

**Preliminary flora and
fauna assessment of a
proposed wind farm,
Yarram, Victoria.**

December 2005

Daniel Gilmore

**Report for
Synergy Wind Pty Ltd**

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assessment of a proposed a
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FINAL REPORT

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ABBREVIATIONS

AVW	Atlas of Victorian Wildlife
CAMBA	China-Australia Migratory Bird Agreement
DEH	Department of the Environment & Heritage (Australia)
DSE	Department of Sustainability & Environment (Victoria)
EPBC	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EVC	Ecological Vegetation Class
FFG	<i>Flora and Fauna Guarantee Act 1988</i>
FIS	Flora Information System
JAMBA	Japan-Australia Migratory Bird Agreement
IUCN	International Union for the Conservation of Nature
sp.	Species (one species)
spp.	Species (more than one species)
subsp.	Subspecies

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SUMMARY

Background

Biosis Research Pty. Ltd. was commissioned by Synergy Wind Pty Ltd to conduct a flora and fauna assessment at a proposed wind farm site at Yarram, Victoria. Synergy Wind Pty Ltd develop the site into a wind farm, supporting nine turbines and associated infrastructure. The site is located approximately 150 kilometres east of the Melbourne central business district.

The study area was inspected on 15 December 2005. General observations were made on the vegetation and fauna habitat of the study area. Lists of flora and fauna species were compiled. Given the highly modified nature of the vegetation, site survey focussed on locating native species. A detailed list of exotic species was not compiled, although the more common species are listed.

Ecological Features

The study area comprises predominantly introduced vegetation with scattered individual and groups of remnant trees and scattered understorey species. Weed levels are high, and only small numbers of native species are present. The condition of native vegetation within the study area is poor and there are no extant Ecological Vegetation Classes (EVCs) remaining.

No flora or fauna of national or state significance was recorded during the present assessment and none are considered likely to occur. Five flora species of regional conservation significance were recorded in this survey.

The majority of the study area has negligible ecological value owing to a high level of disturbance and loss of native vegetation. Remnant trees and understorey species are of at least local significance due to the depletion of native vegetation in the bioregion. Impacts to native flora resulting from the proposal are expected to be minimal.

Commonwealth Biodiversity Legislation

A key consideration in determining whether an action is likely to have a significant impact on a matter of national environmental significance under the EPBC Act is to estimate the extent and the intensity of the impacts. For example, a wind farm may have greater or lesser impacts depending on the extent of excavation, vegetation clearance and other disturbance involved in site preparation, the intensity and geographic extent of construction related impacts, and the number, size and configuration of turbines. It is important to consider the extent and intensity of all impacts, including indirect and offsite impacts in the

context of the environment which will be impacted.

In our opinion, it is unlikely that the proposed wind farm would have a significant impact on any EPBC-listed threatened or migratory species. Nevertheless, we consider it prudent to refer all wind farm developments to DEH as part of the assessment process and therefore recommend that this proposal be referred to the Australian Minister for the Environment and Heritage for a determination.

State Biodiversity Legislation

No areas of native vegetation assessable under the Native Vegetation Management Framework (greater than 10 % cover) are located within the study area. A Net gain Assessment will not be required due to the degree of modification of the site.

The land is privately owned and is not declared ‘critical habitat’. Therefore a permit to ‘take’ listed flora species is not required under the FFG Act.

A permit will be required from Wellington Shire under the *Planning and Environment Act 1987* to remove native vegetation within the study area.

Recommendations

Birds

Although the likely impacts of this wind farm on avifauna are likely to be low, based on this preliminary assessment, if further confirmation of this view is required, some further avifauna survey would be needed. Any further survey should follow the Australian Wind Energy Association (AusWEA) guidelines for assessing the impacts of wind farms on birds (Brett Lane and Associates 2005). We recommend that as per the AusWEA report, a “level 1” assessment be undertaken. This would be restricted to a single-season point count survey to calculate utilisation rates. Further work should include the following:

- To obtain baseline data, a spring or summer bird survey should be conducted within the site in order to determine which species may fly through the site and/or which areas have the highest levels of bird usage.
- Three or four point count locations should be established at appropriate locations across the wind farm site.
- Ten 30-minute survey replicates should be undertaken at each point, noting the bird species observed, the number of birds, and their behaviour and flight height.
- This data can then be used to define the avifauna of the wind farm, calculate bird utilisation rates (for comparison with other wind farms) and if required,

mortality rates.

Bats

Bat monitoring can only indicate levels of bat activity on the site and utilisation/risk assessment cannot be calculated for this group. Bat monitoring is achieved using remote Anabat Ultrasonic detectors. The possibility of hoisting the Anabat microphone to the top of the existing monitoring tower should be investigated. This allows for detection of high flying species such as the Common Bent-wing Bat. Bat monitoring over four or five nights in spring or summer is recommended to provide information on they types of species occurring at the site and the level of activity.

Flora

- Use locally indigenous species from the appropriate EVC for any landscape plantings.
- Offset the incidental loss of indigenous species through a suitable ecological management option such as supplementary understorey planting within stands of indigenous trees which have already been fenced within the property to protect them from stock damage, or extension of this fencing program to provide additional tree protection and encourage natural regeneration.
- Protect by fencing any trees in the vicinity prior to and during construction activities. A minimum of five metres from the drip line of tree canopy is recommended.
- Implement control measures in accordance with the EPA's "Environmental Guidelines for Major Construction Sites", publication 480 of the Best Practice Environmental Management Series (BPEMS), to minimise the risk of sediment and other pollutants from reaching any waterways.

1.0 INTRODUCTION

1.1 Project Background

Biosis Research Pty. Ltd. was commissioned by Synergy Wind Pty Ltd to conduct a flora and fauna assessment at a proposed wind farm site at Yarram, Victoria. Synergy Wind Pty Ltd develop the site into a wind farm, supporting nine turbines and associated infrastructure. The site is located approximately 150 kilometres east of the Melbourne central business district.

1.2 Objectives

The objectives of the project are to:

- undertake a database review of flora and fauna issues relevant to the project including the Atlas of Victorian Wildlife, Flora Information System, EPBC Protected Matters Search Tool and relevant reports;
- identify remnant vegetation on the site likely to be affected (ecological vegetation class and status, records of listed flora species and communities from existing data bases and their conservation status);
- identify significant terrestrial fauna that may be affected, based on existing records;
- identify significant bird and bat species that are known to regularly occur on the site or are known to migrate through the site, and the conservation status of such species.
- identify significant habitat on the site or in the vicinity that is likely to be important for birds and bats (eg wetlands);
- undertake a brief field assessment of the flora and fauna habitats of the site and describe the vascular flora, terrestrial vertebrate fauna and habitat values;
- assess the ecological value and significance of the flora and fauna;
- identify the legislative, policy and planning approvals that need to be satisfied in relation to biodiversity;

1.3 Study Area

The study area is located approximately 10 kilometres north-west of Yarram, Victoria (Figure 1). The site is bounded by Bolgers Road to the north, agricultural land to the east and west and Ingles Road to the south.

The DSE interactive mapping (www.dse.vic.gov.au) indicates the study area is within the Strzelecki Ranges Bioregion.

2.0 METHODS

2.1 Taxonomy

Common and scientific names for flora and fauna follow the Flora Information System (FIS) and the Atlas of Victorian Wildlife (AVW) of the Department of Sustainability and Environment (DSE).

2.2 Literature and Database Review

The DSE Flora Information System (FIS 2005), Atlas of Victorian Wildlife (AVW March 2005) and Department of the Environment and Heritage EPBC Protected Matters Search Tool (DEH database), were searched to identify flora and fauna species that may be present within the study area. The extant and pre-1750 EVCs present within the study area and their bioregional conservation status was reviewed (DSE web site: <http://www.dpi.vic.gov.au/dse/nrence.nsf/>).

2.3 Field Survey

The study area was inspected on 15 December 2005. General observations were made on the vegetation and fauna habitat of the study area. Lists of flora and fauna species were compiled. Given the highly modified nature of the vegetation, site survey focussed on locating native species. A detailed list of exotic species was not compiled, although the more common species are listed.

2.4 Limitations

The present survey includes only vascular flora (ferns, conifers and flowering plants) and terrestrial vertebrate fauna (birds, mammals, reptiles, frogs).

The survey was conducted during early summer, a sub-optimal time for the identification of seasonally dormant plant species such as orchids and lilies. Given the highly modified condition of vegetation within the study area, this is not considered a significant limitation to the study, although it is possible that a small number of additional native species may be present that have not been recorded.

The survey effort, combined with information available from other sources, is considered suitable to assess the overall ecological values of the site. However, the following qualifications apply:

- Ecological surveys provide a sampling of the flora and fauna at a given time. As such, more species may be recorded with more time in the field or with the survey during different seasonal conditions.

- Due to the impacts of grazing in the study area, some species may lack live, fertile material for identification.

Due to the modified condition of the study area, these qualifications are unlikely to affect the conclusions of this investigation.

2.5 Conservation Significance

Criteria used in this report to assess the conservation significance of flora and fauna at regional, state and national levels are provided in Appendix 1.

3.0 RESULTS

3.1 Flora

3.1.1 Species

Records during present assessment

A total of 42 vascular plant species was recorded from the study area, of which 16 are indigenous, and 26 are introduced. It is likely that further survey work would find additional species in the area, but it is expected that the majority of these would be exotic. Species are listed in Appendix 2.

Database records

There are no existing flora records from the study area.

The FIS contains records of 568 flora species from within 10 kilometres of the study area. The records from this database include 19 species that are significant at national or state level (Appendix 2).

The DEH database predicts the occurrence of, or suitable habitat for, two additional listed flora species within 5 kilometres of the study area (Appendix 2). These are discussed in section 4.1.1. It is unlikely that these species occur in the study area due to the degree of modification of the site

3.1.2 Plant Communities

Classification of native vegetation in Victoria is based on Ecological Vegetation Classes (EVCs). Each EVC contains one or more floristic communities. Classification of EVCs in this assessment follows DSE benchmarks (www.dse.vic.gov.au).

DSE's pre-1750 EVC mapping indicates that the site would have supported mostly Shrubby Foothill Forest, with areas of Damp Forest along local drainage lines such as Jack River and Stony Creek.

The current vegetation is predominantly exotic pasture species and weeds, such as Perennial Ryegrass *Lolium perenne*, Sweet Vernal Grass *Anthoxanthum odoratum*, Cocksfoot *Dactylis glomerata*, clovers *Trifolium* spp. Isolated individuals and stands of eucalypts (Mountain Grey Gum *Eucalyptus cypellocarpa* and Yellow Stringybark *Eucalyptus muelleri*) are also present. A small number of native grasses and forbs occur as scattered individuals, including wallaby-grasses *Austrodanthonia* spp., Common Wheat-grass *Elymus scaber*, Cotton Fireweed *Senecio quadridentatus* and

Twining Glycine *Glycine clandestina*. These species occur in small numbers and native species contribute less than 10% of the overall vegetation cover.

3.1.3 Condition of Native Vegetation

The condition of native vegetation in the study area is poor and no intact EVCs remain.

3.2 Fauna

3.2.1 Species

Records during the present assessment

Thirty-three indigenous fauna species (31 birds, one mammals and one reptile) and nine introduced fauna species (six birds, three mammals) were recorded in the study area during the present assessment (Appendix 3).

AVW database records

There are no pre-existing AVW records within the study area.

The AVW contains recent (within last 20 years) records of 143 additional terrestrial vertebrate fauna species from within a 10 km radius of the study area: 45 birds (all native), 28 mammals (25 native, three introduced), ten reptiles (all native) and seven frogs (all native). The study area contains suitable habitat for a limited number of these species, which are mostly woodland-associated species.

3.2.2 Habitat

Several fauna habitat types occur within the study area, including:

Pasture

Introduced pasture typically occurs wherever native vegetation has been wholly or substantially removed. Pasture can reach a height of up to 50 centimetres, although most areas have been grazed to a low level.

Relatively few fauna species would be expected to use this habitat type, mainly common open country birds such as Australian Magpie, Willie Wagtail and Welcome Swallow. Raptors such as Wedge-tail Eagle, Brown Falcon, and Nankeen Kestrel would forage over this habitat, while Common Wombats and Black Wallabies are also likely to forage within the paddocks at night.

Although introduced pasture is not considered to support many fauna species, it is likely act as a broad open space, which would allow ground-dwelling fauna such as small mammals, reptiles and frogs, to disperse into more suitable habitats.

Remnant trees (in paddocks)

A small number of isolated individual trees and small clusters of remnant trees are scattered throughout much of the study area.

Remnant trees, largely mature eucalypts, reach a height of up to 15 metres. Areas underneath most of these remnant trees have been grazed and are comprised of largely exotic species. A small number of these trees also support hollows.

Remnant trees would be used mainly by common woodland species capable of traversing open areas (e.g. birds and bats). They are also likely to be used as perching and nesting trees by raptors (e.g. falcons, eagles). Tree hollows would also provide a valuable habitat resource for many hollow-dwelling fauna such as possums, parrots, owls and insectivorous bats. When in flower, the trees provide a food source for nectar feeding birds such as wattlebirds and honeyeaters.

Wetlands (artificial)

A number of artificial wetlands (dams) are scattered throughout the study area, and.

Most dams within the study area have been extensively grazed around their edges, and lack significant amounts of fringing and submerged vegetation and are therefore generally poor fauna habitat.

These waterbodies provide drinking water for a variety of fauna including mammals and birds. Common waterbirds such as Australian Wood Duck and Pacific Black Duck also regularly frequent these areas.

Planted trees and shrubs

Wood lots of eucalypts (mainly Blue Gums) and native shrub species have been established along fencelines and in other fenced-off areas within the study area. These plantings are approximately 10 years old.

These plantings do not possess hollows, and the understorey vegetation is still largely introduced pasture grasses. Low levels of ground debris (logs, sticks, mulch and leaves) are present. Most of these trees have not reached an age to support hollows.

Native mammals including Common Brushtail and Common Ringtail Possums would use planted vegetation for foraging activities. Small passerine species (wrens, thornbills, honeyeaters etc.), and open country birds (Australian Magpie, Grey Butcherbird) which are largely associated with fragmented or cleared landscapes are likely to use planted vegetation for foraging and nesting. Introduced birds such as Common Starling, Indian Myna and House Sparrow would also use this habitat type.

4.0 ECOLOGICAL SIGNIFICANCE

On the basis of the available information, the majority of the study area has **low significance** for biodiversity, due to the substantial modification of the original vegetation and habitats. No threatened flora species are likely to occur within the study area.

Remnant vegetation (scattered trees and understorey species) within the study area is of at least **local significance** to biodiversity, due to the widespread loss of native vegetation within the bioregion.

4.1 Significant Flora Species

Significant species are defined in Appendix 1. Significant flora species recorded during the present assessment, recorded in the local area (FIS) or predicted to occur in the local area (DEH database) are discussed in the following section and listed in Appendix 2.

4.1.1 National and state significance

No species of national or state significance were recorded in the study area.

The FIS database contains recent (in the last 30 years) records of two species of national conservation significance and 16 species of state conservation significance from within 10 kilometres of the study area. The DEH database identifies potential habitat for two additional flora species listed under the EPBC Act (Appendix 2).

Due to the degree of modification of the site, there is no suitable habitat for the species identified by these conservation databases.

4.1.2 Regional significance

Five species recorded have regional significance within the Strzelecki Ranges Bioregion. These are listed in Appendix 2.

4.2 Significant Vegetation Communities

No intact EVCs remain within the study area.

4.3 Significant Fauna Species

Significant fauna species recorded during the present assessment, recorded in the local area (AVW) or predicted to occur in the local area (DEH database) are discussed in the following section and listed in Appendix 3. Species listed under migratory provisions of the EPBC Act are addressed in Section 5.

4.3.1 National significance

No fauna species of national conservation significance were recorded from the study area during the present assessment. Eleven species have been recently recorded or predicted to occur in the local area. The majority of these species would not be expected to occur in the study area due to a lack of suitable habitat (Appendix 3). The following two species are considered to have some potential to occur within the study area:

- Swift Parrot *Lathamus discolor* is a migratory species, breeding in Tasmania during the summer months, then moving to feed on flowering eucalypts in south-eastern mainland Australia during the winter months. Small numbers of Swift Parrots may occasionally forage within remnant the study area, but this is considered unlikely. Small numbers may also occasionally fly through the wind farm site.
- Grey-headed Flying-fox *Pteropus poliocephalus* is a bat that may occasionally fly through the site during migratory movements through eastern Victoria. The study site is not near a known camp location (Mallacoota being the nearest camp) and does not support a large foraging resource for the species.

4.3.2 State significance

No state significant fauna species were recorded in the study area during the present assessment. Eleven species of state conservation significance have been recently recorded (AVW) or are predicted to occur (DEH database) in the local area. Some of these species have some potential to occur in the study area:

- Great Egret *Ardea alba* may occasionally forage around the farm dams.
- Grey Goshawk *Accipiter novaehollandiae*, which may occasionally fly through the site (the site does not support suitable woodland habitat).
- Tree Goanna *Varanus varius*, which could occasionally use remnant trees for foraging

5.0 IMPLICATIONS OF LEGISLATION AND GOVERNMENT POLICY

Following is a guide to the implications of relevant government legislation and policies affecting the species and environments identified during this assessment.

5.1 Commonwealth

5.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) applies to developments and associated activities that have the potential to significantly impact on matters protected under the Act.

Under the Act, unless exempt, actions require approval from the Australian Government Minister for Environment and Heritage if they are likely to significantly impact on a ‘matter of national environmental significance’. There are currently seven matters of national environmental significance (NES):

- World Heritage properties;
- National Heritage properties;
- nationally listed threatened species and ecological communities;
- listed migratory species;
- Ramsar wetlands of international significance;
- Commonwealth marine areas; and
- nuclear actions (including uranium mining).

The EPBC Act also applies to the environment in general if actions are taken on Commonwealth land, or if actions that are taken outside Commonwealth land will impact on the environment on Commonwealth land.

Any person proposing to take an action that may, or will, have a significant impact on a matter of national environmental significance must refer the action to the Australian Government Minister for Environment and Heritage.

NES matters relevant to the proposed development

There are three matters of national significance that are of relevance to the proposed development:

- listed threatened species and ecological communities; and
- listed migratory species
- Ramsar wetlands of international significance

These are summarised below.

Listed threatened species and/or ecological communities

Ecological communities: No threatened ecological communities occur within the study area or are predicted to occur.

Listed flora species: Flora species listed under the Act are discussed in Section 4.1 and listed in Appendix 2. In summary, no listed species was recorded in the study area. It is unlikely that any individuals of any species would persist in this modified environment.

Listed fauna species: Fauna species listed under the Act are discussed in Section 4.3 and listed in Appendix 3. In summary, it is possible that small numbers of two species, Swift Parrot and Grey-headed Flying-fox, could fly through the study area on rare occasions. The study site does not support woodland habitat for these species, however the presence of scattered trees provides a small and marginal foraging resource.

Listed migratory species

The list of migratory species under the EPBC Act is a compilation of species listed under three international conventions: China-Australia Migratory Bird Agreement (CAMBA), Japan-Australia Migratory Bird Agreement (JAMBA), Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Species listed under the ‘migratory’ provisions of the EPBC Act are listed in Appendix 3 and summarised below:

- Two species (Pacific Black Duck, Australian Wood Duck) were recorded during the present assessment.
- Eleven species have been recently recorded from the local area (AVW).
- Ten additional species are predicted to occur, or their habitat is predicted to occur, within 5 kilometres of the study area (DEH database).

Ramsar sites

The study area is within the catchment of the Corner Inlet Ramsar site (approximately 15 km inland). It is considered unlikely that the proposed wind farm would have any impacts on this Ramsar site.

EPBC recommendation

A key consideration in determining whether an action is likely to have a significant impact on a matter of national environmental significance under the

EPBC Act is to estimate the extent and the intensity of the impacts. For example, a wind farm may have greater or lesser impacts depending on the extent of excavation, vegetation clearance and other disturbance involved in site preparation, the intensity and geographic extent of construction related impacts, and the number, size and configuration of turbines. It is important to consider the extent and intensity of all impacts, including indirect and offsite impacts in the context of the environment which will be impacted.

In our opinion, it is unlikely that the proposed wind farm would have a significant impact on any EPBC-listed threatened or migratory species. Nevertheless, we consider it prudent to refer all wind farm developments to DEH as part of the assessment process and therefore recommend that this proposal be referred to the Australian Minister for the Environment and Heritage for a determination.

5.2 State

5.2.1 Flora and Fauna Guarantee Act 1988

The primary legislation dealing with biodiversity conservation and sustainable use of native flora and fauna in Victoria is the *Flora and Fauna Guarantee Act 1988* (FFG Act).

A permit from DSE is required to ‘take’ listed flora species; species that are members of listed communities or protected flora from public land. A permit is not required under the FFG Act for private land, unless listed species are present and the land is declared ‘critical habitat’ for the species.

Implications for the proposed development

The land is privately owned and is not declared ‘critical habitat’. Therefore a permit is not required under the FFG Act.

5.2.2 Planning and Environment Act 1987

A planning permit is required under the *Planning and Environment Act 1987* to remove, destroy or lop native vegetation on a landholding of more than 0.4 hectares. The Department of Sustainability and Environment is a mandatory referral authority in some circumstances, such as where vegetation clearance is proposed on public land, or where vegetation clearance is proposed on private land for an area of greater than 10 hectares.

Implications for the proposed works

A permit will be required from Wellington Shire under the *Planning and Environment Act 1987* to remove low levels of scattered native plants within the study area.

5.2.3 Native Vegetation Management Framework

The Native Vegetation Management Framework (NRE 2002) is State Government policy for the protection, enhancement and revegetation of native vegetation in Victoria. The primary goal of the Framework is:

a reversal, across the whole landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain (NRE 2002).

In association with the Draft Native Vegetation Plans, which have been prepared for each Catchment Management Authority, the Framework provides decision-making tools for native vegetation management.

There is a **three-step approach** to ensure Net Gain:

1. Avoid adverse impacts, particularly through vegetation clearance.
2. If impacts cannot be avoided, minimise impacts through appropriate consideration in planning processes and expert input to project design and management.
3. Identify appropriate offset options.

Implications for the proposal

A Net Gain Assessment was not part of this study. However, no areas of native vegetation assessable in terms of habitat hectares (NRE 2002) are located within the study area, including the stretch of roadside through which access will be obtained to the property. We are also advised that no indigenous trees will be removed.

No formal offsets are required in terms of habitat hectares or tree protection and/or replacement, and any incidental removal of scattered native species that may occur could be offset through landscape plantings. Another option would be supplementary understorey planting within stands of indigenous trees which have already been fenced within the property to protect them from stock damage, or extension of this fencing program to provide additional tree protection and encourage natural regeneration.

5.3 Local

5.3.1 Local Government Planning Scheme (Wellington Shire)

An Environmental Significance Overlay or Vegetation Protection Overlay does not cover the study area.

6.0 FURTHER WORK AND POTENTIAL IMPACTS

6.1 Potential Impacts

6.1.1 Flora

The study area no longer supports intact EVCs and is dominated by predominantly introduced vegetation. It is unlikely that any flora species threatened at a national or state level persists within the subject land and further flora survey is not warranted.

It is our understanding that development of the wind farm will not necessitate the removal of any remnant trees. However, it is inevitable that scattered native grasses and forbs growing within the pasture will be removed as part of the development. The loss of these individuals will be confined to areas where the turbines will be sited and where ancillary works (access tracks etc) require removal of vegetation. In the context of the whole site, such areas are limited in extent and it is unlikely that any of these species would be eliminated from the site. Overall impacts on native flora would therefore be minimal.

6.1.2 Fauna

The site does not support habitat that is considered important for any threatened fauna species. Threatened species that have been recorded from the local area are generally associated with woodland and forest habitats, which do not occur within the site. Habitat for threatened species will not be removed during the construction phase of the wind farm.

There is potential for birds and bats to collide with turbines during the post construction phase of the wind farm, however research to date has shown that collision risks for most species is extremely low due to avoidance behaviour.

Birds and Turbines

A brief literature review of avoidance rates in birds is provided below:

1. Directly observed avoidance rates (i.e. observations of birds passing through a turbine array, but showing active avoidance of collisions):
 - 100% - Barnacle, Greylag, White-fronted Geese, Sweden (Percival 1998);
 - 100% - range of species (Common Starling, Straw-necked Ibis, Australian Magpie, Australian Raven, Little Raven, *European Goldfinch, White-fronted Chat, *Skylark, Black-shouldered Kite, Brown Goshawk, Richards Pipit,

Magpielark, Nankeen Kestrel, White-faced Heron, Brown Songlark, Wedge-tailed Eagle, Swamp Harrier, Brown Falcon, Collared Sparrowhawk, egret sp., White Ibis), Codrington, Victoria (Meredith et al. 2002);

- 99% - migrating birds, Holland (diurnal and nocturnal data) (Winkelman 1992a);
- 99.9% - gulls, Belgium (Everaert et al 2002, in Langston & Pullan 2003);
- 99.8% - Common Terns, Belgium (Everaert et al 2002, in Langston & Pullan 2003);
- 99.5% - Common Terns avoiding powerlines (Henderson et al 1996);
- 97.5% - waterfowl and waders, Holland (Winkelman 1992b, 1994);
- 87% - waterfowl and waders at night, Holland (Winkelman 1990).

(* introduced species)

2. Calculated avoidance rates (i.e. recorded fatalities compared with measured utilisation rates – these are more accurately considered as survival rates of birds passing through a wind farm, but they give an indirect estimate of avoidance rate):

- 100% - waterfowl, Yukon, Canada (Mossop 1997);
- 100% - raptors, Yukon (ibid);
- 99% - Australian Magpie, Skylark, Codrington Victoria (Meredith et al. 2002);
- 99% - waterfowl, waders, cormorants, UK (Percival 2001);
- >95% - Brown Falcon, Victoria [Codrington] (Meredith et al. 2002).

Based on the experience cited above, it is reasonable to conclude that an avoidance rate of 0.99 or greater is typical for most birds during daylight and normal weather. The only measured avoidance rate of nocturnal flights is 0.87 (87% in Winkelman 1990). While other sources conclude that birds' avoidance behaviour differs between night and day, they do not provide actual avoidance rates. Radar studies record 100% avoidance in most cases, but where a "reduction" in avoidance is noted, they don't provide corresponding avoidance rates (Dirksen et al. 1996, 1998a, 1998b). These sources suggest that at night, birds are more cautious about flying into a wind farm area, but have potentially lower rates of avoidance if they do enter a wind farm. Since 0.87 is the only avoidance rate figure available for conditions of poor visibility (e.g. night, fog),

and in the absence of any other empirical data this is most reasonable to use as a lower bound on ecologically reasonable rates.

Bats and Turbines

A brief literature review of what is known about bats and turbines is provided below:

Recent research suggests that species most at risk of collision are high flying and/or migratory species. The White-striped Freetail Bat, a high flying bat, has been known to occasionally collide with wind turbines at the Codrington wind farm site (M. Venosta pers. comm.), and a small number of fatalities of this species have been documented at the Toora Wind Farm in South Gippsland, Victoria (Brett Lane and Associates 2003). Several other forest bat species have also died as a result of wind turbine collision at Woolnorth Wind Farm, northwestern Tasmania (T. Robinson, Hydro Hydro-Electric Corporation, pers comm.). At a wind farm in the USA (Buffalo Ridge Minnesota), large numbers of bats (184 in total) were killed as a result of wind turbine collision (Ugoretz 2001). However, this was a one off mortality event and similar numbers of bats have not routinely been killed at the site (Johnson et al. 1999).

6.2 Recommendations

6.2.1 Vegetation and land protection

- Use locally indigenous species from the appropriate EVC for any landscape plantings.
- If necessary, offset the incidental loss of indigenous species through a suitable ecological management option such as supplementary understorey planting within stands of indigenous trees which have already been fenced within the property to protect them from stock damage, or extension of this fencing program to provide additional tree protection and encourage natural regeneration.
- Protect any trees in the vicinity of construction areas prior to and during construction activities. An exclusion zone of a minimum of five metres from the drip line of tree canopy is recommended.
- Implement control measures in accordance with the EPA's "Environmental Guidelines for Major Construction Sites", publication 480 of the Best Practice Environmental Management Series (BPEMS), to minimise the risk of sediment and other pollutants from reaching any waterways.

6.2.2 Birds and Bats

Although the likely impacts of this wind farm on avifauna are likely to be low, a referral to DEH is recommended to determine if a significant impact will occur from the proposed development. As DEH are likely to seek further information at this early stage, and to further inform the planning application process, further bird and bat survey is recommended as set out below prior to making any referral.

Birds

Although the likely impacts of this wind farm on avifauna are likely to be low, based on this preliminary assessment, if further confirmation of this view is required, some further avifauna survey would be needed. Any further survey should follow the Australian Wind Energy Association (AusWEA) guidelines for assessing the impacts of wind farms on birds (Brett Lane and Associates 2005). We recommend that as per the AusWEA report, a “level 1” assessment be undertaken. This would be restricted to a single-season point count survey to calculate utilisation rates. Further work should include the following:

- To obtain baseline data, a spring or summer bird survey should be conducted within the site in order to determine which species may fly through the site and/or which areas have the highest levels of bird usage.
- Three or four point count locations should be established at appropriate locations across the wind farm site.
- Ten 30-minute survey replicates should be undertaken at each point, noting the bird species observed, the number of birds, and their behaviour and flight height.
- This data can then be used to define the avifauna of the wind farm, calculate bird utilisation rates (for comparison with other wind farms) and if required, mortality rates.

Bats

Bat monitoring can only indicate levels of bat activity on the site and utilisation/risk assessment cannot be calculated for this group. Bat monitoring is achieved using remote Anabat Ultrasonic detectors. The possibility of hoisting the Anabat microphone to the top of the existing Monitoring tower should be investigated. This allows for detection of high flying species such as the Common Bent-wing Bat. We have successfully used this technique recently at another wind farm site. Bat monitoring over four or five nights in spring or summer is recommended to provide information on they types of species occurring at the site and the level of activity.

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APPENDICES

APPENDIX 1

Significance Assessment

The common language meaning of significance is ‘importance; consequence’ (Macquarie Dictionary). While the general meaning of this is clear, in natural resource assessment and management this meaning needs to be defined in scientific terms.

A1.1 Significant Species and Communities

Species and community conservation significance is defined as follows:

A taxon or community is significant at a particular geographic level (national, state, regional, local) when it is considered to be rare or threatened at that level.

A taxon is an officially recognised species, subspecies or variety of a species. The significance of a taxon or community is a function of its rarity within a specified geographic context: nation, state, region, local area. In each context a taxon or community has a conservation status: not rare, rare, vulnerable, endangered, extinct. ‘Threatened’ is a combination of the ‘vulnerable’ and ‘endangered’ categories.

The significance of the taxon or community is the largest geographic context in which it is at least rare. For example, if a species is uncommon in a state and rare within a region of that state, it has regional significance within that region.

Species listed as ‘poorly known’ are not considered rare or threatened at present and are assigned an intermediate rating. For example, a species listed as poorly known in a state list has potential state significance and is assigned ‘regional/state’ significance.

A1.2 Sites

Site conservation significance is defined as follows:

A site is significant at a particular geographic level (national, state, regional, local) when it is considered to make a substantial contribution to biodiversity at that level.

As a guideline, one per cent of the total extant population of a significant species within a specified geographic area or of the total extant area of a significant ecological community within a specified geographic area is a threshold for ‘substantial contribution’. Comprehensive data are not always available for such assessments and interpretation of available data and information is usually required.

In some cases a site may be small when viewed in isolation but it forms an integral and functional part of a larger site of significance. If there is no ecological reason to divide the larger site, then the rating that applies to the larger site applies to the smaller site.

Sites with a particularly high level of local or regional significance are assigned ‘high local’ or ‘high regional’ significance, respectively. These terms are not applied to state and national levels of significance or to species and communities.

To determine whether a site makes a ‘substantial contribution’ to biological conservation, it is assessed against the following criteria:

- Size – overall size of site or habitats/vegetation communities within the site.
- Significant species and populations – number of significant species or populations known or likely to occur on the site.
- Significant habitat or vegetation communities – presence and extensiveness of significant habitats and vegetation communities on the site.
- Ecological integrity – degree of intactness, level of past disturbance (such as weed invasion) and overall condition of vegetation communities on the site.
- Richness and diversity – quantity of species, vegetation communities and habitats.
- Connectivity – Quality and quantity of linkages between site and adjacent areas of native vegetation/habitat (wildlife corridor value).
- Viability – level of existing and/or future disturbances, degree of existing and/or future fragmentation.
- Distribution – proximity of the site to known distribution limits for significant species, populations, habitats and/or vegetation communities.
- Level of conservation – representation of site attributes in conservation reserves.

As a guideline, *one per cent* of the total extant population of a significant species within a specified geographic area or of the total extant area of a significant ecological community within a specified geographic area is a threshold for ‘substantial contribution’. Comprehensive data are seldom available and interpretation of limited available data and information is usually required.

A1.3 Scale: Geographic Context

Significance is determined within specified geographic contexts:

- Australia
- State Victoria
- Region Strzelecki Ranges Bioregion (DSE Flora Information System)
- Local area Yarram area (within 10 km of the study area)

A1.4 Conservation Status: Degree of Threat

Official government lists define species and communities that are rare or threatened (and thus significant) at *national* and/or *state* levels. Most of these lists appear as schedules under legislation and are followed unless further evidence is available.

Species and communities that are rare or threatened at *regional* and *local* levels are determined from the available literature, data and information, and consultation with relevant individuals where relevant reports and government listings are not available.

National Significance

Species

Species of national significance are either:

- Flora or fauna listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable or conservation dependent under the *Environment Protection and Biodiversity Conservation Act 1999*.

- Flora listed as rare in Australia in *Rare or Threatened Australian Plants* (Briggs and Leigh 1996).
- Fauna listed as extinct, endangered, vulnerable or rare/near-threatened in Australia in an Action Plan published by Environment Australia.

Communities

Ecological communities of national significance are either:

- Listed as critically endangered, endangered or vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*.
- Considered to be rare or threatened in Australia by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Ecological communities include flora and/or fauna communities.

State Significance

Species

Species of state significance in Victoria are either:

- Flora or fauna listed as threatened under the *Flora and Fauna Guarantee Act 1988*.
- Flora listed as extinct, endangered, vulnerable or rare in Victoria in the DSE Flora Information System 2004 Version.
- Flora listed as poorly known in Australia in *Rare or Threatened Australian Plants* (Briggs and Leigh 1996).
- Fauna listed as extinct, critically endangered, endangered, vulnerable or near-threatened in the *Advisory List of Threatened Vertebrate Fauna in Victoria, 2004* (DSE 2003).

Communities

Ecological communities of state significance in Victoria are either:

- Listed as threatened under the *Flora and Fauna Guarantee Act 1988*.
- Considered to be rare or threatened in Victoria by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Regional Significance

Species

Species of regional significance are:

- Flora recorded from less than < 5 % of documented sites (quadrats/defined area lists) from the Gippsland Plain bioregion in the DSE Flora Information System unless there is reason to believe they are undersampled in the available data.
- Fauna considered to be rare or threatened at the bioregional level by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Communities

Ecological communities of regional significance in Victoria are:

- Listed as an endangered, vulnerable or depleted ecological vegetation class within a particular bioregion in a Draft Native Vegetation Plan.
- Considered to be rare or threatened at the bioregional level by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Local Significance

Species

Species of local significance are:

- Flora or fauna considered to be rare or threatened at the local level by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Communities

Ecological communities of local significance are:

- Considered to be rare or threatened at the local level by Biosis Research using IUCN criteria where applicable (IUCN 2000).

No Significance

Species and ecological communities are not significant when they are considered not to be rare or threatened at any geographic level by Biosis Research using IUCN criteria where applicable (IUCN 2000). Species that are not indigenous to a given study area are not significant. Plantings are generally not significant.

APPENDIX 2

Flora Results

A2.1 Flora species recorded within the study area

Table A2.1 Flora species recorded from the study area (FIS list U40560).

Species of regional significance are highlighted in **bold**. All indigenous species have at least local significance.

Scientific Name	Common Name
<u>Indigenous species</u>	
<i>Austrodanthonia laevis</i>	Smooth Wallaby-grass
<i>Austrodanthonia racemosa</i> var. <i>racemosa</i>	Stiped Wallaby-grass
<i>Austrostipa rudis</i> subsp. <i>nervosa</i>	Veined Spear-grass
<i>Carex longebrachiata</i>	Bergalia Tussock
<i>Elymus scaber</i> var. <i>scaber</i>	Common Wheat-grass
<i>Eucalyptus cypellocarpa</i>	Mountain Grey-gum
<i>Eucalyptus muelleriana</i>	Yellow Stringybark
<i>Glycine clandestina</i>	Twining Glycine
<i>Juncus australis</i>	Austral Rush
<i>Juncus bufonius</i>	Toad Rush
<i>Linum marginale</i>	Native Flax
<i>Lythrum hyssopifolia</i>	Small Loosestrife
<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass
<i>Persicaria hydropiper</i>	Water Pepper
<i>Rubus parvifolius</i>	Small-leaf Bramble
<i>Senecio quadridentatus</i>	Cotton Fireweed
<u>Introduced species</u>	
<i>Agrostis capillaris</i> s.l.	Brown-top Bent
<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass
<i>Briza minor</i>	Lesser Quaking-grass
<i>Bromus catharticus</i>	Prairie Grass
<i>Bromus hordeaceus</i> subsp. <i>hordeaceus</i>	Soft Brome
<i>Cynosurus cristatus</i>	Crested Dog's-tail
<i>Dactylis glomerata</i>	Cocksfoot
<i>Ehrharta erecta</i> var. <i>erecta</i>	Panic Veldt-grass
<i>Erodium</i> spp.	Heron's Bill
<i>Geranium molle</i> var. <i>molle</i>	Dovesfoot

<i>Holcus lanatus</i>	Yorkshire Fog
<i>Hypochoeris radicata</i>	Cat's Ear
<i>Lolium perenne</i>	Perennial Rye-grass
<i>Lotus subbiflorus</i>	Hairy Bird's-foot Trefoil
<i>Malva</i> spp.	Mallow
<i>Medicago sativa</i> subsp. <i>sativa</i>	Lucerne
<i>Paspalum dilatatum</i>	Paspalum
<i>Plantago lanceolata</i>	Ribwort
<i>Poa annua</i>	Annual Meadow-grass
<i>Polygonum aviculare</i> s.s.	Hogweed
<i>Prunella vulgaris</i>	Self-heal
<i>Rumex pulcher</i> subsp. <i>pulcher</i>	Fiddle Dock
<i>Senecio jacobaea</i>	Ragwort
<i>Trifolium repens</i> var. <i>repens</i>	White Clover
<i>Vicia sativa</i>	Common Vetch
<i>Vulpia</i> spp.	Fescue

A2.2 Significant flora species

Table A2.2. Flora of national or state significance recorded or predicted to occur within 10 km of the study area

Source: DSE Flora Information System, DEH database

Australian status:

E Listed under EPBC Act as endangered

V Listed under EPBC Act as vulnerable

Victorian status

DSE Advisory list of rare or threatened plants in Victoria –2005 (DSE 2005)

e Endangered

v Vulnerable

r Rare

Victorian FFG Act (DSE Flora Information System, 2004 Version):

L Listed

FIS: Recorded within 5 km of centre of study area, DSE Flora Information System

DEH: Species predicted to occur in local area, EPBC Act Protected Matters Search Tool

Scientific Name	Common Name	Source	EPBC	DSE	FFG Act
National significance					
<i>Amphibromus fluitans</i>	River Swamp Wallaby-grass	FIS	V		
<i>Caladenia tessellata</i>	Thick-lipped Spider-orchid	DEH	V		
<i>Prasophyllum frenchii</i>	Maroon Leek-orchid	FIS	E	e	L
<i>Xerochrysum palustre</i>	Swamp Everlasting	DEH	V	v	L
State Significance					
<i>Acacia howittii</i>	Sticky Wattle	FIS		r	
<i>Caladenia flavovirens</i>	Summer Spider-orchid	FIS		r	
<i>Caladenia fragrantissima</i>	Scented Spider-orchid	FIS		e	
<i>Caladenia patersonii</i> s.s.	Cream Spider-orchid	FIS		e	
<i>Caladenia X variabilis</i>	Variable Spider-orchid	FIS		e	
<i>Cyathea cunninghamii</i>	Slender Tree-fern	FIS		v	L
<i>Cyathea X marcescens</i>	Skirted Tree-fern	FIS		v	
<i>Echinodium hispidum</i>	Madeira Moss	FIS		r	
<i>Eucalyptus willisii</i> subsp. <i>willisii</i>	Promontory Peppermint	FIS		r	
<i>Fissidens dealbatus</i>	Nerveless Pocket-moss	FIS		r	
<i>Glossodia minor</i>	Small Wax-lip Orchid	FIS		r	
<i>Prasophyllum parviflorum</i>	Slender Leek-orchid	FIS		v	
<i>Pterostylis fischii</i>	Fisch's Greenhood	FIS		r	
<i>Pterostylis X ingens</i>	Sharp Greenhood	FIS		r	
<i>Pyrrhobryum bifarium</i>	Umbrella Thyme-moss	FIS		v	
<i>Tetraphidopsis pusilla</i>	Arc Moss	FIS		v	

Trachyloma planifolium

Trachyloma

FIS

r

APPENDIX 3

Fauna Results

A3.1 Fauna species recorded within the study area

Table A3.1. Terrestrial vertebrate fauna recorded from the study area.

Key:

- introduced species

Common Name	Scientific Name
Australian Wood Duck	<i>Chenonetta jubata</i>
Pacific Black Duck	<i>Anas superciliosa</i>
Yellow-tailed Black-Cockatoo	<i>Calyptorhynchus funereus</i>
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>
Long-billed Corella	<i>Cacatua tenuirostris</i>
Crimson Rosella	<i>Platycercus elegans</i>
Blue-winged Parrot	<i>Neophema chrysostoma</i>
Rainbow Lorikeet	<i>Trichoglossus haemotodus</i>
Tawny Frogmouth	<i>Podargus strigoides</i>
Laughing Kookaburra	<i>Dacelo novaeguineae</i>
Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalis</i>
Welcome Swallow	<i>Hirundo neoxena</i>
Tree Martin	<i>Hirundo nigricans</i>
Grey Fantail	<i>Rhipidura fuliginosa</i>
Willie Wagtail	<i>Rhipidura leucophrys</i>
Golden Whistler	<i>Pachycephala pectoralis</i>
Rufous Whistler	<i>Pachycephala rufiventris</i>
Grey Shrike-thrush	<i>Colluricincla harmonica</i>
Magpie-lark	<i>Grallina cyanoleuca</i>
Superb Fairy-wren	<i>Malurus cyaneus</i>
Spotted Pardalote	<i>Pardalotus punctatus</i>
Yellow-rumped Thornbill	<i>Acanthiza</i>
Silvereye	<i>Zosterops lateralis</i>
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>
Richard's Pipit	<i>Acanthus novaeseelandiae</i>
Lewin's Honeyeater	<i>Meliphaga lewinii</i>
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>
Red Wattlebird	<i>Anthochaera carunculata</i>
Grey Currawong	<i>Strepera versicolor</i>
Australian Magpie	<i>Gymnorhina tibicen</i>
Australian Raven	<i>Corvus coronoides</i>
Common Blackbird*	<i>Turdus merula</i>
Skylark*	<i>Alauda arvensis</i>
House Sparrow*	<i>Passer domesticus</i>
European Goldfinch*	<i>Carduelis carduelis</i>

Common Myna*	<i>Acridotheres tristis</i>
Common Starling*	<i>Sturnus vulgaris</i>
Common Wombat	<i>Vombatus ursinus</i>
European Rabbit*	<i>Oryctolagus cuniculus</i>
Red Fox*	<i>Canis vulpes</i>
Cat (feral)*	<i>Felis catus</i>
Blotched Blue-tongued Lizard	<i>Tiliqua nigrolutea</i>

A3.2 Significant fauna species

Table A3.2. Terrestrial vertebrate fauna of national or state significance recently recorded, or predicted to occur, within 10km of the study area

Source: DSE Atlas of Victorian Wildlife, DEH database

Status of species:

CR	critically endangered
EN	endangered
VU	vulnerable
NT	near threatened
DD	data deficient (insufficient known)
R	rare or insufficient known
L	listed under Flora and Fauna Guarantee Act

Sources used to derive species status:

EPBC *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)

DSE *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2003)

FFG *Flora and Fauna Guarantee Act 1988* (Vic.)

Action Plans: Maxwell et al. (1996) for marsupials and monotremes, Duncan et al. (1999) for bats, Lee (1995) for rodents, Garnett and Crowley (2000) for birds, Cogger et al. (1993) for reptiles, Tyler (1997) for amphibians.

denotes species predicted to occur or with habitat predicted to occur in the local area (DEH database)

Common Name	Scientific Name	Last AVW Record	EPBC	DSE	FFG	Action Plan	Use of study area
National Significance							
Australian Painted Snipe	<i>Rostratula australis</i>	#	VU	CR	L	VU	Unlikely
Swift Parrot	<i>Lathamus discolor</i>	#	EN	EN	L	EN	Rare visitor; overfly
Regent Honeyeater	<i>Xanthomyza phrygia</i>	#	EN	CR	L	EN	Unlikely
Spot-tailed Quoll	<i>Dasyurus maculatus maculatus</i> (SE mainland population)	#	EN	EN	L	VU	Unlikely
Southern Brown Bandicoot	<i>Isodon obesulus obesulus</i>	#	EN	NT		NT	Unlikely
Long-nosed Potoroo (SE mainland)	<i>Potorous tridactylus tridactylus</i>	#	VU	EN	L	VU	Unlikely
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	#	VU	VU	L	VU	Unlikely; possible overfly
Smoky Mouse	<i>Pseudomys fumeus</i>	#	EN	EN	L	R	Unlikely
Growling Grass Frog	<i>Litoria raniformis</i>	#	VU	EN	L	VU	Unlikely
Australian Grayling	<i>Prototroctes maraena</i>	1987	VU	VU	L	VU	Unlikely
Dwarf Galaxias	<i>Galaxiella pusilla</i>	#	VU	VU	L	VU	Unlikely
State Significance							
Latham's Snipe	<i>Gallinago hardwickii</i>	#		NT			Unlikely
Great Egret	<i>Ardea alba</i>	#		VU	L		Occasional visitor to farm dams
Freckled Duck	<i>Stictonetta naevosa</i>	1992		EN	L		Unlikely
Grey Goshawk	<i>Accipiter novaehollandiae</i>	1922		VU	L		Rare visitor
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	#		VU	L		Unlikely;

Powerful Owl	<i>Ninox strenua</i>	2000	VU	L	Unlikely
Sooty Owl	<i>Tyto tenebricosa</i>	1990	VU	L	Unlikely
Tree Goanna	<i>Varanus varius</i>	1992	VU		Rare visitor
Cox's Gudgeon	<i>Gobiomorphus coxii</i>	1982	EN	L	Unlikely
Strzelecki Burrowing Cray	<i>Engaeus rostrigaleatus</i>	1999		L	Unlikely
South Gippsland Spiny Cray	<i>Euastacus neodiversus</i>	1981		L	Unlikely

A3.3. Migratory species

Table A3.3. Migratory fauna species recorded, or predicted to occur, within 10km of the study area

Source: DSE Atlas of Victorian Wildlife, DEH database

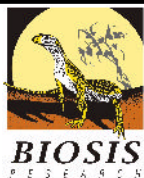
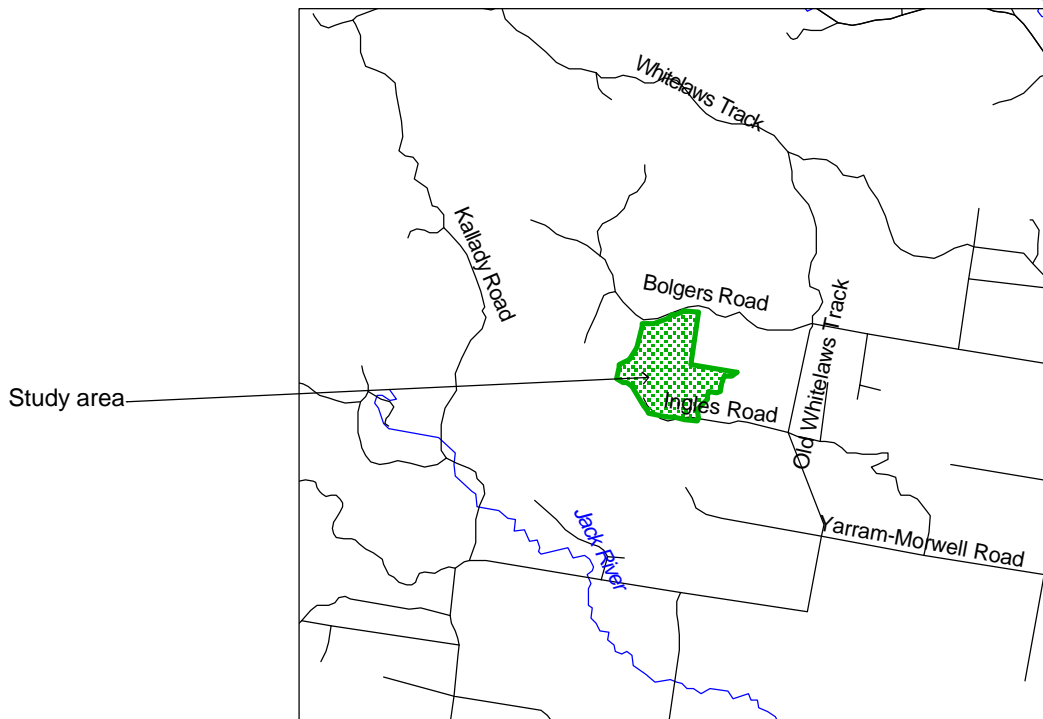
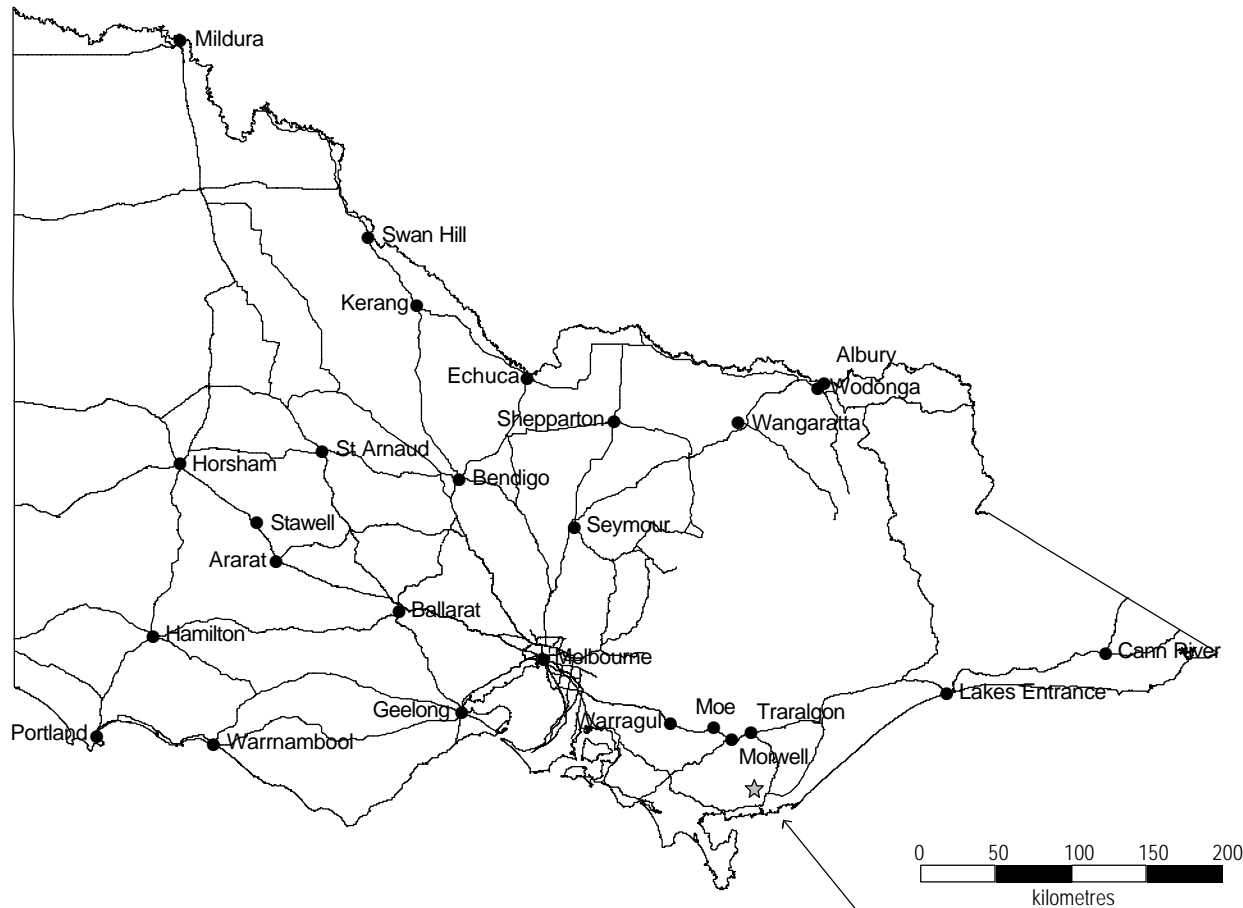
Note:

Species in bold were recorded in the study area during the present assessment.

denotes species predicted to occur or with habitat predicted to occur in the local area (DEH database)

Common Name	Scientific Name	Last AVW record
Masked Lapwing	<i>Vanellus miles</i>	1977
Australian Wood Duck	<i>Chenonetta jubata</i>	1977
Black Swan	<i>Cygnus atratus</i>	1977
Australian Shelduck	<i>Tadorna tadornoides</i>	1977
Pacific Black Duck	<i>Anas superciliosa</i>	1977
Grey Teal	<i>Anas gracilis</i>	1977
Freckled Duck	<i>Stictonetta naevosa</i>	1992
Grey Goshawk	<i>Accipiter novaehollandiae</i>	1922
Wedge-tailed Eagle	<i>Aquila audax</i>	2000
Australian Hobby	<i>Falco longipennis</i>	1977
Peregrine Falcon	<i>Falco peregrinus</i>	1991
Regent Honeyeater	<i>Xanthomyza phrygia</i>	#
Latham's Snipe	<i>Gallinago hardwickii</i>	#
Australian Painted Snipe	<i>Rostratula australis</i>	#
Great Egret	<i>Ardea alba</i>	#
Brown Goshawk	<i>Accipiter fasciatus</i>	1991
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	#
White-throated Needletail	<i>Hirundapus caudacutus</i>	#
Fork-tailed Swift	<i>Apus pacificus</i>	#
Rufous Fantail	<i>Rhipidura rufifrons</i>	2003
Satin Flycatcher	<i>Myiagra cyanoleuca</i>	#
Black-faced Monarch	<i>Monarcha melanopsis</i>	#
Cattle Egret	<i>Ardea ibis</i>	#

FIGURES



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Figure 1: Location of the study area

DATE: 21 December 2005

Checked by: DCG | File number: 5323

Location: ...MRG 5300s\5323\mapping\5323 Fig 1.wor

Scale:

