

9 MODIFYING THE PROPOSAL

Following consultation with **ngh**environmental, modifications were made to the original infrastructure layout to address concerns highlighted in the biodiversity constraints and impact assessments presented above (Sections 7 and 8). The modifications seek to implement specific recommendations outlined in Section 8.1.5 to reduce habitat loss and modification of high constraint areas and values. They involved either avoiding areas of high constraint or micro-siting infrastructure. The modifications help to reduce overall impacts on biodiversity values as a result of the proposal and ensure that the development maintains or improves environmental outcomes.

To demonstrate the amount of refinement the proposal has undergone, the original infrastructure layout is supplied in Appendix I. Where layouts have been refined, additional constraints mapping refinement has also been undertaken to assist avoidance or minimization of impacts in high and moderate constraint areas. All maps and impact area calculations within this report are based on the final infrastructure layout provided by the proponent.

9.1 REVISIONS, GENERAL

While the majority of infrastructure avoids treed areas, the site's understorey is also of concern in many areas. The mosaic nature of better condition understorey, changing seasonally, means that it is impossible to entirely avoid. A commitment to using an ecologist to help micro-site the infrastructure away from better quality areas of understorey is required. This allows the Proponent the flexibility to move infrastructure within the envelope. The additional assessment would occur in the detailed design phase and may require minor route or location revisions.

Specific areas where infrastructure layout revision was undertaken are discussed below. Areas 1-9 correspond to the constraints map sheets provided in Figure 7-1. For comparison, the original infrastructure layout is provided in Appendix I (map sheets 1-8).

9.2 REVISIONS, SPECIFIC

Area 2, northern end of Cluster 3

Two tracks were indicated in areas of high constraint woodland at the northern end of this cluster (shown in Appendix I, map zone 2). Additionally, a transmission easement is required in this area.

Widening the track is possible as the groundcover is not of significance in this area. Tree removal should be avoided, particularly impacts on hollow bearing trees. Track width should be minimized. Tracks and powerlines should be aligned to reduce the overall amount of clearing required. More detailed mapping was undertaken to facilitate micro-siting the tracks to minimize impacts.

These tracks have now been rerouted to minimise impacts.

Area 2, transmission easement east of Cluster 3

This easement heads north east from the centre of Cluster 3. If centred on the easement development envelope (shown in Appendix I, map zone 2), it would dissect a high constraint area. Potential exists

here to straighten the transmission line and avoid high constraint areas by micro-siting the poles. Trees are the constraint in this area.

The Area 2 constraints map now indicates the transmission line at the southern edge, rather than within this high constraint area.

Area 4, transmission easement between Clusters 5 and 7

This easement heads south east between Clusters 5 and 7. If centred on the easement development envelope (shown in Appendix I, map zone 2), it would dissect a high constraint area. Clearing for tracks or power line poles or trenches would impact this area of EEC and it is strongly advised to avoid this area. Threatened fauna issues are also relevant here.

The Area 4 constraints map now indicates the transmission line has been routed south to avoid this area.

Area 7, Cluster 10 turbines

The current layout shows that two turbines are located near hollow-bearing trees and rocky outcrops in this area (Area 7, Cluster 10). Clearing would be required for these turbines, affecting hollow-bearing trees and the rocky outcrops. Nearly all the trees in this area are hollow bearing and pose a threatened fauna issue; groundcover is not a constraint. The rocky outcrop has been assessed as a low constraint however, preclearance reptile surveys are recommended if this area cannot be avoided. It is strongly advised to avoid all hollow bearing trees. If these cannot be avoided, further work (stag watching, spotlighting and anabating) should be undertaken to determine the level of use of these hollows. Wildlife handlers would be required during the felling of hollows and hollows should be replaced with nest boxes at a more suitable distance from the turbine, to retain this resource type. Offsetting should also be undertaken.

The Proponent has advised that the contours of the site in this area make avoidance impossible. An offsetting strategy, and the recommendations stated above would be undertaken in this area.

Area 7, middle of Cluster 10 track and turbine

At the midsection of Cluster 10, a track and turbine are shown dissecting a high constraint area in the original layout (shown in Appendix I, map zone 7). The groundcover in this area is of high diversity and is a constraint.

In the final turbine layout (Area 7), the track has moved east to avoid the constraint and an optional track is being investigated. If a track is required through the high constraint, it should be micro-sited with an ecologist and minimised in width. It would require offsetting.

Area 7, southern end of Cluster 10 turbine

At the midsection of Cluster 10, a turbine is shown dissecting a high constraint area in the original layout (shown in Appendix I, map zone 7). It would be preferable to move this turbine into a cleared area to avoid the moderate condition Long-leaved Box--Red Stringybark woodland remnant. This area has no hollow bearing trees. This area is also very steep and rocky.

In the final turbine layout (Area 7), the turbine has been moved to avoid the constraint.

Area 6, southern end of Cluster 7b, turbines and track

This area is of high constraint; it has been increased in area since the original constraints mapping (Appendix 1, Zone 6). The groundcover as well as the overstorey are a constraint in this area; minimising track width and avoiding trees are required. As the area would qualify as EEC there would be very large offset ratios required for any disturbance. Mitigation here would need to include minimised track width and disturbance if it cannot be avoided altogether. Furthermore, the location of a turbine within a woodland fragment increases collision risks.

Close-ups in Figure 7-1, Area 6 have been used to show the ability of the turbines to be sited in clearings however, minimizing understorey disturbance will also be required. The Proponent has advised that the contours of the site in this area make avoidance impossible. An offsetting strategy, and the recommendations stated above in Section 8 would be undertaken in this area.

10 CONCLUSIONS

10.1 SUMMARY OF BIODIVERSITY VALUES

Three threatened species: Yass Daisy, Superb Parrot and Diamond Firetail and a threatened ecological community Box-Gum Woodland were detected within the study area. Potential habitat for threatened species was also detected. Assessments of Significance (TSC and EPBC Act) were undertaken for 27 fauna, 2 flora species and 1 ecological community. The proposed project infrastructure layout largely avoids these areas, and therefore the proposal is not expected to have a significant impact on threatened flora species or ecological communities.

Risk assessments identified two threatened species as being at high risk of significant population-scale impacts arising from the development: Superb Parrot (habitat removal) and Eastern Bent-wing Bat (barotrauma and collision impacts). There is also likely to be a high risk to local populations of the non-threatened Wedge-tailed Eagle. Habitat avoidance and further monitoring and mitigation measures discussed will ensure that these impacts will be minimised to acceptable levels.

The proposal is **not considered likely to result in a significant impact** on threatened or migratory fauna provided that the recommendations outlined in Section 8 of this report are effectively implemented.

The *Microbat Study* undertaken in January and documented in a separate report will inform the adoption of measures specific to microbats at Coppabella Hills Precinct.

10.2 SUMMARY OF RECOMMENDATIONS

Direct and indirect impacts on flora, fauna and their habitats can be minimised by avoiding sensitive features and undertaking the recommended mitigation measures (Section 8). High constraint areas include moderate to good condition Box-Gum Woodland EEC, threatened species habitat, and mature woodland remnants.

Areas of particular concern include:

- Within the transmission envelope between Clusters 5 and 7a
- Remnants on Cluster 10
- Woodland below Cluster 7b along the proposed turbine access track

Alterations to the proposal have been made by the proponent that address these issues, either avoiding areas of high constraint or undertaking to micro-site infrastructure to ensure impacts to biodiversity values area minimized (refer to Section 9). The considerations informing this outcome include the potential impact on threatened flora and fauna, the contribution of the proposal to a number of key threatening processes, as well as the locally important habitat features these areas provide.

For the remaining areas within the development envelope (moderate to low constraint) the final infrastructure layout will determine the precise amount of clearing required, and the specific offset requirements. It is recommended to secure offsetting for areas of habitat permanently removed by the proposal. In due course, formal agreements should be sought with the relevant land owners.

It is concluded that the project is able to maintain or improve environmental outcomes by locating infrastructure in cleared paddocks, obtaining offsets and by avoiding highly constrained areas. The proposal should also be viewed in terms of the wider environmental benefits of establishing renewable energy generation in a rural area, which has significant broad level environmental benefits.

The key mitigation strategies considered necessary to reduce the potential operational impacts to an acceptable level include the following (full details are found in Section 8):

- Avoidance of high constraint areas, indicated on Constraints Mapping, Figure 7-1.
- Mitigation (by offsetting and application of general measures) of impacts within moderate constraint areas.
- A Bird and Bat Monitoring Plan should be designed to document mortalities, remove carcasses and assess the effectiveness of controls. Standardised and publicly available data should be collected to increase the knowledge base on this subject. If mortalities exceed a pre-determined threshold (set out in the monitoring program), additional mitigation measures should be considered, such as diversion structures, blade painting (refer Hodos *et al.* 2001), turning off turbines at critical times, further turbine ridge habitat modification and enhancement of off-site habitats.

11 ASSESSMENT PERSONNEL

Personnel	Role	Qualifications	Expertise and experience
Eleanor Stalenberg	Fauna survey and site assessment Report writing and research	Bachelor of Science (Zoology) Honours	Eleanor has experience in comprehensive fauna survey in southern NSW. She has undertaken a number of biodiversity assessments and EIA reports in a wide range of habitats on the Southern Tablelands, Cooma Monaro and South Coast of NSW. These reports have included threatened floral and faunal species assessments, research, field work and GIS components.
Jackie Miles	Flora site assessment and report writing	Bachelor of Science (Honours)	Jackie is ngh environmental's naturalist, specialising in botanical and zoological surveys. Jackie has worked on a number of large assignments including extensive fauna surveys for the Comprehensive Regional Assessment program, and botanical surveys including CRA full floristic surveys, field validation for the Parks & Wildlife Division - Dept. of Environment and Conservation Vegetation Map for South East Forests, botanical surveys for mapping of all NSW ski resort areas, surveys of significant remnant grassy vegetation for Bega Valley Shire Council.
Paul McPherson	Flora and site assessment	Bachelor of Applied Science (Natural Resources)	With ngh environmental since 1996 undertaking flora and fauna survey, planning assessment and environmental impact assessment. Prior to this, Commonwealth Government environmental policy, resource assessment and program delivery.
Nick Graham-Higgs	Senior review	B Sc (EIANZ Certified Environmental Practitioner)	Nicholas has worked as an environmental planning and resource consultant since 1992, specialising in natural resource management. A wide range of assignments covering diverse natural and modified environments, have enabled Nick to develop a broad knowledge base in the area of natural resource planning and management. Nick is accredited as a Certified Environmental Practitioner by the Environment Institute of Australia and New Zealand.
Brooke Marshall	Senior review	B Natural Resources (Hons)	Brooke graduated as a first class honours Natural Resources graduate of the University of New England (UNE). Since joining ngh environmental, Brooke has prepared impact assessment reports relating to a variety of infrastructure development (including roads, wind farms, telecommunications, water supply management and residential development) as well as river modification and prescribed burning works. These reports have included threatened floral and faunal species assessments, research, fieldwork and GIS components.
Steven Sass	Senior Review	B App Sci (Env Sci) (Hons) EIANZ Certified Environmental Practitioner	Steven is an experienced ecologist having undertaken more than 500 aquatic and terrestrial threatened flora and fauna surveys and habitat assessments. As a Certified Environmental Practitioner by the Environment Institute of Australia and New Zealand and as Senior Ecologist, Steven provides technical advice and peer-review to the ngh environmental ecology team.

Personnel	Role	Qualifications	Expertise and experience
Bianca Heinze	Editing Fauna technical assistant	B AppSc (ERM/Coastal Mgt)	Since joining ng h environmental Bianca has focused on biodiversity assessment and field work across a variety of ecosystems. Prior to joining ng h environmental, Bianca was employed with the Department of Sustainability & Environment, Victoria, in the field of fire management. During her 2 years, she was involved with fire operations planning, community engagement and fire suppression.

12 REFERENCES

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Appendix A **FLORA SURVEY**

- A.1 FLORA SURVEY EFFORT**
- A.2 COMPOSITE SPECIES LIST FOR THE SITE**
- A.2 REPRESENTATIVE 20X20M QUADRATS**
- A.3 RANDOM MEANDER RESULTS**
- A.4 COMPOSITE LISTS**
- A.5 YASS DAISY (*Ammobium craspedioides*) RECORDS**

A.1 FLORA SURVEY EFFORT

No.	X_Proj	Y_Proj	survey_type
1	639651	6152669	quadrat
2	642508	6154483	quadrat
3	640534	6155672	quadrat
4	641672	6154060	random meander
5	638560	6156039	random meander
6	637956	6152651	random meander
7	642070	6155434	random meander
8	642227	6155038	random meander
9	642395	6154327	random meander
10	640864	6155376	random meander
11	644096	6154073	random meander
12	642921	6152915	random meander
13	644146	6150715	random meander
14	640553	6155623	random meander
15	641771	6154231	random meander
16	645482	6150020	random meander
17	645701	6149386	random meander
18	641972	6152272	random meander
19	640869	6155385	random meander
20	641876	6155165	random meander
21	641742	6155016	random meander
22	645700	6153122	random meander
23	644124	6153486	random meander
24	644721	6153512	random meander
25	645089	6153207	random meander
26	642305	6154026	random meander
27	644145	6147936	random meander
28	642311	6150191	random meander
29	633863	6154253	spot check
30	639264	6159396	spot check
31	636821	6155410	spot check
32	638355	6156211	spot check
33	643526	6152076	spot check
34	638637	6155900	spot check
35	638663	6155914	spot check

No.	X_Proj	Y_Proj	survey_type
36	638768	6155507	spot check
37	637777	6152682	spot check
38	641610	6155358	spot check
39	644675	6150132	spot check
40	644434	6150529	spot check
41	645007	6150030	spot check
42	645558	6150890	spot check
43	645447	6149753	spot check
44	641726	6155990	spot check
45	645434	6153130	spot check
46	642020	6154106	spot check
47	647375	6152137	spot check
48	646878	6152150	spot check
49	646740	6152161	spot check
50	646015	6152118	spot check
51	648561	6152298	spot check

Relative abundance is given by a cover abundance scale (modified Braun-Blanquet):

1	1 to a few individuals present, less than 5% cover
2	many individuals present, but still less than 5% cover
3	5 - < 20% cover
4	20 - < 50% cover
5	50 - < 75% cover
6	75 - 100% cover

Cover/abundance scores relate to general abundance over the entire site, not to representative quadrats.

*Introduced species are preceded by an asterisk.

“off site” refers to the woodland on the southern slope of site 7a, the potential offset area north of site 10, or the banks of Jugiong Creek outside the potential transmission crossing area.

A.2 COMPOSITE SPECIES LIST FOR THE SITE

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
TREES			
<i>Acacia implexa</i>	lightwood or hickory	Fabaceae	1
<i>Allocasuarina verticillata</i>	dryland drooping sheoak	Casuarinaceae	1
<i>Brachychiton populneus</i>	kurrajong	Sterculiaceae	1
<i>Eucalyptus albens</i>	white box	Myrtaceae	0-3
<i>Eucalyptus blakelyi</i>	Blakely's red gum	Myrtaceae	0-3
<i>Eucalyptus bridgesiana</i>	apple box	Myrtaceae	1 (off site)
<i>Eucalyptus camaldulensis</i>	river red gum	Myrtaceae	1
<i>Eucalyptus gonicalyx</i>	bundy, long-leaved box	Myrtaceae	0-3
<i>Eucalyptus macrorhyncha</i>	red stringybark	Myrtaceae	0-2
<i>Eucalyptus melliodora</i>	yellow box	Myrtaceae	0-3
<i>Eucalyptus polyanthemos</i> ssp <i>polyanthemos</i>	red box	Myrtaceae	0-2
SHRUBS, SUB-SHRUBS			
<i>Acacia decora</i>		Fabaceae	1
<i>Amyema pendulum</i>	a mistletoe	Loranthaceae	0-2
<i>Callistemon ?sieberi</i>	river bottlebrush	Myrtaceae	1
<i>Dillwynia sericea</i>		Fabaceae	1
<i>Dodonaea viscosa</i> ssp <i>angustissima</i>	hop bush	Sapindaceae	1
<i>Hibbertia obtusifolia</i>	guineaflower	Dilleniaceae	1
<i>Melichrus urceolatus</i>		Epacridaceae	1
<i>Muellerina eucalyptoides</i>	a mistletoe	Loranthaceae	1
<i>Pultenaea foliolosa</i>		Fabaceae	1

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
<i>*Rosa rubiginosa</i>	briar rose, sweet briar	Rosaceae	1
<i>*Rubus fruticosus</i> sp. agg.	blackberry	Rosaceae	1
FERNS			
<i>Asplenium flabellifolium</i>	necklace fern	Aspleniaceae	1
<i>Cheilanthes austrotenuifolia</i>		Sinopteridaceae	0-2
<i>Cheilanthes distans</i>	bristly cloak fern	Sinopteridaceae	0-2
<i>Cheilanthes sieberi</i> ssp <i>sieberi</i>	rock or mulga fern	Sinopteridaceae	0-2
<i>Ophioglossum lusitanicum</i>	adder's tongue	Ophioglossaceae	1
<i>Pleurosorus rutifolius</i>	blanket fern	Aspleniaceae	1
VINES AND TWINERS			
<i>Convolvulus erubescens</i> s. lat.	bindweed	Convolvulaceae	1
<i>Glycine clandestina</i>	twining glycine	Fabaceae	1
FORBS			
<i>Acaena agnipila</i>		Rosaceae	0-2
<i>Acaena echinata</i>		Rosaceae	1
<i>*Acetosella vulgaris</i>	sheep sorrel	Polygonaceae	1-3
<i>Ammobium craspedioides</i>	Yass daisy	Asteraceae	0-2 (off site)
<i>*Amsinckia calycina</i>	fiddleneck	Boraginaceae	1
<i>*Anagallis arvensis</i>	scarlet pimpernel	Primulaceae	1
<i>*Arctotheca calendula</i>	capeweed	Asteraceae	1-3
<i>Arthropodium milleflorum</i>	pale vanilla lily	Anthericaceae	1 (off site)
<i>Asperula conferta</i>	common woodruff	Rubiaceae	1
<i>Brachyscome ciliaris</i>		Asteraceae	1
<i>Bulbine bulbosa</i>	bulbine lily	Asphodelaceae	1
<i>*Carduus tenuiflorus</i>	winged slender thistle	Asteraceae	1
<i>*Carthamus lanatus</i>	saffron thistle	Asteraceae	0-4
<i>*Centaurea</i> sp.	cockspur thistle	Asteraceae	1
<i>*Cerastium</i> sp.	chickweed	Caryophyllaceae	1
<i>Chamaesyce drummondii</i>	caustic weed	Euphorbiaceae	1
<i>*Cirsium vulgare</i>	black or spear thistle	Asteraceae	1
<i>Cotula australis</i>	carrot weed	Apiaceae	0-2
<i>Craspedia variabilis</i>		Asteraceae	1
<i>Crassula decumbens</i>		Crassulaceae	1
<i>Crassula sieberiana</i>	Australian stonecrop	Crassulaceae	0-2
<i>*Crepis capillaris</i>	smooth hawk's beard	Asteraceae	1
<i>Cymbonotus</i> sp.	bear's ear	Asteraceae	1
<i>Cynoglossum australe</i>	hound's tongue	Boraginaceae	1

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
<i>Daucus glochidiatus</i>		Apiaceae	1 (off-site)
<i>Desmodium varians</i>	slender tick trefoil	Fabaceae	1
<i>Dianella longifolia</i>	blue flax lily	Phormiaceae	1
<i>Dichondra repens</i>	kidney weed	Convolvulaceae	1
<i>Diuris chryseopsis</i>	early snake orchid	Orchidaceae	0-2
<i>Drosera peltata</i> ssp <i>peltata</i>	sundew	Droseraceae	0-2
* <i>Echium plantagineum</i>	Paterson's curse	Boraginaceae	0-4
<i>Einadia nutans</i>	berry saltbush	Chenopodiaceae	1
<i>Epilobium billardierianum</i> ssp <i>cinereum</i>	willow herb	Onagraceae	1
* <i>Erodium brachycarpum</i>	heronsbill	Geraniaceae	0-2
* <i>Erodium cicutarium</i>	common storksbill	Geraniaceae	0-2
<i>Erodium crinitum</i>	blue storksbill	Geraniaceae	1
* <i>Erodium moschatum</i>	musky storksbill	Geraniaceae	0-2
<i>Eryngium rostratum</i>	blue devil	Apiaceae	1 (off site)
* <i>Galium murale</i>	annual bedstraw	Rubiaceae	1
* <i>Geranium molle</i>		Geraniaceae	0-2
<i>Geranium solanderi</i> var. <i>solanderi</i>		Geraniaceae	1
<i>Glossodia major</i>	waxlip orchid	Orchidaceae	1 (off site)
<i>Gonocarpus tetragynus</i>	raspwort	Haloragaceae	0-2
<i>Haloragis heterophylla</i>		Haloragaceae	1 (off site)
<i>Hydrocotyle laxiflora</i>	stinking pennywort	Apiaceae	1
<i>Hypericum gramineum</i>	native St Johns wort	Clusiaceae	1
* <i>Hypochaeris glabra</i>		Asteraceae	0-2
* <i>Hypochaeris radicata</i>	cat's ear, flatweed	Asteraceae	1-3
<i>Hypoxis vaginata</i> var. <i>brevistigmata</i>	yellow star	Hypoxidaceae	1
<i>Hypoxis vaginata</i> var. <i>vaginata</i>	yellow star	Hypoxidaceae	0-2
<i>Isotoma axillaris</i>	showy isotome	Lobeliaceae	1
* <i>Lactuca serriola</i>	prickly lettuce	Asteraceae	1
<i>Leptorhynchus squamatus</i> ssp A	scaly buttons	Asteraceae	1
* <i>Malva parviflora</i>	small-flowered mallow	Malvaceae	0-2
* <i>Marrubium vulgare</i>	horehound	Lamiaceae	1
<i>Microseris lanceolata</i>	murnong, yam daisy	Asteraceae	1 (off site)
* <i>Moenchia erecta</i>	erect chickweed	Caryophyllaceae	1
<i>Montia fontana</i> ssp <i>chondrosperma</i>		Portulacaceae	1
* <i>Onopordum acanthium</i>	Scotch thistle	Asteraceae	0-4
<i>Oreomyrrhis eriopoda</i>	Australian carraway	Apiaceae	1 (off site)
* <i>Orobanche minor</i>	broomrape	Scrophulariaceae	1

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
<i>Oxalis ?perennans</i>	oxalis	Oxalidaceae	0-2
?* <i>Papaver hybridum</i>	rough poppy	Papaveraceae	1
* <i>Petrorhagia nanteuilii</i>	proliferous pink	Caryophyllaceae	1
<i>Poranthera microphylla</i>		Euphorbiaceae	1
<i>Pterostylis curta</i>	common greenhood	Orchidaceae	1 (off site)
<i>Pterostylis nutans</i>	nodding greenhood	Orchidaceae	1 (off site)
<i>Ranunculus lappaceus</i>	common buttercup	Ranunculaceae	1
<i>Rumex brownii</i>	native dock	Polygonaceae	1
* <i>Rumex</i> sp.	dock	Polygonaceae	1
* <i>Sanguisorba minor</i> ssp <i>muricata</i>	sheep's burnet	Rosaceae	1
<i>Scleranthus biflorus</i>	knawel	Caryophyllaceae	1
<i>Scleranthus fasciculatus</i>		Caryophyllaceae	1
<i>Scutellaria humilis</i>	soft skullcap	Lamiaceae	0-2
<i>Senecio tenuiflorus</i>		Asteraceae	1
* <i>Silene gallica</i>	French catchfly	Caryophyllaceae	1
<i>Solenogyne dominii</i>		Asteraceae	0-2
* <i>Sonchus asper</i>	prickly sow thistle	Asteraceae	1
<i>Stackhousia monogyna</i>	creamy candles	Stackhousiaceae	1 (off site)
* <i>Stellaria media</i>	common chickweed	Caryophyllaceae	0-4
<i>Stellaria pungens</i>	prickly starwort	Caryophyllaceae	1
<i>Stuartina ?muelleri</i>		Asteraceae	1
* <i>Taraxacum officinale</i>	dandelion	Asteraceae	1
<i>Thysanotus patersonii</i>	twining fringe-lily	Anthericaceae	1 (off site)
? <i>Thysanotus/ Arthropodium</i> sp.		Anthericaceae	0-2 (off site)
<i>Tricoryne elatior</i>	yellow rush-lily	Anthericaceae	1
* <i>Trifolium arvense</i>	hare's foot clover	Fabaceae	1
* <i>Trifolium subterraneum</i>	sub clover	Fabaceae	0-3
* <i>Trifolium</i> sp.	clover	Fabaceae	0-4
<i>Triptilodiscus pygmaeus</i>		Asteraceae	1
* <i>Urtica urens</i>	stinging nettle	Urticaceae	0-5
<i>Veronica plebeia</i>	common speedwell	Scrophulariaceae	1
<i>Viola betonicifolia</i>	narrow-leaved violet	Violaceae	1 (off site)
<i>Wahlenbergia communis</i>	tufted bluebell	Campanulaceae	1
<i>Wahlenbergia stricta</i>	tall bluebell	Campanulaceae	1
<i>Wurmbea dioica</i>	early nancy	Colchicaceae	0-2
<i>Wurmbea latifolia</i>	early nancy	Colchicaceae	0-2
GRASSES			

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
* <i>Aira caryophyllea</i>	hair grass	Poaceae	1
* <i>Anthoxanthum odoratum</i>	sweet vernal grass	Poaceae	1
<i>Aristida ramosa</i> var. <i>ramosa</i>		Poaceae	0-6
<i>Austrodanthonia eriantha</i>	wallaby grass	Poaceae	0-3
<i>Austrodanthonia monticola</i>	wallaby grass	Poaceae	1
<i>Austrodanthonia racemosa</i> var. <i>racemosa</i>	wallaby grass	Poaceae	1
<i>Austrodanthonia</i> spp.	wallaby grass	Poaceae	0-5
<i>Austrostipa ?bigeniculata</i>		Poaceae	1
<i>Austrostipa ?densiflora</i>		Poaceae	0-2
<i>Austrostipa scabra</i> ssp <i>falcata</i>	corkscrew grass	Poaceae	0-2
* <i>Avena</i> sp.	wild oats	Poaceae	1
<i>Bothriochloa macra</i>	red-stem grass	Poaceae	0-3
* <i>Briza maxima</i>	quaking grass	Poaceae	0-3
* <i>Briza minor</i>	shivery grass	Poaceae	1
* <i>Bromus racemosus</i>	soft brome	Poaceae	1
* <i>Bromus sterilis</i>		Poaceae	0-3
<i>Chloris truncata</i>	windmill grass	Poaceae	1
<i>Cymbopogon refractus</i>	barbed wire grass	Poaceae	1
* <i>Cynosurus echinatus</i>	dog's tail grass	Poaceae	0-2
<i>Echinopogon ovatus</i>	hedgehog grass	Poaceae	1
<i>Elymus scaber</i>	common wheat grass	Poaceae	0-2
<i>Eragrostis</i> sp.		Poaceae	1
* <i>Hordeum leporinum</i>	barley grass	Poaceae	0-4
<i>Joycea pallida</i>	robust wallaby grass	Poaceae	1 (off site)
* <i>Lolium perenne</i>	perennial ryegrass	Poaceae	0-4
<i>Microlaena stipoides</i>	weeping grass	Poaceae	0-4
* <i>Nassella trichotoma</i>	serrated tussock	Poaceae	1?
<i>Panicum effusum</i>	hairy panic	Poaceae	0-2
* <i>Poa annua</i>	winter grass	Poaceae	0-2
<i>Poa sieberiana</i> var. <i>sieberiana</i>		Poaceae	1 (off site)
<i>Themeda australis</i>	kangaroo grass	Poaceae	1
* <i>Vulpia bromoides</i>	squirrel tail fescue	Poaceae	0-2
GRAMINOIDS			
<i>Carex appressa</i>	tall sedge	Cyperaceae	1
* <i>Juncus acutus</i>	jointed rush	Juncaceae	1 (off site)
<i>Juncus</i> sp.		Juncaceae	1
<i>Lomandra filiformis</i> ssp <i>coriacea</i>		Lomandraceae	0-3

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
<i>Lomandra filiformis</i> ssp <i>filiformis</i>		Lomandraceae	1
<i>Lomandra longifolia</i>	spiny matrush	Lomandraceae	1
<i>Luzula</i> sp.		Juncaceae	0-2 (off site)

A.3 REPRESENTATIVE 20X20M QUADRATS

Exotic Pasture

Location: AGD 639650 6152700, elevation 570m. Site 4, saddle half way along this ridge.

Heavily grazed, 20% rock cover, very sparse Kurrajong (*Brachychiton populneus*) in vicinity.

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
FERNS			
<i>Cheilanthes sieberi</i> ssp <i>sieberi</i>	rock or mulga fern	Sinopteridaceae	1
FORBS			
* <i>Acetosella vulgaris</i>	sheep sorrel	Polygonaceae	3
* <i>Arctotheca calendula</i>	capeweed	Asteraceae	2
* <i>Carthamus lanatus</i>	saffron thistle	Asteraceae	4
<i>Crassula sieberiana</i>	Australian stonecrop	Crassulaceae	1
<i>Dichondra repens</i>	kidney weed	Convolvulaceae	1
<i>Einadia nutans</i>	berry saltbush	Chenopodiaceae	1
* <i>Erodium cicutarium</i>	common storksbill	Geraniaceae	2
* <i>Erodium moschatum</i>	musky storksbill	Geraniaceae	1
* <i>Geranium molle</i>		Geraniaceae	1
<i>Hydrocotyle laxiflora</i>	stinking pennywort	Apiaceae	1
* <i>Hypochaeris radicata</i>	cat's ear, flatweed	Asteraceae	1
* <i>Malva parviflora</i>	small-flowered mallow	Malvaceae	1
* <i>Onopordum acanthium</i>	Scotch thistle	Asteraceae	1
<i>Oxalis ?perennans</i>	oxalis	Oxalidaceae	2
<i>Rumex brownii</i>	native dock	Polygonaceae	1
* <i>Stellaria media</i>	common chickweed	Caryophyllaceae	1
* <i>Trifolium subterraneum</i>	sub clover	Fabaceae	2
* <i>Trifolium</i> sp.	clover	Fabaceae	4
GRASSES			
<i>Austroanthonia racemosa</i> var. <i>racemosa</i>	wallaby grass	Poaceae	1
<i>Austrostipa scabra</i> ssp <i>falcata</i>	corkscrew grass	Poaceae	2

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
* <i>Lolium perenne</i>	perennial ryegrass	Poaceae	4
<i>Microlaena stipoides</i>	weeping grass	Poaceae	3
* <i>Poa annua</i>	winter grass	Poaceae	2

Native Pasture

Location: AGD 640534 6155672, elevation 650m. Site 6, ridge crest, northern end.

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
FERNS			
<i>Cheilanthes sieberi</i> ssp <i>sieberi</i>	rock or mulga fern	Sinopteridaceae	1
FORBS			
* <i>Acetosella vulgaris</i>	sheep sorrel	Polygonaceae	1
* <i>Arctotheca calendula</i>	capeweed	Asteraceae	2
* <i>Carthamus lanatus</i>	saffron thistle	Asteraceae	1
* <i>Cerastium</i> sp.	chickweed	Caryophyllaceae	1
<i>Crassula sieberiana</i>	Australian stonecrop	Crassulaceae	1
<i>Dichondra repens</i>	kidney weed	Convolvulaceae	2
* <i>Echium plantagineum</i>	Paterson's curse	Boraginaceae	1
<i>Einadia nutans</i>	berry saltbush	Chenopodiaceae	1
* <i>Erodium cicutarium</i>	common storksbill	Geraniaceae	3
* <i>Erodium moschatum</i>	musky storksbill	Geraniaceae	1
* <i>Hypochaeris radicata</i>	cat's ear, flatweed	Asteraceae	1
<i>Oxalis ?perennans</i>	oxalis	Oxalidaceae	2
<i>Rumex brownii</i>	native dock	Polygonaceae	2
<i>Solenogyne dominii</i>		Asteraceae	2
* <i>Trifolium subterraneum</i>	sub clover	Fabaceae	2
* <i>Trifolium</i> sp.	clover	Fabaceae	4
* <i>Urtica urens</i>	stinging nettle	Urticaceae	1
GRASSES			
<i>Austrodanthonia</i> spp.	wallaby grass	Poaceae	4
<i>Austrostipa scabra</i> ssp <i>falcata</i>	corkscrew grass	Poaceae	2
? <i>Bothriochloa macra</i>	red-stem grass	Poaceae	1
<i>Microlaena stipoides</i>	weeping grass	Poaceae	3
* <i>Poa annua</i>	winter grass	Poaceae	3

A.4 RANDOM MEANDER RESULTS

Woodland on Lower Slope

Location: AGD 637956 6152651, elevation 460m. Site 3, midslope, southern end.

Heavy grazing (sheep), rabbits, trees small with few or no hollows. Rock 5% cover.

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
TREES			
<i>Eucalyptus albens</i>	white box	Myrtaceae	1
<i>Eucalyptus macrorhyncha</i>	red stringybark	Myrtaceae	3
SHRUBS, SUB-SHRUBS			
* <i>Rubus fruticosus</i>	blackberry	Rosaceae	1
FERNS			
<i>Asplenium flabellifolium</i>	necklace fern	Aspleniaceae	1
<i>Cheilanthes austrotenuifolia</i>		Sinopteridaceae	1
<i>Cheilanthes sieberi</i> ssp <i>sieberi</i>	rock or mulga fern	Sinopteridaceae	1
<i>Pleurosorus rutifolius</i>	blanket fern	Aspleniaceae	1
FORBS			
* <i>Acetosella vulgaris</i>	sheep sorrel	Polygonaceae	1
* <i>Arctotheca calendula</i>	capeweed	Asteraceae	2
* <i>Carthamus lanatus</i>	saffron thistle	Asteraceae	1
?* <i>Cerastium</i> sp.	chickweed	Caryophyllaceae	1
<i>Cotula australis</i>	carrot weed	Apiaceae	1
<i>Crassula sieberiana</i>	Australian stonecrop	Crassulaceae	1
<i>Cymbonotus</i> sp.	bear's ear	Asteraceae	1
* <i>Erodium cicutarium</i>	common storksbill	Geraniaceae	1
* <i>Geranium molle</i>		Geraniaceae	1
<i>Geranium solanderi</i> var. <i>solanderi</i>		Geraniaceae	2
<i>Hydrocotyle laxiflora</i>	stinking pennywort	Apiaceae	1
* <i>Hypochaeris radicata</i>	cat's ear, flatweed	Asteraceae	2
<i>Hypoxis vaginata</i> var. <i>brevistigmata</i>	yellow star	Hypoxidaceae	1
* <i>Marrubium vulgare</i>	horehound	Lamiaceae	1
<i>Oxalis</i> ? <i>perennans</i>	oxalis	Oxalidaceae	1
* <i>Silybum marianum</i>	variegated thistle	Asteraceae	1
<i>Solenogyne dominii</i>		Asteraceae	1
* <i>Stellaria media</i>	common chickweed	Caryophyllaceae	2
* <i>Trifolium</i> sp.	clover	Fabaceae	2

GRASSES			
<i>Austrodanthonia</i> spp.	wallaby grass	Poaceae	2
<i>Austrostipa ?densiflora</i>		Poaceae	1
<i>Austrostipa scabra</i> ssp <i>falcata</i>	corkscrew grass	Poaceae	3
* <i>Avena</i> sp.	wild oats	Poaceae	1
* <i>Briza maxima</i>	quaking grass	Poaceae	1
<i>Elymus scaber</i>	common wheat grass	Poaceae	1
<i>Eragrostis</i> sp.		Poaceae	1
<i>Microlaena stipoides</i>	weeping grass	Poaceae	3
<i>Panicum effusum</i>	hairy panic	Poaceae	2

Woodland on Upper Slope

Location: AGD 638560 6156039, elevation 660m. Site 3, upper slope, northern end.

Heavy grazing (sheep), rabbits, trees mature and regrowth, 10-20cm DBH with few hollows. Rock 5% cover. Lower down slope tree canopy is just Long-leaved Box, Yellow Box (several) present in saddle 100m to south.

Most woodland remnants surveyed on crests/upper slopes are in similar condition to this example, or worse (e.g. *E. albens* 3, **Urtica urens* 5)

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
TREES			
<i>Brachychiton populneus</i>	kurrajong	Sterculiaceae	1
<i>Eucalyptus albens</i>	white box	Myrtaceae	3
<i>Eucalyptus gonicalyx</i>	bundy, long-leaved box	Myrtaceae	3
FERNS			
<i>Cheilanthes austrotenuifolia</i>		Sinopteridaceae	1
FORBS			
* <i>Acetosella vulgaris</i>	sheep sorrel	Polygonaceae	1
* <i>Amsinckia calycina</i>		Boraginaceae	1
* <i>Arctotheca calendula</i>	capeweed	Asteraceae	2
* <i>Carthamus lanatus</i>	saffron thistle	Asteraceae	1
* <i>Cerastium</i> sp.	chickweed	Caryophyllaceae	1
* <i>Echium plantagineum</i>	Paterson's curse	Boraginaceae	2
* <i>Erodium brachycarpum</i>	heronsbill	Geraniaceae	1
* <i>Erodium cicutarium</i>	common storksbill	Geraniaceae	2
* <i>Erodium moschatum</i>	musky storksbill	Geraniaceae	2
* <i>Geranium molle</i>		Geraniaceae	2
<i>Geranium solanderi</i> var. <i>solanderi</i>		Geraniaceae	1
* <i>Hypochaeris radicata</i>	cat's ear, flatweed	Asteraceae	2

<i>Oxalis ?perennans</i>	oxalis	Oxalidaceae	1
<i>Rumex brownii</i>	native dock	Polygonaceae	1
* <i>Rumex</i> sp.	dock	Polygonaceae	1
* <i>Stellaria media</i>	common chickweed	Caryophyllaceae	2
* <i>Trifolium subterraneum</i>	sub clover	Fabaceae	2
* <i>Trifolium</i> sp.	clover	Fabaceae	2
* <i>Urtica urens</i>	stinging nettle	Urticaceae	2
GRASSES			
<i>Austrodanthonia</i> spp.	wallaby grass	Poaceae	1
<i>Austrostipa scabra</i> ssp <i>falcata</i>	corkscrew grass	Poaceae	1
<i>Bothriochloa macra</i>	red-stem grass	Poaceae	1
* <i>Cynosurus echinatus</i>	dog's tail grass	Poaceae	1
<i>Elymus scaber</i>	common wheat grass	Poaceae	1
<i>Microlaena stipoides</i>	weeping grass	Poaceae	4
<i>Panicum effusum</i>	hairy panic	Poaceae	1

Woodland on upper slope near saddle

Location: AGD 64914 6155146, elevation 700m, slope 10 °, aspect SSW. Saddle between sites 6 and 7a within transmission route envelope. Light grazing. Rock 5% cover.

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
TREES			
<i>Eucalyptus gonicalyx</i>	bundy, long-leaved box	Myrtaceae	3
<i>Eucalyptus macrorhyncha</i>	red stringybark	Myrtaceae	1
SHRUBS, SUB-SHRUBS			
<i>Hibbertia obtusifolia</i>	guineaflower	Dilleniaceae	1
FERNS			
<i>Cheilanthes austrotenuifolia</i>		Sinopteridaceae	1
<i>Cheilanthes sieberi</i> ssp <i>sieberi</i>	rock or mulga fern	Sinopteridaceae	0-2
VINES AND TWINERS			
<i>Glycine clandestina</i>	twining glycine	Fabaceae	1
FORBS			
<i>Acaena agnipila</i>		Rosaceae	2
<i>Ammobium craspedioides</i>	Yass daisy	Asteraceae	0-3
<i>Arthropodium milleflorum</i>	pale vanilla lily	Anthericaceae	1
<i>Bulbine bulbosa</i>	bulbine lily	Asphodelaceae	1
<i>Cymbonotus</i> sp.	bear's ear	Asteraceae	1
<i>Daucus glochidiatus</i>		Apiaceae	1

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
<i>*Echium plantagineum</i>	Paterson's curse	Boraginaceae	1
<i>Galium</i> sp.		Rubiaceae	1
<i>Hydrocotyle laxiflora</i>	stinking pennywort	Apiaceae	2
<i>Hypericum gramineum</i>	native St Johns wort	Clusiaceae	1
<i>*Hypochaeris glabra</i>		Asteraceae	1
<i>*Hypochaeris radicata</i>	cat's ear, flatweed	Asteraceae	2
<i>Oreomyrrhis eriopoda</i>	Australian carraway	Apiaceae	1
<i>*Orobanche minor</i>	broomrape	Scrophulariaceae	1
<i>Oxalis ?perennans</i>	oxalis	Oxalidaceae	2
<i>*Petrohragia nanteuilii</i>	proliferous pink	Caryophyllaceae	1
<i>Poranthera microphylla</i>		Euphorbiaceae	2
<i>Rumex brownii</i>	native dock	Polygonaceae	1
<i>Scutellaria humilis</i>	soft skullcap	Lamiaceae	2
<i>Tricoryne elatior</i>	yellow -lily	Anthericaceae	1
<i>Triptilodiscus pygmaeus</i>		Asteraceae	1
<i>Wahlenbergia stricta</i>	tall bluebell	Campanulaceae	2
<i>Wurmbea</i> sp.	early nancy	Colchicaceae	1
GRASSES			
<i>*Anthoxanthum odoratum</i>	sweet vernal grass	Poaceae	0-2
<i>Aristida ramosa</i>	wiregrass	Poaceae	1
<i>Austrodanthonia eriantha</i>	wallaby grass	Poaceae	0-2
<i>Austrodanthonia racemosa</i> var. <i>racemosa</i>	wallaby grass	Poaceae	2-3
<i>Austrostipa scabra</i> ssp <i>falcata</i>	corkscrew grass	Poaceae	1
<i>*Avena</i> sp.	wild oats	Poaceae	1
<i>*Briza maxima</i>	quaking grass	Poaceae	0-2
<i>*Briza minor</i>	shivery grass	Poaceae	0-2
<i>*Bromus sterilis</i>		Poaceae	1
<i>Elymus scaber</i>	common wheat grass	Poaceae	2
<i>Joycea pallida</i>	robust wallaby grass	Poaceae	1
<i>*Lolium perenne</i>	perennial ryegrass	Poaceae	1
<i>Microlaena stipoides</i>	weeping grass	Poaceae	0-2
<i>Poa sieberiana</i> var. <i>sieberiana</i>		Poaceae	1-3
GRAMINOIDS			
<i>Juncus filicaulis</i>		Juncaceae	1
<i>Lomandra filiformis</i> ssp <i>coriacea</i>		Lomandraceae	1
<i>Lomandra filiformis</i> ssp <i>filiformis</i>		Lomandraceae	1
<i>Luzula</i> sp.		Juncaceae	1

Open woodland on crest

Location: AGD 644146 6150715 and 500m to east, elevation 600-630m, slope 5-15°. Western third of site 10.

Heavy grazing (sheep and horse), trees all large and old at western end, to 1m DBH, all with multiple hollows. Rock 10% cover.

Groundcover is in better condition on the lower western, more sparsely treed, end of the site and deteriorates closer to the peaks, becoming much weedier. The large trees with hollows and proximity to a large tract of high quality vegetation on the flats to the north gives this vegetation conservation significance for fauna, but despite being box-gum woodland its botanical condition is poor-moderate.

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
TREES			
<i>Brachychiton populneus</i>	kurrajong	Sterculiaceae	1
<i>Eucalyptus albens</i>	white box	Myrtaceae	2
<i>Eucalyptus blakelyi</i>	Blakely's red gum	Myrtaceae	1-2
<i>Eucalyptus goniocalyx</i>	bundy, long-leaved box	Myrtaceae	1-2
<i>Eucalyptus macrorhyncha</i>	red stringybark	Myrtaceae	1
<i>Eucalyptus melliodora</i>	yellow box	Myrtaceae	1
<i>Eucalyptus polyanthemos</i> ssp	red box	Myrtaceae	1
FERNS			
<i>Ophioglossum lusitanicum</i>	adder's tongue	Ophioglossaceae	1
FORBS			
* <i>Arctotheca calendula</i>	capeweed	Asteraceae	2
* <i>Carthamus lanatus</i>	saffron thistle	Asteraceae	2
<i>Crassula sieberiana</i>	Australian stonecrop	Crassulaceae	1
* <i>Echium plantagineum</i>	Paterson's curse	Boraginaceae	0-5
* <i>Erodium</i> spp.	storksbill	Geraniaceae	3
* <i>Hypochaeris radicata</i>	cat's ear, flatweed	Asteraceae	2
* <i>Onopordum acanthium</i>	Scotch thistle	Asteraceae	1
<i>Oxalis ?perennans</i>	oxalis	Oxalidaceae	1
<i>Rumex brownii</i>	native dock	Polygonaceae	1
<i>Solenogyne dominii</i>		Asteraceae	1
* <i>Stellaria media</i>	common chickweed	Caryophyllaceae	1
* <i>Trifolium</i> spp.	clover	Fabaceae	3
* <i>Urtica urens</i>	stinging nettle	Urticaceae	1
GRASSES			
<i>Aristida ramosa</i> var. <i>ramosa</i>		Poaceae	0-2
<i>Austrodanthonia</i> spp.	wallaby grass	Poaceae	0-5

<i>Aurostipa scabra</i> ssp <i>falcata</i>	corkscrew grass	Poaceae	0-3
<i>Bothriochloa macra</i>	red-stem grass	Poaceae	1
* <i>Hordeum leporinum</i>	barley grass	Poaceae	2
<i>Microlaena stipoides</i>	weeping grass	Poaceae	0-2
* <i>Poa annua</i>	winter grass	Poaceae	0-2

Regrowth woodland in saddle

Location: AGD 645170 6150012, elevation 570m, slope 5°. Saddle at centre of site 10.

Accessible to sheep and horses, but relatively lightly grazed despite that; trees all regrowth to 20cm DBH, with no hollows; some ringbarked older regrowth present. Rock 40% cover.

Groundcover is in better condition here than at any other elevated site surveyed, but becomes rapidly weedier on the knolls east and west of the saddle. This area could come under the EPBC Act definition of Box-Gum Woodland.

Scientific name	Common name	Family	Abundance
TREES			
<i>Acacia implexa</i> (dead)	lightwood or hickory	Fabaceae	1
<i>Eucalyptus albens</i>	white box	Myrtaceae	3
<i>Eucalyptus blakelyi</i>	Blakely's red gum	Myrtaceae	1
<i>Eucalyptus macrorhyncha</i>	red stringybark	Myrtaceae	3
<i>Eucalyptus polyanthemos</i> ssp <i>polyanthemos</i>	red box	Myrtaceae	1
SHRUBS, SUB-SHRUBS			
<i>Hibbertia obtusifolia</i>	guineaflower	Dilleniaceae	1
<i>Melichrus urceolatus</i>		Epacridaceae	1
* <i>Rosa rubiginosa</i>	briar rose, sweet briar	Rosaceae	1
FERNS			
<i>Cheilanthes austrotenuifolia</i>		Sinopteridaceae	1
<i>Cheilanthes sieberi</i> ssp <i>sieberi</i>	rock or mulga fern	Sinopteridaceae	2
FORBS			
<i>Acaena echinata</i>		Rosaceae	1
<i>Bulbine bulbosa</i>	bulbine lily	Asphodelaceae	1
<i>Crassula sieberiana</i>	Australian stonecrop	Crassulaceae	1
<i>Diuris chryseopsis</i>	early snake orchid	Orchidaceae	1
<i>Geranium solanderi</i> var. <i>solanderi</i>		Geraniaceae	2
<i>Hydrocotyle laxiflora</i>	stinking pennywort	Apiaceae	3
* <i>Hypochaeris radicata</i>	cat's ear, flatweed	Asteraceae	1
<i>Oxalis ?perennans</i>	oxalis	Oxalidaceae	2
* <i>Petrorhagia nanteuilii</i>	proliferous pink	Caryophyllaceae	1

Scientific name	Common name	Family	Abundance
<i>*Trifolium arvense</i>	hare's foot clover	Fabaceae	1
<i>Wahlenbergia stricta</i>	tall bluebell	Campanulaceae	1
<i>Wurmbea dioica</i>	early nancy	Colchicaceae	2
<i>Wurmbea latifolia</i>	early nancy	Colchicaceae	2
GRASSES			
<i>Aristida ramosa</i> var. <i>ramosa</i>		Poaceae	4
<i>Austrostipa ?bigeniculata</i>		Poaceae	1
<i>Austrostipa ?densiflora</i>		Poaceae	2
<i>*Briza maxima</i>	quaking grass	Poaceae	2
<i>Cymbopogon refractus</i>	barbed wire grass	Poaceae	1
<i>*Cynosurus echinatus</i>	dog's tail grass	Poaceae	1
<i>Elymus scaber</i>	common wheat grass	Poaceae	1
<i>Themeda australis</i>	kangaroo grass	Poaceae	2
GRAMINOIDS			
<i>Lomandra filiformis</i> ssp <i>coriacea</i>		Lomandraceae	3
<i>Lomandra filiformis</i> ssp <i>filiformis</i>		Lomandraceae	1

Regrowth woodland on crest

Location: AGD 645700 6149386 to 645876 6149290, elevation 570-600m, slope c. 5-20°. Wooded knoll at SE end of site 10.

Heavily grazed sheep camp; trees all regrowth 5-70cm DBH, with very few hollows. Rock 60% cover. Groundcover is more native than exotic, owing to the shallow rocky soils, but not very diverse.

Scientific name	Common name	Family	Abundance
TREES			
<i>Acacia implexa</i>	lightwood or hickory	Fabaceae	1
<i>Brachychiton populneus</i>	kurrajong	Sterculiaceae	1
<i>Eucalyptus goniocalyx</i>	bundy, long-leaved box	Myrtaceae	3
<i>Exocarpos cupressiformis</i>	native cherry	Santalaceae	1
SHRUBS, SUB-SHRUBS			
<i>Hibbertia obtusifolia</i>	guineaflower	Dilleniaceae	1
<i>Melichrus urceolatus</i>	urn heath	Epacridaceae	1
FERNS			
<i>Cheilanthes austrotenuifolia</i>		Sinopteridaceae	1
<i>Cheilanthes distans</i>	bristly cloak fern	Sinopteridaceae	1
<i>Cheilanthes sieberi</i> ssp <i>sieberi</i>	rock or mulga fern	Sinopteridaceae	1

Scientific name	Common name	Family	Abundance
FORBS			
<i>Acaena echinata</i>		Rosaceae	1
* <i>Acetosella vulgaris</i>	sheep sorrel	Polygonaceae	1
* <i>Arctotheca calendula</i>	capeweed	Asteraceae	2
* <i>Carduus tenuiflorus</i>	winged slender thistle	Asteraceae	1
* <i>Cirsium vulgare</i>	black or spear thistle	Asteraceae	1
<i>Cotula australis</i>	carrot weed	Apiaceae	1
<i>Crassula sieberiana</i>	Australian stonecrop	Crassulaceae	2
<i>Desmodium varians</i>	slender tick trefoil	Fabaceae	1
<i>Einadia nutans</i>	berry saltbush	Chenopodiaceae	1
* <i>Erodium cicutarium</i>	common storksbill	Geraniaceae	2
* <i>Geranium molle</i>		Geraniaceae	1
<i>Hydrocotyle laxiflora</i>	stinking pennywort	Apiaceae	1
* <i>Hypochaeris glabra</i>		Asteraceae	2
<i>Oxalis ?perennans</i>	oxalis	Oxalidaceae	2
* <i>Petrorhagia nanteuilii</i>	proliferous pink	Caryophyllaceae	1
<i>Rumex brownii</i>	native dock	Polygonaceae	1
<i>Solenogyne dominii</i>		Asteraceae	1
* <i>Stellaria media</i>	common chickweed	Caryophyllaceae	1
* <i>Trifolium subterraneum</i>	sub clover	Fabaceae	3
GRASSES			
<i>Aristida ramosa</i> var. <i>ramosa</i>		Poaceae	3
<i>Austrodanthonia</i> spp.	wallaby grass	Poaceae	3
<i>Austrostipa scabra</i> ssp <i>falcata</i>	corkscrew grass	Poaceae	1
<i>Bothriochloa macra</i>	red-stem grass	Poaceae	3
* <i>Briza maxima</i>	quaking grass	Poaceae	1
<i>Cymbopogon refractus</i>	barbed wire grass	Poaceae	1
* <i>Hordeum leporinum</i>	barley grass	Poaceae	2
<i>Microlaena stipoides</i>	weeping grass	Poaceae	3
<i>Panicum effusum</i>	hairy panic	Poaceae	1
GRAMINOIDS			
<i>Lomandra filiformis</i> ssp <i>coriacea</i>		Lomandraceae	3
<i>Lomandra filiformis</i> ssp <i>filiformis</i>		Lomandraceae	2

Woodland on north-facing upper slope

Location: AGD 645700 6153122, elevation 610m, slope 15°. Eastern end of site 7b.

Grazed by sheep; mature trees with no regrowth. Rock 5% cover.

Scientific name	Common name	Family	Abundance
TREES			
<i>Brachychiton populneus</i>	kurrajong	Sterculiaceae	0-3
<i>Eucalyptus albens</i>	white box	Myrtaceae	3
<i>Eucalyptus melliodora</i>	yellow box	Myrtaceae	0-3
FERNS			
<i>Cheilanthes sieberi</i> ssp <i>sieberi</i>	rock or mulga fern	Sinopteridaceae	1
FORBS			
* <i>Carduus tenuiflorus</i>	winged slender thistle	Asteraceae	1
* <i>Carthamus lanatus</i>	saffron thistle	Asteraceae	2
<i>Crassula sieberiana</i>	Australian stonecrop	Crassulaceae	1
<i>Dichondra repens</i>	kidney weed	Convolvulaceae	2
* <i>Echium plantagineum</i>	Paterson's curse	Boraginaceae	0-2
* <i>Geranium molle</i>		Geraniaceae	1
* <i>Hypochaeris radicata</i>	cat's ear, flatweed	Asteraceae	1
* <i>Onopordum acanthium</i>	Scotch thistle	Asteraceae	1
<i>Oxalis ?perennans</i>	oxalis	Oxalidaceae	2
* <i>Petrorhagia nanteuilii</i>	proliferous pink	Caryophyllaceae	1
<i>Rumex brownii</i>	native dock	Polygonaceae	1
* <i>Sonchus oleraceus</i>	sow thistle	Asteraceae	2
* <i>Trifolium arvense</i>	hare's foot clover	Fabaceae	0-2
* <i>Trifolium dubium</i>		Fabaceae	0-2
* <i>Trifolium</i> sp.	clover	Fabaceae	0-2
GRASSES			
* <i>Aira caryophyllea</i>	hair grass	Poaceae	1
<i>Austrodanthonia racemosa</i> var. <i>racemosa</i>	wallaby grass	Poaceae	0-3
<i>Austrostipa scabra</i> ssp <i>falcata</i>	corkscrew grass	Poaceae	0-2
* <i>Avena</i> sp.	wild oats	Poaceae	3
* <i>Briza maxima</i>	quaking grass	Poaceae	0-3
* <i>Bromus racemosus</i>	soft brome	Poaceae	2
* <i>Bromus sterilis</i>		Poaceae	0-3
* <i>Cynosurus echinatus</i>	dog's tail grass	Poaceae	1
* <i>Hordeum leporinum</i>	barley grass	Poaceae	1
<i>Microlaena stipoides</i>	weeping grass	Poaceae	0-4

A.5 COMPOSITE LISTS

More intact woodland on sheltered slope (two quadrats and one random meander)

Location: AGD 642279 6154581 and 642508 6154483, elevation 615/640m, slope 20-25°. Below site 7a, lower to midslope, central.

Occasional grazing (sheep), rabbits, trees mostly regrowth, occasionally to 60cm DBH, few hollows. Rock 5-15% cover.

Remnant vegetation on steep slopes generally appeared to be in relatively good condition with the main weeds being annuals (**Briza* spp, **Stellaria media*). Grazing pressure appears light. The upper edge of such remnants is more heavily grazed and weedier.

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
TREES			
<i>Acacia implexa</i>	lightwood or hickory	Fabaceae	1
<i>Eucalyptus goniocalyx</i>	bundy, long-leaved box	Myrtaceae	3
<i>Eucalyptus macrorhyncha</i>	red stringybark	Myrtaceae	1
<i>Eucalyptus melliodora</i>	yellow box	Myrtaceae	1/3
SHRUBS, SUB-SHRUBS			
<i>Amyema pendulum</i>	mistletoe	Loranthaceae	1
<i>Hibbertia obtusifolia</i>	guineaflower	Dilleniaceae	1
<i>*Rosa rubiginosa</i>	briar rose, sweet briar	Rosaceae	1
FERNS			
<i>Asplenium flabellifolium</i>	necklace fern	Aspleniaceae	1
<i>Cheilanthes austrotenuifolia</i>		Sinopteridaceae	1
<i>Cheilanthes sieberi</i> ssp <i>sieberi</i>	rock or mulga fern	Sinopteridaceae	1
VINES AND TWINERS			
<i>Glycine clandestina</i>	twining glycine	Fabaceae	1
FORBS			
<i>Acaena echinata</i>		Rosaceae	2
<i>*Acetosella vulgaris</i>	sheep sorrel	Polygonaceae	1
<i>Ammobium craspedioides</i>	Yass daisy	Asteraceae	0/2
<i>*Anagallis arvensis</i>	scarlet pimpernel	Primulaceae	1
<i>*Arctotheca calendula</i>	capeweed	Asteraceae	1
<i>Arthropodium milleflorum</i>	pale vanilla lily	Anthericaceae	2
<i>Bulbine bulbosa</i>	bulbine lily	Asphodelaceae	1
<i>*Carduus tenuiflorus</i>	winged slender thistle	Asteraceae	1
<i>*Centaurea</i> sp.	cockspur thistle	Asteraceae	1
<i>*Cerastium</i> sp.	chickweed	Caryophyllaceae	1
<i>*Cirsium vulgare</i>	black or spear thistle	Asteraceae	1
<i>Crassula sieberiana</i>	Australian stonecrop	Crassulaceae	1
<i>Cymbonotus</i> sp.	bear's ear	Asteraceae	2

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
<i>Daucus glochidiatus</i>		Apiaceae	1
<i>Drosera peltata</i> ssp <i>peltata</i>	sundew	Droseraceae	0/2
<i>Epilobium billardierianum</i> ssp <i>cinereum</i>	willow herb	Onagraceae	1
<i>Geranium solanderi</i> var. <i>solanderi</i>		Geraniaceae	1/2
<i>Gonocarpus tetragynus</i>	raspwort	Haloragaceae	1/2
<i>Hydrocotyle laxiflora</i>	stinking pennywort	Apiaceae	2
<i>Hypericum gramineum</i>	native St Johns wort	Clusiaceae	1
* <i>Hypochaeris radicata</i>	cat's ear, flatweed	Asteraceae	2
<i>Hypoxis vaginata</i>	yellow stars	Hypoxidaceae	0/1
<i>Leptorhynchus squamatus</i> ssp A	scaly buttons	Asteraceae	0/1
<i>Oreomyrrhis eriopoda</i>	Australian carraway	Apiaceae	0/2
<i>Oxalis ?perennans</i>	oxalis	Oxalidaceae	1
<i>Poranthera microphylla</i>		Euphorbiaceae	0/2
<i>Pterostylis curta</i>	common greenhood	Orchidaceae	1
<i>Pterostylis nutans</i>	nodding greenhood	Orchidaceae	0/1
<i>Ranunculus lappaceus</i>		Ranunculaceae	1
<i>Rumex brownii</i>	native dock	Polygonaceae	1
<i>Senecio tenuiflorus</i>		Asteraceae	1
<i>Solenogyne dominii</i>		Asteraceae	1
* <i>Sonchus oleraceus</i>	sow thistle	Asteraceae	1
* <i>Stellaria media</i>	common chickweed	Caryophyllaceae	1/3
* <i>Taraxacum officinale</i>	dandelion	Asteraceae	1
* <i>Trifolium</i> sp.	clover	Fabaceae	1
<i>Veronica plebeia</i>	common speedwell	Scrophulariaceae	2
<i>Viola betonicifolia</i>	narrow-leaved violet	Violaceae	0/2
<i>Wahlenbergia stricta</i>	tall bluebell	Campanulaceae	2
<i>Wurmbea dioica</i>	early nancy	Colchicaceae	1
<i>Wurmbea latifolia</i>	early nancy	Colchicaceae	1
GRASSES			
<i>Aristida ramosa</i> var. <i>ramosa</i>		Poaceae	1/2
<i>Austrodanthonia</i> spp.	wallaby grass	Poaceae	2/4
<i>Bothriochloa macra</i>	red-stem grass	Poaceae	1
* <i>Briza maxima</i>	quaking grass	Poaceae	1/3
* <i>Cynosurus echinatus</i>	dog's tail grass	Poaceae	1/2
<i>Echinopogon ovatus</i>	forest hedgehog grass	Poaceae	1
<i>Elymus scaber</i>	common wheat grass	Poaceae	2/3
<i>Microlaena stipoides</i>	weeping grass	Poaceae	1/3

SCIENTIFIC NAME	COMMON NAME	FAMILY	ABUNDANCE
<i>Panicum effusum</i>	hairy panic	Poaceae	1
? <i>Poa sieberiana</i> var. <i>sieberiana</i>		Poaceae	1
GRAMINOIDS			
<i>Lomandra filiformis</i> ssp <i>coriacea</i>		Lomandraceae	1/2
<i>Lomandra filiformis</i> ssp <i>filiformis</i>		Lomandraceae	1
<i>Luzula</i> sp.		Juncaceae	1/2

Woodland on flat and mid-slopes (off-site, possible offset area, provided for comparison with more degraded ridge top sites) (two random meanders)

Location: AGD 645482 6150020 to 644246 6151295, elevation 570-500m, slope 0-10°. From 300m east of saddle at centre of site 10 down slope through large woodland remnant to gate at its western end.

Lightly grazed by sheep; trees mostly regrowth to 50cm DBH with occasional large trees to 1m DBH, occasional small hollows. Rock 0-5% cover.

Very little shrub layer (though more than anywhere else in the vicinity). Groundcover is in quite good condition and includes Yass Daisy and several geophytes. This area would definitely come under the EPBC Act definition of Box-Gum Woodland.

Scientific name	Common name	Family	Abundance
TREES			
<i>Acacia implexa</i>	lightwood or hickory	Fabaceae	1
<i>Eucalyptus albens</i>	white box	Myrtaceae	0-3
<i>Eucalyptus blakelyi</i>	Blakely's red gum	Myrtaceae	1-3
<i>Eucalyptus bridgesiana</i>	apple box	Myrtaceae	1
<i>Eucalyptus goniocalyx</i>	bundy, long-leaved box	Myrtaceae	1
<i>Eucalyptus macrorhyncha</i>	red stringybark	Myrtaceae	1
<i>Eucalyptus melliodora</i>	yellow box	Myrtaceae	0-3
<i>Eucalyptus polyanthemos</i> ssp <i>polyanthemos</i>	red box	Myrtaceae	0-3
SHRUBS, SUB-SHRUBS			
<i>Acacia decora</i>		Fabaceae	1
<i>Amyema pendulum</i>	a mistletoe	Loranthaceae	1
<i>Dillwynia sericea</i>		Fabaceae	1
<i>Hibbertia obtusifolia</i>	guineaflower	Dilleniaceae	1
<i>Melichrus urceolatus</i>		Epacridaceae	0-2
<i>Pultenaea foliolosa</i>		Fabaceae	1
FERNS			
<i>Cheilanthes austrotenuifolia</i>		Sinopteridaceae	1

Scientific name	Common name	Family	Abundance
<i>Cheilanthes sieberi</i> ssp <i>sieberi</i>	rock or mulga fern	Sinopteridaceae	2
VINES AND TWINERS			
<i>Glycine clandestina</i>	twining glycine	Fabaceae	1
FORBS			
<i>Acaena echinata</i>		Rosaceae	1-2
* <i>Acetosella vulgaris</i>	sheep sorrel	Polygonaceae	1
<i>Ammobium craspedioides</i>	Yass daisy	Asteraceae	0-3
* <i>Cirsium vulgare</i>	black or spear thistle	Asteraceae	1
<i>Cotula australis</i>	carrot weed	Apiaceae	1
<i>Crassula sieberiana</i>	Australian stonecrop	Crassulaceae	0-2
<i>Cymbonotus</i> sp.	bear's ear	Asteraceae	1
<i>Daucus glochidiatus</i>		Apiaceae	1
<i>Dianella longifolia</i>	blue flax lily	Phormiaceae	1
<i>Dichondra repens</i>	kidney weed	Convolvulaceae	1
<i>Diuris chryseopsis</i>	early snake orchid	Orchidaceae	0-2
<i>Drosera peltata</i> ssp <i>peltata</i>	sundew	Droseraceae	0-2
* <i>Echium plantagineum</i>	Paterson's curse	Boraginaceae	1
* <i>Erodium brachycarpum</i>	heronsbill	Geraniaceae	1
<i>Eryngium rostratum</i>	blue devil	Apiaceae	1
<i>Geranium solanderi</i> var. <i>solanderi</i>		Geraniaceae	0-2
<i>Glossodia major</i>		Orchidaceae	1
<i>Gonocarpus tetragynus</i>	raspwort	Haloragaceae	1
<i>Haloragis heterophylla</i>		Haloragaceae	1
<i>Hydrocotyle laxiflora</i>	stinking pennywort	Apiaceae	2
<i>Hypericum gramineum</i>	native St Johns wort	Clusiaceae	1
* <i>Hypochaeris glabra</i>		Asteraceae	2
* <i>Hypochaeris radicata</i>	cat's ear, flatweed	Asteraceae	2
<i>Hypoxis vaginata</i>	yellow star	Hypoxidaceae	2
* <i>Lactuca serriola</i>	prickly lettuce	Asteraceae	1
<i>Microseris lanceolata</i>	murnong, yam daisy	Asteraceae	1
<i>Oxalis ?perennans</i>	oxalis	Oxalidaceae	2
<i>Ranunculus lappaceus</i>	common buttercup	Ranunculaceae	1
<i>Rumex brownii</i>	native dock	Polygonaceae	1
<i>Senecio tenuiflorus</i>		Asteraceae	1
<i>Solenogyne dominii</i>		Asteraceae	1
<i>Thysanotus patersonii</i>	twining fringe-lily	Anthericaceae	1
? <i>Thysanotus</i> sp./ <i>Arthropodium</i> sp.		Anthericaceae	0-2

Scientific name	Common name	Family	Abundance
<i>*Trifolium arvense</i>	hare's foot clover	Fabaceae	1
<i>Veronica plebeia</i>	common speedwell	Scrophulariaceae	1
<i>Viola betonicifolia</i>	narrow-leaved violet	Violaceae	1
<i>Wahlenbergia ?communis</i>	tufted bluebell	Campanulaceae	1
<i>Wurmbea dioica</i>	early nancy	Colchicaceae	1
<i>Wurmbea latifolia</i>	early nancy	Colchicaceae	1
GRASSES			
<i>Aristida ramosa</i> var. <i>ramosa</i>		Poaceae	2-3
<i>Austrodanthonia</i> spp.	wallaby grass	Poaceae	2
<i>Austrostipa scabra</i> ssp <i>falcata</i>	corkscrew grass	Poaceae	2
<i>Bothriochloa macra</i>	red-stem grass	Poaceae	1-3
<i>*Briza maxima</i>	quaking grass	Poaceae	1-4
<i>*Briza minor</i>	shivery grass	Poaceae	1
<i>Cymbopogon refractus</i>	barbed wire grass	Poaceae	1
<i>*Cynosurus echinatus</i>	dog's tail grass	Poaceae	2
<i>Elymus scaber</i>	common wheat grass	Poaceae	2
<i>Microlaena stipoides</i>	weeping grass	Poaceae	1-4
<i>Panicum effusum</i>	hairy panic	Poaceae	1
<i>Poa ?labillardierei</i>	river tussock	Poaceae	1
<i>Poa ?sieberiana</i> var. <i>sieberiana</i>		Poaceae	2
<i>Themeda australis</i>	kangaroo grass	Poaceae	0-2
GRAMINOIDS			
<i>Carex appressa</i>	tall sedge	Cyperaceae	0-2
<i>Juncus</i> sp.		Juncaceae	1
<i>Lomandra filiformis</i> ssp <i>coriacea</i>		Lomandraceae	1-3
<i>Lomandra longifolia</i>	spiny matrush	Lomandraceae	0-2

A.6 YASS DAISY (*Ammobium craspedioides*) RECORDS

Site	Easting	Northing
6-7a saddle (transmission route)	641914	6155146
6-7a saddle (transmission route)	641932	6155173
6-7a saddle (transmission route)	641735	6154976
6-7a saddle (transmission route)	641785	6154984
7a lower slope (off site)	642279	6154581
7a lower slope (off site)	642395	6154327
Potential offset area N of 10 (off site)	645190	6150964
Potential offset area N of 10 (off site)	644226	6151037

Appendix B FAUNA SURVEY RESULTS

B.1 FAUNA SURVEY EFFORT

E: Elaanor Stlenberg

A: Amy Currey

X_PROJ	Y_PROJ	Survey_type	EFFORT	Surveyor
BIRDS				
643496.83	6149694.96	bird	40	E & A
644702.47	6150193.62	bird	25	E & A
645431.29	6150333.65	bird	120	E & A
643420.71	6151550.32	bird	40	E & A
638435.55	6151724.88	bird	40	E & A
636724.83	6151937.90	bird	40	E & A
639866.93	6152336.33	bird	10	E & A
640923.25	6152385.03	bird	20	E & A
638009.41	6152671.00	bird	40	E & A
639544.80	6152733.39	bird	10	E & A
644336.09	6153384.12	bird	60	E & A
634086.48	6153498.27	bird	20	E & A
644363.14	6153503.90	bird	40	E & A
642076.39	6153734.53	bird	45	E & A
642152.72	6154201.12	bird	20	E & A
642016.76	6155200.35	bird	40	E & A
642144.00	6155353.71	bird	40	E & A
640864.87	6155376.29	bird	60	E & A
641588.42	6155458.39	bird	40	E & A
638755.40	6155535.00	bird	40	E & A
641945.73	6155689.96	bird	25	E & A
640109.76	6156023.14	bird	40	E & A
638316.24	6156135.98	bird	20	E & A
638355.37	6156211.59	bird	90	E & A
639389.26	6159730.09	bird	90	E & A
TRAPPING				
645431.29	6150333.65	ground elliot transect 1	10	E & A
645431.29	6150333.65	ground elliot transect 2	10	E & A
645431.29	6150333.65	Cage trap transect 1	5	E & A
641807.00	6155028.00	tree elliot	1	E & A
641773.00	6155084.00	tree elliot	1	E & A
641957.00	6155384.00	tree elliot	1	E & A
641983.00	6155286.00	tree elliot	1	E & A

641976.00	6155148.00	tree elliot	1	E & A
642016.76	6155200.35	ground elliot transect 3	10	E & A
642016.76	6155200.35	ground elliot transect 4	15	E & A
642016.00	6155200.00	Cage trap transect 2	5	E & A
640864.87	6155376.29	ground elliot transect 5	5	E & A
REPTILES				
634002.67	6153748.42	reptile search	20	E & A
637747.44	6153088.31	reptile search	10	E & A
638010.41	6152672.00	reptile search	20	E & A
638009.41	6152671.00	reptile search	40	E & A
638059.36	6157210.09	reptile search	20	E & A
638355.37	6156211.59	reptile search	20	E & A
638356.37	6156212.59	reptile search	15	E & A
638564.23	6156233.84	reptile search	20	E & A
639589.75	6152628.50	reptile search	40	E & A
639836.97	6152396.26	reptile search	30	E & A
640335.47	6157574.00	reptile search	20	E & A
640336.47	6157574.00	reptile search	20	E & A
640788.27	6155469.04	reptile search	40	E & A
640864.90	6152266.74	reptile search	60	E & A
641588.42	6155458.39	reptile search	40	E & A
642076.39	6153734.53	reptile search	45	E & A
642144.00	6155353.71	reptile search	40	E & A
642146.00	6155353.71	reptile search	20	E & A
642771.12	6153549.12	reptile search	20	E & A
643420.71	6151550.32	reptile search	30	E & A
643493.72	6149621.95	reptile search	10	E & A
644336.09	6153384.12	reptile search	40	E & A
644893.46	6150060.68	reptile search	20	E & A
645598.74	6150346.73	reptile search	10	E & A
HABITAT ASSESSMENT				
639389.26	6159730.09	aquatic	90	E & A
636724.83	6151937.90	aquatic	30	E & A
638435.55	6151724.88	aquatic	30	E & A
643496.83	6149694.96	aquatic	30	E & A
643039.49	6149533.90	aquatic	30	E & A
642153.32	6154141.28	aquatic	90	E & A
640748.58	6152403.88	aquatic	60	E & A
633949	6153507	habitat	point	E & A

636666	6154931	habitat	point	E & A
639655	6152653	habitat	point	E & A
639908	6159188	habitat	point	E & A
640565	6155697	habitat	point	E & A
640869	6155385	habitat	point	E & A
641662	6154167	habitat	point	E & A
641727	6155989	habitat	point	E & A
641748	6155016	habitat	point	E & A
641876	6155165	habitat	point	E & A
642070	6155437	habitat	point	E & A
642222	6155043	habitat	point	E & A
642274	6154629	habitat	point	E & A
642275	6153643	habitat	point	E & A
642295	6154551	habitat	point	E & A
642296	6154425	habitat	point	E & A
642318	6153999	habitat	point	E & A
642881	6152935	habitat	point	E & A
643297	6152328	habitat	point	E & A
644098	6153460	habitat	point	E & A
644168	6150706	habitat	point	E & A
644206	6153963	habitat	point	E & A
644455	6150544	habitat	point	E & A
644591	6151032	habitat	point	E & A
645700	6153122	habitat	point	E & A
642070	6155434	habitat	point	E & A
642020	6154106	habitat	point	BH
647375	6152137	habitat	point	BH
646878	6152150	habitat	point	BH
646740	6152161	habitat	point	BH
646015	6152118	habitat	point	BH
648561	6152298	habitat	point	BH
OPPORTUNISTIC				
643906	6151967	Incidental	point	J. Miles
643100	6149500	Incidental	point	J. Miles
644146	6150715	Incidental	point	J. Miles
645330	6149940	Incidental	point	J. Miles
642508	6154483	Incidental	point	J. Miles
644591	6151032	Incidental	point	J. Wellington

643336	6152317	Incidental	point	J. Miles
645305	6150200	Incidental	point	J. Miles
639650	6152669	Incidental	point	J. Miles
634200	6151750	Incidental	point	J. Miles
635720	6148900	Incidental	point	J. Miles
641531	6153932	Incidental	point	P. McPherson
641400	6153800	Incidental	point	P. McPherson
640168	6156570	Incidental	point	J. Miles
640534	6155672	Incidental	point	J. Miles
642070	6155434	Incidental	point	J. Miles
644096	6154073	Incidental	point	J. Miles
643400	6149600	Incidental	point	J. Miles
639200	6159800	Incidental	point	J. Miles
642227	6155038	Incidental	point	P. McPherson
NOCTURNAL SURVEY				
643910.90529919	6148343.32502358	nocturnal	point	E & A
643301.62453757	6149334.78038422	nocturnal	point	E & A
639389.26242906	6159730.09252078	nocturnal	point	E & A
642153.32096534	6154141.27591236	nocturnal	point	E & A

B.2 FAUNA SPECIES LIST

SCIENTIFIC NAME	SPECIES	NUMBER	OBS. TYPE
BIRDS			
<i>Falco longipennis</i>	Australian Hobby		o
<i>Alisterus scapularis</i>	Australian King Parrot		O
<i>Gymnorhina tibicen</i>	Australian Magpie	multiple	h
<i>Corvus coronoides</i>	Australian Raven		o
<i>Chenonetta jubata</i>	Australian Wood Duck		o
<i>Tyto alba</i>	Barn Owl (probable)	1	o
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		h
<i>Falco berigora</i>	Brown Falcon		o
<i>Acanthiza pusilla</i>	Brown Thornbill		o
<i>Acanthiza reguloides</i>	Buff-rumped Thornbill		o
<i>Acrocephalus stentoreus</i>	Clamorous Reed Warbler	1	o
<i>Accipter cirrhocephalus</i>	Collared Sparrow-hawk		o
<i>Turdus merula</i>	Common Blackbird		o
<i>Sturnus vulgaris</i>	Common Starling	multiple	o
<i>Ocyphaps lophotes</i>	Crested Pigeon	2	o
<i>Platycercus elegans</i>	Crimson Rosella		h
<i>Stagonopleura guttata</i>	Diamond Firetail	6	o
<i>Tauniopygia guttata</i>	Double-barred Finch	2	o
<i>Artamus cyanopterus</i>	Dusky Woodswallow		o
<i>Platycercus eximius</i>	Eastern Rosella		o
<i>Fulica atra</i>	Eurasian Coot		o
<i>Cacomantis castaneiventris</i>	Fantail Cuckoo	multiple	h
<i>Petroica rodinogaster</i>	Flame Robin		h
<i>Cacatua rosicapilla</i>	Galah		o
<i>Rhipidura fuliginosa</i>	Grey Fantail		o
<i>Anas platyrhynchos</i>	Grey Teal		o
<i>Aythya australis</i>	Hardhead		o
<i>Poliiocephalus poliocephalis</i>	Hoary-headed Grebe		o
<i>Passer montanus</i>	House Sparrow		
<i>Microeca fascinans</i>	Jacky Winter		o
<i>Dacelo novaeguineae</i>	Laughing Kookaburra		h
<i>Myiagra rubecula</i>	Leaden Flycatcher		o
<i>Cacatua sanguinea</i>	Little Corella		o
<i>Philemon citreogularis</i>	Little Friarbird		h
<i>Vanellus miles</i>	Masked Laping		o
<i>Falco cenchroides</i>	Nankeen Kestrel	1	o
<i>Philemon corniculatus</i>	Noisy Friarbird		o
<i>Cuculus pallidus</i>	Pallid Cuckoo		o
<i>Anas superciliosa</i>	Pacific Black Duck		
<i>Geopelia placida</i>	Peaceful Dove	1	h
<i>Cracticus nigrogularis</i>	Pied Butcherbird		

SCIENTIFIC NAME	SPECIES	NUMBER	OBS. TYPE
<i>Strepera graculina</i>	Pied Currawong		O
<i>Merops ornatus</i>	Rainbow Bee-eater		o
<i>Anthochaera carunculata</i>	Red Wattlebird		h
<i>Neochmia temporalis</i>	Red-browed Finch	10	o
<i>Petroica goodenovii</i>	Red-capped Robin		h
<i>Psephotus haematonotus</i>	Red-rumped Parrot		o
<i>Anthus novaeseelandiae</i>	Richard's Pipit		o
<i>Pachycephala rufiventris</i>	Rufous Whistler		h
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		
<i>Myzomela sanguinolenta</i>	Scarlet Honeyeater		h
<i>Zosterops lateralis</i>	Silveryeye	multiple	o
<i>Ninox novaeseelandiae</i>	Southern Boobook		
<i>Pardalotus punctatus</i>	Spotted Pardalote		h
<i>Pardalotus striatus</i>	Striated Pardalote		h
<i>Acanthiza lineata</i>	Striated Thornbill		h
<i>Coturnix pectoralis</i>	Stubble Quail		
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	1	o
<i>Polytelis swainsonii</i>	Superb Parrot	10	o
<i>Malurus cyaneus</i>	Superb-blue Fairy Wren	multiple	o
<i>Podargus strigoides</i>	Tawny Frogmouth		o
<i>Hirundo nigricans</i>	Tree Martin		o
<i>Daphoenositta chrysoptera</i>	Varied Sitella		o
<i>Malurus lamberti</i>	Variegated Fairywren		
<i>Aquila audax</i>	Wedge-tailed eagle	1	o
<i>Smicrornis brevirostris</i>	Weebill		o
<i>Hirundo neoxena</i>	Welcome Swallow		o
<i>Epthianura albifrons</i>	White-fronted Chat		
<i>Sericornis frontalis</i>	White-browed Scrubwren		o
<i>Ardea novaehollandiae</i>	White-faced Heron		
<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater	multiple	o
<i>Gerygone olivacea</i>	White-throated Gerygone		h
<i>Cormobates leucophaeus</i>	White-throated Treecreeper		o
<i>Corcorax melanorhamphos</i>	White-winged Cough		o
<i>Rhipidura leucophrys</i>	Willie Wagtail		o
<i>Acanthiza nana</i>	Yellow Thornbill		h
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill		h
AMPHIBIANS			
Plains Froglet	<i>Crinia parinsignifera</i>	multiple	h
Brown Froglet	<i>Crinia signifera</i>	multiple	h
Banjo Frog	<i>Limnodynastes dumerilii</i>	multiple	h
Spotted Marsh Frog	<i>Limnodynastes tasmaniensis</i>	multiple	h
MAMMALS			
<i>Bos taurus</i>	Cow*		o
<i>Trichosurus vulpecula</i>	Common Brushtail Possum	6	o
<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum		o

SCIENTIFIC NAME	SPECIES	NUMBER	OBS. TYPE
<i>Vombatus ursinus</i>	Common Wombat		sc
<i>Macropus giganteus</i>	Eastern Grey Kangaroo	mob	o
<i>Macropus robustus</i>	Euro	mob with Eastern Greys	o
<i>Oryctolagus cuniculus</i>	European Rabbit		o
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat		a
<i>Mormopterus sp. 4</i>	Freetail Bat spp.		a
<i>Nyctophilus spp</i>	<i>Nyctophilus spp</i>		a
<i>Lepus europeaus</i>	European Hare *		o
<i>Vulpes vulpes</i>	Red Fox*	1	h
<i>Macropus rufogriseus</i>	Red-necked Wallaby	2	o
<i>Ovis aries</i>	Sheep*		o
<i>Wallabia bicolor</i>	Swamp Wallaby		o
<i>Scotorepens balstoni</i>	Western Broad-nosed Bat		a
<i>Tadarida australis</i>	White-striped Freetail bat		
REPTILES			
<i>Pogona barbata</i>	Common Bearded Dragon		o
<i>Ctenotus taeniolatus</i>	Coppertail Skink		o
<i>Egernia cunninghami</i>	Cunningham's Skink	2	o
<i>Pseudonaja textilis</i>	Eastern Brown Snake		o
<i>Delma inornata</i>	Legless Lizard		o
<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake		O
<i>Chelodina longicollis</i>	Snake-necked Turtle		o
<i>Tiliqua rugosa</i>	Shingleback lizard		o

Appendix C EPBC ACT ERT REPORT

Appendix D THREATENED AND MIGRATORY SPECIES EVALUATION

D.1 THREATENED FLORA HABITAT EVALUATIONS

D.2 THREATENED FAUNA HABITAT EVALUATIONS

An evaluation of threatened species known from the area from both the Environmental Reporting Tool (EPBC Act) and DECC Wildlife Atlas database (TSC Act) determined that several species have potential to occur at the subject site based on the ecology of the species such as habitat requirements and their recorded distribution. The following definitions are used in this evaluation.

Assessment methodology

Presence of Habitat:	
Present:	Potential or known foraging, roosting, nesting, refuge, movement corridor (including movement of genetic material) or other habitat is present within the study area
Absent:	No potential foraging, roosting, nesting or other habitat is present within the study area
Likelihood of Occurrence	
None:	Species has a very low, or no, probability of occurrence
Vagrant:	Species could occur on occasion as a vagrant or passing over/across the study area (usually applies to more mobile species)
Possible:	Species could occur and utilise resources in the study area
Present:	Species was recorded during the field investigations
Possible Impact	
No:	The proposal would not impact this species or its habitats. No Seven-Part Test is necessary for this species.
Yes:	The proposal could impact this species or its habitats. A Seven-Part Test for NSW threatened species or an EPBC Assessment of Significance for Commonwealth Migratory of Threatened Species has been applied to these entities.

D.1 THREATENED FLORA HABITAT EVALUATIONS

An evaluation of the presence of habitat, nearest records, likelihood of occurrence and potential impact to threatened species recorded within and predicted to occur from the Murrumbateman, Upper Slopes and Bondo CMA subregions (from the Murrumbidgee region) on the NSW DECC threatened species website, and from the Commonwealth DEWHA Environmental Reporting Tool for within a 50km radius of the study area (centre point 34° 44' 42.51" S, 148° 33' 36.16" E, 24/09/2008). Marine and littoral species have been excluded from this analysis due to the absence of suitable habitat.

SPECIES	ECOLOGY	PRESENCE OF HABITAT	NEAREST RECORDS	LIKELIHOOD OF OCCURRENCE	POSSIBLE IMPACT?
FERNS					
Austral Pillwort <i>Pilularia novae-hollandiae</i> E TSC	In NSW, this species has been recorded from suburban Sydney, Khancoban and the Riverina between Albury and Urana in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous. Most of the records in the Albury-Urana area were from table drains on the sides of roads. An ACT record is from a subalpine grassy plain.	Absent	Predicted Upper Slopes sub-catchment. Not recorded from the locality	None, no wetlands on the site	No
FORBS					
Yass Daisy <i>Ammobium craspedioides</i> V TSC V EPBC	This species is found on the Southern Tablelands and South West Slopes near Wagga Wagga and Yass, most often in dry sclerophyll forest, Box-Gum Woodland and grasslands derived from clearing of these communities (DECC 2008b).	Present	Recorded approximately 10km east of the site.	Recorded in two locations close to the site (on adjacent lower slopes below site 7a and saddle between sites 6 and 7a) and off-site north of site 10.	Yes. 7 part test completed.
Woolly Ragwort <i>Senecio garlandii</i> V TSC V EPBC	This species is found mostly on the south-west slopes, with the largest populations at The Rock and Mt Tabletop near Wagga Wagga. It occurs on sheltered slopes of rocky outcrops (DECC 2008b).	Present	This species has been recorded in the region, near Lake Burrinjuck.	Very low due to heavy grazing pressure on rocky areas. Could occur on some very steep and rocky sideslopes (for example, site 3), which were not searched and would be outside the impact zones.	No

<p>Austral Toadflax <i>Thesium australe</i> V TSC V EPBC</p>	<p>This species is found in small populations across eastern NSW, along the coast and from the Northern to Southern Tablelands. It occurs in grassland or grassy woodland (DECC 2008b), often in damp sites, and is closely associated with Kangaroo Grass (<i>Themeda australis</i>), on which it is a partial root-parasite.</p>	<p>Absent</p>	<p>No records from the region (all south from the ACT)</p>	<p>None, almost no kangaroo grass on the site, heavy grazing pressure in most areas.</p>	<p>No</p>
<p>Silky Swainson-pea <i>Swainsona sericea</i> V TSC</p>	<p>This species has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains, but its stronghold is on the Monaro. It is found in Natural Temperate Grassland and Snow Gum (<i>Eucalyptus pauciflora</i>) Woodland on the Monaro and in Box-Gum Woodland in the Southern Tablelands and South West Slopes.</p>	<p>Marginal within site</p>	<p>No records for the region. Closest from Tumut and Queanbeyan</p>	<p>Very low due to heavy grazing pressure over most of the site.</p>	<p>No</p>
<p>Small Scurf-pea <i>Cullen parvum</i> E-TSC E-EPBC</p>	<p>A perennial forb to 30cm high, recorded mainly from grassland or forest on the plains of the Murrumbidgee and Murray Rivers (Harden, 2002). This species was recently located in remnant box-gum woodland at Galong (FOG, 2006). In Victoria, where it is more common, it grows in grassland, woodland and grazing country in the 450-700mm rainfall belt (DECC, 2008b). Plants may die back in summer and resprout after rain. There had been good rainfall at the time of the survey.</p>	<p>Marginal within site</p>	<p>Not predicted, but possible, as nearest record is only c. 25km N of the site</p>	<p>Very low due to heavy grazing pressure over most of the site. Almost no native peas were recorded anywhere on the site</p>	<p>No</p>
<p>Hoary Sunray <i>Leucochrysum albicans</i> ssp <i>albicans</i> <i>var. tricolor</i> E EPBC</p>	<p>This species may be locally common on the Southern Tablelands, and is therefore not listed as threatened in NSW. It grows in natural and secondary grasslands and grassy woodlands, often colonising disturbed sites such as road verges. It does not appear to persist well in heavily grazed situations (J. Miles, pers. obs.) although bare ground is clearly important for recruitment (Gilfedder and Kirkpatrick, 1994).</p>	<p>Present</p>	<p>Road verges west of Goulburn (J. Miles, pers. obs.)</p>	<p>Very low due to heavy grazing pressure over most of the site.</p>	<p>No</p>

ORCHIDS					
<p>Pine Donkey Orchid <i>Diuris tricolor</i> (Syn. <i>D. sheaffiana</i>) V TSC V EPBC</p>	<p>Sporadically distributed from Narrandera across the western slopes to northern NSW, usually in grassy <i>Callitris</i> woodland on sandy soils in flat country or on top of small hills. There is a 1906 record from the Goulburn area. Flowering period is Sept-Nov (Bishop 1996).</p>	<p>Marginal within site</p>	<p>Not recorded in the Yass area, but there are records from further west in the Upper Slopes sub-catchment.</p>	<p>Very low due to heavy grazing pressure and lack of Cypress Pine communities and sandy soils. Soils at the site are clay-loam and the usual range of this species is well to the west. The survey was within the flowering period.</p>	<p>No</p>
<p>Tarengo Leek Orchid <i>Prasophyllum petilum</i> E TSC E EPBC</p>	<p>Known from three sites on the Southern Tablelands, at Boorowa and Captain's Flat in NSW and Hall in the ACT, growing in Natural Temperate Grassland, Box-Gum Woodland or moist grassy flats, with kangaroo grass or wallaby grasses (<i>Austrodanthonia</i> spp). The Captains Flat population occurs in an area with a high watertable. Flowering period is Oct-Nov(Bishop 1996)., with 22 October recorded as a time when this species was flowering profusely at Booroowa (FOG, 2006).</p>	<p>Marginal</p>	<p>Recorded in the region, at Boorowa.</p>	<p>This species is known only from ungrazed or lightly grazed remnants of high native species diversity, a habitat not occurring within the turbine clusters. The survey timing was too early to detect this species.</p>	<p>No</p>
<p>Burrinjuck Spider Orchid <i>Caladenia</i> aff. <i>concolor</i> (Burrinjuck) Not currently listed but would satisfy criteria for listing as Endangered.</p>	<p>The Crimson Spider Orchid, <i>Caladenia concolor</i> is confined to granite ridge country in the Nail Can Hill Crown Reserve near Albury, and two localities in Victoria (DECC 2008b). It is listed as Endangered under TSC and EPBC Acts. There is a similar undescribed species from near Cootamundra (<i>Caladenia</i> sp. Bethungra) and another undescribed species (Burrinjuck Spider Orchid) occurs in Burrinjuck Nature Reserve and Burrinjuck Waters State Park, and possibly in other locations on private property nearby. It grows in dry open forest or tall open forest dominated by <i>E. goniocalyx</i>, <i>E. dives</i>, <i>E. mannifera</i>, <i>E. macrorhyncha</i> or <i>E. rossii</i> (NSW NPWS 2002). Neither of the undescribed species are currently listed as threatened, but they appear to be similarly restricted in distribution to <i>C. concolor</i>, and may face some similar threats (e.g. collection by orchid enthusiasts). Flowering period is late August to October.</p>	<p>Marginal</p>	<p>Burrinjuck Dam area</p>	<p>Low due to heavy grazing pressure over most of the sites. Survey was conducted during the flowering period and the Burrinjuck Spider Orchid was not detected, though it is unlikely to flower reliably every year, or could flower later than the survey period (16-21 Sept).</p>	<p>Yes, if present. 7 part test completed.</p>

SHRUBS					
Cotoneaster Pomaderris <i>Pomaderris cotoneaster</i> E TSC	This shrub grows in riparian and rocky areas, the latter often close to creeks. It is known from the Tumut area (Goobarragandra River), and Bungonia Gorge (J. Miles, pers. obs.), but not from near Yass.	Absent	Goobaragandra River	None, sites are remote from drainage lines.	No
Wee Jasper Grevillea <i>Grevillea iaspicula</i> E TSC E EPBC	This species is found only in the Wee Jasper area and on the shores of Lake Burrinjuck. It grows only on rocky outcrops, cave entrances and cliff bases in limestone country (DECC 2008b).	Absent	Near Burrinjuck. Lake	None, there is no limestone on the sites	No
Tumut Grevillea <i>Grevillea wilkinsonii</i> E TSC	The Tumut Grevillea is found in two areas: one is a 4.5 km stretch of the Goobarragandra River, approximately 18 km south-east of Tumut; the other at a small site near Gundagai. Habitat is in dense riparian shrubland on steep rocky slopes or on alluvial terraces with sparse tree cover. Typical associated tree species are <i>E. blakelyi</i> , <i>E. macrorhyncha</i> , <i>E. bridgesiana</i> and <i>E. melliodora</i>	Absent	Near Gundagai	None, sites are remote from drainage lines and heavy grazing pressure has removed virtually all shrubs.	No
ECOLOGICAL COMMUNITIES					
Aquatic ecological community in the natural drainage system of the lower Murray River catchment ECTSC	This community refers largely to fauna (fish and invertebrates) rather than flora. The Lower Murray aquatic ecological community includes all native fish and aquatic invertebrates, within all natural creeks, rivers, lagoons, billabongs and lakes of the regulated portions of the Murray, Murrumbidgee and Tumut Rivers, as well as all their tributaries and branches. The portion of the Murrumbidgee River below Burrinjuck Dam is included. The listing of this community as an EEC gives all aquatic fauna within it the status of endangered species (NSW DPI, 2007).	Absent except for one transmission route	Present in the Upper Slopes sub-catchment of Murrumbidgee CMA	The sites are remote from major drainage lines, except for a transmission easement crossing of Jugiong Creek, which drains into the Murrumbidgee River below Burrinjuck Dam.	No

<p>Aquatic ecological community in the natural drainage system of the lowland catchment of the Lachlan River</p> <p>EC TSC</p>	<p>This community refers largely to fauna (fish and invertebrates) rather than flora. The Lowland Catchment of the Lachlan River is part of the Murray-Darling Basin. The area covered includes all natural rivers, creeks, streams and associated lagoons, billabongs, lakes, wetlands, paleochannels, floodrunners, effluent streams (those that flow away from the river) and the floodplains of the Lachlan River within the State of NSW, and including Lake Brewster, Lake Cargelligo and Lake Cowal. Excluded are man-made canals, off-stream reservoirs, water distribution and drainage works, and farm dams. The Coppabella Hills are part of the watershed between the Lachlan and Murrumbidgee catchments, and so are at the extreme upper end of the Lachlan catchment.</p>	Absent	Present in the Upper Slopes sub-catchment of Lachlan CMA	The sites are remote from major drainage lines on this catchment.	No
<p>Inland Grey Box Woodland in the Riverina; NSW South Western Slopes; Cobar Penepplain; Nandewar and Brigalow Belt South Bioregions</p> <p>EC TSC</p>	<p>A grassy woodland dominated by Grey Box (<i>Eucalyptus microcarpa</i>) which may intergrade with White Box-Yellow Box-Blakely's Red Gum Grassy Woodland, generally occurring further west on the NSW western slopes and plains and on alluvial soils and in flatter parts of the landscape.</p>	Absent	Known from Upper Slopes sub-catchment	None. Sites are all on ridge crests, not alluvial flats. The characteristic dominant tree species is not present.	No
<p>Natural Temperate Grassland of the Southern Tablelands of NSW and the ACT</p> <p>EC EPBC</p>	<p>Natural Temperate Grassland is a naturally treeless or sparsely treed community, characterised by the dominance of native grasses including kangaroo grass (<i>Themeda australis</i>), poa tussock (<i>Poa sieberiana</i>), river tussock (<i>P. labillardieri</i>), spear grasses (<i>Austrostipa spp</i>) and wallaby grasses (<i>Austrodanthonia spp</i>). A high diversity of forbs is typical of better quality remnants (DECC 2008b).</p>	Absent	Unknown, but likely to be present in the region	Low. Treeless sites appear to be derived from clearing of woodlands	No
<p>White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland</p> <p>EC TSC CEEC EPBC</p>	<p>This is a grassy woodland community, with White Box (<i>Eucalyptus albens</i>), Yellow Box (<i>E. melliodora</i>), and Blakely's Red Gum (<i>E. blakelyi</i>). Some sites may contain additional tree species, shrubs are generally sparse, and the groundcover contains numerous grasses and forbs. (DECC 2008b).</p>	Present	Remnants common in the Yass area	Present on the site, generally in poor condition within the impact zones, though better quality remnants occur nearby.	Yes, TSC and EPBC tests of significance

D.2 THREATENED FAUNA HABITAT EVALUATIONS

Due to the additional collision and impact risk posed on fauna, a preliminary impact assessment was conducted to help identify those species most at risk from the proposal. Fauna species with a preliminary impact factor (PIF) of more than 4 have been assessed for their potential to be significantly impacted by the proposal and have been assessed for significance of impact. Two additional species (White-bellied Sea-eagle and Little Whip Snake) have been included based on impact types and potential to occur.

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
AMPHIBIANS						
Green and Golden Bell Frog <i>Litoria aurea</i> E TSC V EPBC	Formerly, this species had a wide distribution across most of NSW, although since 1990 recorded populations have become largely restricted to small, coastal or near coastal populations. This species has been recorded in a wide variety of natural and man-made waterbodies such as coastal swamps, marshes, lagoons, permanent farm dams and other excavations capable of capturing water (DEC NSW, 2005c). Habitats are generally permanent, still or slow-flowing, unpolluted waterbodies with a complexity of vegetation structure and abundance of refuge sites, although without heavy shading (DEC NSW 2005)	Marginal. Farm dams are accessible to stock, with little or no aquatic or fringing vegetation, and generally eroded	Has not been recorded within 20km of the site	Unlikely	Yes, farm dams near the turbines would be filled to prevent attracting birds and bats to the site, this would have impacts on amphibian species present on the site	4
Booroolong Frog <i>Litoria booroolongensis</i> E TSC E EPBC (Likely)	This species occurs predominately along the western-flowing streams of Great Dividing Range. It occurs in permanent rocky streams with fringing vegetation cover such as ferns, sedges or grasses (DECC, 2008b). Adults shelter under rocks adjacent to streams and lay their eggs under small in-stream rocks and rocky margins (Regan 2002). The majority of records are from the Tumut area.	Absent	This species has been recorded in the region, near Burrinjuck Dam.	None	No	2
Yellow-spotted Bell Frog <i>Litoria castanea</i> E TSC E EPBC	This species has not been recorded in the wild since the 1970s (DECC, 2008b). It occurs in highland habitats and has only two known populations, in the New England Tableland and on the southern highland ranges from Lake George to Bombala. It occurs between 1000 and 1500 AHD in permanent ponds, wetlands and slowly moving streams with abundant emergent bulrushes and other vegetation (NPWS	Absent	Has not been recorded in the region	No	No	0

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
	2001).					
Southern Bell Frog <i>Litoria raniformis</i> E TSC V EPBC	Formally this species was distributed along the Murray and Murrumbidgee Rivers and their tributaries; however its current distribution is limited to isolated populations in the Coleambally Irrigations area, the Lowbidgee floodplain and around Lake Victoria (DECC 2008b). This species is found in permanent swamps or billabongs along floodplains and river valleys.	Absent	Has not been recorded in the region	None	No	0
AVES						
Speckled Warbler <i>Pyrholaemus saggitatus</i> V TSC	This species occurs in a wide range of eucalypt woodland communities in the hills and tablelands of the Great Dividing range. Habitats typically are structurally diverse with a grassy understorey, a sparse shrub layer and an open canopy (DECC 2008b; Watson <i>et al.</i> 2001). Declines have been linked to habitat fragmentation as the species appears to be locally extinct in districts where no habitat fragments larger than 100ha remain (Watson <i>et al.</i> 2001). Further, larger remnants (about 300ha) may be required for populations to be viable (Gardner 2002a). The species is sedentary and nests and forages on the ground. Nests are built directly on the ground amongst leaf litter and understorey vegetation and are vulnerable to predation by large birds such as Currawongs (Gardner 2002b).	Present, however woodland remnants are fragmented – largest remnant is approximately 150 ha on flat north of the development envelope	Recorded at Marilba Hills This species has been recorded in the region, in the Mardoonen Nature Reserve.	Possible	Yes, grassy woodland habitat is present within the development envelope and has been recorded from the region	6
Square-tailed Kite <i>Lophoictinia isura</i> V TSC	This species has a large and sparsely populated range throughout mainland Australia (Griffioen and Clarke 2002) and is a breeding migrant to the south east from July to December. It occurs primarily in coastal and sub-coastal open forest, woodlands and mallee. It has been recorded inland along timbered watercourses and adjacent areas (NPWS 1999e). The species hunts small passerines, especially honeyeaters in the tree canopy. Resident pairs have large hunting ranges of greater than 100 km ² (DECC 2008b). Nests are a platform of sticks up to 90cm in diameter in a fork of a tall tree in forest or woodland (DEC NSW 2004).	Present	This species has been recorded in the region, in the Mardoonen Nature Reserve.	Possible	Yes, this species may be impacted by removal of woodland habitat and blade-strike	8
Blue Billed Duck	This species is widespread in NSW although is most common	Not present,	This species has	Vagrant	Yes, habitat is not	5

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
<i>Oxyura australis</i> V TSC	in the southern Murray-Darling Basin area. During spring and summer birds travel up to 300km from non-breeding areas on the Murray River system and coastal lakes to breed in deep swamps of inland NSW (NPWS 1999b). They are often seen in coastal areas in summer and during drought (DECC 2008b). Feeding occurs in permanent freshwater wetlands and swamps with deep water and dense aquatic vegetation. Nesting occurs in Cumbungi over deep water or in dense wetland vegetation.	however species may fly between Burrunjuck lake inland to breed	been recorded in the region near the Murrumbidgee River, Bundarbo, approx. 20km south west of the site.		present, however the species has been recorded in the region and may be at risk of blade-strike	
Freckled Duck <i>Stictonetta naevosa</i> V TSC	This species occurs on wetlands of inland NSW. Large temporary swamps created by floods in the Bulloo and Lake Eyre basins and the Murray-Darling system, particularly along the Paroo and Lachlan Rivers, and other rivers within the Riverina are a breeding stronghold (DECC 2008b). The species is partially migratory and may move to coastal habitats during severe inland drought. The species inhabits a variety of plankton-rich wetland types, including swamps, lakes farm dams, sewerage ponds and floodwaters that are heavily vegetated with Cumbungi, Lignum, Canegrass or Tea-tree (DECC 2008b).	Absent, however may move across the site to Burrunjuck during drier periods	Has been recorded from Lake George (approx. 80km east of the site)	Vagrant	No, although there is potential for blade strike, the species has not been recorded in the region and is unlikely to pass over the site.	3
Australasian Bittern <i>Botaurus poiciloptilus</i> V TSC	This species is widespread although uncommon over south-eastern Australia (DECC, 2008). It favours permanent shallow freshwater or brackish wetlands and swamps with dense vegetation including rushes (particularly bulrushes <i>Typha</i> spp.), sedges and reeds (Garnett and Crowley 2000; NPWS 1999a). This species are mainly sedentary although sightings are occasionally irruptive (suddenly occurring in great numbers) after heavy rains.	Absent	Known from Lake George	Unlikely	No, habitat is not present and the species has not been recorded from the locality. Local movements would be more likely restricted to wet habitat corridors and wetlands which occur adjacent to the site.	3
Bush Stone-curlew <i>Burhinus grallarius</i> E TSC	This species has a broad distribution although has suffered severe declines throughout its range, particularly in disturbed and fragmented areas and where foxes are common (DEC NSW 2006a). In NSW, it is not found on the escarpments but on lower elevation grassy woodlands of the coast or west of	Present, however no records from region	Not recorded from the region. Records are from the coast or Wagga Wagga	Unlikely	No, this species is sedentary and has not been recorded from the locality. Therefore it is unlikely to be	4

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
	the divide. The area bounded roughly by Albury, Wagga Wagga, Hay and Wentworth is regarded as the stronghold for the species in NSW (DEC NSW 2006a). This species inhabits open forests and grassy woodlands where it builds nests directly on the ground (DECC 2008b). It requires logs, fallen trees and branches, coarse litter and some shrubs for shelter. Foraging may occur over a wide area within woodlands, paddocks, grasslands, residential gardens and saltmarsh (DEC NSW 2006a). Breeding pairs are generally sedentary within home ranges estimated to be 250-600ha for foraging year round, with a core of 10-25ha during breeding. It is very vulnerable to predation by exotic predators, the clearing of native woodlands, habitat degradation and even trampling by stock.				impacted by the proposal	
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i> V TSC	In NSW, this species is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the ACT. It feeds in pairs or small flocks on seeds of eucalypts and wattles, and occurs primarily in heavily timbered and mature wet forest, but occasionally in towns, farming areas (DECC 2008b). It is often a seasonal altitudinal migrant, moving to lower altitudes and more open forests and woodlands (particularly Box-Ironbark assemblages for winter. This species requires large hollows in which to breed (Gibbons and Lindenmayer 2000)	Present, however habitat is open	This species has been recorded in the region, south of Binalong, approximately 9km east of the site.	Unlikely/vagrant	Yes. Breeding (hollow-bearing trees) and foraging habitat is present within the development envelope (Cluster 10, 7 and 3). Potential for collision with turbine blades also apply.	7
Brown Treecreeper (eastern subspecies) <i>Climacteris picumnus victoriae</i> V TSC	The species occurs in eucalypt woodlands, mallee and drier open forest on inland slopes and plains of the Great Dividing Range (DECC 2008b). Populations have declined over much of their range, particularly in fragments smaller than 300 hectares that have been isolated or fragmented for more than 50 years (Barrett <i>et al.</i> 1994; DECC 2008b). Declines in NSW have been attributed primarily to habitat fragmentation which limits dispersal and recruitment (Cooper and Walters 2002; Walters <i>et al.</i> 1999). The species occurs in eucalypt woodlands dominated by stringybarks or other rough-barked eucalypts with an open canopy and sparse understorey and shrub layer (DECC 2008b). It is sedentary and gregarious and	Present, however woodland habitats on the site are highly fragmented	This species has been recorded in the region near the Murrumbidgee River, Bundarbo; west of the Burrinjuck Dam.	Possible	Yes, Although continuous woodland habitat is not present within the development envelope, some collision impacts may apply	5

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
	<p>nects in tree hollows. It forages for insects on tree trunks and on the ground amongst fallen timber and leaf litter.</p>					
<p>Diamond Firetail <i>Stagonopleura guttata</i> V TSC</p>	<p>This species is widely distributed in NSW, occurring predominantly west of the Great Dividing Range, although populations are known from drier coastal areas near Sydney, the Hunter Valley and the Bega Valley. Habitat is grassy eucalypt woodlands, including Box-Gum and Snow Gum assemblages (DECC 2008b). The species may also occur in open grassy forest, mallee, Natural Temperate Grassland, secondary grassland and lightly wooded farmland.</p> <p>The species is gregarious and primarily sedentary. It forages on the ground for grass seeds and other plant material and nests in shrubby understorey and will nest in mistletoe (Cooney and Watson 2005; DECC 2008b).</p>	Present	<p>This species was observed by ngenvironmental at Marilba Hills, approximately 7km from the site in 2008.</p> <p>This species has been recorded in the region north of Yass.</p>	Present	<p>Yes, grassy woodland habitat is present within the development envelope and has been recorded from the region</p>	7
<p>Brolga <i>Grus rubicunda</i> E TSC</p>	<p>This species was formally found across Australia, except for the south-east corner. It inhabits large open wetlands, grassy plains, coastal mudflats and irrigated croplands. Breeding and foraging habitat includes shallow (< 50 cm) wetlands, mudflats and margins of deeper waterbodies with emergent vegetation (e.g. canegrass, lignum or sedges) (DECC 2008b).</p>	Absent	<p>Has not been recorded from the region, records are clustered inland from Wagga Wagga and Forbes</p>	None	No	3
<p>Painted Honeyeater <i>Grantiella picta</i> V TSC</p>	<p>This species primarily occurs on the inland slopes of the Great Dividing Range, although is nomadic and may occur in low densities in other parts of NSW in suitable habitat. It inhabits dry open forests and woodland including Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark open forests, also paperbark and casuarinas (DECC 2008b; Pizzey <i>et al.</i> 2003). It is a specialist feeder on mistletoe, particularly of genus <i>Amyema</i>, and generally requires 5 or more mistletoes per hectare (DECC 2008b). Seasonal migrant, movements are linked to the fruiting of mistletoe.</p>	Marginal, Mistletoe is present however only in low densities	<p>Closest records are from Cootamundra and north of Young, approximately 50km west of the site.</p>	Vagrant	<p>Yes, mistletoe feed resources are present within the development envelope, however in low densities. Migratory/nomadic. Potential for collision impacts.</p>	5
<p>Black-chinned Honeyeater (Eastern Subspecies) <i>Melithreptus gularis gularis</i></p>	<p>This species is widespread west of the Great Dividing Range, although has declined throughout its range due to removal and fragmentation of habitat. It inhabits the upper levels of drier open forests or woodlands most often dominated by box and ironbark eucalypts, particularly Mugga Ironbark, White Box, Grey Box, Yellow Box and Forest Red Gum (DECC</p>	Present, however marginal as woodland highly fragmented on the site	<p>This species has been recorded in the region near Harden-Murrumburrah approximately</p>	Vagrant	<p>No, although woodland habitat is present, this habitat has been fragmented and disturbed, which reduces the likelihood</p>	4

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
V TSC	2008b). A gregarious species usually seen in pairs and small groups of up to 12 birds and occupies large home ranges of at least 5 hectares. Local populations appear not to persist in remnants less than 200 ha in area (NSW Scientific Committee 2001).		30km west of the site (1992) Frogmore (60km north) and Goulburn.		of this species occurring on the site.	
Regent Honeyeater <i>Xanthomyza phrygia</i> E TSC E EPBC M EPBC	This species was formally widely distributed across NSW, although has since greatly declined in numbers and range extension due to land clearing. There are now only a small number of known breeding sites in NSW, the most important of which are: Warrumbungles NP, Pilliga NR, Barraba district, central coast around Gosford, Hunter Valley, and Capertee Valley (NPWS 1999d). Most records are from box-ironbark eucalypt associations and it appears to prefer wetter fertile sites within these associations (Menkhorst <i>et al.</i> 1999). It is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Yellow Gum, Blakely's Red Gum and White Box (Menkhorst <i>et al.</i> 1999). It also occurs in riparian forests of River She-oak and wet lowland coastal forests dominated by Swamp Mahogany and Spotted Gum and (DECC 2008b; NPWS 1999d). The species can undertake large-scale nomadic movements in the order of hundreds of kilometres.	Foraging (feed trees) habitat present	This species has been recorded in the region, south of Binalong, approximately 9km east of the site.	Possible	Yes, species is nomadic; potential for collision impacts. Feed tree species are present within and adjacent to the site	7
Gilbert's Whistler <i>Pachycephala inornata</i> V TSC	This species is sparsely distributed over much of the arid and semi-arid zone of inland southern Australia, west of the western slopes of NSW (DECC 2008b). There are only three separate populations left in NSW. Most of the eastern population occurs in an area enclosed by a line joining Gilgandra to Cobar, then south to Narrandera, east to Wagga Wagga, north to Wellington and back to Gilgandra. In NSW the species occurs mostly in mallee shrubland in association with Spinifex and low shrubs. It also occurs in box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests. In woodland habitats, the species requires a dense shrubby understorey (DECC 2008b).	Absent	-	None	No	1
Hooded Robin	This species is sparsely distributed throughout much of NSW,	Present	This species has	Possible	Yes, habitat is present	6

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
(South eastern form) <i>Melanodryas cucullata cucullata</i> V TSC	and is rarely found on the coast. It is sedentary and occurs in open eucalypt woodland and scrub, often in or near cleared areas (DECC 2008b). The species generally occurs in woodland remnants with high habitat complexity (Watson <i>et al.</i> 2001) and uses stumps, posts or fallen timber for nesting and locating prey on the ground. Territories range from 10 to 30ha (DECC 2008b).		been recorded in the region, near Blakney Creek.		within the development envelope and has been recorded from the region	
Grey-crowned Babbler (Eastern Subspecies) <i>Pomatostomus temporalis temporalis</i> V TSC	This species. In NSW this species occurs west of the Great Dividing Range and on the coast near the Hunter Valley and several locations on the north coast of NSW. It prefers Box-Gum Woodlands although also inhabits open forests, scrub lands, even farmlands and suburbs (DECC 2008b; Pizzey <i>et al.</i> 2003). The species is gregarious and forage on the ground on invertebrates on tree trunks and branches and by foraging amongst litter and tussocks. Territories of family groups range from one to fifty hectares (DECC 2008b).	Present	This species has been recorded from Boorowa (2000; approx 45km north of the site). Most records are west of the line between Cowra and Albury.	Unlikely, given the lack of records from the region	No, species has not been recorded from the region, no potential for collision	4
Swift Parrot <i>Lathamus discolor</i> E TSC E EPBC (species or habitat may occur) Marine overfly (may)	This species breeds in Tasmania, migrating to south and eastern NSW in autumn/winter where it inhabits eucalypt forests and woodlands, particularly Box-Ironbark Forests of central Victoria and southern NSW (DECC 2008b; Smales 2005). Mostly occurs on the south-west slopes. It feeds on nectar flowers of eucalypts and lerp-insects, also soft fruits and berries sometimes foraging in grass (Pizzey and Knight 2003). Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, and White Box (DECC 2008b).	Present, foraging only	This species has been recorded near McMahons Reef (1997, within 10km of the site)	Possible	Yes, foraging habitat is present within the development envelope, potential collision risks are also present refer to (Smales, 2005)	7
Turquoise Parrot <i>Neophema pulchella</i> V TSC	In NSW, this species is typically recorded west of the escarpment in the tablelands and on the western slopes, extending to the coastal districts through the Hunter Valley (NPWS 1999f). It occurs in grassy woodland and open forest carrying a mixed assemblage of White Box, Yellow Box, Blakely's Red Gum, Red Box and Red Stringybark (NPWS 1999f). The species will also utilise the edges of woodland, timbered ridges and creeks in farmland and nests in tree	Present	Records are west of the line between Cowra and Albury (40km west of the site).	Possible, although records are from west of the dividing range	Yes, although the species has not been recorded locally, woodland habitat is present within the development envelope, collisions risks may also apply	6

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
	hollows, logs or posts (DECC 2008b). The species lives in pairs or small groups and forages on the ground.					
Superb Parrot <i>Polytelis swainsonii</i> V TSC V EPBC (Breeding likely to occur)	This species is found throughout eastern inland NSW. On the South-western slopes the core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west (DECC 2008b). It inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. The species nests in the hollows of large trees (dead or alive) in open Box-Gum Woodland or isolated paddock trees. Species known to be for used for nesting are Blakely's Red Gum, Yellow Box, Apple Box and Red Box (DECC 2008b). It forages on the ground in grassy woodland, also on fruit, seeds and blossoms of acacias, eucalypts and mistletoes (Pizzey and Knight, 2003).	Present	Observed onsite in remnant grassy woodland and road side trees. A flock of 10 Superb Parrots were observed onsite during the surveys.	Present	Yes. The species was recorded on the site within habitat that occurs within the development envelope, collision risks also apply	8
Barking Owl <i>Ninox connivens</i> V TSC	This species is found throughout Australia except for the central arid regions and Tasmania. It has declined across much of its range across NSW and is most frequently recorded on the western slopes and plains (DECC 2008b). It occurs in dry box-dominated forest and woodlands and roosts in dense foliage of <i>Acacia</i> , <i>Casuarina</i> or <i>Eucalyptus</i> species. It nests in large hollows (20-46 cm diameter) of large, old eucalypts including River Red Gum, White Box, Red Box and Blakely's Red Gum (DECC 2008b; NPWS 2003a). Nest and roost sites are usually near watercourses or wetlands (NPWS 2003a). The species have also been recorded in remnants of forest and woodland and in clumps of trees at farms, towns and golf courses (NPWS 2003a). Have large territories of 30 to more than 200 hectares (DECC 2008b; NPWS 2003a).	Present	This species has been recorded in the region near Jugiong Reservoir and the Burrinjuck Nature Reserve.	Possible	Yes, woodland habitat and hollow-bearing trees and present within the development envelope, collision risks may also apply, particularly for nocturnal fliers	7
Powerful Owl <i>Ninox strenua</i> V TSC	This species occurs primarily in tall, moist productive eucalypt forests of the eastern tableland edge and the mosaic of wet and dry sclerophyll forests occurring on undulating, gentle terrain nearer the coast (DEC NSW 2006b). Only scattered, mainly historical records are from the western slopes and plains (DECC 2008b). The species requires old hollow eucalypts in unlogged, unburnt forests for nesting, and roosts in dense mid-canopy trees or tall shrubs (She-oaks, wattles or	Absent	This species has been recorded in the region, near Burrinjuck Dam. And Burrinjuck Nature Reserve.	Unlikely	No	3

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
	rainforest species). Nesting and roosting habitat occurs in sheltered gullies, or within 100m of streams, creekflats or minor drainage lines (DEC NSW 2006b). Hollows greater than 45 cm diameter and greater than 100 cm deep are required. Breeding pairs of this species defend large (300-1500hectare), permanent territories. Optimal habitat includes a tall shrub layer with abundant hollows and supporting high densities of arboreal marsupials (DEC NSW 2006b).					
Painted Snipe or Australian Painted Snipe <i>Rostratula benghalensis</i> E TSC V EPBC M EPBC CAMBA Marine overfly (may)	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. It is most common in the Murray-Darling Basin (DECC 2008b). It inhabits inland and coastal ephemeral and permanent freshwater wetlands, especially where there is a cover of vegetation. It has been recorded on the margins of wetlands, dams and even sewage ponds, also found in wet pastures, marshy areas, irrigation systems, tea tree scrub and adjacent open woodlands (Pizzey and Knight 2003). The species is likely to be nomadic in response to suitable conditions, such as floods (NPWS 1999c).	Absent	This species has not been recorded in the region. Canberra (1964)	Unlikely/vagrant	No, habitat is not present and the species has not been recorded from the locality. Local movements would be more likely restricted to wet habitat corridors and wetlands which occur adjacent to the site.	2
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i> M EPBC CAMBA Listed (likely)	This species is resident from India through southeast Asia to Australia. It occurs around coastal areas, islands and estuaries, but is also found in inland areas where there are from large rivers, wetlands and reservoirs (Pizzey and Knight 2003). This species is known from the area and is thought to use terrestrial as well as riparian corridors to access inland areas (R. Falconer pers. comm. Dec 6 2005).	Absent	This species has been recorded along the Murrumbidgee River system near the site at Burrinjuck Dam and Yass.	Vagrant	Yes, although the risk assessment indicates that the risk to this species is low; it is considered that there is a high collision risk for this highly nomadic species, should it occur on the site	4
Fork-tailed Swift <i>Apus pacificus</i> Marine overfly area M EPBC	This species breeds from central Siberia eastwards through Asia and winters south to Australia. Uncommon in eastern Australia. It spends most of its time in the air feeding on insects, occasionally roosting on cliffs or in large trees (Pizzey et al. 2006). It spends most of its life in the air feeding on insects. It occurs throughout mainland Australia, mostly west	Present, although generally occur west of the divide	This species is uncommon in eastern Australia (Pizzey et al., 2006) Closest record is from Junee (100km	Vagrant	No, the site is outside this species migratory range and therefore it is highly unlikely to occur.	4

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
CAMBA JAMBA ROKAMBA	of the divide.		west of the site, in 1980)			
White-throated Needletail <i>Hirundapus caudacutus</i> M EPBC CAMBA JAMBA Marine overfly (may)	This species is noted as one of the world's fastest birds, this species has been recorded in the airspace above woodlands, forests and farmlands (Pizzey and Knight 2006). It is a regular summer migrant to eastern Australia and returns to the northern hemisphere in mid-April to breed. It is often seen 'patrolling' favoured feeding grounds above ridges and hilltops. It feeds on flying insects and has been recorded flying at c.1000-2000m ASL over the Australian Alps (Pizzey <i>et al.</i> 2006).	Present	This species has been recorded in the region in the Bungongo State Forest (approx. 30km south of the site).	Possible	Yes, the species has been recorded locally and is at risk of collision with turbine blades	6
Rainbow Bee-eater <i>Merops ornatus</i> M EPBC Marine overfly area (may)	This species inhabits open woodlands with sandy, loamy soil (Pizzey and Knight 2006); also occurs in riverbanks, sandspits, road cuttings, beaches and golf courses. It builds a burrow in sandy ground or bank cuttings. The species is a summer breeding migrant (Sept-Apr) to south-eastern Australia, but winters in northern Australia, Solomon Islands, PNG and Indonesia, moving in large flocks.	Present	This species was observed on the site and has been recorded near Jugiong Creek.	Present	Yes, Although habitat would not be impacted, the species is migratory and is therefore at risk of collision	7
Satin Flycatcher <i>Myiagra cyanoleuca</i> M EPBC Marine overfly	This species is normally found in heavily vegetated gullies in tall forests, woodlands wherever a shrub layer is present (Pizzey and Knight 2003). During migration it is often found in coastal forests, woodlands and trees in open country. It breeds mostly in south-east Australia, nesting on a dead branch 5-25m high under live foliage (Pizzey and Knight 2003), regularly returning to the same locality to breed. The species moves northwards in winter to northern Queensland and Papua New Guinea, returning south to breed in spring.	Optimal habitat is not present	This species has been recorded in the region north-east of Yass.	Possible (during migration only)	No. Breeding habitat and optimal habitat (dense gullies) is not present on the site	4
Great Egret <i>Ardea alba</i> V EPBC M EPBC	Great Egrets occur throughout most of the world. They are common throughout Australia, with the exception of the most arid areas. They prefer shallow water in rivers, estuaries, tidal mudflats, freshwater wetlands, sewerage ponds, irrigation areas and larger dams etc (Pizzey <i>et al.</i>	Absent	This species has not been recorded in the region.	Unlikely	No, habitat is not available onsite. Any long-distance movements would follow wetland	3

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
CAMBA, JAMBA Overfly Marine area	2006). They nest in treetop canopy over water in swamp woodland or mangroves (Pizzey <i>et al.</i> 2006).				corridors and thereby avoid the site.	
Cattle Egret <i>Ardea ibis/ Bubulcus ibis</i> M EPBC CAMBA, JAMBA Marine overfly area	The Cattle Egret is found in grasslands, woodlands and wetlands. It also utilises pasture lands, paddocks and croplands where drainage is poor, often in association with cattle and other stock; wetlands, tidal mudflats and drains (Pizzey <i>et al.</i> 2006). Nests in swamp woodlands in groups. Originally found in Africa, Europe and Asia, the Cattle Egret is now found on nearly every continent. Occurs on the north and east coast of Australia. Partially migratory.	Present	This species has been recorded near Murrumbidgee west of the site.	Possible, around the pasture and dams on the flats	Yes, minor impacts would occur on flats, however the removal of dams may impact this species. Collision risks also apply	7
Latham's Snipe <i>Gallinago hardwickii</i> M EPBC JAMBA Marine overfly area	This species breeds in northern Japan and migrate to eastern Australia in during the Australian summer. The species is generally coastal and sub-coastal, although also move inland through Murray-Darling regions (Pizzey <i>et al.</i> 2006). It usually inhabits open, freshwater wetlands with low, dense vegetation for shelter (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies) although can also occur in habitats with saline or brackish water, and in modified or artificial habitats including pasture, ploughed paddocks, irrigation channels and drainage ditches (DEWHA 2008). It requires areas of mud and some form of vegetative cover for feeding (DEWHA 2008).	Absent	This species has not been recorded in the Murrumbidgee CMA catchment.	Vagrant	No, habitat is not available onsite. Any long-distance movements would follow wetland corridors and thereby avoid the site.	3
MARSUPIALS						
Eastern Pygmy-possum <i>Cercartetus nanus</i> V TSC	In NSW this species is found from the coast inland as far as the Pillaga, Dubbo, Parkes and Wagga Wagga on the western slopes. It prefers woodland and heath although has been recorded in a broad range of habitats including rainforest and sclerophyll (including Box-Ironbark) forest (DECC 2008b). This species feeds largely on nectar and pollen from banksias or other proteaceous or myrtaceous shrubs incl. Melaleucas, Tea-trees & Callistomens (DECC 2008b). This species requires hollows, cracks or fissures > 2.0 cm diameter in trees, stumps or logs,	Absent, woodland doesn't have shrubs	Closest record is from Mundoonen Nature Reserve near Gunning (1996).	None	No	2

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
	bark or disused bird's nests for breeding (DECC 2008b).					
Spotted-tailed Quoll <i>Dasyurus maculatus</i> V TSC E EPBC (species of habitat may occur)	This species is found in a variety of forest types such as rainforest, wet and dry sclerophyll forest, woodland, coastal heath and scrub, sometimes Red Gum forest along inland waterways (Menkhorst and Knight 2004). It utilises hollow-bearing trees, fallen logs, rock caves and crevices as denning and breeding sites (DECC 2008b). Mostly nocturnal it hunts mammals, birds and large arthropods. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares; usually traverse their ranges along densely vegetated creeklines.	Absent	This species has been recorded in the region, near Burrinjuck Dam, and Burrinjuck Nature Reserve.	Unlikely, given absence of suitable habitat	No	2
Yellow-bellied Glider <i>Petaurus australis</i> V TSC	This species is found along the eastern coast to the western slopes of the Great Dividing Range (DECC 2008b). It occurs in tall mature wet and damp eucalypt forest with high rainfall and nutrient rich soils and feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein (DECC 2008b; Menkhorst and Knight 2004). A large number of eucalypt species are used as sap trees throughout the range (NPWS 2003c). Have large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources. Trees with hollows >10 cm diameter are required for nesting in eucalypt forests.	Absent	This species has been recorded in the region, near Burrinjuck Dam. Burrinjuck Nature Reserve.	None	No	2
Squirrel Glider <i>Petaurus norfolcensis</i> V TSC	This species inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas (DECC 2008b). It prefers mixed species stands with a shrub or Acacia understorey although will occur in areas where no understorey if there is more than one species of Eucalypt. Feeds on insects, nectar and exudates from leaves and trees (<i>Eucalyptus</i> and <i>Acacia</i>) and requires abundant tree hollows greater than 5cm diameter (DECC 2008b). It can use patches less than 1 ha & isolated trees if within 75 m of other patches (DECC 2008b). Has a mean home range of 1.4–2.8 ha (Quin 1995; Ree and Bennett 2003).	Present	This species has been recorded in the region, near Burrinjuck Dam. and Bungongo State Forest	Possible	Yes, potential woodland habitat is present within the development envelope	6

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
Brush-tailed Phascogale <i>Phascogale tapoatafa</i> V TSC	This species is found in a variety of forest types although prefers dry sclerophyll forest with a sparse groundcover (DECC 2008b). It generally occurs in areas where the annual rainfall exceeds 500mm. Have large overlapping territories between 20 – 100 hectares. It requires tree hollows with openings 25-40mm wide for nesting and utilises multiple trees throughout its lifetime. Prefer large trees and are most abundant where there are more than 2 trees per ha greater than 60cm DBH. It requires remnants greater than 25ha in dry forests and ridges.	Present, although marginal due to fragmentation	No records from the Murrumbidgee CMA	Unlikely	No	4
Koala <i>Phascolarctos cinereus</i> V TSC	This species was historically abundant in the south of NSW, although now occurs in sparse and possibly disjunct populations. It occurs in woodland communities, coastal forests, woodlands of the tablelands and western slopes and the riparian communities of the western plains (NPWS 2003b). May also utilise isolated paddock trees (NPWS 2003b). Primary feed tree species listed for the central and southern tablelands are Ribbon Gum and River Red Gum, secondary species include Candle Bark, Blakely's Red Gum, White Box, Yellow Box and Brittle Gum (DECC 2008a).	Present	This species has been recorded approximately 8km east of the site (2004)	Possible	Yes, feed tree species are located within the development envelope	6
BATS						
Little Pied Bat <i>Chalinolobus picatus</i> V TSC	This species occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress-pine forest, mallee, bimbil box (DECC 2008b). It roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. It often forages along watercourses (Menkhorst and Knight 2004) where it feeds on moths and possibly other flying invertebrates.	Present	This species has been recorded in the region north of Yass.	Possible	Yes, collision and barotrauma risk, Woodland habitat is located within the development envelope.	7
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i> V TSC	This species occurs on the south-east coast and ranges of NSW. It tends to prefer moist forests with tall trees. It roosts in tree hollows, under bark, or in buildings. The species hibernates in winter (DECC, 2008b)	Present	Closest records are from Cuumbeun Nature Reserve, near Queanbeyan (90km south-east)	Unlikely, vagrant	Yes, collision and barotrauma risk.	4
Eastern Bent-wing	This species is a common although a vulnerable species that is likely to be widely distributed throughout the region. It	Foraging habitat is	This species was recorded on the	Possible	Yes, collision and barotrauma risk is	8

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
Bat <i>Miniopterus schreibersii oceanensis</i> V TSC	roosts and raises its young in caves and mine tunnels (Strahan 1995). The species appears to forage above the forest canopy in a diverse range of forest types (Strahan 1995).	present on the site	site. Wee Jasper Caves is a known breeding site for the species, approximately 35km south of the site.		present. Foraging habitat is located within the development envelope	
Greater Long-eared bat (south-eastern form)/ Eastern Long-eared Bat <i>Nyctophilus timoriensis</i> V TSC V EPBC	The distribution of the south eastern form coincides approximately within arid regions in the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species (DECC, 2008b). This species inhabits a variety of vegetation types, including mallee, bullock but more commonly box/ironbark/cypress-pine communities that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland (DECC 2008b). It is a slow flying agile species and forages in the lower parts of the canopy, even amongst the shrub layers and on the ground (Menkhorst and Knight 2004). The species roosts in tree hollows, and under loose bark.	Absent	No records of the species exist for the Murrumbidgee CMA area.	Unlikely	No, It is unlikely that the species occurs in the proposed Coppabella Wind Farm area due to the lack of suitable habitat types.	1
Large-footed Myotis <i>Myotis adversus</i> V TSC	This species is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers (DECC, 2008b). It forages on the surface of water bodies such as rivers, lakes and swamps. It roosts in small groups in caves, mine, tunnels and old buildings (Hall & Richards 1979).	Foraging habitat (dams and Jugiong Creek) is present on the site	Most records of this species are from west of the dividing range although there is a single record from Wee Jasper approximately 35km south of the site.	Vagrant, given that the site is more than 100km from the coast	Yes, potential foraging habitat (dams) would be impacted. Collision and barotrauma risk also exists.	6
Yellow-bellied Sheathtail-bat <i>Saccolaimus flaviventris</i> V TSC	This species is a wide-ranging species across northern and eastern Australia. It roosts alone or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows (DECC 2008b). Seasonal movements are unknown; is thought to be sedentary, however the species may migrate to southern Australia in late summer and autumn (DECC 2008b).	Foraging and breeding habitat is present	No records of the species have been recorded in the Murrumbidgee CMA area.	Vagrant	Yes, potential breeding and foraging habitat is present within the development envelope. Collision and barotrauma risk	5

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
					also exists.	
RODENTIA						
Smoky Mouse <i>Pseudomys fumeus</i> E TSC E EPBC (species or habitat may to occur)	In NSW, there are 3 records from Kosciuszko National Park and 2 records adjacent to the park in Bondo and Ingbyra State Forests; the remainder are centred around Mt Poole, Nullica State Forest and the adjoining S. E. Forests National Park (DECC 2008b). The species has been recorded on heathy ridge tops and slopes within sclerophyll forests, heathland and open forest from the coast to sub-alpine regions (DECC 2008b). It forages on seeds and fruits from leguminous shrubs, some invertebrates and fungi.	Absent	Not recorded in the region	None	No	0
REPTILIA						
Little Whip Snake <i>Suta flagellum</i> V TSC	This species is found within an area bounded by Crookwell in the north, Bombala in the south, Tumbarumba to the west and Braidwood to the east (DECC 2008b). It occurs in Natural Temperate Grasslands and grassy woodlands, including those dominated by Snow Gum or Yellow Box as well as secondary grasslands derived from clearing of woodlands. It is commonly found on well-drained hillsides with loose scattered rocks.	Present	This species has not been recorded in the region. Records are from north and east of the ACT.	Unlikely, beyond the known distribution of the species	Yes, although the site is more than 30km from this species known distribution range, extensive areas of potential habitat are present within the development envelope	4
Pink-tailed Legless or Worm Lizard <i>Aprasia parapulchella</i> V TSC V EPBC	This species is only known from the Central and Southern Tablelands, and the South Western Slopes (Osborne and Jones 1995). This species inhabits sloping, open woodland areas with predominantly native grass groundlayers, particularly those dominated by Kangaroo Grass (<i>Themeda australis</i>). Typically these areas are well-drained, with rocky outcrops or scattered, partially-buried rocks. Commonly found beneath small, partially-embedded rocks in burrows below these rocks; the burrows usually have been constructed by and are often still inhabited by small black ants and termites (Osborne and Jones 1995). This species feeds on the larvae and eggs of these ants (DECC 2008b).	Present, however rocky habitat is severely grazed	The closest record is from Boorowa (2001), approximately 35km north of the site.	Possible	Yes, potential habitat (rock outcrops) is located within the turbine development envelope	6
Striped Legless Lizard	Populations of this species are known in the Goulburn, Yass, Queanbeyan, Cooma and Tumut areas. It inhabits temperate lowland grasslands, secondary grasslands and occasionally in	Present	This species has been recorded in the region near Yass	Possible	Yes, potential habitat (rock outcrops) is located within the	6

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
<i>Delma impar</i> V TSC V EPBC	open Box-Gum Woodland. It has been recorded at sites dominated by introduced species (such as <i>Phalaris aquatica</i> , <i>Nasella trichotoma</i> and <i>Hypochaeris radicata</i>) and sites with a history of grazing and pasture improvement (Smith and Robertson 1999). Shelters in grass tussocks, thick groundcover, soil cracks, under rocks, spider burrows, and ground debris such as timber. The key to their survival in rural areas may be the availability of shelter during disturbance events (Smith and Robertson 1999).		(1997).		turbine development envelope	
Rosenberg's Goanna <i>Varanus rosenbergi</i> V TSC	This species occurs on the Sydney Sandstone in Wollemi National Park to the north-west of Sydney, in the Goulburn and ACT regions and near Cooma in the south. It is found in heath, open forest and woodland. It is known to nest in termite mounds and feeds on carrion, birds, eggs, reptiles and small mammals. Individuals require large areas of habitat.	Absent	This species has not been recorded in the region	Unlikely	No	0
FISH						
Macquarie Perch <i>Macquaria australasica</i> V TSC E EPBC (species or habitat may occur)	The Macquarie Perch is a riverine, schooling species. It prefers deep, rocky holes with considerable cover and a substrate of small boulders, pebbles and gravel. Occurs within rivers, dams and tributaries in Southern NSW (Ecology Lab, 2003), but mainly in the upper reaches of rivers and streams where siltation levels are low. The species appears to prefer pools with cover.	Absent	Recorded from Yass Known from all three	None	No	0
Murray Cod <i>Maccullochella peelii peelii</i> V EPBC (species or habitat may occur)		Absent	-	None	No	0

Species and status*	Ecology	Presence of habitat	Nearest records	Likelihood of occurrence	Potential to be impacted?	PIF
INVERTEBRATES						
Golden Sun Moth <i>Synemon plana</i> ETSC CE EPBC (species of habitat likely to occur)	This species is distributed in an area of NSW between Queanbeyan, Gunning, Young and Tumut (DECC 2008b). It occurs in grassy Box-Gum Woodlands and natural temperate grasslands, typically low, open and dominated by several wallaby grass species. Also may be associated with spear-grasses (<i>Austrostipa</i> spp.) or Kangaroo Grass (<i>Themeda australis</i>).	Present	Closest record is from Queanbeyan	Unlikely, site is beyond the known distribution of the species	No	0
ENDANGERED POPULATION						
Squirrel Glider population in the Wagga Wagga LGA <i>Petaurus norfolcensis</i>	The extent of the endangered population is legally defined by the boundaries of the Wagga Wagga LGA. The site does not occur within this LGA.	-	-	-	No	0

Appendix E **ASSESSMENTS OF SIGNIFICANCE**

E.1 TSC Act (NSW)

E.2 EPBC Act (COMMONWEALTH)

Species and communities that have been assessed for significance of impacts are outlined below:

SCIENTIFIC NAME	COMMON NAME	LISTING*	TEST APPLIED
FLORA			
<i>Ammobium craspedioides</i>	Yass Daisy	V, v	TSC Act, EPBC Threatened Species
<i>Caladenia</i> sp <i>Burrinjuck</i>	Burrinjuck Spider Orchid	E, e	TSC Act, EPBC Threatened Species
ECOLOGICAL COMMUNITIES			
White Box Yellow Box Blakely's Red Gum Woodland (TSC Act) / Yellow Box – White Box- Blakely's Red Gum Grassy Woodland and Derived Native Grasslands (EPBC Act)		EEC, ceec	TSC Act, EPBC Act Ecological Communities
FAUNA			
<i>Pyrrholaemus saggitatus</i>	Speckled Warbler	V	TSC Act
<i>Lophoictinia isura</i>	Square-tailed Kite	V	TSC Act
<i>Oxyura australis</i>	Blue-billed Duck	V	TSC Act
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	TSC Act
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V	TSC Act
<i>Stagonopleura guttata</i>	Diamond Firetail	V	TSC Act
<i>Grantiella picta</i>	Painted Honeyeater	V	TSC Act
<i>Xanthomyza phrygia</i>	Regent Honeyeater	E, e, m	TSC Act, EPBC Act Threatened Species, EPBC Act Migratory Species
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V	TSC Act
<i>Lathamus discolor</i>	Swift Parrot	E, e, m	TSC Act
<i>Neophema pulchella</i>	Turquoise Parrot	V	TSC Act
<i>Polytelis swainsonii</i>	Superb Parrot	E, e	TSC Act
<i>Ninox connivens</i>	Barking Owl	V	TSC Act
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	m	EPBC Act Migratory Species
<i>Hirundapus caudacutus</i>	White-throated Needletail	m	EPBC Act Migratory Species
<i>Merops ornatus</i>	Rainbow Bee-eater	m	EPBC Act Migratory Species
<i>Ardea ibis</i>	Cattle Egret	m	EPBC Act Migratory Species
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	TSC Act
<i>Phascolarctos cinereus</i>	Koala	V	TSC Act
<i>Chalinolobus picatus</i>	Little Pied Bat	V	TSC Act
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	TSC Act
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bent-wing Bat	V	TSC Act
<i>Myotis adversus</i>	Large-footed Myotis	V	TSC Act
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	TSC Act
<i>Suta flagellum</i>	Little Whip Snake	V	TSC Act
<i>Aprasia parapulchella</i>	Pink-tailed Worm-lizard	V, v	TSC Act, EPBC Act Threatened Species
<i>Delma impar</i>	Striped Legless Lizard	V, v	TSC Act, EPBC Act Threatened Species

*V: Vulnerable TSC Act, E: Endangered TSC Act, EEC: Endangered Ecological Community TSC Act, v: Vulnerable EPBC Act, e: Endangered EPBC Act, ceec: Critically Endangered Ecological Community EPBC Act

E.1 TSC ACT ASSESSMENT OF SIGNIFICANCE

The following Assessments of Significance (7-part tests) assess the significance of likely impacts associated with the Coppabella Hills Precinct wind farm proposal on NSW listed threatened species and Endangered Ecological Communities considered at risk from the proposal.

Guid	a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction
FLORA	
Ecology	<p>Yass Daisy, <i>Ammobium craspedioides</i></p> <p>The Yass Daisy is a rosette-forming perennial. Leaves are spoon-shaped, to 12 cm long and 17 mm wide, hairy on top and white and woolly underneath. The spring flower heads are hemispherical buttons, to 20 mm wide, and surrounded at the base by papery leaf-like structures (bracts). The solitary flower heads are borne on unbranched stems to 60 cm tall; the stems are sparsely leafed, and edged with narrow "wings". Rosettes die off after fruiting.</p> <p>The species is found from near Crookwell on the Southern Tablelands to near Wagga Wagga on the South Western Slopes. Most populations are in the Yass region. It occurs in dry forest, Box-Gum Woodland and secondary grassland derived from clearing of these communities. It grows in association with a large range of eucalypts (<i>Eucalyptus blakelyi</i>, <i>E. bridgesiana</i>, <i>E. dives</i>, <i>E. goniocalyx</i>, <i>E. macrorhyncha</i>, <i>E. mannifera</i>, <i>E. melliodora</i>, <i>E. polyanthemos</i>, <i>E. rubida</i>).</p> <p>It is apparently unaffected by light grazing, as populations persist in some grazed sites though the intensification of grazing regimes and invasion of weeds are listed as potential threats to this species. Other threats include agricultural developments, road works (particularly widening or re-routing), inappropriate mowing or slashing in the cemetery sites where species occurs.</p>
Assessment	<p>Occurrences of this species were found on slopes within the potential transmission corridor on the saddle between Clusters 6 and 7a. Another two occurrences were recorded on slopes below sites 7a and north of Cluster 10 were found, however these were outside the proposed development envelope. It is possible that more occur nearby and in similar moderate to good condition woodland, given that not all of the woodland on adjacent slopes was included in the flora survey. The probability that this species occurs on the heavily grazed ridges and upper slopes within the turbine impact zone is very low, as it was not recorded in any of the areas surveyed in this type of habitat.</p> <p>The species was observed within a heavily grazed paddock on the nearby property 'Marilba', though only within 10 metres of where it was abundant in woodland in an adjacent lightly grazed paddock. Given that all turbine clusters are heavily grazed, it is not likely that a seed source of the species would persist in these areas, even if seeds were continually transported from nearby woodland habitats.</p> <p>The occurrences found on the slopes between Clusters 6 and 7a were within a potential transmission corridor in the initial infrastructure layout. However, the layout has since been modified to avoid impacts to high constraint woodland in this area.</p> <p>Potential habitat for this species occurs in moderate, moderate-good and good condition woodland patches (high constraint woodland) in areas that aren't heavily grazed or cleared, such as on steep slopes. Approximately 11.45 hectares of Box-Gum Woodland and Dry Grass Forest has the potential to be removed as a result of the proposal, of this total approximately 0.59 hectares of high constraint woodland would be impacted.</p> <p>It is possible that offsets such as fencing of more lightly grazed remnants where it occurs (such as in the woodland remnant north of Cluster 10) to manage the timing of grazing may produce a positive</p>

Guild	<p>a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction</p>
<p>outcome for Yass Daisy populations at the Coppabella site. Provided that works avoid impacts on good and moderate to good quality woodland habitats, it is considered highly unlikely that the proposed activity would have an adverse effect life cycle of the Yass Daisy such that a viable local population of the species is likely to be placed at risk of extinction.</p> <p>Burrinjuck Spider Orchid, <i>Caladenia</i> sp. Burrinjuck</p> <p>The Burrinjuck Spider Orchid is only known from the Burrinjuck Nature Reserve, about 20km south of the site and Burrinjuck Waters State Park. The habitat in which it occurs within the reserve include dry open forest dominated by <i>E. goniocalyx</i>, <i>E. dives</i>, <i>E. mannifera</i>, and <i>E. rossii</i> or tall open forest dominated by <i>E. dives</i>, <i>E. goniocalyx</i> and <i>E. macrorhyncha</i> (NSW NPWS 2002). This habitat type is not very similar to the grassy woodland on fertile soils found on the subject site, and this dissimilarity, along with the heavy grazing regime on most of the site, means that it is very unlikely to occur there.</p> <p>The survey was undertaken within the flowering period of this orchid, which may occur between late August and October. However, if the local flowering time was October, then the surveys in mid-September and early November would not have detected it. Given that remnant populations of rare orchid species can be small and isolated, if one does occur on the site, the development could eliminate it. However, the probability of this occurring is extremely low. It is considered unlikely that the proposed activity would have an adverse effect life cycle of the Burrinjuck Spider Orchid such that a viable local population of the species is likely to be placed at risk of extinction.</p>	
FAUNA	
Waterbirds	
Ecology and life cycle	<p>Blue-billed Duck</p> <p>The Blue-billed Duck has been recorded in the region approximately 20km south west of the study area. During spring and summer birds travel up to 300km from non-breeding areas on the Murray River system and coastal lakes to breed in deep swamps of inland NSW (NPWS 1999b). They are often seen in coastal areas in summer and during drought (DECC 2008b). Feeding occurs in permanent freshwater wetlands and swamps with deep water and dense aquatic vegetation.</p>
Assessment	<p>This species has been recorded near the Murrumbidgee River, Bundarbo, approximately 20km south west of the site.</p> <p>The site does not provide potential feeding or breeding habitat, however, the species disperses long distances for breeding and during drought. There are several large water bodies within a 300km radius, and birds travelling between them may pass over ridges within the study area and be at risk from collision with turbine blades. Potential long-distance movement paths may occur between Lake Burrinjuck and Lake Cowal, Lake Wyangala or the Murrumbidgee River (see Figure 4-1).</p> <p>Their large body and awkward flight characteristics, as well as their flocking habits, increase the potential impact to any local population. It is possible that this species may pass over the turbine sites during movement between foraging and breeding areas, however this movement is unlikely to be regular given that no large water bodies or wetlands are located near the site to act as attractants for this species. DECC Atlas of NSW Wildlife records indicate the species are more likely to follow river systems than ridges between water bodies. Therefore, the risk to local populations as a result of collision is likely to be low. Monitoring during wind farm operation would target this species to document collision impacts and ensure that adaptive measures would be adopted if mortalities are</p>

Guild	a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction
	<p>found to occur.</p> <p>The proposed development is not likely to result in adverse impacts on the Blue-billed Duck such that a local population is likely to be placed at risk of extinction.</p>
Raptors	
Ecology and life cycle	Square-tail Kite and Barking Owl
	<p>The Square-tailed Kite and Barking Owl occur sparsely throughout mainland NSW. Square-tailed Kite occurs primarily in coastal and sub-coastal open forest, woodlands and mallee, although has been recorded inland along timbered watercourses and adjacent areas (NPWS 1999e). Barking Owl is most frequently recorded on the western slopes and plains (DECC 2008b) in dry box-dominated forest and woodlands and has been recorded in farmland forest and woodland remnants and in clumps of trees at farms, towns and golf courses (NPWS 2003a).</p> <p>The two species tend to prefer structurally diverse habitats (G. Czechura, in Garnett, 1992; Garnett & Crowley 2000). Square-tail Kites appear to prefer open environments, while Barking Owl prefers dense foliage of <i>Acacia</i>, <i>Casuarina</i> or <i>Eucalyptus</i> species along water courses and in gullies for roosting (Schodde and Tidemann 2007); DNRE 1999; NPWS, 2003a). Square-tailed Kites hunt small passerines, especially honeyeaters, in the tree canopy. Barking Owl feeds primarily invertebrates, but also takes birds and small to medium size mammals.</p> <p>Raptors are long-lived with low fecundity. The two species occur in pairs in low densities (DNRE 1999; NSW Scientific Committee 1998; Olsen 1998) and occupy very large territories for hunting, from 1000 ha (Barking Owl) to 10,000ha (Square-tailed Kite) (Hollands 2008; Pizzey & Knight 1999). The Square-tailed Kite is considered partially nomadic, whilst the Barking Owl is nomadic (DNRE 1999; Pizzey & Knight 1999).</p> <p>Breeding requirements are limiting for the species. The Square-tailed Kite requires species rich patches of woodland with structural diversity (G. Czechura, in Garnett, 1992; Olsen 1998). Nests are a platform of sticks up to 90cm in diameter in a fork of a tall tree in forest or woodland (DEC NSW 2004). The Barking Owl requires large tree hollows (20-46 cm diameter) in large, old eucalypts for nesting including River Red Gum, White Box, Red Box and Blakely's Red Gum (DECC 2008b; NPWS 2003a). Nest and roost sites are usually near watercourses or wetlands (NPWS 2003a).</p>
Assessment	<p>Square-tailed Kite and Barking Owl were not detected in the study area; however they have been recorded within potential home range distance from the study area and foraging habitat is within the woodland habitat on the site. The potential impacts of the proposal relate to loss and degradation of woodland habitat, decline in prey species due to habitat degradation and fragmentation, loss of hollow-bearing trees and collision with turbine blades.</p> <p>The risk to local populations as a result of woodland habitat removal and degradation, decline of prey species and impacts to hollow-bearing trees is likely to be low for the following reasons: -</p> <ul style="list-style-type: none"> • Riparian and gully habitat will not be affected by the proposal • Woodland that would be cleared or modified is primarily degraded due to fragmentation, grazing and weed invasion • The impact area on woodland habitats would be small (11.45 hectares in total, and only 0.38 hectares of higher quality woodland habitat) relative to large territories of the raptors. • The works would not further fragment continuous areas of forest; works would only occur in

Guild	<p>a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction</p>
	<p>marginal habitat on the edges of woodland and in small isolated patches on steep slopes and ridges.</p> <ul style="list-style-type: none"> A small number of hollow-bearing trees occur within the development envelope, however these trees are unlikely to provide hollows large enough for Barking Owl and are not located near watercourses or wetlands. <p>To further minimise impacts on these woodland species, works should avoid impacts on high constraint woodland patches, particularly mature areas with hollow-bearing trees (along Whitefields Road, on Cluster 10 and in the transmission easement between 6 and 7a).</p> <p>Collision impacts: The foraging height and use of thermals by the Square-tailed Kite places it at risk from collision and changes in habitat utilisation due to potential avoidance of turbine areas. Northern hemisphere studies suggest that raptors are among the most vulnerable to blade-strike (Smales and Muir, 2005, Barclay et al., 2007). The study area carries cleared lands and woodland patches provide habitat for this species, however the degree of fragmentation from clearing across the site, particularly on the ridges, reduces the potential for the species to occur on the site. Therefore the risk of collision impacts on a local population of this species arising from the Coppabella wind farm is considered to be moderate.</p> <p>The Barking Owl forages within the canopy and in open areas at night. Therefore, turbines positioned above the canopy or within open areas nearby to woodland/forest pose the greatest risk from blade-strike or changes in habitat utilisation. Higher risk turbine sites to Barking Owl occur along Cluster 7a and 7b, north end of Cluster 3 and Cluster 10. Owls are more likely to be found foraging in gully areas than exposed ridges, and tend to use a perch and pounce method of foraging rather than gliding, risk to local populations from collision or changes in habitat utilisation is likely to be moderate.</p> <p>The collision risk of both raptor species has been assessed as being moderate, although are unlikely to result in a significant impact on the species such that a local population of the species is likely to be placed at risk of extinction. However the cumulative impact of the other wind farms proposed for nearby ridges (at Marilba and Carrols Ridge) increases the risk to local populations of these species given that they occur at low densities over a very large area. Monitoring of raptor collisions during wind farm operation would be undertaken at all proposed wind farm sites to ensure impacts to populations are monitored and appropriately managed.</p>
Woodland Birds	
Ecology and life cycle	<p>Speckled Warbler, Brown Treecreeper, Diamond Firetail, Hooded Robin</p> <p>The Speckled Warbler, Brown Treecreeper, Diamond Firetail and Hooded Robin forage for seeds and insects on the ground in <i>Eucalyptus</i> dominated communities with a grassy understorey and sparse shrub layer (Garnett & Crowley 2000; Hogendyk 2008; NSW Scientific Committee 2008). The Hooded Robin also utilises dead stumps and woody debris for perch and pounce on prey, while the Brown Treecreeper forages for invertebrates on tree trunks and on the ground amongst fallen timber and leaf litter (DECC, 2008b; Hogendyk 2008). The Diamond Firetail and Hooded Robin often utilise open grassy areas adjacent to woodland habitats, with the Diamond Firetail often occurring in grassland and lightly wooded farmland foraging for grass seed and other plant material.</p> <p>The species tend to persist only in large woodland areas (100-300 ha) containing structurally diverse habitat, particularly the Speckled Warbler and Brown Treecreeper (Barrett <i>et al.</i> 1994; Hogendyk 2008; NSW Scientific Committee 2008; TAMS 2005). Warblers appear to be adverse to open canopy areas, thus limiting dispersal between fragments (Garnett & Crowley 2000). The species generally</p>

Guild	<p>a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction</p>
Assessment	<p>occur in low densities, although the Diamond Firetail and Brown Treecreeper are gregarious (Cooney & Watson 2005; DECC 2008b). The territory ranges in size from 2-20 ha depending on habitat richness (NSW Scientific Committee 2008; Olsen et al. 2005).</p> <p>The Speckled Warbler nests in leaf litter on the ground and are therefore highly vulnerable to predation by large birds and mammalian and reptilian carnivores. The Brown Treecreeper nest in tree hollows.</p> <p>Potential threats to this suite of species arising as a result of the proposal are clearance and fragmentation of habitat including removal of dead timber, over-grazing, invasion of exotic grasses and increases in edge predators (Cooper and Walters, 2002; Garnett & Crowley 2000; James 2003; NSW Scientific Committee 2008; Walters et al., 1999; Watson et al. 2001). Poor dispersal abilities increase the vulnerability of the Speckled Warbler to these threats (Garnett & Crowley 2000).</p> <p>Diamond Firetail was detected within the study area. Speckled Warbler was recorded from Marilba Hills by nghenvironmental 2008 and Hooded Robin have been recorded within the locality.</p> <p>The species may occur in higher quality woodland patches, particularly north of Cluster 10 and on the south-east facing slope of 7, however these predominately occur outside the envelope. Lower constraint woodland (poor and poor-moderate condition) is considered to be only marginal for these species as they are not structurally complex and are fragmented from other woodland areas. The proposal would remove approximately 11.5 ha of woodland habitat. Impacts would primarily occur within disturbed and fragmented areas, or along the edges of larger remnants. Excepting Diamond Firetail and Hooded Robin, these species tend to be adverse to open canopy areas and edge habitats, suggesting that habitat removal would not be likely to impact these species. Diamond Firetail and Hooded Robin may occur on the edges of woodland or in pasture areas and may therefore utilise the impact zone. However, given the disturbed condition of these areas, and the large extent of similar and high quality habitat nearby, the removal of habitat is not likely to be significant for these species.</p> <p>A small risk of collision with turbine blades is also present for these species; however as they are sedentary, forage primarily on the ground or on tree trunks and generally prefer continuous woodland habitats, the risk of collision is very low. The Diamond Firetail forages in groups in open areas and have been recorded to travel 5km during dispersal (Olsen et al. 2005) and may be at higher risk of collision than the other species, however their small size and ground-foraging habit suggests that they are unlikely to fly at the height of the turbine blades.</p>
Honeyeaters	
Ecology and life cycle	<p>Regent Honeyeater, Painted Honeyeater (Honeyeaters Meliphagidae)</p> <p>The Regent Honeyeater and Painted Honeyeaters are arboreal honeyeaters and are found at low densities in eucalypt open forests or woodlands, particularly box-ironbark and box-gum assemblages. Regent Honeyeaters appear to prefer wetter, more fertile sites along creek flats, broad river valleys and lower slopes. The Painted Honeyeater prefers dry woodlands and open forests and also paperbark and casuarina forests.</p> <p>The Painted Honeyeater is a specialist forager on mistletoe, particular from the genus <i>Amyema</i>. Pairs or small groups generally require 5 or more mistletoes per hectare to persist in an area. In contrast, Regent Honeyeaters are generalist foragers, which feed mainly on nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Yellow Gum, Blakely's Red Gum and White Box (Menkhorst <i>et al.</i> 1999). Stands suitable species growing on high quality sites where nectar production is copious and relatively predictable appear to be critical to the</p>

Guild	<p>a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction</p>
Assessment	<p>survival of the Regent Honeyeater (Menkhorst et al., 1999).</p> <p>These species are nomadic, with movements linked to flowering events of favoured feed species (Garnett & Crowley 2000; NSW Scientific Committee, 2008). Regent Honeyeaters are known to undertake irruptive nomadic movements hundreds of kilometres between coastal and inland resources (DECC, 2008b). While their relative mobility should make the species better able than some to cope with fragmentation, local populations appear not to persist in small remnants (less than 200 ha in area) (Garnett & Crowley 2000; NSW Scientific Committee, 2008).</p> <p>Potential threats to these species arising from the proposal include habitat loss and degradation and collision risks.</p> <p>Habitat loss and degradation: Neither of these species was detected in the study area. Painted Honeyeater has not been recorded within 50km of the site, and predominately occurs west of the dividing range. The site does provide habitat for the species, including mistletoe species <i>Amyema pendulum</i> and <i>Muellerina eucalyptoides</i>. Mistletoe was identified at low densities on the midslopes below Cluster 7a (outside the development envelope) and on parts of Cluster 10 within the development envelope. Although these mistletoe species are a potential feed resource for the Painted Honeyeater, it occurs in low densities and may not provide sufficient resources to support a local population. The fragmentation and low availability of resources suggests that there is a low probability of Painted Honeyeater occurring on the site, therefore removal and degradation of habitat associated with the proposal is unlikely to significantly impact the species at the population level.</p> <p>Regent Honeyeater has been recorded in the region, south of Binalong, approximately 9km east of the site. Suitable foraging habitat was found for the Regent Honeyeater including Yellow Box, Blakely's Red Gum, White Box and mistletoe. Based on an indicative layout, the proposal would impact approximately 11.5 hectares of woodland primarily along the edges of larger patches of woodland and in isolated stands on ridge tops and slopes, only 3.6 hectares of which is considered to be in moderate to good condition. The works would not impact habitat connectivity. Given the disturbed and fragmented condition of much of the woodland present within the development envelope, and the extent of woodland elsewhere within the study area, it is not considered that the removal or degradation of these resources would significantly impact the species at the population level.</p> <p>Collision risks: The Regent Honeyeater and Painted Honeyeater undertake large-scale nomadic movements across the landscape, both moving in flocks. Records from the DECC Atlas of NSW Wildlife suggests that the species may pass over the site when travelling between the western slopes and the coast. White Box Yellow Box Blakely's Red Gum Woodland north of Cluster 10 and the on western slope of Cluster 7b may act as sinks, attracting the Regent Honeyeater to the site. However, research in grazing landscapes in southern NSW showed a pronounced trend for nectarivores to move along densely vegetated areas, and using the same route for return journeys (Fischer and Lindenmayer 2002). This suggests that if present, the honeyeater species are more likely to use valleys, roadside remnant corridors and low hills than the disturbed high ridges of the proposed turbine sites to reach foraging habitat. Consequently, blade-strike and habitat removal are assessed to be low risk to these species and are unlikely to adversely affect the lifecycle of these species such that a viable local population is likely to be placed at risk of extinction.</p>
Ecology and life cycle	<p>Gang-gang Cockatoo, Swift Parrot, Superb Parrot, Turquoise Parrot (Parrots Psittaciformes)</p> <p>The Turquoise Parrot and Superb Parrot occur in Box-Gum grassy woodland and open forest (NPWS, 1999f), and also on the edges of these habitats. Swift Parrot and Gang-gang Cockatoo also occur in eucalypt forests and woodlands, particularly Box-Ironbark assemblages (Higgins, 1999). All four species</p>

Guild	a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction
	<p>are long lived with low fecundity and require tree hollows for nesting (Gibbons and Lindenmayer 2002). The Gang-gang Cockatoo are known to favour old growth attributes for nesting and roosting and rely on large hollows (NSW Scientific Committee, 2008).</p> <p>Turquoise Parrots are generally sedentary and occur in pairs or small groups (Pizzey <i>et al.</i> 2006). Nesting sites are located within a few kilometres of foraging grounds usually in tree hollows, in forests within 100 m from cleared land and 250 m from surface water (Higgins 1999). The other three parrots undertake nomadic or seasonal migratory movements (Swift Parrot and Gang-gang Cockatoo) for breeding and foraging (Garnett & Crowley, 2000). The Gang-gang Cockatoo moves between tall mature wet sclerophyll forest for breeding (summer) and dry open eucalypt forests (winter). The Swift Parrot is an annual migrant to the southern mainland from Tasmania (where it breeds). On the mainland, Swift Parrots inhabit eucalypt forests and woodlands, particularly box-ironbark forests, with a preference for sites along drainage lines (Higgins 1999).</p> <p>Superb Parrots utilise Box-Gum Woodland for foraging and breeding (summer), mostly nesting in dead trees (Manning <i>et al.</i>, 2006; Webster, 1988). Where suitable nesting trees are widely dispersed, they forage up to 15 km from the nest. In winter they move into box, box-pine <i>Callitris</i>, and Boree <i>Acacia pendula</i> woodlands to feed on lerp, mistletoe berries, eucalypt flowers and grass seed (Higgins, 1999).</p> <p>All four parrots occupy different niches within forest and woodland environments. The Gang-gang Cockatoo feed mostly in the canopy on seeds of eucalypt trees and shrubs (e.g. banksia, hakea, casuarina), and may also eat invertebrates (Cameron 2007). The Swift Parrot is a specialised nectar- and pollen-feeder, particularly favouring <i>E. globulus</i>, and also eats psyllids and exotic fruits (Hingston <i>et al</i> 2004; Blakers <i>et al.</i> 1984, Emison <i>et al.</i> 1987). The Turquoise Parrot forages mostly on the ground for seeds of grasses and herbaceous plants, or browses on vegetable matter (Garnett & Crowley 2000). The Superb Parrot forages on the ground or in trees, feeding on lerp, mistletoe berries, eucalypt flowers and grass seed (Higgins, 1999).</p> <p>Assessment</p> <p>Potential impacts arising from the proposal are similar for the four parrots: habitat loss and degradation; the loss of hollow bearing trees as breeding (Superb Parrot and Turquoise Parrot) and roosting habitat, and blade-strike impacts.</p> <p>Records: Superb Parrot was detected in flying in a flock of approximately 12 over the woodland patch north of Cluster 10, outside the development envelope. This species was also detected by the authors in disturbed mature woodland alongside Illalong Road, approximately 5 km from the study area. None were observed in the vicinity of the proposed turbine sites. The Gang-gang Cockatoo and Swift Parrot have been recorded from within 10km of the site (south of Binalong and near McMahons Reef respectively). Turquoise Parrot records are from west of dividing range, with the closest record occurring approximately 40km west of the site.</p> <p>Habitat loss and degradation: Suitable foraging, roosting and breeding habitat (excluding Swift Parrot) is present on the site for these parrot species. Removal or degradation of breeding habitat has the potential to place local populations at risk. However, Turquoise Parrots are generally found west of the Great Dividing Range and Gang-gang Cockatoo move to tall mature wet sclerophyll forest to breed and therefore the likelihood of impacting important breeding areas is very low.</p> <p>Superb Parrots breed locally and have low fecundity, therefore loss or degradation of habitat suitable for breeding, particularly along Whitefields Road, is considered to be a high risk to a local population. The proposal would remove approximately 11.5 hectares of woodland, however only 3.5 hectares of this is within high condition remnants. Potential Superb Parrot habitat occurs in:</p> <ul style="list-style-type: none"> • road-side remnants adjacent to Whitefield's Road

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	<ul style="list-style-type: none"> • in the saddle and north west crest on Cluster 10 • in the transmission easement on the south-facing slope and saddle between Clusters 6 and 7a • in hollow-bearing paddock trees and woodland that occur within the valley between Clusters 5 and 7a <p>Impacts on these areas, in particular on hollow-bearing trees, should be avoided to ensure that the proposed action does not result in a significantly impact on the lifecycle of Superb Parrot such that a local population is likely to be placed at risk of extinction.</p> <p>Collision risk: Gang-gang Cockatoo, Swift Parrot and Superb Parrot populations may be at risk from collision when travelling above canopy during migration and dispersal. If present, the Turquoise Parrot may also be at risk of collision when travelling between foraging sites; however the lack of local records suggests that the probability of collision risk is low and would be unlikely to result in population-scale impacts.</p> <p>Superb Parrots and Swift Parrots may fly in large flocks (>50 birds) and Gang-gang Cockatoos in family groups increasing the risk factor to moderate (S.Sass pers. comm.2008). No flight height data is available for these species; however a variety of other parrot species are known to fly at turbine blade height at times, although the great majority of recorded flights are from below that zone (Biosis Research 2006). Superb Parrots use woodland remnants to forage and move across the landscape and are less likely to cross extensive open areas (Garnett & Crowley, 2000). Feeding areas and flying routes are therefore more likely to correspond with valleys and low hills with tree cover and remnant woodland along roadsides, rather than with the ridge top turbine sites.</p> <p>Swift Parrots and Gang-gang Cockatoo may fly at turbine blade height as they migrate to other woodland and forest sites, however the lack of mature woodland habitats at the turbine sites suggest that the frequency of visits is likely to be low. Swift Parrots and Gang-gang Cockatoos are manoeuvrable fliers and do not breed locally. A recent cumulative assessment of 39 wind farms located in the distribution range of the Swift Parrot concluded that the combined blade-strike impact of all of these wind farms would not be significant (Biosis Research 2006).</p> <p>These three species would be among the bird species targeted for the bird and bat monitoring during the wind farm operation. Adaptive measures would be adopted if mortalities are found to occur. Impacts arising from the proposed development associated with collision and habitat removal are not considered likely to result in an adverse effect on the life cycle of these four parrot species such that a viable local population of the species is likely to be placed at risk of extinction.</p>
Marsupials	
Ecology and life cycle	<p>Koala, Squirrel Glider</p> <p>Both these species occupy woodland and forest and appear able to occupy moderately disturbed environments although it is questionable whether these species can persist in fragmented habitats over time (Ahern & van der Ree 2003; DECC 2008b; Gordon et al. 1988; McAlpine et al 2006; Wintle 2004).</p> <p>Squirrel Gliders have been found to travel over a large area for forage (up to 2.6km), while Koalas are less able to travel between fragments due to their low energy diet (Ahern & van der Ree 2003; Menkhorst 2004). Important habitat parameters for Squirrel Gliders are the presence of Yellow Box, Long-leaved Box, and Red Stringybark species, abundant tree hollows greater than 5cm diameter, and</p>

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Assessment	<p>vegetated corridors if in fragmented landscape (showing a preference for lowlands and gullies) (Ahern & van der Ree 2003; DECC 2008b).</p> <p>Koalas are specialised foragers and regionally utilise Ribbon Gum and River Red Gum as primary habitat and Blakely's Red Gum, White Box, Yellow Box and Brittle Gum as secondary habitat (DECC 2008a). Connectivity is important for Koala persistence in an area. Secondary habitat has been found to be highly important, as it is more common and aids dispersal (McAlpine et al 2006).</p> <p>These species were not detected within the study area. Koala has been recorded within 8km in 2004, and Squirrel Glider from Burrinjuck Dam (approximately 25km of the site). Preferred eucalypt species for both animals are found on site.</p> <p>Potential impacts on these species associated with the proposal include habitat removal and degradation.</p> <p>Habitat removal and degradation: Squirrel Glider feed trees are present in all woodland areas, however hollow-bearing trees are not found in high numbers in any of these areas. Consequently the site is considered to provide only marginal habitat for this species. Hollow-bearing trees in mature (although disturbed) woodland within the development envelope are found on Cluster 10, along the edges of woodland within the transmission envelope between Clusters 6 and 7a and along Whitefields Road. Impacts on woodland within these areas should be avoided to minimise impacts on Squirrel Glider.</p> <p>The primary Koala feed tree River Red Gum occurs along Jugiong Creek, a small portion of which may be impacted by a proposed electricity easement. Secondary feed trees Blakely's Red Gum, White Box and Yellow Box occur in all examples of Box-Gum Woodland on the site. Approximately 29.57 hectares of Box-Gum Woodland and Dry Grass Forest has the potential to be removed as a result of the proposal, based on the indicative development layout. Additional mature disturbed woodland occurs along Whitefields Road which may contribute to east-west connectivity across the site. Given that the site is already highly fragmented and disturbed, impacts to these habitat is not considered likely to place a viable local population at risk of extinction should one occur on the site. Avoiding impacts on good to moderate condition and mature Box-Gum Woodland would reduce potential impacts on this species.</p>
Insectivorous microbats	
Ecology	<p>Eastern Bent-wing Bat- <i>Miniopterus schreibersii oceanensis</i></p> <p>The Eastern Bent-wing Bat is a cave dependant species. Females migrate to specific cave sites in October-November each year to give birth in December and raise one young. Post weaning, females leave maternity sites in late February-March (Dwyer in Strahan 1983), with young dispersing from the sites approximately two weeks later (late March) (G. Richards pers.comm).</p> <p>Eastern Bent-wing Bats will utilise other structures for roosting such as mines, and occasionally buildings, when caves are in short supply. The species moves roosts based on climatic conditions and life cycle stage (Dwyer in Strahan 1983). Specific conditions are required in caves or mines used for winter torpor, mating events in Autumn, and raising of young.</p> <p>Eastern Bent-wing Bats require forested areas to forage in, flying above the canopy and to some height over the canopy to capture insects on the wing. The species will utilise "flyways"- tracks or roads- to forage also. There is no evidence that they have a strong affiliation with gradient, being recorded on ridges, midslopes and gullies.</p>

Guild	<p>a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction</p>
Distribution and movements	<p>The species would forage in the same areas over the breeding season, and each year. Wilkinson (1992) showed that for a North American cave dwelling species, <i>Nycticeius humeralis</i>, that also congregates into maternity caves, bats exchanged information at roosts (and by 'eavesdropping' on echolocation of other bats) and followed successful bats to rich sources of insects.</p> <p>The maternity cave at Wee Jasper is in an open paddock area and demonstrates that the species will utilise open areas, though this may be an artefact of their requirement for specific cave conditions to raise young. Caves such as Wee Jasper's Church Cave and Drum Cave at Bungonia are not common in the Eastern Australian landscape and they seem to have strong affiliation with the sites that provide climatic conditions suitable for raising young</p> <p>The Eastern Bent-wing Bat was not recorded by Anabat surveys at the site conducted in September 2008, although was recorded at nearby proposed Precincts, Carrolls Ridge and Marilba. Females migrate to specific cave sites in October-November each year to give birth in December and raise one young. Post weaning, females leave maternity sites in late February-March (Dwyer in Strahan 1983), with young dispersing from the sites approximately two weeks later (late March) (G. Richards pers.comm).</p> <p>The species distribution covers a wide area along the east coast of Australia, with populations dispersed within 300 kilometres of each of the known maternity roosts (DEC 2005). Eastern Bent-wing Bat are long-lived species. Churchill (1998) records an adult banded female being recaptured 18 years post banding.</p> <p>Four maternity caves are known in NSW: Willi Willi and Riverton in the north and Church (near Yass) and Drum in southern NSW. Each maternity cave often has an associated "staging" cave close by (Wee Jasper's is Mt Fairy Cave situated in the triangle between Bungendore, Tarago and Doughboy).</p> <p>Church Cave at Wee Jasper is c.42kilometres in a straight line from the site of the proposed Coppabella Wind Farm. The maternity colony size at Church Cave has been estimated at 60,000 when juveniles are flying with mothers (ie 30,000 pregnant females+ 30,000 babies). Dwyer (1968) suggested that the nursery colony at Church Cave, Wee Jasper was the maternity centre for the population of Eastern Bent-wing Bat from the Murrumbidgee, Lachlan and Moruya drainages, plus some of those from the Shoalhaven drainage (Mt fairy & Major's Creek).</p> <p>The exact nature of the migration route taken by females to reach or disperse from Church or other maternity caves is unknown, though supposed by Dwyer (1968) to be strongly related to topography-both waterways and divides, with the species flying along ridges or waterways, using them as navigation aides, rather than over. Dwyer went on to say that Eastern Bent-wing Bat may alter navigational cues from area to area. Home ranges are not confined to river basin areas (Wilson 2003).</p> <p>Flight speed has been recorded at 5.8metres/second or c.20kms/hour (Bullen & McKenzie 2008). Eastern Bent-wing Bats will not fly in wind speeds higher the c. 50kms/hour (Richards pers comm. 2008). Wind farms generally operate between 0.24 and 90km/hour.</p> <p>Dwyer (1964) recorded emergence and re-entry times of Eastern Bent-wing Bat's at mines and caves on the NSW north coast. He found that Eastern Bent-wing Bat's emergence correlated strongly with astronomical sunset, though slight differences in caves was based on the light intensity it received (ie facing West or North etc). Re-entry was however not so precise. Dwyer proposed re-entry was based more on food availability. Other factors affecting re-entry would be stage of development of the individual (juveniles only emerge for short periods when first flying at c.12 weeks old) (Dwyer 1963), females would forage longer with return flights to nursery caves when lactating, there is lower activity all round in winter. These factors could assist in helping to model peak activities of Eastern Bent-wing</p>

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Assessment	<p>Bat's in the area for turbine operation.</p> <p>Potential impacts on this species include collision and barotrauma and foraging habitat removal (woodland).</p> <p>In light of the fact that the Eastern Bent-wing Bat would migrate to and from coastal areas, migration impacts on the species by the proposed Coppabella wind farm are unlikely as the site is located to the north-west of the maternity cave at Wee Jasper. However, large numbers of females are present at the maternity cave during the maternity season and a high mortality of foraging females may result in population-scale impacts. The cumulative impact risk arising from all three proposed Yass wind farms exacerbates the risks to this the local population of this species.</p> <p>Dwyer (1968) stated that nightly male movements did not often exceed 100 miles (120 kilometres). This is verified by Wilson (2003) assessing recaptured bat records from the Australian Bird and Bat Banding Scheme, as giving a population range of no more than 200 km from any roost, including maternity caves. Females would travel further to reach maternity caves, and may travel further afield than males in order to meet nutritional requirements of lactation. When not breeding however, most movements are local for foraging for both males and females. The 42km distance of Coppabella Hills from Wee Jasper would be perhaps too far for regular nightly foraging activity, given 120km is considered a maximum total night's flying.</p> <p>The turbine development envelope at the Coppabella site is predominately cleared and highly fragmented, however it continues to carry woodland and disturbed woodland habitats which are foraging habitats for this species. The removal of foraging habitat for the proposed wind farm is unlikely to result in population scale impacts given that the area of impact is small compared with the extent of similar habitats within the locality. However, the presence of foraging habitat within and adjacent to the proposed turbine locations may attract foraging individuals to the site, increasing the risk of collision and barotrauma. Eastern Bent-wing Bat occurrences within the forest patches in the study area are likely to be less frequent than in the larger, more continuous areas of forest that occur within the nightly foraging distance of 120km such as Burrinjuck Nature Reserve and nearby State Forest and National Park estate.</p> <p>Further monitoring in November to March during the maternity period, and follow-up assessment is considered necessary to determine the frequency that the species may forage on the site, and therefore the potential frequency of collision and barotrauma mortality during this time. This monitoring would help to determine the potential risk to the survival of the local population that is associated with the proposed wind farms.</p> <p>Potential mitigation measures which may reduce the risk to this species acceptable levels include the operating the wind farm only during low activity periods, such as during winter and only in high wind (between 50km/h and 90km/h), or during the day.</p>
Ecology and Life cycle	<p>Little Pied Bat- <i>Chalinolobus picatus</i></p> <p>The Little Pied Bat roosts in caves, mines, buildings, and tree hollows in small groups, though one colony of 40 individuals has been recorded (Churchill, 1998). It prefers open, dry forests such as Mulga woodlands, chenopod shrublands or mallee with access to water sources (Churchill 1998, DECC 2008b). Little Pied Bat forage within the canopy (or subcanopy), as with most of the Vespertilinidae in Australia. It often forages along watercourses (Menkhorst and Knight 2004) where it feeds on moths and possibly other flying invertebrates. It gives birth usually to two young in November.</p> <p>Little Pied Bat is a sedentary species, little is known of home ranges for foraging but the species has been known to travel up to 34 km to gain access to water in more arid environments (Queensland</p>

Guild	a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction
	Murray Darling Basin Commission, 2008). One record is present from the region: near Bowning is present for the Yass area, approximately 20 km from the site.
Assessment	Though the species is recorded in a wide variety of habitats, they are mainly found in arid inland areas. The site is unlikely to provide suitable habitat for the species, as it contains dry grass/herb forests and woodlands in mostly poor condition. The dams on the site are highly degraded and are unlikely to attract species to the site. It is considered highly unlikely that the species occurs in the area and therefore the proposal is not likely to result in impacts on the species such that a viable local population is likely to be placed at risk of extinction.
Ecology and Life cycle	<p>Eastern False Pipistrelle- <i>Falsistrellus tasmaniensis</i></p> <p>The Eastern False Pipistrelle utilises tree hollows for roosting, and has also been found under loose bark and in buildings (DECC 2008b). Colonies are small, from 3 to 36 individuals having been recorded, often segregated by sex (Churchill 1996).</p> <p>The Eastern False Pipistrelle relies on forested areas and forages within or just above the forest canopy. It is a relatively fast, manoeuvrable flyer that hunts prey by pursuit. The species prefers tall wet sclerophyll forest with trees approximately 20 metres in height, though has been found in drier forests foraging. It can move medium distances to forage (c. 12km) (Churchill 1996). It is a winter hibernating species and it has been suggested that some highland populations migrate to the coast for winter (Parnaby in Strahan 1983), though by what route is unknown.</p> <p>Eastern False Pipistrelle give birth to one young in late Spring/Summer (December usually) and young are weaned by late February (Churchill 1998).</p>
Assessment	All records for this species in the greater area are in forested areas south-west and south-east of Burrinjuck Dam. The closest records are from Cuumbeun Nature Reserve, near Queanbeyan (90km south-east). The site does contain small, fragmented patches of suitable foraging habitat for the species; however the distance from the closest known recordings of the species, it's preference for wet sclerophyll forest and its limited foraging range suggest that impacts on the species by the proposal are highly unlikely to result in population-scale impacts such that it could be placed at risk of extinction.
Ecology and Life cycle	<p>Large-footed Myotis <i>Myotis adversus</i></p> <p>The Large-footed Myotis is known to use tree hollows, caves, mines, under bridges, storm water drains, and vegetation such as Pandanus for roosting. Foraging is dependent on the presence of water bodies, both riparian and artificial such as dams. The species gleans insects from the waters surface and just below, as well as aerial prey. In NSW one young born per year in November / December (Churchill 1998).</p> <p>Only one record exists in the area for the Large-footed Myotis, at Wee Jasper near Burrinjuck Dam. The next closest record is south of the ACT border.</p>
Assessment	<p>Potential impacts on this species include collision and barotrauma risks and habitat removal.</p> <p>This species is rarely found away from water, often not further in than 100km from coast or along substantial rivers such as the Murray or Fitzroy. There are no major water bodies or large dams on the site. Given that the site is more than 100km from the coast, the species is unlikely to frequently occur on the site. The species may occur along Jugiong Creek north of the site; however moments are likely to be restricted along this riparian line and not on ridge top sites, reducing the risk of collision or</p>

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	<p>barotrauma impacts.</p> <p>Given that the species is unlikely to occur on the site and that wetland habitats would not be impacted, it is not considered likely that the proposal would result in adverse impacts on the species such that a viable local population is likely to be placed at risk of extinction. Hollow-bearing trees are present on the site and provide breeding habitat for this species. Impacts to hollow-bearing trees in mature woodland remnants should be avoided.</p> <p>Yellow-bellied Sheathtailed Bat <i>Saccolaimus flaviventris</i></p> <p>Listed as vulnerable under the NSW TSC Act, this cryptic species is known to use a variety of habitats. Yellow-bellied Sheathtailed Bats roost solitarily or in small groups in hollows, old buildings or occasionally abandoned nests of other species such as Sugar Gliders (Churchill 1996). The species is sedentary and possibly territorial, though has been found in Southern Australia only between January and June (Churchill 1998), which may suggest some movement for hibernation. A fast flying species with low manoeuvrability, it favours a range of insect species, mainly beetles (Churchill 1998; Richards 2001). One young are born December to mid-March, though peak is likely to be December (Churchill 1998)</p> <p>Assessment</p> <p>Potential impacts on this species include habitat removal and collision and barotrauma risks.</p> <p>No records of the species have been recorded in the Murrumbidgee CMA area; however it is a wide ranging species in northern and eastern Australia. Richards (2005) claims that the species may favour habitat in large tracts that has extensive understory flora (shrubs). This habitat is not provided on the site, being dissected by grazing paddocks and with low understorey richness from grazing activities. It is considered unlikely that the species occurs in the proposal area and therefore the proposal is not likely to have an adverse effect on the life cycle of the species such that a local population is likely to be placed at risk of extinction.</p>
Conclusion: all microbats	<p>Habitat loss, collision and barotrauma impacts on microbats may occur as a result of the proposed activity.</p> <p>Habitat loss is assessed as a low risk for all species given the small area of impact compared with the extent of similar vegetation in the locality and the mobility of the species. Mitigation measures should include protection of good and moderate-good condition woodland, and retention of mature hollow-bearing trees.</p> <p>Collision and barotrauma is assessed as being a high risk for Eastern Bentwing Bat as:</p> <ul style="list-style-type: none"> - The species is known from the locality. - Although the site is not along a migration route between maternity and staging caves and the coast, the site is located within the foraging range of a known maternity cave. - Cumulative impacts arising from the development of the other two Yass wind farm sites have the potential to result in population-scale impacts <p>Large areas of suitable forested foraging habitat occur within the foraging range of the maternity cave (120km), particularly to the south. The site is within fragmented rural farmland, suggesting that the species may not frequently visit the site when compared with other areas, however further monitoring needs to be undertaken in order to determine the significance of potential impacts on this species.</p> <p>Collision and barotrauma is assessed as a low risk for the other microbat species, Yellow-bellied Sheathtailed Bat, Little Pied Bat, Eastern False Pipistrelle, Large-footed Myotis due to the absence of</p>

Guild	<p>a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction</p>
	<p>preferred habitat on the site and the lack of local records. <i>It is considered unlikely that the proposal would result in adverse impacts on these species such that a local population would be placed at risk of extinction.</i></p> <p>Additional microbat surveying has been conducted in January 2009 to coincide with foraging periods during the maternity season. The results of this survey will be reported in a separate report.</p>
Reptiles	
Ecology and life cycle	<p>Pink-tailed Legless Lizard (<i>Aprasia parapulchella</i>), Little Whip Snake (<i>Suta flagellum</i>) and Striped Legless Lizard (<i>Delma impar</i>)</p> <p>Pink-tailed Legless Lizard occur in areas where a moderate to extensive cover of native grass occurs (Jones 1998). The presence of Grass (<i>Themeda australis</i>) is likely an indicator of less disturbed areas where pasture improvement has not occurred. Little Whip Snake has been found in grasslands, grassy woodlands, and secondary grasslands. Both species require well-drained slopes with loose scattered rocks or rocky outcrops as these provide basking, shelter and foraging habitat. Pink-tailed Legless Lizards feed on the larvae and eggs of ants and termites and have frequently been found in arthropod burrows beneath small, partially embedded rocks (DECC 2008b; Osborne and Jones 1995).</p> <p>Striped Legless Lizards tend to prefer native grassland dominated by perennial, tussock-forming grasses such as Kangaroo Grass (<i>Themeda australis</i>), spear-grasses (<i>Austrostipa</i> sp.) and poa tussocks (<i>Poa</i> sp.), but have also been recorded in grassy woodland, secondary grassland and grasslands that have a high exotic component (DECC 2008b; Smith and Robertson 1999). The Striped Legless Lizard recovery plan suggests that their key to survival in disturbed habitat may be linked with grassland with a dense and continuous structure and to the presence of refuge sites such as dense grass tussocks, rock outcrops, road easements, less disturbed neighbouring land or even soil cracks and arthropod burrows in the short-term; however it is not known whether the species can survive in disturbed sites in the long-term (Smith and Robertson 1999).</p> <p>Distribution/records</p> <p>These species were not recorded during the field surveys and have not been recorded within 20km of the site. Pink-tailed Legless Lizard and Striped Legless Lizard are known from the region (DECC 2008b; Osborne and Jones 1995); however, Little Whip Snake has been found within an area bounded by Crookwell in the north, Bombala in the south, Tumbarumba to the west and Braidwood to the east which the Coppabella site would sit within (DECC 2008b). Despite the lack of records from the locality, the site provides suitable habitat for these species.</p> <p>Pink-tailed Legless Lizard have been found to occupy small home sites of up to 500 cm², with multiple individuals sharing the same home site; however home range and movements of this species is unknown (Jones 1998). Little Whip Snake is likely to have a home range of around 2000-5000 m² (S. Sass Pers com 2008). Striped Legless Lizard species is relatively long lived (around 10 years) and is wide ranging for a small reptile (Smith and Robertson 1999). Movements of between 5-20m per day, or utilisation of an area of up to 0.25ha over a week (Kutt 1993).</p> <p>Assessment</p> <p>Potential impacts on these reptile species arising as a result of the proposed development include rocky outcrop, woodland and secondary grassland habitat removal, degradation and fragmentation.</p> <p>Rocky outcrops on well-drained slopes provide habitat for the Pink-tailed Legless Lizard and Little Whip Snake. This habitat occurs on all ridge tops across the site and forms a large proportion of the development envelope. The low mobility of the species, particularly the Pink-tailed Legless Lizard</p>

Guild	a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction
	<p>suggests that even a small area of impact within their home site may result in population-scale impacts. The highest quality rocky habitat for these threatened reptiles is present within native pasture habitats (Little Whip Snake) and in grassy woodland (both species).</p> <p>Approximately 197.56 hectares of rocky outcrops occurs within the development envelope, and 5.15 hectares would be removed, based on the indicative layout. Groundcover composition varies considerably between and within clusters; however, with the exception of Cluster 10, all ridge top rocky outcrops surveyed were heavily degraded by grazing, clearing and extensive weed invasion. All had an exotic forb component, and many were dominated by exotic grasses and forbs (surveys on Clusters 1, 2 and 4, parts of 5 and 6 upper slope, parts of 7a and 7b ridge and upper slope; 3a upper slope; and parts of 10). Observations from adjacent view-points revealed that non-surveyed cleared ridge tops were also heavily degraded, with little top soil. Grazing, clearing and weed invasion has been shown to reduce the suitability of rocky sites for reptile species (Dorrough and Ash 1999; Fischer <i>et al.</i> 2004) and these processes are listed as threats for both species (DECC 2008b). Therefore the cleared rocky outcrops that occur on the ridge top sites are only considered to be marginal habitat for these species.</p> <p>Rocky outcrops predominately occur in cleared pasture habitats, although occasionally within woodland on lower slopes, predominately outside the development envelope. Cluster 10 is the only area within the development envelope that features rocky outcrops in woodland. Given the discrete nature of the development, the extent of similar nearby habitat, present condition of habitat at Coppabella, habitat removal is considered to be a low risk for these species. It is unlikely that the proposal would result in an impact on Pink-tailed Legless Lizard and Little Whip Snake such that a viable local population of the species is likely to be placed at risk of extinction.</p> <p>Striped Legless Lizard is predominately restricted to grassland habitats, although has also been recorded within grassy woodland and grassland with a predominately exotic component (Smith and Robertson 1999). Cleared grassy habitats occur within the development envelope, however all areas are heavily degraded by grazing and do not provide suitable refuge sites for the species such as a dense and continuous groundcover structure or dense grass tussocks.</p> <p>Moderate to good condition woodland habitats may also provide habitat for this species, provided that there is suitable grassy groundcover and refuge sites available. All woodland remnants that occur within the development envelope have been grazed and there is few refuge sites present. Less disturbed areas are present on Cluster 10 (particularly on the saddle and slope), the edge of 7b and along proposed power-line route between Clusters 6 and 7a. Moderate to good condition woodland habitats are also listed as an Endangered Ecological Community (Box-Gum Woodland) and are considered to be high constraint areas for the proposal. Impacts to these areas should be avoided. Provided that works avoid impacts on good quality woodland habitats, it is considered highly unlikely that the proposed activity would have an adverse effect life cycle of the Striped Legless Lizard such that a viable local population of the species is likely to be placed at risk of extinction.</p>
B) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	
	N/A

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

Approximately 983.1 hectares of the Endangered Ecological Community **White Box- Yellow Box - Blakely's Red Gum Grassy Woodland** occurs within the development envelope, 265.2 hectares of this total is considered to be in moderate to good condition (high constraint). Areas of pasture dominated by native grasses and a moderate diversity of forbs also come under the EEC definition. Areas of native pasture are irregularly interspersed between extensive areas of exotic dominated pasture throughout the development envelope. While small remnants or isolated trees in native pasture on other parts of the site must be regarded as belonging to the EEC under NSW legislation, they are considered to be of relatively low conservation significance due to the highly degraded nature of the groundcover and very limited recovery potential and therefore their removal is not considered likely to result in significant impacts on the extent or composition of the community such that its occurrence is likely to be placed at risk of extinction.

High conservation value EEC patches are considered to be high constraints for the proposal. The location and potential impacts on high constraint woodland EEC are outlined in the table below.

Location of high constraint woodland within development envelope	Aspect of works which may potentially impact the patch
On the central saddle on Cluster 10	Access track and turbine envelope
On the most south easterly crest on 10	track and 1 turbine
In the far north west corner on 10	track
Patches on the south facing slopes on 8	no impact
Patches on the south facing slopes on 7a and 7b	1 turbine
Within saddles and east of the northern part of Cluster 3	2 turbines, tracks and transmission easement
Within the transmission envelopes in the valley between 6 and 7a	Transmission easement

Based on the indicative layout, the proposal would remove approximately 3.5 hectares of Box-Gum Woodland in moderate to good condition, primarily along the edges of larger patches of woodland and in isolated stands on ridge tops and slopes. Of this total, only 0.59 hectares is woodland of high constraint (good, moderate to good and moderate condition).

The central saddle on Cluster 10 is the only area within the impact zones where the groundcover is in

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

moderate-good condition (few weeds and a fair level of native species diversity); however this habitat is continuous with an extensive area of good condition woodland EEC (about 100ha) immediately north of Cluster 10 which provides habitat to a number of threatened species. Tracks and turbines on Cluster 10 should be micro-sited to avoid impacts to high constraint woodland. Woodland on the slopes and valley between Clusters 6 and 7a is primarily on steep slopes, which is likely to be less suitable for transmission siting. This area is connected to a large woodland remnant along the south west facing slope of Cluster 7. The transmission routes should be micro-sited further south west to avoid impacting this woodland patch. Impacts on these two areas should be avoided in order to ensure that the proposal does not result in a significant impact on the extent or composition of the community.

Woodland remnants on Cluster 3 and in other areas are of less concern as these areas are more fragmented and disturbed by clearing than the patches around 10 and 7. Despite being of lower relative value, transmission, track and turbine siting should be micro-sited to minimise impacts to the existing woodland to maintain habitat stepping stones and avoid impacts to native understorey areas. This is particularly important when considering the cumulative impacts of the three Yass wind farms, all of which contain Box-Gum Woodland within the proposed development envelope.

Vegetation clearing in lower conservation significant areas (poor, poor-moderate condition and cleared native pasture) is likely to be required, however given the current fragmented and disturbed condition of these areas, and the small extent of works given the large extent of similar habitats onsite, this is not considered to be significant. All vegetation clearing should be offset to achieve an 'improve or maintain biodiversity values' outcome. Further survey work should be undertaken once the final turbine layout has been determined in order to calculate likely offset targets for derived Box-Gum Woodland native pasture.

Provided that impacts to high constraint woodland EEC are minimised, and any vegetation clearing is offset within nearby Box-Gum Woodland remnants, the proposal would not place the EEC at this location at risk of extinction, or modify the composition of remaining stands such that they are placed at risk of extinction.

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

Flora

Moderate to good condition woodland that occurs on the steep slopes of Cluster 7a are habitat for Yass Daisy. A proposed transmission envelope was within this area; however, the proposal has been modified to avoid

d) in relation to the habitat of a threatened species, population or ecological community:

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

impacts on high constraint woodland. Given that this species also occurs within woodland on other areas outside the development envelope, the proposed action is not considered likely to impact the long-term survival of the species within the locality.

It is very unlikely that either Yass Daisy or Burrinjuck Spider Orchid occurs undetected in other parts of the turbine sites due to the heavy grazing pressure to which all the higher parts of the site appear to have been subjected.

Ecological Communities

i) Extent of EEC removal and modification: Approximately 11.5 hectares of Box-Gum Woodland and Dry Grass Forest EEC has the potential to be removed as a result of the proposal, based on the indicative development layout; of this only 0.59 hectares is considered to be in good, moderate to good and moderate condition.

Removal of lower constraint woodland and derived native pasture is likely to be removed as a result of the proposal; however this is not likely to be significant given the disturbed and fragmented condition of these remnants. Vegetation offsetting would help to reduce the overall loss of woodland within the locality, and may also increase the habitat value of existing remnants offsets through fencing and weed control.

ii) Fragmentation: The works will not significantly exacerbate the existing fragmentation of the habitat and EEC. Fragmentation is already such that only more mobile fauna species and long-distance dispersing are likely to be able to utilise the habitat patches, and genetic exchange between remnants is likely to be limited.

iii) Examples of good and moderate condition Box-Gum Woodland are relatively rare within the region. Areas of this highly constrained woodland EEC occurs within the development envelope and is likely to be contribute to the long-term survival of the community within the locality. Derived native pasture and lower condition remnants are of lower conservation significance. The removal and modification of lower constraint EEC as a result of the proposal would contribute to the ongoing loss and degradation of the woodland community across the region, however given the extent of Box-Gum Woodland within the broad development envelope (983.12 ha) and elsewhere within the locality, this is not likely to impact the long-term survival of the species within the locality.

Fauna

i) Extent of removal and modification: five distinct habitat types are present on the site: modified wetland habitats, woodland and disturbed woodland, pasture and rocky outcrops.

These are summarised below:

Habitat type	Total extent within DE(hectares)	Threatened species potentially occurring in this habitat type
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d) in relation to the habitat of a threatened species, population or ecological community:

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

Woodland	241.37	Square-tailed Kite, Barking Owl, Hooded Robin, Diamond Firetail, Brown Treecreeper, Speckled Warbler, Painted Honeyeater, Regent Honeyeater, Superb Parrot, Turquoise Parrot, Swift Parrot, Gang-gang Cockatoo, Squirrel Glider, Koala, Eastern Bent-wing Bat, Little Pied Bat, Eastern False Pipistrelle, Yellow-bellied Sheathtailed Bat, Striped Legless Lizard, Little Whip Snake and Pink-tailed Legless Lizard
Disturbed woodland	780.75	Square-tailed Kite, Barking Owl, Hooded Robin, Diamond Firetail, Painted Honeyeater, Superb Parrot, Turquoise Parrot, Swift Parrot, Squirrel Glider, Koala, Eastern Bent-wing Bat, Little Pied Bat, Eastern False Pipistrelle and Yellow-bellied Sheathtailed Bat
Pasture with scattered trees	1,834.7	Square-tailed Kite, Diamond Firetail, Hooded Robin, Eastern Bent-wing Bat, Little Pied Bat, Eastern False Pipistrelle and Yellow-bellied Sheathtailed Bat, Striped Legless Lizard
Rocky outcrops	197.56	Little Whip Snake and Pink-tailed Legless Lizard
Modified wetland habitats	11.27	Large-footed Myotis; potentially all species for watering

The total direct footprint of the proposed turbine sites and associated infrastructure is approximately 70 hectares (refer to Tables 8-1 and 8-2). Impacts to higher quality woodland areas and wetland habitats would be avoided.

A number of threatened species utilise hollow-bearing trees for roosting and nesting. Only a small number of hollow-bearing trees occur within the development envelope on Clusters 10, on the edges of woodland on 7a and 6, and also adjacent to Whitefields Road. Impacts to hollow-bearing trees would be avoided where possible to minimise impacts to threatened fauna.

ii) Fragmentation: the site is already highly fragmented by clearing and grazing pressure. The proposed development would not further fragment woodland habitats as works would impact only isolated patches and copses of trees or the edges of larger woodland remnants.

d) in relation to the habitat of a threatened species, population or ecological community:

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

iii) The importance of the habitat to be removed as a result of the proposal has been assessed as a low and very low risk to the long-term survival of most of the relevant threatened fauna within the locality (part a. above). This is because the site is already highly fragmented and disturbed by clearing, grazing and weeds, wetland habitat would not be affected and works would aim to avoid impacts to high quality woodland habitat and hollow-bearing trees. Furthermore, the area to be impacted is small in relation to the availability of similar habitats on the site and within the locality and works would not result in fragmentation of habitats.

Only Superb Parrot was assessed as being at high risk of habitat removal. Superb Parrot is known to breed locally and have low fecundity. Suitable breeding habitat of Superb Parrot occurs within the site. This habitat is likely to be important to the long-term survival of Superb Parrot within the locality. Impacts to Superb Parrot habitat (identified in a.) should be avoided to ensure that the proposed action does not impact the long-term survival of the Superb Parrot within the locality.

Species	○ whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)
	No areas of critical habitat have been declared within the district.

Species	○ whether the action proposed is consistent with the objectives or action of a recovery plan or threat abatement plan
Flora and Ecological Communities	There is no national or NSW Recovery Plan for White Box – Yellow Box –Blakely’s Red Gum Woodland or for Yass Daisy. A Draft Recovery Plan exists for the closely related <i>Caladenia concolor</i> , <i>Caladenia</i> sp. <i>Bethungra</i> and <i>Caladenia</i> sp. <i>Burrinjuck</i> . Objectives or actions relevant to the latter species include survey for new populations in the vicinity of known populations, monitoring of known populations and improving public awareness of the three spider orchids in order to enlist support for the recovery program. The proposed action is consistent with these objectives, in that areas of (marginally) potential habitat have been surveyed for the relevant taxon as part of the preparations for the proposal.

Species	<ul style="list-style-type: none"> ○ whether the action proposed is consistent with the objectives or action of a recovery plan or threat abatement plan
Fauna	<p>Recovery Plans are have been made or adopted for the following species:</p> <ul style="list-style-type: none"> • Barking Owl • Regent Honeyeater • Swift Parrot • Koala • Striped Legless Lizard
Barking Owl	<p>The broad objective of the Draft Recovery plan for the Barking Owl is to ensure the long-term persistence of the Barking Owl in NSW through education, threat abatement and mitigation and through organisational support (NPWS 2003a). The recovery plan identifies the following relevant key threatening processes:</p> <p>Clearing of native vegetation;</p> <p>Continued net loss of native hollow bearing trees and coarse woody debris Removal of dead wood, dead trees and logs;</p> <p>Broad threat mitigation recommendations are as follows:-</p> <ul style="list-style-type: none"> • Avoid clearing good and moderate-good condition woodland. Preserve hollow-bearing and mature trees where possible, particularly in better quality remnants (such as on the edges of 7a, Cluster 10 and along Whitefields Road). • Offset vegetation clearing by protecting high quality areas outside the development envelope and within the locality (north of Cluster 10 and on the slope below 7). Ensure offset areas contribute to maintaining connectivity across the region.
Regent Honeyeater	<p>The broad objective of the National Recovery Plan for the Regent Honeyeater 1999-2003 is to ensure that the species persists and increases in the wild through maintaining and enhancing the value of habitat throughout their former range (Menkhorst <i>et al.</i> 1999). Relevant mitigation measures include:</p> <ul style="list-style-type: none"> • Avoid impacts to feed tree species (including Yellow Box, Blakely's Red Gum, White Box) within woodland remnants. • Avoid impacting habitat connectivity by restricting impacts to the edges of continuous woodland or isolated stands
Swift Parrot	<p>The broad objective of the Swift Parrot Recovery Plan is to change the conservation status of the Swift Parrot from endangered to vulnerable and to achieve sustained improvement in the quality of swift parrot habitat (Tasmanian Department of Primary Industries, Water and Environment) (Swift Parrot Recovery Team 2001). Relevant threats include habitat loss and adult mortality. Relevant mitigation measures to minimise impacts on Swift Parrot arising from the proposal include:</p> <ul style="list-style-type: none"> • Minimise impacts to woodland habitats, particularly along drainage lines to

Species	<ul style="list-style-type: none"> ○ whether the action proposed is consistent with the objectives or action of a recovery plan or threat abatement plan
	<p>protect foraging habitat</p> <ul style="list-style-type: none"> • Ensure collision impacts are monitored and implement adaptive measures are adopted if mortalities are found to occur.
Koala	<p>The broad objective of the Approved Recovery Plan for the Koala is to reverse the decline of Koala and to protect, manage and restore Koala habitat. The Plan identifies the following relevant threats:</p> <ul style="list-style-type: none"> • Clearing of native vegetation resulting in the loss, fragmentation and degradation of habitat • Broad threat mitigation recommendations are as follows:- • Avoid clearing good and moderate-good condition woodland, mature woodland, and potential movement corridors. Specific areas include Cluster 10, between Cluster 6 and 7, and within the mature woodland along Whitefields Road. • Offset vegetation clearing by protecting high quality areas within the locality
Striped Legless Lizard (EPBC)	<p>The broad objective of the National recovery plan for the Striped Legless Lizard (<i>Delma impar</i>) 1999-2003 is to ensure the long-term survival of <i>D. impar</i> throughout its distribution. Its main threat throughout its entire range is listed as habitat degradation and destruction (Smith and Robertson 1999). Relevant mitigation measures to minimise impacts on Striped Legless Lizard arising from the proposal include the protection of high-quality grassy woodland habitats from impacts on the site.</p>
Conclusion	This proposal is considered to be consistent with the objectives of these recovery plans.

Species	<ul style="list-style-type: none"> ○ whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process
	<p>Five Key Threatening Processes (NSW Scientific Committee 2008) are relevant to this proposal:</p> <p>Bush Rock Removal. Includes removal of rocky outcrops or rock within areas of native vegetation. Impacts of bush rock removal includes loss or disturbance of native flora and fauna species habitat, including those described (e.g. <i>Delma impar</i>). Rocky outcrops occur on all ridge sites within the development envelope. Disturbed rocks should be relocated in situ to ensure suitable micro-habitat resources are maintained.</p> <p>Invasion of perennial grasses: The invasion of native vegetation by exotic perennial grass has the potential to occur following the construction phase. The Box-Gum Woodland EEC in particular is vulnerable to the introduction and spread of perennial grasses such as African Love Grass, Serrated Tussock, Phalaris, Cocksfoot, Yorkshire Fog and Paspalum. Weed controls should be implemented through an Environmental Control Plan prior to commencement of works.</p>

	<p>Clearing of native vegetation. Impacts of clearing include fragmentation, destruction of habitat, riparian zone degradation, loss of leaf litter layer and increased habitat for invasive species. Clearing is defined as “...the destruction of a sufficient proportion of one or more strata within a stand or stands of native vegetation ...” (NSW Scientific Committee 2008).</p> <p>Loss and/or degradation of sites used for hill-topping by butterflies. Hill-topping in butterflies is a very complex behaviour that often facilitates meeting of the sexes. Factors which determine whether an area is suitable can be subtle so that even small changes may cause butterflies to abandon the area. Disturbance of plants on, or topography of, the hill-top, or to its slopes and immediate surroundings, may render it unsuitable to butterflies as a hill-topping site. In the absence of other hill-topping sites, butterflies may disappear entirely from a district. Loss of hill-top habitats throughout NSW would affect butterfly species which rely on such sites and some local extinctions have undoubtedly occurred due to hill-top alteration. Loss of hill-topping sites due to habitat alteration (e.g. loss of vegetation for communication towers or power transmission lines), may lead to loss of perching or patrolling sites for male butterflies, loss of focal points for mating and thus local extinctions.</p> <p>Considered cumulatively, the impacts of the proposed Coppabella wind farm and the other 3 sites planned for the District may exacerbate this threatening process.</p> <p>Loss of hollow-bearing trees. Around 174 NSW vertebrate species are known to use tree hollows for shelter and nesting, including those discussed. Generally hollow-bearing trees are in decline due to reasons including lack of recruitment and clearing. In particular, trees bearing large hollows are rare, and required by species discussed including Powerful Owl. Generally hollow-bearing trees near riparian habitat are most valuable.</p> <p>Only a small number of hollow-bearing trees occur within the development envelope on Clusters 10, 3 north, along the edges of woodland below 7a and 6, and also adjacent to Whitefields Road. These do not occur near riparian habitat. Removal of these trees in higher quality woodland habitat and in mature remnants would be avoided.</p> <p>Removal of dead wood and dead trees. Removal of standing or fallen dead wood removes potential hollows in stags as well as ground refuge sites. All the sites provide this habitat resource. The proposed works may exacerbate this process during clearing for tracks or turbines, however all litter and timber disturbed would be relocated in situ to ensure suitable micro-habitat resources are maintained.</p>
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E.2 EPBC ASSESSMENTS OF SIGNIFICANCE

The *Environmental Protection and Biodiversity Conservation Act (C'th) 1999* specifies factors to be taken into account in deciding whether a development is likely to significantly affect Endangered Ecological Communities, threatened species and migratory species, listed at the Commonwealth level.

The assessment should be read in conjunction with the Assessment of Significance under the NSW EP&A Act and TSC Act (Appendix E), and the *Windfarm Risks to Birds and Bats Addendum* (Appendix G) which contain background information in relation to species ecology, species and community distribution and scale, specific development impacts, and impact risks. The assessments have been made assuming no mitigation measures. Some high risk category impacts may potentially be mitigated. Mitigation measures are detailed in Section 8.

Endangered Ecological Communities

White Box - Yellow Box - Blakely's Red Gum Woodlands Critically Endangered Ecological Community (CEEC)

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

a) reduce the extent of a community,

Approximately 15ha of grassy woodland occurs within the development envelope that is of sufficient integrity to be classified as Box, Yellow Box, Blakely's Red Gum Grassy Woodland CEEC, under the EPBC Act occurs within the proposed development envelope: between Clusters 5, 6, and 7a (Area 4, shown in Appendix I, map zone 2). Woodland in this area is primarily on steep slopes, which is likely to be less suitable for transmission siting. Works in this area would reduce the extent of CEEC woodland on the site and should be avoided or micro-sited further south west to avoid impacting standing live and dead trees within this woodland patch. The modifications outlined in Section 9 demonstrate that the proposal has been modified to avoid impacts on this area.

b) fragment or increase fragmentation of the community, for example by clearing vegetation for roads or transmission lines;

The proposal would not act to fragment this community provided that the proposed transmission in the valley between 5 and 7a proceeds further south west to avoid standing live and dead trees within the CEEC area.

c) adversely affect habitat critical to the survival of an ecological community which consists of, or includes, fauna species;

The development would not have this effect, provided that the transmission between 5 and 7a is micro-sited to avoid impacting trees within this woodland patch and weed controls implemented.

d) modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;

Soils and nutrient balance are already highly disturbed due to grazing impacts over most of the site. It is apparent from differences in soil levels across some fences on ridge crests within the site that there has been substantial soil loss from some areas due to baring of the soil from overgrazing and sheep trampling, and wind erosion. Elevated nutrient levels are clearly present in areas favoured as sheep camps, with vegetation dominated by thistles and nettles. Some modification of surface water drainage patterns has undoubtedly also occurred due to soil compaction and loss of vegetation cover. Salinisation is reported by some landowners in the district, though no definite evidence of this was detected on the site.

This aspect of the landscape (soils and the water cycle) is already quite heavily disturbed. The proposal could lead to further damage if roading to provide access to the ridge crests, or other infrastructure development associated with the development interferes further with overland runoff.

Sediment controls should be implemented through a Construction Environmental Plan to prevent onsite habitat degradation during and following the proposed works. This Plan would ensure that the CEEC patches are not substantially impacted by the modification of essential abiotic factors.

e) cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;

The proposal would not have this effect, provided that works in this area are micro-sited to avoid trees within the community and weed controls are implemented.

f) cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: - assisting invasive species that are harmful to the listed ecological community to become established; and - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community;

The proposal would not have this effect, since the area of vegetation likely to be cleared or modified is small in comparison to the extent of the community that occurs within the locality; and works in this area would be discrete and could be micro-sited to avoid trees within the community. Hazardous spill and sediment erosion controls would be implemented as part of the proposed works.

The invasion of native vegetation by exotic species may impact this community. The Box-gum Woodland CEEC in particular is vulnerable to the introduction and spread of perennial grasses such as African Love Grass, Serrated Tussock, Phalaris, Cocksfoot, Yorkshire Fog and Paspalum. It appeared at the time of the survey that perennial exotic grasses were uncommon on the site, so the proposal is unlikely to exacerbate their spread, unless new grass weeds are introduced. Weed control measures should be implemented through an Environmental Control Plan prior to commencement of works. Machinery and vehicles should be washed down before being brought onto the site and unnecessary soil disturbance should be avoided, to minimise the risk of exacerbating weed invasion in the EEC remnants.

g) interfere with the recovery of an ecological community.

The proposal would not interfere with the recovery of the EEC, since the area of vegetation likely to be cleared or modified is small in comparison to the extent of the community that occurs within the locality; and works in this area would be discrete and could be micro-sited to avoid trees within the community. No recovery plan has yet been prepared for this EEC.

Threatened flora and fauna species

Species	a) Will the action lead to a long-term decrease in the size of a population of a species?
FLORA	
Yass Daisy	<p>Yass Daisy was recorded on the slopes below 7a, part of which falls within a proposed transmission corridor between Clusters 6 and 7a; and also in the woodland patch north of Cluster 10. Burrinjuck Spider Orchid has not been recorded on the site and is not likely to, given the absence of suitable habitat and the grazing history.</p> <p>Yass Daisy may occur within moderate to good condition woodland patches on steep slopes in other areas on the site. The probability that this species occurs on the heavily grazed ridges and upper slopes within the turbine impact zone is very low, as it was not recorded in any of the areas surveyed in this type of habitat.</p> <p>Works within the proposed transmission easement between Clusters 6 and 7a should be micro-sited so that moderate to good condition woodland is not impacted. A pre-clearance survey should be conducted prior to works along the edges of moderate to good condition woodland to ensure that no individual Yass Daisies are impacted. This would ensure that works are not likely to lead to a long-term decrease in the population size.</p>
FAUNA	
Regent Honeyeater	<p>Local feed species including Yellow Box and Red Stringybark are present on the site, however given the disturbed and fragmented nature of the site, the removal of 11.5 hectares of woodland vegetation is not considered likely to impact this species given their high mobility and the extent of similar vegetation present within the vicinity.</p> <p>Research in grazing landscapes in southern NSW showed a pronounced trend for nectarivores to move along densely vegetated areas, and using the same route for return journeys (Fischer and Lindenmayer 2002a). This suggests that if present, Regent Honeyeaters are more likely to use valleys, roadside remnant corridors and low hills than the disturbed high ridges of the proposed turbine sites to reach foraging habitat. Consequently, blade-strike and habitat removal are assessed to be low risks to this species and are unlikely to lead to a long-term decrease in the size of a local population.</p>
Superb Parrot	<p>West of Yass forms part of the core breeding population of the Superb Parrot. This species have low fecundity and are known to nest locally in September-January in small colonies, using tree hollows in open Box-gum Woodland or isolated paddock trees (Manning et al. 2004). Habitat removal, particularly the removal of hollow-bearing trees in mature woodland remnants, is considered to be a high risk for this species, and has the potential to result in significant impacts on a local population of this species. The proposal would remove approximately 11.5 hectares of woodland, however only 0.59 hectares of this is within woodland of good, moderate to good and moderate condition. Potential Superb Parrot habitat occurs in:</p> <ul style="list-style-type: none"> • road-side remnants adjacent to Whitefield's Road

- **in the saddle and north west crest on Cluster 10**
- **in the transmission easement on the south-facing slope and saddle between Clusters 6 and 7a**
- **in hollow-bearing paddock trees and good condition woodland that occur within the valley between Clusters 5 and 7a**

Impacts on these areas, in particular on hollow-bearing trees, should be avoided to ensure that the proposed action does not lead to a long-term decrease in the size of a population of the Superb Parrot.

Superb Parrots fly in large flocks and have low fecundity and are at risk of population-scale impacts as a result of blade-strike. The species tend to use woodland remnants to forage and move across the landscape and are less likely to cross extensive open areas (Garnett & Crowley, 2000). Consequently, feeding areas and flying routes are more likely to correspond with valleys and low hills with tree cover and remnant woodland along roadsides, rather than with the ridge top turbine sites, reducing the risk of collision impacts. This species would be targeted for monitoring during the operation of the wind farm. Adaptive measures would be adopted if mortalities are found to occur in order to ensure that the action does not lead to a long-term decrease in the size of a local population.

Swift Parrot The Swift Parrot is a migratory species travel in large flocks, however, they are maneuverable fliers and do not breed locally. A recent cumulative assessment of 39 wind farms located in the distribution range of the Swift Parrot concluded that the combined blade-strike impact of all of these wind farms would not be significant (Biosis Research 2006). The species may forage within the woodland on the site; however given that the species does not breed in the region, the removal of 11.5 hectares of box gum woodland vegetation is not likely to result in significant impacts on the species such that the action leads to a long-term decrease in the size of a local population.

Pink-tailed Legless Lizard There is likely to be a low risk to Striped Legless Lizard populations due to habitat loss given the absence of suitable native grassland habitats. The species may also occur within marginal grassland habitats with exotic species or grassy woodland; however the extent of grazing and weed invasion greatly reduces the likelihood that the species would persist on the site.

Striped Legless Lizard Pink-tailed Legless Lizard occurs within rocky outcrops in native grassy woodland. Clusters 10 is the only area within the development envelope that features rocky outcrops in woodland. Rocky outcrops also occur within grazed native and exotic pasture habitats. Given the discrete nature of the development, the extent of similar nearby habitat and the grazing regime within these areas, habitat removal is considered to be a low risk for these species. The action is not likely to result in significant impacts on the species such that the action leads to a long-term decrease in the size of a local population.

b) Will the action reduce the area of occupancy of the species?

FLORA

Development within moderate to **good** condition woodland on slopes for transmission construction would reduce the area of potential habitat for Yass Daisy. Works on the saddle and slopes between Clusters 6 and 7a have been moved south so that moderate to good condition woodland is not impacted to ensure that the

development does not reduce the area of occupancy of the species.

It is not likely that suitable habitat for the Burrinjuck Spider Orchid is present within the development envelope.

FAUNA

Works within moderate to good condition woodland, particularly mature woodland, may reduce the breeding area for Superb Parrot. Specific areas of concern for this species include impacts to road-side remnants along Whitefields Road, in the saddle and north west crest on Cluster 10, in the transmission easement on the saddle between Clusters 6 and 7a, and in hollow-bearing paddock trees in the valley between Clusters 5 and 7a. Impacts to these areas (in particular the removal of mature trees) should be avoided.

Regent Honeyeater and Swift Parrot are migratory and do not breed within the region. Works within woodland habitats would result in a reduction in potential foraging habitat for these species; however, impacts would primarily occur within disturbed and fragmented areas on ridge tops and in cleared habitats, with only 0.59 hectares of moderate to good condition woodland expected to be impacted. This is not considered to be a significant loss of habitat for these species.

The risk of blade-strike reduces aerial habitat for bird species. On-going monitoring to study the long-term effects of the operational wind farm on birds and bats in the locality is recommended.

The proposal would remove approximately 54 hectares of native and exotic pasture and 5.15 hectares of rocky outcrops. These habitats occur on all turbine Cluster ridges and are predominately disturbed by intensive grazing and weed invasion and could only be considered marginal habitat for the Striped Legless Lizard and the Pink-tailed Legless Lizard. Impacts to rocky outcrops within higher quality woodland habitat on Cluster 10 may reduce the area of occupancy for the Pink-tailed Legless Lizard, should it occur on the site; however this represents only a small habitat loss in relation to the availability of similar habitat outside the development envelope and is unlikely to significantly impact the species.

c) Will the action fragment an existing population into two or more populations?

The proposed works are unlikely to result in fragmentation of woodland habitats given that the site is already highly fragmented and disturbed from grazing and clearing. Permanent habitat removal for wind turbines would occur primarily within marginal ridge-top woodland. Access to the turbine Clusters is via existing tracks and roads, along the edges of woodland habitats or within cleared and disturbed areas. Works be micro-sited to avoid removal of mature and hollow-bearing trees and continuous woodland habitat. Track and road widening would not dissect continuous patches; however this may result in the reduction of habitat 'stepping stones' for use by mobile fauna. This is not considered likely to result in significant impacts on fauna and flora in the locality given the limited extent of woodland habitat removal in relation to the extent of woodland that occurs within the broad development envelope (983.12 ha).

d) Will the action adversely affect habitat critical to the survival of a species?

Yass Daisy was found within moderate to good condition continuous woodland on the steep slopes below 7a and north of Cluster 10. Similar condition woodland patches on steep and lower parts of the site could be considered critical habitat for this species, provided that grazing is not severe.

The Superb Parrot is known to breed within the region. The loss of large hollow-bearing trees and mature forest remnants from land clearing is an ongoing threat for the species within the region. Suitable breeding and habitat is present within the study area and could be considered critical habitat for this species.

The site is not considered to be critical to the survival of any of the other flora or fauna species assessed.

e) Will the action disrupt the breeding cycle of a population?

The proposal may disrupt the breeding cycle of **Yass Daisy** by reducing potential habitat in moderate to good condition forest remnants on steep slopes and lower parts. Specifically, works within the proposed transmission easement between Clusters 6 and 7a have been moved south so that moderate to good condition woodland is not impacted. All construction works should be conducted outside the flowering and seeding season for this species (late spring – early summer).

The proposal may disrupt the breeding cycle of **Superb Parrot** by reducing breeding habitat in mature forest remnants. The following potential works are high risk:

- Road widening within mature woodland remnants on Whitefields Road, resulting in removal of hollow-bearing trees
- Removal of mature woodland and hollow-bearing trees on the north west peak on Cluster 10
- Removal of moderate and moderate-good quality Box-gum Woodland in the saddle on Cluster 10
- Removal of hollow-bearing trees and good quality Box-gum Woodland between Clusters 6 and 7a for the electricity transmission

The visual and noise impact of the wind turbines has the potential to disrupt foraging behaviour. This is most likely to be an issue at Clusters 10 given the proximity to good condition woodland.

Works would not disrupt the breeding cycle of the Pink-tailed Legless Lizard or the Striped Legless Lizard given that the site could only be considered marginal habitat for these species.

Swift Parrot and Regent Honeyeater do not breed within the region.

f) Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Generally, the proposal is unlikely to cause a decline of the assessed species. However, the works in locations already highlighted in a) pertaining to the Superb Parrot and Yass Daisy, may cause a decline in the local populations.

Works in these areas should be micro-sited so that moderate to good condition woodland, and hollow-bearing paddock trees are not impacted in order ensure that the proposal does not cause a decline in the local population of either species.

g) Will the action result in invasive species that are harmful to a critically endangered or endangered/vulnerable species becoming established in the endangered or critically endangered species/vulnerable habitat?

Flora

The proposal could result in the introduction or spread of any exotic species if seed of invasive plants are introduced on machinery or vehicles, or enabled to spread from nearby pasture as a result of disturbance of the groundcover or soil on the site. A dense infestation of weeds could reduce the amount of bare ground available for orchids or other native forbs, and lead to the local extinction of a population of the Yass Daisy or Burrinjuck Spider Orchid should one occur on this site. However, given that the locations where the Yass Daisy currently occurs adjacent to the site are not particularly weedy, despite intense disturbance from grazing and weeds nearby, it seems unlikely that the additional disturbance caused by this proposal will make much

change to its habitat in this respect. Weed controls should be implemented through a Construction Environmental Plan to prevent onsite habitat degradation during and following the proposed works.

Fauna

The development is unlikely to result in the introduction or spread of any exotic species harmful to assessed species.

h) Will the action interfere with the recovery of the species?

Flora

Impacts on woodland that occurs on the steep slopes of Cluster 7a would be likely to impact the local population of Yass Daisy that occurs within this area. However, given that this species also occurs within woodland on other areas outside the development envelope, and that the transmission development could be micro-sited to avoid impacts on continuous woodland, the proposed action is not considered likely to interfere with the recovery of the Yass Daisy.

Fauna

Potential impacts disruption to breeding, or removal of breeding habitat may interfere with species recovery. As already discussed, this may be an issue for Superb Parrot. Impacts on hollow-bearing and mature trees within the areas listed in d) should be avoided in order ensure that the proposal does not interfere with the recovery of this species.

The proposal is not likely to interfere with the recovery of the other species assessed (see part f. of the TSC Act seven-part test, Appendix E).

Migratory species

Of the ten migratory terrestrial species indicated as having potential to be present within 50 kilometres of the proposal site by the Search Tool report, the following six *have at least moderate potential* to use aerial habitat at the proposal site:

- Regent Honeyeater (*Xanthomyza phrygia*)
- Swift Parrot (*Lathamus discolor*)
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*)
- White-throated Needle-tail (*Hirundapus caudacutus*)
- Rainbow Bee-eater (*Merops ornatus*)
- Cattle Egret (*Ardea ibis/ Bubulcus ibis*)

The significance of potential impacts to the Regent Honeyeater and Swift Parrot has been addressed above. A monitoring and adaptive management program would be developed and implemented to respond to any unforeseen impacts on any significant species (refer Section 8.2.2).

The risk of blade-strike is the most likely potential impact to migratory species from the proposal.

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

a) Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species

No, the development is not likely to substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the assessed migratory species.

The **White-bellied Sea-Eagle** and **Cattle Egret** are mostly associated with lowland areas including riparian corridors, wetlands, rivers and lakes (Schodde and Tidemann 2007). Cattle Egrets also forage within moist paddocks, creeks and farm dams. These latter habitats occur within the study area, although are highly disturbed from grazing, weed invasion, erosion and sedimentation and are not considered to provide important habitat for these species. The species are migratory and may cross the ridges within the study area while migrating from larger wetland systems in the west to wetlands on the coast, or between Lake Burrinjuck and wetlands in the north, and therefore be at risk of blade-strike. However given that wetland habitats do not occur locally, bird movements across the site are likely to be diffuse and irregular, rather than concentrated and seasonal. Long-distance migratory birds are likely to have attained a travelling altitude greater than the turbine height. Further, water birds are probably likely to follow riparian corridors, rather than travel over ridge systems in agricultural land. The ridges do not directly bisect large water bodies therefore do not fragment or isolate areas of habitat. Habitat removal and collision impacts are considered to pose **very low** and **low risks** respectively to migratory water-birds.

The **Rainbow Bee-eater** utilises a variety of habitats, including woodland, cleared areas, open forest usually near water. This species was observed during the surveys. The species forages for insects from open perches, pursuing prey on the wing. Approximately 11 hectares of disturbed riparian forest occurs within the development envelope, at the point where the transmission envelope crosses Jugiong Creek. Impacts to this area are likely to be minimal (0.14 hectares) and are unlikely to impact this species. There are few threats recorded for the species, although collision with lighthouses during migration may cause mortality. Mortality from such causes appears to be rare (DEWHA 2008). Migration and movement patterns are poorly understood. The species is highly manoeuvrable, and therefore it is considered unlikely that the proposal would result in impact habitat such that there would be a population scale effect on the Rainbow Bee-eater. Monitoring during wind farm operation would target this species to document collision impacts and ensure that adaptive measures would be adopted if mortalities are found to occur.

The **White-throated Needle-tail** travel in large numbers between the northern (breeding) and southern hemisphere. They forage on insects, captured in flight, often feeding in rising thermal currents and travelling nomadically following storm updraughts (DEWHA 2008; Schodde and Tidemann 2007). The species flies at great heights above the Earth's surface and has been recorded flying c.1000-2000m ASL over the Australian Alps (Pizzey et al., 2006), making it unlikely that the species would regularly encounter wind turbines blades, or be impacted by the minor loss in aerial foraging habitat. The development would not substantially modify, destroy or isolate an area White-throated Needle-tail habitat.

b) Result in invasive species that is harmful to the migratory species becoming established in an area of important habitat of the migratory species

The development would not result in the introduction or spread of any exotic species harmful to migratory species.

c) Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species

It is likely that the proposal poses a **low risk** to the lifecycle of **Cattle Egret** and **White-bellied Sea-Eagle**, as suitable habitat does not occur on the site and these species would be likely to follow rivers and wetlands, rather than travel over ridges to reach suitable breeding and foraging grounds.

It is likely that the proposal poses a **low risk** to the lifecycle of **Rainbow Bee-eater** and **White-throated Needle-tail** over the population. Although the proposed development may reduce the total amount of aerial habitat available for foraging, may cause changes in habitat utilisation during foraging and has potential to cause blade-strike mortality due to foraging habits (such as foraging in groups, utilising thermals (Needle-tail only)), these impacts are unlikely to seriously disrupt the lifecycle of the species resulting in population scale impacts.

Appendix F **NON-LISTED** **FAUNA** **RISK**
ASSESSMENT

The framework provided in the Australian standard for risk management and related guidelines, AS/NZS 4360 (Anon 2004a, 2004b), and the associated guide for environmental risk management HB203:2000 (Anon 2000), assesses risk using a combination of consequence (or potential impact) and the likelihood of occurrence of the impact (See below Auswind 2006)

Likelihood	Consequence			
	Insignificant	Minor	Moderate	High
Very rare	L	L	M	H
Rare	L	L	M	H
possible	L	M	H	H
probable	M	H	H	H

Where: L: Low risk, M: Moderate risk, H: High risk

Species	Description	Relevant behavioural ecology	Potential effects	Likelihood	Consequence	Risk (pop)
Wedge-tailed Eagle <i>Aquila audax</i>	Common and widely distributed in forest and plain habitats across Australia. Breeding pairs are monogamous and sedentary within a large well defined and defended home range of up to 100km (DECC 2002; Sharp <i>et al.</i> 2001).	Usually forages at or above blade height over open country but nests in forests. Foraging is by soaring on air currents and swooping onto prey (Schodde and Tidemann 2007). Feeds on birds, rabbits, small mammals. Rabbits and lambs are local food sources. Can soar continuously for up to 90 minutes, reaching heights of 2000m ASL (DECC 2002). Soar and skirmish in	This species has been observed successfully avoiding turbines at several different wind farms and are considered to have at least a 95% avoidance rate (Brett Lane & Associates 2003); Wonthaggi EES Panel 2003). However, Wedge-tailed Eagles are known to have died as a result of blade-strike in Tasmania and Victoria (URS Australia 2004). Mortalities for the related Golden Eagle in US were attributed to the presence of prey around turbines. Turbines with lower blade reaches were most deadly to Golden Eagles,	Possible	Moderate	H

Species	Description	Relevant behavioural ecology	Potential effects	Likelihood	Consequence	Risk (pop)
		wind over steep hills and peaks. Territorial displays include steep dives (Pizzey <i>et al.</i> 2006). Observed five times above 40m: ridge of 7a, 5, 9 and flying over the gully between Clusters 5 and 7a (2 individuals).	with summer and winter having the highest mortality rates (Thelander <i>et al.</i> 2003). Transient juvenile Wedge-tailed Eagles rapidly fill empty territories (Sharp <i>et al.</i> 2001). If ongoing fatalities occur at the proposed wind farm, there is a risk of becoming a population sink.			
Nankeen Kestrel <i>Falco cenchroides</i>	Sedentary or nomadic. Nests in tree hollows; nests of other raptor, babbler or chough; ledge or cavity in cliffs (Pizzey <i>et al.</i> 2003). Hollows are found in isolated paddock trees and in woodland fragments and more extensive areas of woodland at all sites.	Singles, pairs, or family parties hover over grasslands at about 10-20m height and soar in air currents on cliffs and buildings (Pizzey <i>et al.</i> 2003). Feeds on ground-dwelling prey including invertebrates and small reptiles and mammals. Tend to forage by perch-pounce when still and by hovering during windy conditions (Genelly 1978). Observed five times above 40m: ridge of 6, 7a (twice), 7b and 10	Studies indicate that kestrels do not display avoidance behaviour around turbines, yet report low mortality. Foraging may occur at blade height, although generally during windy conditions appears to remain closer to the ground (10-20m). Relatively large number of individuals within populations. The species is relatively common at the Woolnorth and Codrington wind farm sites and no collisions have been recorded at those sites (Meredith <i>et al.</i> 2002). Likely to habituate to turbines over time.	Possible	Insignificant	L
Brown Falcon <i>Falco berigora</i>	Sedentary or nomadic. Inhabits broad range of habitats including open woodland, forest clearings, farmlands and roadsides, among other habitat types. Local populations can be	Relatively high populations density (McDonald <i>et al.</i> 2003b). Forages from perches and also quarters and hovers high through open country at 10-30m, also soars to great heights (Pizzey <i>et al.</i> 2006; Schodde and Tidemann 2007). The main prey	A Brown Falcon mortality has been reported from the Codrington wind farm. Using this case, the avoidance rate for this species was calculated to be 95% (Meredith <i>et al.</i> 2002).	Possible	Insignificant	L

Species	Description	Relevant behavioural ecology	Potential effects	Likelihood	Consequence	Risk (pop)
	irruptive (McDonald <i>et al.</i> 2003b; Pizzey <i>et al.</i> 2003). Prey includes lagomorphs, small ground prey, small birds, large birds or reptiles (McDonald <i>et al.</i> 2003a).	attack technique is hover and drop (Baker-Gabb 1984). Courtships displays involve rotating and gliding descents and mutual soaring (McDonald <i>et al.</i> 2003b). Observed flying above 40m at two locations: from the ridge on Cluster 6 and over a valley north of 6				
Australian Hobby <i>Falco longipennis</i>	Inhabits a range of open habitats, typically woodland with large trees and timbered watercourses. Often seen over cities (Pizzey <i>et al.</i> 2006). Builds stick nest in top of tall trees. Nomadic and migratory (Schodde and Tidemann 2007).	Pursues in flight small and medium sized birds (including ducks and herons) at tree-top level and soars for flying insects (Pizzey <i>et al.</i> 2006). Also often hunts at dusk (Schodde and Tidemann 2007). Appears able to adapt and habituate to developed environments. Uncommon (Pizzey <i>et al.</i> 2006). Observed flying above 40m from Cluster 5	There is little available information on the behaviour and movement patterns of this species in and around wind farms. The assessment is made considering that the species probably occurs at low densities, is migratory and appears to fly and forage within range of turbine blades at dusk.	Possible	Minor	M
Black-shouldered Kite <i>Elanus axillaris</i>	Distributed throughout mainland in woodlands. Feeds on rodents, reptiles, amphibians and insects. Builds nest in tall trees (Schodde and Tidemann 2007).	Foraging activity peaks at dusk. Usually hunt at 10-30m above ground by quartering and hover and drop attacks (Baker-Gabb 1984). Also uses perches. Soaring and fluttering forms part of courtship (Schodde and	There is little available information on the behaviour and movement patterns of this species in and around wind farms. Given that this bird is highly manoeuvrability it is assumed that it would be likely to have similar avoidance rate to Brown Falcon (95%).	Possible	Insignificant	L

Species	Description	Relevant behavioural ecology	Potential effects	Likelihood	Consequence	Risk (pop)
		Tidemann 2007). May raise 2-4 successive broods in a good spring (Pizzey <i>et al.</i> 2003)				
Black Kite <i>Milvus migrans</i>	Sedentary, dispersive and irruptive (Pizzey <i>et al.</i> 2006). Occurs in woodland and savannah across most of Australia. Feeds on carrion and live rodents, reptiles and insects (Schodde and Tidemann 2007).	Usually congregates in flocks of several hundred and forage communally (Schodde and Tidemann 2007). Quarters low and soars high during foraging (Pizzey <i>et al.</i> 2006).	As above.	Possible	Insignificant	L
Whistling Kite <i>Haliastur sphenurus</i>	Inhabits open forests and foothills, usually near water. Builds a bulky nest of sticks high in eucalypt. Occasionally nomadic (Schodde and Tidemann 2007).	Usually forage by transects low (15m) or by soaring at height and appears to dive attack (Baker-Gabb 1984). May forage alone or in large loose flocks (>100) although this is rare (Schodde and Tidemann 2007).	There is little available information on the behaviour and movement patterns of this species in and around wind farms. Given that the Kite may travel in flocks and is likely to forage within the height of turbine blades, it probably has a similar avoidance rate as Brown Falcon or Wedge-tailed Eagle (95%).	Possible	Insignificant	L
Swamp Harrier <i>Circus approximans</i>	Migratory, breeding mostly in Tasmania, Victoria and South Australia. Inhabits swamps and wetlands, tall grasslands and grain crops (Pizzey and Knight	Foraging tactics most commonly used are low quartering and transect hunting and flushing by stooping. Swamp Harriers soar occasionally. They appear to confine foraging to over lagoons, foreshores and long	It appears that specific investigations have not been undertaken into the behaviour and movement patterns of this species in and around wind farms, however, it is considered unlikely that the flight paths of Swamp Harriers would cause blade-strike risk.	Very rare	Insignificant	L

Species	Description	Relevant behavioural ecology	Potential effects	Likelihood	Consequence	Risk (pop)
	2003).	grass (Baker-Gabb 1984). More likely to be associated with flats than ridges and is unlikely to occur in study area, although may be found along Lake Burrinjuck.				
Brown Goshawk <i>Accipiter fasciatus</i>	Occurs in woodlands, open forests and scrublands. Builds nests in living trees 6-20m. Preys on small birds as well as small mammals (Pizzey <i>et al.</i> 2003). Sedentary; young birds may disperse up to 900km. Fairly abundant (Schodde and Tidemann 2007).	Mostly forages by perching with gliding or direct flying attacks within canopy. May also soar (Baker-Gabb 1984). Rarely leave the cover of forest or woodland (Schodde and Tidemann 2007).	Avoidance rate likely to be as for Brown Falcon, however, the species is unlikely to forage on cleared ridges.	Rare	Insignificant	L
Barn Owl <i>Tyto alba</i>	This species inhabits open forests, woodlands and grasslands with stands of timber, including farmlands. It nests in tree hollows. Diet includes small mammals, birds, lizards. Nomadic (Schodde and Tidemann 2007).	Usually nocturnal, although occasionally crepuscular foragers. Most often use perch and glide attacks, and also low quartering with hover and drop attack (Baker-Gabb 1984). Observed at Jugiong Creek, approximately 5km north of the site (near a proposed transmission easement).	Likely to fly at blade-height. Avoidance rate may be lower than for other birds discussed as is nocturnal hunter. However, specific investigations do not appear to have been undertaken.	Possible	Minor	M

Species	Description	Relevant behavioural ecology	Potential effects	Likelihood	Consequence	Risk (pop)
Tawny Frogmouth <i>Podargus strigoides</i>	Observed at Bannister and Pomeroy. Inhabits heavy forests to open woodlands, timber along watercourses in inland areas. Nests in flimsy stick platforms on branches 5-10m high. Sedentary (Pizzey 1985).	Active at dusk, takes prey from sitting position from ground surfaces such as roads. Feeding activities are more likely in timbered lowlands, and would generally occur below blade height.	Unlikely to forage a blade-height on ridges	Very rare	Insignificant	L
Peregrine Falcon <i>Falco peregrinus</i>	Habitat most commonly gorges and timbered watercourses, generally near rivers and swamps. Nests on rock crevice, bare ledge, tree hollow or old corvid nest, also on spires and tall buildings (Pizzey 1985). Sedentary with a home range of about 20-50km (Schodde and Tidemann 2007). Many local records.	This species appears able to adapt and habituate to human developments. Swoops on prey from above, at speeds of more than 300km/hours. Courtship involves circling flights, diving, swooping and tumbling from height (Schodde and Tidemann 2007).	No studies. Avoidance assumed to be as for Brown Falcon (95%). However, the speed at which may swoop on prey may affect negatively manoeuvrability while hunting.	Possible	Minor	M
White Ibis <i>Threskiornis molucca</i>	Can occur in large flocks, typically in pastures and swamps. Nests over water in dense trees or swamp growth. Highly nomadic, migratory or dispersive (Pizzey 1985).	Flocks in lines or 'v' formations with quick wing beats and glides. Australian White Ibises and other waterbird species demonstrate crepuscular peaks of abundance (Hamilton <i>et al.</i> 2004). Ibis and other waterbirds	In the Hunter Valley, the White Ibis was found to be one of the species most at risk of colliding with powerlines at night (Hunter Wetlands Research 1996 in URS 2004). In daytime bird behavioural studies at Codrington Wind Farm, where Straw-necked Ibises are abundant, 517 Ibises were	Rare	Minor	Low

Species	Description	Relevant behavioural ecology	Potential effects	Likelihood	Consequence	Risk (pop)
		may travel large distances between local water bodies and those in Canberra. They probably use riparian corridors.	observed. This study found that 476 birds adopted avoidance strategies of weaving between the turbines and 39 flew in a straight line through the site in a path that kept them well away from the turbines. There were no observed Ibis collisions and no Ibis carcasses have been found (Biosis Research 2002). Given that there are no suitable habitats for Ibis on the site or within close proximity, visitation to the site is not likely to be frequent.			
White-winged Triller <i>Lalage tricolor</i>	Occur in woodland and dry open forest throughout the mainland. It prefers lightly timbered country with an open shrub layer and grassy groundcover. Breed in colonies. Migratory and partially nomadic (Schodde and Tidemann 2007).	Migrates in large flocks, moving south to breed in spring, travelling in small flocks of 3-50 birds. May forage for insects during flight (Schodde and Tidemann 2007). Displaying includes circling, climbing and gliding flight. Local records.	Migrating songbirds were shown to be the most affected group in wind farms studies in the northern hemisphere (AusWEA 2002). The ridges on the site are predominately cleared and heavily grazed, with no shrub understorey, which reduces the collision risk	Rare	Minor	L
Australian Magpie <i>Gymnorhina tibicen</i>	Occur in eucalypt woodland throughout most of Australia. Sedentary, living in groups of 3-24 birds.	Forage on the ground in open fields. Glide to foraging sites. May fly to great heights in aggressive pursuit of potential predators. Flocks may become very large with food flushes (Schodde and Tidemann 2007).	Regularly use air-space at blade height although readily adapts to human developments. The species is also abundant and common; therefore the population scale impact would be low.	Possible	Insignificant	Low

Species	Description	Relevant behavioural ecology	Potential effects	Likelihood	Consequence	Risk (pop)
		Observed in all habitats on the site				
Silvereye <i>Zosterops lateralis</i>	Most vegetation types, preferring dense coastal shrubs, commercial orchards and urban parks and gardens. Partially migratory (Schodde and Tidemann 2007).	Forage in low shrubs. Migrate to northern Australia in large groups flying high during the night with activity appearing to peak pre-dawn (Chan 1995).	Night migrating song birds were the greatest impacted type of bird in North American and European wind farm studies. This suggests the likelihood of blade-strike for Silvereye would be probable. However, Atlas of NSW Wildlife records indicate that there may be a migration route to the coast following the more densely vegetated areas south of the study area. The majority of migration occurs along the coast (Schodde and Tidemann 2007). Flocking is a risk behaviour however given the small size of the bird, mass mortalities may not occur during a blade-strike event.	Possible	Minor	M
Galah <i>Cacatua roseicapilla</i> Sulphur-crested Cockatoo <i>Cacatua galerita</i>	Occur in a variety of habitat types including open country with scattered suitable trees or woodland areas	Both may travel some distance between roosting and feeding places, and feed on the ground, often in large flocks. When travelling between roosting and feeding sites both fly at height. Galahs are fast and agile fliers (Schodde and Tidemann 2007). Observed on the site in all habitats.	Galahs are considered high risk in the aeronautical industry as they fly unpredictably in large flocks; groups are often struck by planes (ATSB 2002). Both cockatoos are agile fliers, galahs perhaps more so, and therefore are likely to have a high avoidance rate. Both species are also abundant and common, therefore the population scale impact would be low.	Possible	Insignificant	L

Species	Description	Relevant behavioural ecology	Potential effects	Likelihood	Consequence	Risk (pop)
Crimson Rosella <i>Platycercus elegans</i>	Sclerophyll forests, woodlands and timbered farmlands. Sedentary living in small groups of bonded pairs; juveniles may form large flocks (Pizzey <i>et al.</i> 2006).	Feeds on the ground in shade or on the outer branches of eucalypts, foraging on fruits and seeds. Fast, undulating flight between feeding, watering and roosting places (Schodde and Tidemann 2007).	Rosellas are seen flying high above canopy and over open areas (pers.ob), although prefer cover. They may encounter turbines during daily dispersal, but are likely to have a high avoidance rate, as for other parrot and cockatoo species. There is no information about parrots being in a high risk group amongst Australian wind farm literature.	Rare	Insignificant	L
BATS						
Recorded bats <i>Chalinolobus gouldii</i> <i>Mormopterus</i> sp 4 <i>Nyctophilus</i> spp <i>Scotorepens balstoni</i> <i>Vespadelus</i> spp	The non-listed bats recorded on site are mostly forest dwelling bats (Strahan 1983) and roost in tree hollows.	The bats recorded (see Appendix B) mostly forage for insects close to the ground or within the forest canopy (Strahan 1983).	The bats considered roost and forage within forest and woodland blocks. They may encounter turbine areas travelling between blocks, but are generally unlikely to be travelling at blade height	Rare	Minor	L

Appendix G **WINDFARM RISKS TO BIRDS AND BATS**

Please see Attachment 3.3 of the Yass Valley Wind Farm Environmental Assessment

Appendix H **PHOTOGRAPHS OF THE SITE**







	
<p>Photo 1. Extensive rocky outcrops along ridges in Cluster 4</p>	<p>Photo 2. Areas heavily grazed by sheep in Cluster 1</p>
	
<p>Photo 3. Extensive rocky outcrops in Cluster 2</p>	<p>Photo 4. Creek crossing near proposed transmission route to the north of Cluster 2</p>
	
<p>Photo 5. Looking west from Cluster 6 toward Cluster 3, showing steepness of hillsides</p>	<p>Photo 6. Potential reptile habitat and refuge at Cluster 7a</p>



Photo 7. Edge of Box-gum Woodland CEEC (*E.albens* pictured) at the north end of Cluster 3

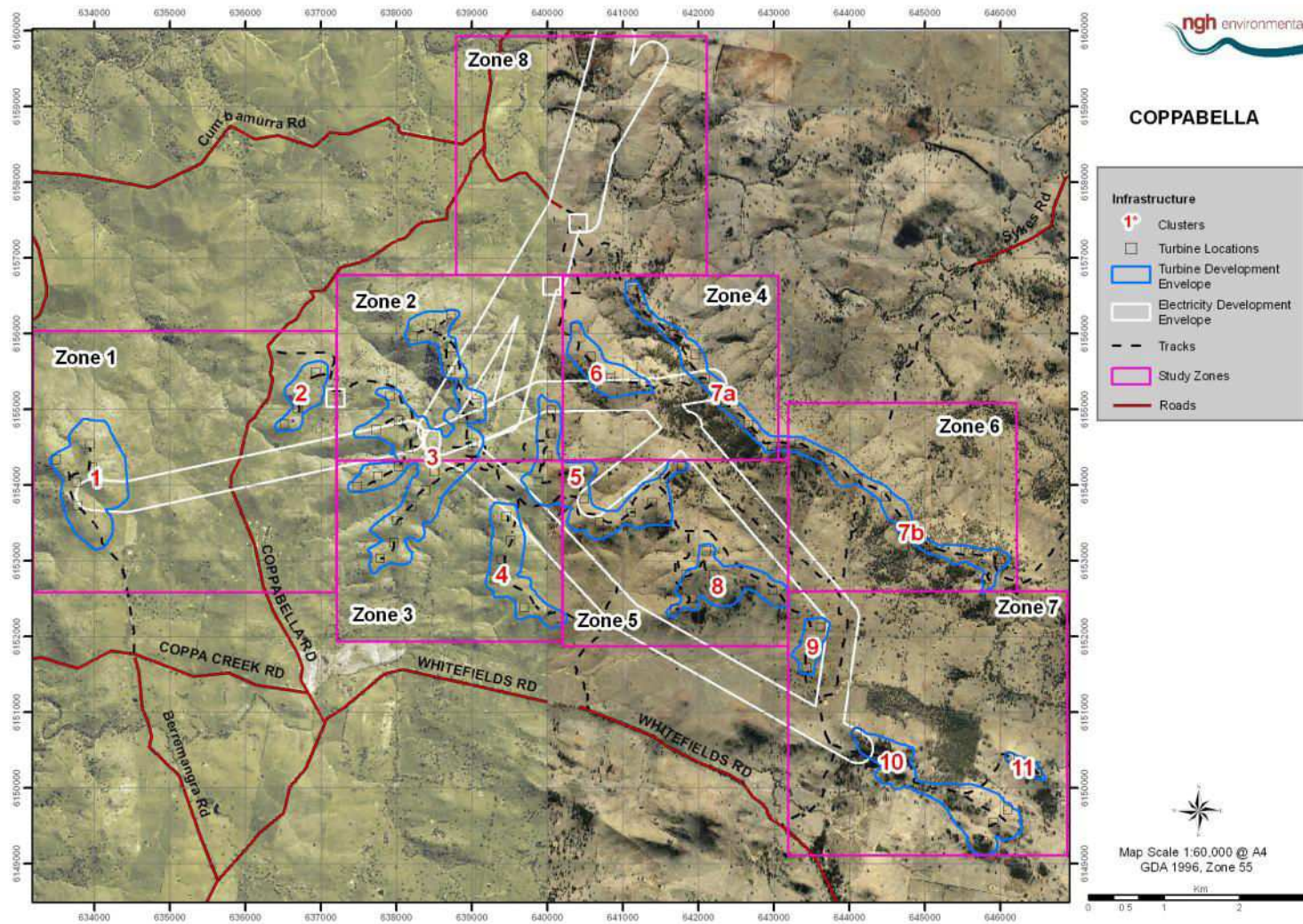


Photo 8. Edge of Box-gum Woodland CEEC (*E.melliodora* pictured) at the north end of Cluster 3

Appendix I ORIGINAL INFRASTRUCTURE LAYOUT

The infrastructure layout has been revised to reflect biodiversity constraints.

The original infrastructure layout is shown in the following map set (9 maps, including site overview).

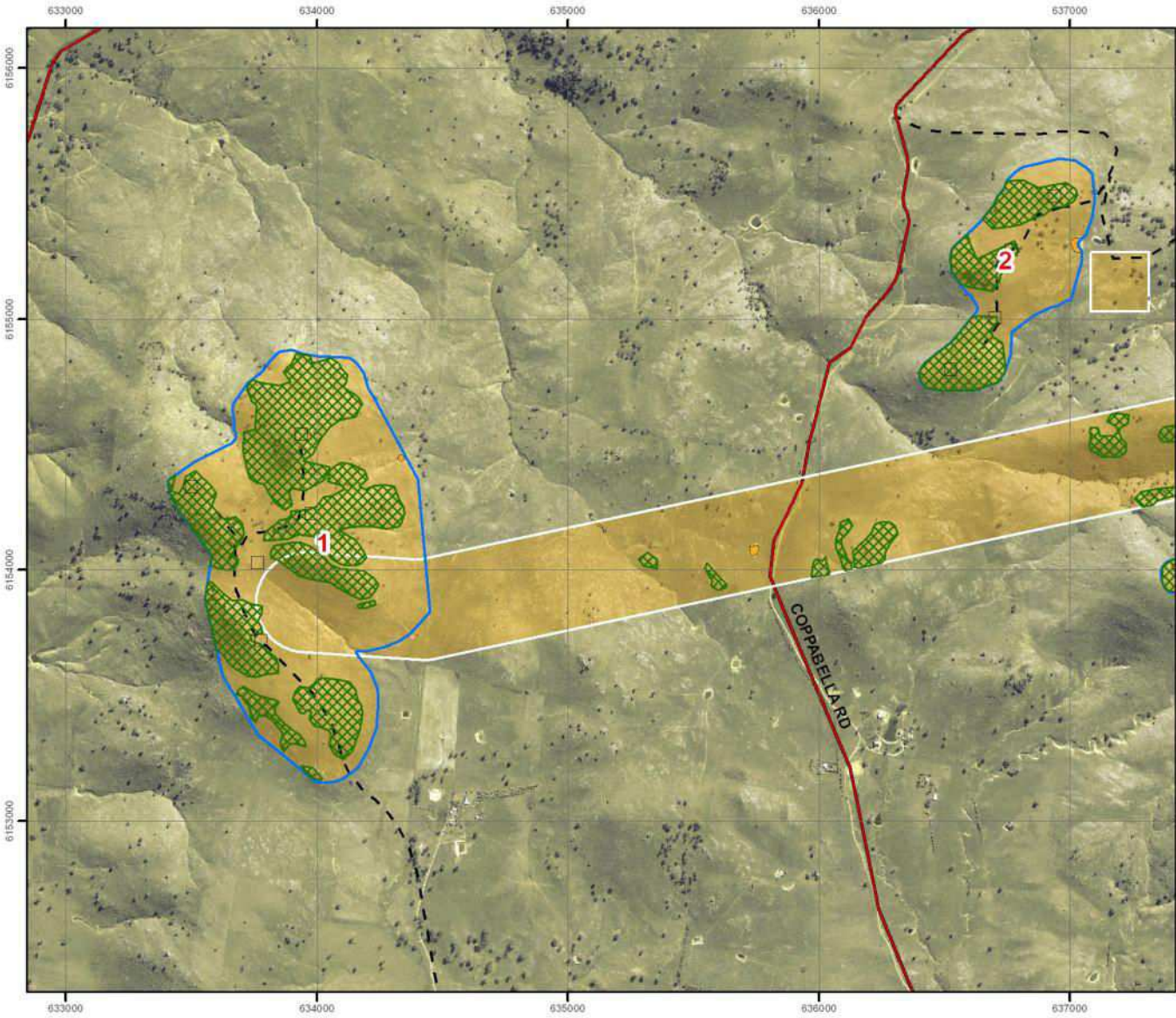




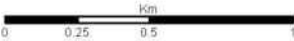
COPPABELLA

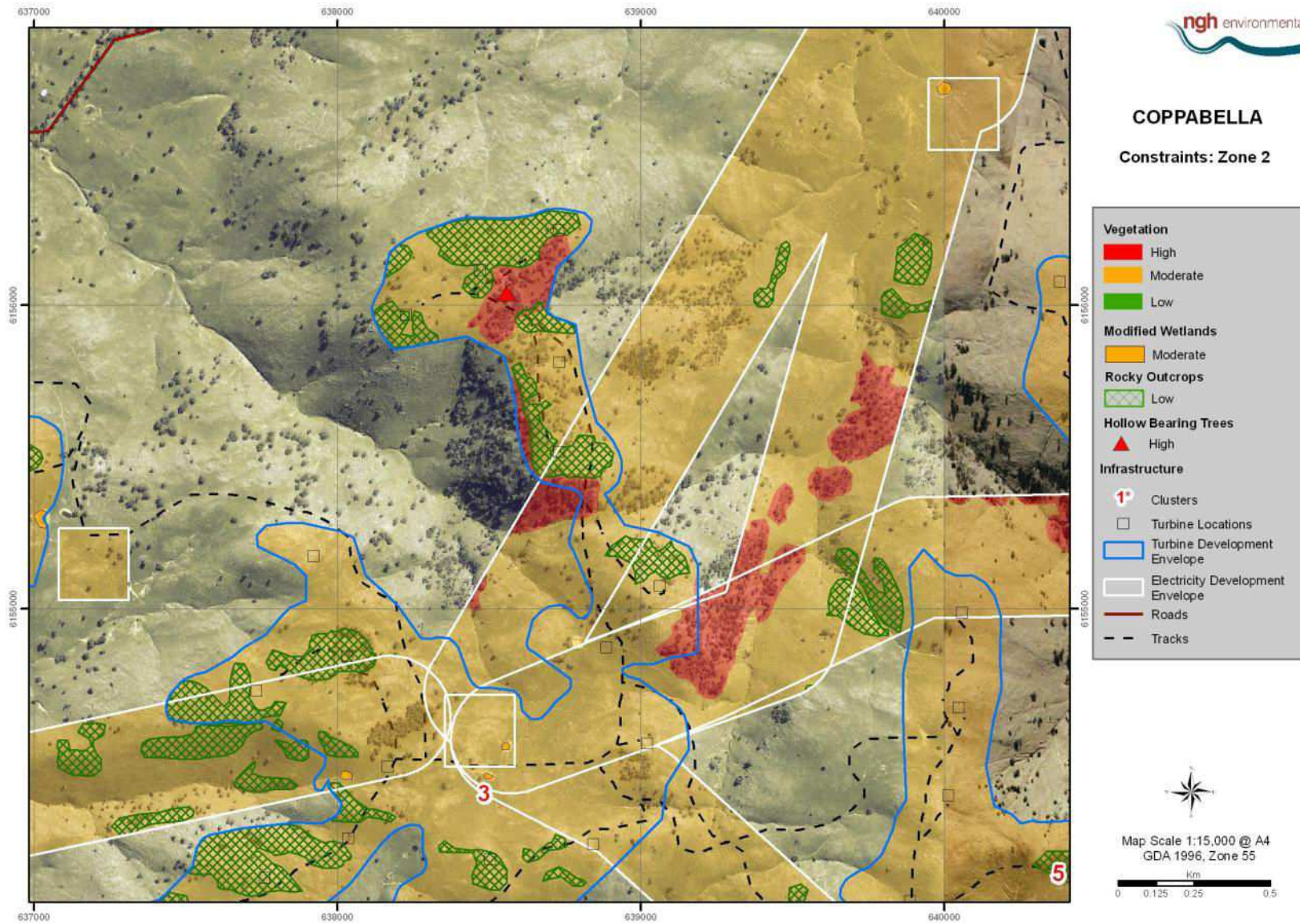
Constraints: Zone 1

Vegetation	
High	[Red]
Moderate	[Orange]
Low	[Green]
Modified Wetlands	
Moderate	[Orange]
Rocky Outcrops	
Low	[Green with cross-hatch]
Infrastructure	
Clusters	[Red star]
Turbine Locations	[White square]
Turbine Development Envelope	[Blue outline]
Electricity Development Envelope	[White outline]
Roads	[Red line]
Tracks	[Dashed black line]



Map Scale 1:20,000 @ A4
GDA 1996, Zone 55



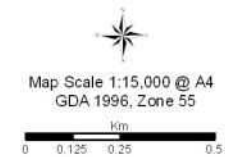
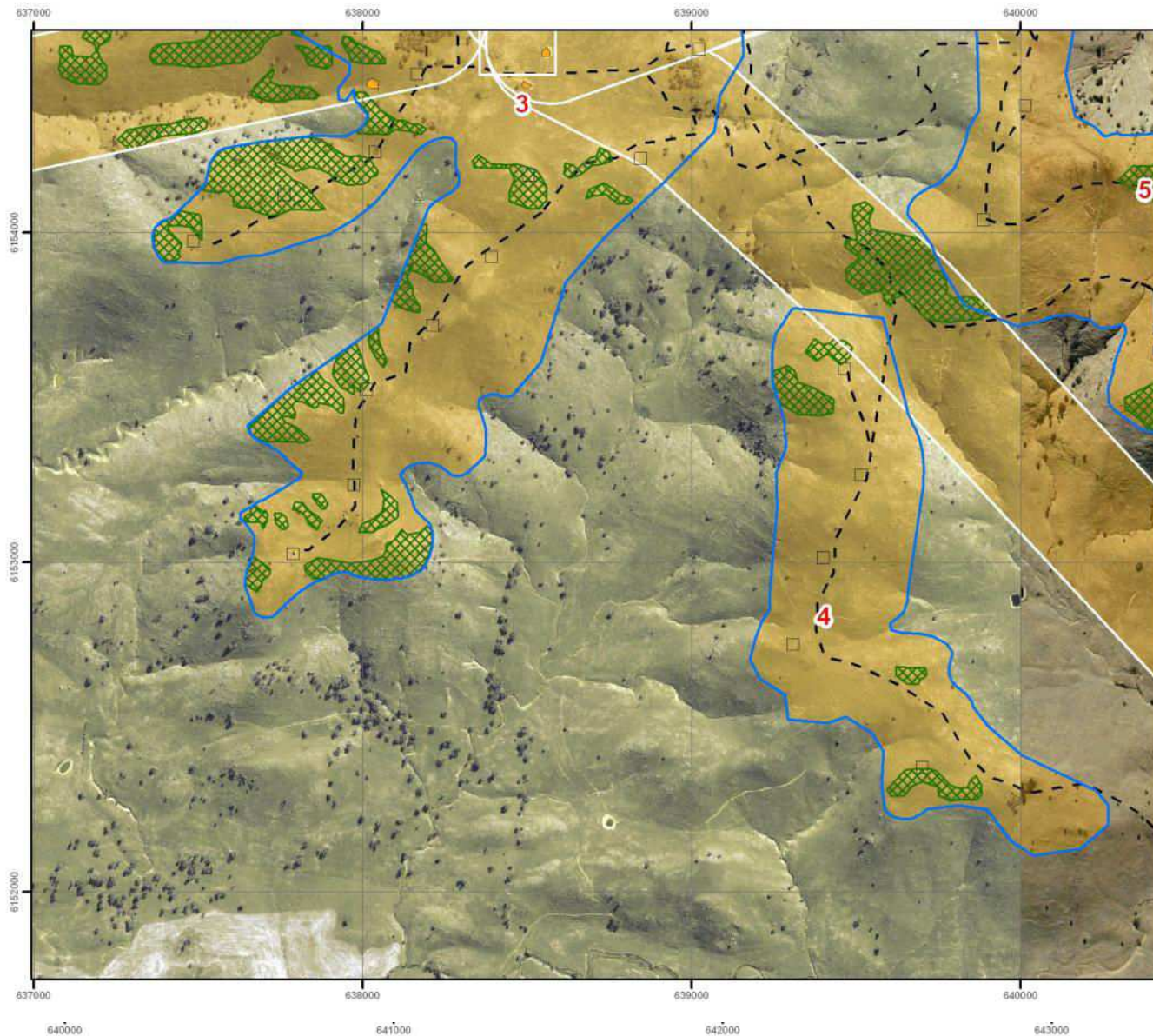




COPPABELLA

Constraints: Zone 3

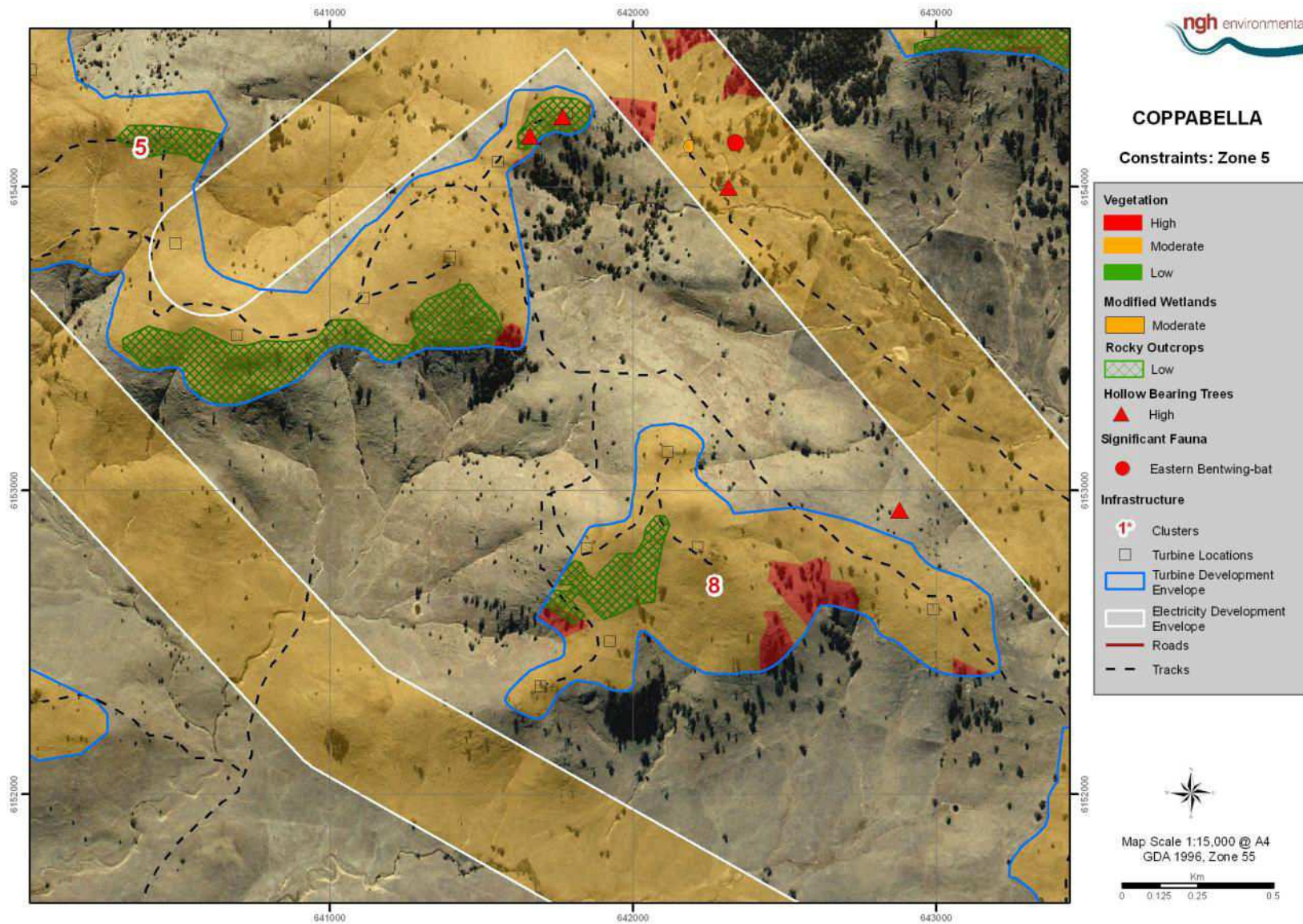
Vegetation	
[Red Box]	High
[Orange Box]	Moderate
[Green Box]	Low
Modified Wetlands	
[Orange Box]	Moderate
Rocky Outcrops	
[Green Cross-hatch Box]	Low
Infrastructure	
[Red 1 in Circle]	Clusters
[Small Square]	Turbine Locations
[Blue Outline]	Turbine Development Envelope
[White Outline]	Electricity Development Envelope
[Dashed Line]	Tracks

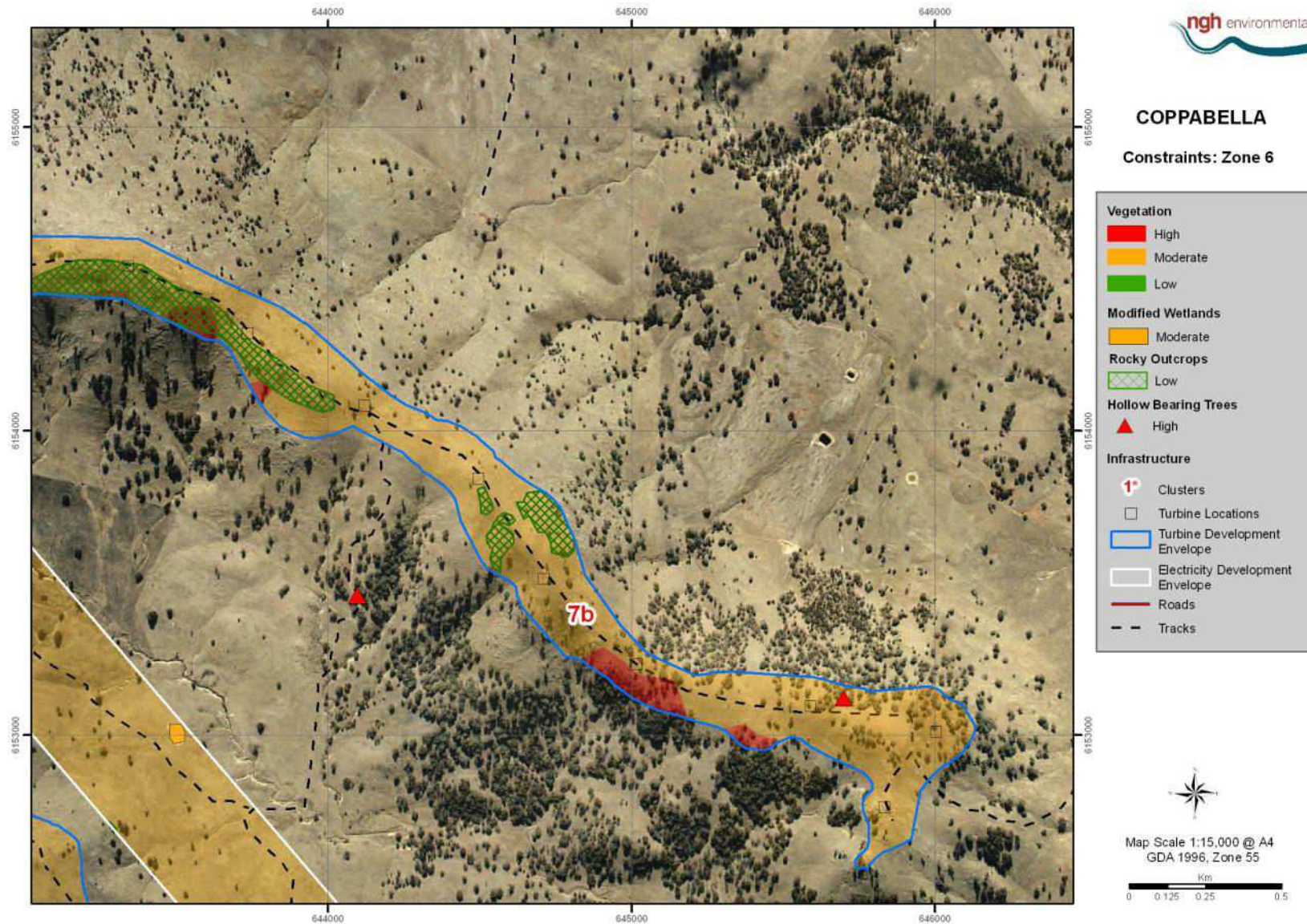




COPPABELLA

Constraints: Zone 5

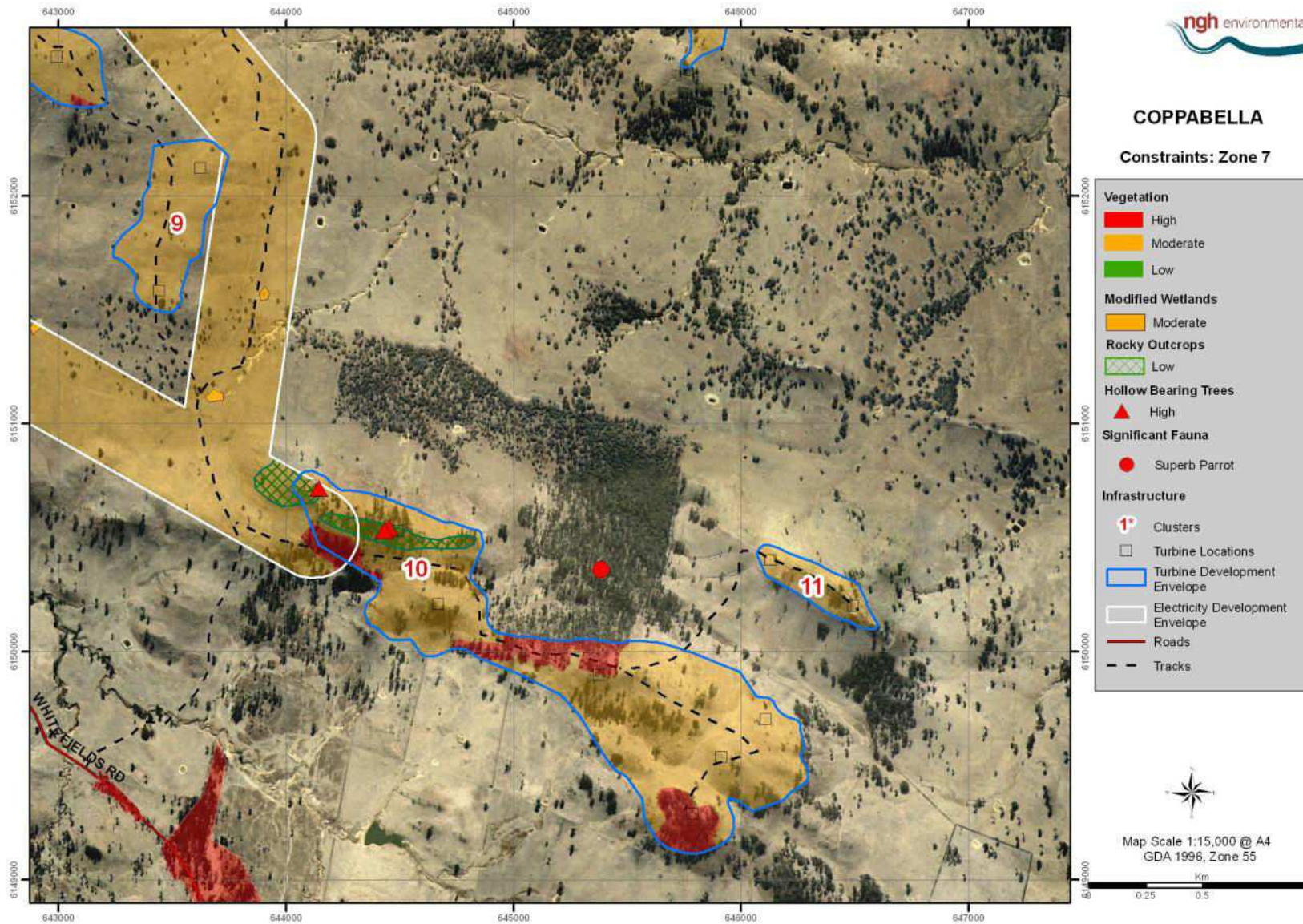






COPPABELLA

Constraints: Zone 7

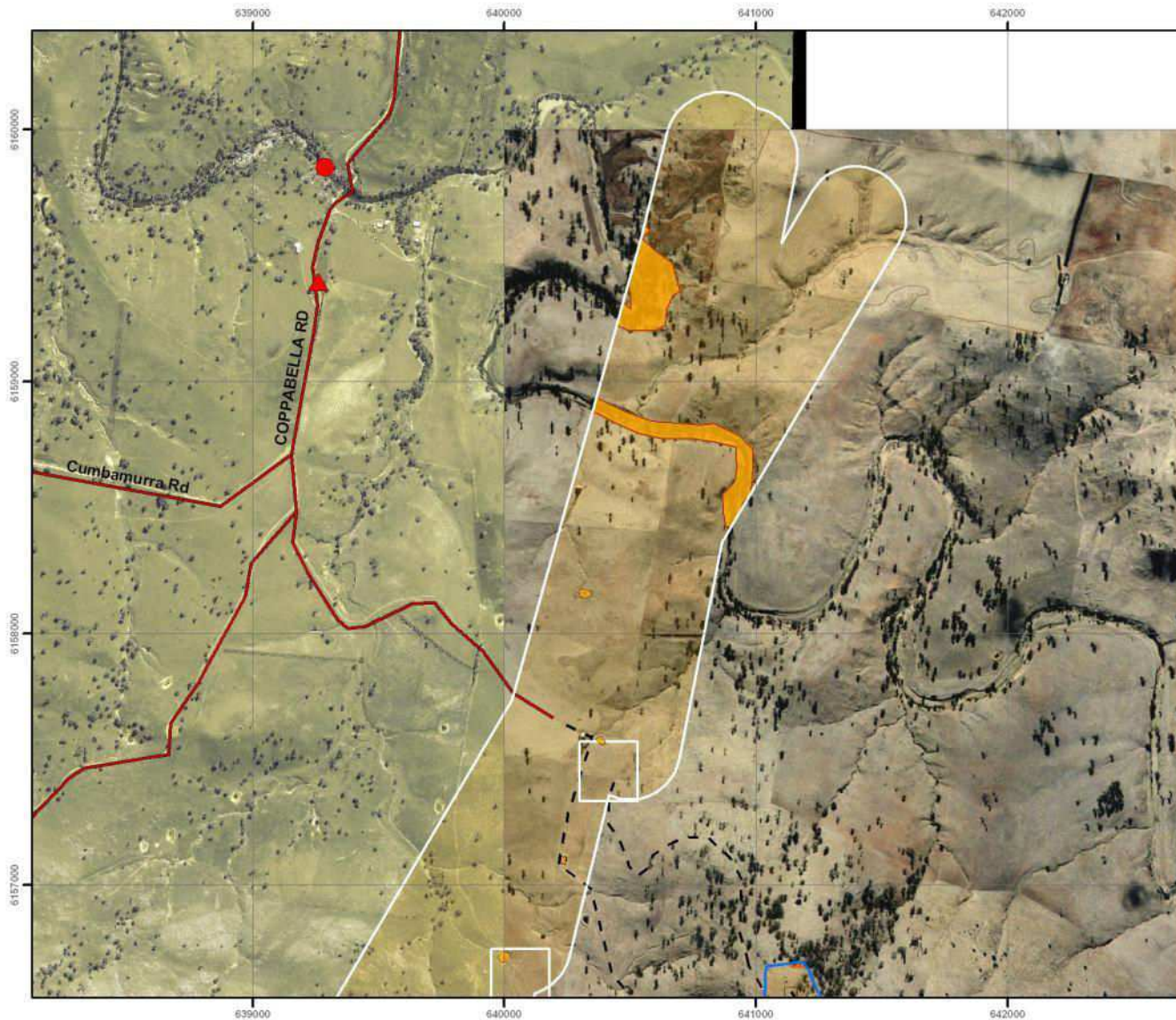




COPPABELLA

Constraints: Zone 8

Vegetation	
[Red Box]	High
[Orange Box]	Moderate
[Green Box]	Low
Modified Wetlands	
[Orange Box]	Moderate
Rocky Outcrops	
[Green Box with Dotted Pattern]	Low
Hollow Bearing Trees	
[Red Triangle]	High
Significant Fauna	
[Red Circle]	Eastern Bentwing-bat
Infrastructure	
[Red Star]	Clusters
[Black Square]	Turbine Locations
[Blue Outline Box]	Turbine Development Envelope
[White Outline Box]	Electricity Development Envelope
[Red Line]	Roads
[Black Dashed Line]	Tracks



Map Scale 1:20,000 @ A4
GDA 1996, Zone 55



Environmental Reporting Tool

You are here: [Environment Home](#) > [ERIN](#) > [ERT](#)

19 November 2008 10:56

Database Report

This report includes places of national environmental significance that are registered in the Department of the Environment and Water Resources' databases, for the selected area. The information presented here has been provided by a range of groups across Australia, and the accuracy and resolution varies.

Search Type: Point
Buffer: 50 km
Coordinates: -34.73805,148.5241



Report Contents: [Summary](#) >> [Details](#) >> [Caveat](#) >> [Acknowledgment](#)

Biodiversity	
Threatened Species:	20
Migratory Species:	12
Listed Marine Species:	10
Invasive Species:	14
Whales and Other Cetaceans:	None
Threatened Ecological Communities:	2
Heritage	
World Heritage Properties:	None
Australian Heritage Sites:	49
Wetlands	
Ramsar sites: (Internationally important)	1
Nationally Important Wetlands:	None
National Pollutant Inventory	
Reporting Facilities:	None
Airsheds:	None
Catchments:	None
Protected Areas	
Reserves and Conservation Areas:	5
Regional Forest Agreements:	1



This map may contain data which are
 © Commonwealth of Australia (Geoscience Australia)
 © 2007 MapData Sciences Pty Ltd, PSMA

Biodiversity

Threatened Species [[Dataset Information](#)]

Birds

[Lathamus discolor](#)

Swift Parrot

Status Comments

Endangered Species or species habitat may occur within area

[*Polytelis swainsonii*](#)

Superb Parrot

Vulnerable Breeding likely to occur within area

[*Rostratula australis*](#)

Australian Painted Snipe

Vulnerable Species or species habitat may occur within area

[*Xanthomyza phrygia*](#)

Regent Honeyeater

Endangered Species or species habitat likely to occur within area

Frogs[*Litoria booroolongensis*](#)

Booroolong Frog

Endangered Species or species habitat likely to occur within area

Insects[*Synemon plana*](#)

Golden Sun Moth

Critically
Endangered Species or species habitat likely to occur within area**Mammals**[*Dasyurus maculatus maculatus \(SE mainland population\)*](#)

Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)

Endangered Species or species habitat may occur within area

[*Nyctophilus timoriensis \(South-eastern form\)*](#)

Eastern Long-eared Bat

Vulnerable Species or species habitat may occur within area

[*Pseudomys fumeus*](#)

Konoom, Smoky Mouse

Endangered Species or species habitat may occur within area

Ray-finned fishes[*Maccullochella peelii peelii*](#)

Murray Cod, Cod, Goodoo

Vulnerable Species or species habitat may occur within area

[*Macquaria australasica*](#)

Macquarie Perch

Endangered Species or species habitat may occur within area

Reptiles[*Aprasia parapulchella*](#)

Pink-tailed Worm-lizard

Vulnerable Species or species habitat likely to occur within area

[*Delma impar*](#)

Striped Legless Lizard

Vulnerable Species or species habitat likely to occur within area

Plants

[Ammobium craspedioides](#)

Yass Daisy

[Caladenia concolor](#)

Crimson Spider-orchid, Maroon Spider-orchid

[Diuris sheaffiana](#)

Tricolour Diuris

[Grevillea iaspicula](#)

Wee Jasper Grevillea

[Leucochrysum albicans var. tricolor](#)

Hoary Sunray

[Prasophyllum petilum](#)[Thesium australe](#)

Austral Toadflax, Toadflax

Migratory Species [[Dataset Information](#)]**Migratory Terrestrial Species****Birds**[Haliaeetus leucogaster](#)

White-bellied Sea-Eagle

[Hirundapus caudacutus](#)

White-throated Needletail

[Merops ornatus](#)

Rainbow Bee-eater

[Myiagra cyanoleuca](#)

Satin Flycatcher

[Xanthomyza phrygia](#)

Regent Honeyeater

Migratory Wetland Species**Birds**[Ardea alba](#)

Great Egret, White Egret

Vulnerable Species or species habitat likely to occur within area

Vulnerable Species or species habitat likely to occur within area

Vulnerable Species or species habitat may occur within area

Endangered Species or species habitat likely to occur within area

Endangered Species or species habitat likely to occur within area

Endangered Species or species habitat likely to occur within area

Vulnerable Species or species habitat likely to occur within area

Status Comments

Migratory Species or species habitat likely to occur within area

Migratory Species or species habitat may occur within area

Migratory Species or species habitat may occur within area

Migratory Breeding likely to occur within area

Migratory Species or species habitat likely to occur within area

Migratory Species or species habitat may occur within area

[Ardea ibis](#)

Cattle Egret

[Gallinago hardwickii](#)

Latham's Snipe, Japanese Snipe

[Rostratula benghalensis s. lat.](#)

Painted Snipe

Migratory Marine Birds

[Apus pacificus](#)

Fork-tailed Swift

[Ardea alba](#)

Great Egret, White Egret

[Ardea ibis](#)

Cattle Egret

Listed Marine Species [[Dataset Information](#)]

Birds

[Apus pacificus](#)

Fork-tailed Swift

[Ardea alba](#)

Great Egret, White Egret

[Ardea ibis](#)

Cattle Egret

[Gallinago hardwickii](#)

Latham's Snipe, Japanese Snipe

[Haliaeetus leucogaster](#)

White-bellied Sea-Eagle

[Hirundapus caudacutus](#)

White-throated Needletail

Migratory Species or species habitat may occur within area

Migratory Species or species habitat may occur within area

Migratory Species or species habitat may occur within area

Migratory Species or species habitat may occur within area

Migratory Species or species habitat may occur within area

Migratory Species or species habitat may occur within area

Status Comments

Listed - overfly marine area Species or species habitat may occur within area

Listed - overfly marine area Species or species habitat may occur within area

Listed - overfly marine area Species or species habitat may occur within area

Listed - overfly marine area Species or species habitat may occur within area

Listed Species or species habitat likely to occur within area

Listed - overfly marine area Species or species habitat may occur within area

[Lathamus discolor](#)

Swift Parrot

Listed -
overfly marine
area Species or species habitat may occur within area[Merops ornatus](#)

Rainbow Bee-eater

Listed -
overfly marine
area Species or species habitat may occur within area[Myiagra cyanoleuca](#)

Satin Flycatcher

Listed -
overfly marine
area Breeding likely to occur within area[Rostratula benghalensis s. lat.](#)

Painted Snipe

Listed -
overfly marine
area Species or species habitat may occur within areaInvasive Species [[Dataset Information](#)]

Selected Invasive Species: Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Status Comments

Mammals[Capra hircus](#)

Goat

Feral Species or species habitat may occur within area

[Felis catus](#)

Cat, House Cat, Domestic Cat

Feral Species or species habitat likely to occur within area

[Oryctolagus cuniculus](#)

Rabbit, European Rabbit

Feral Species or species habitat likely to occur within area

[Sus scrofa](#)

Pig

Feral Species or species habitat likely to occur within area

[Vulpes vulpes](#)

Red Fox, Fox

Feral Species or species habitat likely to occur within area

Plants[Asparagus asparagoides](#)

Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus

WoNS Species or species habitat may occur within area

[Genista sp. X Genista monspessulana](#)

Broom

Invasive Species or species habitat may occur within area

[Lycium ferocissimum](#)

African Boxthorn, Boxthorn

Invasive Species or species habitat may occur within area

[Nassella neesiana](#)

Chilean Needle grass

WoNS Species or species habitat may occur within area

[Nassella trichotoma](#)

Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ)

WoNS Species or species habitat may occur within area

[Pinus radiata](#)

Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine

Invasive Species or species habitat may occur within area

[Rubus fruticosus agg.](#)

Blackberry, European Blackberry

WoNS Species or species habitat likely to occur within area

[Salix spp. except S.babylonica, S.x calodendron & S.x reichardtiji](#)

Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow

WoNS Species or species habitat may occur within area

[Ulex europaeus](#)

Gorse, Furze

WoNS Species or species habitat may occur within area

Threatened Ecological Communities [[Dataset Information](#)]

Status Comments

[Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory](#)

Endangered Community likely to occur within area

[White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland](#)

Critically Endangered Community likely to occur within area

Heritage

Australian Heritage Sites [[Dataset Information](#)]

Note that not all Indigenous sites may be listed.

Historic[ANZ Bank NSW](#)[Beggan Beggan Homestead Group NSW](#)[Binalong Courthouse Group NSW](#)[Binalong Courthouse NSW](#)[Boorowa Courthouse NSW](#)

[Bundarbo Homestead, Outbuildings and Garden NSW](#)

[CBC Bank \(former\) NSW](#)

[CBC Bank, Residence, Fences, Hitching Posts and Stables NSW](#)

[Comur Street Group NSW](#)

[Cooma Cottage, Hardwicke and Douro Landscape Area NSW](#)

[Cooma Cottage, Stables, Outbuildings and Surrounds NSW](#)

[Cunningham Plains Homestead \(former\), Barn and Garden NSW](#)

[Dendavilleigh NSW](#)

[F L Kelly and Company \(former\) NSW](#)

[Grampian Street Group NSW](#)

[Kerrowgair NSW](#)

[Linton and Garden NSW](#)

[Murrumburrah Courthouse NSW](#)

[Murrumburrah Public School and Residence NSW](#)

[Police Residence and Cells NSW](#)

[Public School Group NSW](#)

[Rathluba NSW](#)

[Redbank and Stables NSW](#)

[Reedy Creek Homestead \(former Inn\) NSW](#)

[Ronnoco NSW](#)

[Rose Cottage and Kitchen NSW](#)

[St Clements Anglican Church NSW](#)

[St Clements Rectory NSW](#)

[Stables of Redbank NSW](#)

[State Bank Rural Bank \(former\) NSW](#)

[The Elms NSW](#)

[Vale View Homestead, Woolshed & Building and Landscape Elements NSW](#)

[Westpac Bank NSW](#)

[Yass Courthouse Group NSW](#)

[Yass Courthouse NSW](#)

[Yass Junction Railway Station NSW](#)

[Yass Police Station NSW](#)

[Yass Post Office Group NSW](#)

[Yass Post Office Including Hitching Posts NSW](#)

[Yass Urban Conservation Area NSW](#)

Indigenous

[Narrangullen Area NSW](#)

Natural

[Coolac Geological Site NSW](#)

[Derringullen Creek Area NSW](#)

[Hattons Corner Area NSW](#)

[Lake Burrinjuck Grevillea laspicula Site 1 NSW](#)

[Lake Burrinjuck Grevillea laspicula Site 2 NSW](#)

[Upper Lake Burrinjuck Area NSW](#)

[Wee Jasper Grevillea laspicula Site 1 NSW](#)

[Wee Jasper Nature Reserve NSW](#)

Wetlands

Wetlands of International Importance (Ramsar sites) [[Dataset Information](#)]

[FIVEBOUGH AND TUCKERBIL SWAMPS](#)

Within same catchment as Ramsar site

Other

Reserves and Conservation Areas [[Dataset Information](#)]

Black Andrew Nature Reserve, NSW

Burrinjuck Nature Reserve, NSW

Hattons Corner Nature Reserve, NSW

Oak Creek Nature Reserve, NSW

Wee Jasper Nature Reserve, NSW

Regional Forest Agreements [[Dataset Information](#)]

Note that all RFA areas including those still under consideration have been included.

Southern RFA, New South Wales

Caveat

The information presented here has been drawn from a range of sources, compiled for a variety of purposes. Details of the coverage of each dataset are included in the metadata [[Dataset Information](#)] links above.

Acknowledgment

This database has been compiled from a range of data sources. The Department acknowledges the following custodians who have contributed valuable data and advice:

- [New South Wales National Parks and Wildlife Service](#)
- [Department of Sustainability and Environment, Victoria](#)
- [Department of Primary Industries, Water and Environment, Tasmania](#)
- [Department of Environment and Heritage, South Australia Planning SA](#)
- [Parks and Wildlife Commission of the Northern Territory](#)
- [Environmental Protection Agency, Queensland](#)
- [Birds Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Atherton and Canberra](#)
- [University of New England](#)

- Other groups and individuals

[ANUcliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University](#) was used extensively for the production of draft maps of species distribution. The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.