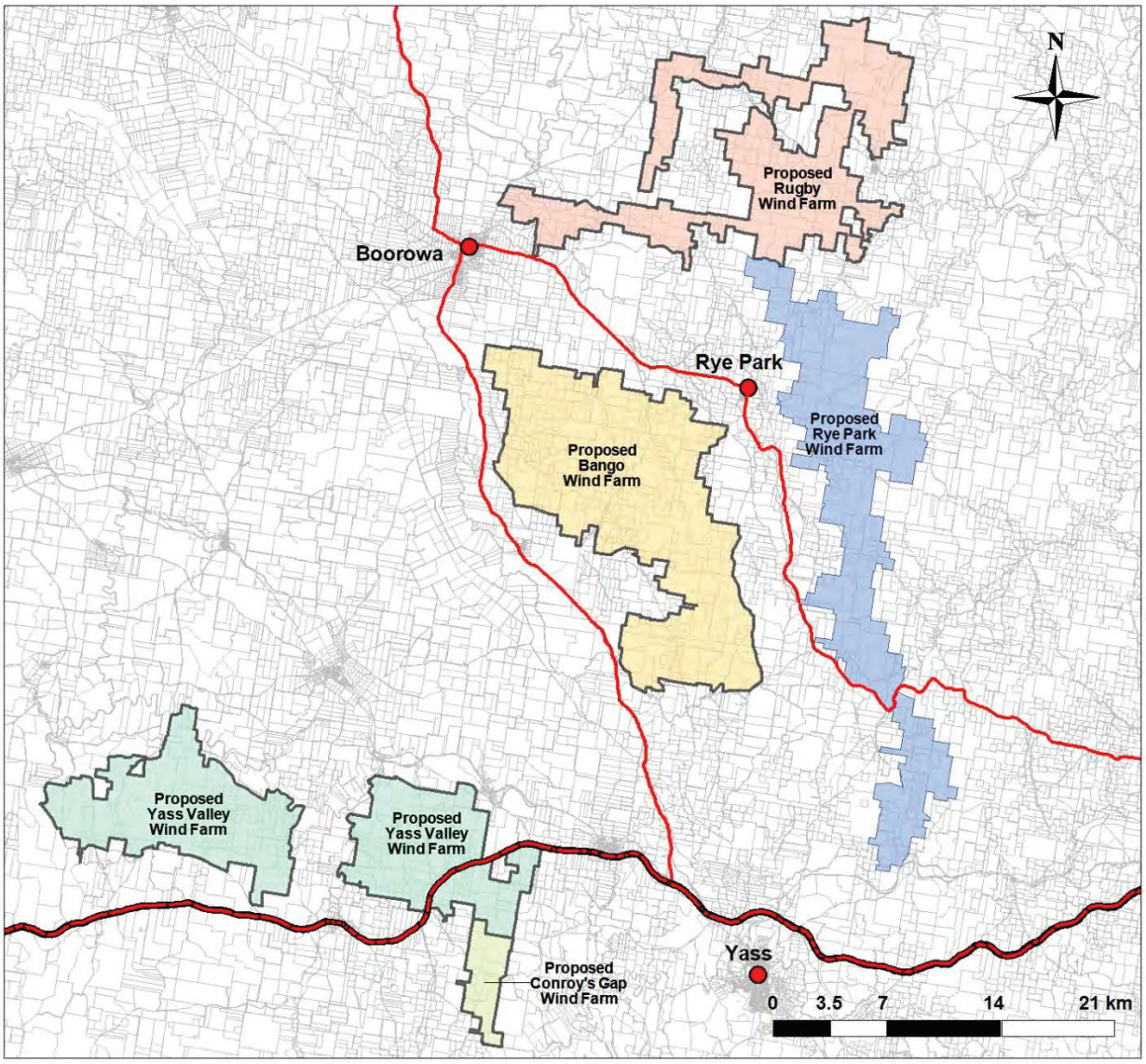

Figure 4-6 Nearby wind farms, proposed. No approved wind farms are located nearby.

4.2.5 Positive cumulative impacts

The construction and operational biodiversity impacts of the wind farm take place in a context of existing (and adds to the existing environmental impacts resulting from) land clearing, agricultural activities, weed and pest animal infestations and drought conditions. The district has experienced extensive losses to ecosystem integrity and stability. Woodland and grassland communities in particular, which coincide with prime agricultural land, and riparian and wetland communities have been heavily simplified and destabilised. It is likely that many woodland flora and fauna species have become locally extinct, and many are in continuing decline. It is important to note however, that wind farm development is preferable in such areas and that there are opportunities to improve these landscapes, rather than propose developments in pristine areas of higher conservation value.

Positive cumulative impacts are also relevant to wind farm development and are more certain:

- Provision of an alternative income stream to involved landowners; this may positively impact grazing practices and restoration works.

- Provision of offset lands, calculated to ensure an overall 'maintain or improve' biodiversity outcome; this ensures that relevant areas will be protected and managed in the locality (detailed further in Section 6).
- Assisting the transition to renewable energy sources with their resultant greenhouse gas emission benefits. Particularly for species west of the Great Dividing Range, projected climatic extremes are likely to be detrimental.
- Additional data collected from operational bird and bat management plans to provide more locally relevant data upon which to base future management actions.

4.3 Will impacts be unknown, unpredictable or irreversible

The direct loss of habitat for the affected species is detailed in Table 3-3 and is considered to be relatively accurate, being based on the available literature of habitat preferences, known records for the species / communities and extensive vegetation mapping for the project site. However, the extent of habitat within the region is difficult to define and is based on broad mapping of the region. This is particularly evident for the extent of Box Gum Woodland CEEC in the region. However, impacts to this community have been largely avoided and knowledge of its regional distribution is not vital in this context.

The Golden Sun Moth can be found in a variety of habitats including grassy Box-Gum Woodlands, natural temperate grasslands, and open habitat dominated by several wallaby grass species. It has also been recorded in degraded and weed infested patches of grasses dominated by Redleg grass (*Bothriochloa macra*), spear grasses (*Austrostipa* spp.), weeping grass (*Microlaena stipoides*) and the introduced Chilean needle grass (*Nassella neesiana*) (OEH 2013). It has now been recorded within the Marilba precinct area; however, it could occur in additional areas that were not surveyed. As this species is also now being recorded at other wind farm sites nearby (Rye Park, Bango), it is more regionally abundant than previously assumed. To manage the degree of uncertainty with regard to the significance of loss of habitat, a management plan based on further preconstruction surveys would be developed to minimise impacts where possible and offset the residual impacts in areas where this species is known to occur.

Bird species that are threatened (small populations), already compromised from significant habitat loss, or those that may move in large flocks, such as the Regent Honeyeater, Superb Parrot and Swift Parrot, are considered to be at higher risk of collision from artificial structures, such as wind turbines. Mortality impacts through collision for nomadic flocking species is considered a high risk for wind farms as it could affect the species at a population level by removing a significant proportion of the population during migration events. While it has been assessed that the risk of collision for the affected bird species is considered low, there is still uncertainty regarding 'real' impacts to migratory or nomadic bird species within Australian wind farms (Parsons & Battley 2013).

Currently, impact assessment of bird risks for wind farms is underpinned by educated assumptions made in the absence of extensive operational data; there is a low amount of Australian wind farm data and even less local data upon which to draw conclusions. To a degree however, wind farm collision risks are reversible. The Yass Valley Wind Farm would operate under a bird and bat operational management plan, designed to identify consequences that were not able to be anticipated. This is a Statement of Commitment of the proposal. These plans are adaptive and feedback mechanisms operate to ensure management is responsive to monitoring data. While this cannot prevent mortalities, it can identify trends and where required, shut down turbines in high risk windows, if required. Other likely management actions are prompt removal of stock carcasses near turbines and no lambing near turbines. Design measures also operate to reduce risks of collision; minimal lighting installed on turbines, for example.

Wind farm construction impacts are highly reversible. During decommissioning, all above ground infrastructure would be removed, restoring a large proportion of the original impact area.

4.4 Additional studies

Citations of literature or additional studies relevant to the affected species have been incorporated into the discussion of each species within Section 4.1.

Targeted surveys for the Golden Sun Moth were undertaken in November/December 2013 to determine if this species was present on site, and if so record its distribution and abundance across the Yass Valley Wind farm site. Surveys

were undertaken by Blue Gum Ecological Surveys over a period of five days. Surveys were conducted at 96 proposed turbine sites and surrounding areas that comprised of relatively suitable habitat. The species was recorded at a range of altitudes and topographic areas including broad grassy valleys, low rolling grassy hills, mid slope areas and rock hill tops. All Golden Sun Moths recorded were found inhabiting areas dominated or comprising a high proportion of Wallaby Grass. Not all areas containing such grasslands recorded this species though. A copy of the survey report for the Golden Sun Moth is located in Appendix H

5 Proposed Avoidance, Management & Mitigation Strategies

The general approach taken to avoid, minimise and manage impacts is outlined below. All biodiversity mitigation measures that accompany the proposal to manage impacts relevant to EPBC matters, including an additional measure included after revised consideration in this review, are provided in Section 5.4.

5.1 Overview

5.1.1 Avoiding impacts

During early investigations of the proposal site vegetation type and condition were mapped within the entire development envelope 6, not just the development footprint (impact area). The biodiversity survey effort samples the development envelope. Constraints mapping is produced to identify high moderate and low constraint areas. This strategy provides flexibility for future changes in the layout, context regarding biodiversity impact assessment, and maximises avoidance of high conservation areas early in the layout design. The primary means to arrive at an acceptable infrastructure layout has been to provide the client with constraints mapping, as the biodiversity assessment progresses. This shows the client:

High constraint	Red	Impacts to these areas and habitat resources are difficult to offset and should be avoided
Moderate constraint	Orange	Impacts to these areas should be avoided or specific measures taken to mitigate impacts. Losses should be offset with similar or better condition examples
Low constraint	Green	No special mitigation measures required

The layout now demonstrates that in general, all high constraint areas are avoided and prescriptive measures are developed to guide infrastructure placement in other areas.

Specific examples where avoidance has been applied by the proponent with relevance to EPBC listed matters include:

- Substation (site 31 - map 9 of the SER 2012, constraints map)
- The substation has been shifted to the north-west, reducing the impact on CEEC.
- Existing Yass Daisy colonies have been mapped and avoided and would not be impacted by the proposal.
- Powerline (site 25, map 8 of the SER 2012, constraints map)
- The line has been moved east out of CEEC and now traverses a less densely treed area. This reduces clearing and fragmentation impacts.

5.1.2 Managing impacts

A key characteristic of wind farm development that has bearing on the biodiversity survey and impact assessment approach is the uncertainty regarding the final infrastructure footprint. The infrastructure layout is refined and alignments moved several times from the commencement of the project, to reflect constraints (such as biodiversity), maximise wind yield, incorporate land owner changes, and increasing site knowledge that may influence civil

[6] The development envelope is the broad area within which infrastructure could potentially be located.

infrastructure placement. Therefore, biodiversity survey coverage cannot be restricted to a specific infrastructure layout. The 'development envelope' survey strategy explained above is a response to this.

The movement of turbines and other infrastructure within the development envelope is termed 'micro-siting'. Limits are placed on micro-siting by the draft standard conditions for wind farms developed by the NSW Department of Planning and Infrastructure (a location allowance of 100 metres radius for development components as long as impacts remain consistent with that assessed - http://www.planning.nsw.gov.au/standard-and-model-conditions). Where uncertainty exists with regard to impacts, and as a further opportunity to minimise and manage impacts, we regularly recommend that micro-siting be undertaken with input from an ecologist. Examples in this management strategy with relevant to EPBC matters include:

- Golden Sun Moth construction management plan – undertake further surveys to verify the extent of Golden Sun Moth habitat within the development footprint. Micrositing of tracks and power lines would be undertaken where practical. Offsetting in areas of known habitat would be undertaken.
- To assist to minimise impacts on CEEC at Site 13, the one area of CEEC that cannot be entirely avoided by infrastructure (overhead power line only).

Additional management strategies include follow-up targeted surveys, which will assist to preserve important features or avoid adverse impacts:

- A Biodiversity Management Plan would be prepared ... [and] would include specific additional survey work which would be used to microsite infrastructure, where practical, and offset impacts, where they cannot be avoided. The target features / species include:
    - Hollow bearing trees (of relevance to the Superb and Swift Parrot)
    - Striped Legless Lizard

Furthermore, offsetting is proposed to account for residual impacts that cannot be avoided or suitably minimised. This is set out in detail in Section 6.

5.2 Proposed construction exclusion zones and buffers zones and areas will be avoided or protected

An environmental constraint, for the purposes of the biodiversity assessment, is an environmental condition that reduces the capability of a site to accommodate a specific development. The constraint class maps provide a simple visual representation of areas key biodiversity values which may be impacted by the proposal. The maps also allow for the selection of alternative less constrained sites for development works.

Constraints maps sets within the Marilba Hills Precinct Biodiversity Assessment, Coppabella Hills Precinct Biodiversity assessment and Supplementary Ecology Report (SER) – Yass Valley Wind Farm together provide a complete set of maps to guide the development of the wind farm with regard to biodiversity constraints.

- High constraints, all high constraints areas would be avoided (there are small exceptions to this which have been deemed non-significant)
- Moderate constraints, impacts would be strictly minimised in all moderate constraint areas
- Low constraints, infrastructure should be preferentially located in these areas.

The high constraint areas can be viewed as exclusion zones. The maps sets are expected to be a key component of the Biodiversity Management Plan that would be prepared to guide construction, ensuring that any future infrastructure micro-siting is not in contravention of the conclusions of the assessment undertaken for the project.

Additionally,

- Buffers would apply to mature hollow-bearing trees to ensure indirect impacts (such as noise and dust) are minimised where practical. An appropriate buffer width would be twice the tree drip line, for example. This is included as a mitigation measure.

5.3 How turbines have been sited to minimise risk to threatened birds

Considering the affected species identified in Section 3, risks to threatened birds posed by this development occur in the construction and operational stages:

Table 5-1 Threatened bird risks

Affected species	*Construction risk*	*Operational risk*
Superb Parrot	Loss of foraging and breeding habitat	Collision
Swift Parrot	Loss of foraging habitat	Collision
Regent Honeyeater	Loss of foraging habitat	Collision

The level of risk is characterised for these species in Section 4. Measures that have been taken to avoid or minimise these risks include:

5.3.1 Avoid

Construction impacts are addressed by avoidance of important habitat resources for these species. These equate to high constraint areas, as discussed above. For these affected species, areas/features include:

- Hollow-bearing trees (Marilba and Coppabella, specifically clusters 10, 3 north and 6; in paddock trees in low lying areas within transmission envelopes; and also adjacent to Whitefields Road)
- Box Gum Woodland in moderate to good and good condition classes (Marilba, Coppabella and new areas assessed in the SER)
- Woodland remnants at clusters 3, 4, 6 and 7 (Marilba) and clusters: 3 and 10, and small areas on 7 as well as the power line between 6 and 7a, and on the eastern slope of 3 (Coppabella)

This list is not exhaustive. Additional avoidance requirements are spelled out in the relevant BAs and SER.

Specifically, collision risk has been reduced as follows:

a Location of foraging, breeding, movement corridors

No infrastructure in better conditions remnants. Turbine placement on ridges is largely avoiding the preferred low land areas for MNES. Refer to Appendix J.

b Foraging or nesting habitat isolated or surrounded by the turbine layout

The turbine placement does not isolated any areas of habitat. It is a series of linear ridgelines. Foraging or nesting habitat occurs adjacent to high constraint areas but not close enough to be considered an unacceptable collision risk. The Assessment demonstrates that avoidance rates are expected to be high:

Marilba Section 8.2.2 - Biosis Research Pty Ltd, on behalf of the Commonwealth Department of Environment and Heritage, recently completed an assessment of the cumulative wind farm collision risk for threatened and migratory birds (Biosis Research 2006). The study involved cumulative risk modelling for four threatened species (the Orange-bellied Parrot, Tasmanian Wedge-tailed Eagle, Swift Parrot and White-bellied Sea-eagle) and a preliminary risk assessment for 34 bird species with potential to occur at wind farm sites in Gippsland, Victoria. 39 operating and planned wind farms in south-east Australia were used in the assessment, including Crookwell, Gunning and Taralga on the Southern Tablelands.

The modelling took into account turbine number and size, local population size and density, duration of residency and the ability of birds to actively avoid collision with turbines. Avoidance rates are expressed as a percentage of flights made by a bird in which the bird takes no evasive action to avoid collision. Directly observed avoidance rates have been documented as 100% for a range of species at Codrington, Victoria, including the Wedge-tailed Eagle, Brown Goshawk, Nankeen Kestrel, Swamp Harrier, Brown Falcon, Richards Pipit, Magpie-lark, Magpie, Raven, Straw-necked Ibis, White Ibis, Egret spp. and White-faced Heron (Meredith et al. 2002). Calculated avoidance rates at Codrington –

taking recorded mortalities into account – showed a reduced rate for the Magpie (99%) and Brown Falcon (>95%) (Meredith et al. 2002). The cumulative risk modelling applies three collision avoidance rates; 95%, 98% and 99%.

5.3.2 Minimise or manage

Collision risks are addressed in the design stage, by eliminating features known to increase collision risk. The following list is summarised from the Coppabella BA:

- Marker lights, if required should be minimised in number and fitted to reduce their ability to attract migrating birds and insects. Red lights are preferred, with the least number of flashes per minute. Cowls may also shield the light when viewed from the ground and reduce potential to attract wetland birds taking off at dusk. It is understood that CASA requirements will prevail. An aviation assessment has confirmed that obstacle lighting will not be required for the wind farm.
- Guy lines should not be fitted to towers or associated structures, where possible.
- The turbine towers should not provide perching opportunities.
- Electrical connection lines should be installed underground where possible.
- Power poles would be designed to minimise perching and roosting opportunities where practical.
- Power poles and overhead transmissions would be designed to reduce impacts on birds (for example by using flags or marker balls, large wire size, wire insulation, wire and conductor spacing) in areas of elevated risk of bird strike.

Prescriptions to minimise risks relevant Marilba recommendations are cited below:

- Where practicable, the turbines will be sited centrally on the ridgeline, away from the ends and edges of linear ridges, to minimise disturbance to raptors using updrafts and microbats using ridgelines as navigational aids.
- Where possible, the turbine sites should avoid corridors between microbat and bird habitat areas, and turbines should be sited as far as practicable from the edge of woodland and forest remnants.
- The turbine towers will be as widely spaced as possible to reduce bird collision risks.
- If lights are required to be fitted to the towers (eg for aircraft safety), they should be red flashing lights to reduce attractiveness to insects and possibly night-flying birds (subject to CASA requirements). For similar reasons, turbine paint should be non-reflective if practicable.
- Guy lines will not be fitted to turbine towers. Any guy lines which need to be used on associated structures will be indicated with marker balls or flags.
- The turbine towers and associated structures will minimise perching opportunities.
- The Operational Environmental Management Plan would contain details of a three-tiered monitoring program for bird and bat mortalities and habitat utilisation impacts. The design of the monitoring program would draw on the Australian Wind Energy Association's Wind Farms and Birds: Interim standards for Risk Assessment (Brett Lane and Associates 2005) and the Wind Farm Risks to Birds and Microbats study (nghenvironmental 2009a) (Appendix F). [Outline now provided as Attachment N].

In the operational stage, risks are managed by monitoring actual collision impacts and taking actions where required to address these. The Yass Valley Wind Farm would operate under a bird and bat operational management plan. The plan would be adaptive and feedback mechanisms would operate to ensure management is responsive to monitoring data. While this cannot prevent mortalities, it can identify trends and where required, shut down turbines in high risk windows, if required. The framework of the Yass Valley Bird and Bat Management Plan is provided as Appendix N.

Review of research and monitoring of blade strike mortalities

In response to a request for specific additional information on monitoring, the following text is provided. The information above cites collision risk analysis, based on ecology and site specifics. Actual collision data is limited in

Australia, but the following summarises what is known that is applicable to MNES at Yass Valley, both in Australia and overseas.

Extracted from Marilba Section 8.2 –

> *Wind farm impacts are usually site-specific and species-specific. Nonetheless, there are a growing number of studies and monitoring programs in Australia and overseas which provide some insight into the nature and scale of potential risks to birds from wind farms.*
>
> **Overseas –**
>
> A recent review of overseas wind farms showed low mortality rates for most wind farms (Langston and Pullen 2002). On average for all birds, new generation projects in the US (outside California) have recorded three fatalities per megawatt per year (Erikson et al. 2001). A review of 32 wind farms in North America produced an average of 1.4 birds per turbine per year, with a range of zero to 4.3 (Barclay et al. 2007). A review of European and North American wind farms indicates that most wind farms in agricultural settings affect between 2 and 4 birds per turbine per year (Lane and Associates 2004). However, the most commonly recorded bird group to collide with European and North American turbines were night-migrating songbirds, of which there are comparatively few in Australia [*the Superb Parrot, Swift Parrot, Regent Honeyeater, White-throated Needle tail and Satin Flycatcher do not fall into this category*].
>
> Looking at wind farms in Europe, Winkelman (1994) produced an estimated average of 0.04 to 0.09 mortalities per turbine per day. 43% of these were killed by being swept down by the wake behind a blade, 36% flew directly into a blade, and for 21% the cause of death was unknown. At Altamont Pass in the United States, 55% of raptors were killed by striking a blade, 8% from electrocution, 11% from wire collision and 26% from unknown causes (Orloff and Flannery 1992 in Canada Bird Studies 2001). Winkelman concluded that the number of birds killed per unit of energy produced is low compared to other human-related causes of bird death.
>
> Research conducted on farmland around two wind farms in the East Anglian fens in the United Kingdom found the turbines had no effect on the distribution of seed-eating birds, corvids (the crow family), gamebirds and Eurasian skylarks (Devereux et al. 2008). There was only one bird whose distribution was affected by the turbines – the common pheasant – the largest and least manoeuvrable species encountered. The researchers cite this as evidence that the present and future location of large numbers of wind turbines on European farmland is unlikely to have detrimental effects on farmland birds.
>
> **Australia –**
>
> There are relatively few published bird mortality studies at Australian wind farms, and most are of short duration. The studies do however suggest a generally low rate of blade collision, and that species at most risk are locally common birds which are active at the bladeswept height, including some raptors, skylarks, magpies and some seabirds (Meredith 2003, Hydro Tasmania 2004).
>
> Monitoring research at the three operational wind farms in Victoria has recorded no rare, threatened or endangered birds killed by wind turbines to date. Searches conducted by Biosis Research for dead birds around seven turbines at the Codrington Wind farm (Victoria) showed three bird deaths attributable to impact with wind generators. The species concerned were the introduced skylark (1), Richard's pipit (1) and Australian magpie (1). Incidental carcass finds showed a further adult brown falcon death. The estimated total number of deaths likely from Codrington's 14 turbines over one year is 18 to 38 birds, or 1.2 to 2.7 birds per turbine per year (Brett Lane and Associates 2005).
>
> At the Toora Wind Farm in Victoria, no bird carcasses were found during a year of monitoring or during informal inspections. Wedge-tailed eagles were regularly observed before and after operations began at this site. Eagles were observed to avoid the turbines by flying around or between them, not into them (Brett Lane

and Associates 2005). A study at Codrington also found that all birds approaching the turbines were observed to take avoidance action, by flying over, around or under the rotating turbine blades (Biosis Research Pty Ltd 2002).

The 140 MW Woolnorth Wind Farm project in north-west Tasmania was progressively developed between 2002 and 2007. The rate of bird collisions for stage 1 of the project is estimated at 14 native birds per year or 2.3 birds/turbine/year (Hydro Tasmania 2004). Monitoring recorded 18 bird collisions in 2003, 7 of which were the introduced Skylark. One of these collisions was a Wedge-tailed Eagle. Eagles have been observed living near the turbines for more than 12 months and the collision occurred during a period of limited visibility (Hydro Tasmania 2003).

Woolnorth's owners Roaring 40s report that 11 Wedge-tailed Eagles (*Aquila audax fleayi*), an endemic and threatened Tasmanian sub-species, have been killed by collision with rotors since operations commenced. Roaring 40s have managed risks to eagles by reducing food resources around turbines, studying eagle behaviour and breeding success in the local population and protecting nest sites elsewhere in Tasmania (Roaring 40s website 2008).

More recent assessments by **ngh**environmental in the locality of Rye Park to the north-east of Yass Valley, provides the following additional information:

Available data from operational wind farm monitoring (i.e. carcass searches) at Australian wind farms is presented in the table below. …carcass searches at operational wind farms have found an average mortality of 0.71 birds and 0.55 bats per turbine per year, although these rates are imperfect given the limited datasets. [The table] shows that although a range of species has been recorded from carcasses searches, four species are disproportionately represented: White-throated Needletail, Wedge-tailed Eagle, White-striped Freetail Bat and Gould's Wattled Bat.

The White-throated Needletail is a seasonal migrant present in Australia outside of breeding season, and may occur in large flocks foraging aerially at heights of up to 1,000 m above the ground (SEWPAC 2012). As the species breeds overseas, the potential for impact would be upon migration resulting in potential collision risk during the operational phase of the wind farm. It appears to collide with wind turbines in some areas and the species has been affected at other wind farms around eastern Australia, with one Bird Monitoring Report recording that "no other non-raptor species had more than four mortality events over the 3 year period" (Roaring 40s Renewable Energy 2010). Based on the collision data presented below, on average there may be around four collisions of White-throated Needletails per year at Rye Park *[a similar sized proposal for 126 turbines].* However, an even temporal distribution of mortality events of this species is unlikely given the natural flux in numbers across season and weather conditions. Although the species' total population is unknown, it is thought to be abundant in areas where it is found (SEWPAC 2012). Given the large area of occupancy of this species, the Rye Park wind farm is unlikely to affect an ecologically significant proportion of the population.

Table 7.1 Collisions per turbine per year from five Australian wind farms (source Marilba BA)

Species	Elmoby Ecology 2012 (2 turbines, 6 mths)	Hydro Tasmania 2012 (62 turbines, 1 yr)	Roaring 40s 2011 (62 turbines, 1 yr)	Roaring 40s 2012 (62 turbines, 1 yr)	nghenvironmental (unpubl.) (15 turbines, 2 yrs)	Av.
Brown Falcon	1	0	0	0.03	0	
Silvereye	0	0.02	0	0	0	
Australian Pelican	0	0.02	0	0	0	
White-throated Needletail	0	0.02	0.02	0.08	0	
Wedge-tailed Eagle	0	0	0.02	0.05	0.13	

Species	Elmoby Ecology 2012 (2 turbines, 6 mths)	Hydro Tasmania 2012 (62 turbines, 1 yr)	Roaring 40s 2011 (62 turbines, 1 yr)	Roaring 40s 2012 (62 turbines, 1 yr)	nghenvironmental (unpubl.) (15 turbines, 2 yrs)	Av.
Swamp Harrier	0	0	0	0.011	0	
Pied Currawong	0	0	0	0	0.03	
Australian Magpie	0	0	0.35	0	0.003	
Other bird species	0		0.4	0.35		
ALL BIRDS	2	0.05	0.79	0.52	0.2	0.71
White-striped Freetail Bat	1	0	0	0	0.27	
Gould's Wattled Bat	0	0.05	0.15	0.11	0.07	
Large Forest Bat		0	0	0	0.03	
Other bat species				0.02	0.03	
ALL BATS	2	0.05	0.15	0.13	0.4	0.55

To date, no known Superb, Swift Parrot or Regent Honeyeater collisions with wind turbines have occurred. White-throated Needletail collisions would not be expected to affect a population, based on monitoring data at other wind farms. Specific to the Yass Valley Wind Farm site, the infrastructure is not considered to be inappropriately sited, such that collision impacts may affect local populations of these species. Significant impact is not anticipated. Mitigation measures including an adaptive management program address remaining uncertainty. The framework of the Yass Valley Bird and Bat Management Plan is provided as Appendix N.

5.4 Description of mitigation measures prescribed to address indirect impacts to matters of NES (on- and off-site)

Table 5-2 documents the prescribed management measures committed to by the proponent to avoid, minimise and offset impact to the affected species. Most are not species-specific and thereby apply to MNES as well as other species. The measures, as worded, are expected to be effective for the following reasons:

- They have been developed by an organisation with experience in wind farm and electricity transmission projects as well as on-ground management of wind farm and transmission line development. **ngh**environmental have assessed over ten wind farm proposals, provided biodiversity assessments for over ten and have provided onground and environmental management support for an additional six projects during construction and or operation. **ngh**environmental have provided independent Environmental Representatives to four wind farms, responsible for ensuring that conditions of consent are met by the proposal. The measures therefore, have been developed specific to the requirements of this type of infrastructure proposal. The key feature being the need to retain some flexibility in the final infrastructure layout.
- They have been worded so that they are not overly prescriptive; they are structured as sets of protocols that apply to different aspects of the proposal. Specific to MNES, measures include weed management, general habitat management, habitat connectivity, etc. This will allow for the most practical on-ground implementation to achieve the objective. A series of subplans will be developed in construction and operation to ensure all of these protocols are captured and implemented in an auditable manner.
- Collection of additional data has been included as a mitigation measure, where the information is required to provide more certainty regarding the success of the measure. Specific to MNES, measures include (1) the location of hollow bearing trees to be cleared for the proposal; (2) the collection of base line data for an adaptive Bird and Bat Management Plan; (3) the production and implementation of an adaptive Bird and Bat Management Plan.

Overall, the scale and intensity of the development is reflected by the format of the mitigation measures. That is, an environmental management framework has been developed within which additional information will be required to produce the detailed management plans that will ensure effective on-ground outcomes. Endorsement of these plans will be a requirement of project consent.

Specific to MNES, the outcomes that the avoidance and mitigation measures will achieve are:

- Avoiding CEEC and impacts to EPBC listed threatened flora
- Monitoring of bird and bat collisions with operational turbines, to verify the assumptions of the assessment and take risk management actions should additional impacts be detected. This will take in all species though will be focussed on higher risk species in terms of response actions.
- Monitoring of bird and bat avoidance or alienation impacts, to verify the assumptions of the assessment and take risk management actions should additional impacts be detected. This will take in all species though will be focussed on higher risk species in terms of response actions.
- Offsets, in accordance with NSW policies, to ensure that all impacts to native vegetation are appropriately offset and that an overall 'maintain or improve' environmental outcome is met for the project. This is more than is required under the EPBC Environmental Offsets Policy (EOP) but will have broader benefits by protecting and preserving habitat for species including those listed under the EPBC Act.

Table 5-2 Management measures to avoid, minimise, or offset impacts of the proposal.

Note these measures represent those measures that relate specifically or broadly to the affected species. They have been drawn from the Coppabella and Marilba BAs and the SER. Additionally, a new measure has been added to properly address risks to the Golden Sun Moth (orange shading).

ID	Target Species/Community	Objective	Avoid, Minimise, Offset	Mitigation Tasks	Project Phase	Auditing7
SPECIFIC MEASURES						
1	All species / communities	Ensure all infrastructure will be sited entirely within the areas assessed in the Biodiversity Assessment.	Avoid, minimise, offset	All infrastructure would be sited entirely within the development envelope assessed in the Biodiversity Assessments. Where this is not possible, additional assessment would be undertaken and the appropriate approval would be sought (i.e. variation to Conditions of Approval).	Detailed design of infrastructure layout	CEMP
2	All species / communities	Avoid significant impact to high value biodiversity area	Avoid	All infrastructure would be sited to avoid high constraint areas (including high constraint habitat features) and minimise impacts in moderate constraint areas.	Detailed design of infrastructure layout	CEMP
3	Hollow-bearing Trees	To ensure core breeding habitat for hollow-dependent species is not adversely affected by the proposal (i.e. Superb Parrots and Swift Parrots).	Avoid, minimise, offset	Infrastructure micro-sited to avoid hollow-bearing trees, where possible. These are identified as a high constraint (avoid) at Coppabella and Marilba. Ideally, construction and any required tree clearance should avoid the peak breeding time for fauna and nesting time for birds (e.g. spring-summer). For hollow-bearing trees to be cleared a management plan should be prepared by an ecologist detailing: procedures to minimise impacts to, and relocate resident fauna; timing of works to avoid breeding periods; number and type of hollow-bearing trees to be removed and offset (to be included in Flora & Fauna Management Plan). Where hollow-bearing trees are to be cleared a standard pre-clearance survey, such as that described in *Biodiversity Guidelines* (**ngh**environmental / RTA 2011), should be undertaken and details of hollow-bearing trees cleared including number and size of hollows and number of hollow-bearing trees recorded.	Detailed design of infrastructure layout	CEMP
4	Superb Parrot, Swift Parrot	To minimise habitat loss for the Superb Parrot and Swift Parrot.	Avoid, minimise, offset	Where hollow-bearing trees cannot be avoided, nest boxes would be installed to replace this resource. This is stipulated in the offset strategy. This measure is considered supplementary to offsets that would also take into account the removal of hollows. Approach routes to the subject site should be selected to minimise the need to clear or trim remnant eucalypts along local roads such as Illalong Road and Grace's Flat Road, since most of this vegetation falls within the Box-Gum Woodland EEC definition and is likely to be significant for threatened fauna species such as Superb Parrot. Contractors and staff would be made aware of the potential risk of vehicle collision to the threatened Superb Parrot feeding on spilt grain beside local roads, particularly Illalong Road and Burley Griffin Way. Staff and contractors would limit driving speed on Illalong Road to 80 kph and report any grain spills to DECC.	Detailed design of infrastructure layout	CEMP
5	Box Gum Woodland CEEC	Prevent unauthorised clearance. Minimise clearing as much as possible to reduce track and powerline impacts.	Avoid, minimise	Clearly demarcate works areas nearby or within Box Gum Woodland areas (Appendix E) to strictly define permitted clearance zone. Remnant CEEC would be protected from peripheral and indirect impacts and would not be used for site access or materials/equipment laydown. Minimise track width to the minimum required for safe access and operation. Tracks and powerline works would be micro-sited with the advice of an ecologist. Removal of topsoil and subsoil for trenching to be replaced and revegetate disturbed areas with local native grasses (i.e. Kangaroo Grass, Wallaby Grass or Spear Grass). A buffer twice the distance of the tree drip-line would be established in sensitive areas identified in the Biodiversity Assessment constraint map set for each precinct to ensure indirect impacts (such as compaction, noise and dust) are minimised where practical.[8]	Detailed design of infrastructure layout	CEMP
6	Yass Daisy	Avoid impact to known populations.	Avoid	Works should be sited outside known Yass Daisy population areas (Appendix F). The Yass Daisy population would be identified and protected during the construction and operation phases. Special rehabilitation measures would be used for works in the vicinity of any populations, including topsoil removal, storage and replacement, whole sod removal and replacement if practicable and effective weed control at all stages. Exposed areas along the trench line would be revegetated with local native grasses (*Microlaena stipoides* and/or *Themeda triandra*). **Marilba Precinct:** The proposed cable route between the Marilba substation and cluster 7 would be located to avoid direct or indirect impacts	Detailed design of infrastructure layout	CEMP

[7] The Construction and Operation Environmental Management Plans (CEMP and OEMP) are documents submitted to Dept. Planning prior to construction and operation. Incorporation of these commitments within these management plans allows each commitment to be auditable.

[8] The mitigation measure is given to protect trees that will be retained from damage during the construction phase and is not related to bird or bat collision buffers.

ID	Target Species/Community	Objective	Avoid, Minimise, Offset	Mitigation Tasks	Project Phase	Auditing7
				to all recorded plants and colonies, with a minimum 2 m buffer. If trenching is used at the cluster 7 site, the works would temporarily disturb around 340 m^2 of potential habitat (but no individual plants). Special protection and restoration measures would apply. If overhead cabling is used, the potential habitat area would not be impacted. Track and powerline works on the eastern side of Marilba cluster 4 would be micro-sited to avoid impacts to plants colonising from the adjacent woodland. Turbine works at cluster 6 adjacent to woodland would be micro-sited to ensure Yass Daisy plants are not impacted. **Coppabella:** Powerline routes through potential population areas (including between Coppabella clusters 6 and 7a would be micro-sited by an ecologist to avoid impacts to Yass Daisy plants.		
7	Golden Sun Moth (GSM)	Avoid impact to known populations.	Minimise and offset	Preliminary surveys have indicated the species occurs within the Marilba precinct. Preconstruction surveys of the final infrastructure layout would be completed in accordance with the relevant survey guidelines (Significant Impact Guidelines for the critically endangered Golden Sun Moth *Synemon plana;* DEWHA 2009a) for this species. The results of these surveys would be used to minimise impacts and ensure offsetting requirements, where avoidance is not possible. The management protocols for this species would be documented within a management plan, to be implemented as part of the construction process.	Detailed design of infrastructure layout	CEMP
GENERAL MEASURES						
8	All species and vegetation communities	Weed management	Avoid	Control noxious weeds in works area according to plans and control measures of the Local Government Authorities Minimise use and adhere to best practice guidelines for herbicide treatment in environmentally sensitive areas (i.e. Box Gum Woodland) Establish hygiene plan to ensure vehicle and machinery is absent of organic matter pre- and post-site access Sign environmentally sensitive areas (i.e. CEEC areas) and designate clean-down area for entry / exit points into these areas. Monitoring and weed control in areas of known noxious or invasive species. Understorey vegetation in easements should be managed to maintain composition and quality to prevent weed invasion	Construction	CEMP
9	All species and vegetation communities	Pollution prevention	Avoid	Establish a spill plan to prevent chemicals or pollutants from having an adverse effect on the environment. Backfill cable trench where cement is used; at least 20 cm of cement free topsoil to be replaced as the top layer in the back fill. Establish an erosion and sediment control plan so appropriate controls are in place prior to commencement of works.	Construction	CEMP
10	All species and vegetation communities	Site management	Avoid	Lightly mulch exposed soils with chipped vegetation or sterile hay in areas dominated by exotic groundcover species. Sow with an appropriate cover crop in consultation with land owners. Lightly mulch exposed soils with chipped vegetation or sterile hay in areas dominated by native grasses using local provenance species. Fertiliser should not be used to promote revegetation in areas dominated by native grasses.	Construction	CEMP
11	All species and vegetation communities	Site inductions to avoid unauthorised impact	Avoid	Contractors and staff would be made aware of the significance and sensitivity of the constraints identified in the Biodiversity Assessment constraint map set for each precinct during the site induction process.	Construction	CEMP
12	Habitat features including reptile habitats for Pink-tailed Worm-lizard and Striped Legless Lizard	Habitat management	Minimise	Clusters of rocks and boulders should be avoided where possible. Where rocks and boulders cannot be avoided, they should be placed directly adjacent to the works area to preserve the availability of refuge. Where rocks are to be removed, pre-clearance for threatened reptiles should be undertaken by experienced personnel (refer point 15). Standing dead trees, stumps and woody debris should be avoided where possible. Where they require removal to allow for the tracks and hardstand areas, they should be placed adjacent to the impact areas, to retain these refugia in the immediate area.	Construction	CEMP
13	Water sources	Habitat management	Minimise	Should dams be required to be removed during site development, alternative watering points would be established to compensate for their loss, where practical and with the agreement of the landowner.	Construction	CEMP

ID	Target Species/Community	Objective	Avoid, Minimise, Offset	Mitigation Tasks	Project Phase	Auditing7
14	All species and vegetation communities	Offset Plan Development of an offset plan to offset impacts to maintain or improve biodiversity in the longer term	Offset	The Proponent would commit to preparing and implementing an Offset Plan, to offset the quantum and condition of native vegetation to be removed, in order to achieve a positive net environmental outcome for the proposal. Offset areas would reflect the actual footprint of the development (i.e. footing areas and new tracks) not the maximum impact areas. The Offset Plan would be prepared in consultation with OEH, prior to construction.	Prior to construction	CEMP
15	All species and vegetation communities	Biodiversity Management Plan To avoid significant impact to flora and fauna outside of the accepted clearance boundaries and prevent 'unassessed' impacts occurring.	Minimise	A Biodiversity Management Plan would be prepared within the CEMP to document the implementation of biodiversity measures, sourcing the Biodiversity Assessments prepared for each precinct for area specific measures. This would include construction and operational activities. The management plan should highlight ecological important areas (vegetation communities and threatened fauna species habitat) and their management. Detail pre-construction survey work which would be used to microsite infrastructure, where practical, and offset impacts, where they cannot be avoided. The target species include Striped Legless Lizard and hollow-bearing trees. A final site inspection should be carried out after road and electricity easements are finalised, to ensure that threatened species habitat and high constraint EEC vegetation has been avoided or that impacts are manageable.	Prior to construction	CEMP
16	High risk bird and bat species, particularly threatened species (including Swift Parrot, Superb Parrot, Regent Honeyeater and migratory species)	Bird and Bat Monitoring Program. Development of an 'insurance' monitoring program to address uncertainty inherent in the assessment.	Minimise, offset	An adaptive Bird and Bat Monitoring Program would be developed prior to construction and would include the collection of baseline (pre-operation) as well as operational monitoring data.	Prior to construction	CEMP, OEMP
17	All species and vegetation communities	To avoid significant impact to flora and fauna outside of the accepted clearance boundaries and prevent 'unassessed' impacts occurring.	Avoid, minimise	A flora and fauna assessment would be undertaken prior to decommissioning to identify biodiversity constraints and develop specific impact mitigation measures.	Decommissioning	OEMP

6 Proposed Offsets

6.1 Proposed offset, protection and management

6.1.1 Introduction

Offsets are required for this development to achieve the overall 'maintain or improve' outcome required of Part 3A developments, assessed under the NSW Environment Planning and Assessment Act 1979. The commitment to offset has been outlined in a strategy document (Appendix H of the Supplementary Ecology Report – Yass Valley Wind Farm; nghenvironmental 2012) to provide certainty around how offsets will be identified, secured and managed, rather than defining an offset site at the pre-approval stage. An update of the offset strategy document is attached to this report (Appendix G) and referenced in the sections below to provide the information requested by DoE.

It is noted that the final offset package would be prepared in consultation with the NSW Office of Environment and Heritage and Catchment Management Authority and final offset ratios may vary slightly, however the strategy demonstrates that offsets are feasible for this project.

6.1.2 How will offsets be calculated

Appendix H of the SER sets out key components of the offset methodology including the calculation of areas to be impacted, the determination of suitable offset ratios and how the final offset site will be selected.

Calculating the areas to be impacted (areas requiring offsets)

As part of the biodiversity assessment for the Yass Valley Wind Farm proposal, the impact area for the proposal has been estimated to both assess the impacts of the habitat loss and habitat modification associated with construction, but also to inform the commitment to offset the impacts of clearing. The proponent commits to offset all permanent habitat loss as a result of the construction of the wind farm. Permanent habitat loss includes all footings and tracks as well as easements where they occur in treed areas.

This area has been estimated for the proposal (Appendix F of the SER) however, as the proponent commits to offset *actual* not *estimated* impacts, the proponent also commits to a post-construction audit of vegetation impact prior to finalising the boundaries of the offset site. In this way, there is a mechanism to ensure the *actual* amount of clearing is offset and a further incentive throughout construction to minimise impacts wherever possible, thereby reducing the offset requirement for the proposal.

Determining a suitable offset ratio

Using the information currently available for the site and additional survey data that will be collected (for example, in preclearance surveys specified in the project's Statements of Commitment), the proponent commits to determining an offset ratio with reference to:

- The conservation status of the vegetation
- The condition of the vegetation
- Whether the habitat provides (*actual*, not *potential*) threatened species habitat

The proposed ratios below have been developed based on experience with the NSW Biobanking Assessment Methodology. They are a simplification of that methodology but have the benefit of being transparent to the proponent and the consent authority. Hollow-bearing tree (HBT) offset requirements are supplementary to area offsets; for each HBT removed, a nest box would be installed.

Table 6-1 Proposed offset ratios for native vegetation to be permanently removed

Condition class	*Proposed offset ration based on conservation status of habitat*			
(as presented in the SER 2012)	*Vegetation NOT OF conservation significance*	*Vegetation OF conservation significance*[9]	*Threatened species habitat*	*HBT removed: nest box*
Poor	1 : 1	1 : 2	1 : 2	1 : 1
Poor-moderate	1 : 1	1 : 2	1 : 2	1 : 1
Moderate	1 : 1	1 : 5	1 : 5	1 : 1
Moderate-good	1 : 1	1 : 10	1 : 10	1 : 1
Good	1 : 1	1 : 10	1 : 10	1 : 1

Specific offset outcomes for EPBC affected species are set out below, in *How will the offset compensate for the impacts on affected species.*

6.1.3 When will the offsets be implemented and delivered

For several reasons, the commitment to offset has been proposed as a strategy document which outlines and provides certainty around how offsets will be identified, secured and managed rather than defining a site at the pre-approval stage. These reasons primarily relate to timing; the length of time to obtain a wind farm approval and the length of time once approved, between completion of detailed design, commencement of construction and operation can be several years. The final infrastructure layout affects the areas of clearing and the landholders involved, which in turn will affect the final makeup of the offset site. Threatened entity listings and condition of vegetation may change over this time.

As it is important to ensure that the final area to be offset reflects the actual, not estimated, area of clearing, to address the timing delays, the offset strategy sets out a criteria which must be met by the offset site (above) and specifies that a post-construction audit of vegetation impact is required before the boundaries of the offset site are finalised. In this way, there is a mechanism to ensure the actual amount of clearing is offset and further, there is an incentive throughout construction to minimise impact areas, reducing the offset requirement for the proposal and minimising the overall environmental impact of the development. While securing and defining an offset site at the pre-approval stage would provide the appearance of certainty, it would not reflect the reality of wind farm development and would not guarantee that the actual areas impacted would be offset.

The implementation sequence would be:

Pre-approval	1. Offset strategy developed: criteria to define the offset site, demonstration that the offset is achievable and feasible.
Pre-construction	2. Offset planning fully developed with input from relevant agencies as part of pre-construction environmental management documentation, for submission to the consent authority.
Pre-operation	3. Actual offset boundaries defined and attached to land titles prior to the operation of the wind farm, reflecting the actual impact areas of construction.
Ongoing	4. Management actions commence as soon as the boundaries are established and will remain in perpetuity.

Management and security of the offset site is discussed further below in *How will the offsets be managed and secured.*

[9] Endangered ecological communities listed either under the NSW TSC or EPBC Act.

6.1.4 Where will the offsets be defined

Because of the agreements with landholders to lease the properties for the life of the wind farm (25-30 years minimum), the preferred approach with regard to offsetting is to include as part of the agreements with landholders, securing offset land within the site boundaries. The broad vegetation type mapping undertaken as part of the Biodiversity Assessments provides certainty that the type of vegetation that will be cleared, occurs in sufficient quantity to offset the impacts of clearing.

The table below summarises some of the reasons why identifying the offsets from within the site boundaries would result in achievable offsets.

Table 6-2 Benefits of offsetting within the site boundaries

Development (impact areas) characteristics	*Result for offset site*
The wind farm impact area is a small proportion of the site boundaries. Broad vegetation type mapping is available for the larger site.	*Ample residual area in each vegetation type to be considered as offsets (ample ratios demonstrated as able to be achieved for each vegetation type that will be impacted).*
The wind farm impact areas are generally of lesser habitat quality when compared to the vegetation retained within the site boundaries. This is achieved through early constraints mapping to inform the site layout and Statements of Commitment to avoid, wherever possible, areas of high constraint.	*Land in the locality of higher biodiversity value able to be identified and protected.*
The land on which the wind farm is constructed will be owned by the same persons who will own the offset sites.	*Offset agreements can be a part of lease agreements, included in landowner negotiations.*
Large parcels of land that share property boundaries.	*Coordinated management.* *Potential to reduce edge area effect by linking sites on neighbouring properties.*

The offsets will be defined from within the involved land holder boundaries (the project site boundaries).

The agreements with the landholders provide certainty that the areas can be managed appropriately, including the establishment of a vehicle to protect the areas in perpetuity. The wording in landholder contracts for this development is as follows:

> ***Biodiversity offset.*** *If requested by the Wind Farm Company, the Landowner agrees to negotiate in good faith to set aside part of the Land (or nearby land owned by the Landowner) for the purpose of providing appropriate biodiversity offsets in relation to the Wind Farm, including, if appropriate, the registration of a covenant regarding future use and management of that part of the land. The Wind Farm Company shall pay reasonable compensation and the reasonable costs of the Landowner in negotiating and establishing the biodiversity offset.*

6.1.5 How will the offsets be managed and secured

It is proposed that the wind farm operator would be responsible for the management of the offset site, during the operational life of the wind farm. The operator is likely to finance the landowner of the site to undertake management actions (such as fencing and weed control) but would retain responsibility for the management of the site. This provides surety that the actions will be undertaken, as the requirement to offset would be a condition of the wind farm operator's project consent.

At the decommissioning stage, the ongoing management would be the responsibility of the landowner. It is expected that by this time the majority of the required management actions would have been undertaken and ongoing management tasks will largely coincide with routine agricultural activities. Land use restrictions will remain in place on the offset site so that any activities undertaken on the offset site must be compatible with the site's overall function: to improve biodiversity values.

The proponent commits to securing a formal vehicle to manage the offset site in perpetuity. A Conservation Property Vegetation Plan (CPVP) is proposed, attached to the land title under the NSW *Native Vegetation Act 2003*. The

agreement will specify management actions and restrictions on land use, in accordance with the finalised offset plan for the site and will operate in perpetuity.

6.1.6 How will the offset compensate for the impacts on affected species

The offset land will be set aside and managed in perpetuity for conservation purposes. The long-term improvement in the offset site and its contribution to local landscape connectivity will compensate for the loss of smaller areas of habitat of generally lesser biodiversity value.

Considering affected EPBC listed species, the following offsets ratios have been proposed with reference to Appendix G.

Table 6-3 Offsets for affected species

Affected species	*Condition of vegetation, where relevant (5 class condition categorisation)*	*Ratio from Offset Strategy*
Box Gum Woodland	M-G	*1:10*
	G	*1:10*
Yass Daisy		*1:10*
Golden Sun Moth		*1:10*
Superb Parrot	P, P-M	*1:2*
	M	*1:5*
	M-G	*1:10*
	G	*1:10*
Swift Parrot	P, P-M	*1:2*
	M	*1:5*
	M-G	*1:10*
	G	*1:10*
Regent Honeyeater	P, P-M	*1:2*
	M	*1:5*
	M-G	*1:10*
	G	*1:10*
Hollow bearing trees		*1:1*

Condition classes include poor, poor-moderate, moderate, moderate to good and good.

Notes:

- The Yass Daisy impact area can be confidently stated as 0 ha, because targeted surveys have informed micro-siting of infrastructure to avoid all individuals so far detected.
- The site contains breeding and foraging habitat for the Superb Parrot. Impact areas would be estimated by declaring all Box Gum Woodland as potential habitat.
- The Swift Parrot is considered, based on the results of surveys to date, not to reliably utilise the site. If detected during future surveys, prior to construction, this species would be offset however, available information suggests that no offset will be required for this species.
- The site contains foraging habitat for the Regent Honeyeater. Impact areas would be estimated by declaring all Box Gum Woodland as potential habitat

- HBT offsets are supplementary. That is, for each HBT removed, a nest box (or remounted hollow) would be installed. This may occur on offset or other land within the site boundaries. HBTs are high constraints in the Coppabella and Marilba precincts (avoid) and moderate in the new areas (minimise); micro-siting will be undertaken to minimise the number requiring removal and therefore offsetting.

6.1.7 How will the offset will ensure protection, conservation and management for affected species

A Conservation Property Vegetation Plan is proposed, attached to the land title under the NSW *Native Vegetation Act 2003*. The agreement will specify management actions and restrictions on land use, in accordance with the finalised offset plan for the site and will operate in perpetuity.

A CPVP is a legally binding agreement under both the NSW *Native Vegetation Act 2003* and the NSW *Threatened Species Conservation Act 1995*. The terms of the CPVP will not be affected by any changes to local or state planning rules or new listings of threatened species. A CPVP can be varied at the landholder's request, provided the variation will still improve or maintain environmental outcomes.

The long-term improvement in the offset site and its contribution to local landscape connectivity will compensate for the loss of smaller areas of habitat of generally lesser biodiversity value.

6.2 Commonwealth offset policies

6.2.1 Offset calculations

The EPBC Act Environmental Offsets Policy (EOP) outlines the Australian Government's approach to the use of environmental offsets ('offsets') under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). This policy relates to all matters protected under the EPBC Act. Offsets are required where a significant impact is anticipated. For the proposed Yass Valley Wind Farm, this could include:

- Golden Sun Moth

This is because sufficient surveys have not been undertaken to conclusively demonstrate a significant impact could be avoided. Conversely, given the completion of field surveys for all other species and the assessed impacts on the EPBC listed threatened birds, as no significant impact is anticipated, no EPBC offset is proposed. It is noted that under the NSW requirements however, areas of potential habitat for Superb, Swift Parrot and Regent Honeyeater will be offset, as a part of offsetting native vegetation that would be removed. Offsets for indirect impacts are not explicitly contained within the existing strategy. However, it is noted that, if a confirmed stakeholder of the offset plan, input from DoE would be sought.

The section below therefore relates specifically to the Golden Sun Moth.

Methods

The Offsets Assessment Guide (OAG) was run according to the information contained in the document titled 'How to use the Offsets Assessment Guide' (which is published on the DSEWPaC's EPBC Act environmental offsets policy web page). In running the OAG, the user is required to enter a number of variables which require a quantitative assessment of the condition of the vegetation at the development and offset site and also factors such as the time until the ecological benefit of the offset is realised, the risk of the loss of the offset and the level of confidence in these results. The reasoning used in reaching these values is discussed individually for each below.

Area of habitat – Starting with the surveyed areas that we have now extrapolated to moderate and high potential habitat (223 hectares for the broader Yass Valley site), we have overlaid the infrastructure footprint to estimate moderate and high potential habitat that would be removed by the proposal. The total area of impact is 21.98 ha. The residual area available for use as offset lands is 201.02 ha.

It is noted that, given the broad habitat preference of the species in this location, approximately 2,404 hectares of potential habitat occurs within the Yass Valley site boundaries can could therefore be considered for offsetting (Box Gum Woodland derived pasture in any condition, poor to good).

Quality of habitat

The overall habitat quality score (0-10) was determined by considering the following factors (as outlined in the 'How to use the Offsets Assessment Guide') individually:

- Site condition. Including vegetation condition (weediness), structure and species diversity.
- Site context. The biodiversity importance of the site in terms of its landscape position.
- Species stocking rate. The number of individual populations at the site.

The contribution of these factors was noted according to their level of importance. The results of this analysis are provided in the table below. As the offset site is immediately adjacent to the area to be impacted, the start quality of both areas was considered to be the same.

Factor	Score	Importance Ranking	Reasoning
Site condition	5	1	Habitat for GSM at the site carries a large proportion of exotic species including listed noxious weeds. Species diversity is generally very low. However, this species can tolerate weediness.
Site context	5	2	The site occurs in a highly modified and fragmented environment. The habitat at the site is not considered greatly important with regard to connectivity or for the persistence of the habitat within the landscape which provides similar vegetation and habitat values.
Species stocking rate	5	3	The species is known across this site and in numbers on adjacent sites (Conroys Gap, Bango, Rye Park localities).
Overall habitat quality score	5		

Time over which loss is averted for the offset

As the offset site is to be legally secured and managed in perpetuity under a Conservation Property Vegetation Plan pursuant to the Native Vegetation Act 2003, the maximum forecast term of 20 years was selected for this variable.

Future quality with or without offset and time until ecological benefit

The values for these variables are largely based on the management actions proposed as part of the offset plan including:

- Exclusion of stock
- Weed control
- Rabbit control

It is considered reasonable that the overall quality of the habitat within the offset site could be increased to a value of 7 over a period of 10 years by maintaining these management actions. Conversely, if current land management practices continue, it is considered likely that the site would further degrade in quality eventually becoming so poor as to not represent habitat suitable for the GSM. Over the 10 year period it is considered likely that the overall habitat quality would degrade to a value of 2.

As the degradation at the site has been largely caused by weed invasion and over grazing and that the management actions described above would be required to be carried out as part of the project's consent, a confidence level of 80% has been applied. This is considered reasonable as it still allows for unforeseen circumstances such as extreme weather events.

Risk of loss of the offset site with or without the offset

The offset sites under consideration are currently utilised for grazing and is situated within a landscape where this is the dominant land use. The land is zoned 1(a) General Rural. The land is privately owned and not protected by any conservation agreements or reservation schemes. There are no known pending mining leases or development applications that apply to the offset site. As stated in the 'How to use the Offsets Assessment Guide', degradation to the quality of the site due to current management practices and use should not be incorporated into the risk of loss as these factors are incorporated in the quality score however, it is considered reasonable that future land management practices be taken into account. These may include broad scale spraying and cropping. An estimate of 50% risk of loss without offset has been applied as the site is unprotected and the future intentions of the landowner are unknown.

With the offset in place, the risk of loss is considered to be very low as the offset would be legally secured in perpetuity. There is a small chance that the offset may be lost due to unforeseen circumstances. A 5% risk of loss has been applied to account for this.

The estimated values for risk of loss are based on factors outside the control of the proponent but are considered reasonable, given the known land use history. An 80% confidence in these results has been applied.

Results

Utilising the values described above, the OAG returned a ~500% direct offset for the impact. While additional survey is required to inform impact areas and offsets, this result shows that an offset for this species would be highly feasible. No additional compensatory measures are considered to be required.

6.2.2 Offset policy

To satisfy the EPBC Act EOP suitable offsets must:

1. ***deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action***

   The offset areas would be subject to in perpetuity management for biodiversity outcomes. Management would be specific to the values of the offset site and including monitoring and hence ensure the viability of habitat quality and persistence.

2. ***be built around direct offsets but may include other compensatory measures***

   As a 100% direct offset has been achieved, no other compensatory measures are considered to be required.

3. ***be in proportion to the level of statutory protection that applies to the protected matter***

   This has been taken into account by entering the status of the GSM into the offset calculations.

4. ***be of a size and scale proportionate to the residual impacts on the protected matter***

   Direct impacts include habitat loss and mortality where habitat coincides with the infrastructure footprint. The estimated habitat loss, based on current survey data, has been entered in the offset calculator.

5. ***effectively account for and manage the risks of the offset not succeeding***

   The direct offset will be managed in perpetuity for biodiversity under a legally binding agreement which provides surety of the offset succeeding for the long-term.

6. ***be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action, see section 7.6)***

   The offset site includes land that is currently private grazing land, not protected by any other conservation or zoning measure

7. ***be efficient, effective, timely, transparent, scientifically robust and reasonable***

   An Offset Plan would be prepared in consultation with NSW OEH, and local Councils and Catchment Management Authorities. This offset plan would provide efficiencies by also satisfying the requirements of the EPBC EOP.

Satisfying the plan and management requirements pertaining to the offset would be a condition of the project's consent and in this manner, transparent and timely.

8. ***have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.***

A CPVP will be prepared and implemented to secure and manage the direct offset. This ensures that the site is protected in perpetuity and that restrictions on land use that apply will be attached to the title, as will management measures.

During the operational life of the wind farm (expected to be around 30 years), the management and maintenance of the offset site will be auditable through the project's Operational Environmental Management Plan as the offset is part of the consent conditions of the approved project.

Summary

This information demonstrates that suitable offsets are feasible for the project. The details will be contained within an Offset Plan, developed in consultation with DoE and other stakeholders and informed by further targeted surveys for this species.

6.2.3 What is the anticipated cost of delivery of the offset

Costs associated with the offset area are as follows:

- **Purchase of land.**

As the land is currently owned by involved land holders, no exchange of title or purchase of land is foreseen.

- **Lease of land**

Lease payments are made to the landowners throughout the operational life of the wind farm by the proponent, commensurate with the number of turbines located on each property. Additional payments to compensate for lost income on offset land would also be made by the proponent to land owners, where applicable.

- **Management actions during the operation of the wind farm**

The bulk of the management costs are expected to be incurred at the establishment of the offset site. This would include fencing, signage, weed control, pest animal control and installation of nest boxes, where required. These costs would be solely borne by the proponent.

- **Management actions after the decommissioning of the wind farm**

It is possible that the landowner would be provided some upfront payment by the proponent, in consideration of any obligations after decommissioning of the wind farm. Strictly speaking, these costs would be borne by the land owner and are expected to amount to routine agricultural maintenance of fencing, weed control and pest animal control. Managed grazing, with care to retain set biomass levels, is expected to be permitted, providing some income for the management of this land.

6.2.4 Conclusion

The Offset Strategy developed as part of this project application sets out a methodology to calculate, manage and secure an offset site to offset the impacts of the construction of the proposed Yass Valley Wind Farm. A site has yet to be identified, but there is ample land of suitable type within the project boundaries to demonstrate that offsets are achievable for EPBC affected species, where they are demonstrated to occur. Further, the plan provides clear incentives, in the form of pre-set ratios that relate to existing mapping, for the proponent to further minimise impacts and thereby reduce the offset requirement for the proposal.

7 Social & Economic Impacts

7.1 Existing environment

The proposed Yass Valley Wind Farm would be located primarily within the Yass Valley Local Government Area (LGA). The exception is the Coppabella Hills Precinct, a portion of which is located within the Harden Shire LGA.

Key statistics pertaining to the two LGAs are provided in Table 7-1 and Table 7-2 (ABS, 2011a; ABS, 2011b).

Table 7-1 Key statistics for the LGA

	Yass Valley (2011)	*Harden (2011)*
Size of shire: Area of sq. km.	3,997	1,869
Population		
Number	15,516	3,582
% Growth since 2007	10%	-0.4%
Medium age (yrs.)	39.8	46.7
Average Total Income (excl. pensions) (2010)	$50,239	$35,879

Source: Australian Bureau of statistics

Table 7-2 Top 10 industries by % employed (2011)

Yass Valley		*Harden*	
Public administration and safety	19.1	Agriculture, forestry and fishing	28.8
Construction	10.2	Retail trade	8.6
Health care and social assistance	8.6	Health care and social assistance	8.6
Agriculture, forestry and fishing	8.2	Education and training	8.2
Professional, scientific and technical Services	8.2	Public administration and safety	5.3
Education and training	8.1	Construction	5.1
Retail trade	7.9	Transport, postal and warehousing	5.1
Accommodation and food services	6.5	Manufacturing	4.9
Other services	3.1	Accommodation and food services	4.7
Manufacturing	3	Wholesale trade	3.5

The Yass Valley Shire is largely agricultural. Extensive grazing of sheep and cattle are the predominant land uses. In recent years many new agricultural industries are emerging including cool climate wines, alpaca studs, miniature cattle studs, olives and berries (Yass, 2013). The major industry sectors within the Yass Valley Shire are agriculture, retail trade and tourism, which reflect the predominately rural nature of the area. Bowning and Binalong are the closest villages to the three Precincts and provide limited services (groceries, accommodation). Yass, the major centre of the Yass Valley LGA is located approximately 20-30 kilometres east of the three Precincts and has a population of approximately 6,000 residents. The Yass Valley LGA features historic buildings, wineries, rural villages, antiques and art galleries along with Burrinjuck Water State Park valued by locals and visitors alike.

The Harden Shire Council is known for its rich agricultural base including cereal cropping, horticulture and grazing. Land within the Harden Shire LGA has the highest dryland wheat production within NSW. The predominate industry within the Shire is agriculture; the second largest industry is transport. The Harden shire is strategically located at the junction of the major transport routes, the Hume and Olympic highways as well as the Burley Griffin Way.

Relevant to both LGAs, the drought has put increasing pressure on agricultural enterprises. Increasing growth in the Yass Valley also places water resources and other services under greater demand.

7.2 Impact Assessment- Construction and Decommissioning

The project would provide temporary employment opportunities during construction and decommissioning. The increased demand for services in the local area, most likely during the construction phase, would also accompany the development, as contractors seek to accommodate and utilise other services in the local area. While it is hard to predict the exact amount of investment that will be injected into the local economy, there have been studies conducted to calculate the likely impacts based on the size of a proposed wind farm. The Clean Energy Council commissioned Sinclair Knight Merz (SKM) to prepare a report into the investment costs and benefits of wind farms in Australia. SKM released the report '*Wind Farm Investment, Employment and Carbon Abatement in Australia'* in June 2012 which presents an updated national and state-based snapshot of wind farm investment, jobs and carbon abatement. The study aimed to use financial and other data from a range of sources to provide a reasonable set of indicative figures to estimate the financial inputs and outputs for wind farms on a per MW basis (SKM, 2012).

Construction

SKM reviewed data based on the expenditure per MW of a number of wind farms that were recently developed or under construction. It found that this review closely reflected the expenditure data from Hallett 1, Waubra and Macarthur wind farms. These figures have been extrapolated for the Yass Valley Wind Farm and the results can be seen in Table 7-3.

Table 7-3 Local, State and Australian construction expenditure for a 315 MW wind farm ($million)

Construction Expenditure	*Local / Regional*	*State*	*Australia*
Wind turbine generators	$60.46	$202.21	$300.48
Site administration and design	$7.53	$25.20	$37.45
Site construction works	$7.53	$25.20	$37.45
Site electrical works	$8.49	$28.00	$41.56
Labour	$9.45	$31.15	$46.29
Total construction	$93.54	$312.11	$463.66
Local operational expenses (annual)	$6.30	$9.80	$22.40

Using the estimations from this report, it is anticipated that $93.5 million could be spent within the region as a result of the construction phase of the wind farm.

There is an opportunity for local contracting and manufacturing services to be contacted during the site development. These may include concreting; earthworks, steel works and electrical cabling, as well as other service-related employment would follow, with the provision of food, fuel, accommodation and other services for the contractors. Based on the construction phase spanning 18-24 months, employment would likely increase by around 346 full time equivalent jobs across the local area. It is considered that construction, property and business services and retail trade would make up most of the employment growth. Precise economic benefits would vary based on the final site design, turbine suppliers, timing of works and other details. Currently there are no facilities capable of making turbine components (nacelles and blades) in Australia. There may be potential for manufacturing towers in Australia.

There are a number of constraints related to the potential of the socioeconomic environment described. These include supply-side constraints, primarily the supply of labour. Furthermore, the capacity of local business to service new contracts, together with the quality of local housing, amenities and other physical and social infrastructure are also factors that may affect the ability to attract and retain workers. Using the SKM model it is estimated that over $800,000 would be spent during the construction period by workers in the local community. Table 7-4 highlights these estimated annual values.

Table 7-4 Estimated local project expenditure within the region

Construction Annual Expenditure	Local / Regional
Accommodation	$270,544
Food	$405,802
Fuel	$162,332
Total	$838,650

The construction and decommissioning phases of the project would take place over a considerable time period (estimated to the 18-24 month for construction and approximately 12 month for decommissioning). There is potential to adversely impact the current grazing activities on the land parcels that would be developed and for the additional heavy vehicle traffic on public roads to interfere with other economic activities, for example, scenic drives, field days and other tourist related activities. It is anticipated that the grazing impacts would be confined to the involved land holders. Involved land owners would be compensated by the Proponent for allowing the infrastructure to be constructed on the individual properties. It is considered that this compensation would off-set the disruption of grazing.

Operation

Wind farms are an economically viable means to generate electricity. The project would be privately funded and there would be no ongoing financial expenses to the community or any government agency.

Turbine rental provides additional revenue for involved property owners while allowing conventional farming activities to continue as usual. This would create an increased value to these properties and contribute to additional investment in the local area.

7.3 Agricultural Impacts

7.3.1 Existing environment

Agriculture is the main land use in the Yass Valley, occupying approximately 73% of the total land area or about 290,913 hectares (Yass, 2007). Agriculture in the region is dominated by wool production. Yass Valley LGA is diversifying its rural products; many new agricultural industries are emerging including wine, alpaca studs, olives and berries. The close proximity of Canberra to the Yass Valley LGA is assisting the establishment of these new enterprises (Yass, 2013). The shift from grazing to cropping and mixed farming is a recent trend and may be related to the recent drought conditions; this trend has been recognised as having implications for land degradation as the land capability is not suited to long-term cultivation.

In general, the precincts are comprised of cleared ridges, slopes and flats containing scattered trees and forest remnants. The pasture is a mixture of native and exotic species.

The Proposal would provide a drought resistant supplementary income stream for involved land holders, compatible with current grazing practices.

7.3.2 Impact assessment - construction and decommissioning

Adverse impacts affecting the agricultural use of the three Precincts and surrounding properties would be greatest during the construction and decommissioning phases of the development. They would centre on restrictions to stock access and potential to affect grazing land (direct loss of land, due to footings and tracks, and potential degradation of land, through erosion and sedimentation, pollution and weed ingress).

During construction and decommissioning, stock may need to be excluded from the works area and, in some cases, restricted from access roads, to minimise the risk of collisions. There are likely to be temporary speed limits enforced to mitigate the risk. The impact of exclusion of stock would be high Coppabella Hills and Marilba Hills which involve very large land holdings and multiple affected agricultural enterprises.

During the construction phase, soil disturbance through the construction and upgrading of tracks, laying electrical cables, excavate footings and create hardstand areas would remove pasture currently available for grazing. In many

cases, this impact would be temporary, as disturbed areas would be rehabilitated before the completion of the construction phase (crane hard stand areas, access tracks not required during the operational phase and underground cable trenches). During decommissioning, further areas would be restored to their pre-existing capacity (access and spur tracks not required by the landowner, electricity easements). During the restoration activities, stock access would be periodically restricted while vegetation is re-established. The total amount of land not able to be returned to pre-project agricultural capacity is a minor proportion of the total impact area (access tracks, the footings of turbines, control building and substation).

Potential for indirect impacts is present where soil compactions, erosion, turbid runoff, weed ingress and pollution from chemical spills is not managed adequately. Impacts such as erosion, turbid runoff and weed ingress have the potential to spread, affecting much greater areas of land. Unmitigated, these impacts would reduce the productivity of the affected areas. These impacts are highly manageable, however.

Noise and dust generated during the construction and decommissioning are manageable and considered to represent negligible impacts for agricultural activities, given the mitigation proposed in the Environmental Assessment prepared for the NSW DPI.

Construction impacts are therefore considered to be largely temporary and manageable. Affected land owners would be compensated for the loss of the development footprint by way of the lease arrangements they enter into with the Proponent.

There is an opportunity to improve the native composition of the site and production capacity in some areas onsite. The ongoing expenses of resowing exotic species as well as the resultant loss of soil condition and ingress of weeds are good reasons to investigate the sustainability of using native species rather than replacing them with exotics during site restoration. The precincts retain varying degrees of native understorey, a result of soil type, stocking rate and improvement practices. The rehabilitation and encouragement of native grasses onsite could have production and conservation benefits and should be explored as a potential offset to clearing during the construction phase of project development. Revegetation of disturbed and weedy areas with productive native species, excluding stock from unstable areas as well as management of the timing and intensity of grazing, could be implemented during and following site development to benefit landform stability, native vegetation diversity and may create more drought tolerant pastures.

7.3.3 Impact assessment - operation

7.3.3.1 Grazing practices

The operational wind farm is not anticipated to affect the way that involved landowners or neighbouring landowners currently manage their agricultural activities. Nor is it anticipated to affect the production capacity of the land, apart from a minor loss of the available grazing area taken up directly by the foot print of the Proposal which will be less than 2% of the land involved. The operational wind farm provides a benefit to involved landowners, a supplementary drought resistant income stream throughout the life of the project.

7.3.3.2 Agricultural agriculture

The use of aeroplanes and helicopters for agricultural purposes such as crop dusting, spraying and fertilising occurs throughout the Southern Tablelands and in the region of the wind farm.

Agricultural operations involving low level flying can only occur in good conditions (high visibility) in accordance with the aviation regulations. It is considered that these conditions would be conducive to wind turbines being readily observable. Pilots who are engaged in low level flying and agricultural operations are required to undertake a risk assessment for each flight. This would identify specific hazards such as trees and powerlines and wind turbines would be treated no differently. An aeronautical assessment confirmed that the location of the wind farm and any of its individual turbines will not impact on the approach, circuit work or take-off of aircraft from any of the identified aerodromes, airfields or airstrips in the region. Advice from a local operator was that the wind farm would present no operational issues for the agricultural operations.

8 Other Approvals & Conditions

8.1 State Government Legislation and Policy

Planning approval for major projects like the Yass Valley Wind Farm in NSW is governed by the *Environmental Planning and Assessment Act 1979* (*EP&A Act*). *Transitional Part 3A Project*

Yass Valley Wind Farm is a transitional Part 3A project (*EP&A Act,* Schedule 6A Transitional arrangements—repeal of Part 3A – clauses 1, 2 and 3).This is due to the fact that it has a capital investment value of more than $30 million and was confirmed to be a project to which Part 3A of the EP&A Act applies by the Director-General of the Department of Planning and Infrastructure on 28 October 2008. Part 3A continues to apply to Yass Valley Wind Farm because Director General's Requirements were issued before 1 October 2011 (on 12 January 2009), and because this EA is lodged by 30 November 2012, or as extended by DPI.

The local Councils are not the Consent Authority for this project, and there is no obligation to comply with all relevant Development Control Plans (DCPs) prepared by each Council. However, compliance or otherwise against these DCPs must be taken into consideration in carrying out the assessment.

Critical Infrastructure

Given that the proposed Yass Valley Wind Farm will be capable of generating more than 30 MW of electricity from renewable energy resources, it is a 'critical infrastructure project' under former Part 3A (former section 75C EP&A Act; *Government Gazette* 27 November 2009 page 5841; letter from Department of Planning to Proponent dated 28 October 2008*).*

Consent Authority

The Minister determines transitional Part 3A projects (former section 75J(1)). The Minister has delegated this power to the Planning Assessment Commission (Government Gazette, 28 September 2011, page 5682). If the Commission proposes a voluntary planning agreement, the instrument of delegation requires the Commission to first consult with the Minister.

Director General's Requirements

The NSW Director General of the Department of Planning has issued requirements for Epuron to consider and address in this EA (known as the Director General's Requirements or DGRs). These requirements incorporate inputs from the various government agencies that will provide advice to the Department in the assessment of this proposal.

The steps in the planning determination process are outlined in Table 8-1.

Table 8-1 Planning Assessment Process

Stage of the Assessment	*Description*
Project Application and Preliminary Environmental Assessment	A Preliminary Environmental Assessment (PEA) is conducted by the Proponent to support the Project Application and give context around the site and potential issues that would need to be considered.
Director General Requirements (DGRs)	Using the PEA and advice from other governmental departments the Department of Planning and Infrastructure (DPI) issues DGRs. This is a list of issues that must be addressed by the proponent in an EA
Environmental Assessment and Consultation	The Proponent prepares an EA following the DGRs. This involves extensive studies to be conducted on site as well as consultation with the local community and other stakeholders.
Submission and Departmental Review of the EA	The Proponent submits the EA and supporting studies to the DPI who undertakes a review of the EA to ensure the document is acceptable and addresses all issues raised in the DGRs. The DPI may require further work to be carried out by the Proponent. The Yass Valley Wind Farm EA was submitted to the DPI in November 2009

Stage of the Assessment	*Description*
Public Exhibition	The EA is placed on display locally and electronically for the public to review and provide feedback via submissions to the DPI. It is expected the EA will be on display for a minimum of 60 days.
Response to Submissions	The DPI provides the Proponent with a summary of issues raised in submissions. The Proponent is required to respond to each issue that is raised in the submissions and submit a Submissions Report to support the EA.
Determination	The DPI considers the EA and the Submissions Report, preparing its advice and recommendations for the Minister for Planning and Infrastructure, and the Planning Assessment Commission (as delegate of the Minister) determines the application.

9 Information Sources Provided in the Preliminary Documentation

This Additional Information Report has been prepared by Epuron Pty Ltd with significant input from **ngh**environmental, particularly for sections 3, 4, 5 and 6.

The information within the report is current as of the date of this report.

The methodologies for the environmental assessment, including fieldwork, are described in sections 3 and 4 of this report including references to other sources where relevant.

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