NSW GOVERNMENT | Office of Environment & Heritage

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SSD 6686

Planning Services
NSW Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Attention: Executive Director – Resource Assessments and Business Systems

Bango Wind Farm – Environmental Impact Statement 2016 – OEH submission

The Office of Environment and Heritage (OEH) submits the following review and recommendations for the 2016 Bango Wind Farm Environmental Impact Statement (EIS), Appendix A12 Ecological Assessment and Appendix A13 Archaeological and Cultural Heritage Assessment.

Recommendations

Prior to submitting the proposal for approval, the proponent:

- Refine the infrastructure layout using all available and required biodiversity data, and remove the turbines with the highest risk of potentially significant impact on threatened and at-risk species.
- Provide adequate responses to all of the biodiversity issues raised by OEH in our adequacy review in 2013, including re-running the BioBanking Assessment (see Attachment 1).
- Provide additional information related to Aboriginal cultural heritage management as detailed in Attachment 2.

History

OEH has previously raised a number of concerns about the potential impacts of this proposed development on biodiversity and Aboriginal cultural heritage. Please refer to our Adequacy Review of the draft Environmental Assessment (EA) against the Director-General's Environmental Assessment Requirements (DGEARs), submitted to the Department of Planning and Infrastructure on 20/06/13 (appended here in Attachment 1 for your information). In that 2013 submission, we advised that the EA does not adequately address the DGEARs.

Biodiversity

OEH notes that the Ecological Assessment that has been appended to the 2016 EIS has not been updated since our 2013 adequacy review. However we understand that additional survey, mapping and data analysis has been undertaken since then to target some of OEH's major concerns, including mapping of Superb Parrot flight paths and Golden Sun Moth habitat, along with analysis of impacts on hollow-bearing trees. However, OEH understands that the supplementary work does not

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address all of our concerns, so there are still issues which the proponent must address prior to approval, to ensure the assessment has met the requirements of the DGEARs.

OEH recommends that the proponent incorporates all biodiversity survey data collected to date, into the final design for the Bango Wind Farm. Areas of high use by threatened fauna at risk of blade-strike should be omitted from the infrastructure layout, particularly known and potential Superb Parrot breeding habitat (hollow-bearing trees), flyways and high use areas. We note that six Wedge-tailed Eagle nests are mapped on the site and recommend 500m buffers around each nest to reduce the likelihood of blade-strike of fledglings and adults defending nests. The currently exhibited layouts would have a heavy impact on known and optimal habitat of Golden Sun Moth, which will be difficult to adequately offset.

As indicated in the original DGEARs the cumulative impacts of wind farms in this region must be addressed. In particular the cumulative loss and fragmentation of Superb Parrot breeding habitat (hollow-bearing trees) along high conservation roadsides and within the project boundary, and the cumulative impacts of blade-strike on the 'at-risk' Wedge-tailed Eagle, an essential top-order predator in the region. Cumulative losses of Box-Gum Woodland Endangered Ecological Community and Golden Sun Moth habitat in the region must also be considered.

Based on our current understanding of the biodiversity values on the site, we recommend that a number of turbines should be removed from the development, most of them in the Langs Creek turbine cluster. This would assist in avoiding impacts in areas of concentrated Superb Parrot activity and optimal Golden Sun Moth habitat, both of which are listed as threatened in NSW and Commonwealth legislation.

BioBanking

In 2013, OEH raised concerns about the calculations of the offset requirements using the BioBanking Assessment Methodology (BBAM), including the location of survey plots, removal of some ecosystem credit species, calculation of offset ratios. We recommend that the proponent consult with OEH to determine what additional plots must be surveyed, and re-run the credit calculator encompassing any changes to the development footprint following EIS exhibition.

Aboriginal cultural heritage

We note that the majority of the concerns raised in our 2013 submission have been addressed in the 2016 EIS. However, correspondence from registered Aboriginal stakeholders regarding the project has not yet been provided.

We recommend that the management and mitigation strategies outlined in section 11.5 of the EIS and in the revised Statement of Commitments are followed. Further recommendations regarding Aboriginal cultural heritage values are detailed in Attachment 2.

If you have any queries regarding the issues raised in this letter please do not hesitate to contact us at rog.southeast@environment.nsw.gov.au.

Yours sincerely

Allison Treweek

ALLISON TREWEEK 28/11/16
Senior Team Leader, Planning
South-East Region

Contact officer: VIRGINIA THOMAS
6229 7105

Attachment 1 – OEH review of the draft Bango Wind Farm EA for adequacy against the Director-General's Environmental Assessment Requirements (DGEARs) (20/6/13)

Your reference: MP11_0039
Our reference: DOC13/26154
Contact: Virginia Thomas
6229 7105

Attention: Alison Nash

Neville Osborne
Team Leader - Energy
Major Projects Assessment
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Mr Osborne

I refer to your letter dated 30 May 2013 and the enclosed draft *Bango Wind Farm Environmental Assessment* (EA) regarding the proposed 122 turbine wind farm near Boorowa.

As requested, OEH has completed a review of the draft EA for adequacy against the Director-General's Environmental Assessment Requirements (DGEARs) issued for the project and these comments are provided in the following attachments:

- Attachment A provides detailed comments on Biodiversity impacts of the development.
- Attachment B provides detailed comments on Aboriginal heritage matters.

Summary of comments on Biodiversity impacts:
OEH considers that the proponent has underestimated the impacts of this proposed development on an Endangered Ecological Community (EEC). The DGEARs have not been adequately met for many threatened species, including Superb Parrot and Golden Sun Moth, and OEH requires further information from the proponent in order to be able to fully assess the impacts of the proposed development. OEH has a number of concerns about the offsetting calculations in the BioBanking Assessment Report, and requires the tool data be provided in order to assess it properly.

Of particular concern to OEH is that the likely cumulative impacts of all the proposed wind farms in the vicinity of Bango Wind farm are considered in the draft EA. OEH consider it essential to address this matter with particular attention to the collective impact of the large number of turbines that will be operating within the area (should all three wind farm proposals be realised) upon the regionally significant population of the threatened Superb Parrot and other threatened bird species. OEH would appreciate the opportunity to discuss these issues with staff from the Department of Planning and Infrastructure.

Summary of comments on Aboriginal Cultural Heritage impacts:
OEH notes that some areas of the proposal were not surveyed as part of the Aboriginal heritage assessment. OEH is concerned with proposals to undertake further heritage assessment after Project approval, due to the reduced capacity to consider all Aboriginal heritage values, including cumulative aspects, up front and thereby allow for appropriate consideration of management measures prior to proposed impacts.

OEH is also concerned that the draft statement of commitments do not adequately incorporate the Aboriginal cultural heritage recommendations in the draft EA so as to formulate appropriate management and mitigation measures for the Aboriginal cultural heritage values recorded to date and any new Aboriginal cultural heritage values that be subsequently recorded following any additional archaeological survey that may be required.

OEH is happy to discuss these comments further with the Department of Planning and Infrastructure and the proponent, including any on site meeting. Please contact Virginia Thomas on 02 6229 7105 in regard to obtaining further input on this matter from OEH.

Yours sincerely

Allison Treweek 20/6/13

ALLISON TREWEEK
A / Senior Team Leader, Planning – South-East
Regional Operations Group
OFFICE OF ENVIRONMENT AND HERITAGE

Enclosure:

Attachment A - Office of Environment and Heritage Adequacy Comments on Biodiversity for the draft Environmental Assessment for the *Bango Wind Farm.*

Attachment B - Office of Environment and Heritage Adequacy Comments for Aboriginal Heritage on the draft Environmental Assessment for the *Bango Wind Farm.*

ATTACHMENT A

OEH BIODIVERSITY COMMENTS ON THE DRAFT ENVIRONMENTAL ASSESSMENT

BANGO WIND FARM

The following comments refer to the Bango Wind Farm Environmental Assessment (EA) and Appendix 12 Ecological Impact Assessment (EIA), and whether they adequately meet OEH's Director-General's Environmental Assessment Requirements (DGEARs) and OEH's updated survey requirements (letter 19/7/12). An assessment of the BioBanking Assessment Report (BBAR) – Annex H of the EIA is also provided.

Endangered Ecological Communities (EEC)

OEH considers that the proponent has not adequately assessed the impacts of this proposed development on EEC. The EIA does not include low condition Apple Box-Yellow-Box as EEC - e.g. Table 5.6 (p.82) should be amended to include the 469.57ha of low condition Box-Gum Woodland as EEC under the TSC Act. Condition is not a factor in determining if the community is an EEC under the TSC Act, though is a factor in how the community is treated under BioBanking. This error is carried through all calculations of impact on EEC and must be amended, e.g. the EIA states (p.86) that 45.52ha of EEC occurs in the permanent development footprint, but the figures in Table 6.5 (p.134) clearly show that 101.44ha of EEC occurs in the development footprint, 83.63ha of permanent impact, 17.81ha temporary impact.

OEH has previously provided advice that "temporary" impacts in Box-Gum Woodland may be very difficult if not impossible to rehabilitate, so all impacts should be considered to be permanent in this EEC. OEH requests further information on the cause, magnitude and longevity of these impacts in order to assess whether they can be considered "temporary".

Habitat Loss

The approach used in the EIA to determine the area of 'habitat' to be impacted is inappropriate. The assessment relies on coarse habitat 'types' when assessing impacts on individual species – native grassland, native woodland, and exotic grassland (Table 6.6, p.137; and Table 5.9, p.91).

The method used in calculating the area of habitat in each of the coarse habitat types has resulted in an underestimate of the extent of available habitat. For example, the area of native woodland within the study area is shown as 166.78ha in Table 6.6. However, only woodland in moderate-good condition has been included in this figure. There is an additional 708.29ha of low condition woodland within the study area, much of which is likely to provide fauna habitat. Habitat quality will vary dependent on the requirements of individual species and does not necessarily coincide with vegetation community condition classes. This should be discussed and considered in the assessment.

The methodology used in determining habitat extent has resulted in a gross underestimate of the area of habitat to be removed by the proposal. For example, the assessment states that only 8.62ha of native woodland will be cleared. This figure represents the area of woodland in moderate-good condition to be cleared. As shown in Table 6.5 (p.134), an additional area of 70.92ha of low condition woodland will be cleared. OEH requests further information to support the inclusion of low condition Box Gum Woodland (EEC) and low condition Red Stringybark Open Forest in the Exotic Grassland category as listed in Table 5.9 (p.91 EIA). The Exotic Grassland category also contains paddock trees, a significant fauna habitat component (p.93).

Fauna habitat quality was assessed as high, medium or low quality (p 52-53), but the results of this assessment do not appear to have been provided. There is a need to document the extent and condition of available habitat for each threatened species (or groups of threatened species where these have identical habitat requirements). Habitat maps (including areas of different habitat quality) for each species should be provided (as per updated OEH advice).

Offset calculations and BioBanking Assessment

OEH has a number of concerns about the offsetting calculations in the BioBanking Assessment Report (BBAR) – Annex H of the EIA - and requests that the tool calculations be provided for OEH to review. The BBAR does not provide adequate information regarding the assumptions and decision which have been made when entering the data into the biobanking tool. There is very little information in the BBAR regarding how the calculations were made, what impacts were used in which circles and if different management zones were applied to each vegetation zones or threatened species sub zone. This information along with maps showing location of the site data should be include in the BBAR is order for the offset to be adequately assessed. OEH requests further information to explain how the offset ratio has been derived, given the list of species predicted to occur in Table 4.2 of the BBAR. Many of these species require a far greater offset ratio than the 2:1 ratio proposed. Some of the vegetation types used in the BBAR are considered to be red flag areas, which in OEHs' experience normally require an offset ratio larger than a 2:1 offset, especially considering these areas are in moderate to good condition and in some instance meet the EPBC definition of Box gum woodland.

The BBAR states that temporary impacts have not been assessed using BBAM. Please see our comments in the EEC section regarding temporary impacts in BGW EEC.

Connectivity (Section 4.2)

The report says connectivity would not be severed, but it makes no comment on a reduction in connectivity value. However it is clear that the condition of connectivity will be significantly reduced once the roads, pads and transmission lines are constructed. OEH requests that the details of the BioBanking Credit Calculator (BBCC) be sent to us for analysis to ensure the impact on connectivity has been correctly assessed.

Removal of Ecosystem Credit Species (Section 4.8)

A comment is made that Ecosystem Credit species can be removed if surveys don't locate them on site. Removal of species with ecosystem credits requires significant justification and a report needs to be prepared demonstrating that suitable habitat is not currently present and that such species have little prospect of using habitat at the site in the foreseeable future.

Transmission lines

Assessment of partial loss was discussed for one section of transmission line. It was stated that partial loss assessment was not possible for other section of transmission line due to complexity of Veg Zones. How has this loss been assessed – as total loss, or was it assessed as no loss?

Woodland Birds

More detail is required on the methods, timing, and results of bird surveys. Bird Utilisation Surveys (BUS) were undertaken at 20 sites between November 2012 and February 2013. These surveys were timed to 'capture data during the Superb Parrot breeding season (p.161 EIA)'. No information is provided on the breeding activity of Superb Parrots in the local area over this timeframe. Detail is required on the methods used in determining the location of the BUS, the characteristics of each site, and the numbers of sites within each stratum (expand on p.60). The results of the BUS must be reported in detail, particularly in relation to the bird communities documented at each site. Further analysis of BUS results is required, particularly in relation to differences in the bird community between sites and the influence of habitat characteristics on any differences. More detailed comparisons of the results of the BUS with other studies are required, particularly in relation to reported flight heights.

Surveys for woodland birds were undertaken at 17 sites (p.63 EIA). Comments made in relation to the BUS are also applicable to these surveys. OEH notes that the woodland bird survey methodology did not accord with that detailed in the updated survey requirements. A mix of point and transect methods appear to have been employed, rather than the recommended fixed area searches. Surveys were repeated once, rather than twice, and it is not clear as to the time period between surveys. OEH is concerned by the lack of survey effort in patches of habitat adjacent to the defined study area, as detailed in the updated survey requirements. This latter information is important in determining the nature and health of the local woodland bird population and in allowing impacts at particular sites to be adequately assessed. The adequacy of the woodland bird survey effort cannot be assessed until the requested additional information is provided.

The assessment of impacts on woodland birds is constrained by a lack of information and analysis of the extent and condition of woodland bird habitat in the locality, the spatial configuration of this habitat, and changes in these parameters as a result of the development. For example, no detailed information has been provided on the extent to which clearing associated with the development will reduce the size of existing patches or result in the isolation of patches. No information is provided on the potential for clearing associated with the development to reduce the available habitat below thresholds which might threaten the viability of local populations of woodland birds. Cumulative impacts as a result of other developments in the region need to be considered.

Superb Parrots

Nest trees

OEH's updated survey requirements call for all potential nest trees within 500m of proposed turbines to be monitored for evidence of use by nesting Superb Parrots on at least two occasions (30 days apart) during the breeding season, with known nests used to get the timing right. The updated requirements also state: "*Nest surveys and targeted searches for Superb Parrots must be undertaken throughout the local area during the breeding season, with the objective of identifying foraging areas and flight paths, particularly those that may be negatively impacted by the development. Superb Parrot habitat in the local area, including potential habitat (e.g., paddocks that may be cropped in subsequent years), must be mapped.*"

The EIA states that the information gained from intensive hollow bearing tree (HBT) surveys (within 500m of proposed turbine locations) was used to map the breeding habitat of Superb Parrots (p.57), but no mapping is provided. The tree hollow survey was undertaken late in the breeding season (p.69) and it is not clear how potential nest trees were defined. It is unclear what methods were used to ascertain the presence of nesting birds. It appears no nest surveys in the wider area were undertaken. On this basis, the updated survey requirements for this species have not been met in relation to the identification of nest sites and breeding habitat.

The EIA states that 449 HBT were mapped within 500m of turbines, all of which are "available to the Superb Parrot" (p.173). However, section 5.5.4 (p.94) indicates that these trees contained 1,237 hollows of different sizes, not all of which will be suitable for Superb Parrot breeding. The EIA does not provide details on the suitability of hollows in the 15 HBTs which are to be removed. OEH requests further detail and mapping of hollows that are to be removed and retained, in relation to suitability for and use by Superb Parrots.

Varying extents of Superb Parrot habitat loss are provided: 3.34 ha (p. 185 EA) and 6.58 ha (p. 137 EIA).
OEH requests the correct figures and mapping.

Flight paths

Mapping of Superb Parrot habitat and flight paths was a requirement of the updated survey requirements. This mapping was to be informed by nest surveys and targeted searches. These have not been completed. Superb Parrots were included in other diurnal bird surveys (BUS and woodland birds), and incidental records were made in the course of other field work. Full use has not been made of this data in terms of mapping habitat and identifying movement pathways. The assessment notes that Suburb Parrots were typically observed flying between foraging areas (p.104), but these flight paths have not been documented.

Neither the EIA nor the EA presents any mapping or data on seasonal use or flyways, but the EIA notes (p.125) that: "one WTG was removed due to its high potential of being within the flight path of the Superb Parrot." OEH requests the flight path assessment and mapping information that has been used to designate areas "that have a high potential of being within the flight path of Superb Parrot" (Table 6.2, p.125 EIA).

Cumulative Impacts

An assessment of the cumulative impacts arising from the construction of multiple wind farms in the region was specifically requested. The assessment notes that four other wind farms are approved or proposed for the area, which is recognised as a key site for Superb Parrots (EIA p. 151). However, the section on cumulative impacts makes no attempt to determine the level of cumulative effects, and the impact this may have on the species.

Collision Risk

The collision modelling for Superb Parrots has been undertaken for November to February, apparently because this is when data were available from the BUS surveys. No information was presented on the timing of breeding during the 2012 season, and it unclear if Superb Parrots were recorded during other months (e.g., September, October). Limiting modelling to a single period (late in the breeding season) may underestimate the potential for collisions at other times (e.g., early in the breeding season, or during periods when birds are arriving or departing the area). It also does not allow for changes in behaviour or the timing of activities between years. Data from other sources (e.g., other wind farm assessments) should be used to inform the assessment of collision risk.

In the absence of the requested information, an informed assessment of the impacts of the development upon Superb Parrots cannot be made. This is recognised in the assessment, which states "The potential impacts to the Superb Parrot are not yet known and hard to predict as this species' movement patterns and use of the Study Area are not fully understood (EIA p. 124 / EA p. 190)." The updated survey requirements were specifically aimed at ensuring this information was available to inform the assessment. OEH considers that the EA and EIA do not adequately provide an assessment of the potential impacts of the turbines on the local Superb Parrot population.

Hollow bearing trees (HBT) and Bats

The EIA states that 449 HBT were mapped within 500m of turbines, and the Assessment of Significance (p.F33 - Appendix F of EIA) records 485 HBT within the study area; OEH requests clarification on these different figures.

The EIA refers to a tree hollow survey (section 4.9.2, p.68) and a stag-watching survey (section 4.7.6, p.65). OEH requests the details and results of these surveys, which were not presented in the EIA or on the fauna survey effort maps. The DGEARs require stag-watching or observations of roost sites in HBTs for several species including: Gang Gang Cockatoo, Glossy Black-cockatoo, Superb Parrot, Eastern False Pipistrelle, Eastern Bentwing-bat, Greater Broad-nosed bat, Yellow-bellied Sheathtail-bat and Greater long-eared Bat; these techniques may also be useful for identifying Barking Owl, Powerful Owl and Squirrel Glider.

OEH notes that three records of threatened bats were in close proximity to turbines. Chapter 10 of the EA states (p.188) that "*Measures to prevent bat strike wherever possible will be implemented, including (where practicable) ensuring wind turbines are located no closer than 30m from hollow-bearing trees.*" OEH strongly rejects this as an effective distance to avoid bird or bat strike. Guidelines from overseas recommend buffers around important habitat features like HBTs, into which no part of the turbine intrudes. For example, in England, a buffer of 50m from the top of each tree to the tip of the turbine blade is recommended, requiring a calculation $\mathbf{d=\sqrt{((50+bl)^2 - (hh-th)^2)}}$ based on blade length (bl), hub height (hh) and tree height (th) (www.naturalengland.org.uk). The smallest turbine mentioned in the EA is 80m high, 37m blade and the largest is 120m high, 72m blade. If this formula and these figures are used, the distance between the turbine and a 20m tree should be between 63 and 70m. In light of the threatened species occurring on this site, OEH recommends distances greater than the proposed 30m between turbines and HBTs.

In late spring and summer (when the surveys were carried out at Bango) Eastern Bentwing-bat (EBB) colonies use maternity caves, and the species is particularly at risk within 30km of those caves at that time (the closest known cave is 55km SW of the Bango site). In autumn, the EBB disperses up to 300km from those caves so the value of the habitat at Bango for migrating bats is of particular interest to OEH. OEH stresses the importance of an adequate Bird and Bat Monitoring Plan to be prepared by the proponent in consultation with OEH and approved by OEH's Chief Executive prior to construction.

OEH does not consider the replacement of HBT with artificial hollows to be an adequate mitigation measure, nor is moving felled HBT into adjacent habitat, which may cause further damage to EEC.

Diurnal Birds of Prey and Collision Risk Modelling (CRM)

Several records were obtained for diurnal birds of prey, though the contribution made by different survey methods to this tally is not clear. The timing of the BUS was suboptimal in terms of recording soaring raptors, and is likely to have resulted in birds and species going undetected. More detail on the BUS results should be provided, including reporting on the distance of birds from the observation point and behaviour.

As applied, the collision risk models assume that all birds flying within the rotor area have been detected by the surveys undertaken. For example, a single Little Eagle was detected flying at rotor height in 5.75 hours of survey. This was then used to calculate risk for the month in which this bird was observed. In months when no birds were detected, the risk was assumed to be zero. In reality, a number of factors mean that the number of birds at risk is likely to be underestimated. The number of birds recorded at observation points will be underestimated due to the seasonal nature of the surveys, the possibility that some surveys were undertaken at times of the day when birds would have been grounded (e.g., early morning), and the limited survey effort. In addition, the methodology does not include a spatial component and does not allow for the potential for birds to be attracted to turbines.

Collision rates only have meaning in terms of the impact on population size and demographics, for which no objective data was presented. Important data on Wedge-tailed eagle and Little Eagle populations was requested as part of the updated survey requirements, but this was not provided. The presence of several Wedge-tailed eagle nests in the area was reported, but no information on the number and spatial distribution of territories for either species was provided. All of the located eagle nests are situated in close proximity to turbines, potentially placing the occupants at increased risk of collision. Importantly, it appears that preferred (available) nesting habitat overlaps considerably with the wind farm, suggesting that a high proportion of nesting birds might be similarly at risk. Deleting turbines in close proximity to known nests was not canvassed as a mitigation measure, though used in the case of heightened risk to Superb Parrots at one location. OEH requests a map indicating which of the six Wedge-tailed Eagle nests was active during the survey period, and specification of the distances between each nest tree and infrastructure. The standard buffer distance is greater than 500m.

The EIA states that 99% avoidance is the most realistic avoidance rate for Wedge-tailed Eagles (p 144): "*The number predicted under the 99% avoidance rate is considered negligible when compared with the total number of individuals recorded during the surveys (~0.28 % of 1 individual). The impact of collision to this bird species is therefore not considered adverse.*" OEH notes that the CRM was based on work by Smales *et al* (2005) [note: should this be Smales and Muir (2005)?] but queries whether this provides an adequate prediction of collision risk at Bango. Further work by Smales (2010) and advice by expert ornithologists indicate that this avoidance rate too low for Wedge-tailed Eagles (e.g. McMahon 2010, Menkhorst 2010), and an avoidance rate of 90% is considered more likely for this species in Victoria. As the difference in predicted mortality is an order of magnitude higher at 95% than at 99%, OEH requests that the collision risk modelling be redone at 90% avoidance. This is of particular concern in light of cumulative impacts of neighbouring proposed wind farms.

OEH acknowledges the statement in the EA (p191): "*Of particular concern is the Wedge-tailed Eagle which is considered to be a species that is particularly susceptible to the impacts of wind farms due to the loss of large trees used as breeding habitat and death or injury from rotor collisions. Although significant cumulative impacts on the common non-threatened mainland form of the Wedge-tailed Eagle could occur, evidence indicates that it is unlikely, particularly given the species' abundance throughout NSW.*" As an important higher order predator in this landscape, OEH stresses the significance of adequately predicting collision risk impact on the Wedge-tailed Eagle.

Golden Sun Moth (GSM)

Habitat mapping and Surveys

The EA does not adequately provide mapping of potentially suitable GSM habitat or information on suitability, condition and extent of habitat in the locality, as required by DGEARs. OEH requests that the area surveyed for GSM be quantified and a map showing the survey routes be provided. The EIA states that surveys were carried out over 12 suitable days between 10am and 2pm, however the actual dates and times of each survey together with the weather conditions should be provided in order to confirm the adequacy of the survey for this species.

Habitat Extent

For impact assessment and offsetting calculations, the area of GSM habitat to be impacted by the development should be 100.87ha (not 82.48), as it cannot be assumed that areas temporarily impacted or rehabilitated will be suitable for GSM. OEH considers the removal of 100ha of known Golden Sun moth habitat to be highly significant, and further information is required on how these impacts are to be avoided.

Different figures for GSM habitat loss are provided in the EA and EIA, see Table 1; OEH requests that the figures be corrected in the EA and EIA.

Table 1

Description	Extent (ha)	Reference
Permanent loss	82.48	p 184 and 195 EA
Disturbance and rehabilitation (temporary loss)	18.4	p 129 EIA
Total habitat in development footprint	100.87	p 184 and 195 EA
Total impacted area	98.1	p 138 EIA / p185 EA
Suitable habitat in study area	810.2	p. 170 EIA / p 184 and 195 EA
Total habitat in study area	782.57	p 138 EIA / p185 EA

Amelioration

The shading impacts for GSM (including larvae in the soil) have not been adequately addressed and further information and justification on the effects of shading, particularly in areas close to the towers needs to be provided. The area of habitat to be impacted by shading and the duration of the shading should be modelled and quantified. Potential impacts that need to be considered include reduced sunlight for the grassland flora and soil reducing plant vigour, productivity and soil suitability for GSM larvae. The shading may also reduce the area of suitable habitat for adult GSMs to bask and fly. Therefore, the shading effects need to be modelled, mapped and quantified and then areas that may be deemed unsuitable for GSM should be considered a direct impact for amelioration and offsetting.

Reptiles

Striped Legless Lizard (SLL)

The colour of the tiles, the time of day when the tiles are checked and the prevailing weather conditions influence the use of the tiles by the lizards and hence are critical to interpreting the results of this survey technique. OEH requests that these details be provided in order to determine the adequacy of the survey for this species.

Pink-tailed Worm Lizard (PTWL)

The most reliable survey period for PTWL is mid-August to mid-October, therefore the rock rolling surveys conducted for this assessment were outside this optimum period. Justification should be provided for the timing of the surveys undertaken and the survey effort (area surveyed, number of rocks searched) should also be provided in order to determine the adequacy of the survey for this species.

Different figures for habitat extent and loss for these two species are provided in the EA (p. 185) and EIA, (p. 137-38) see Table 2; OEH requests that the figures be corrected (including previously overlooked potential habitat, as per our comments under EEC and Habitat Loss).

Table 2

Species	EA (p 185)		EIA (p 137-38)	
	Total in Study Area (ha)	**Total Area Impacted (ha)**	**Total in Study Area (ha)**	**Total Area Impacted (ha)**
Striped Legless Lizard	380.53	52.5	313	42.69
Pink-tailed Worm Lizard	380.53	52.5	313	42.69

Squirrel Glider and Habitat Fragmentation

The EA states that removal of Squirrel Glider habitat within the Tangamangaroo Road corridor may increase the level of habitat fragmentation for this species by impeding movement (EA p186 / EIA p 150).

OEH seeks clarification on two seemingly contradictory statements in the Assessment of Significance (Annex F of the EIA) relating to a 60m wide easement for overhead transmission lines in EPBC Act Box-Gum Woodland.

> "*The fragmentation in this location is likely to impede the movement of animals north or south of this area. This can be mitigated by retaining suitable trees at approximate 30 m spacings to allow animals to traverse this area"* (p. F48 Annex F).
>
> "*The nature of the easement would allow for retention of the groundcover and low shrub cover which would provide for connectivity of some of the community strata and is unlikely to present a barrier for dispersal of genetic material"* (p. F2, Annex F).

OEH requests a map of the current extent of Squirrel Glider habitat along Tangmangaroo Road and the extent of proposed clearing. OEH also requests further information on the mitigation proposal of retaining trees within the overhead transmission line easement.

The EA and EIA state in several places that removal of woodland "is unlikely to increase the levels of fragmentation within the study area as it is already highly fragmented" (e.g. p 186 EA / p F18, Appendix F EIA). OEH suggests that this comment should either be substantiated or removed.

Cumulative impacts

OEH does not consider that the proponent has provided an adequate assessment of the likely cumulative impacts of all the proposed wind farms in the vicinity of Bango Wind farm. The EA acknowledges that: "*The operation of a number of wind farms in the area is likely to increase the chance of blade strike for birds and bats and has the potential to increase habitat alienation*" (p. 191 EA). And it suggests: "*Impacts are likely to be restricted to highly mobile species and potentially the cumulative loss of vegetation communities across numerous wind farms"* (p. 191).

The EA and EIA do not provide an assessment of likely cumulative impacts, but still contain statements negating cumulative impacts, such as: "*due to careful design, the cumulative impacts associated with the establishment of up to five wind farms within the region (including Bango Wind Farm) has been assessed as low to negligible*" (p. 191 EA). OEH requests that the proponent provide evidence to substantiate this statement. If no assessment is provided, the statement should be removed.

Indirect Impacts

The EIA notes the potential for the windfarm to result in the avoidance of habitat, which essentially leads to a loss of habitat (p. 121). Reduced densities of animals within habitat adjoining the development, either due to avoidance or other impacts associated with construction or operation of the windfarm, have the potential to significantly impact on fauna populations. OEH notes that approximately 27 turbines are located close to or in some cases surrounding intact remnant vegetation the indirect impacts of these turbines has not been addressed within the EA. The proximity of turbines to remnant stands of native woodland/forest and how that alters the likelihood of potential impact on threatened species by collision with turbines should be considered as a direct impact. Whilst there is an acknowledged paucity of data in Australia on the effects of turbines on

native birds and bats, it is expected that the edges of forest/woodland habitats are likely to have higher levels activity for birds and bats that forage along margins and inhabit these remnants (e.g. owls, parrots, microbats etc) Hence application of the precautionary principle to wind farm design would suggest that turbines should be located a considerable distance from the margins of these areas.
OEH recognises there is little available information on such impacts in the Australian context, but the assessment should model scenarios out to 500m from infrastructure to ascertain potential impacts.

The construction and operation of infrastructure may increase fox densities or facilitate fox access, with the potential to negatively impact on fauna populations. The current abundance and use of the site by foxes should be discussed (data should be available from surveys undertaken for this project). The potential for any increase in fox numbers to negatively impact on fauna populations should be assessed, and any necessary mitigation measures detailed. Improved access as a result of road construction may also lead to an intensification of land use, especially in relation to increased grazing pressure. The potential for this to occur and any associated impacts need to be addressed.

Other Threatened Species Issues

For a number of the target threatened species the report stated that surveys were conducted in suitable habitat, but did not provide adequate detail about the criteria or characteristics that defined suitable habitat. These details should be provided for all subject species or where suitable habitat is referred to in the report. Photos of suitable habitat for each species from the site may be useful here.

OEH does not support the proposed mitigation measure: *"habitat features such as logs, large rocks and fallen hollows within the proposed clearance footprint will be relocated to adjacent areas to supplement habitat where possible"* (EIA p. 128). This should not be undertaken as it may impact on threatened species habitat or the integrity of an EEC.

There are numerous other discrepancies in the fauna habitat impacts presented in the EA (p 185) and the EIA (p 137-38) – see Table 3. OEH requests that the figures be corrected (including previously overlooked potential habitat, as per our comments under EEC and Habitat Loss).

Table 3

Species	**EA** (p 185)		**EIA** (p 137-38)	
	Total in Study Area (ha)	**Total Area Impacted (ha)**	**Total in Study Area (ha)**	**Total Area Impacted (ha)**
Powerful Owl, Barking Owl	405.5	30.6	166.78	6.58
Woodland birds	166.78	8.62	166.78	6.58
Regent Honeyeater, Swift Parrot	166.78	8.62	166.78	6.58
Turquoise Parrot, Gang-Gang Cockatoo	166.78	8.62	166.78	6.58
White-fronted Chat	313	49.16	313	42.69
Spotted Harrier, Little Eagle, Square-tailed Kite	166.78	8.62	166.78	6.58
Koala	101.51	5.54	166.78	6.58
Rosenberg's Goanna	1,180.34	128.7	166.78	6.58
Bats	Not provided	Not provided	166.78	6.58

References

McMahon, A (2010) Expert Witness Statement: Yaloak South Wind Farm: Review of Wedge-tailed Eagle Assessment. Unpublished document. (Ecology Australia Pty Ltd, Melbourne.)

Menkhorst, P. (2010) Yaloak South Wind Energy Facility - Expert Evidence Statement of PW Menkhorst on Behalf of the Department of Sustainability and Environment. Unpublished document.

Smales, I., (2010) Modelling Wind Farm Collision Risk for Raptors. VicBabbler, No 95, June 2010, p.9. (Biosis Research Pty. Ltd.).

Smales, I. & Muir, S. (2005) Modelled cumulative impacts on the Tasmanian Wedge-tailed Eagle of wind farms across the species' range. Biosis Research report to Dept. of Environment and Heritage.

Smales, I., Muir, S. & Meredith, C. (2005) Modelled cumulative impacts on the Orange-bellied Parrot of wind farms across the species' range in southeastern Australia. Biosis Research report to Dept. of Environment and Heritage.

ATTACHMENT B

OEH ABORIGINAL HERITAGE COMMENTS ON THE DRAFT ENVIRONMENTAL ASSESSMENT BANGO WIND FARM

Attachment B comments:

OEH has performed an adequacy review of the Aboriginal cultural heritage information contained within the draft Environmental Assessment (EA) for the *Proposed Development of Bango Wind Farm* (dated May 2013) and the *Bango Wind Farm: Aboriginal Cultural Heritage Assessment Report* (ACHAR) prepared by New South Wales Archaeology (dated May 2013) and provides the following comments:

Aboriginal Cultural Heritage Assessment Report:

OEH is concerned about the adequacy of the current assessment, some areas of the proposal were not surveyed as part of the assessment undertaken for the preparation of the ACHAR (pages 27 and 30). OEH advises it is concerned with proposals to undertake further heritage assessment after Project approval, due to the reduced capacity to consider all Aboriginal heritage values, including cumulative aspects, up front and thereby allow for appropriate consideration of management measures prior to proposed impacts.
Whilst the ACHAR assesses the Project area to be of generally low archaeological significance, based on the relevant predictive model of site distribution and the results of the field survey, additional archaeological assessment is recommended in any areas which are proposed for impacts that have not been surveyed during the current assessment (page 80). The ACHAR also states that significant Aboriginal objects can occur anywhere in the landscape and, accordingly, they need to be identified and impact mitigation strategies implemented prior to impacts (page 80). As such, OEH seeks further clarification about how any new Aboriginal site recordings, that may occur as a result of additional survey required, will be adequately considered and managed within the Project after Project Approval has been issued.

OEH advises it cannot currently comment on the adequacy of the consultation process as copies of the Registered Aboriginal Party responses, received as part of comments on the draft ACHAR, have not been included in the copy of the ACHAR, dated May 2013, which was submitted with the EA.

OEH advises that no Aboriginal Site Recording Forms have been submitted to the Aboriginal Heritage Information Management System (AHIMS) for the fourteen sites recorded during the archaeological heritage assessment. This is a requirement under section 89A of the *National Parks and Wildlife Act 1974* which is not turned off by revisions to the *Environmental Planning and Assessment Act 1979*. Data from these site recordings also contributes to the body of knowledge about site distribution patterns associated with Aboriginal use of the project area and assists with the assessment of cumulative impacts to Aboriginal Cultural Heritage values within the region. Aboriginal Site Recording Forms should be forwarded to OEH as soon as possible.

Environmental Assessment:

OEH is concerned that draft statement of commitments (page 307) do not adequately incorporate the Aboriginal cultural heritage recommendations listed within the ACHAR into the EA so as to formulate appropriate management and mitigation measures for the Aboriginal cultural heritage values recorded to date as well as the requirement to undertaken additional archaeological assessment.

An updated archaeological and assessment of Aboriginal cultural heritage values should also be considered for any plans that are required to be prepared as part of the CEMP – such as the sediment and erosion control plan, traffic management plan, etc, to ensure Aboriginal cultural heritage values are not inadvertently impacted during any necessary control works or access road maintenance works.

With regard to any further archaeological investigations that may be required as part of this Project, OEH advises that copies of any subsequent survey assessment or investigations reports, along with associated OEH Aboriginal site recording forms, must be submitted to the OEH for inclusion on the Aboriginal Heritage Information Management System (AHIMS) database.

Attachment 2
OEH recommendations for Aboriginal cultural heritage – 2016 EIS submission

In addition to the Aboriginal cultural heritage management and mitigation strategies including in the 2016 EIS (section 11.5 and commitment #20 in the Statement of Commitments), OEH has the following recommendations:

1. Additional assessment
   OEH supports the commitment to undertake additional assessment in the Statement of Commitments, with the following revision: that additional assessment occurs prior to impacts in any areas that were not surveyed in the 2013 assessment. Based on the maps provided in Appendix 2 of the 2013 Cultural Heritage Assessment (NSW Archaeology), there are several areas that were not surveyed including proposed locations for infrastructure such as access tracks and turbines. None of the areas proposed for construction facilities, substations or switching stations were surveyed. OEH recommends that archaeological survey of these areas is completed prior to any ground disturbing impacts. If any additional sites are located, these will need to be assessed and appropriate management and mitigation measures proposed.

2. Surface salvage of sites
   OEH recommends that all Registered Aboriginal Parties (RAPs) are consulted about the surface salvage of sites as requested by Ngunawal Heritage Aboriginal Corporation. If agreed on by the RAPs, the proposed salvage methodology will need to be included in the CHMP. This consultation needs to consider the method for salvage and the long term management of any salvaged objects.

3. Cultural Heritage Management Protocol (CHMP)
   OEH supports the measures proposed and recommends the following additions for the preparation of an CHMP:
   a. CHMP must be prepared by a qualified archaeologist, in consultation with OEH and RAPs and submitted to DPE within six months of the project approval.
   b. An unexpected finds protocol, including measures that would be implemented if any previously unrecorded Aboriginal objects or skeletal material is uncovered.
   c. Outline of the process for on-going consultation with RAPs and OEH during the life of the project.
   d. Training of construction and operation personnel to be conducted by a qualified archaeologist. This training should include: identification of Aboriginal objects and skeletal material; Aboriginal cultural awareness and procedures to be followed during the life of the project.

4. Aboriginal consultation
   OEH is still not able to comment on the adequacy of consultation for this project as the correspondence from RAPs has not been provided in the Cultural Heritage Assessment. OEH request copies of any correspondence with RAPs be provided to us for consideration of all RAP issues.