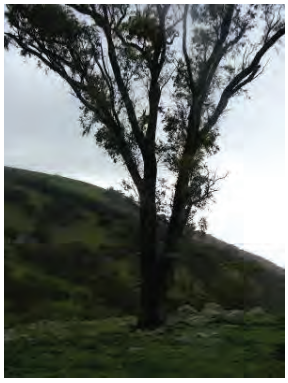
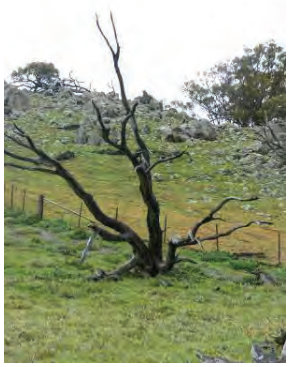
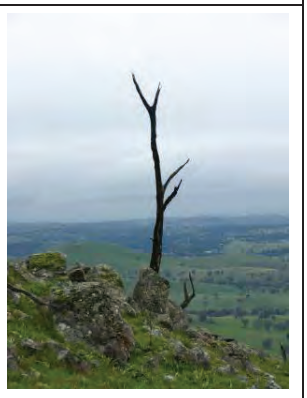
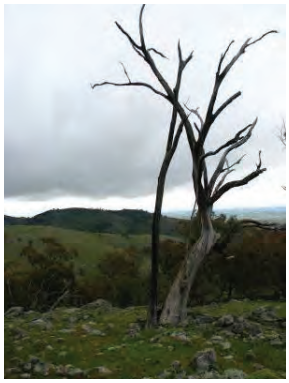
Area 4A									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
19	White Box *Eucalyptus microcarpa*	70	5	>10	0	0	10	641118 E 6155353 N	
20	White Box *Eucalyptus microcarpa*	100	15	>8	3	0	11	641112 E 6155365 N	
21	White Box *Eucalyptus microcarpa*	50	4	>5	1	1	7	641110 E 6155373 N	

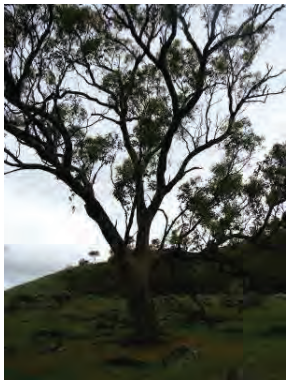
Area 4B									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**

Area 4B									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
1	Stag	1 x 30 4 x 20	7	>10	0	0	10	641986 E 6155696 N	
2	Stag	30	3	<10	0	0	10	641961 E 6155704 N	
3	Stag	20	4	5	0	0	5	642001 E 6155748 N	

Area 4B									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
4	Stag	20 x 10	3	3	0	0	3	641982 E 6155748 N	
5	White Box *Eucalyptus microcarpa*	5 x 20-60	8	<3	0	0	3	641655 E 6155947 N	
6	Stag	50	6	>10	2	0	12	641647 E 6155969 N	

Area 4B									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
7	Stag	70	7	>10	0	0	10	641654 E 6155972 N	
8	White Box *Eucalyptus microcarpa*	80	8	2	0	0	2	641638 E 61155983 N	
9	White Box *Eucalyptus microcarpa*	70	7	4	1	0	5	641630 E 6155985 N	

Area 4B									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
10	Stag	40	5	<10	2	1	13	641664 E 6155993 N	
11	White Box *Eucalyptus microcarpa*	100	15	7	0	0	7	641678 E 6156005 N	
12	White Box *Eucalyptus microcarpa*	90	12	6	2	0	8	641709 E 6156008 N	

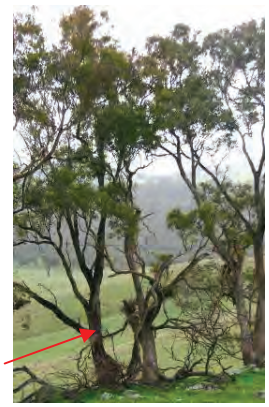
Area 4B									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
13	White Box *Eucalyptus microcarpa*	100	15	3	1	0	4	641718 E 6155989 N	
14	White Box *Eucalyptus microcarpa*	95	15	2	2	0	4	641720 E 6155982 N	
15	White Box *Eucalyptus microcarpa*	80	12	3	0	0	3	641724 E 6155978 N	

Area 4B									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
16	White Box *Eucalyptus microcarpa*	85	12	2	0	0	2	641734 E 6155975 N	
17	White Box *Eucalyptus microcarpa*	200	15	>20	<10	4	35	641719 E 6155948 N	
18	White Box *Eucalyptus microcarpa*	100	10	<5	2	0	7	641718 E 6155930 N	
19	Stag	5 X 50	10	<10	0	0	10	641685 E 6155965 N	

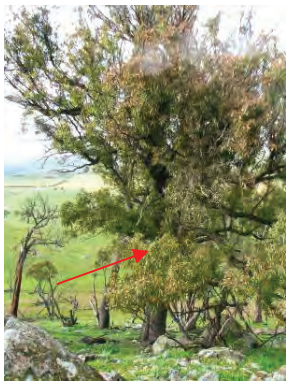
Area 4B									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
20	White Box *Eucalyptus microcarpa*	80	8	<10	0	0	10	641676 E 6155961 N	

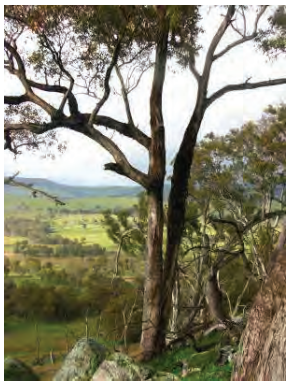
Area 7									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
1	White Box *Eucalyptus microcarpa*	30	12	1	0	0	1	644513 E 6150562 N	
2	White Box *Eucalyptus microcarpa*	80	13	2	1	0	3	644487 E 6150528 N	

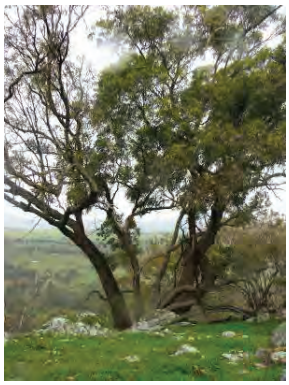
Area 7									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
3	White Box *Eucalyptus microcarpa*	70	10	2	0	0	2	644508 E 6150532 N	
4	White Box *Eucalyptus microcarpa*	60	12	2	0	0	2	644518 E 6150541 N	
5	White Box *Eucalyptus microcarpa*	80	12	3	1	0	4	641521 E 6150542 N	

Area 7									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
6	White Box *Eucalyptus microcarpa*	80	12	2	2	0	4	644531 E 6150543 N	
7	White Box *Eucalyptus microcarpa*	30	12	2	3	0	5	644532 E 6150543 N	
8	White Box *Eucalyptus microcarpa*	50	12	4	2	1	6	644538 E 6150539 N	

Area 7									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
9	White Box *Eucalyptus microcarpa*	40	15	3	2	0	5	644538 E 6150524 N	
10	Stag	60	10	>10	0	0	10	644544 E 6150519 N	
11	White Box *Eucalyptus microcarpa*	50	10	4	2	2	8	64495 E 6150508 N	

Area 7									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
12	Red Stringybark *Eucalyptus macrorhyncha*	80	18	>10	1	0	11	644493 E 6150510 N	
13	Red Stringybark *Eucalyptus macrorhyncha*	80	20	4	2	0	6	644489 E 6150511 N	
14	White Box *Eucalyptus microcarpa*	4 x 60	15	>15	3	2	20	644468 E 6150518 N	

Area 7									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
15	White Box *Eucalyptus microcarpa*	30	8	1	0	0	1	644465 E 6150541 N	
16	White Box *Eucalyptus microcarpa*	70	10	5	1	0	6	644463 E 6150545 N	
17	Stag	60	8	3	0	0	3	644461 E 6150544 N	

Area 7									
No.	**Tree Species**	**D.B.H**	**Tree Height**	**Small < 10 cm**	**Medium 10 – 20 cm**	**Large > 20 cm**	**Total of Hollows**	**GPS Co-ordinates**	**Photo**
18	White Box *Eucalyptus microcarpa*	1 x 100 2 x 10 1 x 60	10	5	2	0	7	644441 E 6150535 N	

4 CONCLUSION

Additional survey was undertaken for the Squirrel Glider, Barking Owl and Bush Stone Curlew, in areas identified as containing abundant hollow-bearing trees within close proximity of indicative turbine locations. Survey limitations included cool to cold weather, rain and access difficulties.

These species were not recorded during the survey. The areas contain an array of mature trees containing hollows of diverse sizes. However, the vegetation structure, specifically the under and mid story, have been radically modified.

The results confirmed the assumptions of previous work, those being that the degree of modification from past clearing and heavy grazing have reduced the habitat quality and the likelihood that the sites provide important resources for the subject species.

It is recommended however, that any hollow removed during site development be offset. This could involve mounting removed hollows or installing nest boxes at a safe distance from the final turbine location (for example 100m). This will retain the level of resources currently found onsite for other hollow-dependant species. It will also retain the opportunity that the site could provide better quality habitat, under less intensive land use in the future.

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6 PHOTOS

Photo 1: Anabat Detection Unit set up at Area 4A.

Photo 2: Trap set up in large tree at Area 4A.

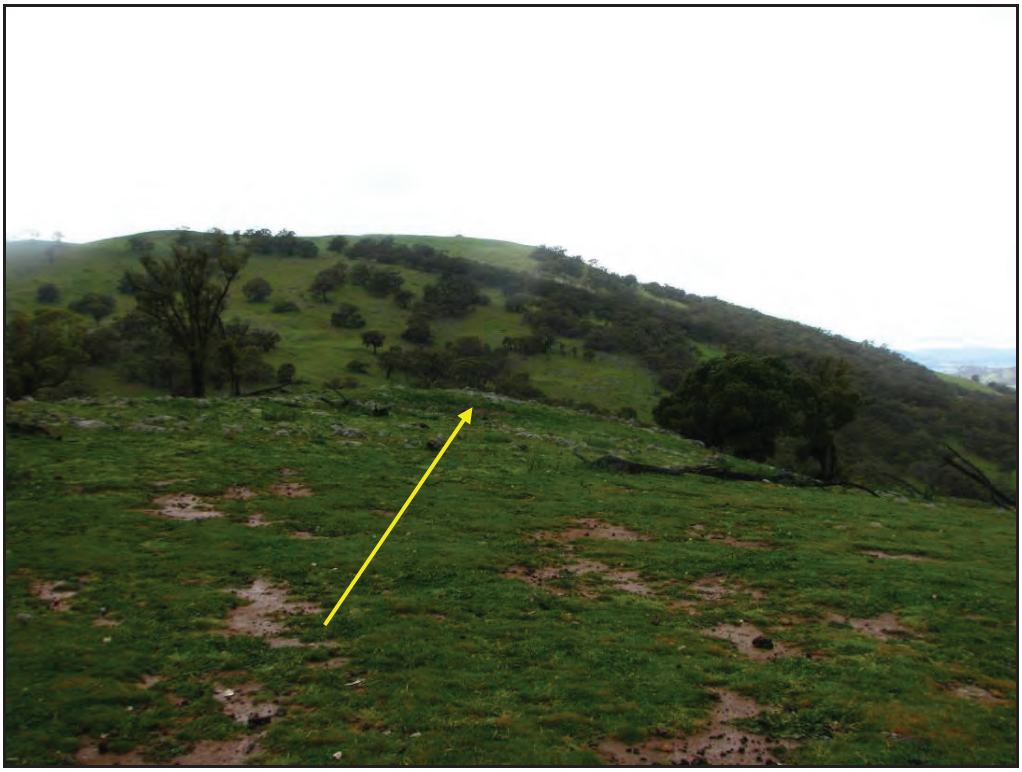
Photo 3: Hollows found at Area 4B .

Photo 4: Trap set up in dead stag at Area 7.

Area 4 A Turbine Locations

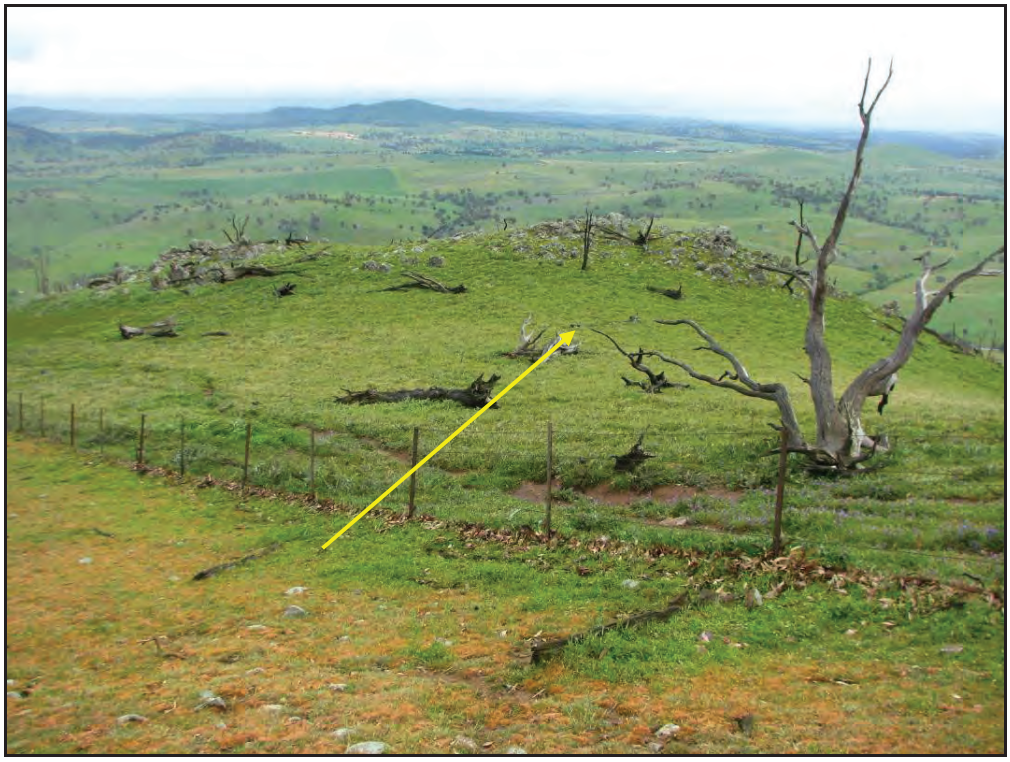
Turbine 1

Turbine 2



Area 4 B Turbine Locations

Turbine 1



Turbine 2

Area 7 Turbine Locations

Turbine 1

Turbine 2

APPENDIX H OFFSET STRATEGY

H.1 REQUIREMENT TO OFFSET

The publically exhibited Yass Valley Wind Farm proposal included as a Statement of Commitment (SoC 21) as follows:

> *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 (ie footing areas and new tracks) not the maximum impact areas included in Table 7.7 and 7.9 (which include easements and existing tracks). The Offset Plan would be prepared in consultation with DECC, prior to construction.*

As part of this revised submission, the following text has been added to SoC 21:

> *The Offset plan would be prepared in accordance with the offset strategy included as Appendix H of the SER.*

The purpose of this appendix is to outline the offset strategy, providing more certainty around:

- How offsets will be identified
- How offsets will be secured
- How offsets will be managed

H.2 PROPOSED METHODOLOGY

The key components of the methodology are:

a) Calculating the areas to be impacted
b) Determining a suitable offset ratio
c) Selecting the offset site

The proposed methodology for each of these components is detailed below.

H.2.1 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 that impact. In response to agency comments, the method for calculating permanent impact areas has been revised. The new calculation format is shown in Table 2-10 of this SER. Particularly:

a) Permanent habitat loss includes all footings and tracks as well as easements where they occur in treed areas
b) Habitat modification includes transmission easements where they occurs in pasture only
c) Temporary habitat loss applies to any areas that can be rehabilitated post construction (not decommissioning).

The proponent commits to offset a) only, that is, permanent habitat loss.

This area has been estimated for the revised proposal (Appendix F) however, the proponent commits to offset actual not estimated impact. Therefore, a post-construction audit of vegetation impact would be undertaken to finalise the boundaries of the offset site. In this way, there is a mechanism to ensure the actual amount of clearing is offset and an incentive throughout construction to minimise impacts and thereby reduce the offset requirement for the project.

H.2.2 Determining a suitable offset ratio

Agency requirements

In response to agency comments (Appendix B), a condition comparison table has been provided in Table 2-2 of the SER to demonstrate how the 5-class condition categorisation method used in the biodiversity surveys relates to the Biometric Assessment Guideline definitions. This is restated below:

Table D.1 Vegetation condition classes used at the site and Box-Gum Woodland EEC/CEEC and Biometric condition relationships

Condition class	Characteristics	CEEC[1]	EEC[2]	Biometric condition[3]
Poor	Groundlayer dominated by exotics (native grasses <50% cover)	No	No	Low
Poor-moderate	Groundlayer dominated by native grasses (>50%), with <5 native non-grass species	No	Yes	Moderate-Good
Moderate	Groundlayer dominated by native grasses (>50%), with 5-11 native non-grass species	No	Yes	Moderate-Good
Moderate-good	Groundlayer dominated by native grasses (>50%), with 12-24 native non-grass species	Yes	Yes	Moderate-Good
Good	Groundlayer dominated by native grasses (>50%), with >25 native non-grass species	Yes	Yes	Moderate-Good

[1] potential Commonwealth CEEC status when applied to the Box-Gum Woodland community (floristic criteria only)
[2] potential NSW EEC status when applied to the Box-Gum Woodland community (floristic criteria only)
[3] potential NSW Biometric condition status when applied to the Box-Gum Woodland community (floristic criteria only)

Agency comments (Appendix B) also require a series of additional threatened species and hollow-bearing tree surveys, to inform the offset site. These surveys have been committed to in the revised SoC 23).

Proposed methodology

Using the information currently available for the site and additional survey data that will be collected, 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

Regarding the latter point, additional surveys will be undertaken in consultation with OEH (as per SoC 23) in areas of habitat to be removed. These will inform whether the habitat is used by threatened species, increasing the offset ratio where threatened species habitat would be removed. Where the survey effort is not considered adequate to make a reasonably confident assessment, the precautionary approach will be employed and the area will be assumed to qualify as threatened species habitat.

Proposed ratios

For a number of reasons, we propose not to calculate ratios using the Biometric Assessment Methodology, but rather to set ratios in advance, based on vegetation type, condition and habitat value. A large amount of biodiversity survey work has been undertaken onsite, as part of several layout revisions to reduce biodiversity impacts. This has included sampling several seasons over several years, providing a substantial baseline from which to propose offsets. The work has been targeted to the specific nature of wind farm impacts – with a focus on birds and bats and to allow the development of management prescriptions to avoid and minimise impacts in specific areas, such as micrositing tracks and transmission infrastructure to avoid impacts on high conservation value areas. The intention is to supplement rather than redo this survey work. Using the Biometric Assessment Methodology at this time would duplicate survey effort.

The proposed ratios below have been developed based on our experience with the Biobanking calculator in similar vegetation types. They are a simplification but have the benefit of being transparent to the proponent and the consent authority. Where multiple factors apply and their ratios are contradictory (ie threatened species habitat and low condition vegetation) it is proposed that the highest offset ratio would apply. Hollow bearing tree requirements (HBT) are supplementary to area offsets. The ratios apply only to areas of moderate and low constraint, as all high constraint areas would be excluded from impact (as per SoC 12).

Table 7-3 Proposed offset ratios for native vegetation to be permanently removed

Condition class	Biometric condition[3]	Vegetation NOT OF conservation significance	Vegetation OF conservation significance	Threatened species habitat	HBT removed: nest box
Poor	Low	1 : 1	1 : 2	1 : 2	1 : 1
Poor-moderate	Moderate- Good	1 : 1	1 : 2	1 : 2	1 : 1
Moderate	Moderate- Good	1 : 1	1 : 5	1 : 5	1 : 1
Moderate-good	Moderate- Good	1 : 1	1 : 10	1 : 10	1 : 1
Good	Moderate- Good	1 : 1	1 : 20	1 : 20	1 : 1

Based on the preferred layout (tabulated in Table 2-11 and illustrated over the constraints map set, Appendix H), the proposed offset ratios would result in the following areas being secured in perpetuity, for the purpose of biodiversity improvement, totalling approximately 211 hectares. The extent of threatened species habitat (to be determined by supplementary surveys) may increase this ratio, where it is found to coincide with vegetation NOT of conservation significance.

Table 7-4 Proposed offset areas

Condition class	Biometric condition[3]	Vegetation NOT OF conservation significance	Vegetation OF conservation significance	Threatened species habitat	HBT removed: nest box	
Poor	Low	70.22	29.15	tbd	tbd	
Poor-moderate	Moderate-Good		33.96	tbd	tbd	
Moderate	Moderate-Good		10.25	tbd	tbd	
Moderate-good	Moderate-Good		39.18	tbd	tbd	
Good	Moderate-Good		5.57	tbd	tbd	
Total (hectares)		**70.22**	**118.11**	tbd	tbd	**188.33**

H.2.3 Selecting the offset site

When selecting the offset site (or sites) able to meet the ratios set out above, the proponent will ensure the selected offset site is:

- Of sufficient size to achieve the set ratios above
- Of appropriate type to achieve a 'like for like' or 'like for better' offset
- Complying with *Principles for the use of biodiversity offsets in NSW* guidance document

Any areas of ambiguity will be clearly stated so that a decision can be made about the overall suitability of the site. For example, it may be that exact ratios and types are not achieved but the overall package is still considered to achieve an overall neutral or beneficial outcome. If so, this will be identified and justified.

A specific site has yet to be identified however, there are large amounts of land of suitable type and condition within the project boundaries to demonstrate that offsets are achievable. The proponent has identified several sites with a total area in excess of 500 hectares, sufficient to offset the estimation provided in the table above.

The publically exhibited Environmental Assessment for the Yass Valley Wind Farm (**ngh**environmental November 2009) demonstrates that these areas include vegetation types that would be impacted by the proposal (both common vegetation types and those of conservation significance) and contains habitat for threatened fauna, particularly woodland birds. Furthermore, within the originally assessed 'development envelope' there are approximately 792 hectares of high constraint EEC (Coppabella and Marilba combined). This is the highest value vegetation that would be impacted by the proposal and therefore a 'like for better' offset is highly feasible for this project.

H.3 SECURING AND MANAGING THE OFFSET SITE

It is proposed that the wind farm operator (which may be different to the proponent) 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 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 Property Vegetation Plan is proposed, attached to the land title. The agreement will specify management actions and restrictions on land use, in accordance with the finalised offset plan for the site.

H.4 CONCLUSION

This Offset Strategy 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. 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.

Appendix L – Relevant Biodiversity Assessments

These include:

1. Marilba Biodiversity Assessment, nghenvironmental Jul 2009
2. Coppabella Biodiversity Assessment, nghenvironmental Jul 2009
3. Supplementary Ecology Report, nghenvironmental Nov 2012

The reason that the biodiversity assessment is spilt between three reports is as follows:

nghenvironmental was engaged in 2008 to investigate the development of three wind farms or wind farm precincts west of Yass, those being Marilba, Coppabella and Carrolls Ridge. The proposals were envisaged as three separate wind farms and a separate biodiversity assessment was commenced for each. Survey work was undertaken throughout 2008 and 2009. Assessment of Carrolls Ridge precinct was halted, largely due to biodiversity constraints.

In 2009, Marilba and Coppabella precincts together were rebranded as the Yass Valley Wind Farm proposal which was submitted to the Department of Planning for validation in August 2009 and placed on public exhibition in November 2009. The submission included the final versions (July 2009) of the Marilba and Coppabella Biodiversity Assessments (as two separate appendices to the environmental assessment).

Post-public exhibition, submissions related to the proposal, including agency and community submissions, were provided to the proponent in December 2009. Based on a number of considerations, revisions were made to the proposal. These included the:

1. Removal of specific turbines and their associated access and electricity transmission infrastructure.
2. Relocation of specific turbines, with minor changes to associated access and electricity transmission line.
3. Addition of specific turbines, access and electricity transmission line easements and substations.

Point 3 required that additional assessment be undertaken. The primary aim of the Supplementary Ecology Report (SER) was to assess the addition of turbines, access and electricity transmission easements and substations, in areas not previously assessed by the Marilba and Coppabella Biodiversity Assessments. The areas of investigation covered by the Marilba and Coppabella Biodiversity Assessments and the SER are shown in Figure 2-1 of the SER [now provided below; grey areas west of the central transmission line are covered in the Coppabella BA, grey areas east of the central transmission line are covered in the Marilba BA, the yellow boxes are the areas covered in the SER]. The SER also provided an updated estimate of the areas of clearing by vegetation type and infrastructure component. The SER survey work was undertaken in October 2012. In addition, the SER considered:

- Specific Statements of Commitment (SoCs) included in the Yass Valley Wind Farm proposal that called for further survey; where this work had now been undertaken, the conclusions were provided and the SoCs amended. This included targeted surveys in October 2009.
- Agency comments, related to further survey; an approach to the further survey was contained within the amended SoCs.
- Offset requirements for the project; an approach was developed to satisfy NSW offset requirements and was included within amended SoCs.

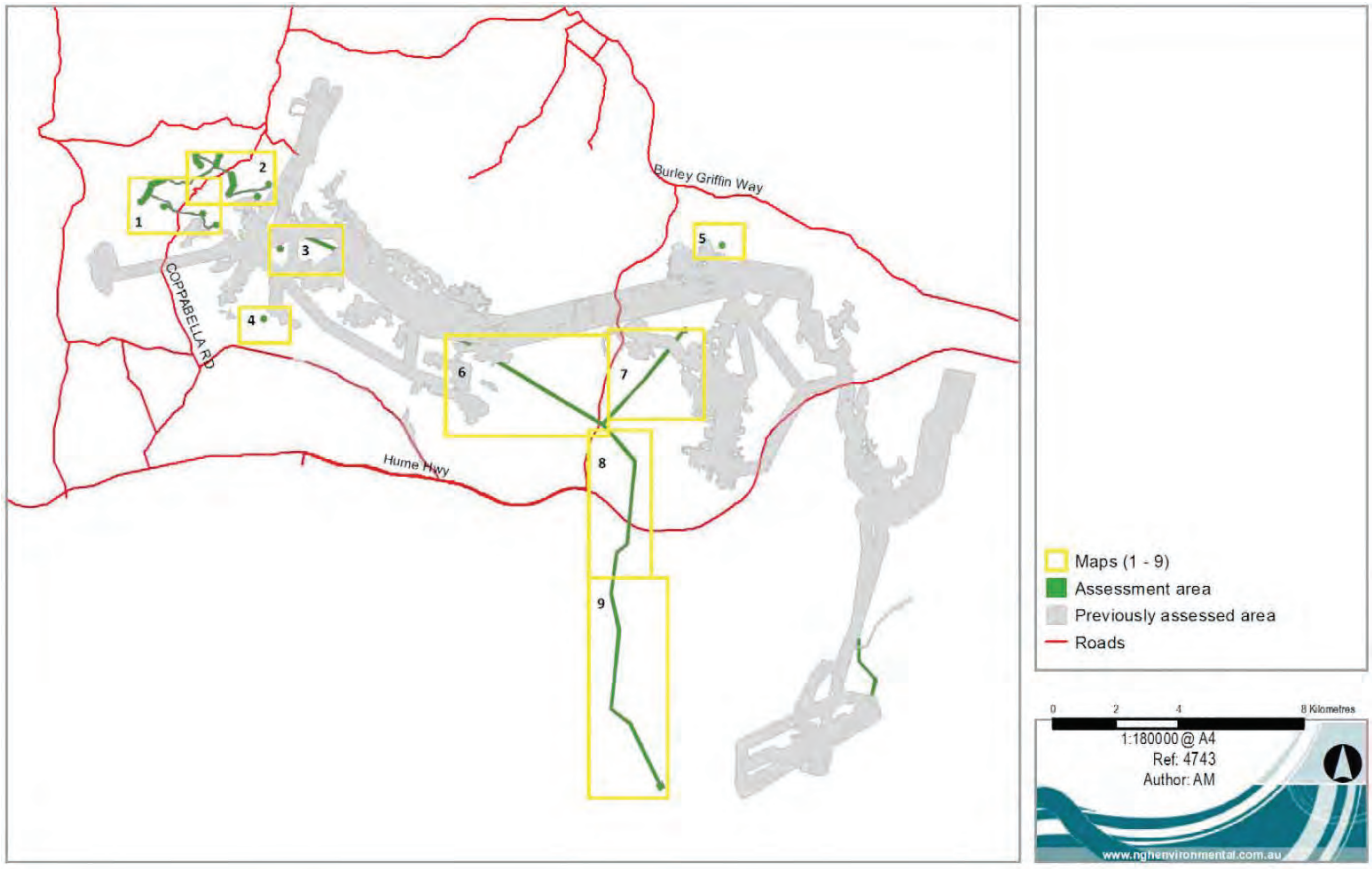


Figure 2-1 extracted from the Supplementary Ecology Report, nghenvironmental Nov 2012

Grey areas west of the central transmission line are covered in the Coppabella BA, grey areas east of the central transmission line are covered in the Marilba BA, the yellow boxes are the areas covered in the SER.

Appendix M – Bird and bat management plan framework

A monitoring outline has been developed for this proposal, included overleaf. The outline document provides a framework for developing and implementing an Operational Bird and Bat monitoring program (OBBMP) for the proposed Yass Valley Wind Farm (YVWF). The aim is to provide guidance for implementing the OBBMP for the YVWF site. The finalised OBBMP will require the input from relevant stakeholders such as landholders, the operator and government agencies including the Commonwealth Department of the Environment (DoE) and the NSW Office of Environment and Heritage (OEH). Specific components of the outline are summarised below.

Monitoring to ensure impacts are reversible

The program includes methods to detect direct and indirect impacts to all bird and bat species - threatened or higher risk species would be subject to more detailed analysis to determine if any mitigation responses are required. Issues of interest regarding data collection and analysis include have been stated in Section 3.2 Survey types, as: Raw numbers of mortalities, Analysis of type of species directly impacted relative to flight behaviour and any avoidance behaviour observed, Decline in species presence when compared with pre-operational and early operational occurrence, Effects of weather on bird behaviour around turbines, Comparison of bird usage (abundance and richness) before and after construction, Comparison of bird usage (abundance and richness) over time since operation commenced, Occurrence of avoidance behaviour relative to time since operation commenced, Impact of scavengers and ground visibility on monitoring data.

To generate a population level impact on any species, ongoing collisions would be required so a program that includes regular monitoring and a decision matrix for action is considered able to address unacceptable impacts before they occur. Refer to Sections 3.6 Decision matrix and triggers for action, 3.7 Adaptive management principles.

Proposed monitoring including timing, method and reporting

Three survey stages are proposed, in Section 3.4:

1. Pre-construction base line data collection, required to compare before and after effects
2. High intensity surveys, immediately after commissioning, to gauge acclimation effects
3. Low intensity surveys, once monitoring data suggest reduced intensity is warranted

Five survey types are detailed in Section 3.2:

1. Bird utilisation surveys
2. Passive microbat surveys
3. Carcass search surveys
4. Opportunistic surveys
5. Scavenger surveys

Reporting

Section 3.8 details reporting. Two types of reporting are proposed:

1. Evaluation and Adaptive Management reports (EAM report)
2. Annual reports.

Response actions

A decision making framework would be developed to:

1. To assist the Expert in determining the ecological significance of an event, using a risk assessment approach.
2. To provide a clear framework for the adaptive management approach.

A range of reasonable and feasible management actions would be developed. This will provide assistance during the implementation of the program, however it is noted that appropriate management actions will depend on the precise circumstances of the issue to be addressed.

This is a key point because the circumstances surrounding a trigger event may be critical to mitigating ongoing collisions of the same type. Investigation of the issue should inform the response. Consider the following scenario: Two superb parrots are detected in carcass searches. A range of possible responses could be considered to mitigate future collisions however not all be appropriate. The main cause of the collisions would be investigated considering utilisation data, weather data, discussion with turbine operators and land owners. Possible causes for the event (necessitating quite different responses) could include:

- Inclement weather, strong winds increasing collision risk (it is noted that turbines shut down in strong winds over 22 m/s to prevent mechanical damage). A one off event that was weather related may not require an action.
- Breeding behaviour close to turbines. Shut down of specific turbines for the breeding period could be considered in the following year. An analysis of other breeding sites onsite may be undertaken to inform the actions.
- Local movements close to a turbine due to grain spills or cropping. Modifications to land use / land management practices may be required.
- Local movements close to a turbine due to movement between local resources. Shut down of specific turbines for the defined risk period could be considered immediately.

Development of a detailed operational plan

In our experience, the provision of a range of mitigation measures that may be required to be implemented rapidly is an essential component of the detailed plan. It allows all stakeholders (including land owners and turbine operators) to understand actions that may affect them. The detailing of every response measure that may be required for every species however, is not seen as practical. Furthermore, it may reduce event-specific considerations of the collision which are more likely to get to the root of the problem.

It is noted that the methods and expectations regarding these programs is changing rapidly. The use of traditional survey approaches versus statistical modelling in determining survey effort is a decision that should be made in consultation with consent authorities. Hence, the outline does not provide this level of detail at this stage.

EPURON

Operational Bird and Bat Monitoring Program Framework

YASS VALLEY WIND FARM

DECEMBER 2013

ngh environmental

Document Verification

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Yass Valley Wind farm

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CONTENTS

TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

Cwth	Commonwealth
Blade Strike	Blade strike refers collectively to mortality of birds and bats through collision with the turbine blades and through pulmonary barotraumas. Pulmonary barotraumas appear to be the main cause of wind-farm related mortality for microbats, where sudden changes in barometric pressurearound turbine blades cause fatal organ injuries (Baerwald *et a*l. 2008).
DECCW	Refer to OEH
DP&I	(NSW) Department of Planning and Infrastructure
DoE	Department of the Environment (formally SEWPAC)
DoPI	NSW Department of Planning and Infrastrucutre
D-G	Director-General of DoPI
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
ER	Environmental Representative
ha	hectares
km	kilometres
Local Population	As defined in OEH's *Threatened Species Assessment Guidelines 2007*: *"the population that occurs in the study area... the local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas that are known or likely to utilise habitats in the study area. The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time"*
LGA	Local Government Area
m	Metres
Mortality	When a known mortality of any species has occurred, evidenced by carcass findings within the TSA.
NSW	New South Wales
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water (DECCW)
OBBMP	Operational Bird and Bat Monitoring Program
Recording rate	The number of surveys in which a species is recorded. Recording rate provides a measure of how common or abundant a species is.
RSA / TSA	Rotor Swept Area / Turbine Sweep Area
SEWPAC	(Cwth) Department of Sustainability, Environment, Water, Population and Communities. Now called Department of the Environment (DoE)

SoC	Statement of Commitments; commitments made by the Proponent as part of the project application
sp/spp	Species/multiple species
The Expert	The suitably qualified expert who has been approved by the D-G and who has an ongoing role in the implementation of the OBBMP.
The Consultant	The company for which the expert works, and to whom the Expert may delegate aspects of their responsibilities.
The Operator	The owner of Yass Valley Wind Farm
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
YVWF	Yass Valley Wind farm

1 INTRODUCTION

This document provides a framework for developing and implementing an Operational Bird and Bat monitoring program (OBBMP) for the proposed Yass Valley Wind Farm (YVWF).

The aim is to provide guidance for implementing the OBBMP for the YVWF site. The finalised OBBMP will require the input from relevant stakeholders such as landholders, the operator and government agencies including the Commonwealth Department of the Environment (DoE) and the NSW Office of Environment and Heritage (OEH).

Refer to Figure 1-1 for a map of the YVWF study area.

1.1 STUDY AREA

The Yass Valley Wind Farm (YVWF) incorporates the areas assessed in several biodiversity assessments including:

- Coppabella Biodiversity Assessment (**ngh**environmental 2009).
- Marilba Biodiversity Assessment (**ngh**environmental 2009).
- Supplementary Ecology Report (**ngh**environmental 2012).

While the YVWF may be divided into two separate projects Conroys Gap Stage 2 (south of the Hume Highway) and the Yass Valley Wind Farm (north of the Hume Highway) it is envisaged that the OBBMP will be used across the site of all 144 turbines.

The overall Yass Valley Wind Farm is spread across two precincts as described in the sections below.

1.1.1 Coppabella

The Coppabella Precinct development envelope is located on farmland north the Hume Highway, approximately 35 kilometres west of Yass, New South Wales. The area is characterised by undulating to hilly terrain with broken ridgelines, mostly on volcanic geology.

The site consists of one main north-west to south-east oriented ridgeline and surrounding hills. Areas within the nominated development envelope contain a combination of native and exotic pasture and remnant and regrowth woodland. The ridgelines within the subject site are cleared and have been grazed for many decades and generally carry only scattered remnant trees or small isolated woodland patches.

Coppabella lies within the Harden Shire Local Government Area (LGA) and Yass Valley Council LGA and is currently used for commercial agriculture (sheep and cattle grazing). Coppabella lies west of Marilba approximately 5 kilometres apart.

1.1.2 Marilba

The Marilba Precinct Wind Farm proposal site is located on private farmland north and south of the Hume Highway, near Conroys Gap, approximately 17 kilometres west of Yass, and 6 kilometres southeast of the village of Binalong in New South Wales. The site extends along a number of north-south oriented ridgelines over a distance of 9 kilometres in a north-south direction and 8 kilometres east-west. The proposed site crosses the existing Hume Highway where a number of turbines are also proposed.

The wider study area is characterised by undulating to hilly terrain, mostly on volcanic geology. The proposed wind farm site is situated in the upper catchment of Jugiong Creek, which drains to the Murrumbidgee River and the Murray River.

Marilba lies within the Yass Valley Council LGA and is currently used for commercial agriculture (sheep and cattle grazing).

1.1.3 Additional areas

As part of the Preferred Project Report, additional areas were added to the Yass Valley Wind Farm. These areas were assessed in the Supplementary Ecology Report (**ngh**environmental 2012) and comprised:

- Additional turbine sites
    - To the north west and in central areas of the Coppabella precinct
    - North of Marilba precinct
- Transmission line infrastructure
    - Connecting Coppabella to Marilba
    - Connecting areas north of the Hume Highway to the substation at the southern end of Marilba.

1.1.4 Other wind farms in the locality

The proposed Bango Wind Farm is located approximately 30km north east of the Yass Valley Wind Farm site. The 15 turbine Conroys Gap Wind Farm approved in May 2007 is located immediately south of the Marilba Precinct.

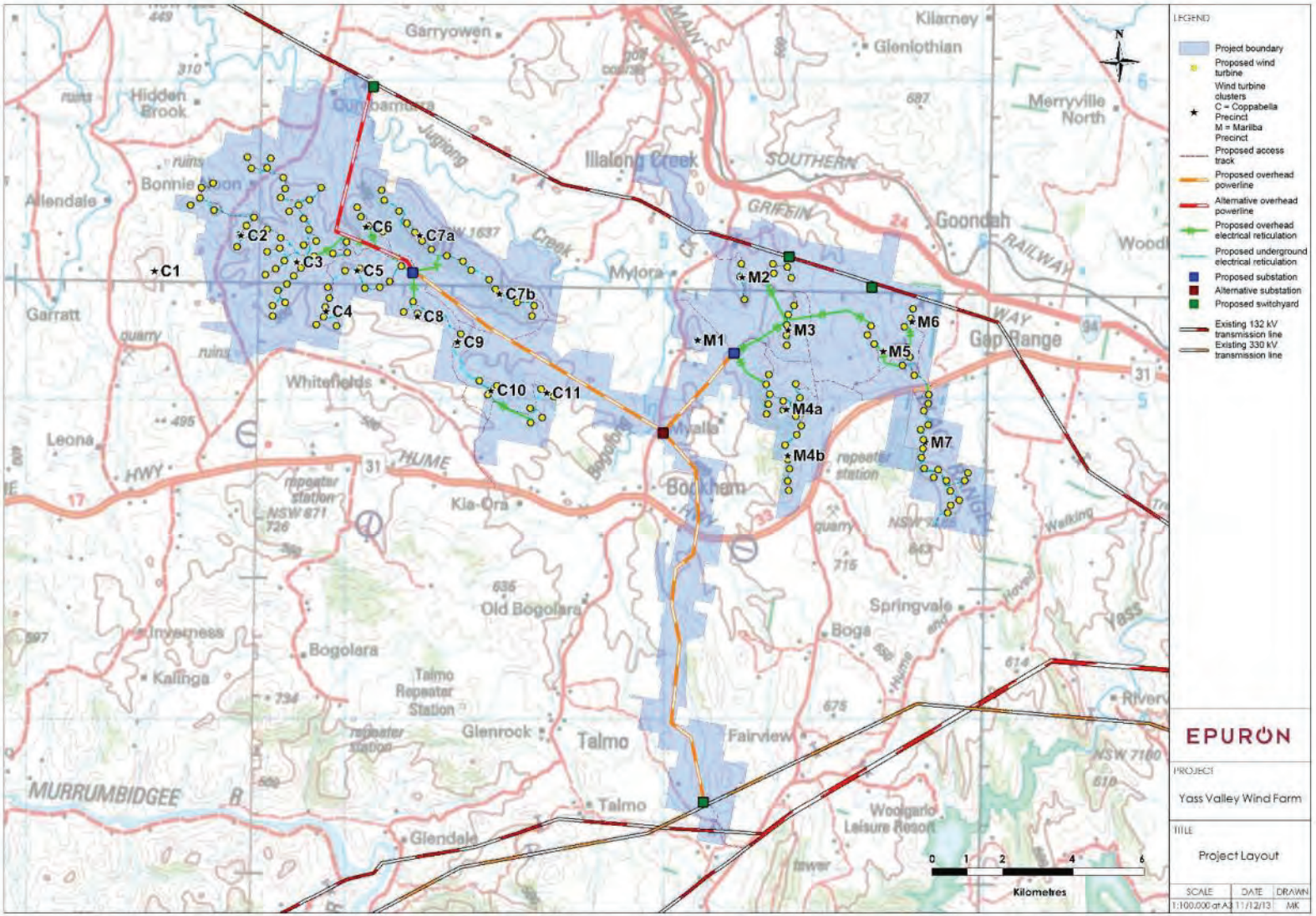

Figure 1-1: Yass Valley Wind farm (YVWF) proposed project layout (Source: Epuron, 2013)

1.2 BACKGROUND TO APPROVAL PROCESS

An application for the YVWF was submitted to the NSW Department of Planning and Infrastructure (DoPI) in August 2009 and placed on public exhibition in November 2009. Up to 66 turbines were proposed for the Marilba Precinct and up to 86 turbines were proposed for the Coppabella Precinct; totalling 152 turbines. Based on a number of considerations, revisions were made to the proposal since the original lodgement. A number of proposed turbines have now been removed, along with their associated access and electricity transmission infrastructure, while other turbines have been slightly relocated. These decisions were made to avoid and or minimise potential biodiversity impacts in response to agency comments and with reference to the biodiversity constraints mapping contained within the Marilba and Coppabella Biodiversity Assessments (**ngh**environmental 2009a, 2009b). The revised project description is now for 144 turbines; eight less than originally proposed. The table below summarises these changes. The revised project description is provided in full in the Preferred Project & Submissions Report (Epuron December 2013).

Table 1-1: Summary of revised turbines.

Precinct	Coppabella	Marilba	Total
Original no. of turbines	86	66	152
Revised no. of turbines	87	57	144

1.3 RATIONALE FOR BIRD AND BAT OPERATIONAL MONITORING

The key legislation of relevance to managing wind farm impacts on birds and bats are the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and, as the YVWF is located in NSW, the NSW *Threatened Species Conservation Act 1995* (TSC Act). While the biodiversity assessments for the project have concluded that with mitigation, significant impacts can be avoided for species listed under these Acts, operational monitoring provides an 'insurance mechanism' to address the inherent uncertainty in the assessment process and provide a framework for management, should unacceptable impacts be detected.

A number of Statement of Commitments (SoC) have been implemented for the proposed YVWF. SoC 22 relates specifically to the implementation of an adaptive bird and bat monitoring program. The table below summaries this SoC.

Table 1-2: Statement of Commitments (SoC) relating to this OBBMP

SoC	Impact	Objective	Mitigation tasks	Project phase
22	Loss or modification of habitat	Avoid, 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

This framework provides the outline to developing the OBBMP for the YVWF site which will involve consultation with DoE and OEH.

Bird and Bat Monitoring programs have been implemented as part of Conditions of Approval (CoA) by DoPI for other wind farm developments. It is likely that the YVWF will also have a similar CoA once approved. The CoA for Collector Wind Farm, being the most recently approved wind farm in NSW, stipulates:

Prior to the commencement of construction, the proponent shall prepare and submit for the Approval of the D-G a Bird and Bat Adaptive Management Program, which takes into account bird/bat monitoring methods identified in the current editions of AusWEA Best Practice Guidelines for the Implementation of Wind Energy projects in Australia and Wind Farm and Birds: Interim Standards for Risk Assessment. The program shall be prepared and implemented by a suitably qualified expert, approved by the D-G. The program shall incorporate spring-summer pre-construction baseline surveys, post construction and operational monitoring, and a decision matrix that clearly sets out how the Proponent will respond to the outcomes of monitoring. It shall:

a) Incorporate an ongoing role for the suitably qualified expert;

b) Set out monitoring requirements in order to assess the impact of the Project on bird and bat populations, including details on spring-summer baseline survey and post-construction monitoring locations, parameters to be measured, frequency, timing and methods of monitoring and analyses and reporting. The monitoring program shall be capable of detecting any changes to the population of birds and/or bats than can reasonably be attribute to the operation of the Project, and includes spring-summer pre-construction baseline survey data;

c) Incorporate a decisions making framework that sets out specific action sand when they may be required to be implemented to reduce any impacts on bird and bat populations that have been identified as a result of monitoring.

d) Identify "at risk" bird and bat groups, seasons and/or areas within the Project site which may attract high levels of mortality and include monthly mortality assessments and periodic local population census and bird utilisation surveys.

e) Identify potential mitigation measures and implementation strategies in order to reduce impacts on birds and bats such as minimising the availability of raptor perches, swift carcass removal, pest control including rabbits, use of deterrents, and sector management including switching off turbines that are predicted to or have had an unacceptable impact on bird/bat mortality at certain times; and

f) Identify matters to be addresses in periodic reports in relation to the outcomes of baseline surveys and post-construction and operational monitoring, the application of the decision making framework, the mitigation measures identified, progress with the implementation of such measures, and their success.

The reports referred to under Part (f) shall be submitted to the D-G and OEH on an annual basis for the first five years of operation and every two years thereafter (unless otherwise agreed to by the D-G), and shall be prepared within two months of the end of the reporting period. The D-G may, at the request of the Proponent at any time, vary the reporting requirement or period by notice in writing to the Proponent.

The Proponent is required to implement reasonable and feasible mitigation measures as identified under part (e) where the need for further action is identified through the Bird and Bat Adaptive Management Programme, or as otherwise agreed with the D-G.

These conditions have been used as a reference in the development of this framework document.

1.4 PURPOSE OF THIS DOCUMENT

Wind turbines, like many other man-made structures, present a collision risk to many bird and bat species. The collision risks posed by wind farms have been reported to be far lower than risk of collisions with other structures, such as communications towers, tall buildings and road fatalities (Erikson *et al*, 2002).

The key operational impacts of wind farms have most relevance to species which fly in the path of operational turbines. There are three key impact types:

1. ***Collision with wind turbines:*** Within this investigation, 'collision' refers to mortality caused by direct collision with turbine blades or towers. The significance of the mortalities is species-specific. If the species is at low density in the landscape or susceptible to multiple collision events (such as for flocking species), collisions may threaten a local population. If the species is a top order predator or key stone species, there may be ecological ramifications of ongoing mortalities for other species.
2. ***Sudden decompression (barotrauma):*** Rapid or excessive air-pressure change near moving turbine blades has been linked to bat fatalities as a result of a haemorrhaging of the lungs (pulmonary barotrauma) (Baerwald *et al.* 2008). This is most relevant to bats.
3. ***'Avoidance' behaviour caused by the presence of the turbines and associated infrastructure.*** Depending on where the turbines are located, this may affect foraging patterns, nesting, roosting or movements around the site. It equates to a loss of habitat, if areas carrying infrastructure are avoided altogether, and therefore can have resultant impacts on the carrying capacity of the site.

This framework provides a structure for developing and implementing the OBBMP for the YVWF. It sets out:

- The roles and responsibilities of stakeholders.
- Identifies higher risk bird and bat species that would be targeted for this project.
- Identifies appropriate survey methodologies.
- Provides guidance on bird and bat management actions that may be required in response to monitoring results.
- Provides guidance on reporting and evaluation.

Details regarding the OBBMP would be undertaken in consultation with stakeholders.

2 ROLES AND RESPONSIBILITIES

There are three key stakeholders relevant to the framework of the YVWF OBBMP. These include:

1. The Operator of YVWF .
2. The landholders on whose land YVWF is located.
3. The Expert engaged to implement the OBBMP.

2.1.1 The Operator

The primary role of the Operator is to engage an Expert to implement the OBBMP. Additionally, the Operator's responsibilities include:

- Engage with the landholders as necessary.
- Oversee the implementation of the management actions recommended by the Expert (these will sometimes be carried out by the Operator and sometimes by the Expert, depending on the action) where reasonable and feasible.
- Submit reports prepared to the D-G. Reporting may be delegated to the Expert but the submission of reports remains the responsibility of the Operator, not the Expert.

2.1.2 The Landholders

Land use can often impact the bird and bat monitoring and management actions of the program may require the assistance of landholders. The role of the Landholders is to:

- Work with the Operator to manage bird and bat impacts, following advice from the Expert.

2.1.3 The Expert

The role of the Expert is to implement the OBBMP in accordance with the consent conditions once approved. This may include the following responsibilities:

- Liaise with the Operator regarding monitoring outcomes.
- Assess the ecological significance of monitoring outcomes, using a risk assessment approach.
- Provide advice and recommendations to the Operator, based on the ecological significance of monitoring outcomes.
- Ensure surveys are conducted to best practice standards.
- Ensure survey and risk reports are adequate (i.e. meets the requirements of consent conditions)
- Ensure implementation of management actions to the satisfaction of the D-G.

2.2 AGENCY CONSULTATION

Once this framework has been submitted to DoE for approval and the CoA have been created, consultation with OEH would be undertaken prior to the OBBMP being implemented for the YVWF site.

3 MANAGEMENT PLAN

Relevant guidelines to develop the detailed approach and methods of the OBBMP include:

- AusWEA *Wind Farms and Birds: Interim Standards for Risk Assessment* (Lane 2005)
- Auswind *Best Practice Guidelines for the implementation of Wind Energy Projects in Australia* (AusWEA 2006)
- Environment Protection and Heritage Council *National Wind Farm Development Guidelines – Public Consultation Draft – October 2009*
- Standard bird and bat survey methodology, such as methods used by Birds Australia and methods outlined in *Survey Guidelines for Australia's threatened Bats* (DEWHA 2009) and *Survey Guidelines for Australia's Threatened Birds* (DEWHA 2008).

3.1 RISK BASED APPROACH

The monitoring program would be risk based, targeting those species considered at most risk from ongoing collision impacts. The risk assessment is based on general literature as well as onsite observations and is summarised below for birds, bats and specifically for the Coppabella and Marilba precincts. The risk assessment would be refined during the development of the OBBMP.

3.1.1 General

Birds

Considering the risk of collision with wind turbines, certain groups of birds may be more affected than others (Kingsley and Whittam 2003, Kunz *et al.* 2007).

Generally, the identified groups at risk are:

- **Passerines:** By far the most abundant flying vertebrates in most terrestrial ecosystems. Until recently passerines have been among the most frequently reported fatalities at utility-scale wind facilities in Europe and America. Breeding birds in the vicinity of wind farms may be at greater collision risk if displaying aerial courtship behaviours. Migrating and nomadic passerines at night, typically fly at altitudes of 150m or higher; above the maximum height of most wind turbines. However, passerines may be at risk of colliding with wind farm structures when their flight altitude is lowered by inclement weather conditions (such as fog or driving rain) and at dawn and dusk.
- **Parrots:** Parrots do not appear to have suffered high rates of collision in Australian wind farm literature. This may be because the majority of flights are below Rotor Swept Area (RSA) and most parrots are highly agile and manoeuvrable fliers. However, particular parrot species that are migratory, such as the Swift Parrot, or flocking species are more likely to be at risk. Parrots are considered to be a less of a risk of collision compared to other bird groups as they typically fly below the RSA and their movement patterns generally follow vegetative corridors; however it is possible they may be at risk of colliding with wind farm structures when their flight altitude is impaired by inclement weather conditions (such as fog or driving rain) and at dawn and dusk. However, risk of collision during adverse weather also seems unlikely as parrots generally stay grounded and reduce movements during such times.
- **Raptors:** Soaring birds are generally of greatest concern as they use landform features such as elevation, ridges and slopes to cruise and take ascendance. Further, they are generally higher order species, meaning they are less abundant and therefore more susceptible to population level

impacts. In the USA, migrant raptors account for up to 65% of the total bird mortality due to collision with wind turbines. Fledging raptors are particularly at risk (Wedge-tailed Eagle, for example).

- **Owls and nocturnal birds:** Owls typically fly within wind turbine height or lower, which may put them at risk of collision. Owls are included in the lists of collision victims at a number of sites around the world. The numbers of owls killed at each site varies, representing a proportion at some sites of up to 10-15% of the total numbers of birds killed. Nightjars exhibit the same nocturnal behaviour as microbats, and are often seen hunting insects attracted by street lights. Most owls rely on forest vegetation for roosting, but many forage in open areas, including the Barking and Masked Owls.
- **Waterbirds:** waterbird (*i.e.* grebes, cormorants, ducks, waders, cranes, rails, crakes, gulls, shorebirds) fatalities have been reported worldwide at wind sites close to their staging, breeding and wintering areas. In the USA, sites reporting the most fatalities are those with year-round waterfowl (ducks and geese) which makes up to 10% or more of the total number of fatalities. Shorebirds (snipes, plovers, sandpipers, stints, etc.) and gulls tend to fly in flocks and descend or ascend rapidly when approaching or leaving feeding areas. Therefore, shorebirds are likely to collide with turbines when these are placed in close proximity to wetlands.

In addition, wind farm sites may be frequented by scavenger species (*e.g.* crows, raptors), attracted by crops, livestock or injured birds and bats and/or their carrions, resulting of collisions with turbines.

Microbats

Bats are the second largest group of vertebrates that suffer casualty from collision at wind farms worldwide (Cryan and Brown 2007, Kunz *et al.* 2007). In terms of blade-strike, Australian species that appear to be most at risk are those that forage above canopy (i.e. in open areas) and move through their environment at high speeds, such as the White-striped Freetail Bat. These species are more likely to travel at blade-sweep height and either fails to detect the moving blades, or are less able to quickly manoeuvre around them.

Two groups of bats have therefore been assessed as higher risk from blade-strike impacts:

- Non-migrating, high-flying microbats.
- Threatened, migrating, high-flying microbats.

3.1.2 Coppabella

The Coppabella Biodiversity Assessment identifies one bird species (Wedge-tailed Eagle) and one micro bat species (Eastern Bentwing Bat), considered to be at a higher level of risk that should be specifically targeted in the operational monitoring program. The Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis)* is listed as Vulnerable under the TSC Act 1995.

3.1.3 Marilba

Appendix D of the Marilba Biodiversity Assessment identifies one bird species (Wedge-tailed Eagle) and one micro bat species (Eastern Bentwing Bat), considered to be at a higher level of risk that should be specifically targeted in the operational monitoring program. The Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis)* is listed as Vulnerable under the TSC Act 1995.

3.2 SURVEY TYPES

Issues of interest regarding data collection and analysis include:

- Raw numbers of mortalities.
- Analysis of type of species directly impacted relative to flight behaviour and any avoidance behaviour observed.
- Decline in species presence when compared with pre-operational and early operational occurrence.
- Effects of weather on bird behaviour around turbines.
- Comparison of bird usage (abundance and richness) before and after construction.
- Comparison of bird usage (abundance and richness) over time since operation commenced.
- Occurrence of avoidance behaviour relative to time since operation commenced.
- Impact of scavengers and ground visibility on monitoring data.

Survey types likely to be undertaken are detailed below.

3.2.1 Bird utilisation surveys

The purpose of undertaking bird and bat utilisation surveys is to quantify which bird species are present, their numbers and activity levels and how they use the site. Data from utilisation surveys will be used to assess whether use of the site by birds changes once turbines have been installed and are functioning and to therefore gauge changes in populations.

This survey is the most widespread method used for generating quantitative data on bird and bat usage of a potential wind farm site. This method can be used to estimate potential collision rates and provide a ranked abundance of species using the site at varying heights. This survey would be used for pre-construction surveys to gather baseline data.

3.2.2 Passive microbat surveys

The purpose of undertaking passive microbat surveys is to determine change in microbat species diversity at the YVWF site overtime and compare activity data to mortality survey results (i.e. activity levels to number of individual bat deaths for each species). Bat utilisation will be monitored using Anabat detectors placed in the same area each monitoring event. This will allow a comparison of species diversity and abundance of bats utilising the study area over time.

Site selection for surveys will be stratified (two detectors each) according to the habitats available (grassland/pasture and woodland), allowing a comparison of species diversity and relative activity levels of bats utilising the study area over time and will be analysed when the technical reports are prepared.

3.2.3 Carcass search surveys

The purpose of undertaking carcass search surveys it to detect deaths of birds and bats as a result of collision with wind turbines. The most common and widespread method of monitoring bird and bat collisions in regards to wind farm developments is the carcass search. This method involves regular searches under the operating wind turbines for bird and bat carcasses and remains.

3.2.4 Opportunistic surveys

The purpose of undertaking opportunistic surveys across the locality is to account for natural and human changes to the surrounding environment that might influence bird/bat behaviour. Opportunistic surveys would be undertaken in conjunction with utilisation surveys and carcass surveys. This would allow the surveyor to document any changes in the local environment and provide a basis upon which to judge whether any observed changes in bird and/or bat behaviour can be reasonably attributable to factors other than the operation of the wind farm, including seasonal factors. The survey may include, but not be limited to, the following:

- Seasonal changes, including evidence of nesting activity by key species.
- Changes in land use practices.
- Significant changes in water levels in nearby water bodies and weather events.
- Anecdotal information from land owners/managers, wind farm staff and local community.

3.2.5 Scavenger surveys

The purpose of undertaking scavenger trial surveys is to ascertain the rate of removal of carcasses by scavengers such as foxes and other birds. The site is known to be habitat for scavengers including ravens, foxes, and raptors. This will need to be considered in interpreting the results of carcass searches (i.e. provide an estimate of background scavenger activity).

3.3 SEASONALITY AND SITE VARIABLES

Any changes in the local environment will be recorded during each site visit on datasheets. Documenting such changes will provide a basis upon which to judge whether any observed changes in bird and/or microbat behaviour can be reasonably attributable to factors other than the operation of the wind farm, including seasonal factors. When appropriate, observations will be recorded for:

- Seasonal changes, including evidence of nesting activity by key species (key species to be identified in the OBBMP).
- Changes in land use practices.
- Significant changes in water levels in nearby water bodies.
- Significant weather events.
- Anecdotal information from land owners, land managers, wind farm staff and the local community.
- Any notable increase in bird or bat food resource abundance.

In order to gain an understanding of the impact of the wind farm upon local bird and microbat populations, surveys must be undertaken across a range of seasons. Seasonal considerations for the Yass Valley site include:

- The Swift Parrot usually arrives between February and March in their south-eastern mainland wintering grounds, and leave them early August to return to breed in Tasmania from mid-September to late January.
- Northern Hemisphere waterbird migrants arrive in August-September and stay until February-March when they start their home-bound migration.
- The Eastern Bentwing-Bat congregates in maternity caves from October to November and young start to fly in March.

- The White-striped Freetail Bat may execute long migrations from south to north in response to intensive period of cold in June-August; etc.

3.4 SURVEY STAGES

Three survey stages are proposed.

1. Pre-construction base line data collection, required to compare before and after effects
2. High intensity surveys, immediately after commissioning, to gauge acclimation effects
3. Low intensity surveys, once monitoring data suggest reduced intensity is warranted

3.4.1 Stage 1: Pre-construction baseline surveys

Initial baseline fauna surveys were undertaken in August - September 2009 (**ngh**environmental 2009). This involved bird surveys and overnight passive microbat surveys (using Anabats) in representative habitat types across the Marilba and Coppabella Precincts. Additional surveys were undertaken for Coppabella targeting the Barking Owl among other species between the 13th and 16th October 2009. This also involved overnight passive Anabat surveys. A supplementary ecology survey was undertaken between the 15th and 18th October 2012 targeting birds and reptiles.

In order to allow adequate comparison between bird and bat assemblages and abundance data before and after construction and operation begins at the YVWF site, additional seasonal baseline data would be collected prior to construction commencing. Collection of seasonal baseline data would be consistent with AusWEA 2006 guidelines/recommendations.

3.4.2 Stage 2: High intensity survey effort

Stage 2 represents a period of higher survey intensity to gather a large amount of data from which to draw comparisons later. The following surveys would be undertaken during each monitoring event:

- Bird utilisation surveys.
- Passive microbat surveys.
- Carcass search survey.
- Opportunistic survey.
- Scavenger survey.

3.4.3 Stage 3: Lower intensity monitoring

During Stage 3, monitoring at YVWF would be undertaken at a lower survey intensity. Survey type and intensity would be informed by the outcomes of monitoring during Stage 2.

3.5 DATA COLLECTION AND ANALYSIS

It is imperative that data be gathered and recorded in a standardised way to facilitate comparison of results between survey events, and in order to identify any trends in the data. All data will be recorded on project-specific data sheets to facilitate this.

3.6 DECISION MAKING FRAMEWORK AND TRIGGERS FOR ACTION

A decision making framework would be developed to:

1. To assist the Expert in determining the ecological significance of an event, using a risk assessment approach.
2. To provide a clear framework for the adaptive management approach.

A range of reasonable and feasible management actions would be developed. This will provide assistance during the implementation of the program, however it is noted that appropriate management actions will depend on the precise circumstances of the issue to be addressed.

It may be appropriate to alter the monitoring program in response to outcomes of monitoring. For example, as time progresses results may indicate that the frequency or intensity of monitoring can be reduced. Alternatively, monitoring frequency or intensity may need to be increased, temporarily or on an ongoing basis, in response to a particular event or ongoing events, such as high rates of collision mortality.

3.7 ADAPTIVE MANAGEMENT PRINCIPLES

An adaptive management approach involves integration of information gained from monitoring and evaluation into the OBBMP. At its core, adaptive management recognises uncertainty about how management actions contribute to management outcomes (Duncan and Wintle 2008). Thus, monitoring and evaluating the efficacy of management actions is a key step of the OBBMP.

3.7.1 The adaptive management cycle

As outlined in Section 1.7, an adaptive management approach involves integration of information gained from monitoring and evaluation into the OBBMP. This cycle is shown diagrammatically in Figure 3-1. . The role of the stakeholders at each step of the OBBMP is identified:

- Monitoring surveys at YVWF site are implemented by the Expert.
- The ecological risk of outcomes of monitoring are assessed by the Expert:
    - Where risk is low, the process of monitoring continues without management intervention.
    - Where risk is moderate to high, discussions regarding potential management actions commence between the relevant stakeholders (Expert and Operator at a minimum; Landholders may also become involved where appropriate).
- The implementation of the agreed management action is undertaken by the relevant stakeholder (e.g. changes to monitoring regime would be undertaken by the Expert).
- The effectiveness of management actions are monitored and evaluated by the Expert.
- The outcomes are fed back into the monitoring program at the YVWF site, and cycle continues.

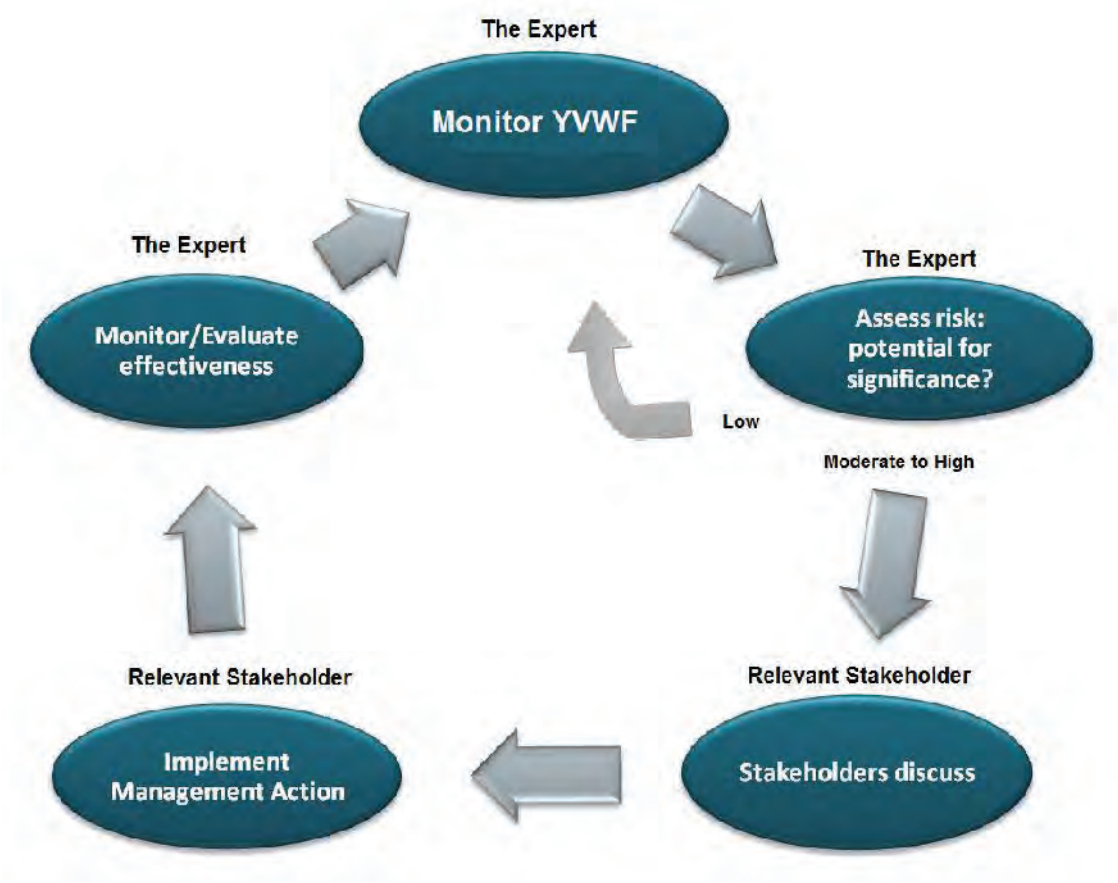

Figure 3-1: Adaptive management cycle of the adaptive bird and bat monitoring program

Additionally, the Environmental Representative (ER) would review the outcomes of the program annually, to assess the compliance of the program with the conditions of approval for the project.

3.8 REPORTING

The Expert will provide regular updates to the Operator on results of the carcass searches and other surveys as relevant. Two types of reporting are proposed:

1. Evaluation and Adaptive Management reports (EAM report)
2. Annual reports.

3.8.1 Evaluation and Adaptive Management (EAM) reports

The periodic EAM reports would be provided to the Operator by the Expert. The Expert would review all monitoring data gathered to date to identify any trends of concern that may trigger a management response or the need for changes in survey protocol. For all other matters to be addressed in the report, the reporting period is for surveys undertaken since the preceding report. The EAM report will:

- Report on the outcomes of monitoring.
- Identify any trends in the data.
- Highlight any issues with monitoring efficacy.
- State whether any triggers for action occurred during the reporting period and discuss the ecological significance of such events.
- Evaluate the triggers for action.
- Discuss and evaluate the application of decision making framework in reaching management decisions.
- Discuss progress with implementation of previous recommendations.
- Evaluate the success or otherwise of management actions employed to date.
- Provide recommendations for management actions, where necessary.

3.8.2 Annual reports

The periodic EAM reports would provide the basis for the Annual Reports. Annual Reports would be prepared by the Expert at 12 month intervals from the commencement of operational monitoring (whether full or part). The matters addressed in the EAM report will also be addressed in the Annual Report.

4 CONCLUSION

This document provides a framework for implementing an OBBMP for the YVWF site. The aim of this document is to provide direction for implementing the OBBMP to meet the conditions of consent once approved.

The finalised OBBMP will require the input from relevant stakeholders such as landholders, the operator and government agencies including DoE and OEH to identify detailed methodologies and survey effort and key species relevant to the YVWF site.

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