RYAN CORNER WIND FARM

BIODIVERSITY IMPACT ASSESSMENT ON PROPOSED MODIFICATIONS

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1. INTRODUCTION

The Ryan Corner Wind Farm received its planning approval on 21 August 2008 for the 'Use and development of land for a Wind Energy Facility' Planning Permit 2006/0222. Condition 3 of the permit details the specifications of the wind farm, including the number and scale of the turbines. The permit originally specified the tower height of the wind turbines at 78 metres, with an overall height of 121.5 metres above natural ground level. On 12 August 2010, the Minister for Planning approved a minor amendment to the specifications of the wind turbines for the wind farm to allow a tower height of 80 metres and overall height of 126.25 metres and a lower minimum RSA of 33.75 metres.

Ryan Corner Development Pty Ltd is now seeking approval to further vary the turbine specifications as detailed on the permit. It is proposed to increase the tower height and rotor diameter to achieve an overall tip height of up to 180 metres and a minimum RSA height of 40 metres, except for one of the proposed turbines (Turbine B35) which will have different specifications, namely a proposed upper RSA of 160 metres and a lower RSA height of 30 m above the ground. In addition, it is proposed to undertake micrositing of a number of turbines and realign access tracks and ultimately, reduce the number of turbines on the Ryan Corner Wind Farm site from the approved 68 to 56.

Planning Permit No PL07/067 was issued to the proponent by the Shire of Moyne on the 21 August 2008 to provide for the removal of native vegetation associated with the construction of the Ryan Corner Wind Farm and associated road access points. Under the permit, prior to construction a plan indicating all native vegetation to be removed must be prepared and submitted to the responsible authority. When approved this plan will be endorsed and will form part of this permit.

BL&A was engaged by Ryan Corner Development Pty Ltd C/- Union Fenosa Wind Australia Pty Ltd to conduct an assessment of the impacts of the proposed layout change on Biodiversity.

This report presents the findings of the assessment, identifies issues and provides recommendations and mitigation options. It is divided into the sections described below.

Section 2 presents the initial assessment of impact on flora

Section 3 presents the results of the field assessment on flora

Section 4 presents the impact on birds and avifuna

Section 5 presents the conclusions and recommendations.

These investigations were undertaken by Elinor Ebsworth (Botanist), Curtis Dougherty (Zoologist), Alan Brennan (Senior Ecologist & Project Manager), Bernard O'Callaghan (Senior Ecologist & Project Manager) and Mahsa Ghasemi (GIS Analyst) and Brett Lane (Principal Consultant).

2. DESKTOP FLORA ASSESSMENT

2.1. Introduction

BL&A was engaged by Ryan Corner Development Pty Ltd C/- Union Fenosa Wind Australia Pty Ltd to conduct a native vegetation impact assessment of the proposed layout change outlined in Section 1. The assessment involved:

- Collation and review of previous literature documenting flora and native vegetation within the Ryan Corner Wind Farm site; and
- Assessment of the potential impacts of the proposed layout change on flora and native vegetation.

BL&A did not complete the original flora and native vegetation for the site. However existing data collected by Environmental Resources Management Australia (ERM) was used to compare the initial approved layout and the revised layout and indentify any potential impacts on flora and native vegetation.

It is noted that the regulatory framework for dealing with native vegetation removal has changed in Victoria since the initial permit was issued. This report considers the implications of these changes.

2.2. Scope of Work and Methodology

This current assessment involved the following:

Existing information on native vegetation of the area was reviewed as follows:

- Native Vegetation Information Management system (NVIM) (DELWP 2015a);
- Biodiversity Interactive Map 2.0. (DELWP 2015b);
- Flora and Fauna Guarantee Act 1988 - Threatened List (DELWP 2015d);
- Victorian Biodiversity Atlas administered by the Department of Environment, Land, Water and Planning (DELWP 2015e);
- The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (DoE 2015);
- Ryan Corner Wind Farm Net Gain Assessment Supplementary Report (ERM 2007);
- Ryan Corner Wind Farm Ecological Assessment (ERM 2006);
- Ryan Corner Wind Farm Arborists Report (Galbraith & Associates 2009); and
- Ryan Corner Wind Farm Peer Review of Ecological Assessment (BL&A 2006).

The sources of information listed above were reviewed to determine the ecological values within the Ryan Corner Wind Farm site. The modification proposal for the Ryan Corner Wind Farm was then considered in light of these ecological values to determine potential impacts of the modified proposal. An assessment of the impacts of the amended redevelopment layout was undertaken using GIS to overlay the proposed modified layout over the existing approved layout and recorded ecological values.

2.2.1. Limitations of assessment

As the primary purpose of the investigation was to conduct a biodiversity impact assessment to determine differences (if any) in potential impacts of the proposed layout

change on flora and native vegetation, the review of existing information, combined with the GIS analysis of the proposed and approved layouts were sufficient to complete this aspect of the assessment.

This portion of the initial assessment has been undertaken on a desk-top only basis, and as such the results and advice contained within this section of the report rely on the accuracy of flora and fauna surveys undertaken by ERM in 2006 and 2007 along with an assessment undertaken by Galbraith & Associates in 2009. A peer review was undertaken by BL&A in 2006 of the initial ERM findings. No additional validation of the accuracy of these surveys and associated mapping has been undertaken as part of this current assessment.

2.3. Legislation and policy

2.3.1. Planning and Environment Act 1987

Victoria's planning schemes are constituted under the *Planning and Environment Act 1987*. The applicable planning provisions in the local planning scheme as discussed below.

Planning Permit No PL07/067 was issued to the proponent by the Shire of Moyne on the 21 August 2008 to provide for the removal of native vegetation associated with the construction of the Ryan Corner Wind Farm and associated road access points. Under the permit, prior to construction a plan indicating all native vegetation to be removed must be prepared and submitted to the responsible authority. When approved this plan will be endorsed and will form part of this permit.

EPBC Act

The *Environment Protection and Biodiversity Conservation Act 1999* protects a number of threatened species and ecological communities that are considered to be of national conservation significance. Any significant impacts on these species require the approval of the Australian Minister for the Environment. If there is a possibility of a significant impact on nationally threatened species or communities or listed migratory species, a Referral under the EPBC Act should be considered.

FFG Act

The Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) lists threatened and protected species and ecological communities. Any removal of threatened flora species or communities (or protected flora) listed under the FFG Act from public land requires a Protected Flora Licence or Permit under the Act, obtained from DELWP. The FFG Act does not apply to development on private land.

However, prior to December 2013 the responsible authority was required to consider impacts to values listed under the FFG Act on private land. Since December 2013, consideration of such matters is no longer required.

EE Act

The "Ministerial Guidelines for Assessment of Environmental Effects under the *Environment Effects Act 1978"* (DSE 2006), identifies the following criteria related to flora and fauna which assist in determining whether a Referral to the State Minister for Planning is required:

- Potential clearing of ten hectares or more of native vegetation from an area that is of an EVC identified as endangered;
- Potential long-term loss of a significant proportion (1 to 5% depending upon conservation status of species concerned) of known remaining habitat or population of a threatened species in Victoria;
- Potential long-term change to a wetland's ecological character, where that wetland is Ramsar listed, or listed in 'A Directory of Important Wetlands in Australia';
- Potential major effects upon the biodiversity of aquatic ecosystems over the long term;
- Potential significant effects on matters listed under the *Flora and Fauna Guarantee Act 1988*.

One or a combination of these criteria may trigger a requirement for a Referral to the Victorian Minister for Planning who will determine if an EES is required.

2.4. Results

2.4.1. Existing information

Pre-European Environmental Vegetation Class (EVC) mapping (ERM 2006; DELWP 2015b) indicated that the study area and surrounds would have supported Aquatic Herblands/Plains Sedgy Wetland Mosaic (EVC 691) and Stony Knoll Shrubland/Plains Grassy Woodland/Plains Grassy Wetland Mosaic (EVC 714) prior to European settlement based on modelling factors including rainfall, aspect, soils and remaining vegetation.

ERM (2006) recorded patches of Stony Knoll Shrubland (EVC 649), Aquatic Herbland (EVC 653) and Plains Grassy Woodland (EVC 55_61) during field investigations. These were mapped during the initial assessment as High Quality Rocky Knoll, High Quality Grassland and Low Quality Grassland, with the provision that determination of the extent and quality of native vegetation would need to be determined during site-specific surveys.

Net Gain assessments and targeted threatened species surveys were conducted by ERM in spring 2006, and are documented in the *Ryan Corner Wind Farm Net Gain Assessment Supplementary Report* (ERM 2007). The study area for this assessment was access tracks and turbines that fell within areas mapped as potential native vegetation, and a 50m radius around such turbines. No remnant native vegetation was mapped within the study area during these surveys. No rare or threatened flora species were detected during these surveys and none were expected to occur within the development footprint (ERM 2007).

2.4.2. Impacts

The proposed layout changes involve a reduction in the number of turbines and an amendment in the location of access tracks and some turbines.

Analysis indicated that there were one potential impact as a result of these proposed modifications that include revised track locations and moving one turbine on native vegetation. The Low Quality Grassland in which the revised tracks and turbine B55 occur was described in ERM (2006) as "generally dominated by Common Tussock Grass interspersed with a range of weeds. The low quality grasslands on ridges include native species such as Common Tussock Grass, Spear Grass *Austrostipa* spp, Kangaroo Grass

Themeda triandra, and Wallaby Grass *Austrodanthonia* spp. Some individual plants of threatened flora may persist within this low quality grassland."

The Ryan Corner Wind Farm, as currently approved, does not involve the removal of any remnant patch native vegetation, scattered trees or impacts to threatened flora species. However, the Ryan Corner Wind Farm, as currently approved, does include the removal of scattered native plants — predominantly native grass species such as Kangaroo Grass and various wallaby grasses (ERM 2007). The currently approved wind farm also includes the pruning of a small number of trees native to Victoria along one access road.

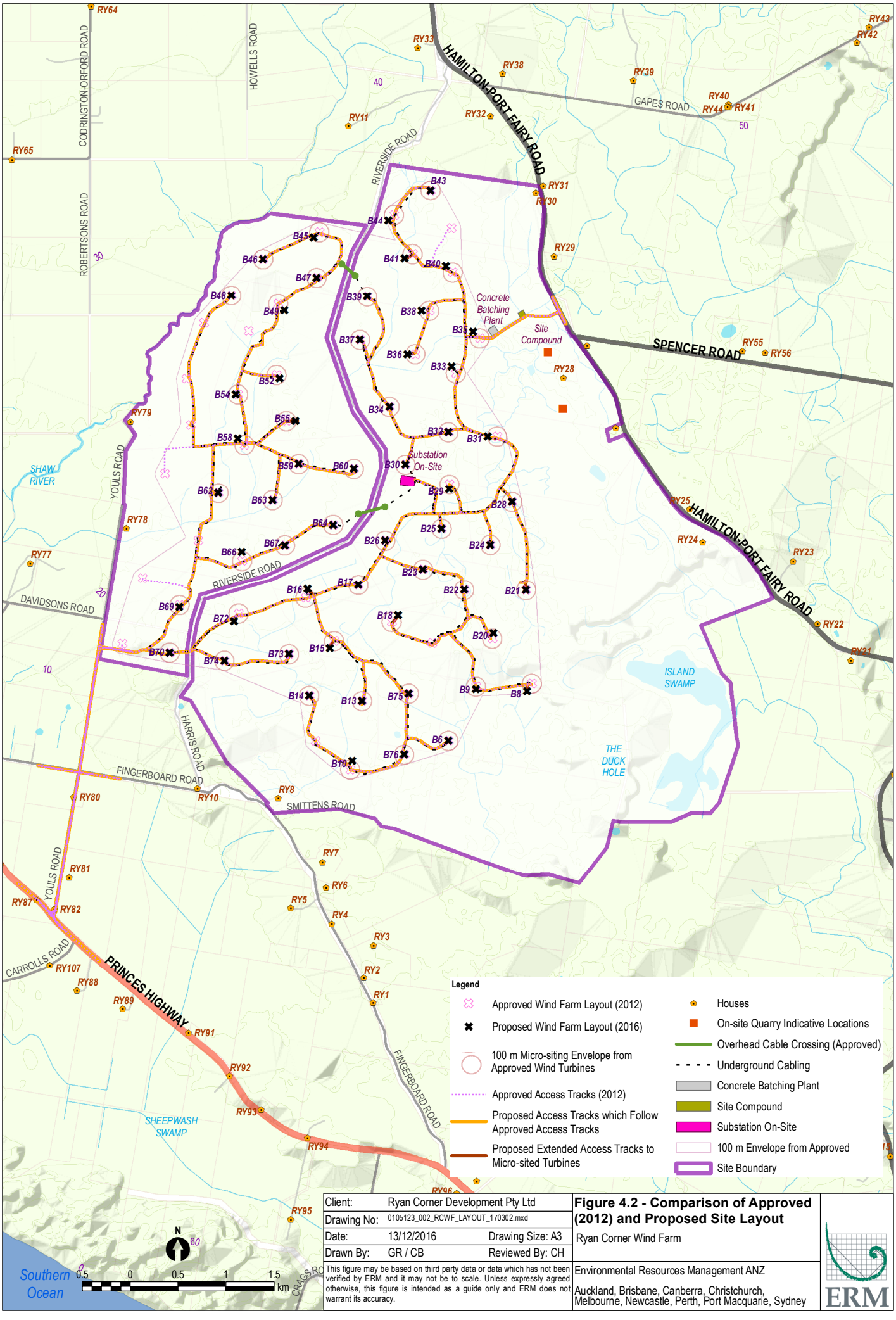
Within the Net Gain assessment study area, ERM (2007) found no remnant vegetation or rare or threatened species within areas previously mapped as Low Quality Grassland. It is therefore considered unlikely that the revised track and turbine location would fall within native vegetation, or impact on rare or threatened species.

However as some portions of the revised tracks and turbine B55 locations fall outside the ERM 2007 study area the potential impacts cannot accurately be determined from the initial ERM 2006 report. Thus, the proposed layout changes could result in impacts to potential native vegetation (mapped as Low Quality Grassland in the ERM 2006 report), which were beyond the scope of the ERM 2007 report. This includes the following location:

- Moving Turbine B55 a distance of more than 50 m within areas mapped as Low Quality Grassland during the initial Ecological Assessment (Figure 1) and associated extension of the access track.

Based on the identification of this potential impact, a field survey to examine this area was conducted. A report detailing the field survey to examine this matter is presented below in Section 3 of this report.

No other potential impacts to native vegetation arising from the proposed changes were determined based on the revised layout.



Client:	Ryan Corner Development Pty Ltd	
Drawing No:	0105123_002_RCWF_LAYOUT_170302.mxd	
Date:	13/12/2016	Drawing Size: A3
Drawn By:	GR / CB	Reviewed By: CH

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Figure 4.2 - Comparison of Approved (2012) and Proposed Site Layout

Ryan Corner Wind Farm

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Melbourne, Newcastle, Perth, Port Macquarie, Sydney

ERM

2.4.3. Implications

The implications under the currently approved layout that remain are as follows:

- The Planning Permit No PL07/067 has been issued to the proponent by the Shire of Moyne to provide for the removal of native vegetation associated with the construction of the Ryan Corner Wind Farm and associated road access points. Under the permit, prior to construction a plan indicating all native vegetation to be removed must be prepared and submitted to the responsible authority. This plan should be developed prior to construction and describe all native vegetation removal.
- A Protected Flora Permit under the FFG Act would be required for the proposed works in relation to the pruning of Black Wattles, and for removal of indigenous plants that constitute the FFG Act listed community *Western (Basalt) Plains Grassland*.

Additional implications under the revised layout are as follows.

An assessment is required to assess the changes by moving Turbine B55 a distance of more than 50 m within areas mapped as Low Quality Grassland during the initial Ecological Assessment (Figure 1) and associated extension of the access track.

Based on the above, a new field survey of this area of the footprint that coincided with areas mapped as Low Quality grassland (including the access tracks and a 50 m radius around turbine B55) was carried out in November 2015 and the details and report is attached in Section 3 below.

3. FLORA FIELD ASSESSMENT

3.1. Introduction

This assessment followed the desktop assessment (See section 2) that identified potential impacts to one area of previously mapped native vegetation arising from the proposed layout change.

The current assessment involved a field survey of the areas to:

- *Determine the presence and extent (if any) of native vegetation;*
- *Determine the condition of native vegetation in accordance with the Habitat Hectares method; and*
- *Conduct a targeted survey for spring-flowering threatened flora species identified in the ERM 2006 report, including:*
    - *Curly Sedge;*
    - *Golden Cowslips;*
    - *Pretty-Hill Leek-orchid; and*
    - *Basalt Leek-orchid.*

It is understood that Union Fenosa Wind Australia Pty Ltd intended to avoid any native vegetation or threatened flora species that are found as a result of this surveys such that no permit amendments in relation to these matters are required.

The results of this assessment are outlined below.

This investigation was undertaken by Elinor Ebsworth (Botanist) and Bernard O'Callaghan (Senior Ecologist & Project Manager).

3.2. Scope of Work and Method

This assessment involved the following:

Existing information on native vegetation of the area was reviewed as follows:

- Ryan Corner Wind Farm Biodiversity Assessment of Layout Change (Section 2)
- Native Vegetation Information Management system (NVIM) (DELWP 2015a);
- Biodiversity Interactive Map 2.0. (DELWP 2015b);
- Flora and Fauna Guarantee Act 1988 - Threatened List (DELWP 2015d);
- Victorian Biodiversity Atlas administered by the Department of Environment, Land, Water and Planning (DELWP 2015e); and
- The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (DoE 2015).

The sources of information listed above were reviewed to determine previously mapped and modeled ecological values within the Ryan Corner Wind Farm site. The biodiversity assessment of layout change (which considers the current proposed layout) (BL&A 2015) identified one areas of previously mapped native vegetation that would potentially be impacted. This was:

- The re-location of turbine B55, and associated extension of the access track.

This site forms the study area for the current assessment, and was examined during the field survey (described below) to determine the presence of native vegetation and listed flora species. The dimensions of the survey were a width of 10 metres for proposed access tracks, and a 50 m radius from proposed turbines.

3.3. Field Methodology

The field assessment was conducted on 9th and 10th November 2015. During this assessment, the study area was surveyed on foot.

Sites in the study area found to support native vegetation or listed matters were mapped. Mapping was undertaken through a combination of aerial photograph interpretation and ground-truthing using a hand held GPS (accurate to approximately five metres). Species and ecological communities listed as threatened under the EPBC Act were also mapped using the same method.

Native vegetation

Native vegetation is currently defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'. The *Biodiversity assessment guidelines* define native vegetation as belonging to two categories (DEPI 2013a):

- Remnant patch; or
- Scattered trees.

The definitions of these categories are provided below, along with the prescribed DELWP methods to assess them.

Remnant patch

A remnant patch of native vegetation is either:

- An area of native vegetation where at least 25 per cent of the total perennial understorey plant cover is native; and/or
- Any area with three or more native canopy trees[1] where the canopy foliage cover[2] is at least 20 per cent of the area.

Remnant patch condition is assessed using the habitat hectare method (Parkes *et al*. 2003; DSE 2004) whereby components of native vegetation (e.g. tree canopy, understorey and ground cover) are assessed against an EVC benchmark. The score effectively measures the percentage resemblance of the vegetation to its original condition.

The NVIM system (DEPI 2014a) provides modelled condition scores for native vegetation to be used in certain circumstances (Section 0). All wetlands mapped on DELWP's native vegetation layer are treated as a remnant patch.

The condition score assists in defining the biodiversity equivalence score (described in Section 0) of the native vegetation and the offset targets if removal of native vegetation is approved.

[1] A canopy tree is a reproductively mature tree that is greater than 3 metres in height and is normally found in the upper layer of the relevant vegetation type.
[2] Foliage cover is the proportion of the ground that is shaded by vegetation foliage when lit from directly above.

Scattered trees

The *Biodiversity assessment guidelines* define scattered trees as a native canopy tree[2] that does not form part of a remnant patch of native vegetation.

Scattered trees are counted, the species identified and their DBH (diameter at breast height or 1.3 metres above ground) measured or estimated.

Flora species and habitats

Records of flora species were made in conjunction with sampling methods used to undertake habitat hectare assessments of native vegetation, described above. Specimens requiring identification using laboratory techniques were collected.

Targeted surveys were undertaken in areas found to support remnant native vegetation for the following species, which were identified as potentially occurring within the study area:

- Curly Sedge,
- Golden Cowslips
- Pretty-Hill Leek-orchid; and
- Basalt Leek-orchid.

Threatened ecological communities

The study area was assessed against identification criteria and condition thresholds for relevant listed threatened ecological communities found to potentially occur in the study area.

3.3.1. Limitations of assessment

Identification of EVCs considers vegetation types which would have naturally occupied the landscape prior to European impacts. Significant past vegetation clearance has resulted in the emergence of the reestablishment of vegetation that is likely to be different to what would have naturally occupied the study area. Identification of EVCs in altered areas was therefore based upon consideration of:

- Modelled EVC mapping (DELWP 2015b);
- Any observed indigenous flora species that are useful for determining EVCs; and
- Relevant published EVC benchmark descriptions.

The study area was subject to grazing (sheep and cattle) at the time of survey. The timing of the survey and condition of vegetation was otherwise considered suitable to ascertain the extent and condition of native vegetation and presence of listed flora species.

3.4. Results

3.4.1. Site description

The study area for this investigation (Figure 1) was private land located within the proposed Ryan Corner Wind Farm site at Yambuk, 10 km north-east of Port Fairy and 250 km south-west of Melbourne, Victoria.

The study area supported shallow stony earths on stony undulating plains of volcanic origin. Vegetation in the study area consisted of a mosaic of Stony Knoll Shrubland (EVC 649) on rocky outcrops and grassland derived from Plains Grassy Woodland (EVC 55-61).

The study area has been cleared of trees in the past and is currently utilised for stock (cattle and sheep) grazing. Surrounding land also predominantly supported stock (cattle and sheep) grazing.

The study area lies within the Victorian Volcanic Plain bioregion and falls within the Glenelg Hopkins catchment and Moyne local government area.

3.4.2. Existing information

Figure 1 shows the approved and revised wind farm layout with native vegetation previously mapped by ERM (2006).

Pre-European Environmental Vegetation Class (EVC) mapping (ERM 2006; DELWP 2015b) indicated that the study area and surrounds would have supported Aquatic Herblands/Plains Sedgy Wetland Mosaic (EVC 691) and Stony Knoll Shrubland/Plains Grassy Woodland/Plains Grassy Wetland Mosaic (EVC 714) prior to European settlement based on modelling factors including rainfall, aspect, soils and remaining vegetation.

ERM (2006) recorded patches of Stony Knoll Shrubland (EVC 649), Aquatic Herbland (EVC 653) and Plains Grassy Woodland (EVC 55_61) during field investigations. These were mapped during the initial assessment as High Quality Rocky Knoll, High Quality Grassland and Low Quality Grassland, with the provision that determination of the extent and quality of native vegetation would need to be determined during site-specific surveys. As the current study area locations fall outside the ERM 2007 detailed assessment study area, potential impacts cannot accurately be determined from the ERM reports, necessitating this assessment.

The investigation area for the current assessment intersected with the following vegetation types mapped by ERM (2006):

- Low Quality Grassland (associated with the access track around turbine B55 and associated extension of the access track).

3.4.3. Field survey results and recommendations

Turbine B55, and associated extension of the access track

This track extension to Turbine B55 was not found to support remnant native vegetation (Figure 1 and Photograph 1). None of the targeted threatened species listed under the EPBC Act were recorded within this area, and are thus considered unlikely to occur. As such, it is considered that the revised location for turbine B55 and the associated extension of the access track will not impact native vegetation.

Photograph 1: Area of proposed re-location of turbine B55 and extension of access track

The findings of the field survey and associated recommendations are summarised in Table 1.

Table 1: Summary of findings and recommendations

Location	Native vegetation	Threatened species	EPBC listed community	Recommendations
Turbine B55, and associated extension of the access track	Non-native vegetation	None recorded	None recorded	Revised location is acceptable, as it will not impact on native vegetation

3.4.4. Implications

The implications for the wider project under the currently approved layout that remain are as follows:

- The Planning Permit No PL07/067 has been issued to the proponent by the Shire of Moyne to provide for the removal of native vegetation associated with the construction of the Ryan Corner Wind Farm and associated road access points. Under the permit, prior to construction a plan indicating all native vegetation to be removed must be prepared and submitted to the responsible authority. This plan should be developed prior to construction and describe all native vegetation removal.
- A Protected Flora Permit under the FFG Act would be required for the proposed works in relation to the pruning of Black Wattles, and for removal of indigenous plants that

constitute the FFG Act listed community *Western (Basalt) Plains Grassland* on public land.

- All EPBC listed species and communities should be avoided.

Additional implications under the revised layout are as follows:

- No additional biodiversity legislative implications exist for the changes to turbine B55 and associated access track.

EPBC Act

There are currently no implications under the EPBC Act in relation to flora and fauna communities.

FFG Act

A Protected Flora Permit under the FFG Act would currently be required for the proposed works in relation to the removal of flora species that constitute the FFG Act listed community *Western (Basalt) Plains Grassland* and the pruning of Black Wattles on public land.

As the proposed impacts are on private land, no further consideration under the FFG Act applies.

4. BIRD AND AVIFAUNA ASSESSSMENT

The Ryan Corner Wind Farm received its planning approval on 21 August 2008 for the 'Use and development of land for a Wind Energy Facility' Planning Permit 2006/0222. Condition 3 of the permit details the specifications of the wind farm, including the number and scale of the turbines. The permit originally specified the tower height of the wind turbines at 78 metres, with an overall height of 121.5 metres above natural ground level. On 12 August 2010, the Minister for Planning approved a minor amendment to the specifications of the wind turbines for the wind farm to allow a tower height of 80 metres and overall height of 126.3 metres and a lower minimum RSA of 33.75 metres.

Ryan Corner Development Pty Ltd is now seeking approval to further vary the turbine specifications as detailed on the permit. It is proposed to increase the tower height and rotor diameter to achieve an overall tip height of up to 180 metres and a minimum RSA height of 40 metres, except for one of the proposed turbines (Turbine B35) which will have different specifications, namely a proposed upper RSA of 160 metres and a lower RSA height of 30m above the ground. In addition, it is proposed to undertake micrositing of a number of turbines and realign access tracks and ultimately, reduce the number of turbines on the Ryan Corner Wind Farm site from the approved 68 to 56.

This section of the report responds to the request to evaluate the impact of the proposed modifications on the likely consequences for birds and bats at the proposed Ryan Corner Wind Farm. It is noted that the proposed modification to the wind farm includes an increase in blade length and associated dimensions of the wind turbines proposed to be constructed.

In this report, 'RSA' refers to 'rotor swept area', or the zone encompassing the area of an operating wind turbine within which the blades rotate, defined in terms of an upper and lower RSA height, and a total circular swept area of the RSA.

This advice is provided based on the information below.

- BL&A 2007, 'Ryan Corner Wind Farm: Bird Utilisation and Brolga Breeding Season Surveys', Report No. 6114 (3.0), Consultants' Report to Gamesa Energy Australia Pty Ltd, May 2007;
- Greg Richards & Associates Pty. Ltd. 2007 'An assessment of the bat fauna and an assessment of regional migration patterns in relation to the Ryan Corner Wind Farm site in Victoria. Consultants Report to TME Australia Pty. Ltd; and
- Information from Union Fenosa Wind Australia Pty Ltd summarising the proposed changes in height and layout of the wind turbines at the wind farm as outlined in Chapter 1 and is summarized below..

The original bird utilisation surveys were for turbines not exceeding 120 metres in height (i.e. from the ground to the top of the highest point reached by the rotating turbine blades). The lower height of the rotor swept area for the original bird surveys was 35 metres above the ground. These two heights were used in the original flora and fauna impact assessment (BL&A 2007) as a basis for understanding the bird and bat risks from operating turbines.

The new turbine envelope will encompass the measurements listed in Table 1 and impacts on birds and bats will be assessed using these maximum measurements.

	Max Tip Height (m)	Minimum Lower RSA Height(m)
Generic Turbine – 55 turbines	180	40
Modified specifications – Turbine B35- 1 turbine	160	30

Table 2: The maximum measurements of the proposed new turbine model to be constructed at Ryan Corner Wind Farms.

The proposed change in turbine dimensions is as follows:

- The proposed minimum lower RSA height is 40 meters above ground, which is 5.5 meters above the original approval and 6.25 metres above the secondary consent approval.
- For one of the proposed turbines a different dimension will be used (Turbine B35), the proposed upper RSA of 160 metres and a lower RSA height will range from 30 to 34m above the ground, or 5 metres closer to the ground than in the original application of 35 metres.

The increase in the rotor diameter from 92.5 metres to 130 metres will bring changes to the total extent of each RSA from 6,720 m^2 to 13,275 m^2, which will increase the total RSA area by approximately 197%. However, over 89% of this change occurs at a height of over 60 metres (except for turbine B35 where the change will occur at a height of over 50 metres).

These larger turbines will be installed at the same locations as the turbines in the approved wind farm layout, although some have been micro-sited in accordance with provisions of the permit. Impacts on birds and bats of the proposed changes are discussed separately below.

Additionally, in line with increasing efficiency of wind turbines it is now proposed that the number of turbines be reduced from the approved 68 turbines to 56 turbines representing a reduction of 18% in the number of turbines. Impacts on birds and bats from the proposed changes are discussed separately below.

4.1. Modification of impacts on birds

During the bird utilisation study for the Ryan Corner Wind Farm, the height of flying birds was recorded and documented in BL&A (2007) in the following height zones:

- Below rotor swept area height: <35 m above the ground;
- At rotor swept area height (35 to 120 m above the ground); and
- Above rotor swept area height (>120 m).

The split of birds between heights was:

- Below rotor swept area height: 96.3 percent;
- Within rotor swept area height: 3.7 percent; and
- Above rotor swept area height: 0.0 percent.

During bird utilisation surveys at Ryan Corner Wind Farm site, detailed records were not kept of bird flight heights other then whether they were in the proposed rotor swept area

height. The surveys were undertaken in 2006 and 2007 before this company began started recording in smaller height intervals.

Thus, to inform an assessment of the impacts on birds of changed turbine dimensions, bird flight height data has been assembled from two other Union Fenosa Wind Australia Pty Ltd wind farms in south-western Victoria: namely Hawkesdale and Berrybank Wind Farms. Table 3 provides the flight heights of birds at these two sites.

Table 3: Height of bird flights at two other Union Fenosa Wind Farms in south-western Victoria

Height class (m)	Berrybank %	Hawkesdale %
Ground	71.0	74.0
1 - 10	17.2	3.5
11 - 20	5.3	6.6
21 - 30	2.8	6.2
31 - 40	0.8	3.8
41 - 60	1.2	2.3
61 - 80	0.3	1.2
81 - 100	0.5	1.5
101 - 120	0.7	0.2
121 - 140	0.0	0.0
>140	0.2	0.8
Total birds counted	**559**	**2,773**

During the bird utilisation surveys for a range of wind farms in southern Australia (n = 11), BL & A (unpubl. data) found that, on average, 5.5% of birds observed flew at rotor swept area (RSA) height, usually between 40 and 120 metres above the ground. On average, 0.3% of birds were observed flying above RSA height.

In relation to Ryan Corner Wind Farm, no birds were recorded above 120 m during the bird utilisation surveys, thus the proposed increase in the maximum height to 180 metres will not have significant incremental effect on birds at the Ryan Corner Wind Farm. This does not mean that there are birds ever flying at this height, but rather the flights are relatively rare at this site. In addition, the data in Table 2 suggests typically less than one percent of birds fly at this height of above 120 metres.

The change in the lower RSA height has the potential to change the impact on birds. Respectively for Berrybank and Hawkesdale wind farms 93.5% and 84.1% were recorded at 20 metres and below metres above ground (Table 2). Birds flying between 21 and 30 metres added another 2.8% and 6.2 % respectively,(representing 96.3% and 90.3% below 30 metres). Those flying between 31 and 40 added 0.8% and 3.8 % respectively, representing 97.1 % and 94.1% of birds recorded below 40 metres.

The proposed RSA envelope will increase the lower RSA to a minimum of 40 metres compared to the original permitted minimum RSA of 34.5 metres and the approved secondary consent minimum RSA of 33.75 metres. This increase in lower RSA will remove the potential for impact of those birds recorded below 40 metres. However, for one of the proposed turbines the lower RSA height will decrease to 30 metres and many impact on birds flying between 31 and 40 (e.g.. 0.8% and 3.8 % respectively, representing 97.1 % and 94.1% of birds recorded below 40 metres at two other sites (see table 3).

In addition, the decrease in the number of turbines from 68 turbines to 56 turbines will result in a decrease of 16% of the number of turbines will also contribute to reducing risk to bird flying below 40 metres.

The change in the blade length would also bring changes to the extent of the RSA. The large proportion of increase in RSA (over 89%) will occur above 60 metres. This increase may put birds that fly at RSA height at a greater risk of collision – between 1.7% and 3.7% of birds recorded at Berrybank and Hawkesdale respectively. The species potentially impacted are not listed as threatened or endangered under the relevant EPBC or FFG legislation.

However, for one of the proposed turbines (B35) the lowest height of the rotor swept area will be a minimum of 30 metres above the ground, which might lead to a proportionate increase in number of birds exposed to a risk of fatal collision with the rotating turbines.

Based on the original bird utilisation surveys at the Ryan Corner Wind Farm, none of the species of birds found regularly over the wind farm were rare or threatened and the site was found to be dominated by common farmland birds. The most commonly observed bird species at rotor swept area height at the Ryan Corner Wind Farm were:

- Skylark;
- Raven sp.;
- Australian Magpie;
- Common Starling; and
- Yellow-rumped Thornbill.

These species are common and widespread in southeastern Australia in agricultural landscapes and any additional collisions as a consequence of the increased rotor swept area from the larger wind turbines is unlikely to have a significant effect on their populations.

4.1.1. Potential impacts of modification on Brolgas

A search of the Victorian VBA for Brolgas was completed to 10 km beyond the proposed boundaries of the Ryan Corner Wind Farm (November 2015). There are no major changes in Brolga distribution in the 10 Km range and no additional records of breeding broglas. There is one 2007 record of a pair of brolgas within the 10 km of the Ryan Corner Wind Farm. There are no new records in the VBA within 5 km of the Wind Farm since the BL&A 2007 report.

It is noted that Brolga fly more frequently below 30 metres (BL&A unpublished data). Based on this, increasing the height of the lower level of the RSA from 33.75 metres to 40 metres above ground level for most of the turbines and setting a minimum 30 metres ground clearance for the one turbine (B35), while reducing the number of turbines from the 68 turbines to 56 turbines, will reduce the overall level of collision risk.

4.2. Modification of impacts on bats

Greg Richards and Associates Pty Ltd (2007) studied the bat fauna of the Ryan Corner Wind Farm and identified nine species of bats on the site. These species were mostly common species, except for the Southern Bent-wing Bat (*Miniopterus schreibersii bassiana*), which is listed as threatened in Victoria and nationally. This species was recorded at Ryan Corner Wind Farm as part of a species complex that may have included

the calls of this and another, more common species, the Little Forest Bat (*Vespadelus vulturnus*). No calls solely attributable to the former species were recorded. Overall, bat activity averaged 2.2 calls per night across all species, indicating the site supports comparatively poor bat habitat.

Records of bat calls above ground are achieved by lifting the call receiver of the detector to heights of up to 50 metres on a wind monitoring mast. In this way, the maximum height of bat calls recorded by the detector is approximately 75 metres above ground. The bat surveys at Ryan Corner involved recording bats at height. The number of bat calls recorded 50 metres above the ground was limited (less than 25 calls recorded over 16 nights involving four common species). Calls that may have belonged to the Southern Bent-wing Bat were recorded on the lower recorder within 20-25 metres of the ground.

Recording at height elsewhere in south eastern Australia (BL&A, unpubl. records) shows that fewer species and many fewer calls are recorded at the height of 50 metres above the ground. At 50 metres, the number of bat calls falls to less than 15% of the number recorded from the ground (i.e. up to a height of c. 25 metres). Between 25 and 50 metres above the ground, call numbers represent about 25% of those recorded at ground level.

The proposed RSA envelope will maintain the lower RSA at a minimum of 40 metres compared to the original permitted minimum RSA of 34.5 metres and the approved secondary consent minimum RSA of 33.75 metres. Overall the level of risk of collision to most bat species that fly low to the ground will be reduced by this modification. However, for one turbine with the lower RSA 30 metres there may be a small increase in potential impact to bats flying between 30 and 35 metres.

However, the overall increase in area of RSA above 40 metres may have an impact on bat species such as White-striped Freetail Bats and other high-flying species of bats. However, these species are not listed as species of conservation concern.

At the Ryan Corner Wind Farm, bat activity was comparatively very low. The incremental effect of the increase in RSA height range and extent are not considered to be significant, with most bat activity likely to remain below the lower RSA height and collisions, when they occur, will almost certainly involve common and widespread species. These impacts would not lead to any significant decline in their populations.

4.3. Aviation Night Lighting

Due to the increase in turbine tip height the requirement for night lighting for aviation safety is highly likely. Several studies have shown a higher-level of foraging activity by bats around artificial lights. Lights on turbines may attract moths and other nocturnal insects, thus increasing the probability of bat collisions since bats feed on insects at night.

Based on experience with lighting of wind farms and communication towers in the United States (Shire *et al.* 2000; Kerlinger and Kerns 2003) to minimize impacts on birds and bats, the shortest possible flash of light is preferable to a longer duration flash or constant illumination. For example, strobe (i.e. those that flash for a very short time) and LED red lights are more preferable than yellow or white lights that are illuminated constantly or for short periods of up to three seconds (Kerlinger *et al*. 2010). Similarly, Gehring *et al.* (2009) found that communication towers lit at night with only flashing red or flashing white lights had significantly fewer avian fatalities than towers lit with a combination of steady-burning and flashing lights.

Although overall, the comparative level of bird and bat utilisation for the Ryan Corner Wind Farm is relatively low, and there were no species of listed birds and no records of an endangered bat at height, the preference remains for red lights in line with CASA recommendations. However, given the evidence from other sources, if lighting was required, flashing red light would minimize the risk to bird and bat species.

4.4. Summary of findings

Based on the foregoing review of relevant information, this report concludes:

In relation to birds:

- The proposed increase in height of the upper RSA of the turbines at Ryan Corner Wind Farm to 180 metres should not have an effect on birds at the Ryan Corner Wind Farm, as no birds were recorded flying above 120 metres.
- The proposed RSA envelope will increase the lower RSA height to 40 metres compared to the original permitted minimum RSA of 34.5 metres and the approved secondary consent minimum RSA of 33.75 metres. This will in effect decrease the potential for interaction between birds flying between 35-40 metres with wind turbines resulting in a decrease in risk to those species.
- The change in the blade length would also bring changes to the extent of the RSA. As height increases, so will the potential interaction with birds that fly at height. Overall, 6% of birds were recorded over 40 metres in height. None of the species recorded at this height were listed a threatened or endangered.
- However, for one of the proposed turbines (B35) the lowest height of the rotor swept area will be a minimum of 30 metres above the ground, which might lead to a proportionate increase in number of birds exposed to a risk of fatal collision with the rotating blades when compared to the original permitted minimum RSA of 34.5 metres and the approved secondary consent minimum RSA of 33.75 metres.
- Bird species most regularly flying at turbine RSA heights are common birds in farmland habitats across southeastern Australia and not listed as threatened or endangered;
- For these reasons, no significant bird population effects are anticipated as a result of the proposed change in turbine size and associated RSA and heights.

In relation to bats:

- The proposed RSA envelope will increase the lower RSA at a minimum of 40 metres compared to the original permitted minimum RSA of 34.5 metres and the approved secondary consent minimum RSA of 33.75 metres. This will reduce the likelihood of interaction between operating turbines as most bats were recorded flying below the proposed lower RSA height.
- However, for one turbine with the lower RSA 30 metres there may be a small increase in potential impact to bats flying between compared to the original permitted minimum RSA of 34.5 metres and the approved secondary consent minimum RSA of 33.75 metres.
- Most bats on the site were common, widespread bat species, the wider populations of which are large and will not be affected by changed conditions.
- No possible Southern Bent-wing Bat calls were recorded at heights greater than 25 metres and impacts are not anticipated on this species.
- However, the increase in area of RSA above 40 metres may have an impact on bat species such as White-striped Freetail Bats and other high-flying species of bats. However, these species are not listed as species of conservation concern.
- At the Ryan Corner Wind Farm, bat activity was comparatively very low. The incremental effect of the change RSA above 40 metres is not considered to be

significant, with most bat activity likely to remain below the lower RSA height and collisions, when they occur, will almost certainly involve common and widespread species. These impacts would not lead to any significant decline in their populations.

In addition, the reduction of twelve approved turbines at Ryan Corner Wind Farm will further reduce the risk of bird and bat impacts.

5. SUMMARY

The Ryan Corner Wind Farm received its planning approval on 21 August 2008 for the 'Use and development of land for a Wind Energy Facility'. Condition 3 of the permit details the specifications of the wind farm, including the number and scale of the turbines. The permit originally specified the tower height of the wind turbines at 78 metres, with an overall height of 121.5 metres above natural ground level. On 12 August 2010, the Minister for Planning approved a minor amendment to the specifications of the wind turbines for the wind farm to allow a tower height of 80 metres and overall height of 126.3 metres.

Planning Permit No PL07/067 was issued to the proponent by the Shire of Moyne on the 21 August 2008 to provide for the removal of native vegetation associated with the construction of the Ryan Corner Wind Farm and associated road access points. Under the permit, prior to construction a plan indicating all native vegetation to be removed must be prepared and submitted to the responsible authority. When approved this plan will be endorsed and will form part of this permit.

Ryan Corner Development Pty Ltd is now seeking approval to further vary the turbine specifications as detailed on the permit. It is proposed to increase the tower height and rotor diameter to achieve an overall tip height of up to 180 metres and a minimum RSA height of 40 metres. In addition, it is proposed to undertake micrositing of a number of turbines and ultimately, reduce the number of turbines on the Ryan Corner Wind Farm site from the approved 68 to 56.

BL&A was engaged by Ryan Corner Development Pty Ltd C/- Union Fenosa Wind Australia Pty Ltd to conduct an assessment of the impacts of the proposed layout change on Biodiversity.

The impacts of the modification as assessed in Sections 2-4 of this report are outlined below:

5.1. Impact on flora and native vegetation

The proposed layout changes involve a reduction in the number of turbines and an amendment in the location of access tracks and some turbines.

There was one potential impact as a result of these proposed modifications that included a revised track location and moving one turbine on flora and native vegetation. The Low Quality Grassland in which the revised tracks and turbine B55 occur was described in ERM (2006) as "generally dominated by Common Tussock Grass interspersed with a range of weeds. The low quality grasslands on ridges include native species such as Common Tussock Grass, Spear Grass *Austrostipa* spp, Kangaroo Grass *Themeda triandra*, and Wallaby Grass *Austrodanthonia* spp. Some individual plants of threatened flora may persist within this low quality grassland." Thus one site where there were potential was surveyed as outlined in Section 5.2 below.

The Ryan Corner Wind Farm, as currently approved, does not involve the removal of any remnant patch native vegetation, scattered trees or impacts to threatened flora species. However, the Ryan Corner Wind Farm, as currently approved, does include the removal of scattered native plants — predominantly native grass species such as Kangaroo Grass and various wallaby grasses (ERM 2007). The currently approved wind farm also includes the pruning of a small number of trees native to Victoria along one access road.

Within the Net Gain assessment study area, ERM (2007) found no remnant vegetation or rare or threatened species within areas previously mapped as Low Quality Grassland. It is therefore considered unlikely that the revised track and turbine location would fall within native vegetation, or impact on rare or threatened species.

However as some portions of the revised tracks and turbine B55 locations fall outside the ERM 2007 study area the potential impacts could not be accurately determined from the initial ERM 2006 report and a field survey was conducted. This site is reviewed in Section 5.2 below.

No other potential impacts to native vegetation arising from the proposed changes were determined.

5.2. Detailed focussed flora surveys

A site survey was conducted of the following modification with potential to impact on native vegetation (as outlined in Section 2).

- The re-location of turbine B55, and associated extension of the access track (Figure 1);

A field survey report is outlined in Section 3 of this report. The following recommendations are made in table 4 below:

Table 4: Summary of findings and recommendations

Location	Native vegetation	Threatened species	EPBC listed community	Recommendations
Turbine B55, and associated extension of the access track	Non-native vegetation	None recorded	None recorded	Revised location is acceptable, as it will not impact on native vegetation

In relation to native vegetation, the implications for the wider project under the currently approved layout that remain are as follows:

- The Planning Permit No PL07/067 has been issued to the proponent by the Shire of Moyne to provide for the removal of native vegetation associated with the construction of the Ryan Corner Wind Farm and associated road access points. Under the permit, prior to construction a plan indicating all native vegetation to be removed must be prepared and submitted to the responsible authority. This plan should be developed prior to construction and describe all native vegetation removal.
- A Protected Flora Permit under the FFG Act would be required for the proposed works in relation to the pruning of Black Wattles, and for removal of indigenous plants that constitute the FFG Act listed community *Western (Basalt) Plains Grassland* on public land.
- All EPBC listed species and communities should be avoided.

Additional implications under the revised layout are as follows:

- No additional biodiversity legislative implications exist for the changes to turbine B55 and associated access track.

EPBC Act

There are currently no implications under the EPBC Act in relation to flora and communities.

FFG Act

A Protected Flora Permit under the FFG Act would currently be required for the proposed works in relation to the removal of flora species that constitute the FFG Act listed community *Western (Basalt) Plains Grassland* and the pruning of Black Wattles on public land.

EE Act

In relation to the EE Act, there is no additional impact on native vegetation if the development avoids the noted floral species and communities. In addition, the overall footprint of the development has been reduced as a result of the proposed modification. Therefore referral of the project under the EE Act is not required.

5.2.1. Bat and avifauna assessment

Based on the foregoing review of relevant information, the conclusions below have been made.

In relation to birds:

- The proposed increase in height of the upper RSA of the turbines at Ryan Corner Wind Farm to 180 metres should not have an effect on birds at the Ryan Corner Wind Farm, as no birds were recorded flying above 120 metres.
- The proposed RSA envelope will increase the lower RSA height to 40 metres compared to the original permitted minimum RSA of 34.5 metres and the approved secondary consent minimum RSA of 33.75 metres. This will decrease the potential for interaction between birds flying between 35-40 metres with wind turbines resulting in a decrease in risk to those species.
- The change in the blade length will change the extent of the RSA. As height increases, so will the potential interaction with birds that fly at height. Overall, 6% of birds were recorded over 40 metres in height. None of the species recorded at this height were listed a threatened or endangered.
- However, for one of the proposed turbines (B35) the lowest height of the rotor swept area will be a minimum of 30 metres above the ground, which might lead to a proportionate increase in number of birds exposed to a risk of fatal collision with the rotating blades when compared to the original permitted minimum RSA of 34.5 metres and the approved secondary consent minimum RSA of 33.75 metres.
- Bird species most regularly flying at turbine RSA heights are common birds in farmland habitats across southeastern Australia and not listed as threatened or endangered;
- For these reasons, no significant bird population effects are anticipated as a result of the proposed change in turbine size and associated RSA and heights.

In relation to bats:

- The proposed RSA envelope will increase the lower RSA at a minimum of 40 metres compared to the original permitted minimum RSA of 34.5 metres and the approved secondary consent minimum RSA of 33.75 metres. This will reduce the likelihood of interaction between operating turbines as most bats were recorded flying below the lower RSA height.

- Most bats on the site were common, widespread bat species, the wider populations of which are large and will not be affected by changed conditions.
- No possible Southern Bent-wing Bat calls were recorded at heights greater than 25 metres and impacts are not anticipated on this species.
- However, the increase in area of RSA above 40 metres may have an impact on bat species such as White-striped Freetail Bats and other high-flying species of bats. However, these species are not listed as species of conservation concern.
- However, for one turbine with the lower RSA 30 metres there may be a small increase in potential impact to bats flying between compared to the original permitted minimum RSA of 34.5 metres and the approved secondary consent minimum RSA of 33.75 metres.
- At the Ryan Corner Wind Farm, bat activity was comparatively very low. The incremental effect of the change RSA above 40 metres is not considered to be significant, with most bat activity likely to remain below the lower RSA height and collisions, when they occur, will almost certainly involve common and widespread species. These impacts would not lead to any significant decline in their populations.

In addition, the reduction of twelve approved turbines at Ryan Corner Wind Farm will further reduce the risk of bird and bat impacts.

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