



# Murra Warra Wind Farm: Flora and Fauna Assessment

Prepared for RES Australia

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## Summary

Biosis Pty Ltd was commissioned by RES Australia to undertake a flora and fauna assessment of the proposed Murra Warra Wind Farm study area. Development of a wind energy facility within the area is under consideration. The study area is located between Horsham and Warracknabeal in the Wimmera Bioregion of Western Victoria. The study area is approximately 10km (east-west) by 7.5 km (north-south) encompassing approximately 6,500 ha of private land between the Blue Ribbon Road and the Henty Highway. The site is within the Wimmera Bioregion, and includes sections of the Yarriambiack and Horsham Local Government Areas.

The vegetation and fauna habitat throughout the majority of the study area has been highly modified by past disturbances which have included broadscale clearing, cropping and grazing. Most of the study area has been significantly degraded and supports predominantly introduced vegetation that is of limited value for native fauna. Native vegetation is present within the study area, with the largest areas being present on roadsides, particularly the three east-west roads (Dimboola-Minyip Road, Kings Road and Old Minyip Road). Within paddocks, occurrence of remnant vegetation patches and scattered trees generally increases towards the east, with the largest patches of remnant vegetation occurring near Barrat Quarry and east of the transmission line further south.

### Ecological values

Key ecological values identified within the study area include:

- The study area supports patches of Plains Savannah, Plains Woodland and Black Box Lignum Woodland in a range of condition states.
- Remnant vegetation is located within paddocks and along roadsides.
- The EPBC listed community Buloke Woodlands of the Riverina and Murray Darling Depression Bioregions.
- Populations of several significant species including Buloke, Buloke Mistletoe, Black Falcon, Hooded Robin, Eastern Bearded Dragon and Brown Treecreeper.

### Government legislation and policy

An assessment of the project against key biodiversity legislation and policy is provided and summarised below.

#### Summary of legislative requirements for the project

Legislation / Policy	Relevant Ecological Feature on site	Permit / Approval Required	Notes
EPBC Act	Buloke Woodlands of the Riverina and Murray Darling Depression Bioregions.	The project is unlikely to result in a significant impact to any matters of national environmental significance.	Targeted survey has been conducted for Golden Sun Moth and Striped Legless Lizard. Not detected within the study area.



Legislation / Policy	Relevant Ecological Feature on site	Permit / Approval Required	Notes
		The project footprint does not impact upon any areas of Buloke Woodland.	
<b>FFG Act</b>	Two protected flora species.	Protected Flora Permit not required.	Site is private land.
<b>Environmental Effects Act</b>	Remnant native vegetation.	No referral criteria triggered.	Only referral criteria relating to flora and fauna have been assessed.
<b>Planning &amp; Environment Act</b>	Remnant vegetation and fauna habitat.	Planning permit will be required, to address clause 12.01-2 and 52.17.	Loss and offset requirements have been determined.

Note: Guidance provided in this report does not constitute legal advice.

### **Permitted clearing of native vegetation: Biodiversity assessment guidelines (the Guidelines)**

Based on the current design, the proposed development will require the removal of 1.685 hectares of native vegetation including 15 scattered trees from within location risk A. Therefore the planning permit application will be assessed on the moderate risk-based pathway. The strategic biodiversity score of the native vegetation to be removed is 0.196.

If a permit is granted, the offset requirements would be 0.110 general biodiversity equivalence units. The general offset must be within the Wimmera catchment management authority area and must have a minimum strategic biodiversity score of 0.157.

It is likely that the required general offsets could be generated through management of retained native vegetation within the study area. This would be a 'first party' offset and would require the appropriate vegetation security agreements and a 10 year offset management plan. Alternatively, the applicant may seek to purchase 'third party' specific offset credits via an accredited trading scheme.

### **Project design and residual impacts**

RES Australia have produced a wind farm design in response to the opportunities and constraints of the site, as identified in a range of studies including the ecological assessment. An important consideration in this design process has been avoiding and minimising impacts to native vegetation and flora and fauna habitat, while also minimising disruption to agricultural production.

Direct and potential impacts to native vegetation have been minimised by:

- Planning turbine locations (including crane pads) on private land with no direct impact on native vegetation.
- Use of existing roads for access.
- Where practicable, creation of access roads through paddocks where nearby public road easements support native vegetation.
- Avoidance of areas surrounding large blocks of remnant vegetation (Barrat State Forest / Flora and Fauna Reserve).

- Where possible, use of underground cabling for power connections.

Based on the current design, the expected residual impacts to ecological values are:

- Removal of 1.685 ha of native vegetation, including 0.630 hectares of remnant vegetation patches and 15 scattered trees, to be assessed under the moderate risk-based pathway. Offsetting these losses requires 0.110 general biodiversity equivalence units with a minimum strategic biodiversity score of 0.157. The proposed offset site is more than sufficient for this purpose.
- The current design involves the potential removal of up to 15 scattered paddock trees. Many of these require removal for construction of the internal power corridor. Removal of some of these may not be necessary, but this will not be known until detailed design of power infrastructure is complete, as the amount of clearance under the power lines will depend on the positioning of poles and the length of spans.
- Impacts to vegetation patches are mostly limited to road reserves, due to requirements to widen roads, to provide access points into paddocks or to cross road reserves, either for access or power infrastructure. Small areas require impact on Kewell North School Road, Barrat Road and Dogwood Road. In terms of area, the largest section of patch vegetation to be removed is within the narrow Dogwood Road reserve. The vegetation along this north-south road is in poor condition, consisting of common native grass species with no overstorey, and the area is subject to regular disturbance by slashing and vehicle movement.
- Loss of native vegetation will also involve minimal removal of habitat for common flora and fauna species and a number of significant species including Buloke, Black Falcon, Hooded Robin, Eastern Bearded Dragon and Brown Treecreeper. Due to the minimal extent of native vegetation removal (< 2 ha across the study area), impacts to these species are expected to be negligible or minor.
- The project will not impact upon any areas of the EPBC Act listed community Buloke Woodlands of the Riverina and Murray Darling Depression Bioregions.
- Construction and operation of aerial infrastructure, including turbines and overhead powerlines will result in an increased risk of collision by birds and bats. The likelihood of significant impacts to threatened species of birds and bats is considered very low, as the listed species recorded or potentially occurring on the site are woodland dependent species unlikely to fly within rotor swept height. Monitoring of impacts to bats and birds will be managed through implementation of an appropriate, project specific Bat and Avifauna Management Plan.



# 1. Introduction

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## 1.1 Project background

Biosis Pty Ltd was commissioned by RES Australia to undertake a flora and fauna assessment of the proposed Murra Warra Wind Farm study area. Development of a wind energy facility within the area is under consideration. A summary of the proposed wind energy facility is provided in section 2.

## 1.2 Scope of assessment

The objectives of this investigation are to:

- Describe the vascular flora, terrestrial vertebrate fauna.
- Map native vegetation and other habitat features.
- Review the implications of relevant biodiversity legislation and policy.
- Identify potential implications of the proposed development and provide recommendations to assist with development design.
- Recommend any further assessments of the site that may be required.

## 1.3 Location of the study area

The study area is located between Horsham and Warracknabeal in the Wimmera Region of Western Victoria (Figure 1). The study area is approximately 10 km (east-west) by 7.5 km (north-south) encompassing approximately 6,500 ha of private land between the Blue Ribbon Road and the Henty Highway. The boundary of the proposed wind farm has changed during the planning and design process. Figure 2 indicates both the current boundary of the proposed wind farm, and the larger area assessed in the initial stages of the flora and fauna studies.

The study area is within the:

- Wimmera Bioregion
- Wimmera Catchment
- Yarriambiack and Horsham Local Government Areas.

## 2. Description of the project

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### 2.1 Brief description of the project

The project will consist of a wind energy facility comprising of up to 116 wind turbine generators.

Turbines will be three bladed and have an expected capacity of approximately 3.6MW (rated capacity will depend on final turbine selection) reaching a maximum height to the tip of the rotor at its highest extent which will not exceed 220m. The turbines will comprise of up to 5 tubular steel tower sections, mounted by a nacelle containing the generator, gear box and electrical equipment. Crane pads of approximately 40x60m will be located at the base of each turbine tower. Each turbine will require a transformer and switchgear which will be housed inside the tower base, or externally, immediately adjacent to the base. Should an external transformer be required, typical dimensions are 5.5m length, 3m width and 3m height.

The turbines will be accessed via a network of access tracks which will be approximately 6m wide to allow access for construction and for ongoing maintenance throughout the life time of the wind farm. Where possible site access tracks will be established to utilise existing access points and roads. It is estimated that there will be approximately 75km of new tracks and upgraded roads required and approximately 50 access points from minor rural roads. There may be a need for some alterations to road junctions close to the site.

Internally, electricity will be distributed from each wind turbine to the Terminal Station via a network of medium voltage 33kV underground and overhead cables. It is estimated that there will be approximately 18km of overhead line, with pole heights of approximately 35m and 70-75km of underground cabling.

There will be a Utility Area, Collector/ Switch Yard, Terminal Station and Quarry which will be co-located at approximately 618363m Easting 5967266m North.

The Utility area will be in a secure enclosed compound and will comprise of an operations and maintenance building, car parking, a site office, warehousing/workshop facility and an external yard area for storage which may include a bunded area for fuel storage, and other ancillary equipment.

The Collector/Switchyard will be in a secure enclosed compound and will be where overhead and underground cables from the wind farm collection system will be terminated. Typically this will comprise of bus bars, switchgear, metering, a control building, reactive and harmonic filtering plant and other ancillary equipment. There will be pylon structures to support cables from the internal overhead lines and out to the adjacent Terminal Station.

The Terminal Station will be in a secure enclosed compound and will typically consist of transformation equipment, bus bars, switch gear, disconnectors, a control building, communications tower and other ancillary equipment to enable connection to the adjacent 220kV transmission line including surge arrestors and pylon structures to support cables from the collector yard and up to the adjacent 220kV transmission line.

The Quarry will be approximately 12Ha inclusive of temporary stock piles for overburden material and will be used to provide base materials for road building. The location of the quarry will be adjacent to and immediately north of the Utility Area and Terminal Station.

Six potential locations have been identified for the placement of hub height anemometry masts. These will be used for monitoring the performance of the wind farm. Final selection of no more than four of these locations will be made after final turbine selection has been made.

There will be other temporary infrastructure associated with the construction of the wind farm. A main site construction compound will be located adjacent to the Utility Area and will typically comprise of offices, laydown area, concrete batch plant, storage, workshops, bundled fuel storage a water storage dam and other ancillary construction equipment. Because of the extent of the site there may be need for an additional two general construction compounds. Preliminary sites for these have been identified in the south west adjacent to the Kings Roads and in the north east adjacent to the Kewell North School Road. These compounds will contain a sub set of the elements described above for the main site compound. There will be two further construction compounds, one to service the construction of the Terminal Station and another one to service the construction of the connection to the 220kV transmission line. These facilities will be located adjacent to the Terminal Station and will also contain a sub set of the elements described above. All temporary infrastructure will be removed at the end of the construction programme and the sites rehabilitated if required by regulators and landowners.

## 2.2 Description of the study area

The project area is located on the Wimmera Plains to the north of Horsham. The area has a long history of dryland agriculture, with squatting and broadscale clearing commencing in the 1840s. Agriculture has involved both sheep farming and dryland cropping. Presently, most of the study area is subject to dryland cropping, using a rotation of cereals and other crops including oilseeds and legumes. Very few sheep are present, with several landholders choosing to permanently remove internal and in some cases external fences to increase paddock size for efficiency reasons. Cropping is conducted with large machinery equipped with precision farming GPS technology to optimize application rates for seed, fertilizer, gypsum and herbicide.

Very few occupied houses remain within the study area, as the size of land holdings has increased in recent generations as larger and larger areas of land are required for farm businesses to remain viable.

Average annual rainfall within the study area is less than 400mm, and can be highly variable from year to year. Grey self-mulching cracking clay soils cover most of the study area, with some lighter soils occurring on low rises in several locations. The grey soils have moderate to high fertility, although application of both phosphorus and nitrogen fertilizer is required to support continuous cropping. Gypsum is applied to improve soil structure.

Native vegetation has been mostly removed from the landscape, and is now limited to road reserves, scattered paddock trees and small remnant patches, typically near old homesteads. Remaining remnant vegetation includes woodlands dominated by Black Box *Eucalyptus largiflorens* and Buloke *Allocasuarina leuhmanii*, with areas of Yellow Box *Eucalyptus melliodora*, Yellow Gum *Eucalyptus leucoxylon* and Bull Mallee *Eucalyptus behriana* occurring on higher ground with lighter soils. Some areas around homesteads, driveways and fencelines have been planted with a range of tree species, including non-Victorian eucalypts and introduced trees such as Radiata Pine *Pinus radiata*.

The study area is generally very flat, and is without any major natural drainage lines. It is situated between the Wimmera River and the Yarriambiack Creek, which are both intermittent, north flowing streams that terminate in lakes. Flow only occurs in these waterways following high rainfall, or following release of environmental flows from water storages higher in the catchment. In the past, water was supplied to farm dams, troughs and tanks within the study area using a series of open channels, which were decommissioned as part of the Wimmera Mallee Pipeline Project between 2006 and 2010. Water supply channels were typically constructed through low points in the landscape, and as a result there is very little sign of the pre-settlement drainage pattern.

There are a number of farm dams located within the study area, but most of these only hold water for short periods, and they are generally not kept full with piped water. As a result, the study area does not support

any permanent aquatic habitats. Following heavy rain, some low-lying areas may hold water and provide habitat for frogs and water birds for short periods.

The Barrat State Forest and Barrat Flora and Fauna Reserve are located to the north of the proposed wind farm. This large block of public land includes areas of eucalypt plantations and areas of remnant woodlands. The reserve is significant, as it is the only large block of reserved native vegetation within a large section of the Wimmera Plains. Other large areas of native vegetation include the riparian vegetation along the Yarriambiack Creek, approximately 10km east of the study area, the Wimmera River approximately 15km west of the study area, and the Little Desert National Park, which stretches from Dimboola (20 km south west of the study area), to the South Australian border. The study area is poorly connected with these larger blocks, although several of the east-west road reserves support significant occurrences of native vegetation.

In particular, the Dimboola-Minyip Rd (Five Chain Road), supports areas of treeless Plains Savannah, patches of Plains Savannah with a dense Buloke overstorey, Plains Woodland and Black Box Lignum Woodland, interspersed with areas dominated by exotic species. Barrat Road and Kewell North School Road also contain moderate quality Plains Woodland. All roadsides within the area are subject to a range of disturbances, including fuel reduction burning, permitted and/or unauthorised cropping, ploughing to create bare earth firebreaks, herbicide application and potentially grazing. As a result, vegetation condition within the road reserves is highly variable, and weed invasion is a significant threat to the long-term persistence of the native vegetation.

The highly modified study area supports habitat for a range of common plants and animals that are well adapted to agricultural landscapes. The area also supports occurrences or potential habitat for several threatened species, which are assessed in detail in this report. Notable species include Buloke Mistletoe *Amyema linophylla* subsp. *orientale*, Pale Flax-lily *Dianella* sp. aff. *longifolia* (Riverina), Brown Treecreeper *Climacteris picumnus victoriae*, Hooded Robin *Melanodryas cucullata*, Eastern Bearded Dragon *Pogona barbata*, Spotted Harrier *Circus assimilis* and Black Falcon *Falco subniger*.

As the Wimmera Plains have been almost entirely cleared, all remaining native vegetation recorded within the study area is considered either vulnerable or endangered by the Victorian State Government Department of Environment, Land, Water and Planning (DELWP). Additionally, the study area supports areas of Buloke Woodland (Plains Savannah EVC), some of which corresponds with the definition of the nationally endangered 'Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions', which is protected by the *Environment Protection and Biodiversity Conservation Act 1999*.

### 3. Legislative and policy background

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The Murra Warra Wind Farm project is subject to a number a legislative and approvals processes under Commonwealth, Victorian and Local Government legislation. A summary of the legislative and approvals processes relevant to the project are described below:

- **EPBC Act** - Matters of national environmental significance (MNES) listed under the EPBC Act; associated policy statements, significant impacts guidelines, listing advice and key threatening processes. If a project is going to have a significant impact on a MNES then a referral is required.
  - There is currently a Bilateral Agreement between the Commonwealth of Australia and the State of Victoria under section 45 of the EPBC Act. This agreement aims to reduce the duplication of process in relation to environmental assessment, where there is an assessment required under State legislation i.e. an EES and under the EPBC Act. .
- **EE Act** - The Victorian *Environment Effects Act 1978* (EE Act) establishes a process to assess the environmental impacts of a project. If applicable, the EE Act requires that an Environment Effects Statement (EES) be prepared by the proponent. The EES is submitted to the Minister for Planning and enables the Minister to assess the potential environmental effects of the proposed development. The EES process can be an accredited assessment pathway for a controlled action under the EPBC Act.
- **FFG Act** - Threatened taxa, communities and threatening processes listed under Section 10 of the *Flora & Fauna Guarantee Act 1988* (FFG Act); associated action statements and listing advice. A permit is required under the FFG Act to take protect flora, this generally only applies to Crown Land.
- **P&E Act** - *Planning and Environment Act 1987* - The Study area is split across two Planning Schemes - Yarriambiack Shire and Horsham Rural City Council. A planning permit is required under Clause 52.17 – Native Vegetation of both Planning Schemes to remove, destroy or lop native vegetation. An assessment is required under the Permitted clearing of native vegetation – Biodiversity assessment guidelines (DEPI 2013a). Other relevant controls include:
  - Farming Zone - Yarriambiack Planning Scheme and Horsham Planning Scheme.
  - Clause 52.32 Wind Energy Facility - Yarriambiack Planning Scheme and Horsham Planning Scheme.
  - Environmental Significance Overlay schedule 3 - Yarriambiack Planning Scheme.
- **CaLP Act** - Noxious weeds and pest animals are listed and controlled under the under the *Catchment and Land Protection Act 1994* (CaLP Act). Landowners must take all reasonable steps to eradicate regionally prohibited weeds; prevent the growth and spread of regionally controlled weeds; and prevent the spread of, and as far as possible eradicate, established pest animals.

## 4. Methods

### 4.1 Literature and database review

In order to provide a context for the study site, information about flora and fauna from within 5 km of the study site (the 'local area') was obtained from relevant public databases. Records from the following databases were collated and reviewed:

- Victorian Biodiversity Atlas 'VBA\_FLORA25, FLORA100 & FLORA Restricted' August 2012 © The State of Victoria, Department of Sustainability and Environment. The contribution of the Royal Botanical Gardens Melbourne to the database is acknowledged.
- Victorian Biodiversity Atlas 'VBA\_FAUNA25, FAUNA100 & FAUNA Restricted' August 2012 © The State of Victoria, Department of Sustainability and Environment.
- DELWP Biodiversity Interactive Map (BIM).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2012 (BA).
- Protected Matters Search Tool of the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPac) for matters protected by the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The following reports were also reviewed:

- Murra Warra Wind Farm Preliminary Flora and Fauna Assessment. Biosis Research 2010.

### 4.2 Definitions of significance

#### 4.2.1 Species and ecological communities

Significance of a species or community is determined by their listing as rare or threatened under Commonwealth or State legislation / policy. The sources used to categorise significance of species and communities in this report are summarised below in Table 1.

**Table 1: Criteria for determining significance of species & ecological communities**

Significance	
<b>National</b>	Listed as threatened (critically endangered, endangered, vulnerable or conservation dependent) under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
<b>State</b>	Listed as threatened (critically endangered, endangered, vulnerable) or rare for flora species, in Victoria on a DELWP Advisory List (DSE 2005a, 2007a). Listed as threatened under the <i>Flora and Fauna Guarantee Act 1988</i> .

Fauna species listed as near threatened or data deficient are listed in Appendix 2, however in accordance with advice from DELWP these fauna species are not considered to be at the same level of risk as higher categories of threat. These species are generally not discussed in detail in this report.



### 4.3 Likelihood of occurrence

The likelihood of occurrence is a broad categorisation used by Biosis to indicate the potential for a species to occur within the site: it is based on expert opinion and implies the relative value of a site for a particular species.

The likelihood of species occurring within the site is ranked as negligible, low, medium or high. The rationale for the rank assigned is provided for each species in Appendix 1 (flora) and Appendix 2 (fauna).

Species which have at least medium likelihood of occurrence are given further consideration in this report. The need for targeted survey for these species is also considered.

### 4.4 Site investigation

A summary of the ecological survey work undertaken within the study area is included in Table 2. Details of these studies are provided in the following sections.

**Table 2: Summary of ecological survey program**

Timing	Description of survey
May 2010	Preliminary flora and fauna survey
February 2013	Flora and fauna assessment
May – June 2013	Preliminary bird and bat utilisation surveys (10 sites – Autumn 2013)
November 2013	Spring 2013 flora surveys
November – December 2013	Spring / Early Summer bird utilisation surveys (24 sites)
January 2014	Bat Trapping (2 sites)
January – February 2014	Late Summer bird and bat utilisation surveys (24 sites)
April 2014	Autumn bird and bat utilisation surveys (24 sites)
November - December 2014	Golden Sun Moth survey
September – December 2015	Striped Legless Lizard targeted survey
November 2015	Spring survey of native vegetation to be impacted

#### 4.4.1 Flora assessment

The flora assessment was undertaken during early February 2013 (4/2 – 8 /2) and a list of flora species was collected (Appendix 3). Additional species located during other field visits to the site have also been added to the list. This list will be submitted to DELWP for incorporation into the Victorian Biodiversity Atlas. Planted species have not been recorded unless they are naturalised.

Classification of native vegetation is based on ecological vegetation classes (EVCs). An EVC contains one or more floristic (plant) communities, and represents a grouping of broadly similar environments. Definitions of EVCs and benchmarks (condition against which vegetation quality at the site can be compared) are as determined by DELWP.

#### **4.4.2 General fauna assessment**

The study area was investigated during early February 2013 with additional surveys conducted in May 2013, to determine its values for fauna. These were determined primarily on the basis of the types and qualities of habitat(s) present. All species of fauna observed during the assessment were noted and active searching for fauna was undertaken. This included direct observation, searching under rocks and logs, examination of tracks and scats and identifying calls. Particular attention was given to searching for significant species and their habitats.

A nocturnal survey of the wind farm site was conducted on the 27<sup>th</sup> of May to assess the site for the presence of nocturnally active birds, particularly owls. The survey was conducted between 7.00 and 10.30 pm under cool to mild conditions with no wind. All trafficable roads within, and bordering the study area were driven at low speed. Close attention was paid to perching points such as fence posts and roadside trees, for the presence of owls. Where birds were located the species was recorded and the location mapped.

Any additional species observed during subsequent site visits (during targeted surveys etc.) have been incorporated into this report.

#### **4.4.3 Bird utilisation surveys**

##### *Preliminary bird utilisation surveys*

Preliminary bird utilisation surveys (BUS's) were carried out at ten locations (Table 2) across the wind farm site between the 27<sup>th</sup> of May and the 10<sup>th</sup> of June 2013. The survey locations are mapped in Figure 4. Two surveys were carried out at each point. Point locations were chosen that broadly reflected the different land use types represented within the wind farm site. The same monitoring locations were used for both birds and bats. Birds were surveyed using the point count method, which entailed the observer recording all birds observed for a period of 20 minutes. For each bird observed a set of parameters were recorded including flight height, distance from observer and behaviour.

##### *Detailed bird utilisation surveys*

Commencing in spring 2013, the bird utilisation surveys were expanded to 24 sites (Table 3). Most of the additional sites were in open areas, either lacking a canopy or with scattered trees.

Surveys were conducted in November-December 2013 (spring/early summer), January-February 2014 (summer) and April 2014 (autumn). The same survey method was used as for the preliminary surveys, with two surveys conducted at each site each season.

Data collected during both preliminary and detailed surveys survey is capable of being used as an input into any potential collision risk modelling for the site.

#### **4.4.4 Bat utilisation surveys**

##### *Preliminary bat utilisation surveys*

The study area was surveyed for bats over two weeks between the 27<sup>th</sup> of May and the 10<sup>th</sup> of June 2013. Ten Anabat units were placed in the field at selected locations within the wind farm boundary. Anabat detector units were mounted on star pickets 1.2m high and were located in areas of selected habitat and this is outlined in Table 3 below. Locations were chosen to broadly reflect the different land use types within the wind farm boundary. Monitoring equipment was installed in areas of remnant woodland, cropped paddock, and open areas containing scattered trees.

**Table 3: Summary of vegetation structural attributes for preliminary bird and bat survey points**

Site	Overstorey	Canopy structure	Dominant overstorey species	Location
1	Absent	–	–	Adjacent to cropped paddocks on an unnamed roadway south of the Dimboola - Minyip Road.
2	Present	Open	Buloke	Remnant patch of Buloke off Newells Road.
3	Present	Open/scattered	Buloke and <i>Pinus halepensis</i>	South of Kings Road amongst an isolated remnant Buloke stand.
4	Present	Open	Buloke	West of Dogwood Road in a patch of mature Buloke.
5	Present	Open	Buloke	North of the Dimboola - Minyip Road in a patch of poor quality Buloke.
6	Present	Open	Yellow Gum	Barrat Quarry in mature Yellow Gum Woodland.
7	Present	Open	Black Box	South of Old Minyip Road in Black Box Woodland.
8	Present	Open/scattered	Black Box	Adjacent to Byrnes Road with large scattered Black Box.
9	Present	Open	Black Box	South-west of the Dimboola - Minyip Road in mature Black Box.
10	Present	Open/scattered	Black Box	East of the Dimboola - Minyip Road adjacent to an isolated mature Buloke.

#### Detailed bat utilisation surveys

In Spring 2013, the bat utilisation surveys were expanded to 24 sites (Table 4). Most of the additional sites were in open areas, either lacking a canopy or with scattered trees.

Surveys were conducted in November-December 2013 (spring/early summer), January-February 2014 (summer) and April 2014 (autumn). The same survey method was used as in the preliminary surveys.

**Table 4: Summary of vegetation structural attributes for detailed bird and bat survey points**

site	Overstorey	Canopy structure	Dominant overstorey species	easting	northing	Location
1	Absent	-	-	612608	5965633	Road reserve between Kings Road and Dimboola-Minyip Road.
2	Present	Planted	Planted species	616116	5967467	Unoccupied homestead off Dogwood Road.
3	Absent	-		615485	5964711	Adjacent to a dam on Kings Road near Dogwood Road.
4	Present	Open	Buloke	613484	5963434	Open woodland near unoccupied house on Old Minyip Road.
5	Present	Open	Buloke	616680	5966865	Unoccupied homestead north of Dimboola Minyip Road.
6	Present	Open	Yellow Gum	618236	5967883	Woodland around Barrat quarry.
7	Present	Open	Black Box	618572	5963099	Old Minyip Road.
8	Present	Open scattered	Black Box	618917	5965859	Ailsa Wheat Road.
9	Present	Open	Black Box	619763	5966393	Dimboola-Minyip Road.

site	Overstorey	Canopy structure	Dominant overstorey species	easting	northing	Location
10	Present	Open scattered	Black Box	619669	5967260	Yarriambiack Drive.
11	Present	Open	Mixed	620901	5968935	Kewell North School Road.
12	Present	Open	Black Box (Creekline)	617737	5968704	Creekline near Barrat Quarry Road.
13	Absent	-		614123	5966442	Dimboola Minyip Road reserve.
14	Absent	-		614055	5964880	Kings Road reserve.
15	Absent			619324	5968669	Ailsa Wheat Road.
16	Absent			615651	5963528	Dogwood Road.
17	Absent			613628	5967993	Schmidts Road.
18	Present	Woodland	Black Box	620236	5964392	Near homestead on Excells Road.
19	Absent			615733	5968493	Dogwood Road.
20	Absent			617424	5964729	Kings Road.
21	Present	Open	Buloke	622502	5970465	Remnant block off Shalders Road.
22	Present	Open	Buloke	619733	5970202	Ailsa Wheat Road.
23	Absent	-	-	622377	5969266	Shalders Road.
24	Present		Mixed	622095	5971927	Barrat Road reserve.

### *Harp trap surveys*

Harp trapping was conducted at two locations over two nights (23-24 January) during the summer 2014 bird and bat utilisation surveys. One trap was installed in the Barrat Quarry, and the other in remnant woodland along Dimboola-Minyip Road. Traps were checked during the evening and again in the morning. All individual bats captured were identified and released either immediately (when caught removed from traps during the night), or at dusk (when removed from traps in the morning).

### *Bat call data analysis*

To analyse call data, calls from all sites were downloaded and converted for analysis using the AnaScheme automated call identification software. The call data was compared to a key containing reference calls of all bat species likely to occur within the region. This provided us with a list of the species recorded at each site. We are also able to ascertain from the data the number of passes made by individual species at each site and this allows for a crude measure of overall bat activity to be calculated. A subset of suspect calls that were not clearly identifiable using the reference key was sent to Lindy Lumsden (DELWP Arthur Rylah Institute) for further analysis and/or for confirmation. This is particularly important to verify potential calls of threatened or listed species. Some groups of species within individual genera are also difficult to identify from call data and this is particularly the case with *Nyctophilus* spp.

#### 4.4.5 Golden sun moth survey

##### *Background*

The Golden Sun Moth (GSM) is listed as a Matter of National Environmental Significance under the *Environment and Protection Biodiversity Conservation (EPBC) Act 1999*, is listed as threatened in all states and territories in which it occurs (Gilmore et al. 2008) and is listed as threatened under Victoria's *Flora and Fauna Guarantee Act 1988*.

The GSM is a medium sized, diurnal (day flying) moth with clubbed antennae (Edwards 1993). The species is sexually dimorphic with the females having an enlarged abdomen and ovipositor that aids in egg laying. The species is also sexually dichromatic in wing colour. The forewings of female GSM are brown and grey while the hind wings are yellow with black spots. Male GSM have dark brown forewings with grey scales and bronze-coloured hind wings. The underside of both pairs of wings is white with small black spots along the margin in females and pale grey with dark brown spots in the males.

The females, which only fly irregularly, position themselves on the ground in a conspicuous location (usually inter-tussock spaces), flashing their golden hind wings (petticoats) to the males, who fly low over the grasses searching for them.

Potential habitat for the GSM consists of areas which previously or currently have native grasslands or grassy woodlands (including derived grasslands) across the historical range of the species. Previous studies found that GSM show a preference for wallaby grasses *Rytidosperma* spp. (particularly *R. carphoides*, *R. auriculata*, *R. setacea*, *R. eriantha*, *R. racemosa*). However, more recent surveys have found GSM present in degraded grasslands and patches invaded with weedy species, including exotic Chilean Needle-grass (*Nassella neesiana*), native Red-leg grass *Bothriochloa macra*, spear grasses (*Austrostipa* spp.) and Weeping Grass (*Microlaena stipoides*) dominated areas (Braby and Dunford 2006; Gilmore et al. 2008).

Inter-tussock spaces are considered important in assisting patrolling males to locate females displaying from a sedentary position (Gilmore et al. 2008). This is supported by observations of male moths showing a preference for relatively open areas with reduced biomass, suggesting females are in turn present in those areas (Gilmore et al. 2008).

Sites considered marginal or unsuitable for GSM include cropped or recently ploughed areas (Gilmore et al. 2008). However, virtually all other grassland and grassy woodland supporting some native grasses or introduced grasses from the genus *Nassella* within the species' historic range have the potential to support the species.

The GSM breeding season begins in mid October and continues through to early January (DEWHA 2009). The breeding season differs slightly from year to year depending on climate and location. During this time adult moths emerge continuously in cohorts and males are seen actively flying in search of females.

It was previously thought that GSM only fly on warm (> about 20 degrees Celsius), calm days with little or no cloud and in the hottest part of the day (between 10:00 hrs and 14:00 hrs) (Clarke and O'Dwyer 2000). However, since 2005 Biosis have often recorded active male GSM on cooler days, on days of partial or full cloud cover, on days within 24 hours following rainfall, during times of moderate to strong wind conditions and also at times earlier and later in the day than previously thought. Sometimes this involves large numbers of individuals. However more typically this has involves smaller numbers of moths than those observed during 'optimal' conditions. Surveying in less than optimal conditions can be sufficient to determine presence / absence of the species at a locality, but is considered less reliable when trying to determine abundance and extent and distribution at a site.

Male flight is low, to about a metre above the ground, fast and typically in a zig zag pattern as they 'patrol' for females. Females have been observed flying without provocation and are capable of flying distances of >

40 m and sometimes a number of females can be observed flying across a site (D. Gilmore, pers. obs.). However, compared to males they are relatively sedentary. Females then tend to walk from tussock to tussock to lay between 100 and 150 eggs between either the tillers of a grass tussock or between the tillers and the soil (Gibson 2006).

GSM larvae are thought to spend 1 - 4 years underground feeding on the roots of native perennial grasses. However, the larval lifespan is unknown. The diet of GSM larvae is thought to consist of the roots of wallaby-grasses, spear-grasses, Red-leg Grass and the introduced Chilean Needle-grass (Braby and Dunford 2006; Gilmore et al. 2008). Adult moths do not have functional mouthparts and therefore are unable to feed. This reduces their adult life to a few days, generally (O'Dwyer and Attiwill 1999).

### Objectives

The objectives of the GSM surveys were to:

- Conduct a survey of GSM within the suitable habitat identified within the wind farm study area.
- Record observed individuals within suitable habitat within the wind farm study area.
- Present the results of the survey program including; pre-season checks, reference site checks, weather conditions on survey days, survey methods and habitat characteristics of the study area.

### Search area

The study area is predicted to have GSM or GSM habitat by the *EPBC Act* Protected Matters Search Tool (search report created on 06/02/2013). The nearest GSM records on the DELWP Biodiversity Interactive Map occur near Salisbury and adjacent to the township of Nhill, approximately 43 and 55 km respectively NNW of the study area.

Several patches of potential GSM habitat were identified along Newells Road and the Dimboola-Minyip Road. The Newells Road survey area extended north from the intersection with Schmidts Road to the northern boundary of the wind farm study area on the eastern side of the road reserve. The Dimboola – Minyip Road survey area extended from the intersection with Newells Road in the west to the Barrat Quarry Road in the east and included habitat on both sides of the existing roadway to the edge of the road reserve. The GSM surveys were limited to these patches of potential habitat.

All other patches of Plains Savanah within the wind farm study area were excluded from the current survey as they were not considered to be of sufficient habitat quality to represent potential GSM habitat or are in locations where there is the potential for them to be avoided. Sites excluded from the current survey included:

- Plains Savanah previously identified on Dogwood Road.
- Plains Savanah west of the intersection of the Dimboola – Minyip Road and Newells Road.
- Plains Savanah east of the intersection of Dimboola- Minyip Road and Barrat Quarry Road.

### Survey methods

Survey was undertaken during the 2014/15 GSM flight season. As the timing of the flight season varies annually and geographically, the best indicator of key survey period is the presence of flying males at known local sites. Reference sites were monitored during the expected flying period and used to guide survey timing at the target site, as specified in the *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth* (EPBC Act Policy Statement 3.12). Pre-season checks were undertaken by a local naturalist based in Nhill on behalf of Biosis to determine the commencement of the GSM flight season for 2014/2015 in the local area.



GSM activity was also monitored throughout Victoria during the season through communication between Biosis and other ecological consultants, using the GSM email group maintained by Biosis.

Targeted GSM surveys were undertaken at the study area on 31/10/2014, 7/11/2014, 19/11/2014 and 28/11/2014. The surveys were undertaken at approximately weekly intervals to allow for variations in emergence patterns. Surveys took place when conditions were suitable for male flight (generally  $>20^{\circ}\text{C}$ , bright, clear days, full sun or sparse cloud, absence of rain and wind other than a light breeze) between 10:00 hrs and 15:00 hrs.

On each survey the entire survey area was searched systematically by driving the length of each potential patch of habitat and by walking a series of transects, spaced approximately 5 m apart. To guide the timing of survey, weather information was obtained from BOM website [www.bom.gov.au](http://www.bom.gov.au).

The nearest reference site was located on the eastern outskirts of Nhill some 50 km from the study area. The site (known as the Nhill Golden Sun Moth Reserve) was checked prior to each survey of the study site. The reserve is a known location for GSM and has been reserved for the conservation of the species. GSM has been observed flying at this location consistently over a number of years and is monitored by a local naturalist who has consistently recorded GSM flying within the reserve from the first week of November each year. Despite consistent monitoring during this flight season at this location GSM were, not recorded by Biosis or any other observer. Biosis has therefore relied on surveys from other reference sites within the broader region to provide information on the flight activity of GSM at the time of survey within the wind farm site. Other reference sites being monitored included sites near St Arnaud, Yea, and within the greater Melbourne area.

Habitat characteristics of the study area were recorded during the GSM survey. Weather conditions, including temperature, humidity and wind speed including, were measured on site using a Kestrel Weather Meter (Model 4000).

#### **4.4.6 Striped Legless Lizard survey**

##### **Background**

The Striped Legless Lizard (SLL) is listed as Vulnerable under the EPBC Act and is considered Endangered in the Advisory List of Threatened Vertebrate Fauna in Victoria (DSE 2013). It is also listed under the FFG Act 1988.

The Striped Legless Lizard inhabits remnant grassland, woodland and rocky areas on Victoria's volcanic plains and adjacent bioregions including the Wimmera.

##### **Objectives**

The objectives of the SLL surveys were to:

- Conduct a survey of SLL within suitable habitat identified within the wind farm study area.
- Record observed individuals within suitable habitat within the wind farm study area.

##### **Search area**

The study area is predicted to have SLL or SLL habitat by the EPBC Act Protected Matters Search Tool (search report created on 06/02/2013). The nearest SLL records on the DELWP Biodiversity Interactive Map occur near the townships of Murtoa and Horsham, approximately 20 km SSE and 25 km SSW respectively of the study area.

Striped Legless Lizard habitat was identified within patches of Plains Savannah (Figure 6). These areas consist of linear strips of remnant grassland along roadsides and in road reserves, and fragmented grassland

patches within adjacent farmland. Extensive linear patches of potential SLL habitat were identified along Dimboola – Minyip Road and Dogwood Road (Figure 6). Initial assessment for Striped Legless Lizard within potential habitat areas was carried out during February and May 2013 via non-destructive rock rolling.

### Survey methods

The survey guidelines for Striped Legless Lizard, as outlined in *Survey guidelines for Australia's Threatened Reptiles* (DSEWPaC 1999) have been adopted for this targeted assessment. This involves placing a tile grid containing 50 non-glazed roof tiles at individual locations in a grid pattern with tiles approximately 5 m apart and covering an area of approximately 900 m<sup>2</sup>. Tiles grids are laid out during winter at least 12 weeks prior to commencement of the survey. This allows tiles to bed-in and provide artificial habitat sites fauna.

Eight roof tile grids, each including 50 tiles, were established on the 30 July 2015 on Dimboola-Minyip Road and Dogwood Road. Tile checking for SSL commenced on 30 September 2015 with seven checks conducted by the end of December 2015. An eighth and final check was conducted on 11 February 2016 during removal of the tile grids from the study area.

## 4.5 Permits

Biosis undertakes flora and fauna assessments under the following permits and approvals:

- Research Permit/Management Authorisation and Permit to Take Protected Flora & Protected Fish issued by the Department of Sustainability and Environment under the *Wildlife Act 1975*, *Flora and Fauna Guarantee Act 1988* and *National Parks Act 1975*.
- Approvals 04.12 and 14.12 from the Wildlife and Small Institutions Animal Ethics Committee.

## 4.6 Qualifications

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected at a site during survey, such as low abundance, patchy distribution, species dormancy, seasonal conditions, and migration and breeding behaviours. In many cases these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

The flora and fauna assessment was conducted during summer and autumn, with additional data collection during the bird and bat utilisation surveys and an assessment of specific locations in spring 2013. The survey effort and timing was sufficient to assess the ecological values of the study area.

A detailed spring flora survey has not been conducted for all areas of remnant vegetation within the study area, as the majority of vegetation within the site will not be impacted by the development. Spring targeted surveys for significant flora species was undertaken in November 2015 at locations where native vegetation is to be impacted under the current project layout.

## 4.7 Legislation and policy

The implications for the project were assessed in relation to key biodiversity legislation and policy including:

- Matters of national environmental significance (MNES) listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); associated policy statements, significant impacts guidelines, listing advice and key threatening processes.
- Threatened taxa, communities and threatening processes listed under Section 10 of the *Flora & Fauna Guarantee Act 1988* (FFG Act); associated action statements and listing advice.
- Permitted clearing of native vegetation – Biodiversity assessment guidelines (DEPI 2013a).
- *Planning and Environment Act 1987* – specifically Clauses 12.01-2, 52.17 and 66.02 and Overlays in the relevant Planning Scheme.
- Noxious weeds and pest animals lists under the *Catchment and Land Protection Act 1994* (CaLP Act).
- *Wildlife Act 1975* and associated Regulations.

## 4.8 Mapping

Mapping was conducted using hand-held (uncorrected) GPS units and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the GPS units (generally  $\pm 7$  metres) and dependent on the limitations of aerial photo rectification and registration.

Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files which contain our flora and fauna spatial data are available to incorporate into design concept plans. However this mapping may not be sufficiently precise for detailed design purposes.

## 5. Results

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The ecological features of the study area are described below and mapped in Figure 2.

Species recorded during the flora and fauna assessment are listed in Appendix 1 (flora) and Appendix 2 (fauna). Unless of particular note, these species are not discussed further.

A list of significant species recorded or predicted to occur in the local area is also provided in those appendices, along with an assessment of the likelihood of the species occurring within the study area.

### 5.1 Vegetation & fauna habitat

The study area supports a range of ecological features including areas of native vegetation (woodlands and savannah), scattered trees and ephemeral drainage lines.

The vegetation and fauna habitat throughout the majority of the study area has been highly modified by past disturbances which have included broadscale clearing, cropping and grazing. Most of the study area has been significantly degraded and supports predominantly introduced vegetation that is of limited value for native fauna. Native vegetation is present within the study area, with the largest areas being present on roadsides, particularly the three east-west roads (Dimboola-Minyip Road, Kings Road and Old Minyip Road). Within paddocks, occurrence of remnant vegetation patches and scattered trees generally increases towards the east, with the largest patches of remnant vegetation occurring near Barrat Quarry and east of the transmission line further south.

The ecological features are shown in (Figure 2) and are described below:

**Plains Savannah EVC 826** (endangered within the Wimmera Bioregion) is widespread throughout the study area, particularly within the western half. This is a structurally diverse vegetation type, ranging from grassland with very few trees to dense Buloke *Allocasuarina luehmannii* woodlands. Condition of this vegetation type is also highly variable, with some areas supporting native tree, shrub and ground strata, and other more degraded areas with no native understorey. Most woodland examples are dominated by Buloke, with some areas supporting scattered Black Box or Yellow Gum trees. Areas co-dominated by Buloke, Black Box and (to a lesser extent) Yellow Gum are limited to the central and eastern portion of the study area and have been mapped as EVC 803 Plains Woodland.

Indigenous ground layer species include Wallaby Grass *Rytidosperma* spp., Spear Grass *Austrostipa* spp., Kangaroo Grass *Themeda triandra*, Fuzzy New-Holland Daisy *Vittadinia cuneata* and Black Cotton-bush *Maireana decalvans*.

Introduced ground layer species include Bearded Oat *Avena barbata*, Paddy Melon *Cucumis myriocarpus* subsp. *leptodermis*, Onion Grass *Romulea rosea* and Common Peppergrass *Lepidium africanum*.

Grassland provides habitat for grassland or open habitat specialists such as the Western Grey Kangaroo *Macropus fuliginosus*, Magpie-lark *Grallina cyanoleuca* and European Skylark *Alauda arvensis*. Open habitat such as this also provides hunting grounds for raptors such as the Spotted Harrier *Circus assimilis*, Nankeen Kestrel *Falco cenchroides* and Brown Falcon *Falco berigora*. Where tussock grasses are dominant there is potential for the nationally significant Golden Sun Moth *Synemon plana* to occur, however this species was not detected during targeted surveys conducted in the 2014/15 flight season.

Buloke Woodland supports a range of avifauna, including the threatened Hooded Robin *Melanodryas cucullata* which was observed foraging within this habitat. Logs and fallen timber provide microhabitats for reptile species.

Four habitat zones have been identified (Figure 3 and Section 5):

- HZ2 includes treeless or near treeless areas with an understorey dominated by native grasses, and with relatively low weed cover.
- HZ3 includes treeless or near treeless areas with more than 20% cover of native species, but a high cover of introduced ground species.
- HZ4 includes Buloke Woodlands, potentially with some Black Box, with a native grassy understorey.
- HZ5 includes Buloke Woodlands, potentially with some Black Box, with a highly disturbed understorey dominated by introduced species.



**Plate 1: Plains Savannah on Newells Road, showing an example with very few trees**





**Plate 2: Plains Savannah adjacent to Dogwood Road south of Old Minyip Road**

**Plains Woodland EVC 803** (endangered within the Wimmera Bioregion) generally supported a mixture of Black Box, Buloke and Yellow Gum. This EVC was mapped in the eastern half of the study area, with the largest occurrences near Barrat Quarry and south of Old Minyip Road (east of the transmission line). Areas dominated by Buloke alone were mapped as EVC 826 Plains Savannah.

The ground layer includes indigenous grasses such as wallaby grass and Spear Grass *Austrostipa* spp. Other indigenous species include Berry Saltbush *Atriplex semibaccata*, Fuzzy New-Holland Daisy *Vittadinia cuneata*, Nodding Saltbush *Einadia nutans* subsp. *nutans* and Grey Germander *Teucrium racemosum*.

Introduced plants are common to abundant throughout the woodland. The dominant weed species are grasses Great Brome *Bromus diandrus* and Bearded Oat *Avena barbata*. Other weed species include African Box-thorn *Lycium ferocissimum*, Small-flower Mallow *Malva parviflora* and Bathurst Burr *Xanthium spinosum*.

Eucalypt woodland provides habitat for a diverse range of avifauna species, including the Brown Treecreeper *Climacteris picumnus victoriae* which was observed foraging within this habitat. Mature trees provide hollows for nesting parrots, while larger trees provide nesting opportunities for raptors such as Spotted Harrier *Circus assimilis*.

Three habitat zones have been identified (Figure 3 and Section 5):

- HZ6 includes woodlands with a highly disturbed understorey dominated by introduced species.
- HZ7 includes woodlands with an understorey dominated by native grasses, and relatively low weed cover.
- HZ8 includes better quality woodlands with an understorey of native grasses and one or more shrub life forms, with relatively low weed cover.

Plains Woodland is endangered within the Wimmera Bioregion.





**Plate 3: Black Box dominated Plains Woodland east of the Transition line to the south of Old Minyip Road.**



**Plate 4: Yellow Gum dominated Plains Woodland at Barrat Quarry**

**Black Box Lignum Woodland EVC 663** (endangered within the Wimmera Bioregion) was recorded along Dimboola-Minyip Road just outside the eastern boundary of the study area. This area supports an overstorey of Black Box, with an understorey dominated by Lignum and a range of other native shrubs and grasses.

One habitat zone (HZ1) has been identified (Figure 3 and Section 5), near the eastern edge of the study area to the south of Dimboola-Minyip Road.

Black Box Lignum Woodland is endangered within the Wimmera Bioregion.





**Plate 5: Black Box Lignum woodland within the Dimboola-Minyip Road reserve near the eastern boundary of the study area**

**Scattered remnant trees** occur throughout the study area. Most of these are Buloke or Black Box trees, with some Yellow Gum and Yellow Box *Eucalyptus leucoxylon* present in the eastern half of the study area. Three Bull Mallee *Eucalyptus behriana* trees were also mapped near Barrat Quarry. Scattered trees provide a potential foraging resource for mobile fauna species. Some of the trees contain hollows although due to their relative isolation only more mobile and common species are likely to utilise this resource.

**Drainage lines and decommissioned channels** also occur within the study area, typically running in a north-south direction. The study area has very low relief, draining to the north, and all open channels have been decommissioned as part of the Wimmera-Mallee Pipeline Project. Decommissioning was conducted by landscaping channels and channel banks completely flat. Some of these areas may still function as drainage lines in very wet conditions, but are generally indistinguishable from surrounding paddocks. The most substantial drainage line running through the study area is the Main Western Channel/West Karkaroc Channel, which travels north-south, passing near Barrat Quarry where it is lined by remnant Black Box and Buloke Woodland.

**Planted vegetation** most commonly occurs in gardens in the vicinity of houses and shedding. Plantings include linear strips along driveways, shelterbelts, small timber plantations and isolated paddock trees.

These areas generally contain some habitat value, particularly if close to remnant woodlands. They are likely to be utilised by common woodland bird and bat species.

A wide range of native and introduced species has been planted, including Sugar Gum *Eucalyptus cladocalyx*, River Red Gum *Eucalyptus camaldulensis*, Swamp Mallet *Eucalyptus spathulata* and Radiata Pine *Pinus radiata*. Some plantations also support scattered native trees (Buloke and Black Box), and may have some native understorey species in areas of low grazing pressure.

Planted trees provide perching, foraging and nesting habitat for a wide variety of bird species.

## **Crops**

The remainder of the study area has been substantially modified for rotational grazing and cropping. These areas are of little value to native fauna other than for open habitat specialists such as Australian Magpie *Gymnorhina tibicen* and Australian Raven *Corvus coronoides*. Crops also provide hunting grounds for raptors such as Spotted Harrier, Swamp Harrier *Circus approximans* and Black-shouldered Kite *Elanus axillaris*.

## **5.2 Landscape context**

The study area is located within an area of broad-acre farming, where the majority of the land has been completely cleared. Remnant vegetation occurs on roadsides, patches of vegetation within paddocks and isolated paddock trees. The nearest block of vegetation managed for conservation is the Barrat Flora and Fauna Reserve, approximately one kilometre to the north of the northern boundary of the study area.

The riparian corridor of the Yarriambiack Creek is located 10 km to the east of the study area. This is an important north-south corridor of remnant vegetation in a landscape which has been otherwise heavily cleared. Similarly, the Wimmera River is located 15 km to the west, passing through Dimboola, and the Little Desert National Park is further west.

Connectivity through the study area for flora and fauna is severely depleted. Remnant vegetation is restricted to scattered patches across the study area and interspersed by introduced vegetation and intensive agricultural practices, predominantly cropping. This limits the opportunity for flora and fauna, except avifauna and large mammals, to disperse through the study area.

The overall biodiversity values of the site, in a landscape context, are low. Remnant vegetation and fauna habitat within the study area are depleted within the local area and are thus of high value for flora and fauna; however the lack of connectivity and the predominance of cropped land reduces the viability of these patches in the long term.

## **5.3 Significant species and ecological communities**

### **5.3.1 EPBC Act, FFG Act & DELWP Advisory listed species**

Lists of significant species recorded or predicted to occur within 5 km of the study area or from the relevant catchment (aquatic species) are provided in Appendix 1 (flora) and Appendix 2 (fauna). An assessment of the likelihood of these species occurring in the study area and an indication of where within the site (i.e. which habitats or features of relevance to the species) is included. A summary of those species recorded or with a medium or higher likelihood of occurring in the study area is provided in Table 5.

**Table 5: Summary of significant species most likely to occur in the study area**

Species and status	Significance*	Area of value within the study area
Australian Piert <i>Aphanes australiana</i>	National: Vulnerable	Plains Savannah Woodlands and Plains Woodlands.
Rigid Spider-orchid <i>Caladenia tensa</i>	National: Endangered	Plains Savannah Woodlands and Plains Woodlands.
Wimmera Rice-flower <i>Pimelea spinescens</i> subsp. <i>pubiflora</i>	National: Critically endangered	Treeless or treed Plains Savannah. Habitat Zones 2 and 4.
Floodplain Rustyhood <i>Pterostylis cheraphila</i>	National: Vulnerable	Seasonally inundated Plains Woodland (HZ 7 & 8) and Black Box Lignum Woodland (HZ 1).
Slender Darling-pea <i>Swainsona murrayana</i>	National: Vulnerable	Heavy Cracking Clays in seasonally undated sites. Potentially Plains Woodland (HZ 7 & 8) and Black Box Lignum Woodland (HZ 1).
Golden Sun Moth <i>Synemon plana</i>	National: Critically Endangered	The Golden Sun Moth is a medium-sized diurnal moth that was formerly thought to be associated with grasslands that have a high cover of native Wallaby Grass ( <i>Austrodanthonia</i> spp.). The species was not detected during targeted surveys conducted in the 2014/15 fligh season.
Bramble Wattle <i>Acacia victoriae</i> subsp. <i>victoriae</i>	State: Rare	Woodland in low lying areas.
Buloke <i>Allocasuarina luehmannii</i>	State : FFG listed	Scattered paddock trees and woodland habitat zones. Recorded within the study area. The current project layout requires the removal of one scattered Buloke tree, and potential minor lopping of one or more trees on Kewell North School Road where the powerline crosses.
Buloke Mistletoe <i>Amyema linophylla</i> subsp. <i>orientale</i>	State: Vulnerable	Scattered paddock Buloke trees and woodlands supporting Buloke. Recorded within the study area. The current project layout does not require the removal of any trees supporting Buloke Mistletoe.
Pale Flax-lily <i>Dianella</i> sp. aff. <i>Longifolia</i> ( <i>Riverina</i> )	State: Vulnerable	Recorded within the Dimboola Minyip Road reserve. Not recorded in any native vegetation patches to be impacted.
Fine-hairy Spear-grass <i>Austrostipa puberula</i>	State: Rare	Buloke Woodlands on sandy sites. Potential to occur in Habitat Zones 2 and 4.
Downy Swainson-pea <i>Swainsona swainsonioides</i>	State: FFG listed	Heavy Cracking Clays in seasonally undated sites. Potentially Plains Woodland (HZ 7 & 8). May also occur in roadside table drains.
Eastern Great Egret <i>Ardea modesta</i>	State: FFG listed	A widespread species which may periodically use farm dams for foraging.
Bush Stone-curlew <i>Burhinus grallarius</i>	State: FFG listed	Larger patches of woodland.

Species and status	Significance*	Area of value within the study area
Yellow-bellied Sheathtail Bat <i>Saccolaimus flaviventris</i>	State: FFG listed	Recorded from the woodland to the south of the site in Autumn 2013 (site 7, refer to Figure 4).
Black-eared Cuckoo <i>Chalcites osculans</i>	State: Near threatened	Woodlands.
Spotted Harrier <i>Circus assimilis</i>	State: Near threatened	Recorded on site. Open woodlands, roadsides and paddocks.
Brown Treecreeper <i>Climacteris picumnus victoriae</i>	State: Near threatened	Woodlands.
Black Falcon <i>Falco subniger</i>	State: Vulnerable	Woodlands and open country. Likely to use any treed habitats and will forage over nearby open country.
Hooded Robin <i>Melanodryas cucullata</i>	State: FFG listed	Woodlands. Recorded in Habitat Zone 1 (outside the wind farm), but likely to be present in other woodland habitat within the wind farm.
Eastern Bearded Dragon <i>Pogona barbata</i>	State: Vulnerable	Woodlands. Recorded within Barrat Flora and Fauna Reserve during current assessment. Highly likely to inhabit larger patches of woodland within the study area.

\* Significance level shown is highest significance for the species. Full status information is presented in Appendix 1 and 2.

+ Indicates species which require determination of best/remaining habitat for rare or threatened species (section 5).

### 5.3.2 Significant ecological communities

The EPBC Act Protected Matters Search Tool (PMST) predicts that three critically endangered ecological communities that are nationally significant are likely to occur within the study area:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (Grey Box Grassy Woodlands).
- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions (Buloke Woodlands).
- Natural Grasslands of the Murray Valley Plains.

Within the Wimmera Bioregion, **Grey Box Grassy Woodlands** typically aligns with the EVCs Alluvial Terraces Herb-rich Woodland and Grassy Woodland. These EVCs were not observed within the study area and are not mapped within the study area by the DELWP Biodiversity Interactive Mapper. Therefore this ecological community does not occur within the study area.

**Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions** (Buloke Woodlands) is present within the study area. Patches of vegetation with an overstorey dominated by Buloke *Allocasuarina luehmannii* with an understorey not dominated by introduced species match the definition of this community. Areas included within Habitat Zone 4 match the definition of this community. At sites where there is complete loss of the understorey species formerly constituting Buloke Woodlands, the ecological community is considered extinct (DSE 2010).

**Natural Grasslands of the Murray Valley Plains** is potentially present within the study area. This community was listed under the EPBC Act as critically endangered in 2012. The definition of this community corresponds in part with EVC 826 Plains Savannah, limited to areas with <10% cover of trees or large shrubs and having a range of key indicator species. In order to qualify for protection under the Act, patches must have higher cover of native plants than perennial weeds, and either have a diverse range of indicator species or be larger patches with lower diversity. The intention of the listing is to protect 'natural' grasslands, rather than sites that are now treeless due to a history of clearing, grazing or other human-induced disturbances.



Our investigation indicates that this ecological community does not occur within the study area.

Two FFG listed threatened communities, Semi-arid Shrubby Pine-Buloke Woodland and Semi-arid Herbaceous Pine-Buloke Woodland, are considered component communities of the EPBC listed Buloke Woodlands Community. There are no action statements or definitions available for these communities to determine presence within the study area. Very few native Pine *Callitris* spp. are present within the study area, although this may be due to preferential harvesting of native pines for fence and building construction.

#### *FFG listed bird communities*

Two additional communities listed under the FFG Act may also require consideration:

- Victorian temperate-woodland bird community.
- Victorian Mallee bird community.

These communities are defined by a broad geographic area and a list of species which are either 'dependent' or 'associated' with woodland and Mallee habitats. Many of the listed species are also individually listed under the Advisory List of Threatened Vertebrate Fauna in Victoria (DSE 2013) and the FFG Act and/or the EPBC Act. As the FFG Act does not apply to private land, further consideration of these species will be limited to those listed under the Advisory List and the EPBC Act.

The significance of habitats within the site for bird species is further discussed in Section 3.4.

## **5.4 Bird utilisation surveys**

### **5.4.2 Preliminary bird utilisation surveys**

In the preliminary BUS assessment a total of 45 species were recorded including six raptor species. The total number of movements by all species across all sites was 374. The six most abundant species by movement recorded from all sites included:

- Australian Magpie
- White plumed Honeyeater
- Willie Wagtail
- Common Starling (introduced)
- Eurasian Skylark (introduced)

The majority of species that were observed are common and widespread and generally found in open country and farmland. Other species recorded are commonly associated with remnant patches of woodland vegetation. The species recorded are outlined in Table 6 and a full set of activity results can be found in the table in Appendix 4. Sites containing remnant patches of Black Box generally recorded more species (and therefore greater activity) than open country sites or sites with isolated remnant paddock trees. Sites 6, 7 and 9 recorded the highest number of species with 20, 18 and 19 species respectively being recorded from these sites. More intact remnant blocks of woodland, particularly those dominated by Black Box and Yellow Gum that also have a diverse understory are important to local bird communities and are a focal point for much of the bird activity recorded on site.

A total of thirty two raptor movements were recorded from the site over the survey period, representing six species:

- Wedge-tailed Eagle
- Black-shouldered Kite
- Brown Falcon



- Nankeen Kestrel
- Whistling Kite
- Black Kite

The majority of the raptor movements were recorded from sites 1, 3 and 4. These sites were located in open country or had a few isolated remnant trees. Raptors tend to favour open environments as they provide good hunting opportunities and this is to be expected on this site given that the major land use is broad acre cropping and this attracts a range of rodents which are a primary source of prey for many raptors. Nankeen Kestrel was the most frequently recorded raptor followed by Brown Falcon, Black-shouldered Kite and Wedge tailed Eagle. A single record was made of both Whistling and Black Kite. A single Black Falcon was recorded in the initial flora and fauna survey, but no further observations of this species were recorded during the BUS surveys.

#### **5.4.3 Detailed bird utilisation surveys**

In the expanded bird utilisation surveys (24 sites), 55 species were recorded, including six not recorded in the preliminary survey. Six species recorded in the preliminary surveys were not recorded during the detailed surveys.

The results of the detailed bird utilization surveys are summarized in Table 6. Bird activity is summarized as the number individual bird movements per 20 minute count, and sites have been grouped according to general habitat type: Black Box Woodland, Buloke Woodland, Mixed Woodland (including non-indigenous native plantations) and open paddocks. Sites in open paddocks may still have scattered trees nearby.

Open country and generalist species were the most frequently recorded, including:

- Australian Magpie
- Red-rumped Parrot
- White-plumed Honeyeater
- Willie Wagtail
- Little Raven
- Australasian Pipit
- Crested Pigeon
- Galah.

Introduced species were commonly encountered at all sites, with the Common Starling and House Sparrow being two of the most frequently recorded species throughout the study. Other introduced species present were Eurasian Skylark and European Goldfinch.

Three significant species were recorded:

- Spotted Harrier (DELWP Advisory List: Near Threatened) was recorded at three sites. A single bird was observed each time.
- Brown Treecreeper (DELWP Advisory List: Near Threatened) was relatively common, recorded at woodland sites 4, 6 and 12 during all survey periods. No Brown Treecreepers were recorded in open paddock sites.
- Hooded Robin (DELWP Advisory List: Near Threatened, FFG Act: Threatened) was recorded at woodland sites 5, 10 and 12.



**Table 6: Number of bird movements per 20 minute survey for each habitat type**

Species	Black Box Woodland	Buloke Woodland	Mixed Woodlands	Open Paddock	All surveys
Australasian Pipit	0.13	0.11	0.09	0.66	0.28
Australian Magpie	0.70	0.85	1.04	0.97	0.89
Australian Raven	0.03	0.07	-	-	0.03
Australian Wood Duck	0.03	-	-	-	0.01
Banded Lapwing	0.03	0.07	-	0.06	0.04
Black Kite	-	-	0.04	0.03	0.02
Black-faced Cuckoo-shrike	0.03	-	-	-	0.01
Black-shouldered Kite	0.07	0.07	0.09	0.09	0.08
Blue Bonnet	0.20	0.07	0.22	0.06	0.13
Brown Falcon	0.27	0.33	0.04	0.20	0.22
Brown Goshawk	-	0.04	-	-	0.01
Brown Songlark	0.07	-	-	0.17	0.07
Brown Treecreeper	0.07	0.04	0.13	-	0.05
Common Bronzewing	-	-	0.04	-	0.01
Common Starling	1.23	0.89	0.26	0.26	0.66
Crested Pigeon	0.43	0.37	0.13	0.11	0.26
Dusky Woodswallow	-	-	0.09	-	0.02
Eastern Rosella	0.27	0.04	-	-	0.08
European Goldfinch	-	0.04	-	-	0.01
European Skylark	-	0.07	-	0.57	0.19
Galah	0.47	0.30	0.13	0.09	0.24
Hooded Robin	0.10	0.04	-	-	0.03
House Sparrow	0.93	0.52	0.30	0.14	0.47
Laughing Kookaburra	0.03	-	-	-	0.01
Little Raven	0.23	0.41	0.13	0.34	0.29
Magpie-lark	0.20	0.15	0.09	-	0.10
Masked Woodswallow	0.07	-	-	-	0.02
Mistletoebird	0.03	0.11	0.04	-	0.04
Musk Lorikeet	-	-	0.13	-	0.03

Species	Black Box Woodland	Buloke Woodland	Mixed Woodlands	Open Paddock	All surveys
Nankeen Kestrel	0.17	0.04	0.09	0.20	0.13
Noisy Miner	0.33	0.11	0.26	-	0.17
Peaceful Dove	-	0.04	-	-	0.01
Pied Butcherbird	0.03	0.07	-	-	0.03
Red Wattlebird	-	0.11	0.52	-	0.13
Red-rumped Parrot	1.73	0.44	0.52	0.03	0.67
Rufous Songlark	-	0.04	-	-	0.01
Rufous Whistler	0.03	-	-	-	0.01
Singing Honeyeater	0.07	0.63	0.39	-	0.24
Southern Whiteface	0.03	-	-	-	0.01
Spiny-cheeked Honeyeater	0.07	-	0.04	-	0.03
Spotted Harrier	-	-	-	0.06	0.02
Striated Pardalote	0.23	0.19	0.43	-	0.19
Striated Thornbill	0.03	-	-	-	0.01
Stubble Quail	0.03	-	-	0.06	0.03
Varied Sittella	0.07	-	-	-	0.02
Wedge-tailed Eagle	-	0.04	-	-	0.01
Weebill	0.03	-	0.09	-	0.03
Welcome Swallow	0.10	0.19	0.22	0.06	0.13
White-browed Woodswallow	0.23	0.19	-	0.09	0.13
White-faced Heron	-	0.04	-	-	0.01
White-fronted Chat	-	0.07	-	-	0.02
White-plumed Honeyeater	0.97	0.11	0.74	-	0.43
White-winged Triller	0.03	0.04	-	-	0.02
Willie Wagtail	0.33	0.56	0.70	0.06	0.37
Yellow-rumped Thornbill	0.13	0.15	-	0.06	0.09

**Table 7: Summary of the bird species recorded during the BUS surveys**

Scientific name	Common name	Preliminary BUS	Detailed BUS
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	✓	✓
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	✓	✓
<i>Acanthiza pusilla</i>	Brown Thornbill	✓	-
<i>Acanthiza reguloides</i>	Buff-rumped Thornbill	✓	-
<i>Acanthiza lineata</i>	Striated Thornbill	-	✓
<i>Aegotheles cristatus</i>	Australian Owlet Nightjar	-	✓
<i>Alauda arvensis</i>	Eurasian Skylark	✓	✓
<i>Anthochaera carunculata</i>	Red Wattlebird	✓	✓
<i>Anthus novaeseelandiae</i>	Australasian Pipit	✓	✓
<i>Aphelocephala leucopsis</i>	Southern Whiteface	-	✓
<i>Artamus cyanopterus</i>	Dusky Woodswallow	✓	✓
<i>Artamus personatus</i>	Masked Woodswallow	-	✓
<i>Artamus superciliosus</i>	White-browed Woodswallow	✓	✓
<i>Carduelis carduelis</i>	European Goldfinch	-	✓
<i>Chenonetta jubata</i>	Australian Wood Duck	✓	✓
<i>Cinclorhamphus cruralis</i>	Brown Songlark	✓	✓
<i>Cincloramphus mathewsi</i>	Rufous Songlark	-	✓
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper	✓	✓
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-Shrike	✓	✓
<i>Corvus coronoides</i>	Australian Raven	-	✓
<i>Corvus mellori</i>	Little Raven	✓	✓
<i>Coturnix pectoralis</i>	Stubble Quail	✓	✓
<i>Cracticus nigrogularis</i>	Pied Butcherbird	✓	✓
<i>Cracticus tibicen</i>	Australian Magpie	✓	✓
<i>Dacelo novaeguineae</i>	Laughing Kookaburra	✓	✓
<i>Daphoenositta chrysoptera</i>	Varied Sittella	✓	✓
<i>Dicaeum hirundinaceum</i>	Mistletoebird	✓	✓
<i>Egretta novaehollandiae</i>	White-faced Heron	-	✓
<i>Eolophus roseicapillus</i>	Galah	✓	✓
<i>Ephthianura albifrons</i>	White-fronted Chat	-	✓
<i>Geopelia straita</i>	Peaceful Dove	-	✓
<i>Glossopsitta concinna</i>	Musk Lorikeet	✓	✓
<i>Grallina cyanoleuca</i>	Magpie-lark	✓	✓
<i>Hirundo neoxena</i>	Welcome Swallow	✓	✓
<i>Lalage sueurii</i>	White-winged Triller	-	✓
<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater	✓	✓

Scientific name	Common name	Preliminary BUS	Detailed BUS
<i>Lichenostomus virescens</i>	Singing Honeyeater	✓	✓
<i>Manorina melanocephala</i>	Noisy Miner	✓	✓
<i>Melanodryas cucullata cucullata</i>	Hooded Robin	-	✓
<i>Northiella haematogaster</i>	Blue Bonnet	✓	✓
<i>Ocyphaps lophotes</i>	Crested Pigeon	✓	✓
<i>Pachycephala rufiventris</i>	Rufous Whistler	-	✓
<i>Pardalotus striatus</i>	Striated Pardalote	✓	✓
<i>Passer domesticus</i>	House Sparrow	✓	✓
<i>Petrochelidon nigricans</i>	Tree Martin	✓	-
<i>Petroica goodenovii</i>	Red-capped Robin	✓	-
<i>Phaps chalcoptera</i>	Common Bronzewing	-	✓
<i>Platycercus eximius</i>	Eastern Rosella	✓	✓
<i>Psephotus haematonotus</i>	Red-rumped Parrot	✓	✓
<i>Purnella albifrons</i>	White-fronted Honeyeater	✓	-
<i>Rhipidura leucophrys</i>	Willie Wagtail	✓	✓
<i>Smicrornis brevirostris</i>	Weebill	-	✓
<i>Sturnus vulgaris</i>	Common Starling	✓	✓
<i>Vanellus tricolor</i>	Banded Lapwing	✓	✓
<i>Zosterops lateralis</i>	Silvereye	✓	-
<b>Raptors</b>			
<i>Aquila audax</i>	Wedge-tailed Eagle	✓	✓
<i>Circus assimilis</i>	Spotted Harrier	-	✓
<i>Elanus axillaris</i>	Black-shouldered Kite	✓	✓
<i>Falco berigora</i>	Brown Falcon	✓	✓
<i>Falco cenchroides</i>	Nankeen Kestrel	✓	✓
<i>Haliastur sphenurus</i>	Whistling Kite	✓	-
<i>Milvus migrans</i>	Black Kite	✓	✓

### Raptors

A total of 57 raptor movements were recorded from the site during the detailed survey. Listed in decreasing order of number of records, the raptor species recorded were:

- Brown Falcon
- Nankeen Kestrel
- Black-shouldered Kite
- Spotted Harrier
- Black Kite
- Wedge-tailed Eagle
- Brown Goshawk



The Whistling Kite, which was recorded during the preliminary survey, was not recorded again during the detailed surveys. Similarly, the Black Falcon (DELWP Advisory List: Vulnerable), which was recorded to the south of the proposed wind farm during the initial flora and fauna assessment, has not been recorded during subsequent surveys.

Over 60% of all raptor movements were of the first three species (Brown Falcon, Black-shouldered Kite and Nankeen Kestrel). These species were recorded in all site types, including woodlands and open paddocks.

## 5.5 Bat utilisation surveys

Preliminary bat acoustic surveys were conducted at ten sites over two weeks during late May and early June 2013. Further surveys were conducted at 24 sites in late spring/early summer 2013, summer 2014 and autumn 2014.

The results of the preliminary survey are presented in this Table 9, and the results of the expanded survey of 24 sites are shown in Table 10.

Nine species were recorded across the study area. The results of this survey are outlined in Table 9. The two most abundant species recorded from the site were the Chocolate Wattled Bat and the Southern Freetail Bat. Both of these species are common and widespread and found across Victoria in a wide range of habitats. The other seven species were recorded in much lower abundance across the site.

### Harp trapping results

Harp trapping was conducted at two sites over two nights in January 2013. Three species were captured (Table 8). The species captured in the greatest numbers was the Southern Freetail Bat, which was also one of the species most regularly recorded in the acoustic survey. All species captured were also recorded in the acoustic surveys.

**Table 8: Harp trapping results**

Site	Scientific name	Common name	Number captured
Barrat Quarry	<i>Vespadelus vulturnus</i>	Little Forest Bat	3
	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	2
	<i>Mormopterus sp. 4</i>	Southern Freetail Bat	5
Dimboola-Minyip Road reserve	<i>Vespadelus vulturnus</i>	Little Forest Bat	1

### FFG listed bat species

The bat survey has revealed the presence of a significant species in the area with a call from the Yellow-bellied Sheathtailed Bat being confirmed from site seven, which is now located outside the wind farm boundary. The automated identification of the bat data picked out several potential Yellow Bellied Sheathtail Bat calls. After looking at these manually, a subset was sent to Lindy Lumsden (DELWP Arthur Rylah Institute) for verification, who confirmed the identification of one of the calls as a Yellow Bellied Sheathtail Bat call. This species is listed as threatened under the Victorian *Flora and Fauna Guarantee Act 1998*, but is not listed on the Victorian advisory list (DEPI 2013) or the National *Environment Protection and Biodiversity Conservation Act 1999*. The distribution of the species is poorly understood in Victoria. There are only 29 records of the species in Victoria, and most of these are dead specimens recorded near Melbourne. The closest record to the study area is about 100km to the north near Tempy. It is relatively common in northern Australia, and is considered to be a rare summer or autumn vagrant to southern Australia. There is speculation that some of the population may migrate southward to cooler zones in summer and autumn. It is a large, rapid flying bat that forages over woodlands and open areas (where it is thought to fly closer to the ground). Listed threats to the

species include removal of hollow trees and clearing of vegetation in agricultural landscapes. No further calls of this species were recorded during the expanded surveys conducted between spring 2013 and autumn 2014.

The survey also revealed that Long-eared Bats (*Nyctophilus* spp.) are present in the area as expected. These are likely to be the Lesser Long-eared Bat (which is common throughout all of Victoria), rather than the significant Greater Long-eared Bat, which occurs further north. These species can't be positively distinguished by their calls, although they are easily distinguished in the hand. The Long-eared Bats are all thought to be foliage gleaners, seldom foraging far from trees. No Long-eared Bats were captured in the Harp Trapping exercise.

**Table 9: Summary of bat species recorded at 10 preliminary survey locations within and near the study area**

Species name	Common name	1	2	3	4	5	6	7	8	9	10
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	3	17	111	9	65	266	100	58	43	8
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	1	83	191	86	117	231	102	717	294	30
<i>Mormopterus</i> sp. 4	Southern Freetail Bat	6	40	456	16	58	498	86	237	66	59
<i>Nyctophilus</i> spp	Long-eared bats	1	0	25	9	22	2	16	52	11	11
<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat	0	0	6	0	0	3	3	1	1	0
<i>Saccolaimus flaviventris</i> *	Yellow-bellied Sheathtail Bat	0	0	0	0	0	0	1	0	0	0
<i>Tadarida australis</i>	White-striped Freetail Bat	1	23	10	8	9	30	3	26	13	5
<i>Vespadelus regulus</i>	Southern Forest Bat	0	5	2	4	2		9	19	0	3
<i>Vespadelus vulturnus</i>	Little Forest Bat	0	4	5	0	34	31	58	56	352	11
<b>Total passes</b>		<b>12</b>	<b>172</b>	<b>806</b>	<b>132</b>	<b>307</b>	<b>1061</b>	<b>378</b>	<b>1166</b>	<b>780</b>	<b>127</b>

**Table 10: Number of identified bat passes within each vegetation type**

Note – data is pooled from 24 sites, with surveys conducted in Spring 2013, Summer 2013/14 and Autumn 2014 (refer to Section 2.4.2)

Sum of passes	Common name	Black Box Woodland	Buloke Woodland	Mixed Woodlands	Open sites
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	672	103	395	418
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	357	232	25	64
<i>Mormopterus</i> sp.	Freetail Bats	97	24	70	134
<i>Mormopterus</i> sp. 4	Southern Freetail Bat	167	31	110	145
<i>Nyctophilus</i> spp.	Long-eared Bats	180	23	16	48
<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat	25	7	15	12
<i>Tadarida australis</i>	White-striped Freetail Bat	19	0	2	6
<i>Vespadelus regulus</i>	Southern Forest Bat	17	11	9	6
<i>Vespadelus</i> spp.	Forest Bat	1829	104	70	238
<i>Vespadelus vulturnus</i>	Little Forest Bat	877	243	35	151
<b>Grand Total</b>		4269	778	747	1222

## 5.6 Golden Sun Moth survey

No GSM were recorded on site during any of the targeted surveys (Table 11). The conditions under which the surveys were undertaken were suitable as outlined in the guidelines and are included in Table 12. Non-target insects were recorded on site during the GSM surveys including other diurnal moths, butterflies, wasps, flies and beetles. Positive sightings of flying GSM males recorded during the survey period at a range of reference sites are listed in Table 12.

**Table 11: Golden Sun Moth survey results**

Date	Time Start	Time Finish	Observer initials	GSM observed on site?
31/10/2014	11:35 am	13:40 pm	GLT	No
7/11/2014	13:05 pm	14:35 pm	GLT	No
19/11/2014	12:30pm	14:00 pm	MSG	No
28/11/2014	12:00 pm	14:10 pm	GLT	No

**Table 12: Onsite weather conditions during Golden Sun Moth surveys**

Date	Temp during survey (°C)	Cloud cover (%)	Wind direction	Average wind speed (km/hr)	Ground conditions	Humidity (%)
31/10/2014	31	<10	N	15	Dry	15
7/11/2014	34	<10	NE	7	Dry	7
19/11/2014	28	10	N	10	Dry	31
28/11/2014	27	<10	SE	4	Dry	15

No GSM were observed flying at the nearest reference site, the Nhill Golden Sun Moth Reserve, during the reference site checks, which were conducted on the same dates as the on-site checks.

Biosis has confirmed that GSM were not observed flying within the accepted flight period of the species at the Nhill Golden Sun Moth Reserve on any occasion where it was being monitored by Biosis or by a local naturalist (C. Crouch pers. comm.). Small numbers of moths (up to 5) were recorded flying in the reserve during early February. This is thought to be as a result of very dry conditions in the period from June to December 2014 followed by heavy rain in January 2015 that may have resulted in increased plant growth and consequently induced moth larvae to hatch later in the season than would otherwise be expected (C. Crouch pers. comm.).

The EPBC Act survey guidelines for GSM require that surveys are conducted during the local flying season. As the timing of the flight season varies annually and geographically, the guidelines specify that reference sites should be monitored during the expected flying period and used to guide survey timing at the target site. Outside of the Melbourne Strategic Assessment Area there is no requirement to conduct reference site checks on the same day as subject site surveys, provided surveys are conducted during suitable weather conditions. However, we confirmed that GSM were flying at other reference sites at the time of our targeted surveys (Table 13).

**Table 13: Golden Sun Moth reference sites with sightings of flying males during the survey period**

Date	Site
30/10/2014	St Arnaud
11/11/2014	Rokewood, Yea
13/11/2014	Epping, Merrimu, Craigieburn
19/11/2014	Craigieburn, Campbelltown
23/11/2014	Epping
28/11/2014	Yea, Altona, Epping, Merrimu
29/11/2014	Epping

Based on these findings, the site is considered unlikely to support a current GSM population. No further GSM surveys are considered necessary.

## 5.7 Striped Legless Lizard survey

No SLL were recorded on site during any of the targeted survey tile checks (Table 14). The timing and duration of the surveys was suitable as outlined in *Survey guidelines for Australia's Threatened Reptiles* (DSEWPac 1999). Two non-target species were recorded on site during the survey - the Olive Legless Lizard and Boulenger's Skink. Neither of these species has a conservation status of concern.

**Table 14: Striped Legless Lizard survey results**

Date	Observer initials	SLL observed on site?
30/09/2015	ADB	No
05/10/2015	ADB	No
16/10/2015	MSG	No
27/10/2015	MV	No
11/11/2015	MSG	No
24/11/2015	MSG	No
22/12/2015	KMC	No
11/02/2016	KMC	No

Based on these findings, the site is considered unlikely to support a current SLL population. No further SLL surveys are considered necessary.

## 5.8 Further survey recommendations

The detailed design process for the wind farm is currently under way. The avoidance of native vegetation and habitat for significant species is being given a high priority in the process. There may, however, be a requirement to remove small areas of native vegetation to facilitate access within the wind farm.

All areas of native vegetation to be impacted under the current design have been assessed. If future design changes result in disturbance to additional areas of native vegetation, these areas should be subject to spring targeted survey for threatened flora species.



## 6. Biodiversity Legislation and Government Policy

This section provides an assessment of the project against key biodiversity legislation and government policy. This section does not describe the legislation and policy in detail and guidance provided here does not constitute legal advice.

### 6.1 Commonwealth

#### 6.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act.

Matters of National Environmental Significance relevant to the project are summarised in Table 15. It includes an assessment against the EPBC Act policy statements published by the Australian Government which provide guidance on the practical application of EPBC Act.

**Table 15: Assessment of the project against the EPBC Act**

Matter of NES	Project specifics	Assessment against Guidelines
<b>Threatened species</b>	Fifteen species have been recorded or predicted to occur in the project search area. The likelihood of these species occurring in the study area is assessed in Appendix 1 (flora) and Appendix 2 (fauna).	<p>Most of these species are not likely to occur and development is unlikely to constitute a significant impact.</p> <p>Targeted survey was conducted in the 2014/15 flight season to assess the occurrence of the critically endangered Golden Sun Moth within the Habitat Zone 2 (Treeless or near treeless Plains Savannah with a native grassy understory). The species was not detected during the survey.</p> <p>Targeted survey was conducted for Striped Legless Lizard. The species was not detected in the surveys and is not considered likely to occur within the study area.</p> <p>Several listed flora species (Wimmera Rice-flower, Australian Piart, Rigid Spider-orchid, Floodplain Rustyhood and Slender Darling-pea) are potentially present in areas of remnant vegetation. Additional spring survey was conducted in areas of native vegetation potentially impacted by the project, and these species were not recorded. It is considered unlikely that they are present, or that they would be impacted by the project.</p> <p>It is not likely that the proposed action will result in a significant impact on any EPBC Act listed threatened species.</p>
<b>Threatened ecological communities</b>	Three listed Threatened Ecological Communities have been predicted to occur within the study area.	<p>Three listed threatened ecological communities have been predicted by the Protected Matters Search Tool as having potential to occur in the study area or its immediate vicinity. They are:</p> <ul style="list-style-type: none"> <li>• Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (Grey Box Grassy Woodlands).</li> <li>• Natural Grasslands of the Murray Valley Plains.</li> </ul>

Matter of NES	Project specifics	Assessment against Guidelines
		<ul style="list-style-type: none"> <li>Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions (Buloke Woodlands).</li> </ul> <p>Flora survey of the site has demonstrated that the two communities Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (Grey Box Grassy Woodlands) and Natural Grasslands of the Murray Valley Plains, do not occur at the site.</p> <p>The study area supports areas of Buloke Woodlands of the Riverina and Murray Darling Depression Bioregions. The design of the wind farm has intentionally avoided this community and it does not entail any impacts upon it.</p> <p>It is not likely that the proposed action will result in a significant impact on any EPBC Act listed threatened community.</p>
<b>Migratory species</b>	Eight migratory species are predicted to have potential to occur in the project search area. Of those, two have been recorded there (Appendix 2).	<p>The study site contains no substantial wetlands and it is unlikely to be visited by 4 of the 8 migratory birds that are wetland-dependent, other than during rare flights on passage through the region.</p> <p>While some of the remaining 4 species would be expected to use the study area or its airspace on occasions, it does not provide important habitat for an ecologically significant proportion of any of these species. It is not likely that the proposed action will result in a significant impact on any EPBC Act listed migratory species.</p>
<b>Wetlands of international importance (Ramsar sites).</b>	The study area is identified as being within the catchment of the Lake Albacutya Ramsar site.	The study area does not drain directly into the Ramsar site and the development is not likely to result in a significant impact on it.

The project is highly unlikely to result in a significant impact to any MNES. If the proponent chooses to refer the project to the Australian Government Minister for the Environment, it is recommended that the referral states that the project is 'not a controlled action'.

## 6.2 State

### 6.2.2 Environment Effects Act 1978

The *Environment Effects Act 1978* establishes a process to assess the environmental impacts of a project. If applicable, the Act requires that an Environment Effects Statement (EES) be prepared by the proponent. The EES is submitted to the Minister for Planning and enables the Minister to assess the potential environmental effects of the proposed development.

The general objective of the assessment process is

*to provide for the transparent, integrated and timely assessment of the environmental effects of projects capable of having a significant effect on the environment (DSE 2006)*

The 'Ministerial Guidelines for Assessment of Environmental Effects under the Environment Effects Act 1978' (DSE 2006) provide a range of criteria that can be used to determine whether an EES may be required for a

project. These criteria relate to individual potential environmental effects and a combination of (two or more) potential environmental effects.

An assessment of the project against the individual potential effects criteria is provided in Table 16, and against the combination of potential effects criteria in Table 17.

**Table 16: Assessment of the project against the individual potential environmental effects referral criteria of the *Environment Effects Act 1978***

Referral criteria	Referral criteria met?	Comments
<p>Potential clearing of 10 ha or more of native vegetation from an area that:</p> <ul style="list-style-type: none"> <li>• is of an EVC classified as Endangered within the Bioregion</li> <li>• is, or is likely to be, of Very High Conservation Significance; and,</li> <li>• is not authorised under an approved Forest Management Plan or Fire Protection Plan.</li> </ul>	No	The total extent of vegetation clearance required for the project will be less than two hectares.
Potential long-term loss of a significant proportion of known remaining habitat or population of a threatened species within Victoria	No	<p>The Yellow-bellied Sheathtail Bat is listed under the FFG Act. A single call of this species was recorded during the bat survey at site 7, just south of the southern boundary of the wind farm. This species is a thought to be a rare visitor to southern Australia, and is unlikely to be making significant use of the site. The species was not detected during subsequent surveys, and is therefore considered an occasional visitor. The project is not likely to impact upon this species.</p> <p>Several other listed species are present, but the project will not significantly impact upon them due to the small amount of habitat removal.</p>
Potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia' (Environment Australia, 2001).	No	The site does not contain, or drain directly into, any wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia' (Environment Australia, 2001).
Potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term.	No	The project will not impact upon aquatic systems.
Potential extensive or major effects on the health, safety or well-being of a human community, due to emissions to air or water or chemical hazards or displacement of residences.	Outside scope of the current study	
Potential greenhouse gas emissions exceeding 200,000 tonnes of carbon dioxide equivalent per annum, directly attributable to the operation of the facility.	Outside scope of the current study	

**Table 17: Assessment of the project against the combined potential environmental effects referral criteria of the *Environment Effects Act 1978***

Referral criteria	Referral criteria met?	Comments
Potential clearing of 10 ha or more of native vegetation, unless authorised under an approved Forest Management Plan or Fire Protection Plan.	No	Under the current design, the project will impact on less than two hectares of native vegetation.
Matters listed under the FFG Act 1988: <ul style="list-style-type: none"> <li>Potential loss of a genetically important population of an endangered or threatened species (listed or nominated for listing) including as a result of the loss or fragmentation of habitats</li> </ul>	No	The Yellow-bellied Sheathtail Bat is listed under the FFG Act. A single call of this species was recorded during the bat survey at site 7, just south of the southern boundary of the wind farm. This species is a thought to be a rare visitor to southern Australia, and is unlikely to be making significant use of the site. The species was not detected during subsequent surveys, and is therefore considered an occasional visitor. The project is not likely to impact upon this species.
<ul style="list-style-type: none"> <li>potential loss of a significant area of a listed ecological community; or</li> </ul>	No	The study area potentially supports components of the FFG Act listed Victorian Temperate Woodland Bird Community and the Victorian Mallee Bird Community. Minimisation of removal of woodland habitat has been given high priority in the design phase.
<ul style="list-style-type: none"> <li>potential loss of a genetically important population of an endangered or threatened species (listed or nominated for listing), including as a result of loss or fragmentation of habitats; or,</li> </ul>	No	Buloke and Hooded Robin have both been recorded within the study area. Several other FFG Act listed have potential to occur. The project will not impact on these species, due to the minimal extent of impact to native vegetation.
<ul style="list-style-type: none"> <li>potential loss of critical habitat; or,</li> </ul>	No	There is no declared critical habitat within the state, including the investigation corridor.
<ul style="list-style-type: none"> <li>potential significant effects on habitat values of a wetland supporting migratory bird species.</li> </ul>	No	The site does not support any major wetlands and it is unlikely that the proposed wind farm will interrupt the flight paths of migratory birds to a major wetland.
Potential extensive or major effects on landscape values of regional importance, especially where recognised by a planning scheme overlay or within or adjoining land reserved under the <i>National Parks Act 1975</i> .	Outside scope of current study.	
Potential extensive or major effects on land stability, acid sulphate soils or highly erodible soils over the short term.	Outside scope of current study.	

Referral criteria	Referral criteria met?	Comments
Potential extensive or major effects on beneficial uses of waterbodies over the long term due to changes in water quality, streamflows or regional groundwater levels.	Unlikely	The project is unlikely to result in long-term changes to the hydrology of the area.
Potential extensive or major effects on social or economic well-being due to indirect or indirect displacement of non-residential land use activities.	Outside scope of current study.	
Potential for extensive displacement of residences or severance of residential access to community resources due to infrastructure development	Outside scope of current study.	
Potential significant effects on the amenity of a substantial number of residents due to extensive or major long term changes in visual, noise and traffic conditions	Outside scope of current study.	
Potential exposure of a human community to severe or chronic health or safety hazards over the short or long term, due to emissions to air or water or noise or chemical hazards or associated transport	Outside scope of current study.	
Potential extensive or major effects on Aboriginal cultural heritage	Outside scope of current study.	
Potential extensive or major effects on cultural heritage places listed on the Heritage Register or the Archaeological Inventory under the <i>Heritage Act 1995</i> .	Outside scope of current study.	

Based on the criteria assessed in this study, the *Environmental Effects Act 1978* is not likely to be applicable. RES may, however, choose to refer the project to the Minister for Planning in order to engage with the regulator as part of the due diligence process.

### 6.2.3 Flora and Fauna Guarantee Act 1988 (FFG Act)

The FFG Act is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes. Under the FFG Act a permit is required from DELWP to 'take' protected flora species from public land. A permit is generally not required for removal of protected flora from private land. Authorisation under the FFG Act is required to collect, kill, injure or disturb listed fish.

No critical habitat is declared within the study area.

A protected flora permit is not required for removal of protected species within private land, however the presence of rare or threatened flora and habitat for threatened fauna will be considered by the Responsible



Authority in determining its response to an application for vegetation clearance under Clause 52.17 (see below). Removal of protected flora on public roadsides will require a protected flora permit if protected species are present.

#### **6.2.4 Catchment and Land Protection Act 1994 (CaLP Act)**

The CaLP Act identifies and classifies certain species as noxious weeds or pest animals, and provides a system of controls on noxious species.

Declared noxious weeds identified in the study area are listed in Appendix 1 and established pest animals are listed in Appendix 2.

Landowners must take all reasonable steps to eradicate regionally prohibited weeds; prevent the growth and spread of regionally controlled weeds; and prevent the spread of, and as far as possible eradicate, established pest animals. The State is responsible for eradicating State prohibited weeds from all land in Victoria.

#### **6.2.5 Planning and Environment Act 1987 (incl. Planning Schemes)**

The *Planning and Environment Act 1987* controls the planning and development of land in Victoria, and provides for the development of planning schemes for all municipalities. As part of the planning process, regard must be given to Action Statements that have been produced under the FFG Act.

Reforms to the native vegetation permitted clearing regulations were gazetted on 20 December 2013 through planning scheme amendment VC105. The reforms made changes to the Victoria Planning Provisions including the State Planning Policy Framework (SPPF), Clause 52.16 and 52.17 of all planning scheme within Victoria and introduced the Permitted clearing of native vegetation: Biodiversity Assessment Guidelines (the Guidelines, DEPI 2013).

The study area includes sections of two local government areas. The section of the study area to the north of Dimboola-Minyip road is within the Yarriambiack Shire Council, and the area to the south is within Horsham Rural City Council. Both planning schemes have classified all areas of the study area as Farming Zone (FZ).

The Horsham Rural City Council section of the study area does not contain any overlays.

The Yarriambiack Shire Council contains sections of ESO3 – Environmental Significance Overlay Schedule 3: Channel and Reservoir Protection. Under this overlay, a permit is required to construct a fence within 20m of the toe of a channel. The overlay also removes the requirement to obtain a permit to remove vegetation for the Wimmera Mallee Pipeline Project. The channels covered by this overlay have been decommissioned (landscaped) and the overlay has no other relevance to the wind farm project. Yarriambiack Shire advise that this overlay will be removed from the planning scheme.

Of particular relevance to the development proposal are controls relating to the removal, destruction or lopping of native vegetation contained within the Planning Scheme (the Scheme), including permit requirements. The Scheme (Clause 72) defines 'native vegetation' as 'Plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'. It is an objective of Clause 12.01-2 of the SPPF (Native Vegetation Management) that permitted clearing of native vegetation results in no net loss in the contribution made by native vegetation to Victoria's biodiversity.

Clause 52.17 (Native Vegetation) requires a planning permit to remove, destroy or lop native vegetation including some dead native vegetation. Decision guidelines are contained in Clause 52.17-5. It should be noted that where native vegetation does not meet the definition of a remnant patch or scattered trees, as described in Section 5, the Guidelines do not apply. However, a permit may still be required to remove, destroy or lop native vegetation under the provisions of the Scheme.

### **6.2.6 Victoria's Biodiversity Assessment Guidelines**

The Guidelines are incorporated into the Victoria Planning Provisions and all planning schemes in Victoria (DEPI 2013a). The Guidelines replace Victoria's Native Vegetation Management – A Framework for Action.

The purpose of the Guidelines is to guide how impacts to biodiversity should be considered when assessing a permit application to remove, destroy or lop native vegetation. The objective for permitted clearing of native vegetation in Victoria is 'No net loss in the contribution made by native vegetation to Victoria's biodiversity'.

A detailed assessment of the implications for the project under the Guidelines is provided in Section 5 of this report. Under the Guidelines, there are three risk-based pathways for assessing an application for a permit to remove native vegetation: low, moderate and high.

### **6.2.7 Regional Strategies**

State Planning Policy Framework Clause 14.02-1 (Catchment planning and management) states that planning must consider as relevant, Regional Catchment Strategies (RCS) and any associated implementation plan or strategy including any regional river health and wetland strategies.

Strategies of relevance to the study area are the:

- Strategy for the protection and improvement of biodiversity in the Wimmera (WCMA 2011).
- Wimmera CMA Regional Catchment Strategy – Consultation Draft (WCMA 2012).

## 7. Victoria's biodiversity assessment guidelines

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The 'Permitted clearing of native vegetation: Biodiversity assessment guidelines' (the Guidelines) were introduced in December 2013. The Guidelines describe the following objective for permitted clearing of native vegetation in Victoria:

*"No net loss in the contribution made by native vegetation to Victoria's biodiversity"*

This objective is to be achieved through Victoria's planning system using a risk-based approach that relies on strategic planning and the permit and offset system. The key strategies for achieving no net loss at the permit level are:

- avoiding the removal of native vegetation that makes a significant contribution to Victoria's biodiversity
- minimising impacts to Victoria's biodiversity from the removal of native vegetation
- where native vegetation is permitted to be removed, ensuring it is offset in a manner that makes a contribution to Victoria's biodiversity that is equivalent to the contribution made by the native vegetation to be removed.

DELWP provides biodiversity information tools to assist with determining the risk associated with permitted clearing and the contribution that native vegetation within the study area makes to Victoria's biodiversity.

All planning permit applications to remove native vegetation are assigned to a risk-based pathway determined by the extent and location of proposed clearing. The risk-based pathway will dictate the information to be provided in a planning permit application and the decisions guidelines the responsible authority (e.g. Council) and/or DELWP as a referral authority will use to assess the permit application.

### 7.1 Proposed removal of native vegetation

The extent of native vegetation patches and the number of scattered trees were mapped within the study area and the condition was assessed in relation to standard methods provided by DSE (2004). The condition of native vegetation was assessed using the DSE Vegetation Quality Assessment Sheet (DSE 2004) and pre-determined EVC benchmarks: <http://www.dse.vic.gov.au/conservation-and-environment/ecological-vegetation-class-evc-benchmarks-by-bioregion>.

The proposed removal of native vegetation was assessed in accordance with the concept design provided. It is proposed to remove 1.685 hectares as shown in Appendix 5. Spatial data (shapefiles) of proposed vegetation removal were submitted to DELWP's native vegetation support team, who provided a BIOR report for the project. This is provided in Appendix 5 and summarised in the following sections.

#### 7.1.1 Patches of native vegetation

Seven habitat zones are identified within the wind farm boundary. An additional zone (Black Box Lignum Woodland - Habitat Zone 1) was initially mapped, but is now outside the wind farm boundary. The results of the vegetation quality assessment are provided in Table 18. Each habitat zone is assigned an overall habitat score, which is multiplied by its area to provide the number of habitat hectares.

**Table 18: Quantification of native vegetation patches (Wimmera Bioregion).**

Habitat Zone			2	3	4	5	6	7	8
EVC #			826	826	826	826	803	803	803
EVC Name			PS	PS	PS	PS	PW	PW	PW
EVC Bioregional Conservation Status			E	E	E	E	E	E	E
Site Condition	Large Old Trees	10	N/A	N/A	3	3	5	5	5
	Canopy Cover	5	N/A	N/A	4	4	4	4	4
	Lack of Weeds	15	6	2	6	2	2	6	9
	Understorey	25	10	5	5	5	5	5	15
	Recruitment	10	3	1	3	1	1	3	5
	Organic Matter	5	3	2	5	2	2	5	5
	Logs	5	N/A	N/A	2	0	0	2	4
	Total Site Score		22	10	28	17	19	30	47
	EVC standardiser (x 75/55)		75/55	75/55	1	1	1	1	1
	Adjusted Site Score		30	14	28	17	19	30	47
Landscape Value	Patch Size	10	2	2	2	2	2	2	2
	Neighbourhood	10	1	1	1	1	1	1	1
	Distance to Core	5	1	1	1	1	1	1	1
	Total Landscape Score		4	4	4	4	4	4	4
HABITAT SCORE		100	34	18	32	21	23	34	51
Habitat points = #/100		1	0.34	0.18	0.32	0.21	0.23	0.34	0.51
Habitat Zone area (ha)			55.3	13.3	13.8	22.0	9.4	38.3	3.7
Habitat Hectares (Hha)			18.8	2.4	4.4	4.6	2.2	13.0	1.9

*E = Endangered. PS = Plains Savannah, PW = Plains Woodland.*

### 7.1.2 Scattered Trees

The impact calculations include the loss of 15 scattered remnant trees. These trees equate to 0.213 Habitat hectares (Table 19).

**Table 19: Habitat hectare conversion for impacts to scattered remnant canopy trees**

Number of scattered trees	Weighted average condition multiplier*	Standard extent (ha)	Habitat hectares (Hha)
15	0.2	0.071	0.213

\*From DELWP NVIM

Outside patches of native vegetation (previous section) the following locally indigenous canopy trees may be impacted (Figure 2):

- Black Box *Eucalyptus largiflorens*
- Buloke *Allocasuarina luehmannii*
- Yellow Box *Eucalyptus melliodora*
- Yellow Gum *Eucalyptus leucoxylon*
- Bull Mallee *Eucalyptus behriana*
- River Red-gum *Eucalyptus camaldulensis*
- Slender Cypress Pine *Callitris gracilis*

Size classes have not been determined for all of these trees, as some were mapped from roadsides with the aid of aerial photography.

### Summary of Habitat hectares to be removed within the study area

The current project design involves the removal of 1.685 hectares of native vegetation, including 15 scattered trees.

## 7.2 Determining the risk-based pathway

To determine the risk based pathway for the permit application, two factors are considered: **location risk** and **extent risk**.

Location risk has been pre-determined by DELWP for all locations in Victoria. The location of a particular site is determined using the *Native vegetation location risk map* available in the Native Vegetation Information Management (NVIM) system.

The extent risk is based on the extent of native vegetation proposed to be removed. Extent risk is determined with reference to the

- area of any remnant patches of native vegetation proposed to be removed
- number of any scattered trees proposed to be removed.



For applications that propose to remove both remnant patch vegetation and scattered trees, the extent of scattered trees is calculated using the standard extent multiplier and added to the extent of remnant patch vegetation, to determine the overall extent to be considered when determining the risk-based pathway.

It is proposed to remove  $\geq 1$  hectare of native vegetation from within location A; therefore the application for removal of this native vegetation must meet the requirements of, and be assessed in, the moderate risk-based pathway. These requirements are provided in Appendix 5.

Although the application will be assessed on the moderate risk-based pathway, RES has commissioned Biosis to prepare a Habitat hectare assessment of the native vegetation within the study area as the condition score assigned in the spatial data model does not accurately represent the condition of the vegetation on site.

### **7.3 Offset strategy**

RES Australia are currently evaluating the suitability of an offset site within the wind farm area. A preliminary assessment of the offset potential of this area, shown in Appendix 6, indicates that the site potentially provides adequate type and quantity of native vegetation credits to offset the losses subject to the current wind farm layout.

## 8. Key Ecological Values, Recommendations and Impacts

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This section identifies the key ecological features of the study area, provides an outline of potential implications of proposed development on those values and includes recommendations to assist RES Australia to design the facility to minimise impacts on biodiversity.

### 8.1 Key ecological values present within the study area

Key ecological values identified within the study area include:

- Patches of Plains Savannah, Plains Woodland and Black Box Lignum Woodland in a range of condition states.
- Scattered paddock trees.
- The EPBC listed community Buloke Woodlands of the Riverina and Murray Darling Depression Bioregions.
- Populations of several significant species including Buloke, Buloke Mistletoe, Black Falcon, Hooded Robin, Eastern Bearded Dragon and Brown Treecreeper.

### 8.2 Recommendations

The primary measure to reduce impacts to biodiversity values within the study area is to minimise removal of native vegetation and habitat. It is critical that this be considered during the design phase of the project, when key decisions are made about the location of turbines, hard stand areas, access tracks and power infrastructure. The project design has been through several iterations, with the aim of designing an efficient layout while minimising impacts to key biodiversity values. Key inputs to the design have been mapping of biodiversity values, consultation with landowners and proximity to existing road and power infrastructure. The design process is documented in further detail in the project planning report. Many of the recommendations listed below have already been incorporated into the design process.

All areas of vegetation/habitat nominated in the final design plan as 'retained' are to be treated as no-go zones and are not to be encroached upon as construction progresses.

Detail on additional mitigation measures is provided below.

#### 8.2.2 Design and pre-construction

- Avoid removal of native vegetation, as mapped in Figure 2:
  - Where possible, wind turbines and associated infrastructure should be located outside of EVCs as mapped in Figure 2 to avoid all native vegetation.
  - Existing gates and access tracks should be used where possible. Where there is a requirement to widen existing or create new access tracks, this should be undertaken outside areas of native vegetation as mapped in Figure 2.
- If removal of native vegetation is unavoidable, minimise the extent to which native vegetation is removed. Identify appropriate offsets for vegetation losses. There is an opportunity to provide offsets on site.

- Protect all areas of retained native vegetation including scattered trees during construction by means of temporary fencing if construction activities are to be conducted in proximity to native vegetation. Fencing must be installed before construction work commences.
- Ensure all environmental constraints are clearly communicated to construction personnel and incorporated into the workforce induction program.

### **8.2.3 Construction**

- Keep the construction footprint to a minimum.
- Protect areas of retained native vegetation and areas of environmental sensitivity. These areas should be fenced and treated as no-go zones.
- Prevent access to no-go zones – including vehicles, construction personnel, equipment and stockpiles.
- If trees are removed or lopped as part of the proposed wind farm development they should be incorporated into reserves, where they can continue to provide fauna habitats.
- All protective fencing must be maintained in good repair throughout construction.

### **8.2.4 Post-construction**

- Site rehabilitation/revegetation.
- Public education/interpretation re biodiversity values.

## **8.3 Project design and residual impacts**

RES Australia have produced a wind farm design in response to the opportunities and constraints of the site, as identified in a range of studies including the ecological assessment. An important consideration in this design process has been avoiding and minimising impacts to native vegetation and flora and fauna habitat, while also minimising disruption to agricultural production. The proposed project is considered to have a very low impact upon ecological values, largely due to the extensive past clearance of native vegetation, and the incorporation of existing values into the design process.

Direct and potential impacts to native vegetation have been minimised by:

- Planning turbine locations (including crane pads) on private land with no direct impact on native vegetation.
- Use of existing roads for access.
- Where practicable, creation of access roads through paddocks where nearby public road easements support native vegetation.
- Avoidance of areas surrounding large blocks of remnant vegetation (Barrat State Forest / Flora and Fauna Reserve).
- Where possible, use of underground cabling for power connections.
- Positioning of power infrastructure to avoid impacts to patches of native vegetation and scattered trees.

The current project design is shown in Figure 6, which indicates where native vegetation is impacted, and where vegetation is retained. Figure 6 also shows the location of the proposed native vegetation offset area.

Based on the current design, the expected residual impacts to ecological values are:

- Removal of 1.685 ha of native vegetation, including 0.630 hectares of remnant vegetation patches and 15 scattered trees, to be assessed under the moderate risk-based pathway. Offsetting these losses requires 0.110 general biodiversity equivalence units with a minimum strategic biodiversity score of 0.157. The proposed offset site is more than sufficient for this purpose.
- The current design involves the potential removal of up to 15 scattered paddock trees. Many of these require removal for construction of the internal power corridor. Removal of some of these may not be necessary, but this will not be known until detailed design of power infrastructure is complete, as the amount of clearance under the power lines will depend on the positioning of poles and the length of spans.
- Impacts to vegetation patches are mostly limited to road reserves, due to requirements to widen roads, to provide access points into paddocks or to cross road reserves, either for access or power infrastructure. Small areas require impact on Kewell North School Road, Barrat Road and Dogwood Road. In terms of area, the largest section of patch vegetation to be removed is within the narrow Dogwood Road reserve. The vegetation along this north-south road is in poor condition, consisting of common native grass species with no overstorey, and the area is subject to regular disturbance by slashing and vehicle movement.
- Loss of native vegetation will also involve minimal removal of habitat for common flora and fauna species and a number of significant species including Black Falcon, Hooded Robin, Eastern Bearded Dragon and Brown Treecreeper. The project may require the removal of one Buloke tree scattered tree and potential minor trimming of a one or more Buloke trees along Kewell North School Road where the powerline crosses. Due to the minimal extent of native vegetation removal (< 2 ha across the study area), impacts to these species are expected to be negligible or minor.
- The landscape is highly fragmented, and the minor extent of vegetation removal proposed for this project is not likely to significantly increase the level of fragmentation, or impact upon fauna movements.
- The project will not impact upon any areas of the EPBC Act listed community Buloke Woodlands of the Riverina and Murray Darling Depression Bioregions.
- Construction and operation of aerial infrastructure, including turbines and overhead powerlines will result in an increased risk of collision by birds and bats. The likelihood of significant impacts to threatened species of birds and bats is considered very low, as the listed species recorded or potentially occurring on the site are woodland dependent species unlikely to fly within rotor swept height. Monitoring of impacts to bats and birds will be managed through implementation of an appropriate, project specific Bat and Avifauna Management Plan. A collision risk modelling exercise has been undertaken for the project, and the results are presented in a separate report.

## References

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- Biosis Research 2010. *Murra Warra Wind Farm: Preliminary Flora and Fauna Assessment*. Report to RES Australia Pty Ltd. Authors: N. Garvey and S. Arber. Biosis Research Pty Ltd, Ballarat. Project no. 11408.
- Braby, M and Dunforn, M 2006. Field observations on the ecology of the Golden Sun Moth *Synemon plana* Walker (Lepidoptera: Castniidae). *The Australian Entomologist* 33: 103-110
- Cheal, D. Lucas, A. and Macaulay, L. 2011. *National Recovery Plan for Buloke Woodlands of the Riverina and Murray Darling Depression Bioregions*. Department of Sustainability and Environment, Melbourne.
- Clarke G M and O'Dwyer C 2000. Genetic variability and population structure of the endangered Golden Sun Moth *Synemon plana*. *Biological Conservation* 92: 371-381
- DNRE 2002. *Victoria's Native Vegetation Management: A Framework for Action*. Department of Natural Resources & Environment, Victoria.
- DEPI 2013a. *Permitted clearing of native vegetation – Biodiversity assessment guidelines*. Victorian Government Department of Environment and Primary Industries, Melbourne, September 2013.
- DEPI 2013b. *Reforms to Victoria's native vegetation permitted clearing regulations. Transitional guidance to support applications to remove native vegetation*. Department of Environment and Primary Industries, Melbourne, September 2013.
- DEPI 2013c. *List of habitat importance maps used in the permitted clearing regulations – version 1.0*. Department of Environment and Primary Industries, Melbourne September 2013.
- DSE 2004. *Native Vegetation: Sustaining a living landscape. Vegetation Quality Assessment Manual – Guidelines for applying the habitat hectares scoring method. Version 1.3*. Department of Sustainability & Environment, Melbourne.
- DSE 2005a. *Advisory List of Rare or Threatened Plants in Victoria - 2005*, Victorian Department of Sustainability & Environment, East Melbourne, Victoria.
- DSE 2005b. *Biosites Maps and Reports, Port Phillip Region* (CD). Department of Sustainability & Environment, Melbourne.
- DSE 2007a. *Advisory List of the Threatened Vertebrate Fauna in Victoria - 2007*, Department of Sustainability & Environment, East Melbourne, Victoria.
- DSE 2007b. *Native Vegetation - Guide for assessment of referred planning permit applications*. Victorian Government, Department of Sustainability & Environment, East Melbourne.
- DSE 2010. Victorian Biodiversity Atlas 'VBA\_FAUNA25, FAUNA100 & FAUNARestricted, FLORA25, FLORA100 & FLORARestricted' August 2010 © The State of Victoria, Department of Sustainability & Environment.
- DEWHA 2009a. *Matters of National Environmental Significance. Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999*. Department of the Environment, Water, Heritage & the Arts. Australian Government, Canberra.
- DEWHA 2009c. *Significant impact guidelines for the critically endangered golden sun moth* (*Synemon plana*). Nationally threatened species and ecological communities EPBC policy statement 3.12. Department of the Environment, Water, Heritage & the Arts. Australian Government, Canberra.

DSE 2006a. *Native Vegetation. Revegetation Planting Standards – Guidelines for establishing native vegetation for net gain accounting*. Victorian Government, Department of Sustainability & Environment, East Melbourne.

DSE 2006b. *Vegetation Gain Approach – Technical basis for calculating gains through improved native vegetation management and revegetation*. Victorian Government, Department of Sustainability & Environment, East Melbourne.

Edwards, T. 1993. Golden Sun Moth. *Australian Natural History*. 24 (6): 16-17.

Gibson L. 2006. *Surveys of the Golden Sun Moth (Synemon plana Walker) population and ant assemblage at the Craigieburn Grassland Reserve*. (Unpublished Bsc Hons Thesis, La Trobe University, Bundoora.

Gilmore, D., Koehler, S. O'Dwyer, C. and Moore, W. 2008. Golden Sun Moth *Synemon plana* (Lepidoptera: Castniidae): results of a broad survey of populations around Melbourne. *The Victorian Naturalist*. 125 (2): 230-37.

O'Dwyer, C. and Attiwill, P.M. 1999. A comparative study of habitats of the Golden Sun Moth *Synemon plana* Walker (Lepidoptera: Castniidae): implications for restoration. *Biological Conservation* 89: 131-141.

WCMA 2011. *Strategy for the protection and improvement of biodiversity in the Wimmera*. Wimmera Catchment Management Authority.

WCMA 2012. *Wimmera Regional Catchment Strategy – Consultation Draft*. Wimmera Catchment Management Authority.