The collision rate (0.5%) was taken from the thermal imaging study of Horn <i>et al</i> (2008) in the USA.	
Total Eastern Bentwing Bat calls in 38 survey nights	3
Average number of calls per night	0.07895
Estimated number of collisions at 0.5% of interactions with turbines	0.00039
Multiplied by 53 turbines in proposal	0.02092
Multiplied by total nights from September to May (273)	5.71145
Estimated number of fatal collisions per year, assuming that all turbines would be encountered, and that bats would be active every night	6

Table 4 shows that it is possible that six Eastern Bentwing Bats per year could be killed by collision with turbines in the proposal or through barotrauma. Although this number is an undoubtedly an over-estimate, it would not present a significant impact upon the breeding population centred upon Wee Jasper each year.

7-PART TEST OF SIGNIFICANCE

- a)** *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*

The absence of any threatened species in the project area, with the exception of the Eastern Bentwing Bat (EBB), indicates that there will be no impact on their life cycle. The low level of activity of the EBB on the site suggests that very few individuals were present on the site at the time of survey (the breeding cave dispersal period), a very small proportion of the local population.

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

There are no endangered populations, listed on Part 2 of Schedule 1 of the TSC Act, within the project area.

- c)** *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*
- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
 - (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

There are no endangered ecological communities, nor any critically endangered ecological communities listed under the TSC Act, in the project area.

- d)** *In relation to the habitat of a threatened species, population or ecological community:*
- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
 - (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
 - (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,*

The only habitat in the project area is open pasture land. Apart from some disturbance due to erection of the turbines and constructions of access roads, no habitat will be removed, modified, fragmented or isolated.

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

No critical habitat is present in the project area.

- f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan*

It is understood that there are no formal recovery plans nor threat abatement plans *per se* for the EBB. However, DECCW list a total of ten “strategies to help recover this threatened species⁶”, which takes the form of a Threatened Species Priorities Action Statement. None of these actions relate directly to the wind farm proposal and do not include management of pasture land habitat.

- g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

The proposal does not constitute part of a key threatening process as listed on Schedule 3 of the TSC Act.

CONCLUSIONS

1. Capital Wind Farm II will be constructed in habitat (tree-less open pasture) that is renowned as being very poor for bat foraging and provides no roost sites for tree dwelling or cave roosting bats.
2. The low level of Eastern Bentwing Bat activity at the adjacent operational Capital Wind Farm, especially in open habitats there, suggests that this species is unlikely to regularly use the Capital Wind Farm II area.
3. Conclusion 2 was supported by extrapolating data to build a “worse-case” scenario, which indicated that less than 10 Eastern Bentwing Bats per year could be killed by all 53 turbines in the proposal.

⁶ http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/pas_profile.aspx?id=10534
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