

Annex E

Updated Visual Impact Assessment





Jupiter Wind Farm

Landscape and Visual Impact Assessment Report

FINAL

0422456 RPT1 FINAL

September 2017

EXECUTIVE SUMMARY

EPYC Pty Ltd seeks to develop the Jupiter Wind Farm approximately 50 km north east of Canberra, 20 km from Bungerdore and 6.0 km south-east of Tarago. The revised Jupiter Wind Farm will comprise up to 54 wind turbines, connection to the electricity grid. The proposed wind turbines would have an overall height of up to 173 m to the tip of the blade and would be the most visible component of the development. Based on this height, the theoretical distance from which wind turbines would be a noticeable component in the landscape extends up to 20 km from the nearest wind turbine (the viewshed).

This Landscape and Visual Impact Assessment has found that the overall visual impact of the Jupiter Wind Farm would be low to negligible from publicly accessible locations within the viewshed. This conclusion has been reached based on the following analysis.

Landscape sensitivity

The predominant land use with viewshed of the Jupiter Wind Farm is rural farmland. This landscape has a low sensitivity to visual change, a value which is recognised both with planning framework in the area and across New South Wales. Similarly, planning schemes and community perception studies recognise area that are more natural in appearance or unmodified such as lakes and water bodies or forested areas are more sensitive to visual change. These more sensitive areas are often protected from development.

Assessment from publicly accessible viewpoints

The seen area analysis shows that the proposed wind turbines have the potential to be visible from publicly accessible locations on highways, local roads and within the rural township of Tarago. This is due to the relatively flat nature of the landscape to the north of the project and low hills towards the south. Visibility is limited by larger hills of the Great Dividing Range to the west and vegetated hills to the east. Existing vegetation located along roadsides, property boundaries and fencelines would filter or screen views to the proposed wind turbines. Views from Tarago towards the wind farm are limited to the edges of residential areas and the newly created sub-division behind the town. Views from both locations are over the town or rail lines and at such a distance that the visual impact would be low to negligible.

With the exception of Kings Highway to the south the majority of local roads carry little traffic. Therefore, few viewers would see the wind turbines from local roads. At its closet point, Kings Highway is approximately 5.0 km to the south of the nearest turbine. The overall visual impact of the Project from publicly accessible locations would be:

- negligible on rural township;
- low on local roads;
- low- negligible on highways; and
- negligible visual impact on scenic areas, public reserves and recreational areas.

Residential Impacts

The major visual and landscape impact will be on residents immediately adjacent to the turbines. Views from the majority of residential dwellings to the proposed turbines are filtered or screened by existing vegetation. For the majority of these dwellings, landscape mitigation is one option available which may reduce the visual impact from affected dwellings.

There are several elevated dwellings towards the northern end of the project which will have either direct or oblique views of turbines. The assessment for dwelling J3 determined that landscape mitigation may screen views to some but not all visible turbines and that landscape mitigation could take some time to be effective. For this dwelling the visual impact would be high. This may also be the case for elevated residential dwellings at Roseview Road. Access was not granted at these dwellings at the time of ERM's site visits.

Cumulative impact

The potential for cumulative visual impacts would be brought about by the proximity of the proposed Jupiter Wind Farm to the proposed Capital and Woodlawn Wind Farms which are to the west. Cumulative visual impacts would be for viewers travelling along the Bungendore – Tarago Road, short sections of Braidwood Road and a limited of residential dwellings to the south and east of the proposed Jupiter Wind Farm. The overall level of cumulative impact will be low.

Community values

Perception studies continually show that for Australian and overseas wind farms, between 60-70% of people find wind turbines an acceptable element in any but the most sensitive landscapes. Perception studies undertaken by AMR which include this region reported that the majority of people did not object to a wind farm within in the areas and many were accepting of a turbine within 1.0 km of their dwelling. It is recognised that these results are not shared by all residents within close proximity to a wind turbine.

Conclusion

The Jupiter Wind Farm site is an area that is largely modified by agricultural activity and associated structures and other signs of development such as roads, tracks, dwellings and electrical infrastructure.

The landscape in the area is one that continues to undergo visual change and modification through sub-division of large rural land holdings into smaller allotments. This process has contributed to a change in landscape character through fragmentation of areas that were once paddocks, within access roads tracks, sheds, outbuildings and dwellings. This process has demonstrated that the landscape can.

Perception studies continually show that the majority of viewers do not object to the construction of wind turbines on any but the most sensitive and localised landscapes. In this instance the wind farm is located in a rural landscape on extensive plain and low hills.

The submissions received to the previous project and Clousten 2016 report did not identify any potentially sensitive public landscapes, areas or features that were potentially impacted by the visibility of turbines. This assessment also did not identify any significant features that would be impacted by the project.

In summary, the landscape and visual impact assessment of the site demonstrates that the site and its surrounds have a low visual sensitivity to a wind farm development and is a suitable landscape for the construction of a wind farm.

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1

INTRODUCTION

EPYC Pty Ltd on behalf of on behalf of Jupiter Wind Farm Pty Ltd (**EPYC**) seeks to develop the Jupiter Wind Farm (The **Project**) located near Tarago within the Southern Tablelands Region of New South Wales.

In March 2016 updated Secretary's Environmental Assessment Requirements (Updated SEARs) which detailed the minimum requirements for all technical studies for the Jupiter Wind Farm Project including landscape and visual assessment.

A Landscape and Visual Impact Assessment was prepared by Clouston and Associates in 2016 (**Clouston 2016 LVIA**). This assessment was based on a turbine layout comprising up to 88 turbines, over three sections.

The Environmental Impact Statement (**EIS**), including the Clouston 2016 LVIA, was publicly exhibited between 30 November 2016 to 1 March 2017.

The Project has been amended to reduce the environmental impacts and respond to issues raised in submissions received during the public exhibition of the EIS. As a result the following key changes have been made to the Project:

- a reduction in the number of wind turbine generators (**WTG**) from 88 to 54 (including deleting from the Project all elements previously proposed to be constructed to the south of Kings Highway); and
- refinements to the locations of a number of WTG, access tracks, powerlines and associated infrastructure.

1.1

Purpose of this report

This report assesses the landscape and visual impacts of the revised wind farm.

The revised Project consists of the construction and operation of up to 54 WTG's, power lines and grid connecting infrastructure, including a substation, access tracks and associated infrastructure.

This Landscape and Visual Impact Assessment (**LVIA**) assesses the landscape and visual impacts of the revised Project with regard to:

- the Updated SEARs;
- the Wind Energy Visual Bulletin, for State Significant Wind Energy Development, December 2016 (**Visual Bulletin**); and
- established landscape and visual methodology including the principles set out:
 1. in the Wind Farms and Landscape Values: National Assessment Framework, Australian Wind (Energy Association and Australian Council of National Trusts) June 2007 (**National Assessment Framework**); and
 2. by Chief Justice Preston of the NSW Land and Environment Court in *Taralga Landscape Guardians Inc v Minister for Planning and RES Southern Cross Pty Ltd* [2007] NSWLEC 59 (12 February 2007) (**Taralga Decision**).
 3. Director-General's Environmental Assessment Report – Gullen Range Wind Farm, (March 2009).

2 STATUTORY CONTEXT

This section will discuss the requirements of the SEARs for this project. Although the Wind Energy Visual Bulletin is not applicable, for the completeness of the assessment, these have also been considered.

2.1 Revised SEARS

The Revised SEARs require the following to be considered by the Landscape and Visual Impact Assessment (LVIA) undertaken for the Project:

- *Provide a comprehensive assessment of the visual impacts of all components of the Project (including turbines, transmission lines, sub-stations, and any other ancillary infrastructure) on landscape values, scenic vistas, rural townships, non-associated residences (including approved but not yet developed dwellings or subdivisions with residential rights), significant public viewing locations, and any cumulative impacts associated with surrounding proposed, approved or operational wind farms in the locality;*
- *Identify a zone of visual influence for the wind farm (no less than 10km);*
- *Assess the impact of shadow 'flicker', blade 'glint' and night lighting from the wind farm;*
- *Utilise recognised tools (such as photomontages and wireframes) at representative locations to adequately assess the visual impacts of the Project, particularly for non-associated residences within 3km of a proposed turbine; and*
- *Provide detailed consideration of the feasibility and effectiveness of the proposed mitigation measures, including consultation with all landowners of non-associated residences within 3 km of a proposed turbine where significant visual impacts are predicted to identify potential approaches to mitigate any adverse impacts, including consideration of negotiated agreements.*

The impacts of shadow flicker and blade glint have been assessed by other independent reports accompanying the EIS.

Chapter 3 outlines the assessment methodology and approach to assess the landscape and visual impacts of the revised Project.

2.2 Wind Energy Visual Bulletin, for State Significant Wind Energy Development, December 2016

The Visual Bulletin, outlines the preferred assessment methodology and steps for undertaking a visual assessment of any State Significant Wind Farm Project in New South Wales.

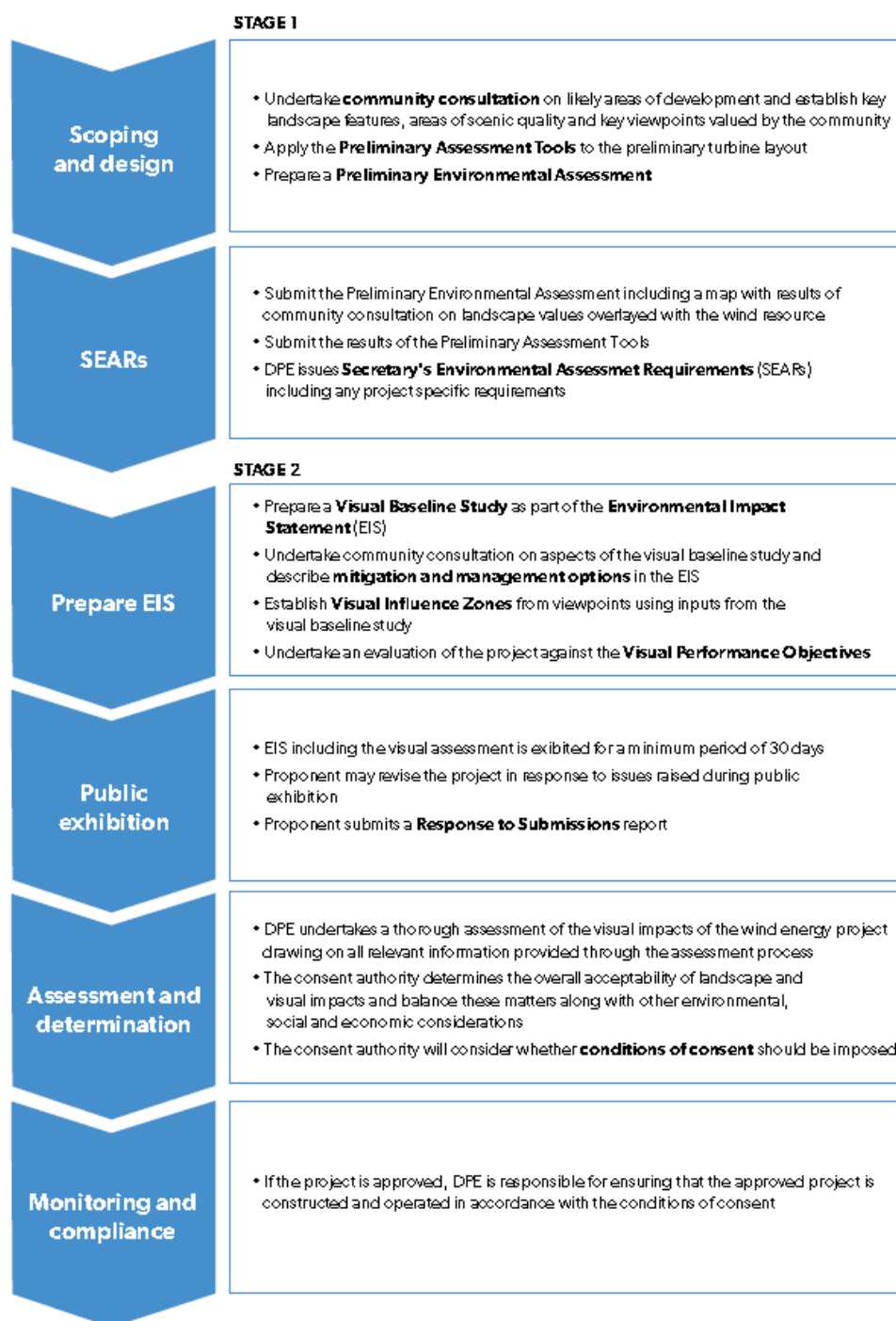
The Visual Bulletin does not apply to the Project as the Revised SEARs were issued prior to the Visual Bulletin. In the interests of completeness, this LVIA has considered and commented on the Visual Bulletin.

The following section briefly outlines the assessment methodology required by the Visual Bulletin.

The Visual Bulletin aims to provide guidance for the siting and design of wind farms by prescribing and clearly outlining a consistent approach and methodology to assessing the visual impact of State Significant Wind Farm Developments.

Figure 2.1 shows the recommended steps contained in the Visual Bulletin for undertaking a visual assessment of a State significant wind farm development.

Figure 2.1

Wind Energy: Visual Bulletin - Visual Assessment Steps

The methodology applied within this assessment is consistent with the requirements as outlined in Appendix 1 and 2 of the Visual Bulletin (as summarised at sections 2.2.1 and 2.2.2 below).

The preliminary assessment tools contained in the Visual Bulletin have not been applied as these are only relevant to the preparation of a preliminary environmental assessment to accompany a request for SEARs and SEARs have already been issued for the Project.

2.3

Draft National Wind Farm Guidelines in July 2010

The Environment Protection and Heritage Council released the *Draft National Wind Farm Guidelines in July 2010* (National Guidelines) on a twelve-month trial basis. This document is not a referral document in the Victorian Planning Scheme and is for guidance only. However, as best practise, the key relevant landscape and visual impact methodology and considerations are described below. Appendix C of the Guidelines lists following four stages:

1. *Project Feasibility/Site Selection*
2. *Planning Application*
3. *Construction and;*
4. *Decommissioning*

The tasks within each of the stages are further broken down and are summarised below.

Preliminary Landscape Assessment (Stage 1) - Completed

- *Defining the scope and policy context;*
- *Preliminary landscape character and significance analysis;*
- *Preliminary views analysis;*
- *Preliminary community values analysis.*

Full Landscape Assessment (Stage 2) - EIS

- *Identification of possible cumulative impacts;*
- *Landscape character analysis;*
- *Landscape significance analysis;*
- *Viewshed and views analysis;*
- *Community values analysis;*
- *Cumulative impacts analysis;*

Visual Impact Assessment (Stage 2) - EIS

- *Develop objectives/ strategies to manage landscape character;*
- *Assessment of impacts on landscape character and significance;*
- *Assessment of impacts on viewsheds and views;*
- *Assessment of impacts on community values;*
- *Assessment of cumulative impacts;*
- *Options for management and mitigation;*
- *Management and mitigation measures consultation;*

Response to Impacts (Stage 3) – Post Permit Approval

- *Agreed management and mitigation measures;*

Management and mitigation (Stage 4) – Post Permit Approval

- *Ensure all construction is managed within landscape mitigation outcomes and recommendations after assessment;*

Rehabilitation: reinstate landscape (Stage 4) – Post Permit Approval

- *Rehabilitate landscape to pre-development condition.*

These National Guidelines follow a similar methodology and staging for the evaluation of landscape and visual impacts as outlined in the *Visual Bulletin and the SEARs*. The National Guidelines requires mitigation measures to be identified during this assessment, however discussion and liaison with landowners is delayed until a permit is granted. The LVIA

methodology is generally aligned to the intent of the above guidelines and is discussed further in Chapter 3.

2.3.1 Visual Assessment Process

Appendix 1 of the Visual Bulletin provides an outline of the steps and factors to be considered when undertaking a baseline study for a wind farm visual assessment. These include

- Identifying areas of Sensitive Land Use
- Describing Landscape Character
- Viewer sensitivity
- Visibility Distance Zones
- Visual Influence Zones.

The Visual Bulletin aims to establish a repeatable assessment methodology that recognises, key features and land uses that contribute to the character of the areas, assigns a levels of sensitivity to those areas to accommodate visual change, viewer sensitivity based on the viewing location and distance before providing an overall level of visual impact.

2.3.2 Mitigation Options

It is widely recognised that wind turbines are unavoidably visible and often contrast with the environments in which they are situated. The approvals process is required to give consideration to the acceptability of impacts on landscape values, the amenity of landholders and communities, and the ability of mitigation measures manage these impacts.

Appendix 2 of the Visual Bulletin provides guidance on mitigation options available to manage visual impact from locations that are considered to be significantly visually affected by a wind farm.

Mitigation measures include:

- re-siting of turbines to locations where they will have less visual impact (or removal if necessary);
- re-sizing of turbines and other alterations (to reduce their visual magnitude);
- re-colouring (for example to reduce hue and tonal contrast); and
- Vegetation screening (for example to screen the alterations from view).

2.4 SEARs

The SEARs require the following to be considered by the Landscape and Visual Impact Assessment (LVIA) undertaken for the project:

- *Provide a comprehensive assessment of the visual impacts of all components of the project (including turbines, transmission lines, sub-stations, and any other ancillary infrastructure) on landscape values, scenic vistas, rural townships, non-associated residences (including approved but not yet developed dwellings or subdivisions with residential rights), significant public viewing locations, and any cumulative impacts associated with surrounding proposed, approved or operational wind farms in the locality;*
- *Identify a zone of visual influence for the wind farm (no less than 10km);*
- *Assess the impact of shadow 'flicker', blade 'glint' and night lighting from the wind farm;*
- *Utilise recognised tools (such as photomontages and wireframes) at representative locations to adequately assess the visual impacts of the project, particularly for non-associated residences within 3km of a proposed turbine; and*
- *Provide detailed consideration of the feasibility and effectiveness of the proposed mitigation measures, including consultation with all landowners of non-associated residences within 3 km*

of a proposed turbine where significant visual impacts are predicted to identify potential approaches to mitigate any adverse impacts, including consideration of negotiated agreements.

The impacts of shadow flicker and blade glint have been assessed by other independent reports accompanying the EIS.

2.5

Taralga Decision

The approach to assessing the visual impacts of wind farms as set out by Chief Justice Preston of the NSW Land and Environment Court in the Taralga Decision as follows:

It is common that the areas that are best suited to wind energy are also the most visually prominent locations. In constructing windfarms, it is necessary to go where the wind is.

...

The threshold question to be considered for such a proposal is whether or not a first "breach" in the present general landscape should be permitted. Once such a breach is permitted, it is then relevant to turn to whether or not the extent of it should be limited, as a general question, and also to turn to the question of the impacts on individual properties. ... Having concluded that one turbine breaching the landscape would be acceptable, it is therefore appropriate to turn to the question of whether or not the totality of that which is proposed is acceptable or whether it should be modified in some fashion ... consider whether it is necessary or appropriate to remove elements of it if, in the first instance, one had reached a prima facie view that the present total project would have an unacceptable impact but that some lesser (but still viable) project might be approved

2.6

Gullen Range Wind Farm

The Gullen Range wind farm is similar to the Jupiter Wind Farm in the following ways.

The Gullen Range is one of the higher points on the Great Dividing Range surrounded by plains to the east of the range. A number of rural residential dwellings are located throughout the surrounding area of the project, there were several operating wind farm in close proximity and a high voltage transmission line bisected the site. Where the projects are different is that the Gullen Range Wind Farm the turbines are located along the top of the elevated ridgeline of the Great Dividing Range. The proposed turbines with the Project are located within plains and low hills below elevated ranges.

..... terms of overall landscape sensitivity, the visual assessment rated the surrounding areas of the project site as either low or moderate. That is, the area is fairly common and typical of the surrounding region. The Department concurs with the Environmental Assessment regarding suitability of the project in the context of Gullen's broad landscape value, rated as up to moderate significance. It acknowledges, however, that some members of the local community may not accept such a moderate ranking of the area's landscape values.

The Department recognises that public perception is an important component but only one element in the visual assessment methodology, as discussed further below. In terms of broad landscape consideration, the site provides a suitable setting for a wind farm development. There is already significant disturbance in the area which is a cleared agricultural landscape including existing built elements such as, industrial agriculture, aerodrome, telecommunication towers, and high voltage transmission lines.

In assessing any wind farm proposal, the Department deems it necessary that the landscape value be seen from a regional, if not State-wide perspective. For example, if a wind farm proposal such as this project is refused solely upon a local perspective of scenic quality, it would probably eliminate opportunities to construct wind farms possibly anywhere in the region, and possibly in the State. The Department's assessment is consistent with the general approach taken for previous wind farm proposals in that a wind farm would have to impact a landscape of regional, if not State or national importance, for it to be refused

on the basis of scenic quality alone. The Department recognises the strong and often highly emotive views of the potentially affected residents. It is understood that many within the local community (who have no financial benefit from the project) have strong negative feelings about the proposed wind farm. In some cases, this is regardless of the actual proximity to the turbines.

The Department considers that the current approach of assessing the impacts and issues associated with the project provides a reasonable and legitimate basis for decision making. The Department does not accept that there are critical and overwhelming matters of regional or State visual sensitivity that would provide grounds for rejecting the proposal outright. For this development, the broader and overall strategic benefits of the proposal are considered to provide a stronger weighting.

With Regards to the impact at residential dwelling, the Director Generals Report offered the following:

....The Department considers that the most significant potential visual amenity impacts from the project would occur within this three-kilometre zone....

The Department recognises this impact and considers it necessary to require the Proponent to provide visual screening to residences who consider themselves to be affected by the proposal. As the viewing location is relatively fixed, planting may be designed to either screen the wind turbines from view, or significantly reduce the visual dominance of wind turbines through filtering. The conditions of approval recommended by the Department permit any residential receiver within three kilometres of the project to request and receive on-site landscape treatments from the Proponent.

Due to the elevation of the site and the limited opportunities for turbine siting/relocation, the Department recognises that landscape screening on neighbouring properties could result in loss of views. However, screening may reduce the potential visual dominance of the turbines, as well as providing a form of offsets for impacted residences. In addition screening may act as a wind break and weather break in some instances. The Department therefore recommends the Proponent to undertake the following actions:

- notify all owners of residential dwellings located within three kilometres of the wind farm site and with views of turbine(s) to request landscaping measures on their property (the three kilometre radius is consistent with the advice in the visual assessment that the visual impact of turbines generally drops rapidly at approximately this distance);
- landscape mitigation measures need to be determined on a case by case basis in consultation with landholders using advice from the local Landcare group;
- a Landscape Plan should be provided detailing the landscaping to be undertaken on the site, including a program of maintenance of all landscaped areas;
- consult with Upper Lachlan Council about the need to provide landscaping measures along public road reserves. Implementation of landscaping measures will be as directed by the Director-General; and
- complete all landscaping required under the approval within 12 months of commencement of operation of the project.

..... Views to the turbines from other locations on the properties are considered of a less sensitive nature and are generally experienced while conducting other activities. The Department concurs with this view and considers that the visual impacts of turbines beyond the confines of the domestic curtilage do not hold the same weighting as for people's immediate living and entertaining areas.

The issue of locating wind farms in rural areas thereby affecting visual amenity has been explored in many assessments undertaken both within NSW and elsewhere within Australia and overseas. It has been argued by proponents of wind farms that the issue of visual amenity from rural properties is largely immaterial where the wind farm is proposed to be located within a rural zone. This is because these zones, unlike rural residential or urban village zones, place a focus on providing land for the purposes of agriculture rather than protecting amenity, be it of a visual or acoustic nature. The same is true of the rural zone in which the project is located.

Agricultural zoning objectives provide land for agricultural purposes and purposes incidental thereto. Agricultural pursuits (excepting feedlots, poultry farms and the like) are permissible without development consent. Rural and residential zones have different objectives and allow for different development types which translate to different amenity expectations. Whilst the Department recognises the genuine visual impact concerns of residents living in a rural zone, the Department considers that

these concerns must be tempered with consideration of the objectives and permissibility of development in the rural zone.

The following section outlines the methodology approach to assess the landscape and visual impacts of the Project.

3 ASSESSMENT METHODOLOGY

Having regard to the statutory context outlined above, the methodology for this LVIA includes the following steps.

3.1.1 Review of background documents

Review of background documentation, including submissions received from the public exhibition of the EIS, including the Clouston 2016 LVIA, and the outcomes of the consultation undertaken by EPYC in relation to the Project.

3.1.2 Visual components of Jupiter Wind Farm

Describe the visual components of the proposed Jupiter Wind Farm (The Project). These include but are not limited to Turbines, substation, access roads and transmission lines.

3.1.3 Community Perception Studies

Understanding people's perception of wind farms in the landscape based upon past research in Australia and overseas, is an important step in assessing the visual impact. Wind farms are unusual in that they are perceived as positive elements in many landscapes by a great majority of viewers. This is dissimilar to the acceptance of many other types of infrastructure within the landscape, which are generally perceived as negative. Therefore it is important that this perception data is understood and that it is recognised as a factor that needs to be considered when assessing the extent of visual impact. The results of local and several overseas studies, which share similar findings to the Australian studies, are discussed in Section 5 of this report.

Visual Bulletin Requirement:
Key Landscape Features

3.1.4 Viewshed and Zones of Visual Influence

Defining the viewshed of the Project and the Zones of Visual Influence (ZVI) will define those areas around the wind farm that could be impacted visually based on distance. The rationale behind the definition of the viewshed is discussed in Section 5 of this report. This section also describes the parameters of human vision, which assists in defining the viewshed.

Visual Bulletin Requirement:
Visibility Distance Zones

3.1.5 Landscape Units and Sensitivity

Landscape Units are based on the physical characteristics of the area considered within the Viewshed. Characteristics that assist in defining the landscape units include geology, vegetation, topography and drainage patterns as well as the extent of urban development and human modification of the landscape.

The sensitivity of a landscape unit is primarily an assessment of the ability for the landscape unit to accept further change. Generally, the greater the extent of modifications to an area, the lower the sensitivity to further visual change.

Visual Bulletin Requirement:

*Sensitive Land Use Designations
Landscape Character Type
Landscape Unit Settings
Scenic Quality*

3.1.6 Seen area analysis

Geographical Information Systems (GIS) software map those areas from which Turbines, whole or in part, are visible which provides guidance on the selection of viewpoints on which to assess visual impact.

This is referred to as a 'Seen Area Analysis' and is further discussed in Section 7.

Visual Bulletin Requirement:

Preliminary Assessment Tool

3.1.7 Assessment of visual impact at publicly accessible locations

Viewpoints are selected from publicly accessible locations where there is likely to be a view to the Turbines.

The assessment of the level of visual impact of the Project on the views from these selected locations is affected by:

- The distance of the viewer from the development;
- The nature of the surrounding landscape (including the landscape units represented and their sensitivity); and
- The number of viewers able to see the development.

Accordingly, the overall visual effect of the Project on each viewpoint has been assessed by evaluating the value of each of these criteria, ranking them as being either low, medium or high and subsequently balancing the relative influence of each of these criteria and deriving an assessment of the overall visual impact along a scale of effects.

The scale of effects that has been used to describe the overall visual impact (low, medium, high) is discussed in Section 9 'Publicly Accessible Viewpoints'.

An assessment of the visual impact from indicative viewpoints within the public domain is partly based on photomontages which show the view of the existing landscape and the alteration to this view to include the proposed wind farm.

Visual Bulletin Requirement:

Visual Influence Zones and Viewpoint Inventory

3.1.8 Impact from Residential properties

The assessment of visual impact from residences is different to that undertaken from publicly accessible viewpoints. An assessment of visitor numbers is not applicable. The landscape sensitivity is always rated as 'high', as it must be recognised that people feel most strongly

about the view from their house and from their outdoor living spaces. This rating of high within this assessment differs from that suggest in Appendices 1: Table 5 of the Visual Bulletin whereby Rural dwellings are rated as having a moderate sensitivity.

Visual Bulletin Requirement:
Visual Influence Zones and Viewpoint Inventory

3.1.9 Landscape Mitigation

Landscape mitigation measures or landscape screening may reduce the visual impact from residences within 3.0 km of a turbine. In some cases, mitigation measures may screen views that are desirable to be retained and therefore may not be considered appropriate from some dwellings.

Wind Energy Visual Bulletin Requirement:
Impact Mitigation Measures

3.1.10 Cumulative visual impact

Examining the cumulative visual impact of the Jupiter Wind Farm against other approved or operating wind farms. A cumulative visual impact will occur when either sequential and/or simultaneous views to wind turbines from public accessible viewpoints or from private viewing locations lead to a change in a community's, resident's or visitor's perception of the area.

3.1.11 Photomontage Methodology

Photomontages illustrate the visibility and scale of the proposed turbines from a selected location.

This assessment is in part based on photomontages which show the location and height of the proposed wind turbines.

The photomontages show the change in visibility within a 60° horizontal field of view which represents the central cone of view in which symbol recognition and colour discrimination can occur. For a wind farm visual assessment, the perceptual accuracy of the horizontal field of view is important if the photomontage images are reliably represent the change in the landscape.

One of the sheets within the photomontage set shows a wireframe view of the computer model to illustrate alignment of the model with existing features in a view. Vertical 'poles' or 'cylinders' within this wireframe are merely points on the landscape such as a group of trees, a corner of a planted hedgerow or a structure, which allow the computer model and the photograph to be accurately aligned. This ensures that the proposed wind turbines are accurately located within the photograph. Once aligned the terrain model is removed and the visible portions of the wind turbines are then rendered into the image.

Photomontages are discussed later in this report and are appended to this report (Refer Annex A for A3 size photomontages).

It is recognised that the photographs included in the assessment and the A3 photomontages included the appendices, whilst technically accurate are not perceptually accurate.

3.1.12 Camera Data

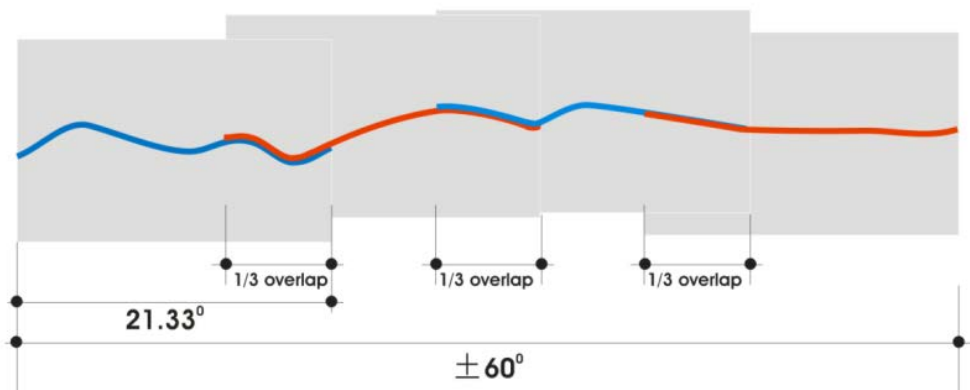
A 70 mm FX Format lens on a Nikon D3 digital camera has a picture angle of 26.5° and a horizontal angle of view of approximately 21.3°.

(http://nikonimaging.com/global/products/lens/af/micro/af_micro60_mmf_28d/).

The camera is held at eye level, approximately 1.65 m above ground level. Four photographs overlapped 1/3 to create an image approximately the same as the central cone of view of human vision, i.e. 50-70° horizontal and 15° vertical. Figure 3.1 demonstrates the overlap of the photographs which are used to create the panorama in the photomontage.

Figure 3.1

Photograph overlap



3.1.13

Computer modelling

Cadastral data as well as the proposed development are modelled within a computer program (3D Max). A virtual camera is set up in the model at the GPS coordinates for each of the photographs that are being used within the panorama.

The digital model or wireframe view is then overlaid on the photographic panorama. Known points within survey information such as topography, building locations or other infrastructure are registered into the base photographs (or other predetermined points). For technical accuracy, these points must align. This verifies the location and apparent height and scale of the proposed development.

Although the proposed turbine height is 173 m, to be conservative the photomontages show a turbine height of 175 m.

After the background reference points have been aligned, the wireframe is removed, leaving only the wind turbines, which are rendered, either to match the lighting conditions at the time the photographs were taken or, more typically, to maximise the wind turbine's visibility by increasing the contrast against the background sky.

Wider panoramas are used to provide a greater number of reference points for the computer model. These wide angle views are shown in the wire frame views where reference points were aligned outside of the final 60° view. If the panorama includes a significant number of additional wind turbines, these are also included in the analysis. However, wide angle views, whilst technically correct, do not represent a perceptually accurate representation of the change to a landscape.

A 50mm lens is often used for visual assessments as it is called a "normal" lens because it produces roughly the same picture angle as the human eye (about 50°). Images that have been produced using a 50mm "normal" lens are often criticised for their on-site perceptual accuracy.

The 70mm lens on the Nikon D3, is near to the equivalent of an 80mm lens on a 35mm film camera, and is chosen intentionally because it increases the apparent size of objects in the middle and far distance which results in a more perceptually correct (and conservative image) as a basis for photomontages.

3.1.14

GPS Coordinates

The Nikon D3 camera records the GPS coordinates as part of the photographic metadata. GPS coordinates are also taken on a hand held GPS and the locations from which the photographs were taken are marked on a digital map within Memory Map.

4

PROJECT DESCRIPTION

The Project involves the construction and operation of the Jupiter Wind Farm. The Project is situated approximately 5km south east of the township of Tarago and approximately 20km east of Bungendore.

For ease of reference the Project will be defined as two precincts with the portion of Project area north of the existing 330kv transmission line being known as the Northern Precinct and the Project area south of the existing transmission line the Southern Precinct.

The Project will consist of the following components:

- Up to 54 Turbines each with three blades mounted on a tubular steel tower, with a combined height of blade and tower limited to a maximum tip height of (173 metres AGL).
- An electrical substation and switchyard located adjacent to the 330kV Transmission line;
- Permanent operations and maintenance building (located within the substation site);
- An internal private access road network connecting the Turbines and the Project to the public network road.
- A short 330kV above ground transmission line connecting the on-site substation to the existing TransGrid 330kV transmission line, which passes through the Project;
- Up to three (3) permanent meteorological monitoring masts.

The following elements will also be required during construction of the Project:

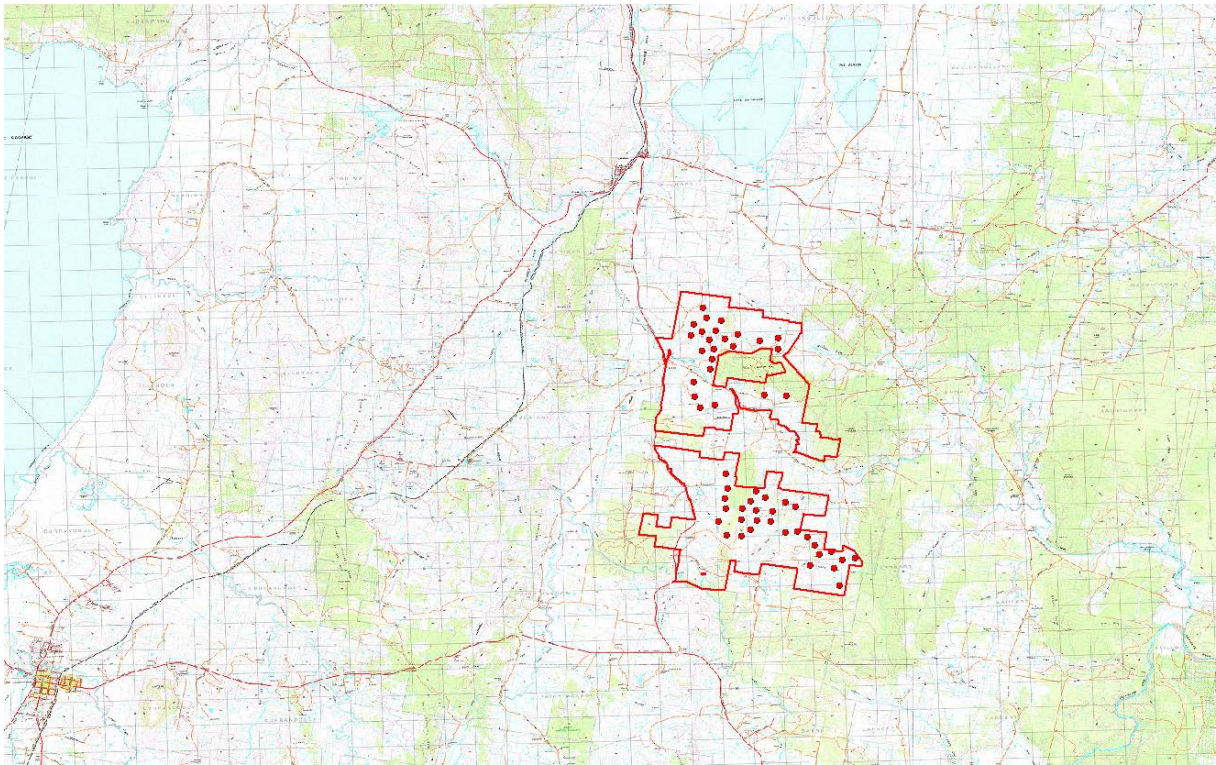
- Temporary mobile concrete batching plant to supply concrete for turbine footings and substation construction works. Two representative locations and supporting access roads are nominated for the batching plant;
- Cleared hardstand areas for construction equipment and storage;
- Temporary buildings and facilities for construction personnel/equipment;
- External water supply for concrete batching plant and construction activities.

4.1

Wind Farm Location

Figure 4.1 shows the location of the proposed wind farm boundary and the roads and townships in the surrounding area.

Figure 4.1 **Location Map**



Tarago is approximately 6.2 km to the north west of the nearest turbine and is the nearest township to the Project. Bungendore is the largest township in proximity to the Project and approximately 20 km to the south west of the nearest turbine.

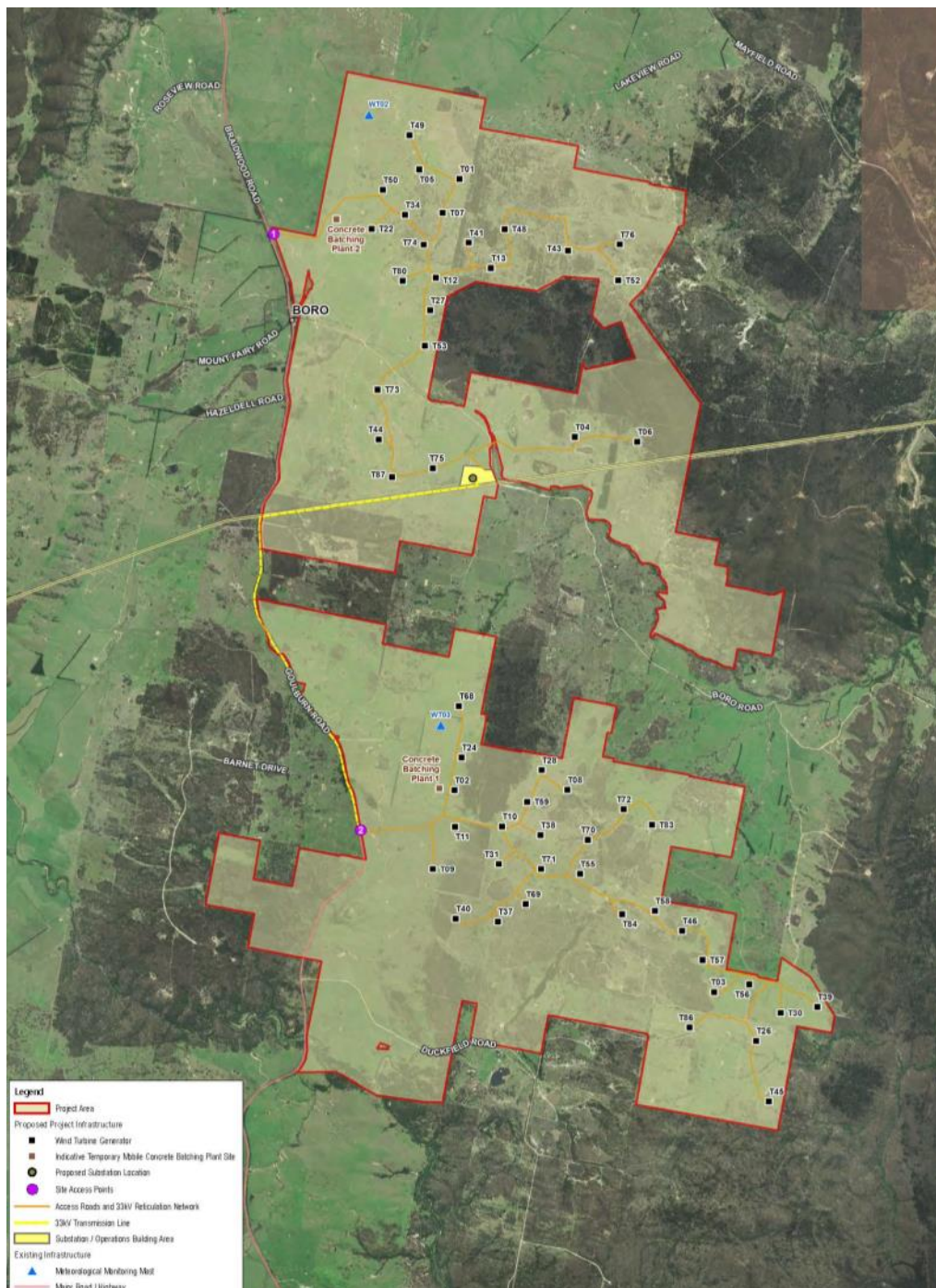
There are a number of sealed and unsealed roads that surround and run through the project area including Braidwood /Goulburn Road which runs along the western edge of the Project. An existing high voltage transmission line runs along the edge of the northern turbine cluster.

4.2 Wind Turbine Layout

The Jupiter Wind Farm comprises 54 Turbines located in two precincts. The upper precinct includes 24 Turbines, while the lower precinct includes 30. The proposed turbine layout is shown in Figure 4.2. The turbine layout includes a 100 m micro-siting buffer.

Figure 4.2

Wind Turbine Layout (TO BE UPDATED)



The wind turbines are the more visually apparent element of a wind farm. The maximum dimensions proposed for wind turbines forming part of the Project are described in Figure 4.3 and Table 4.1.

Figure 4.3

Wind Turbine

A summary of the physical characteristics of the maximum envelope of the wind turbines proposed for the Project is provided in Table 4.1. All values are maximums and may differ slightly between turbine models. Maximum dimensions are used to ensure that the assessment is conservatively based on the largest possible potential turbine model for the Project.

Table 4.1

Wind Turbine Specifications

ITEM	Maximum Values
Hub Height (Up to)	110 m
Rotor Diameter (Up to)	126 m
Overall Height (Up to)	173 m
Proposed number of turbines (Up to)	54 turbines

Other visual components of the Project are described in the following sections.

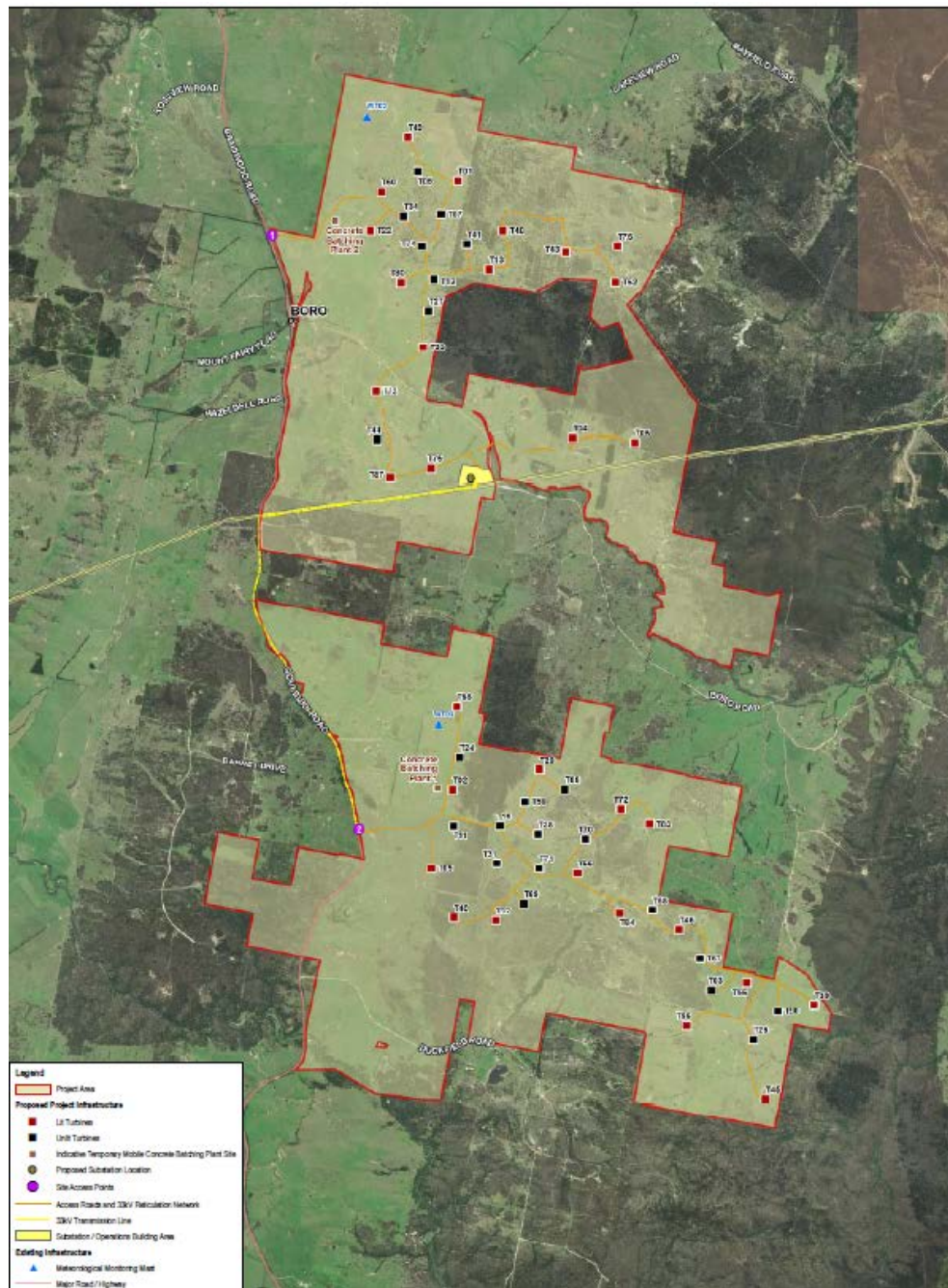
4.3**Aviation Obstacle Lighting**

The Aeronautical Impact Assessment for Jupiter Wind Farm prepared by Aviation Projects has been updated for the revised Project. Obstacle lighting would be required to be installed on 31 turbines. Turbines include 1, 2, 4, 6, 9, 13, 22, 28, 37, 39, 40, 43, 45, 46, 48, 49, 50, 52, 53, 56, 68, 72, 73, 75, 76, 80, 83, 84, 86, 87.

Turbines that are proposed to be incorporate aviation obstacle lights are shown in red in Figure 4.4

Figure 4.4

Aviation Obstacle Lighting



Those turbines identified to include aviation obstacle lighting are to include steady red low intensity lighting at night as per Section 9.4 of the MOS Part 139 as outlined in subsection 9.4.6. low intensity lights.

CASA are exploring the use of Radar Activated Lighting which only activate lighting when aircraft are within 5.0 km of a turbine.

4.4 Substation Facility

A new on-site substation will be located within the wind farm at the northern end of the 330 kV line.

The on-site substation compound would be a fenced enclosure of approximately 350m x 160 m. Figure 4.5 show a typical substation, similar in scale to that proposed as part of the Project. Typically, perimeter screening planting is also established along the boundary of the substation facility to visually screen the substation.

Figure 4.5

Typical substation



A permanent site control and operations building will be constructed within the on-site substation site. The control building may serve as a joint facility for the operation of the wind farm and the electrical substation.

The overall heights of various elements within the on-site and off-site substations will vary.

The scale of these elements will be similar to farm structures and other utility transmission lines visible in the area.

4.5 Power Lines

The Project would connect to the national electricity network via the existing high voltage power line that bisects the Project.

Electrical infrastructure required to connect the Project to the grid will include:

- Transformers at the base of each WTG;
- Underground 33 kV cables which will connect each turbine to a central substation;
- 330 kV overhead power lines which will connect the Project to the grid; and
- An on-site substation central to the wind farm; and

4.5.1 33 kV Infrastructure

The WTG's will be connected to the Projects substation by 33 kV power lines. All 33 kV lines will be underground.

4.6 Access Tracks

Access tracks will be required to construct the wind farm and for ongoing maintenance. Access tracks will be up to 10 m in width with local widening in some areas to clear natural features or allow for turning radius of larger vehicles. Where possible, existing farm tracks will be reused and upgraded to reduce the construction of new access tracks for the wind farm.

Construction of new access tracks will require removal of topsoil to a suitable founding layer. The surface will be constructed by placing and compacting the road base layer. Where tracks cross drainage lines, crossings may need to be installed. Once construction is completed, EPYC would work with the individual landowners to determine tracks, which are no longer required and can be rehabilitated.

4.7 Wind Monitoring Masts

The Project will include up to three permanent on-site wind-monitoring masts. Two have already been constructed, one in each turbine precinct. These may be retained in their current locations.

4.8 Construction

The period from pre-construction through to completed tests following commissioning of the turbines is likely to be between 12 - 24 months. This period is dependent on weather and ground conditions, as well as, detailed design and delivery of equipment. Construction activities, which are likely to have a landscape and/or visual impact, are likely to be the following:

- Temporary construction compound(s);
- Internal site access tracks;
- Establishing turbine foundations and crane hardstands;
- Substation and grid connection networks;
- Excavation of trenches and the laying of power and instrumentation cables;
- Erecting the turbines;
- On site concrete batching plant(s); and
- Vehicular traffic.

Temporary on-site concrete batching plants may be required for the construction of the tower foundations. On-site batching plants are often a requirement to manage traffic impacts on the surrounding road network. Figure 4.6 shows an example of a modular silo batching plant.

Figure 4.6 *Portable batching plant - Modular silo batching plant*



The temporary batching plants will be removed following completion of Project, stockpiles and hardstand areas would be rehabilitated and landscaped.

5 COMMUNITY PERCEPTION

Understanding viewer perception is an important issue particularly when considering wind farm Project in areas close proximity to tourist destinations or heritage areas.

The degree of visual impact also partly depends on how the viewer perceives renewable energy, the wind turbines and the landscape. The following section builds upon ERM's discussion of perception issues in past visual assessments of other wind farms and is pertinent to the visual and landscape assessment of the Jupiter Wind Farm.

Community perception is discussed in the publication "Wind Farms and Landscape Values, National Assessment Framework". Consideration of community perceptions for the proposed wind farm is a matter for consideration in the SEARs.

5.1 Issues Raised in Submissions

This LVIA has been prepared with the benefit of having access to submissions received from the public exhibition of the EIS, including the Clouston 2016 LVIA, and the outcomes of the consultation undertaken by EPYC in relation to the Project. The Response to Submissions Report contains a summary of the key issues raised in submissions, particularly the community submissions on visual impacts.

It is clear from the submissions received that some community members feel very strongly that the Project will result in a very significant and unwanted change in their local landscapes which they feel will adversely impact on views from their property.

5.2 Community Perception Studies

The visual impact of a wind farm ultimately depends on the opinion of the viewer. Community perception studies offer the potential to provide a statistically valid assessment of a community's attitude towards wind farms.

The presence of wind turbines will change some perceptions of landscape character of a locality. However, to assume that the introduction of wind turbines to a landscape will create irreversible damage to landscape values and negatively impact the amenity of the area is not substantiated in statistical data in community perception studies from Australia and overseas. This is discussed below.

5.3 Landscape Type

Perception studies show that many people find the appearance of wind turbines an attractive element in the landscape. Studies have also shown that the majority of those surveyed supported the presence of wind turbines even in scenic landscapes.

Studies undertaken by the Department of Natural Resources and Environment (Kantos & Quint, 2000) showed support for wind farms of 65-68% on coastal headlands adjacent to the Great Ocean Road one of Victoria's most scenic landscapes (refer to Figure 5.1). In less scenic landscapes, support for wind turbines increases from 65% to approximately 80% (refer to Figure 5.2).

Figure 5.1 Wind turbines on a coastal headland (Kantos and Quint, 2000)

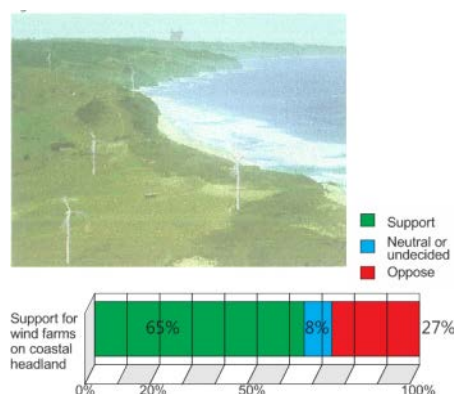


Figure 5.2 Wind turbines in a rural landscape (Lal Lal Wind Farm 2006)



Therefore, for many people the visual impact may be perceived as a positive contribution to a landscape. This is also supported by studies which demonstrated an increased acceptance of wind turbines in non-scenic landscapes (Andrew Lothian, 2000 & 2005).

5.4

Residential Impact

Perception studies show that between 60-70% of people support wind turbines within 1 km of a viewer's residence.

Studies in Victoria for the Ararat Wind Farm (ERM & Reark Pty Ltd, 2007) and Lal Lal Wind Farm (ERM & Reark Pty Ltd, 2006) as well as other studies in Victoria (Offer Sharp and Associates 2000 & 2002), New South Wales (Epuron 2007) and New Zealand (Charmain A Watts 2008) showed 68-71% of viewers supporting a wind farm within 1km of their residence. Results for each of these studies are correlated in Figure 5.3.

Figure 5.3 Wind turbines within 1 km of a respondent's house (Epuron 2008)

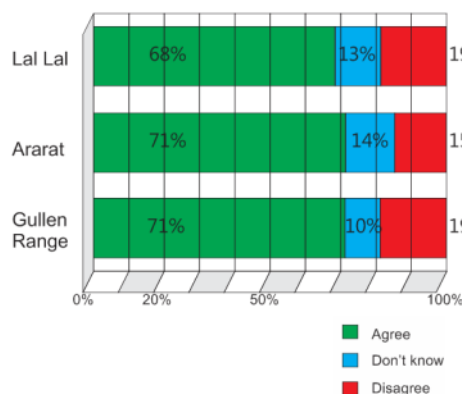
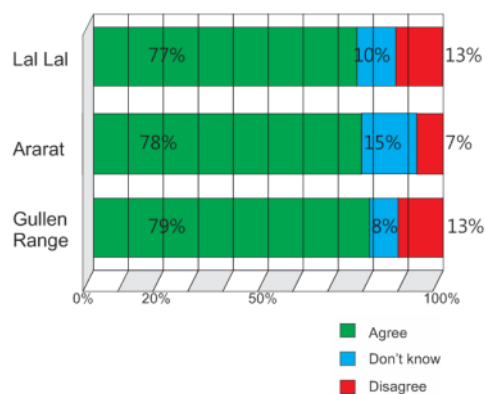


Figure 5.4 Wind turbines within 3 km of a respondent's house (Epuron 2008)



This acceptability of wind farms increases when the residence is further away and at 3km support has increased to 77-80% (refer to Figure 5.4).

These results are similar to the acceptance levels found in research undertaken in NSW.

5.5 NSW Perception studies

A number of studies have been undertaken to understand community acceptance of wind farms both nationally and within NSW. National Studies include CSIRO Acceptance of Rural Wind Farm In Australia - CSIRO 2012, Wind Energy Community Polling Report, Quantitative Research, Clean Energy Council April 2012, Community Attitudes to Wind Farms in NSW – AMR Interactive and various independent studies.

One of the key findings of the CSIRO report, which included several areas across NSW was that *...There is strong community support for the development of wind farms, including support from rural residents who do not seek media attention or political engagement to express their views. This finding contrasts with the level of opposition that may be assumed from the typically 'conflict-oriented' portrayal of wind farm proposals in the popular media. This media coverage frequently gives significant attention to legal challenges, political protests, and vocal opponents including 'Landscape Guardian' and high profile individuals, but fails to balance this with coverage of middle ground views, or with equivalent attention to the potential benefits of with wind farms.*

The Clean Energy Council report found that *A large majority (77%) of survey respondents said they supported wind farm developments. A small but noticeable group (13%) of respondents said they were opposed to wind farms. Differences in ratings between demographic sub-groups were mostly within the margin of error although Yass-Goulburn respondents (Total Support: 69%) provided a lower level of support than other locations.*

The Community Attitudes to Wind Farms in NSW – AMR undertook a targeted assessment for precincts across NSW.

5.5.1 Community Attitudes to Wind Farms in NSW – AMR Interactive

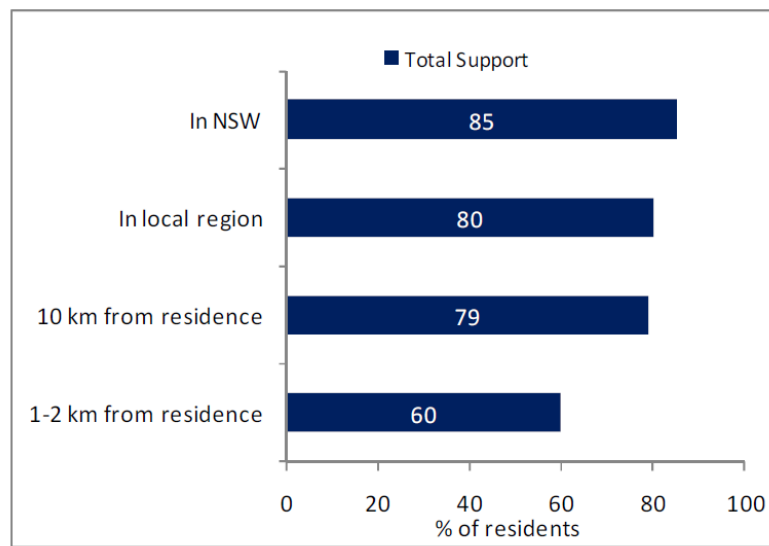
In 2010, the NSW government made a commitment to source 20% of the State's electricity from renewable energy projects by 2020. The 2012 NSW Draft Renewable Energy Action Plan identified wind energy, as the lowest cost utility-scale renewable energy generation technology, is expected to provide a significant contribution to meeting this target. Six precincts across NSW with strong wind resources were identified as regions potentially suitable for wind farm development.

The NSW government commissioned AMR Interactive to undertake a study of community perceptions towards wind farms in NSW and the six renewable energy precincts identified by the Office of Environment and Heritage (OEH). This is the most comprehensive and recent study of community perceptions towards wind farm in NSW. A summary of the results as relevant to the Jupiter Wind Farm are discussed below.

Respondents from the six precincts were asked about wind farms throughout NSW as well as within their region. The majority (85%) of respondents stated that they supported wind farms being built both in NSW as well as in their local region (80%).

Figure 5.5

Community attitudes towards wind farms in NSW (AMR interactive 2010)

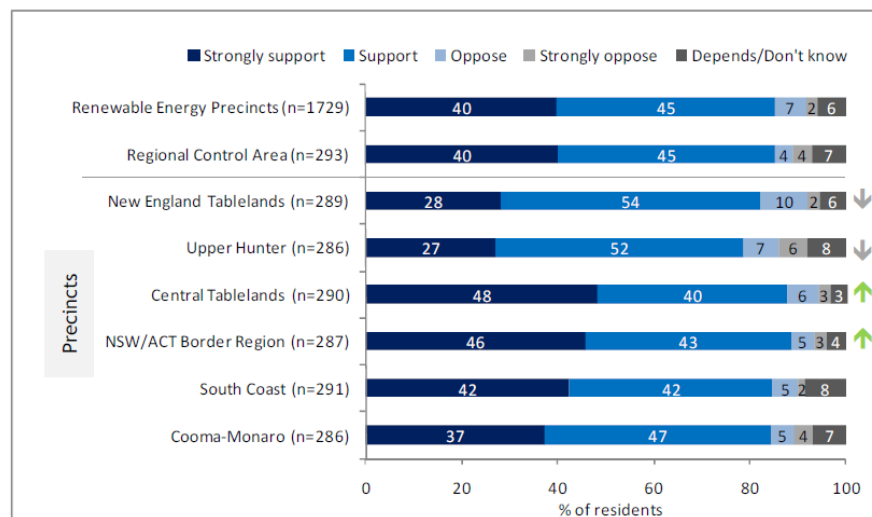


Over three quarters of respondents surveyed (79%) were supportive of wind farms being built within 10 km from their residence, and more than half (60%) supported them at 1-2 km.

The area of the proposed Jupiter Wind Farm was discussed in the Precinct 4, NSW/ACT Border Region. Figure 5.6 compares the results for the project area against the other wind farm precincts.

Figure 5.6

Community attitudes towards wind farms in NSW (AMR interactive 2010)



Base: All respondents

Statistically significant difference between Precincts: highlighting higher=↑, lower=↓ support
Q13. Overall, to what extent do you support or oppose wind farms being built in NSW?

The NSW / ACT border region scored 89% support which is above the average in terms of level of support for wind farm developments and offers support for the conclusion that the community is supportive of future wind farms in this region.

Table 16 summarises community responses towards the perceived impact of wind farms on property values, visual appeal and noise. The findings are ranked under each of the six renewable energy precinct. Table 16 is reproduced in full in Figure 5.7 below.

Figure 5.7

Impact of wind farms on property values, visual appeal and noise, by Precinct and regional control area

Perceived impact	REGIONAL NSW			PRECINCTS				
	Renewable Energy Precincts (n=1729)	Regional Control Area (n=293)	New England Tablelands (n=289)	Upper Hunter (n=286)	Central Tablelands (n=290)	NSW/ACT Border Region (n=287)	South Coast (n=291)	Cooma-Monaro (n=286)
	%	%	%	%	%	%	%	%
Impact on property values								
Positive impact	20	20	24	18	18	20	20	25
No impact	30	27	24	23	30	33	33	31
Negative impact	35	39	37	42	37	31	35	30
Other response	15	15	15	17	15	17	13	14
Visual impact								
Positive impact	25	22	21	18	29	28	23	24
No impact	28	24	31	26	27	33	26	30
Negative impact	41	45	40	48	41	34	43	37
Other response	7	9	8	8	3	6	8	9
Noise a concern if built 1-2 km away								
No/little concern	42	44	38	38	42	49	43	48
Some/great concern	44	43	46	52	47	40	42	44
Depends/Don't know	14	12	15	9	11	12	16	9

Base: All respondents

Statistically significant difference between groups: highlighting more positive and more negative results

Q21. In your view, what impact would wind farms in your local region have on property values?

Q22. In your view, what impact would wind farms have on the visual appeal of the surrounding area?

Q27. In your view, to what extent would noise be a concern for you if a wind farm was 1-2 km away from your residence?

The NSW/ACT Border region received the highest acceptance levels for wind farm projects of each of the six precincts.

Both the Epuron Study undertaken in 2007 and the more recent 2010 AMR Interactive report indicate that majority of respondents within the NSW / ACT border region are accepting of wind farms in their local area.

Moreover, respondents are not averse to having wind turbines in their immediate locality, with the majority (60%) are amenable to wind turbines within one kilometre of their home.

These outcomes are consistent with results from other surveys conducted both within Australia and overseas where acceptance of wind farms in rural communities is still more supportive than opposing. The results of several Victorian and overseas studies are appended to this report (refer to Annex C).

5.5.2

Epuron

In October 2007, Epuron commissioned a report on community perceptions of wind farms in the Southern Tablelands of NSW. The results of this study are discussed in detail in the Landscape and Visual Impact Assessment (ERM 2008) prepared for the Gullen Range Wind Farm.

This study examines community perceptions towards wind farms in south-east NSW and establishes baseline data on community perceptions for this area.

The respondents were located in small urban and rural locations within the vicinity of the Gullen Range Wind Farm as well as:

- areas around Gunning and Yass;
- Binalong;
- Crookwell; and
- Goulburn.

These areas are near to the Jupiter Wind Farm. Other known wind farms at the time of the study and within the study area (NSW Southern Tablelands), included Crookwell Wind Farm and the then proposed Crookwell II, Gunning and Cullerin Range Wind Farms and Yass Wind Farm's. Many of these wind farm's including Gullen Range are now operational.

Figure 5.8 and Figure 5.9 compares results from the Ararat Wind Farm (ERM & Reark Pty Ltd, 2007), Lal Lal Wind Farm (ERM & Reark Pty Ltd, 2006) and (Offer Sharp and Associates 2000 & 2002) against the results received for the 2007 Epuron study which covered the NSW Southern Tablelands region.

These results show acceptance levels of 89% (almost 9 in 10) for wind farm projects being developed in the NSW Southern Tablelands. The results from the Epuron 2007 study which specifically asked respondent's opinions the acceptability of turbines in proximity to dwellings.

Figure 5.8 Wind turbines in Australia & in the Southern Tablelands

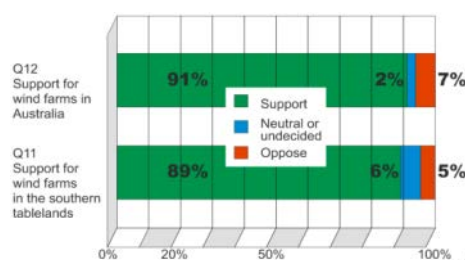
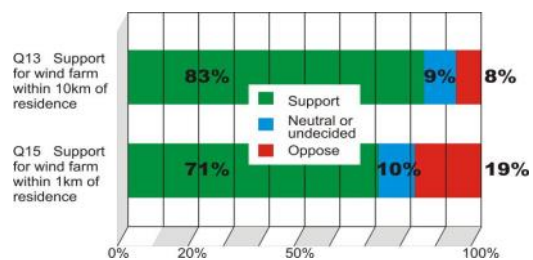


Figure 5.9 Wind turbines within 10km & 1km of a respondent's house



This result is similar to the levels of support shown for wind farms elsewhere in Australia where 91% (almost 9 in 10) of respondents were in favour of wind farm developments.

The 2007 Epuron study of the NSW Tablelands also asked respondents to rate their level of support for turbines at varying distances between wind turbines and dwellings. Most respondents (83% favour, 8% opposed) were accepting of a wind farm set back 10 km from their home, with 7 in 10 respondents (71% Favour, 19% opposed) accepting a wind farm set one kilometre from their home (Figure 5.8 and Figure 5.9). The conclusions of this assessment confirm that a majority of residents living in the NSW Southern Tablelands are in favour of wind farms in the region.

In response to questions assessing the support for multiple (15 to 80 turbines) wind farms in the local rural area, respondents accepted 76% (19% opposed) for one typical wind farm. Three typical wind farms were accepted by 64% (27% opposed) (see Figure 5.10).

Figure 5.10 Support for multiple wind farms (Epuron 2007)

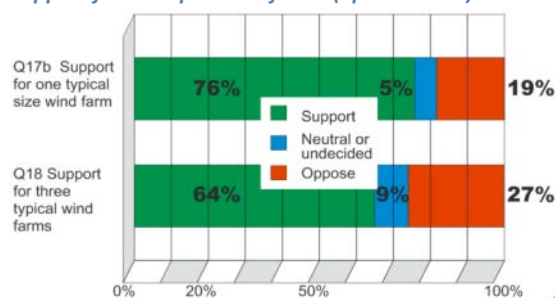


Figure 5.10 again highlights the high levels of support for one or more wind farms in the area. The lowest level of acceptance at 64% for three wind farms is similar to the levels of support shown for wind turbines within one kilometre of the respondent's house.

The Epuron 2007 study also found that the community has no clear preference between a few clusters close together or spread out at reasonable intervals along major roads such as highways. Therefore, it would seem that the majority of community members support multiple new wind farms in the area, and are of the opinion that views in this landscape will not be adversely impacted by future wind farm developments. .

5.6 The Role of Community Perception Studies in Wind Farm Visual Assessment

A key requirement of the SEARs is to consider if the landscape around the proposed Jupiter Wind Farm is of such a quality that a majority of viewers would regard the presence of a wind farm as having an unacceptable impact on the visual character of the area. The results of the research discussed here overwhelmingly supports the conclusion that the majority of the community is in favour of wind farms in the NSW/ ACT Border Region.

The more recent studies undertaken by AMR Interactive 2010 which focussed on NSW specifically and the broader assessment undertaken by CSIRO and Clean Energy Council in 2012 consistently show a higher level of acceptance than that which is often expressed in submissions. The community responses to wind farms in all studies are remarkably similar and consistent whereby the research continually shows a level of community support at around 60-70% and a level of opposition between 5-30%. These higher acceptance levels are similar to the earlier studies on community perceptions towards wind farms in Australia and overseas and are remarkably consistent.

These acceptance levels appear to unique to wind farm projects. ERM have undertaken visual assessments for a range of projects including transmission lines, major roads, quarries and mining projects which have a greater degree of disapproval of the visual change these projects make on the landscape. The assessments for other projects proceed on the assumption that the visual impact is negative. The community perception studies show that for many people, wind farms may in fact create a positive addition to any but the most sensitive landscapes.

It should also be acknowledged that this research relates to viewers in the general community, including visitors, tourists and residents, viewing the wind farm from local roads, tourist locations and from other publicly accessible locations.

However it would not be correct to say that this level of acceptance reflects the views of all residents within close proximity to a wind farm. For this reason, this assessment assumes that a resident is sensitive to the presence of a wind farm, when viewing these from their dwelling.

Part of the assessment must consider if the landscape around the Jupiter Wind Farm is of such a quality that the majority of viewers, including users of the road networks and from residential dwellings would be disturbed by the presence of a wind farm.

It is assumed that residents who have elected to host the turbines on their properties are either not concerned by the presence of the wind farm, or recognise the opportunity to continue farming as a result of compensation for the visual alteration to the landscape is a beneficial use.

Overall it must be recognised that many people support wind farms.

5.6.1 Implications for the assessment of Cumulative Visual Impact

The assessment of cumulative visual impact for wind farms focuses on visual amenity associated with multiple wind farms in a given area.

The proponents of the Mortlake Wind Farm in Victoria have undertaken two rounds of community perception studies. The first study was undertaken by Reark Consulting in 2008 and discussed the issue of cumulative impacts. The Panel Hearing for the Mortlake Wind Farm did not take place until late 2010. During this time, several wind farms including Ararat, Darlington and Oaklands Hill Wind Farms which are in close proximity to the Mortlake Wind Farm had received planning approval in Victoria. Many of these were within close proximity to the proposed Mortlake Wind Farm.

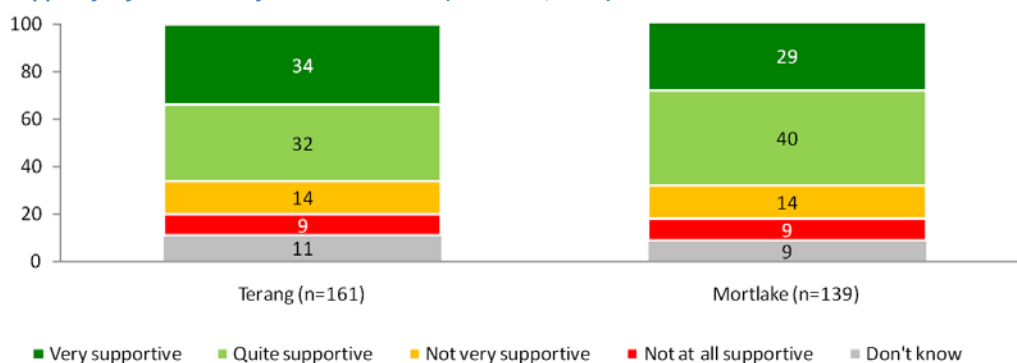
Given the time that had elapsed between the 2008 Reark study was and the Panel Hearing, the proponents of the proposed Mortlake Wind Farm commissioned Quantum to undertake a similar study in January 2010 to test the results in the earlier Reark study.

The Quantum Study, 2010 reconfirmed the results from the prior Victorian and overseas studies discussed above on community perception of multiple wind farms in the Mortlake region even after the approval of several new wind farms in the area.

The most contentious issues of cumulative impacts resulting from the construction of further wind farms in their area. The results are reproduced in Figure 5.11.

Figure 5.11

Support for further wind farms at Mortlake (Quantum, 2010)



Respondents to this recent Quantum study for the Mortlake Wind Farm were asked about their acceptance of an additional wind farm in their local area (87% support, 7% oppose), and their acceptance of three additional wind farms (71% support, 18% oppose).

The 2007 Epuron studies for the NSW Southern Tablelands investigated community attitudes towards multiple 'typical' wind farms (15 to 80 turbines). The results were:

- 76% accepted one 'typical' wind farm;
- 75% accepted two 'typical' wind farms; and
- 64% accepted three 'typical' wind farms. 17% were opposed.

This level of acceptance for multiple wind farms in the area suggests that the cumulative impact to visual amenity of multiple projects would be acceptable to the broader community.

6

VIEWSHED AND ZONES OF VISUAL INFLUENCE

The SEARs require that a zone of visual influence for the wind farm (no less than 10 km) be identified.

This section establishes a rational basis on which to determine the extent of the view shed or study area for this assessment of the visual impact of the Project. Zones of Visual Influence will also be established.

The view shed is the area from which the proposed wind turbines could be recognisable within a view. The view shed is also the study area for visual impact of a wind farm. It may be possible to see wind turbines from areas outside the view shed, however they would be at distances where they would be a small and barely noticeable element in the view.

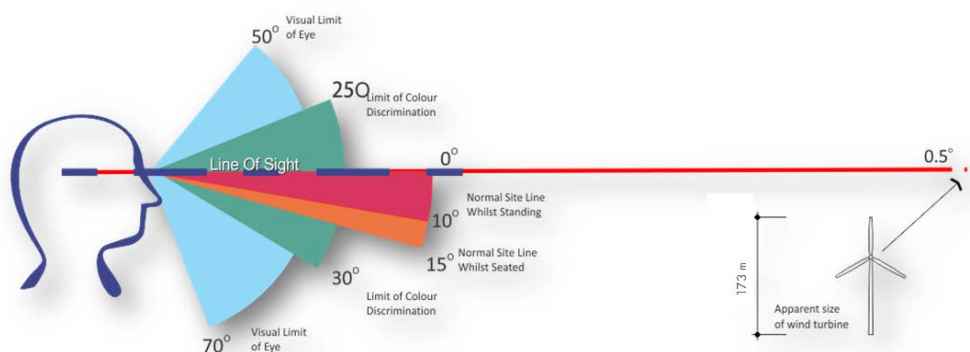
The parameters of human vision include the vertical and horizontal fields of views as shown in Figure 6.1 and Figure 6.2. These figures are based on data from *'Human Dimension and Interior Space'*, Julius Panero & Martin Zellnik, Witney Library of Design, 1979. Similar data can be found in the more recent publication entitled *'The Measure of Man and Woman, Revised Edition'*, Henry Dreyfuss Associates, John Wiley & Sons, 2012.

Typically, the vertical field of view of a person is 10°; therefore 0.5° is 5% of the vertical field of view.

With an overall maximum height of 173 m, the turbines would be the largest element of the Project. For this reason, the turbine height will form the basis on which to establish the view shed, and zones of visual influence for the Project.

Figure 6.1

Determining the views shed extent based on wind turbine in the vertical field of view



The theoretical extent of the view shed can be considered to extend to a distance at which the tallest component of the Project would take up less than 5% of the vertical field of view. Typically, the field of view of a person is 10°, whereby 5% of the vertical field of view is approximately equal to 0.5°.

The distance at which a 173 m high turbine would take up 5% (0.5°) of the vertical field of view is 20km.

The following section will describe the Zones of Visual Influence (ZVI) for the Turbines.

6.1

Zones of Visual Influence

Zone of Visual Influence (ZVI) assist to assess the overall visual impact of the proposed turbines based on distance to a turbine. The calculations used to determine the view shed can also be

used to define visual impact based on distance to a turbine. It must be recognised that zones of visual influence are one of several criteria for assessing visual impacts.

For example, when a view location is closer to a turbine, the turbine would take up a greater percentage of the vertical field of view. The ZVI's and visual significance are described in Table 6.1.

Table 6.1 *Zones of Visual Influence*

Distance to turbine	Vertical angle of view	Zones of Visual Influence
>20km	<0.5	Visually insignificant – Extent of the Project view shed A very small element in the view shed, which is difficult to discern and will be invisible in some lighting or weather circumstances.
10-20km	0.5-1.0	Potentially noticeable , but will not dominate the landscape The degree of visual intrusion will depend on the landscape sensitivity and the sensitivity of the viewer; however, the wind turbines do not dominate the landscape.
4.0 -10km	1.0-2.5	Potentially noticeable and can dominate the landscape The degree of visual intrusion will depend on the landscape sensitivity and the sensitivity of the viewer
2.0-4.0km	2.5-5.0	Highly visible and will usually dominate the landscape The degree of visual intrusion will depend on the wind turbines' placement within the landscape and factors such as foreground screening.
<2.0 km	>5.0	Will always be visually dominant in the landscape Dominates the landscape in which they are sited.

Figure 6.2 shows the various zones of visual influence are derived from the proportion that a wind turbine, fully visible, will occupy in the vertical field of view.

Figure 6.2 *Zones of Visual Influence and Impact*

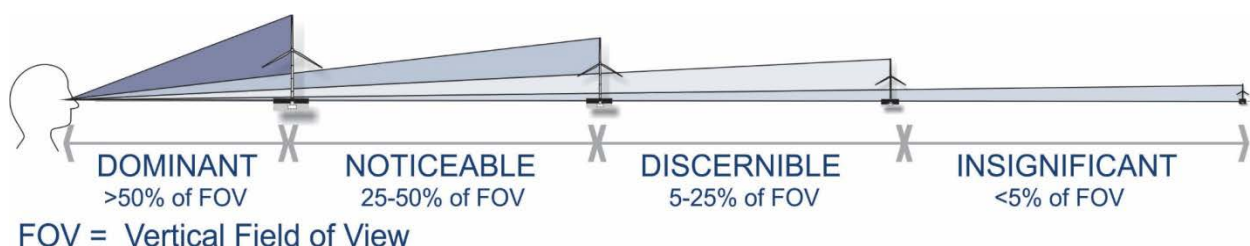
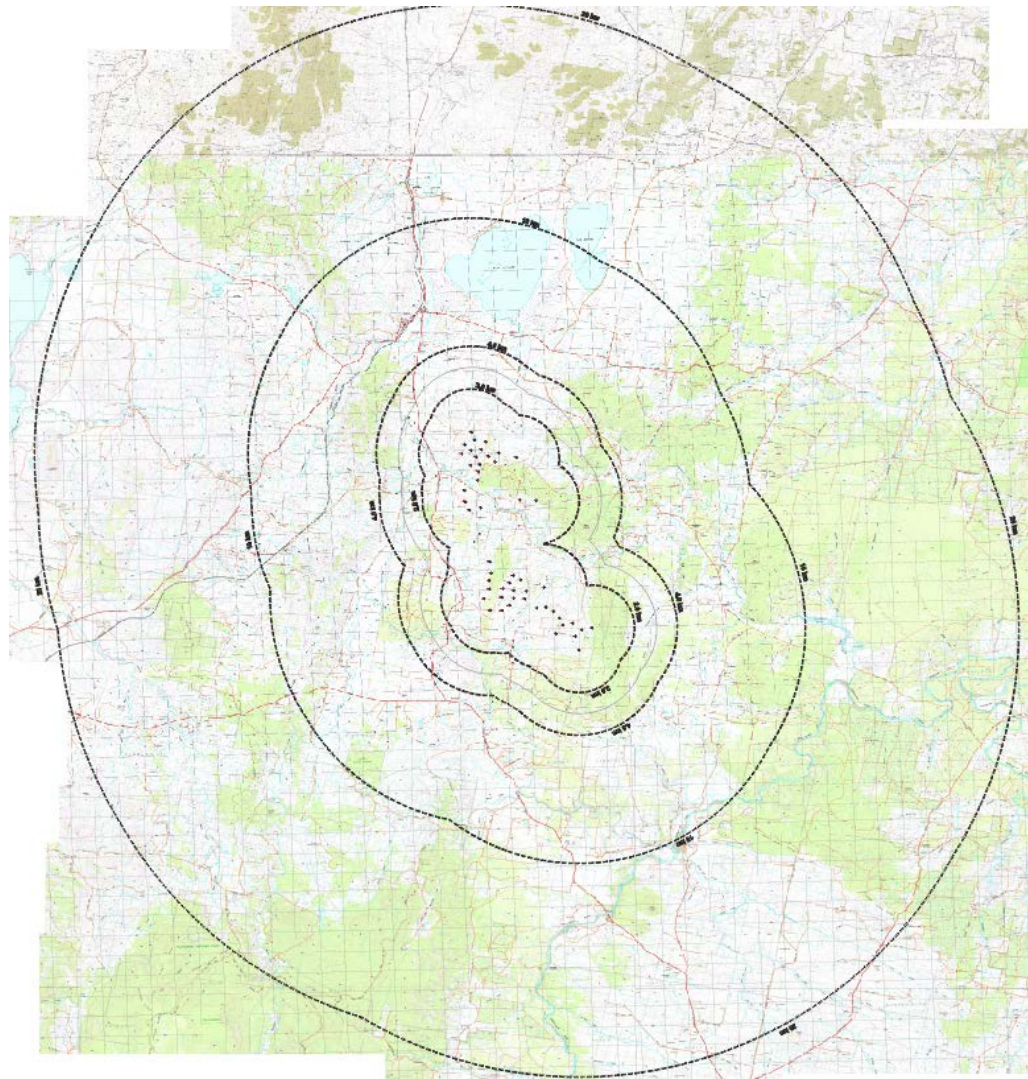


Figure 6.3 shows the ZVI for the proposed Turbines.

Figure 6.3

Viewshed and Zone of Visual Influence (TO BE UPDATED)

It is recognised that visibility does not dramatically change when a viewer moves from 3.9km to 4.1km from the nearest WTG and therefore these zones are a guide only.

Areas that have the potential to be most visually affected by the proposed Turbines are those within 4km of the nearest turbine, while areas that may have potentially noticeable visual impacts associated with the Project extend out to 20 km from the nearest turbine. On clear days, turbines may still be visible beyond 20 km, however they would be a small element within views.

The landscape within the 20 km viewshed of the proposed Jupiter Wind Farm will be analysed:

- To determine the landscape character types of landscape units that occur within this viewshed; and
- To analyse the visual impact from indicative viewpoints.

7

SEEN AREA ANALYSIS

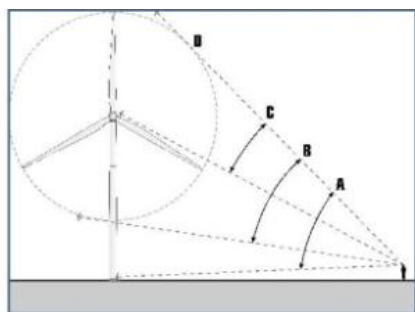
A seen area analysis identifies those areas within the view shed from which wind turbines, or sections of wind turbines, may be visible. Wind farm and turbine visibility depends upon the nature of the intervening topography, vegetation and structures.

The areas from which part or all of the proposed wind turbines can be mapped using Geographical Information Systems (GIS) software. The GIS mapping is based solely on topography and does not take into account screening by vegetation, minor topographic changes and buildings which reduce the visibility from many locations. For these reasons, the GIS analysis is a conservative visibility map and is useful to determine locations from which to assess visual impacts of the Project.

Figure 7.1

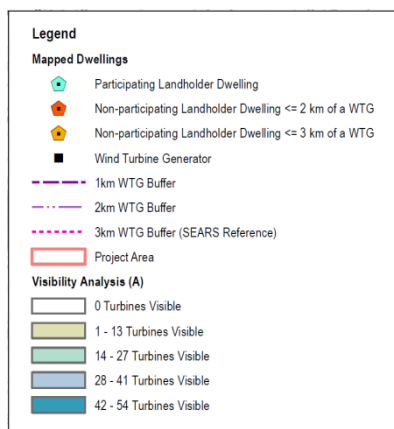
Visibility parameters (not to scale)

The Seen Area Analysis can firstly map those areas from which Turbines may be visible in whole or part.



- **Zone A** – Areas from which one or more Turbines are visible in their entirety;
- **Zone B** – Areas from which the entire swept path of one or more Turbines are visible;
- **Zone C** – Areas from which nacelle and above of one or more Turbines are visible; and
- **Zone D** – Areas from which tip of the blade of one or more Turbines are visible

A location that has the potential to view a wind turbine in its entirety is within Zone A. A viewer at this location will theoretically be able to see “any part of the wind turbine blades” which includes Zone B, C and D.



The number of visible turbines from any area is shown on the seen areas analysis maps and ranked by colour gradation.

The number of visible turbines from any location is mapped by colour as shown in the legend (Opposite)

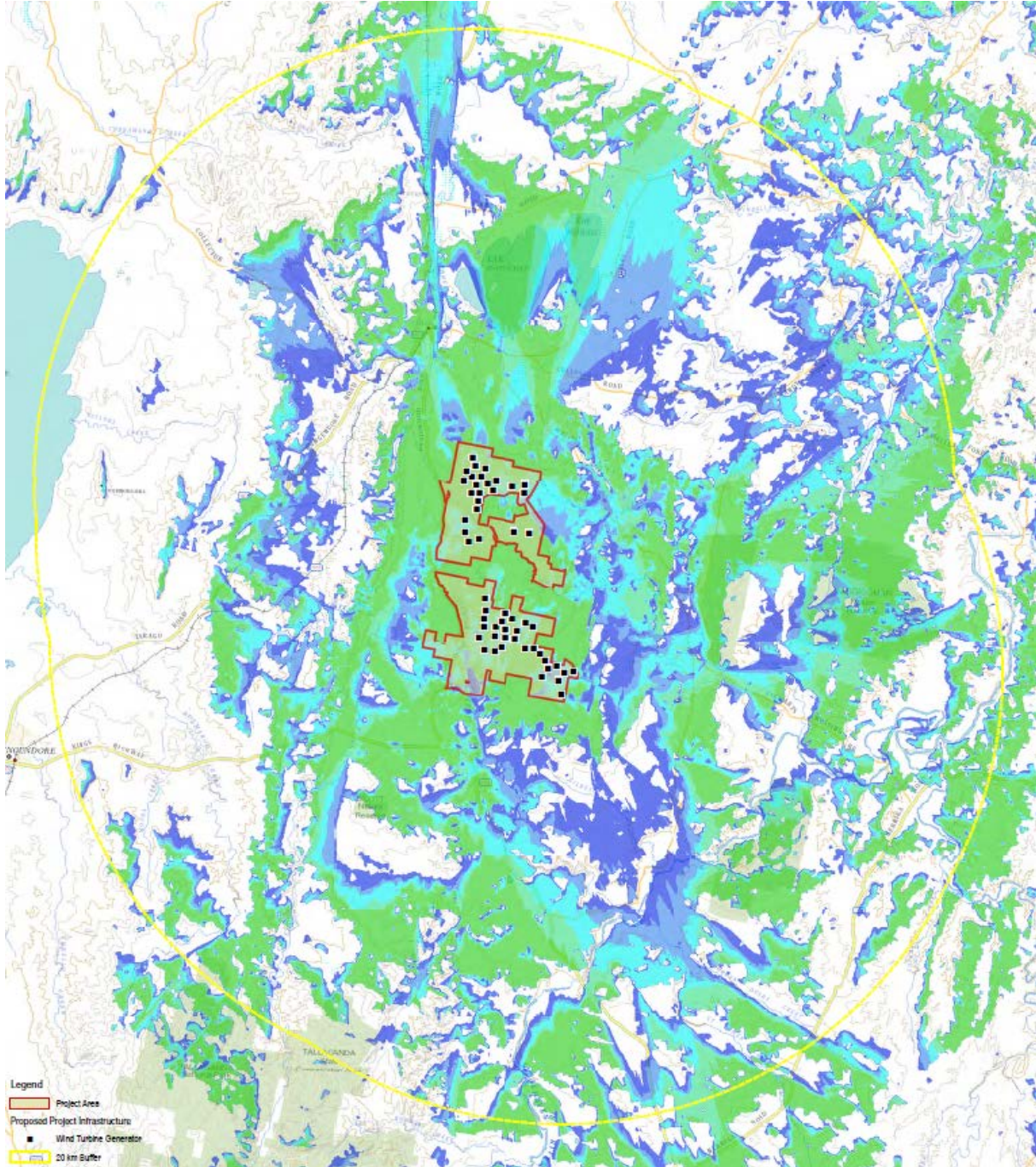
The Jupiter Wind Farm is located within a plain between the Great Dividing Range and local hilly areas to the east. Elevation across the site ranges from approximately 600 m AHD towards the south to 700 m AHD in the north. Local rises, ridges, depressions and gullies can screen views to part or all of the proposed wind turbines.

The following visibility maps will graphically portray turbine visibility for various turbine Zones.

7.1 Areas from which Wind Turbines are potentially visible

Each of four turbine visibility zones can be mapped using this GIS software. Figure 7.2 shows the GIS based mapping of Zones A, B, C and D.

Figure 7.2 *Areas of potential wind turbine visibility*



The proposed turbines will be visible either in part or as whole from many areas within the 3.0 km project view shed. Areas in white are locations where no turbines would be visible based on topography. There are no locations where all turbines would be visible in their entirety.

Turbine visibility will be discussed for each of the four turbine zones described in Figure 7.2. As discussed above, this is a theoretical assessment based on topography and turbine parameters

only. Actual turbine visibility will be influenced by viewer direction, intervening vegetation and structures.

7.2 Zone A – Areas that can potentially see one or more Wind Turbines in their entirety

Zone A maps those areas from which viewers could potentially see entire wind turbines and the numbers of wind turbines that could be visible.

Figure 7.3 shows that viewers in areas near to the site may be able to see between up to 13 turbines in their entirety. There are no locations within the view shed that can see all of the wind turbines in their entirety.

This visibility zone is not a true representation of turbine visibility as only those turbines that are visible from the foundation to the tip of the blade.

7.3 Zone B – Areas that can potentially see the entire swept path or one or more Wind Turbines

Zone B is the area where viewers can theoretically see the entire swept path of a turbine. This includes those areas from which entire turbines are also visible.

Figure 7.4 shows that there are some areas that viewers will potentially see the full swept path of the majority of the proposed wind turbines.

There is only one location that will potentially see the swept path of all of the proposed wind turbines. This area is within the site boundary of the southern turbine cluster.

There are also few areas where the swept path of up to 41 turbines would be visible. The majority of this area is to the south of the Project area and within the site boundaries.

With the exception of the residential cluster to the north of Mount Fairy Road and Boro Road which will see up to 13 turbines, much of the area within 3.0 km has the potential to see the swept path of up to 27 turbines.

7.4 Zone C – Areas that can potentially be seen from the Nacelle and above of one or more Wind Turbines

Zone C maps those areas where a viewer can potentially see the nacelle and above. That is the nacelle and upper portion of the swept path of the turbine blades. This Zone is the most useful for guiding the selection of viewpoints on which to assess the visual impact of a wind farm project.

There are few locations within 3.0 km of the site and outside of the Project boundaries where the nacelle and upper swept path of the turbines would be visible. These areas are towards the south of the southern turbine cluster and near to the end of Duckfield Road. There are several residential dwellings in this area.

Viewers to the in close proximity to the project will be more likely to be able to see the upper half of the swept path of up to 41 turbines in areas south of the Project and up to 27 turbines in the north.

Areas with the greatest visibility will be between 1.5 – 3km from the nearest wind turbine along Braidwood and Mayfield Road. Viewers in these areas may be able to see the nacelle upwards of between 14 to 27 wind turbines.

7.5

Zone D – Areas that can potentially see any part of one or more Wind Turbines

Zone D maps those areas in which a viewer may be able to see the blade tip as it passed through its apex or the highest point. This zone is usually the most conservative.

Even with the mapping criteria set at its most conservative, as in this case where even the visibility of a blade tip is included.

Intervening vegetation, buildings or small topographical features will often screen views to this zone.

Figure 7.3 Zone A

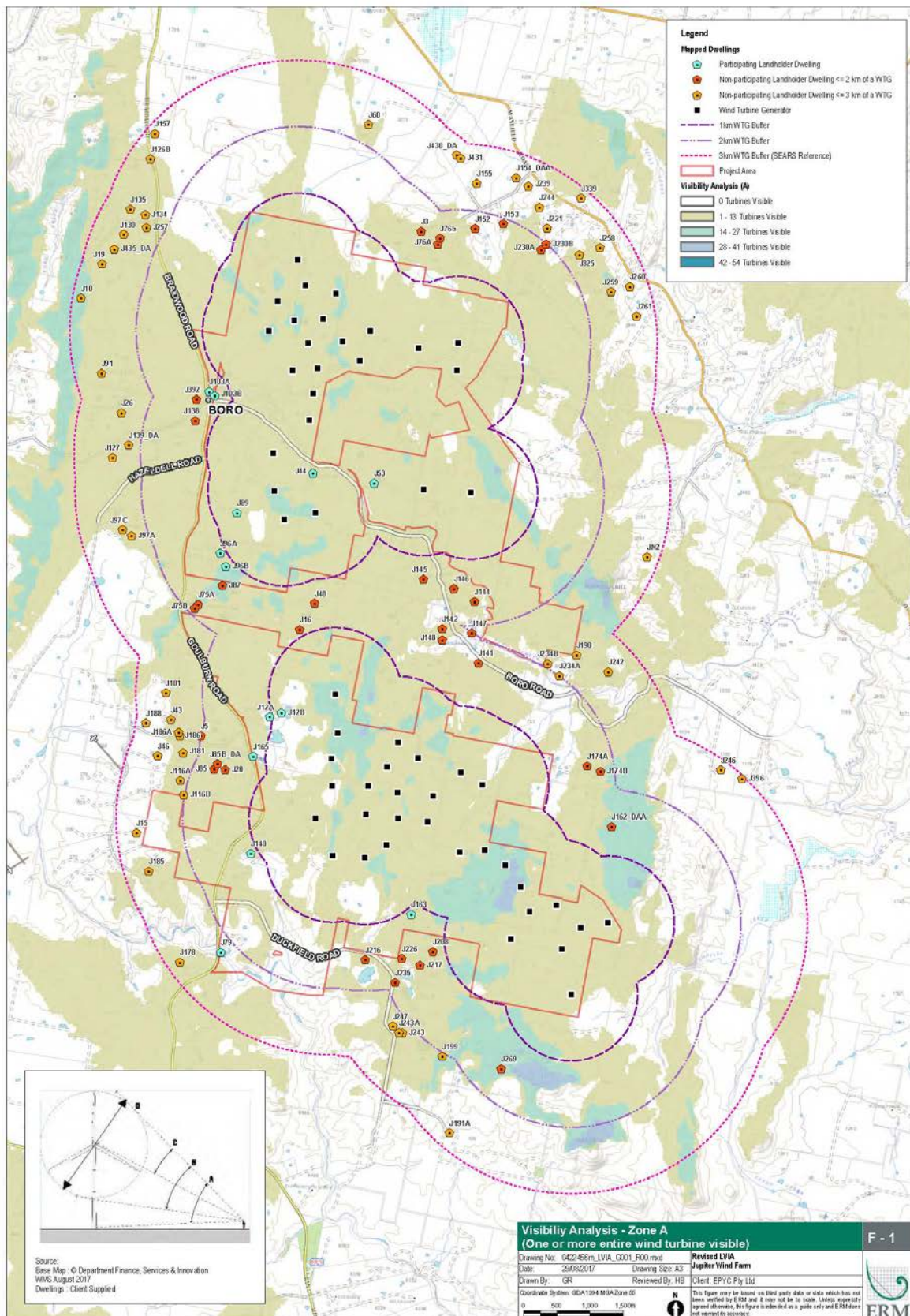


Figure 7.4 Zone B

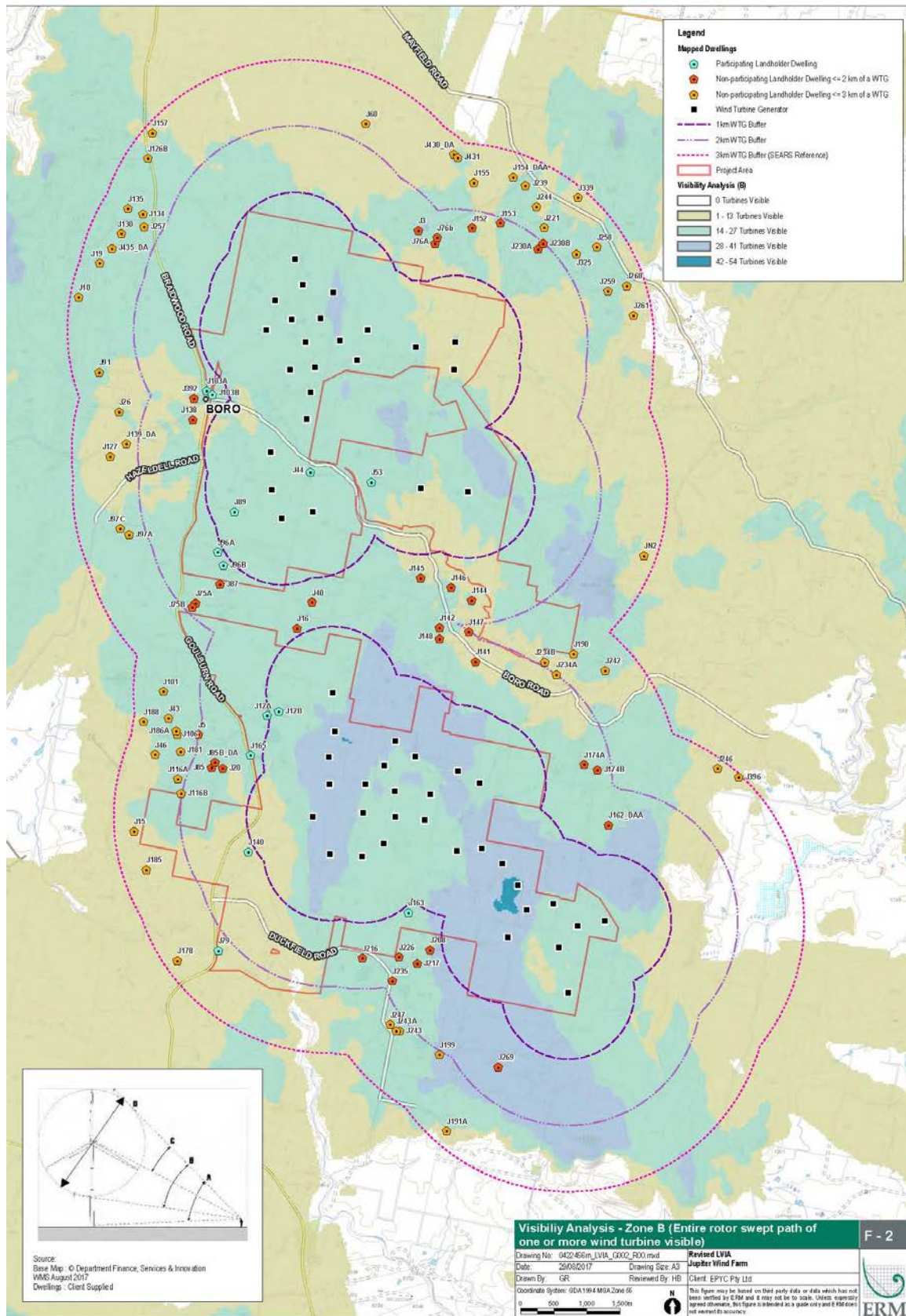


Figure 7.5 Zone C

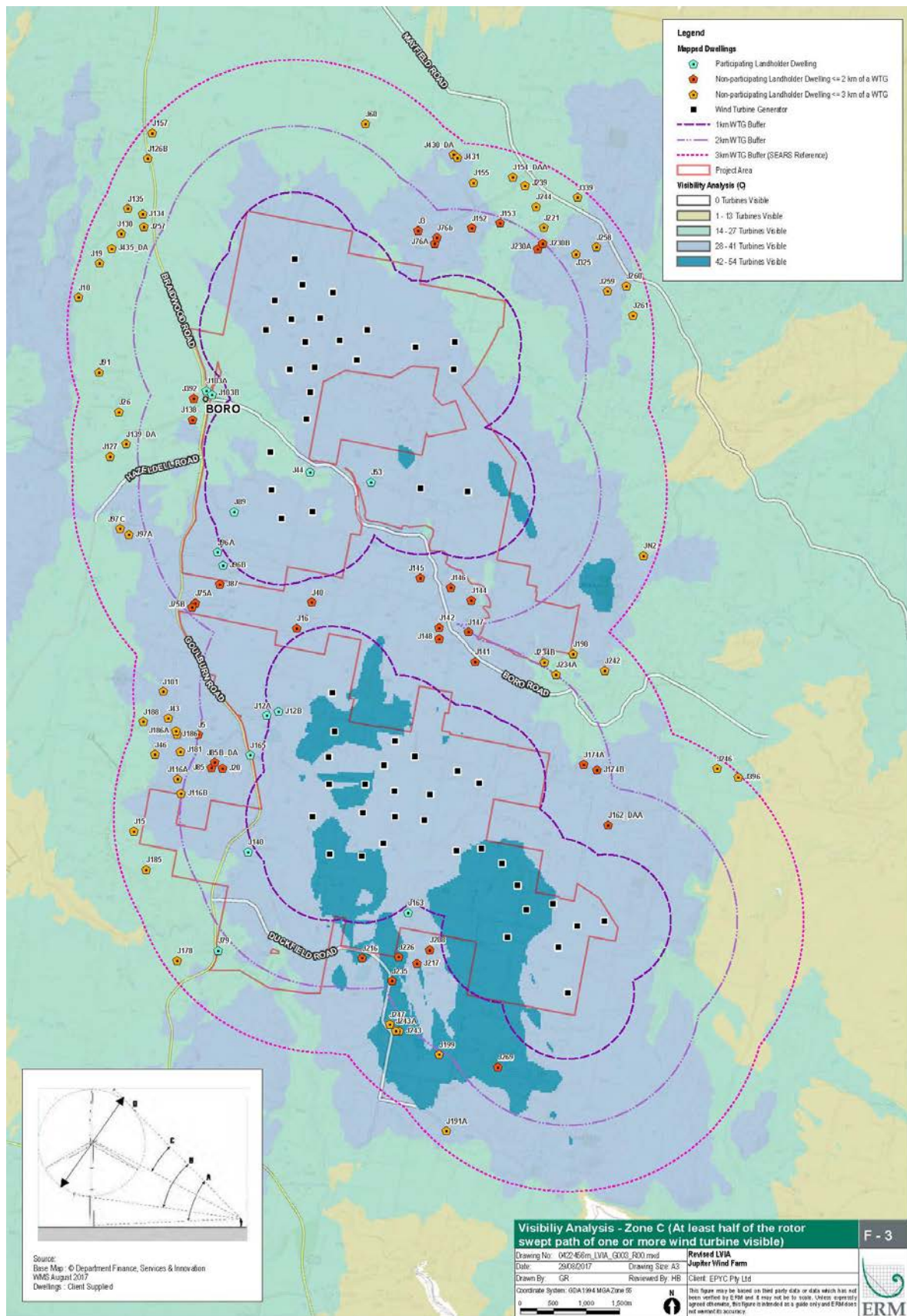
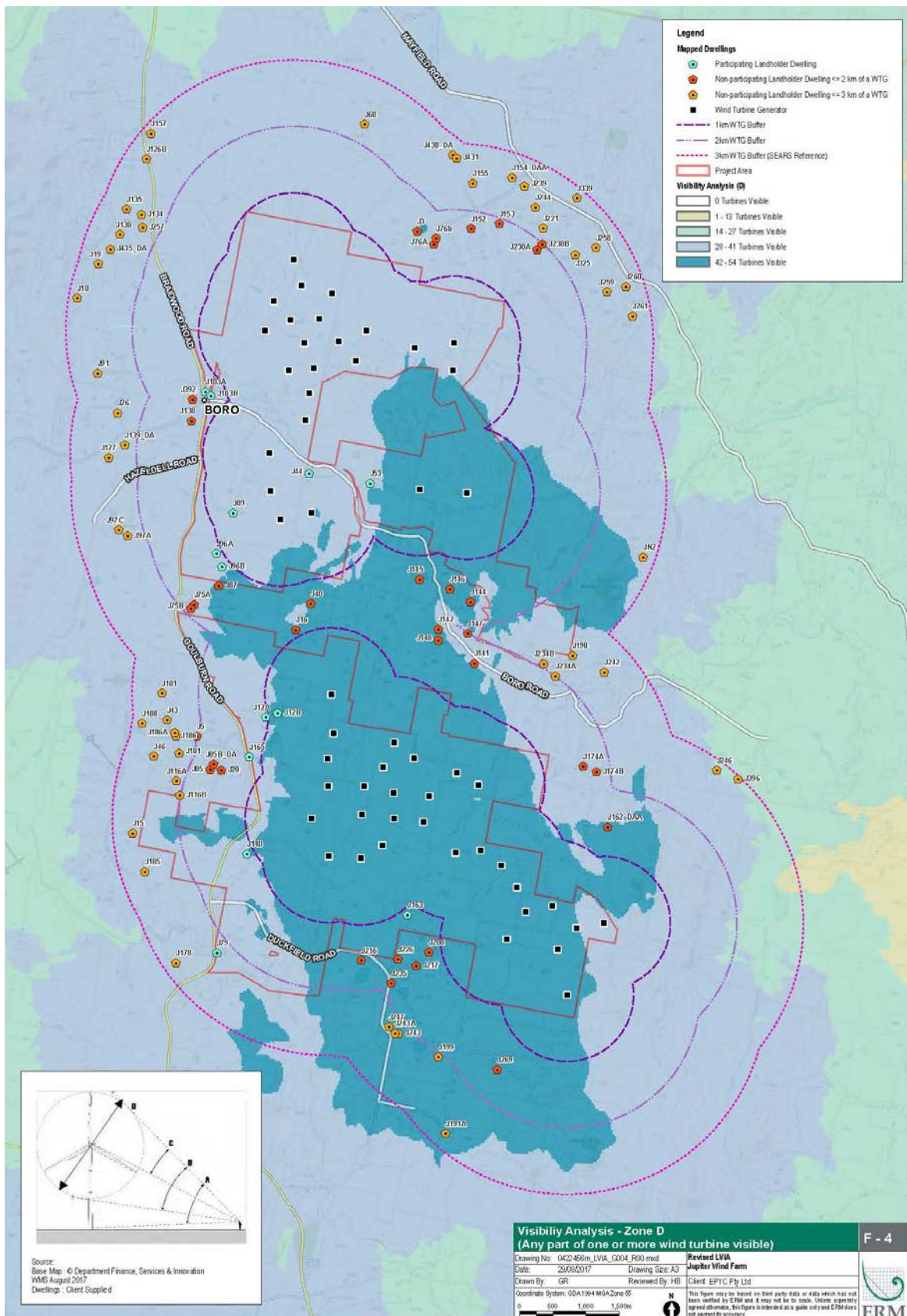


Figure 7.6 Zone D



7.6

The Relevance of this analysis to visual assessment

Examining degrees of turbine visibility (whole or part of turbines) determines locations from which the whole of one or many turbines are visible. Zone D shows those locations where any part (including the tip of a blade of a turbine) is visible.

The preceding seen area analysis shows clearly that the main areas that may be visually impacted by the Jupiter Wind Farm are within the 5.0 km Zone.

The mapping of Turbines in their entirety or the areas from which a blade tip is visible is not indicative of overall visibility, where Zone A is too narrow and Zone D too broad. Mapping for Zones B (swept path) and C nacelle and above) are the most useful.

Zone C (Nacelle and above) will be visible from many locations within the view shed. There will be views to the turbines in their entirety from very few locations. These locations are limited to the immediate west of the wind farm along sections of Braidwood Road on the western slopes of the Great Dividing Range.

The nature of the surrounding landscape including topography and vegetation means that there are no locations within the 20 km view shed where all turbines will be visible in their entirety. There are few locations within the 20 km view shed where all turbines will be visible from the nacelle and above.

The GIS studies show the potential for the wind turbines to be visible from many locations within residential and community areas within Tarago.

However, while topography will not screen views, existing buildings and vegetation readily screen views.

8 LANDSCAPE CHARACTER

Landscape Units are based on areas with similar visual characteristics in terms of topography and features, such as creeks and drainage lines, soil, vegetation and land use. The following sections describe the underlying patterns of these elements to derive the landscape units within the view shed.

The Jupiter wind farm is set within an areas of cleared farmland to the east of the Great Dividing Range and the west of an area of gently undulating, vegetated hills.

The landscape of the Jupiter Wind Farm comprises largely cleared flat to undulating farm land in the northern section to predominantly cleared rolling hills with rocky outcrops in the southern section.

Existing infrastructure includes roads, telecommunication towers, transmission lines and power lines.

8.1 Topography

Jupiter Wind Farm is located on flat plains and low hills to the south east of Tarago. The elevated hills of the Great Dividing Range are to the west, while lower more gently undulating hills lie to the east.

The topography within the viewshed can be described as rolling hills, often creating enclosed visual corridors through hills and vegetation. These characteristics are in part portrayed in the seen area analysis in section 7 of this report.

The Great Dividing Range to the west is of Braidwood Road is elevated above the plain on which the turbines are located. The landscape to the east is more complex comprising several geological patterns which are expressed through the topography. Several historical and abandoned mines are found within the landscape to the east. These can be seen from roads and tracks through forested areas. These hills are oriented roughly north-south.

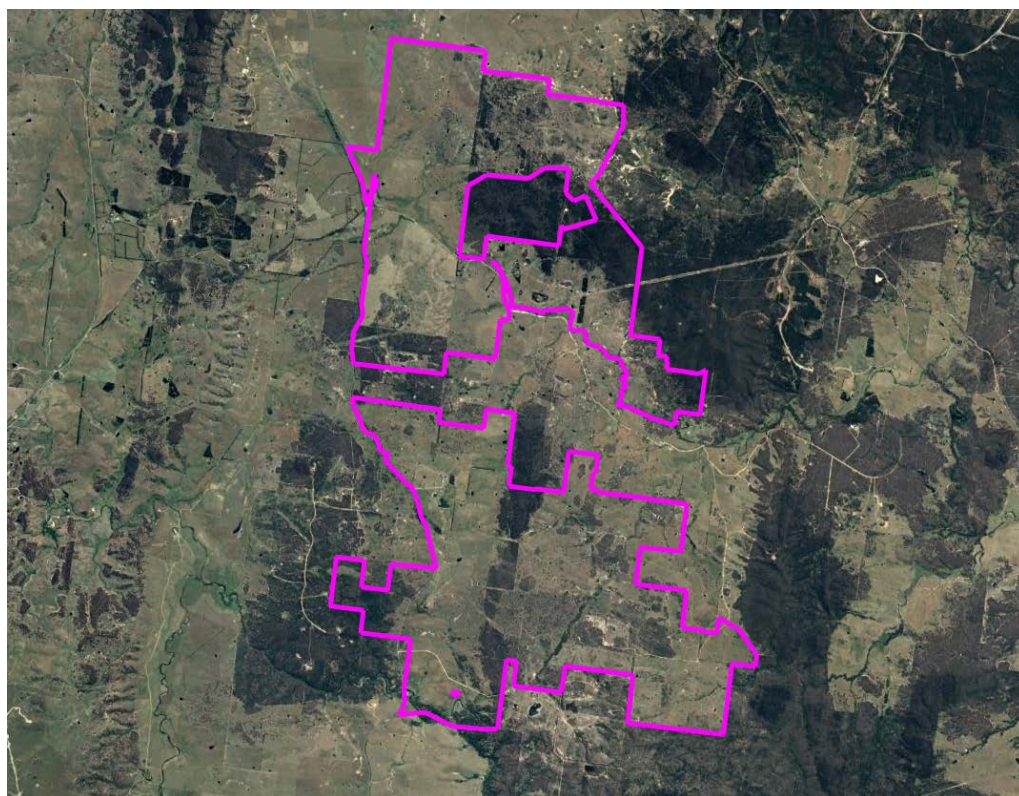
The upper turbine cluster is broadly located within an area of flat to gently undulating plains.

The lower turbine cluster characterised by low rolling hills.

8.2 Vegetation

The vegetation in part reflects the geomorphology of the area, and particularly soil quality and areas of steeper topography.

The majority of the landscape of the Jupiter wind Farm has been cleared for agricultural purposes. Figure 8.1 shows vegetation patterns within the project view shed.

Figure 8.1***Vegetation within the Project Viewshed***

Areas of higher quality soil and flatter topography have been cleared for agricultural use, while areas of poorer soils and steeper slopes were left vegetated. These cleared areas are usually the lower lying plains between hills and ridges.

This is evidenced by the vegetation retained on the steeper areas of the Great Dividing Range and areas more disturbed areas to the east of the Project.

The cleared agricultural land is on richer soils associated with alluvium deposits and better quality igneous material. In agricultural areas natural vegetation is limited to linear bands along streams, drainage lines and road sides or scattered trees. Linear shelterbelts are planted along property boundaries, roads and fence lines.

8.3**Land Use**

Land use and status within the relevant planning schemes assists to understand the significance of an area as identified within the relevant planning schemes. This is due in part to the permissible use and prevalence of that use within an area and the level of protection afforded to that area under the provisions of the planning schemes.

Baseline Study Requirements for the visual impact assessment of State Significant Wind Farm Developments are outlined in Appendix 1: Visual Assessment Process of the Wind Energy Assessment Bulletin for State Significant Wind Farm Developments, December 2016 (the Framework). A description of land uses that are potentially sensitive to visual impact brought about by a wind farm development at the National and State Level. Those that are potentially sensitive at the local level are described at the Local Environment Plan (LEP) level.

Table 3 of The Framework summarises sensitive land uses designations that are to be considered when assessing the visual impact of State Significant Wind Farm Development. Table 3 is reproduced below.

Table 8.1

Reproduced from Appendix 1: Visual Assessment Process of the Wind Energy Assessment Bulletin for State Significant Wind Farm Developments, December 2016

Table 3. Sensitive Land Use Designations

National and State Sensitive Land Use Designation	LEP Zones as per the NSW Standard LEP	
World Heritage Areas	RU5 Village	RE2 Private Recreation
National Parks	R1 General Residential	E1 National Parks and Nature Reserves
National Reserve System reserves	R2 Low Density Residential	E2 Environmental Conservation
Coastal Zone (under the <i>Coastal Protection Act 1979</i>)	R3 Medium Density Residential	E3 Environmental Management
Marine estate (under the <i>Marine Estate Management Act 2014</i>)	R4 High Density Residential	E4 Environmental Living
Commonwealth Heritage List Sites	R5 Large Lot Residential	W1 Natural Waterways
State Heritage Register Sites	SP3 Tourist	W2 Recreational Waterways
	RE1 Public Recreation	

Sensitive Land-uses that are the National and State Sensitivity level include the Tallaganda National Park and State Forest, approximately 18 km to the south west of the nearest turbine. The Scott Nature Reserve, located on the northern side of the Mulloon Road is approximately 8 km also to the south west.

The Project is located within an area's affected by the Goulburn Mulwaree Council to the north and the Palerang Council to the south. There are four land-use zones within the project area boundary as follows:

Goulburn Mulwaree LGA (Goulburn Mulwaree LEP)

- RU1 – Primary Production;
- RU2 – Rural Landscape; and
- E3 – Environmental Management.

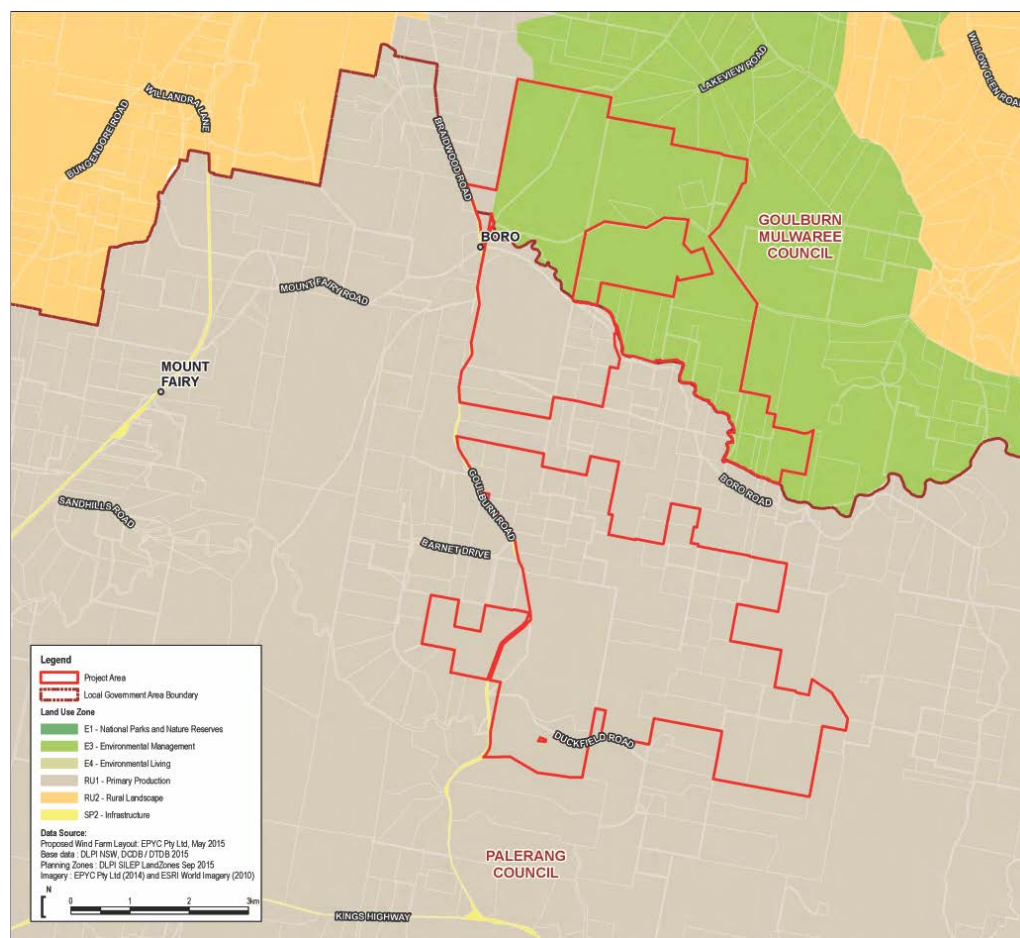
Palerang LGA (Tallaganda LEP)

- 1a – General Rural
- RU1 – Primary Production

Tarago, the majority of which is Zoned RU5 – Village is approximately 6.0 km to the north and is the closest established town in proximity to the Project. Figure 8.2 shows the land use zones within close proximity to the project site boundaries.

Figure 8.2

Land Use Zones



The area affected by the Sensitive Land-use E3 – Environmental Management is designated by the area shown in green.

The predominant land use with the view shed, that is the area within 20 km of a turbine is RU1 Primary Production and RU2 – Rural Landscape. Neither of which are identified as being a sensitive use within The Framework.

8.3.1

E3 – Environmental Management

The zoning map shown in Figure 8.2 illustrates the project area within zone E3 – Environmental Management under the Goulburn Mulwarre LGA. The objectives of zone E3 – Environmental Management are to:

- To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values.
- To provide for a limited range of development that does not have an adverse effect on those values.
- To facilitate the management of water catchment areas, environmentally sensitive land and areas of high conservation value.

Relevant to the assessment of visual impacts is the requirement to protect, manage and restore aesthetic values.

Much of the area affected by land-use Zone E3 – Environmental Management that is proposed to receive turbines is currently cleared and used for agricultural purposes. Areas that contain stands of remnant or intact native vegetation are largely excluded from the project area.

The construction of turbines would allow for the continued of this area for farming practices.

8.4 Landscape Units

There are 4 distinct landscape character types in the area surrounding the proposed Jupiter Wind Farm. These have been assessed on the basis of topography, geology and vegetation. These landscape character types can be defined as the following:

8.4.1 Landscape Unit 1 - Rural Townships



Landscape Unit 1 – Rural Townships describes the small rural townships within the view shed. Rural Townships are characterised by a cluster or residential dwellings around a main street with shops. Some townships have parks and reserves as well as community orientated buildings.

Vegetation within rural communities and townships are typically located within road reserves and residential gardens.

8.4.2 Landscape Unit 2 –Farmland

Landscape Unit 2 – Farmland are areas used primarily for agricultural purposes. There are many instances of constructed elements within this landscape type, including the road network, transmission lines and farm buildings and fences.

Many areas of Farmland within the viewshed has been fragmented into rural residential lots and is evident that this is a landscape capable of visual change.

This landscape unit includes two sub-units ‘The Plains’ and ‘Stony Rises’.

Sub Unit 2A ‘The Plains’

The Plains are characterised by gentle slopes. This landscape unit is predominantly cleared with remnant patches of vegetation occurring along drainage lines and creek beds, interspersed with shelterbelt planting and hedgerow planting.



Sub Unit 2B 'Stony Rises'

The stony are characterised granite tors and boulders scattered throughout the farmland landscape.



8.4.3

Landscape Unit 3 - Forested Hills

Landscape Unit 3 – Forested Hills describes areas that have considerable topographic variation and are covered in vegetation.



8.4.4

Landscape Unit 4 – Waterbodies

The ephemeral lakes of Lake George, to the west and Lake Bathurst to the north are both within the 20 km view shed of the project. Lake George is to the west of the project. The Seen Area Analysis shows that Project turbines would not be visible from Lake George.

The nearest shore of Lake Bathurst is approximately 5.0 km to the north. Lake Bathurst is an ephemeral lake surrounded by private property. As such there is no public access.

8.5

Landscape Sensitivity

Landscape sensitivity is in part a measure of the ability of a landscape to absorb visual change based and attributes of a particular landscape. The sensitivity of the previously described landscape units will depend upon a number of attributes, such as:

- **Location.** The sensitivity of a potential viewer varies according to location. For example, visitors to a National Park where the landscape appears untouched or pristine will be more sensitive to the imposition of new or artificial elements within that landscape. The same viewer travelling along a rural highway, which contains existing examples of modifications and artificial elements, will be less sensitive to the presence of new elements. Modifications or artificial elements are not confined to vertical structures or built form, they also include removal of native vegetation; visibility of roads, tracks, fences and other rural infrastructure all of which decrease the sensitivity of a landscape to further change.
- **The rarity of a particular landscape.** Landscapes that are considered rare or threatened are valued more highly by viewers.
- **The scenic qualities of a particular landscape.** Landscapes that are considered scenic are also those that are considered sensitive. They often contain dramatic topographical changes, the presence of water, coastlines, and other comparable features. The presence of modifications or artificial elements (including built form, roads, tracks, fences, and silos), as well as farming practices including land clearing, cropping and burning can decrease the sensitivity of a landscape's scenic qualities.

The pre-European landscape surrounding the Jupiter Wind Farm has been heavily modified through agricultural practices and clearance of native vegetation. The landscape within the view shed includes many constructed elements including houses and outbuildings, sheds, 330kV high voltage transmission line towers, wind mills, mining and other signs interventions.

The landscape sensitivity of the Farmland 'Plains' Landscape Unit is considered low, as it is relatively common across a large area of the southern tablelands of NSW and undergoes visually apparent changes regularly. Rural structures and associated activities like animal grazing, use of tractors, crop cycles and changes associated with farming and agriculture are constant reminders of human influence on the landscape. However, it must be recognised that some people value the cleared farmland with minimal signs of mechanised construction such as houses, farm sheds and the like. The presence of wind turbines may be perceived as a high visual impact due to the presence of large scale structures on a rural landscape to these viewers.

The landscape sensitivity of the Vegetated Slopes Landscape Unit is considered medium to high, as although it too is relatively common, it appears more pristine or natural than the Farmland 'Stony Rises' landscape unit.

The Rural Townships Landscape Unit is considered to have a medium sensitivity. This is based on the higher number of residents and the historical setting. The village settlement has limited views to the surrounding landscape which is screened by buildings and roadside vegetation.

Table 8.2 rates the sensitivity of the various landscape units within the view shed of the Jupiter Wind Farm.

Table 8.2 *Landscape Sensitivity*

Landscape Unit	Sensitivity
Unit 1 - Rural Townships	Medium - Abundance of built forms and other visual elements lessen the sensitivity of these areas. However as these are urban areas with many houses, the landscape sensitivity is rated medium.
Unit 2a - Farmland 'The plains'	Low - This unit is highly modified, contains visible infrastructure, is not topographically dramatic and does not contain large bodies of water.
Unit 2b - Stony Rises	Medium - This landscape is largely cleared of vegetation however the steeply folded hills create an appealing landscape.
Unit 3 - Forested Hills	Medium to High - This landscape is attractive as it contains areas that appear pristine.
Unit 4 - Water Bodies	High

These landscape sensitivity ratings will be used to assess the visual impact of views from publicly accessible locations within the view shed.

Landscape sensitivity from individual residential properties will always be assessed as "high" as for a resident, their home will always be a highly sensitive location and disturbances to a resident's views must always be considered to have the highest degree of sensitivity.

9 PUBLICLY ACCESSIBLE VIEWPOINTS

This chapter will assess the visual impact of the Project by assessing the visual impact from selected viewpoints. All viewpoints are located within the Project's ZVI and have been selected based on the Seen Area Analysis where the proposed WTGs will be most noticeable. As such the viewpoint assessment forms a conservative assessment based on "worst case" locations.

9.1 Viewpoint locations

36 viewpoints have been selected from publicly accessible locations within the view shed of the Project. The publicly accessible viewpoints are typically selected on the following basis:

- their potential to indicate the scale and extent of the Project at varying distances;
- their proximity to landscape features such as water bodies and volcanic cones;
- where a viewer has a likelihood to pause and have a view to the Project such as gaps in roadside vegetation or near road intersections.
- where it is indicative of the landscape characters defined within the viewshed

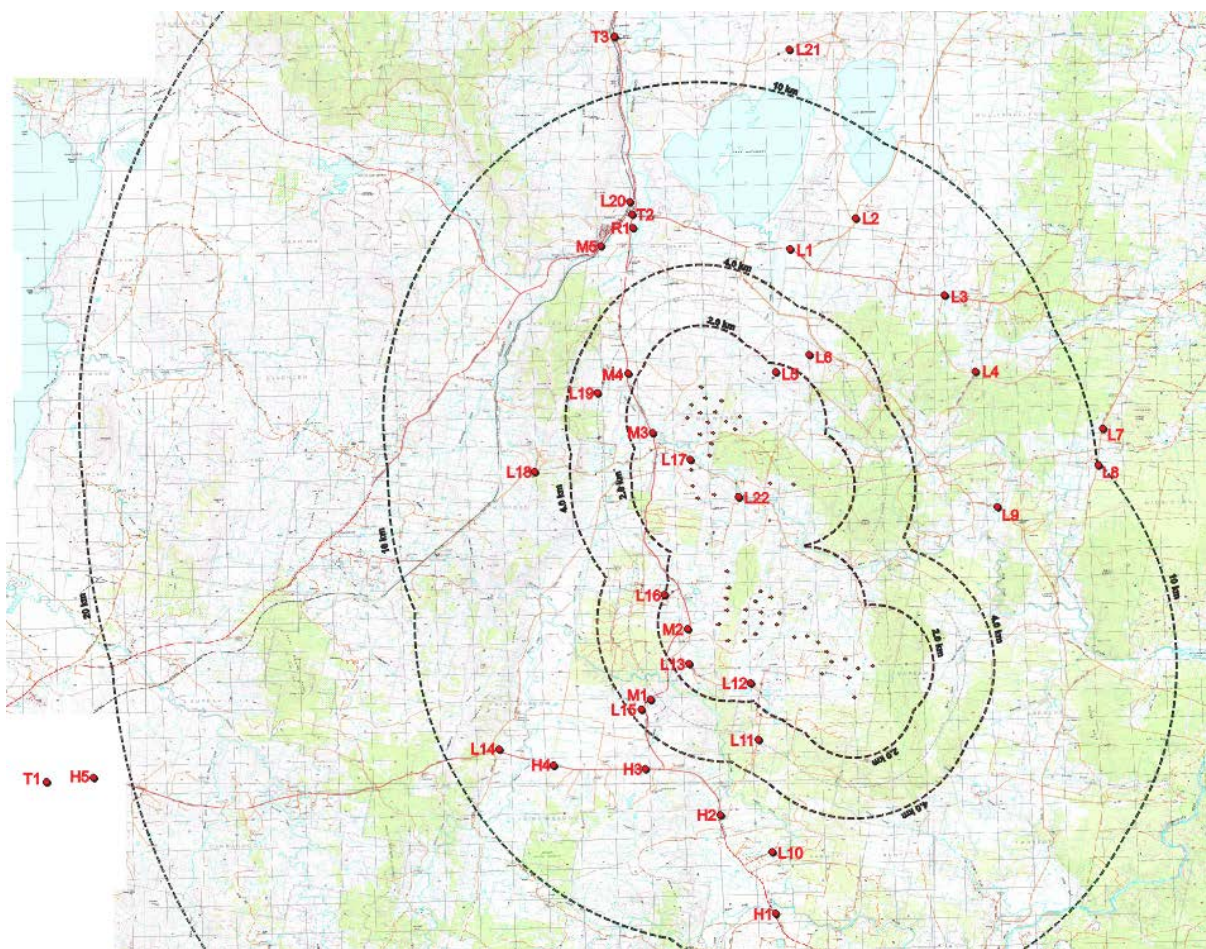
The viewpoints are generally located where direct views to the Project are available. In some viewpoints, there may be roadside vegetation or vegetation within properties that filter views to the Project and, as such, these are representative of the general landscape character of the area. It is acknowledged that there may be views to the Project available from nearby locations on the road network. In all, the 36 indicative viewpoints are representative of the views available from diverse locations within the viewshed, in diverse distance ranges and within the various landscape units.

The visual impact from each of the 36 selected viewpoints is discussed in the following sections to build up an overall assessment of the visual impact of the Project. A number of viewpoints with similar locational attributes are grouped together and discussed to ascertain the overall visual impact from the different areas or locations. Table 9.1 lists the viewpoints that have been assessed to give an indication of the overall visual impact of these areas.

Table 9.1 *Publicly Accessible Viewpoints*

Viewpoint Group	Viewpoint numbers
Townships & Reserves	Viewpoint T1, T2, T3 and R1
Highways	Viewpoint H1-H5
Major Roads	Viewpoint M1-M5
Local Roads	Viewpoint L1-L22

The locations of each of these viewpoints are shown in Figure 9.1. A separate location plan accompanies the discussion of each viewpoint.

Figure 9.1 *Viewpoint Location Map*

All of these viewpoints are taken from along or adjacent to roads. The visual impact of the proposed transmission line is discussed in viewpoint L22. The visual impacts of the substation facilities are discussed in viewpoint L22.

9.2 Photomontages

Photomontages are used within the report to show the anticipated change due to the wind turbines to the existing landscape.

Photomontages have been prepared from Viewpoints M1 and M4. These viewpoints are located at varying distance to the Project and are indicative of the views from the road network within the view shed.

It is recognised that the small photographs and photomontages depicted within this assessment are not indicative of the actual visual impact. They have been included in this assessment as a reference for the discussion and assessment. The A3 images which are appended to this report (Annex B) are clearer, however to view the photomontages in a way that they appear perceptually accurate, they need to be printed and viewed on A0 sized sheets and held at arms' length. Further, for each viewpoint, photomontage of one or more 60° field of view is shown for consistency and comparison. When viewed at A0 the photomontages are representative of the level of visual alteration. The methodology behind the photomontages are also appropriate.

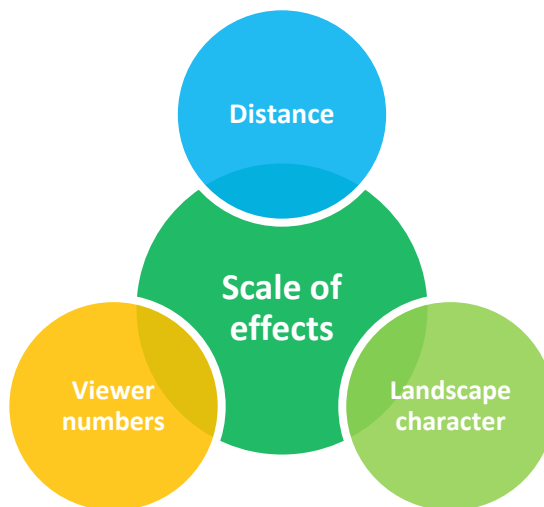
9.2.1 GPS Coordinates and distance to the nearest wind turbine

The Nikon D3 camera also records the GPS coordinates as part of the metadata. GPS coordinates are also taken based on a separate hand held GPS and the locations from which the photographs were taken is also marked on a digital map at the location of each photograph.

GPS Co-ordinates are provided for each viewpoint location at the beginning of each section in Chapter 9 along with the location and distance to the nearest wind turbine.

9.2.2 Assessment of visual impact

The assessment of visual impact and the associated scale of effects are primarily based on the assessment of three parameters, namely distance, viewer numbers and landscape character / sensitivity.



9.2.3 Distance

Distance ranges, or Zones of Visual Influence (ZVI) are one parameter used within this assessment to determine the influence that distance has on assessing the visual impact of the Project. For example, the visibility of turbines is less at 20 km than the visibility of a WTG seen from 2.0 km. This is based on the view shed zones discussed in Chapter 6.

9.2.4 Viewer numbers at publicly accessible viewpoints

In a visual assessment, it is important to differentiate between a “visual impact” and a “landscape impact.” Viewer numbers are important in the assessment of a visual impact, as if

few people see a particular development then the visual impact is reduced, even though there may be a significant change to the landscape and hence a large landscape impact.

When assessing the viewer numbers at viewpoints along roads within the view shed, the viewer number have been based on traffic New South Wales Route Classifications found at ([rms statistics traffic-volumes map](#)) Freeways, highways, and roads with two way sealed traffic lanes including Kings Highway have been given a rating of high viewer numbers. Two-lane roads such as Braidwood-Goulburn Road and Tarago-Bungendore Road are rated as medium level of viewer numbers. Single lane asphalt and unsealed roads, which are not part of this New South Wales road classification system, are given a low level of viewer numbers.

9.2.5 Landscape character

The landscape character and the sensitivity of the landscapes within the view shed have been discussed in Chapter 8.

9.2.6 Scale of Effects

The overall visual impact of the Project from an indicative publicly accessible viewpoint has been assessed using the following scale:

- **Negligible effect** – minute level of effect that is barely discernible over ordinary day-to-day effects.
- **Low adverse effect** – adverse effects that are noticeable, however will not cause any significant adverse impacts.
- **Medium adverse effect** – significant effects that may be able to be mitigated and/ or remedied.
- **High or unacceptable adverse effect** – extensive adverse effects that cannot be avoided, remedied or mitigated.

Negligible effect:

Minute level of effect that is barely discernible over ordinary day-to-day effects.

The assessment of a “negligible” level of impact is usually based on distance. That is, the Project is at such a distance that, when visible in good weather, it would be a small element in the view. Where a view is already highly modified or the view already contains similar modifications to that which is being proposed, the impact that the Project would have on that view could be negligible. However, sometimes the screening afforded by vegetation can lead to a similar level of assessment, as can a minor change to an existing development.

Low adverse effect:

Adverse effects that are noticeable however will not cause any significant adverse impacts.

The assessment of a “low” level of impact can be derived if the rating of any one of three factors, that is distance, viewer numbers and landscape sensitivity, is assessed as low. The reasoning for this “low” assessment is as follows:

- If the viewer numbers and landscape sensitivity were high, however the viewing location is at such a distance (i.e. beyond 10 km) that the Project elements are only just visible in the landscape, then the overall visual impact would be low.
- If viewer numbers were low, (i.e. few people can see the Project from the nominated publicly accessible viewpoint) then even if the Project was close to the viewpoint and the landscape sensitivity was high, the overall visual impact would be low because the change to the landscape is not seen by many viewers. If landscape sensitivity was low or

the landscape was already highly modified then even if the Project was in close proximity to the viewpoint and it was visible to a large number of viewers, the overall visual impact would be low because the viewpoint is not in a landscape of such sensitivity that further change would be unacceptable.

Medium adverse effect

Significant effects that may be able to be mitigated and / or remedied.

The assessment of a “medium” adverse effect will depend upon all three assessment criteria being assessed as higher than “low.”

High or Unacceptable adverse effect

Extensive adverse effects that cannot be avoided remedied or mitigated.

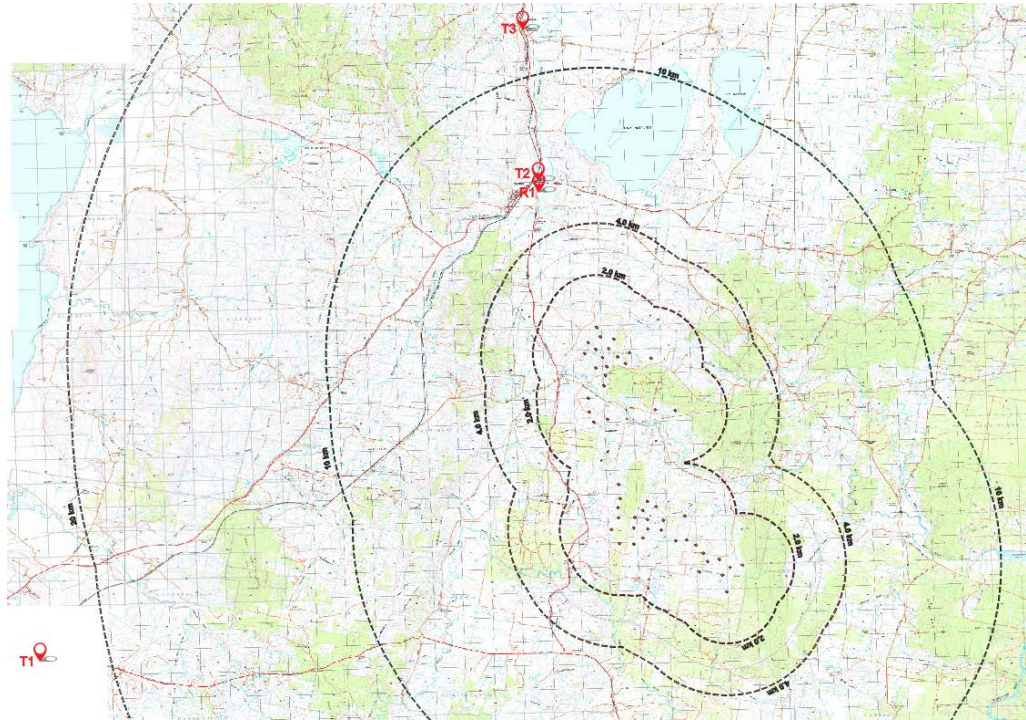
The assessment of a “high” or “unacceptable” adverse effect from a publicly accessible viewpoint usually requires the assessment of all these three elements to be high. For example, a highly sensitive landscape, viewed by many people, with the development in close proximity would lead to an assessment of an unacceptable adverse effect. This assessment is also usually based on the assumption that such a view cannot be mitigated. An example may be a well-frequented viewpoint in a National Park, with the Project located in close proximity to a viewpoint that currently overlooks what appears to be a natural, pristine, un-modified landscape. Landscape treatment would block this view and even though it would mitigate the view to the Project, such treatment would be unacceptable, as it would also block the view from the lookout.

This scale will be used when describing the overall visual impact of the Project from indicative publicly accessible viewpoints, which are discussed in the following sections.

9.3 Townships and Reserves

This section will examine the potential visual impact from Rural Townships and Reserves within the Project viewshed.

Figure 9.2 *Township Viewpoints*



There are three main rural communities within the viewshed of the Project. Four viewpoint locations, T1, T2, T3 and R1 have been selected within the townships and reserves surrounding the Project viewshed. The corresponding GPS co-ordinates and approximate distance to nearest WTG are listed below.

Table 9.2 *Township and Reserve Viewpoints*

Viewpoint No.	GPS Co-ordinates	Approximate distance and direction of nearest WTG	Landscape Unit
T1 - Bungendore	(55H, 722068, 6095804)	22.8km North East (T9)	Unit 1 - Medium
T2 - Tarago	(55H 742060, 6116002)	6.3km south east (T49)	Unit 1 - Medium
T3 - Lake Bathurst Township	(55H 741665, 6122424)	12.6km south east (T49)	Unit 1 - Medium
R1 - Tarago Showgrounds	(55H 741946, 6113925)	4.4km south east (T49)	Unit 2A - Low

The following section examines each of these viewpoints.

9.3.1 Viewpoint T1 – Bungendore

Viewpoint T1 is located along the Kings Highway in Bungendore. Bungendore is approximately 22km from the closest turbine (T9) and therefore located just outside of the Viewshed, however is the largest town within the area.

Figure 9.3

Viewpoint T1 (55H, 722068, 6095804)



Figure 9.4

Viewpoint T1 – view looking west along Kings Highway



Figure 9.5

Viewpoint T1 – view looking east along Kings Highway



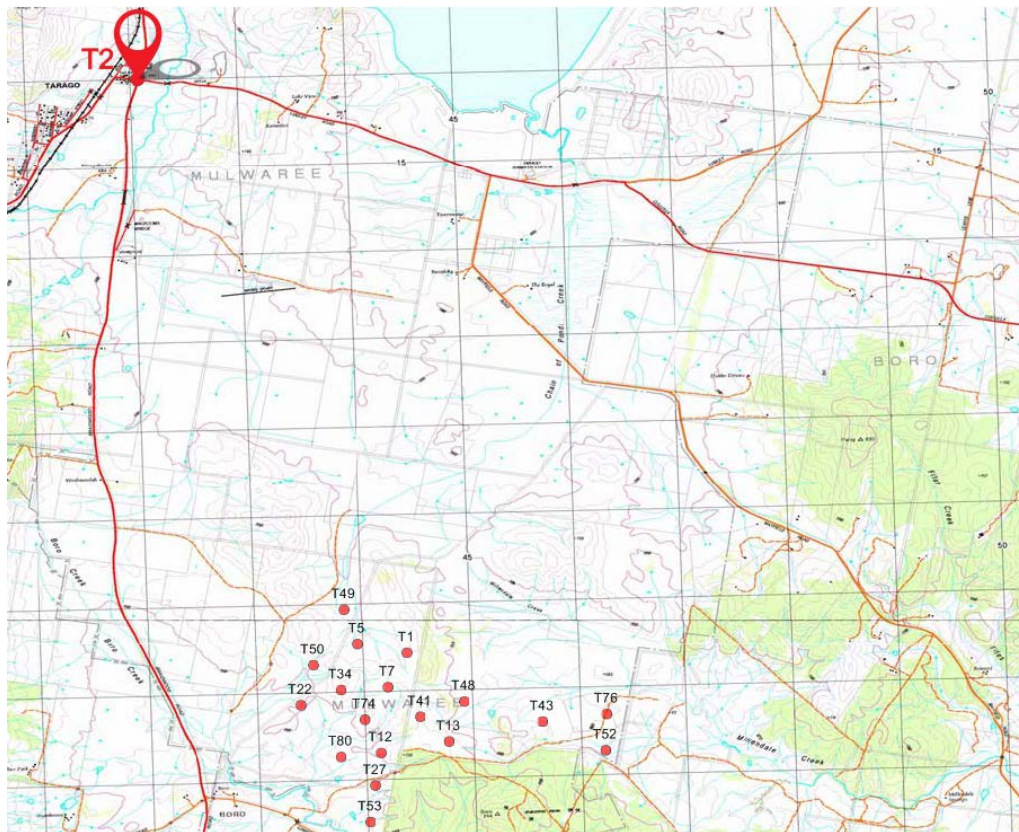
There will be no views to the Project from Bungendore Township. Even on the outskirts at a distance of approximately 22km the wind turbines would be visually insignificant. For these reasons, the overall visual impact for Bungendore would be assessed as Nil.

9.3.2 Viewpoint T2 – Tarago

Viewpoint T2 is located in Tarago. The nearest wind turbine (T49) is approximately 6.3km south east.

Figure 9.6

Viewpoint T2 (55H 742060, 6116002)



Viewpoint T2 is within the Landscape Unit 1 – Rural Townships. Views from the edge of town towards the proposed WTGs are over Landscape Unit 2a – ‘The Plains’. Figure 9.7 shows the view looking south east from Wallace Street with the Loaded Dog Hotel in the right of the image.

Figure 9.7

Viewpoint T2 – view looking south east from Wallace Street



When looking south east the landscape is predominantly cleared flat farmland with hedgerow/wind break planting. There are many constructed elements within this view,

including buildings, signs and powerlines. Figure 9.8 shows the view from the edge of Tarago at the corner of Lumley and Braidwood Roads.

Figure 9.8

Viewpoint T2 – View looking south east from corner of Lumley Road and Braidwood Road



At 6 km the proposed WTGs will be noticeable however they will not dominate views. Street signage, existing overhead powerlines and other infrastructure would be more noticeable in the view than the proposed turbines at this distance.

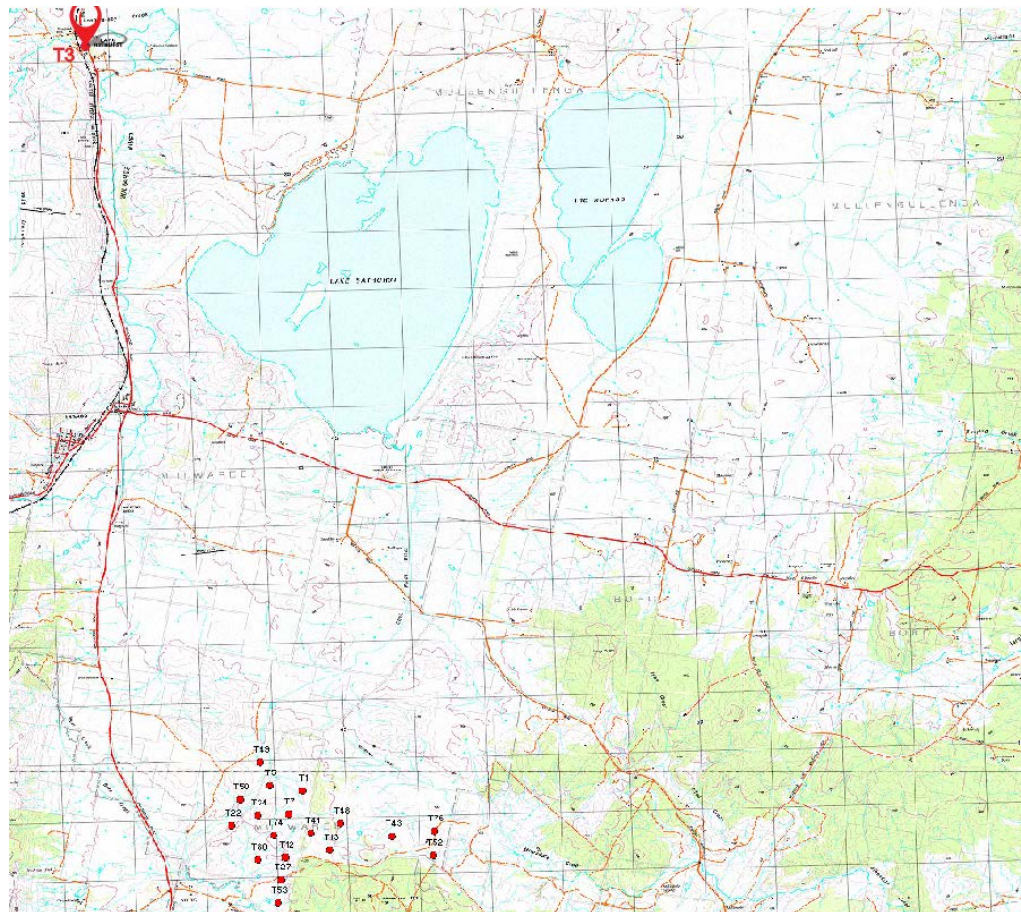
Further, existing vegetation along creek lines and roadsides will filter views to the Project. For these reasons the overall visual impact would be **negligible**.

9.3.3 Viewpoint T3 – Lake Bathurst Township

Lake Bathurst Township is a small rural township approximately 6km north of Tarago along Braidwood Road. The nearest turbine (T49) is approximately 12.6km south east.

Figure 9.9

Viewpoint 3 (55H 741665, 6122424)



Viewpoint T3 is located within the Landscape Unit 1 – Rural Townships. Figure 9.10 shows the view looking south east towards the Project from Braidwood Road.

Figure 9.10

Viewpoint T3 – View looking south east from Braidwood Road



From the majority of the Lake Bathurst township the existing vegetation, buildings and infrastructure will screen views to the Project. Figure 9.11 shows the view from the southern outskirts of Lake Bathurst Township looking southeast to the Project.

Figure 9.11 *Viewpoint T3 – View looking southern edge of Lake Bathurst Township*



At a distance of 12.6km the proposed wind turbines would be potentially noticeable however they will not dominate the view.

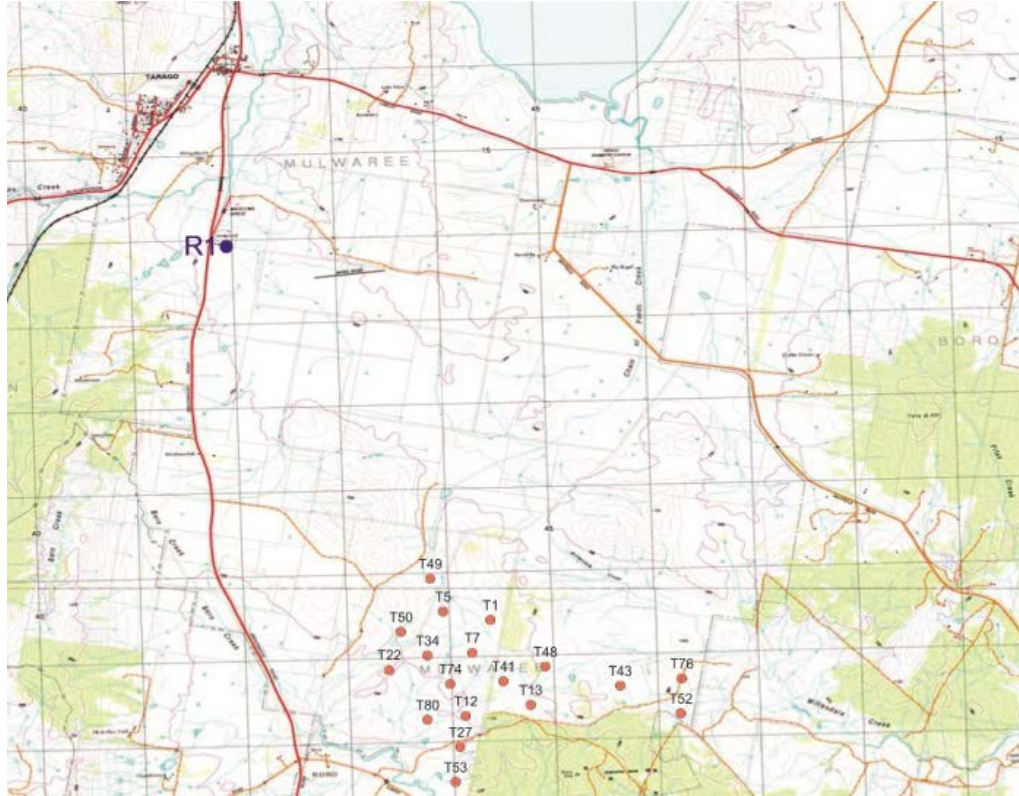
Existing infrastructure and vegetation in the foreground will be the dominant elements in the view. Existing topography and vegetation between this viewing location and the project will also filter views to the turbines.

For these reasons, the overall visual impact will be assessed as **Nil** from the Lake Bathurst township and **Negligible-Nil** from the outskirts.

9.3.4 Viewpoint R1 - Tarago Showgrounds

The Tarago Showground is located approximately 2.0km south of Tarago along Braidwood Road. The nearest turbine (T49) is approximately 4.4km south east.

Figure 9.12 Viewpoint R1 (55H 741946, 6113925)



Viewer numbers are generally Low however would be High during times of an event or carnival.

Figure 9.13 Viewpoint R1 – view looking south from the showgrounds entrance



The proposed turbines would be visible from the entrance to the shows grounds, the oval north of the main pavilion and the southern boundary.

Figure 9.14 *Viewpoint R1 – view looking south east at edge of show grounds*



Views from the sheds and stand would be towards the north away from the proposed Wind Farm.

Figure 9.15 *Viewpoint R1 – View of sheds/stands*



Views to the turbines would be screened by existing sheds, buildings and other structures when in close proximity to the main pavilion. For these reasons the overall visual impact would be **low-negligible**.

9.3.5 Townships and Reserves Overall Visual Impact

Viewpoints T1 and T2 were taken from townships within the viewshed. Townships are rated to have a medium level of landscape sensitivity. Viewpoint R1 was located at the Tarago Showgrounds. The Tarago Showground is outside of the township area and is located within the Landscape Unit 2A 'The Plains'.

The evaluation of each of these viewpoints is summarised in Table 9.3.

Table 9.3 *Overall Visual Impact of Townships and Reserves*

Viewpoint No.	Approximate distance and direction of nearest WTG	Visual Impact
T1 - Bungendore	22.8km North East (T9)	Nil
T2 - Tarago	6.3km south east (T49)	Negligible
T3 - Lake Bathurst Township	12.6km south east (T49)	Nil from Township Negligible - Nil from outskirts
R1 - Tarago Showgrounds	4.4km south east (T49)	Low-negligible
OVERALL VISUAL IMPACT		NEGLIGIBLE

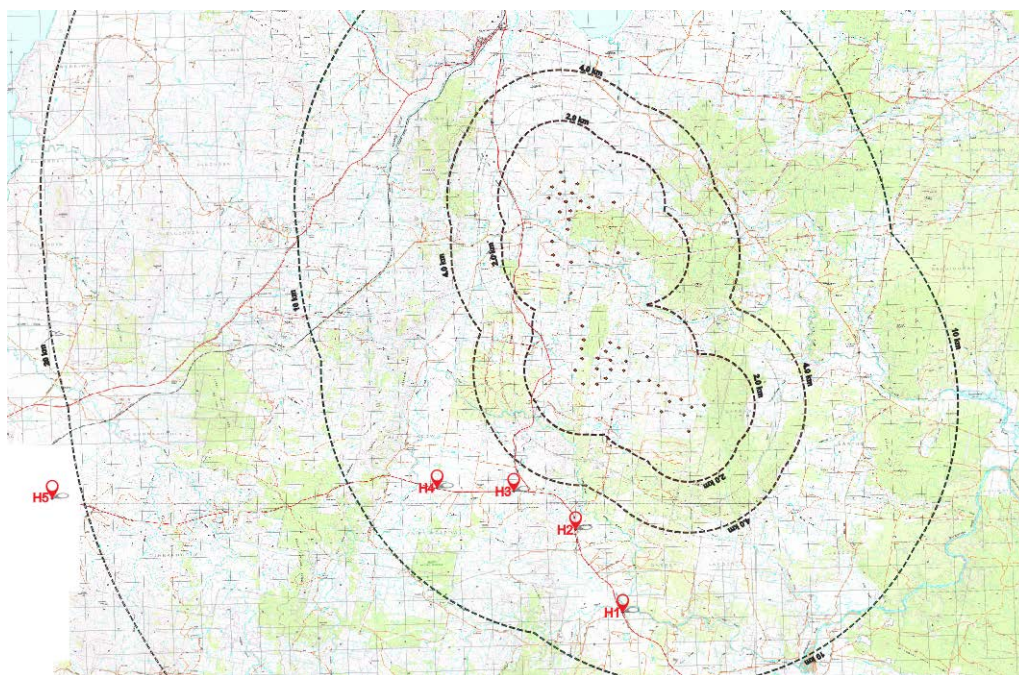
The following section examines views from Highways.

9.4 Highways

This section will examine the potential visual impact from the Kings Highway to the south of the Project.

The Kings Highway is sealed road that runs from Batemans Bay on the east coast to Canberra. The Kings Highway runs along the southern section of the viewshed. It is classified as 3R in the NSW Roads Classification and assessed as having an average of 4,500 trips per day in the traffic report written by GTA Consultants. The viewer numbers for the Kings Highway would be assessed as **High**.

Figure 9.16 Highway Viewpoints



Five viewpoints have been selected along the Kings Highway. The corresponding GPS co-ordinates and approximate distance to nearest WTG are listed below.

Table 9.4 Highway Viewpoints

Viewpoint No.	GPS Co-ordinates	Approximate distance and direction of nearest WTG	Landscape Unit
H1 – Kings Highway	(55H 745473, 6091277)	8.0km north east (T45)	Unit 2A - Low
H2 – Kings Highway	(55H 743936, 6094842)	5.6km north east (T45)	Unit 3 - Medium
H3 – Kings Highway	(55H 741620, 6096487)	5.2km north east (T40)	Unit 2A - Low
H4 – Kings Highway	(55H 739307, 6096666)	6.6km north east (T40)	Unit 2A - Low
H5 – Kings Highway	(55H 723366, 6095556)	21.5km north east (T9)	Unit 2A - Low

The following section examines each of these viewpoints.

9.4.1 Viewpoint H1 – Kings Highway

Viewpoint H1 is located on the Kings Highway south of Manar Road. The nearest WTG (T45) is approximately 8.0km north east.

Figure 9.17 Viewpoint H1 (55H 745473, 6091277)

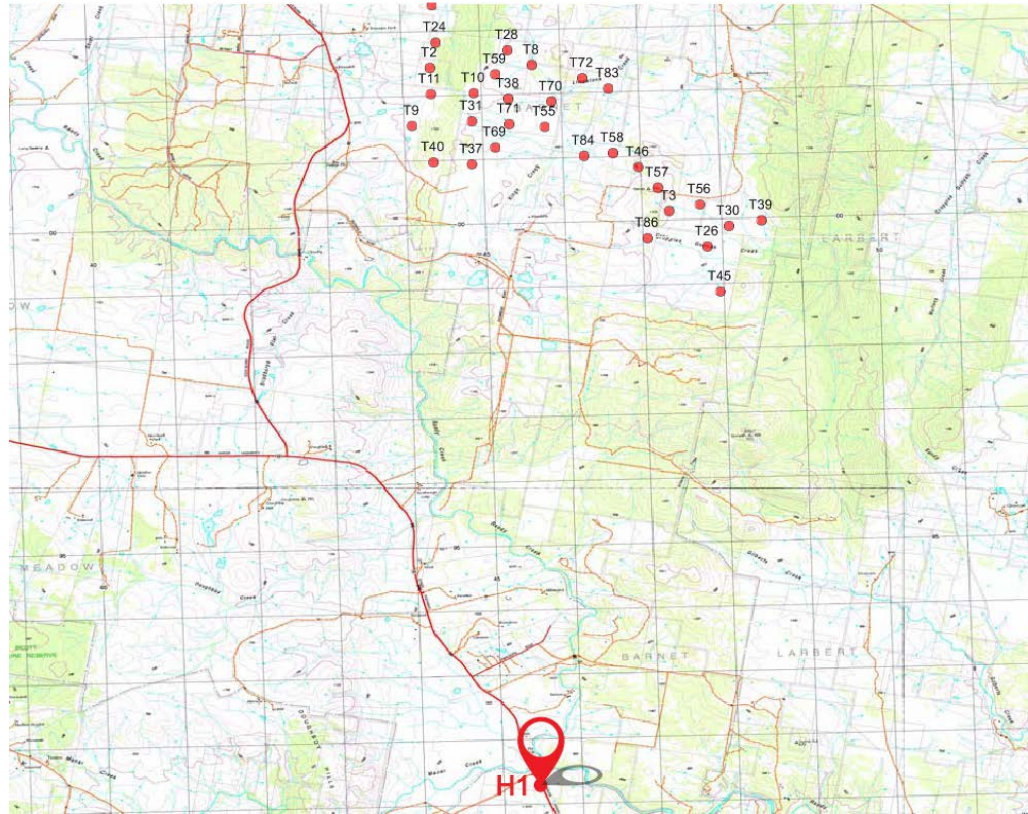


Figure 9.18 shows the view looking north towards the Project from this section of the Kings Highway.

Figure 9.18 Viewpoint H1 – View looking north



The wind farm would be located to the right of the image. Within this view scattered vegetation along the roadside and within properties would most likely screen views to the turbines.

At approximately 8.0 km, existing overhead powerlines and other infrastructure would be more noticeable in the view than proposed turbines at this distance. For these reasons the overall visual impact would be **Negligible**.

9.4.2 Viewpoint H2 – Kings Highway

Viewpoint H2 is located on the Kings Highway south of Doughboy Creek. The nearest WTG (T45) is approximately 5.6km north east.

Figure 9.19

Viewpoint H2 (55H 743936, 6094842)

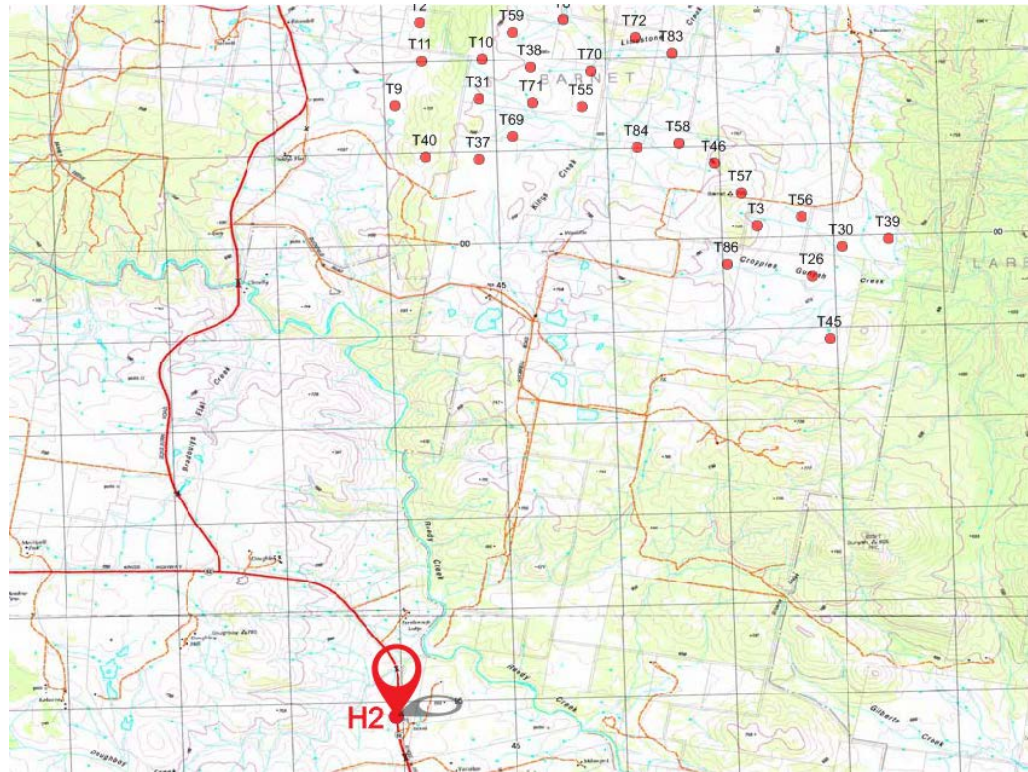


Figure 9.20 shows the view looking north towards the Project. There is extensive vegetation on either side of the Kings Highway through this section.

Figure 9.20

Viewpoint H2 – view looking north



The project will be visible for a narrow section of the view afforded by the break in vegetation for the roadway, for the small section of road where the road runs north/south.

At a distance of approximately 5.6km the turbines will be noticeable, however will appear smaller than the existing trees in the view. For these reasons, the overall visual impact would be assessed as **low-negligible**.

9.4.3 Viewpoint H3 – Kings Highway

Viewpoint H3 is located on the Kings Highway west of Goulburn Road. The nearest WTG (T40) is approximately 5.2km north east.

Figure 9.21

Viewpoint H3 (55H 741620, 6096487)

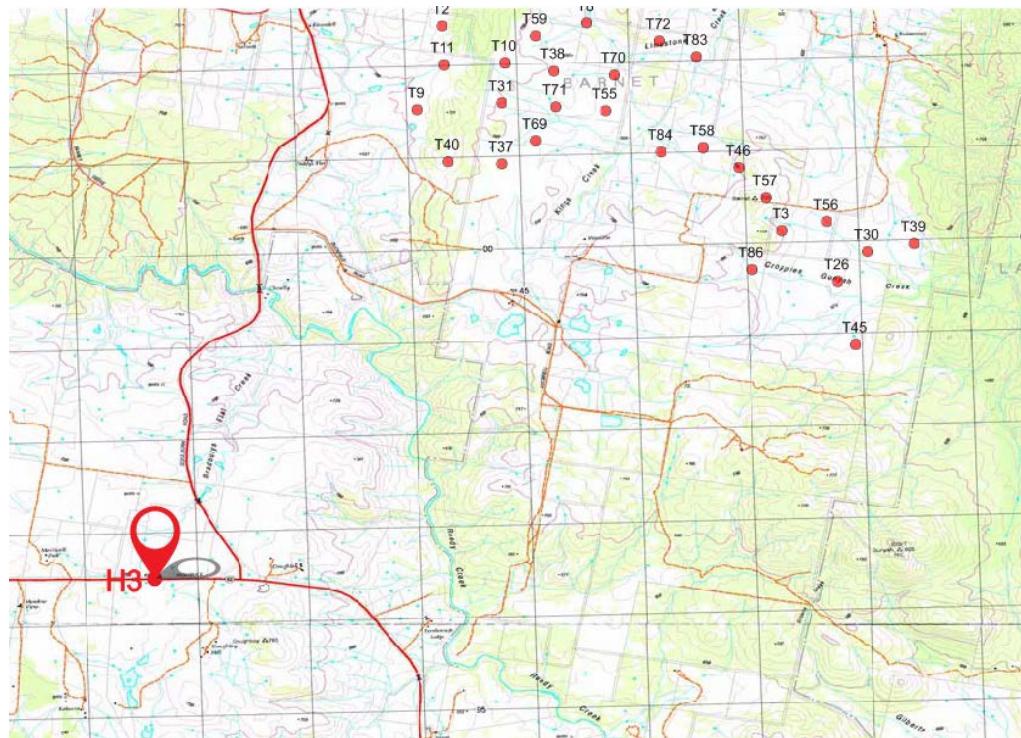


Figure 9.22 shows the view looking north east towards the Project from the Kings Highway. The view is across Landscape Unit 2A 'The Plains', it is mainly cleared flat farmland with scattered vegetation along boundaries and views to small Forested Hills behind.

Figure 9.22

Viewpoint H3 – view looking north east



Along this section of the Kings Highway there is limited roadside vegetation along the northern side which allows views towards the Project. At a distance of 5km the turbines will be noticeable, however this is a fleeting view taken by someone travelling along the Freeway at 100km/hr. For these reasons the overall visual impact would be assessed as **Low**.

9.4.4 Viewpoint H4 – Kings Highway

Viewpoint H4 is located on the Kings Highway to the east of Mulloon Creek. The nearest WTG (T40) is approximately 6.6km north east.

Figure 9.23

Viewpoint H4 (55H 739307, 6096666)

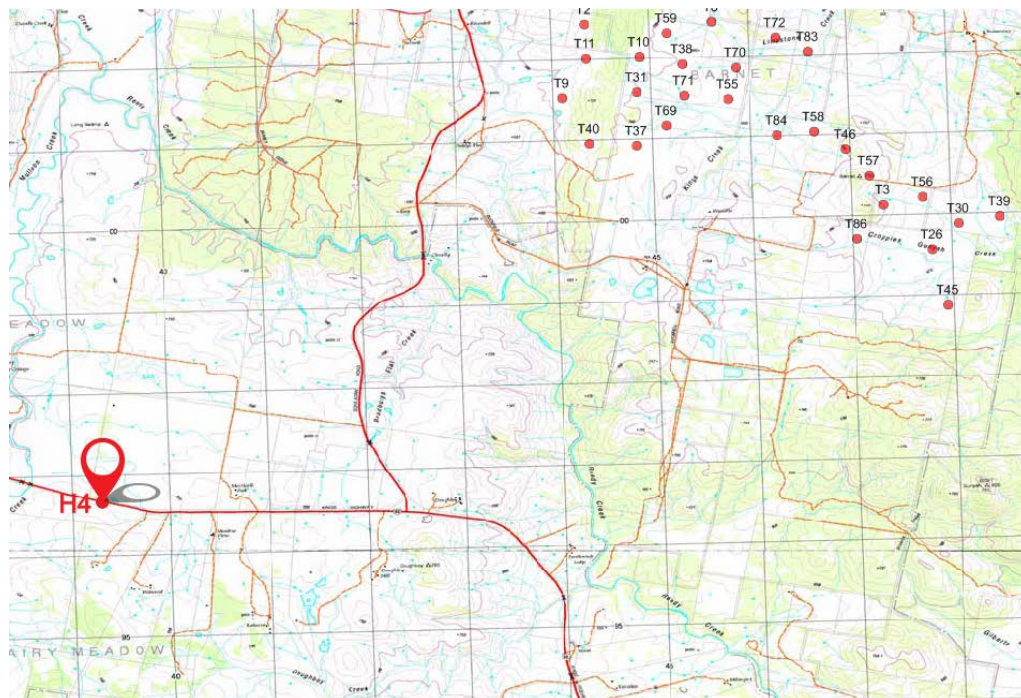


Figure 9.24 shows the view looking north east from the Kings Highway. This is a view that would be seen from someone travelling from Bungendore in an easterly direction. This view is taken from a section of the Kings Highway where there is limited roadside vegetation on the northern side of the road allowing for views towards the Project.

Figure 9.24

Viewpoint H4 – view looking north east



Viewpoint H4 looks across Landscape Unit 2A 'The Plains'. Vegetation is limited to scattered trees and windbreak planting along boundaries. There are clear views through to the project, however at approximately 6.6km to the nearest turbine and when travelling at speed along the Kings Highway this will be a fleeting view. For these reasons, the overall visual impact would be assessed as **Low-negligible**.

9.4.5 Viewpoint H5 – Kings Highway

Viewpoint H5 is located on the outskirts of Bungendore. The nearest WTG (T9) is approximately 21.5km north east.

Figure 9.25 Viewpoint H5 (55H 723366, 6095556)



Figure 9.26 shows the view looking north east as you exit Bungendore along the Kings Highway.

Figure 9.26 Viewpoint H5 – view looking north east



The view is across Landscape Unit 2A 'The Plains' with Landscape Unit 3 'Forested Hills' in the background. At a distance of over 20km even without intervening vegetation, the overall visual impact would be assessed as **negligible-nil**.

9.4.6 Highway Overall Visual Impact

Viewpoints H1-H5 were taken from the Kings Highway to the south of the Project.

Views from Highway viewpoints are across a number of Landscape Units, from Landscape Unit 2A 'The Plains' which has a low sensitivity to Landscape Unit 3 with a medium sensitivity.

The closest views from the Kings Highway are approximately 5.0km from the nearest turbine. At this distance the wind turbines would be noticeable but would not dominate the view.

While it is recognized that the viewer numbers of Highways would be high, these viewers would be travelling at speeds up to 100km/hr.

For this reason, the overall visual impact of Highways would be assessed as **Negligible**.

The evaluation of each of these viewpoints is summarised in Table 9.5.

Table 9.5

Overall Visual Impact of Highways

Viewpoint No.	Approximate distance and direction of nearest WTG	Visual Impact
H1 - Kings Highway	8.0km north east (T45)	Negligible
H2 - Kings Highway	5.6km north east (T45)	Low-Negligible
H3 - Kings Highway	5.2km north east (T40)	Low
H4 - Kings Highway	6.6km north east (T40)	Low-Negligible
H5 - Kings Highway	21.5km north east (T9)	Negligible-Nil
OVERALL VISUAL IMPACT		LOW - NEGLIGIBLE

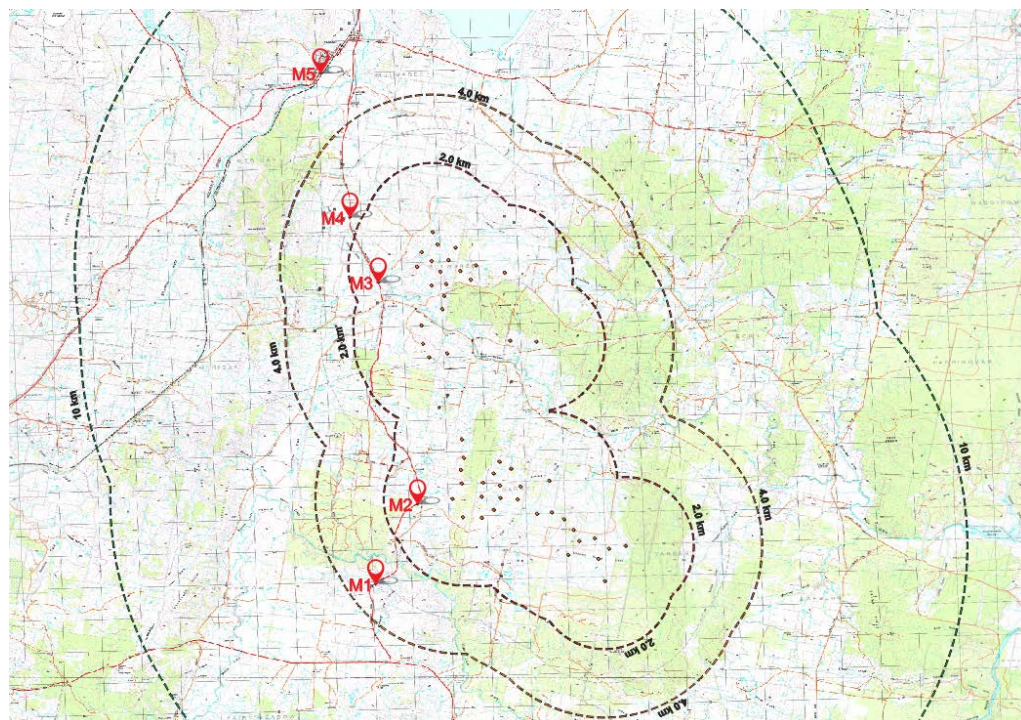
The following section examines views from main roads.

9.5 Main Roads

This section will examine the potential visual impact from Main roads within the Project viewshed. These roads are classified as 2R in the NSW Roads Classification.

Four viewpoints have been selected as representative locations within the viewshed. Viewpoints M1-M3 are located along Goulburn/Braidwood Road which is classified as a State Significant Road and M4 is located along Bungendore Road which is classified as a Regionally significant road. The corresponding GPS co-ordinates and approximate distance to nearest WTG are listed below.

Figure 9.27 Main Road Viewpoints



Goulburn/Braidwood Road is assessed as having an average of between 1,000-1,800 trips per day in the traffic report written by GTA Consultants. While Bungendore Road was not assessed within the traffic report, the viewer numbers along all Main Roads within the viewshed would be assessed as **Medium**.

Table 9.6 Main Road Viewpoints

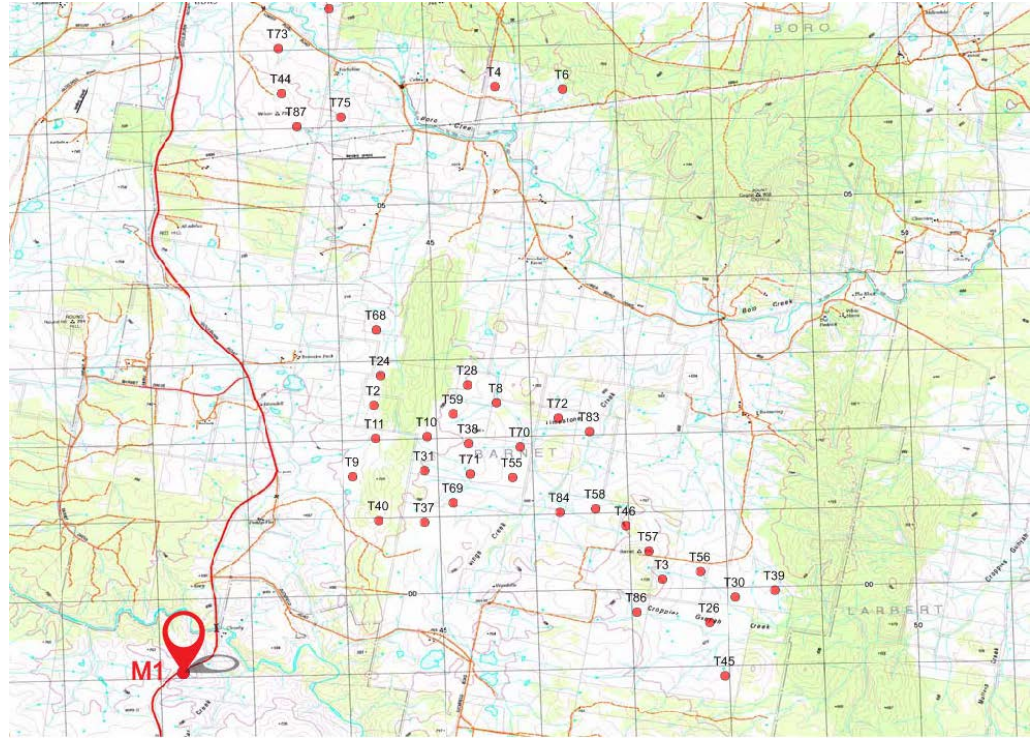
Viewpoint No.	GPS Co-ordinates	Approximate distance and direction of nearest WTG	Landscape Unit
M1 – Goulburn Road	(55H 741965, 6098839)	3.2km north east (T40)	Unit 2A - Low
M2 – Goulburn Road	(55H 743221, 6101416)	885m north east (T9)	Unit 2A - Low
M3 – Braidwood Road	(55H 742366, 6108424)	1.1km north east (T22)	Unit 2A - Low
M4 – Braidwood Road	(55H 741675, 6110509)	2.2km south east (T49/T50)	Unit 2A - Low
M5 – Bungendore Road	(55H 741079, 6114978)	5.7km south east (T49)	Unit 2A - Low

The following section examines each of these viewpoints.

9.5.1 Viewpoint M1 – Goulburn Road

Viewpoint M1 is located on Goulburn Road north of Dog Rocks Close. The nearest WTG (T40) is approximately 3.2km north east.

Figure 9.28 **Viewpoint M1 (55H 741965, 6098839)**



Viewpoint M1 is taken from a section of road that has limited roadside vegetation and allows for views towards the Project. It looks out over Landscape Unit 2B – Stony Rises, with Landscape Unit 3 Vegetated Hills in the distance. Figure 9.29 shows the existing view looking north east towards the Project.

Figure 9.29 *Viewpoint M1 – view looking north east*



Figure 9.30 shows the proposed wind turbines photo montaged into the view.

Figure 9.30 **Viewpoint M1 – Photomontage**



When travelling north along Goulburn/Braidwood Road there will be clear views to the proposed wind turbines and they will be highly visible, with the closest turbine being approximately 3.2km north east. Figure 9.31 shows an enlargement of the photomontage.

Figure 9.31 **Viewpoint M1 – Enlargement**



Whilst there are medium viewer numbers with views across a Landscape Unit 2B – Stony Rises at this location, the landscape has been cleared and is a fleeting view afforded in this section of road with limited roadside vegetation. Sections of Goulburn road both north and south of this location have extensive roadside vegetation.

For these reasons, the overall visual impact is assessed as **low-moderate**.

9.5.2 Viewpoint M2 – Goulburn Road

Viewpoint M2 is located on Goulburn Road north of Duckfield Road. The nearest WTG (T9) is approximately 885m north east.

Figure 9.32 Viewpoint M2 (55H 743221, 6101416)

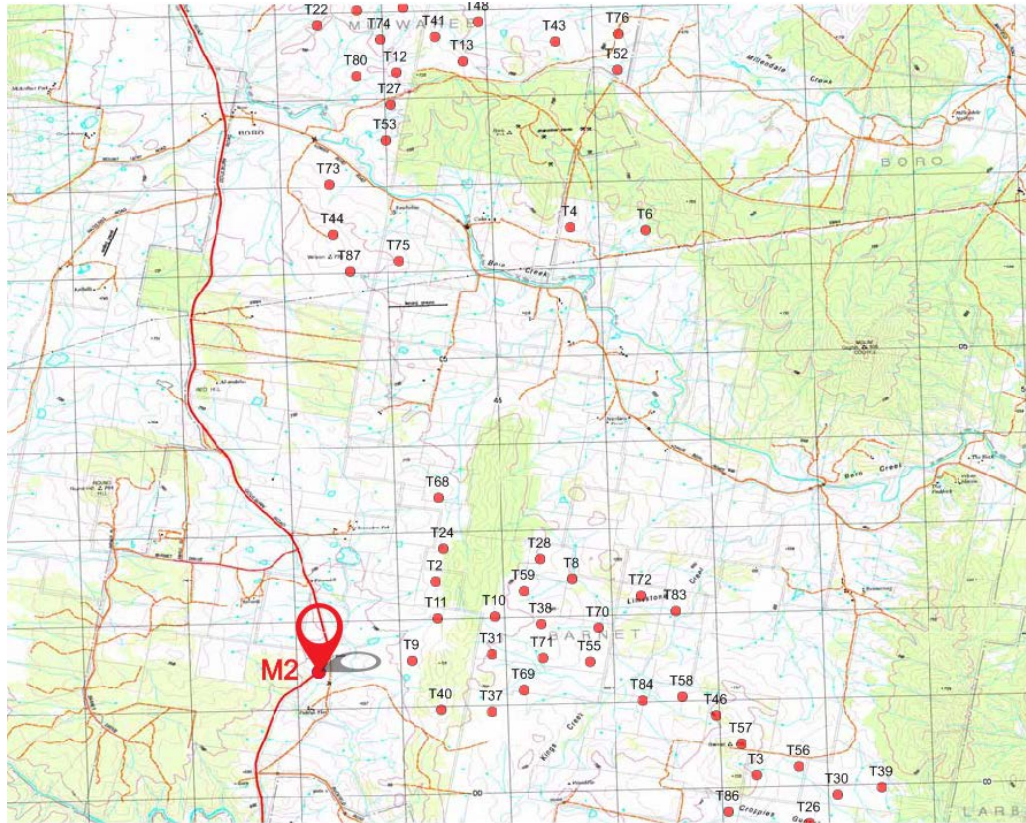


Figure 9.33 shows the view looking north east from Goulburn Road at a break in roadside vegetation that allows views to the Project. This view is across Landscape Unit 2A 'The Plains'. It is predominantly cleared farmland with scattered vegetation along the creek line and hedgerow/wind break planting along the boundaries.

Figure 9.33 Viewpoint M2 – view looking north east



The nearest wind turbine will be located approximately 885m away to the left of the driveway. At this distance the wind turbines will dominate the view. It is important to note that this view is taken from the side of the road at a gap in roadside vegetation, and would only be a glimpse of view for someone traveling north along Goulburn Road.

For this reason, the overall visual impact would be **low-moderate**.

9.5.3 Viewpoint M3 – Braidwood Road

Viewpoint M3 is located on Braidwood Road north of Boro Road. The nearest WTG (T22) is approximately 1.1km north east.

Figure 9.34

Viewpoint M3 (55H 742366, 6108424)

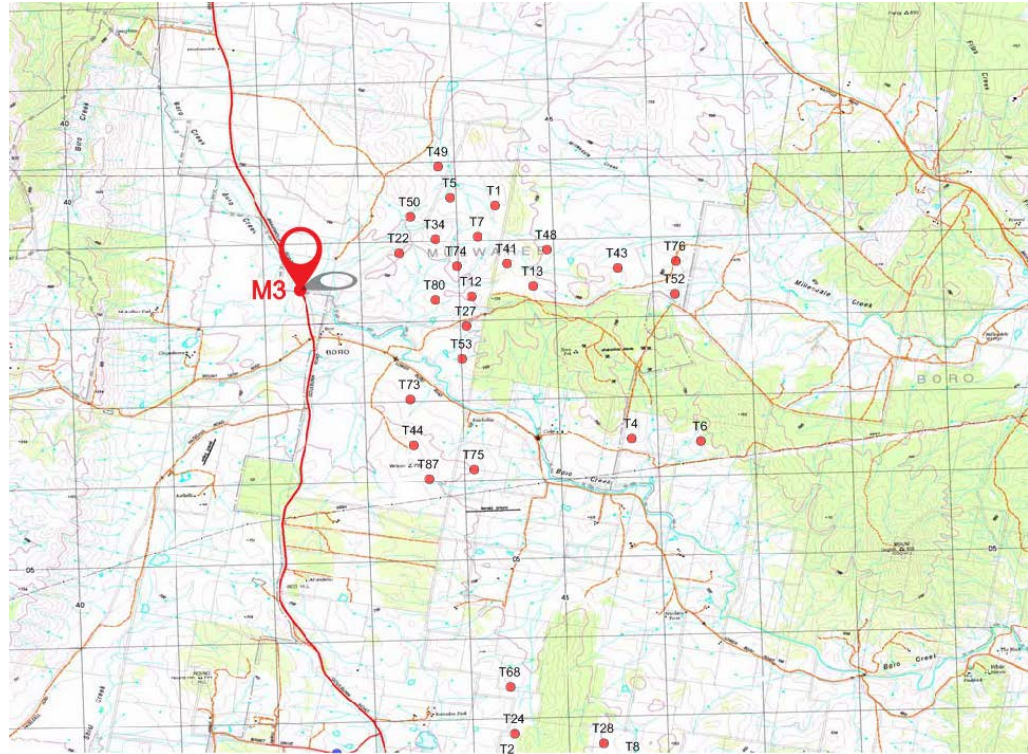


Figure 9.35 shows the view looking south east from a break in roadside vegetation along Braidwood Road that allows for views to the Project. The view is across Landscape Unit 2A 'The Plains', flat farmland with limited vegetation.

Figure 9.35

Viewpoint M3 – view looking south east



At a distance of 1.1km the wind turbines will be highly visible and have the potential to dominate the view.

Views to the turbines are over a landscape that has been extensively cleared and modified and therefore has a low sensitivity to further visual change. For these reasons, the overall visual impact is assessed as **low**.

9.5.4 Viewpoint M4 – Braidwood Road

Viewpoint M4 is located on Braidwood Road at the end of Roseview Road. The nearest WTG (T49/T50) is approximately 2.2km south east.

Figure 9.36 Viewpoint M4 (55H 741675, 6110509)

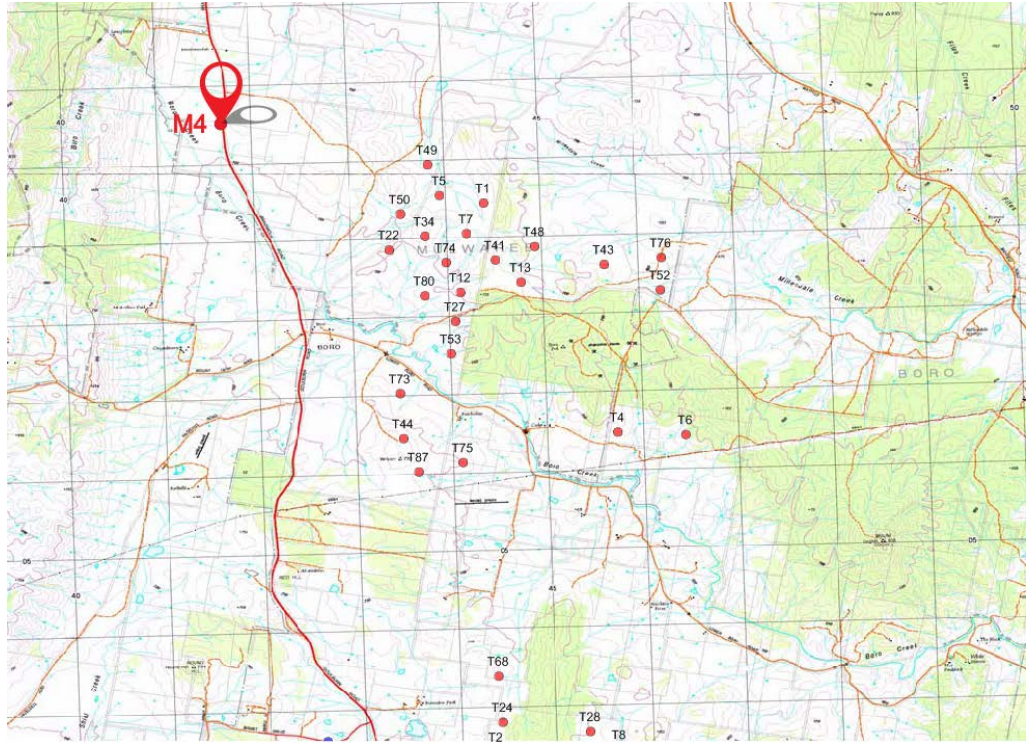


Figure 9.37 shows the existing view looking south east from Braidwood Road at the end of Roseview Road. Views to the south east are across gently undulating cleared farmland.

Figure 9.37 Viewpoint M4 – view looking south east



There are many constructed elements such as road signs, fences, transmission lines and sheds within the view.

Figure 9.38 shows the photomontage of the proposed wind farm from this same location.

Figure 9.38 **Viewpoint M4 – photomontage**



The proposed turbines will be located behind the small ridge line in the view. However at a height of 173m will be visible in the view.

Figure 9.39 shows an enlargement of the photomontage.

Figure 9.39 **Viewpoint M4 – enlargement**



When travelling south along this section of Braidwood Road there will be clear views to the proposed wind turbines. Turbines from the northern precinct of the wind farm would be the most visible part of the Project in the view, however the turbines from southern precinct are also visible in the distance.

Views to the turbines are over a landscape that has been extensively cleared and modified and therefore has a low sensitivity to further visual change. For these reasons, the overall visual impact is assessed as **low**.

9.5.5 Viewpoint M5 – Bungendore Road

Viewpoint M5 is located on Bungendore Road on the outskirts of Tarago. The nearest WTG (T49) is approximately 5.7km south east.

Figure 9.40

Viewpoint M5 (55H 741079, 6114978)

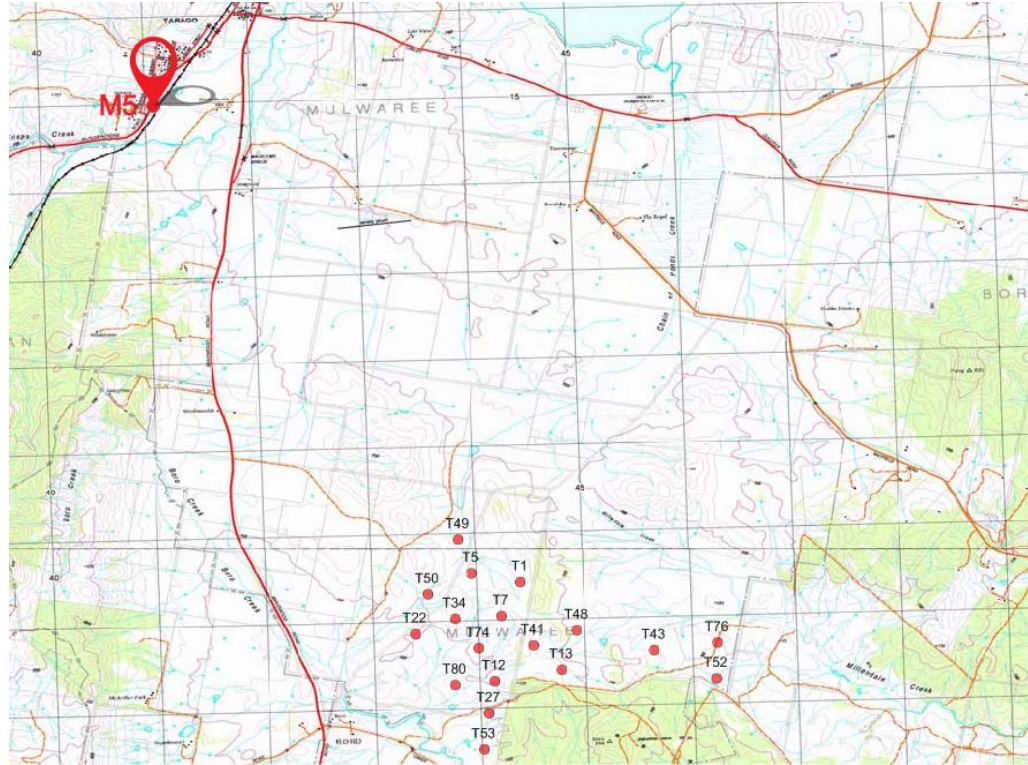


Figure 9.41 shows the view looking south east. The view is from an elevated position that looks over Landscape Unit 2A – ‘The Plains’ with Landscape Unit 3 – Vegetated Hills visible in the background.

Figure 9.41

Viewpoint M5 – view looking south east



This section of Bungendore Road has limited roadside vegetation. Views would be available across cleared farmland to the Project. There are many constructed elements such as sheds telecommunications tower and fences visible within the view. At a distance of approximately 5.7km the wind turbines would be visible but not dominant.

For these reasons, the overall visual impact would be **low-negligible**.

9.5.1 Main Road Overall Visual Impact

Viewpoints M1-M3 are located along Goulburn/Braidwood Road which runs along the west of the Project. These viewpoints are located within close proximity (885m-2.2km) to the Project. M4 is located on Bungendore Road approximately 5.7km to the north west of the Project.

The evaluation of each of these viewpoints is summarised in Table 9.7.

Table 9.7 *Overall Visual Impact of Main Roads*

Viewpoint No.	Approximate distance and direction of nearest WTG	Visual Impact
M1 – Goulburn Road	3.2km north east (T40)	Low-moderate
M2 – Goulburn Road	885m north east (T9)	Low-moderate
M3 – Braidwood Road	1.1km north east (T22)	Low
M4 – Braidwood Road	2.2km south east (T49/T50)	Low
M5 – Bungendore Road	5.7km south east (T49)	Low-negligible.
OVERALL VISUAL IMPACT		LOW

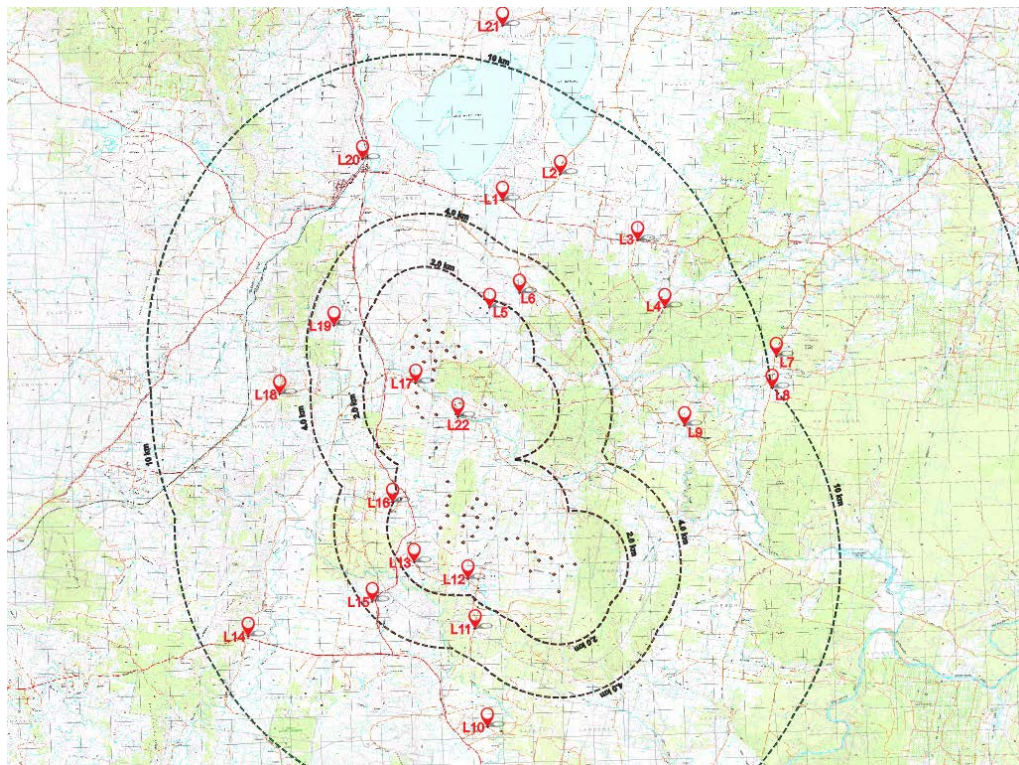
The following section examines views from local roads.

9.6 Local Roads

This section will examine the potential visual impact from local roads within the Project viewshed.

There are many local roads, both sealed and unsealed that service the residences and associated farms as well as townships. The corresponding GPS co-ordinates and approximate distance to nearest WTG are listed below.

Figure 9.42 Local Road Viewpoints



While it is acknowledged that the viewer numbers may be higher on some local roads more than others, the viewer numbers along all Local Roads within the viewshed has been assessed as **Low**.

Table 9.8 Local Road Viewpoints

Viewpoint No.	GPS Co-ordinates	Approximate distance and direction of nearest WTG	Landscape Unit
L1 – Lumley Road	(55H 746397, 6114788)	5.4km south west (T49)	Unit 2A - Low
L2 – Tarago Road	(55H 748495, 6115775)	7.4km south west (T49)	Unit 2A - Low
L3 – Corner Lumley & Willow Glen Roads	(55H 750949, 6112910)	6.3km south west (T76)	Unit 2A - Low
L4 – Corner Millendale & Willow Glen Roads	(55H 751828, 6110222)	5.8km south west (T76)	Unit 3 - Medium
L5 – Hilltop Close	(55H 746157, 6110461)	1.7km south east (T76)	Unit 2A - Low
L6 – Lakeview Road	(55H 747035, 6110916)	2.3km south west (T76)	Unit 2A - Low

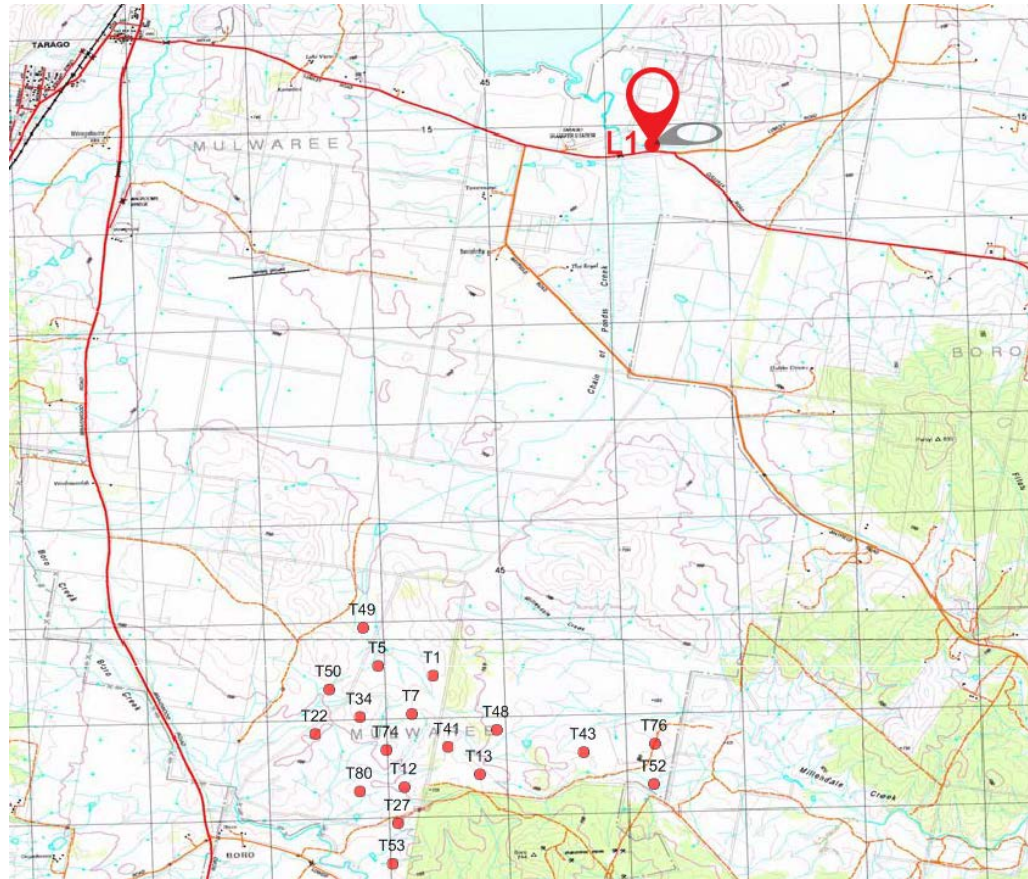
L7 – Sandy Point Road	(55H 755425, 6108220)	9.1km south west (T6)	Unit 3 - Medium
L8 – Sandy Point Road	(55H 755260, 6107102)	8.8km south west (T6)	Unit 2A - Low
L9 – Mayfield Road	(55H 752345, 6105440)	5.9km west (T6)	Unit 2A - Low
L10 – Jamaleopa Road	(55H 745525, 6093506)	5.9km north east (T45)	Unit 3 - Medium
L11 – Duckfield Road	(55H 745076, 6097110)	3.2km north east (T86)	Unit 2A - Low
L12 – Duckfield Road	(55H 744978, 6099464)	1.4km north west (T37)	Unit 3 - Medium
L13 – Duckfield Road	(55H 743221, 6100179)	1.3km north east (T40)	Unit 2A - Low
L14 – Hazeldell Road	(55H 737616, 6097316)	7.6km north east (T40)	Unit 2A - Low
L15 – Dog Rocks Close	(55H 741847, 6098598)	3.4km north east (T40)	Unit 2A - Low
L16 – Barnet Drive	(55H 742589, 6102608)	1.7km east (T2)	Unit 2A - Low
L17 – Boro Road	(55H 743509, 6107394)	370m south (T73)	Unit 2A - Low
L18 – Mt Fairy Road	(55H 738911, 6107125)	4.5km east (T73)	Unit 3 - Medium
L19 – Roseview Road	(55H 740793, 6110055)	2.8km south east (T50)	Unit 2A - Low
L20 – Sherwins Ridge Estate	(55H 741870, 6116538)	6.9km south east (T49)	Unit 2A - Low
L21 – Glenovel Road	(55H 746429, 6121599)	12km south (T49)	Unit 2A - Low
L22 – Boro Road	(55H 744776, 6106112)	690m west (T75)	Unit 2A - Low

The following section examines each of these viewpoints.

9.6.1 Viewpoint L1 – Lumley Road

Viewpoint L1 is located on Lumley Road to the north of the Project see Figure 9.43. The nearest wind turbine (T49) is approximately 5.4km south west.

Figure 9.43 Viewpoint L1 (55H 746397, 6114788)



The landscape unit of Viewpoint L1 is Landscape Unit 2A 'The Plains'. Figure 9.44 shows the view looking south across farmland with scattered vegetation and hedgerows located along boundaries and creek lines.

Figure 9.44 Viewpoint L1 – view looking south



At a distance of 5.4km the wind turbines will be potentially noticeable. However, views towards the wind farm are across a landscape that has low sensitivity and taken at 90 degrees to travellers direction. There are also low viewer numbers.

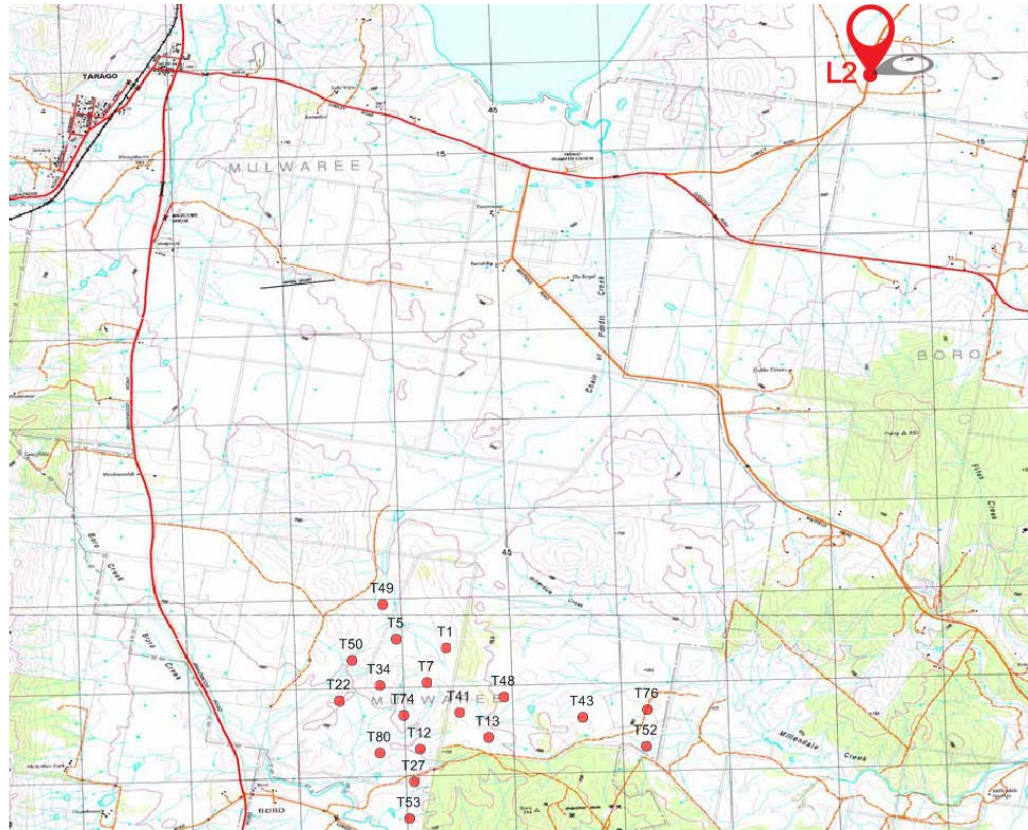
For this reason the overall visual impact is assessed as **low-negligible**.

9.6.2 Viewpoint L2 – Lumley Road

Viewpoint L2 is located on Lumley Road to the north east of the Project see Figure 9.45. The nearest wind turbine (T49) is approximately 7.4km south west.

Figure 9.45

Viewpoint L2 (55H 748495, 6115775)



The landscape unit of Viewpoint L2 is Landscape Unit 2A 'The Plains' and is flat cleared farmland with scattered vegetation and hedgerows along boundaries. Figure 9.46 shows the view looking south towards the Project.

Figure 9.46

Viewpoint L2 – view looking south



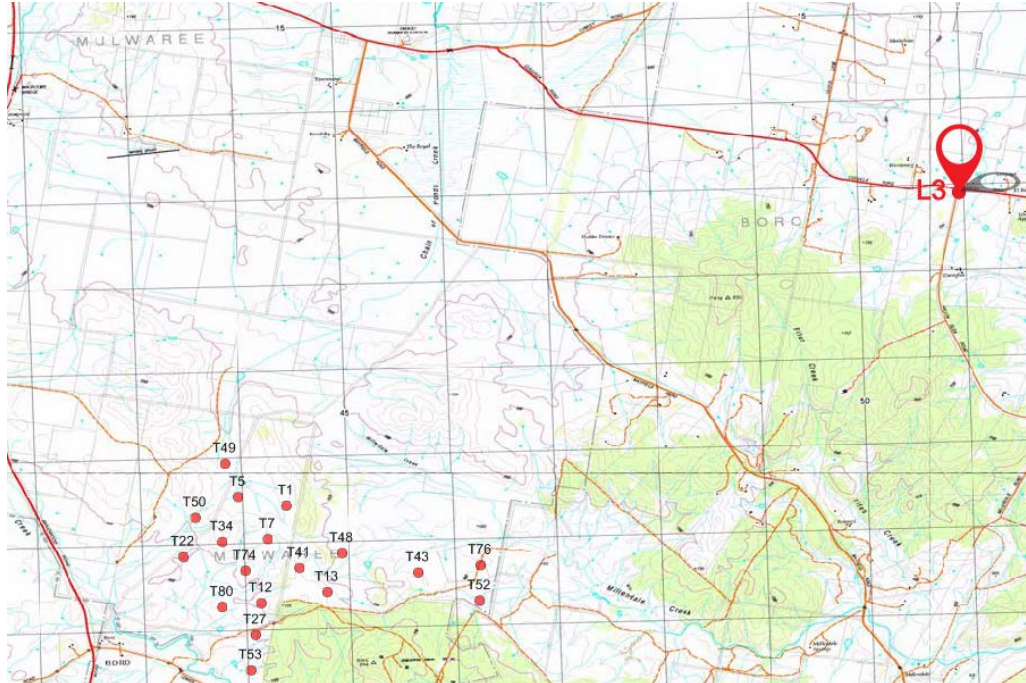
The proposed wind turbines would be visible to the right of the image. At a distance of approximately 7.4km the proposed turbines will be visible however will not dominate the view. Scattered vegetation and minor topographical changes will assist in filtering views to the Project.

For these reasons the overall visual impact would be assessed as **Low-negligible**.

9.6.3 Viewpoint L3 –Willow Glen Road

Viewpoint L3 is located on Willow Glen Road near the corner of Cullulla Road to the north east of the Project. The nearest wind turbine (T76) is approximately 6.3km south west.

Figure 9.47 Viewpoint L3 (55H 750949, 6112910)



The landscape unit of Viewpoint L3 is Landscape Unit 2A 'The Plains' with Landscape Unit 3 Vegetated Hills behind. Figure 9.48 shows the view looking south west towards the Project.

Figure 9.48 Viewpoint L3 – view looking south west



There is extensive roadside vegetation along Cullulla Road as seen to the right of Figure 9.48. There is also a plantation to the south west of the viewpoint seen in the middle of the image.

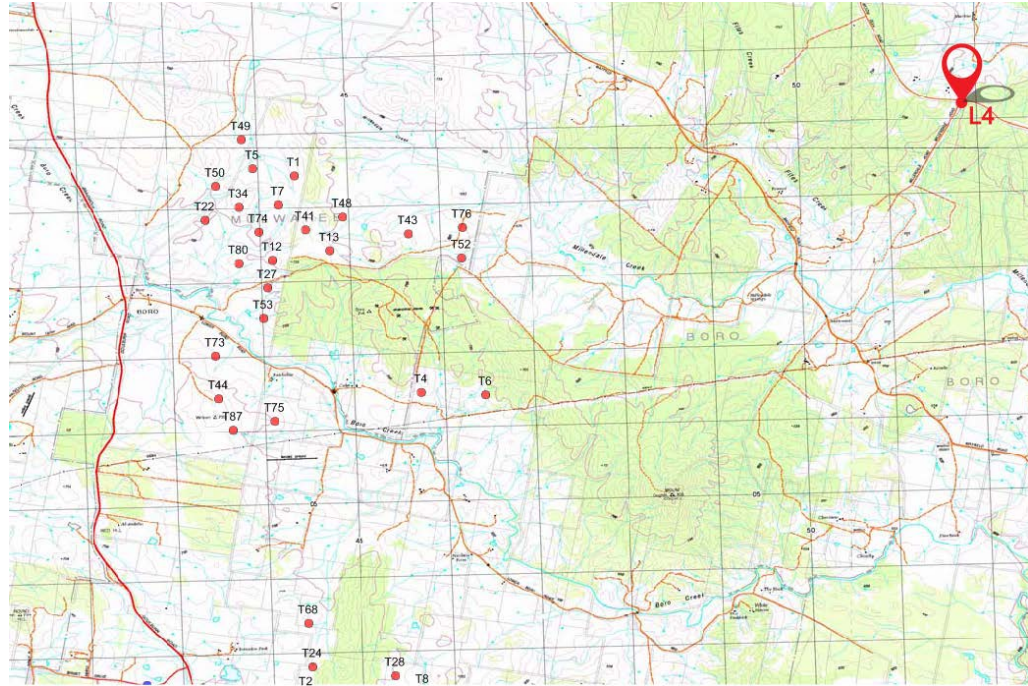
Due to the intervening topography and vegetation it is unlikely the wind turbines will be visible from this location. For these reasons the overall visual impact would be assessed as **Negligible**.

9.6.4 Viewpoint L4 – Corner Millendale Road & Willow Glen Road

Viewpoint L4 is located at the corner of Millendale Road and Willow Glen Road to the north east of the Project. The nearest wind turbine (T76) is approximately 5.8km south west.

Figure 9.49

Viewpoint L4 (55H 751828, 6110222)



The landscape unit of Viewpoint L4 is Landscape Unit 3 Vegetated Hills and is heavily vegetated with the exception of the roadways. Figure 9.50 shows the view looking west towards the Project.

Figure 9.50

Viewpoint L4 – view looking west



Due to the intervening topography and vegetation it is unlikely the wind turbines will be visible from this location. Should turbines be visible, it is likely to be the tips of blades only and would be all but a small element in the view.

For these reasons the overall visual impact would be assessed as **Negligible- Nil**.

9.6.5 Viewpoint L5 – Lakeview Road

Viewpoint L5 is located on Lakeview Road to the north east of the Project area. Lakeview Road is a local gravel road which would be primarily used for access to private properties located along this road. The nearest wind turbine (T76) is approximately 1.7km south east.

Figure 9.51 Viewpoint L5 (55H 746157, 6110461)

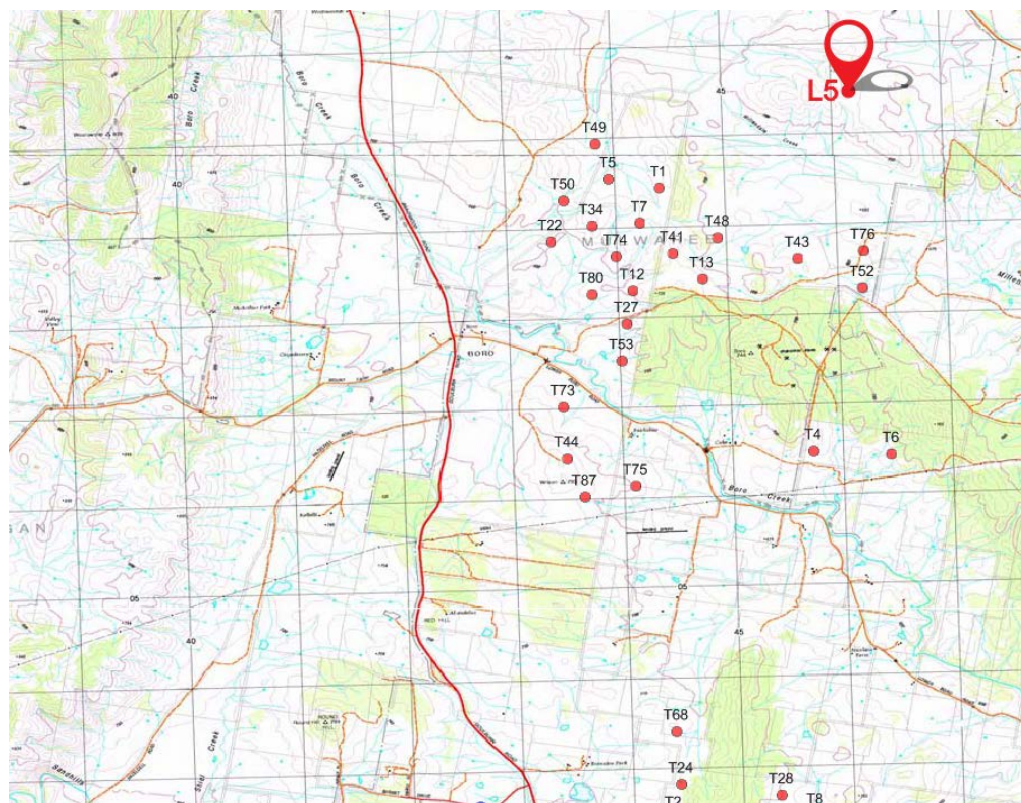


Figure 9.52 shows the view looking south west across the Landscape Unit 2A 'The Plains' with Landscape Unit 3 Vegetated Hills in the background.

Figure 9.52 Viewpoint L5 – view looking south west



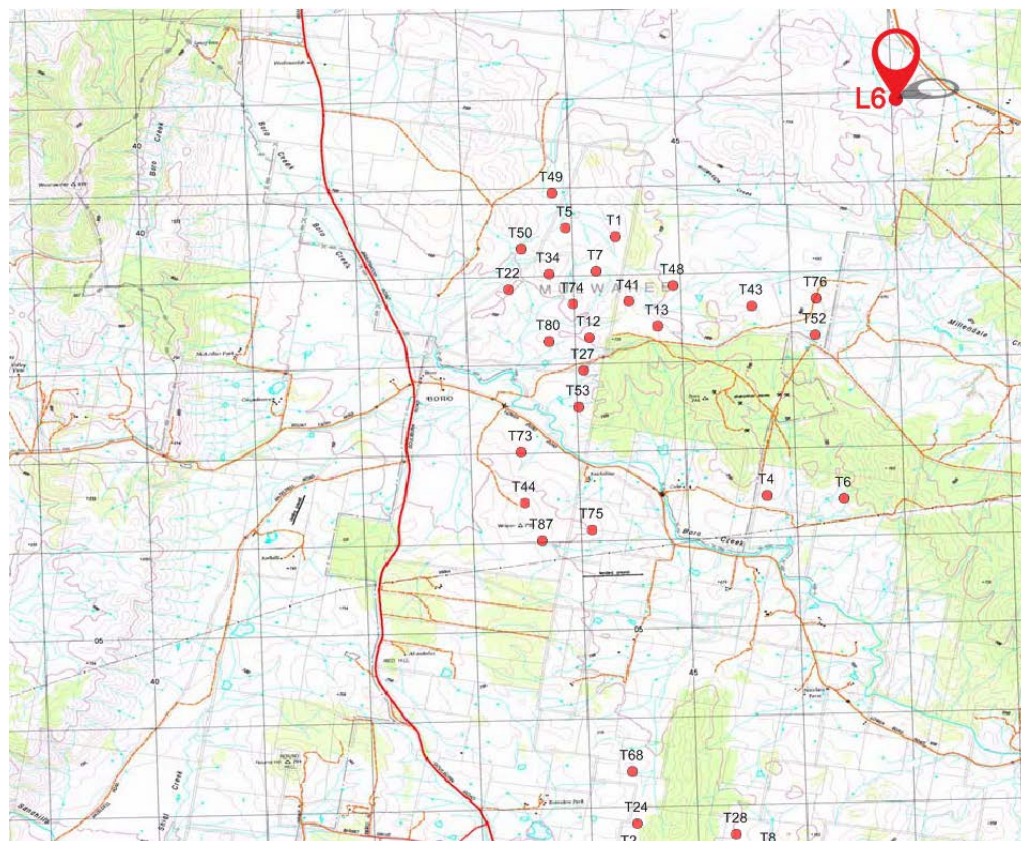
The proposed wind turbines will be approximately 1.7km to the south east of this location. At this distance the turbines will be highly visible and will dominate most views. The undulating character of this section Lakeview Road will filter some views to parts of turbines, however they will still be visible in part above the hill.

Although this location is in close proximity to the proposed wind farm, there are low viewer numbers and a low landscape sensitivity. For these reasons, the overall impact would be assessed as **Low-moderate**.

9.6.6 Viewpoint L6 – Lakeview Road

Viewpoint L6 is located on Lakeview Road to the north east of the Project. Lakeview Road is a local gravel road which would be primarily used for access to private properties located along this road. The nearest turbine (T76) is approximately 2.3km south west.

Figure 9.53 Viewpoint L6 (55H 747035, 6110916)



The landscape unit of Viewpoint L6 is Landscape Unit 2A 'The Plains' and is flat cleared farmland with scattered vegetation and hedgerows along boundaries and drainage lines. Figure 9.54 shows the view looking south west.

Figure 9.54 Viewpoint L6 – view looking south west



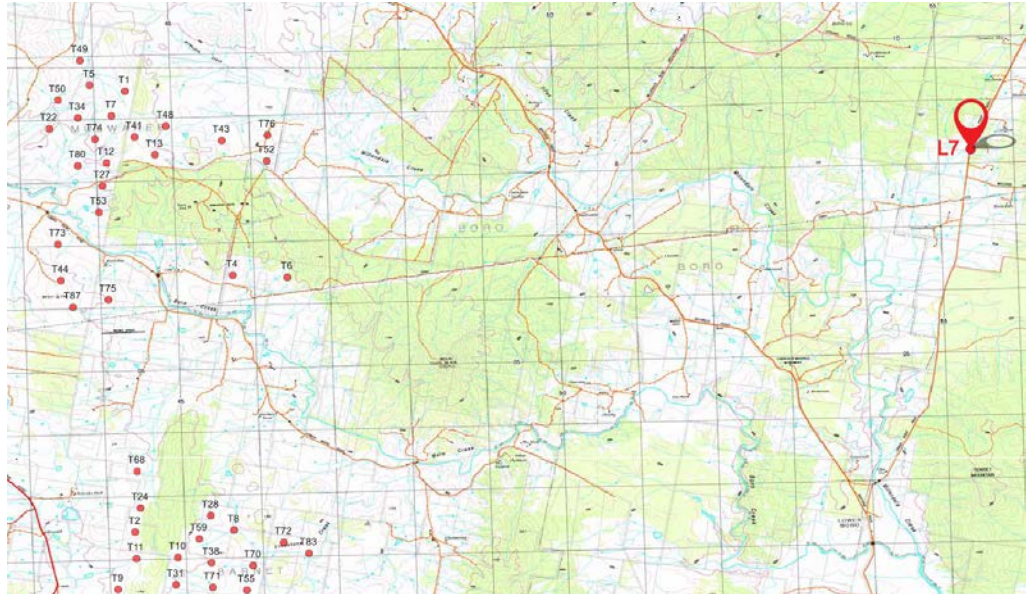
Lakeview Road is a short dead end road with few vehicle movements that services several rural residential properties to north of the Project. At a distance of 2.3km the proposed turbines will be highly visible and have the potential to dominate views.

For these reasons the overall visual impact would be assessed as **low-moderate**.

9.6.7 Viewpoint L7 – Sandy Point Road

Viewpoint L7 is located on Sandy Point Road the east of the Project. The nearest wind turbine (T6) is approximately 9.1km south west.

Figure 9.55 Viewpoint L7 (55H 755425, 6108220)



Viewpoint L7 is located within Landscape Unit 3 Vegetated Hills. There is extensive vegetation throughout this area, clearings of vegetation will allow for narrow views to the Project. Figure 9.56 shows the view looking south west towards the Project from a gap in vegetation.

Figure 9.56 Viewpoint L7 – view looking south west



The existing Transmission easement and line that runs through the middle of the Project site is visible in the view in front of the vegetated hills to the left of Figure 9.56.

Due to the intervening topography and vegetation the majority of the wind turbines will not be visible from this location. For these reasons the overall visual impact would be assessed as **Low-Negligible**.

9.6.8 Viewpoint L8 – Sandy Point Road

Viewpoint L8 is located on Sandy Point Road to the east of the Project. The nearest wind turbine (T6) is approximately 8.8km south west.

Figure 9.57

Viewpoint L8 (55H 755260, 6107102)

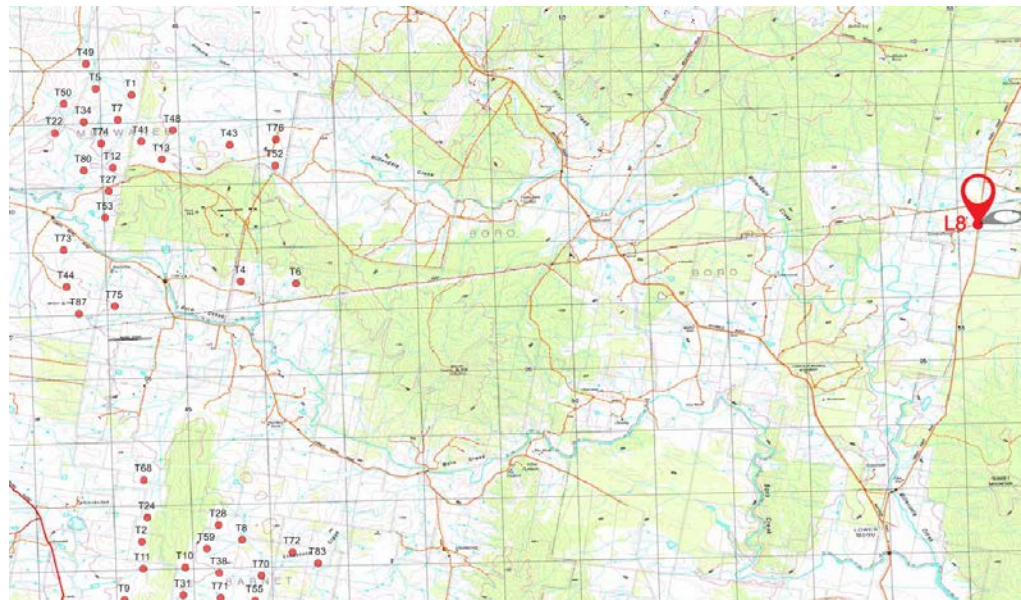


Figure 9.58 is taken from a gap in roadside vegetation that affords views towards the project looking south west from this location. This view is across Landscape Unit 2A 'The Plains' and is an extensively modified landscape. Existing vegetation is predominantly along roadsides and drainage lines.

The tops of the existing transmission line are visible above the hill to the right of the image.

Figure 9.58

Viewpoint L8 – view looking south west



The majority of the northern section of the Project will most likely be screened by the intervening topography and vegetation to the right of Figure 9.58.

However the southern section of the Project will be visible to the left of Figure 9.58. The closest turbine in the southern section (T83) is approximately 10km south west.

At this distance the proposed turbines will be visible, however they will not dominate the view. Existing vegetation within the landscape will assist to filter views to the Project.

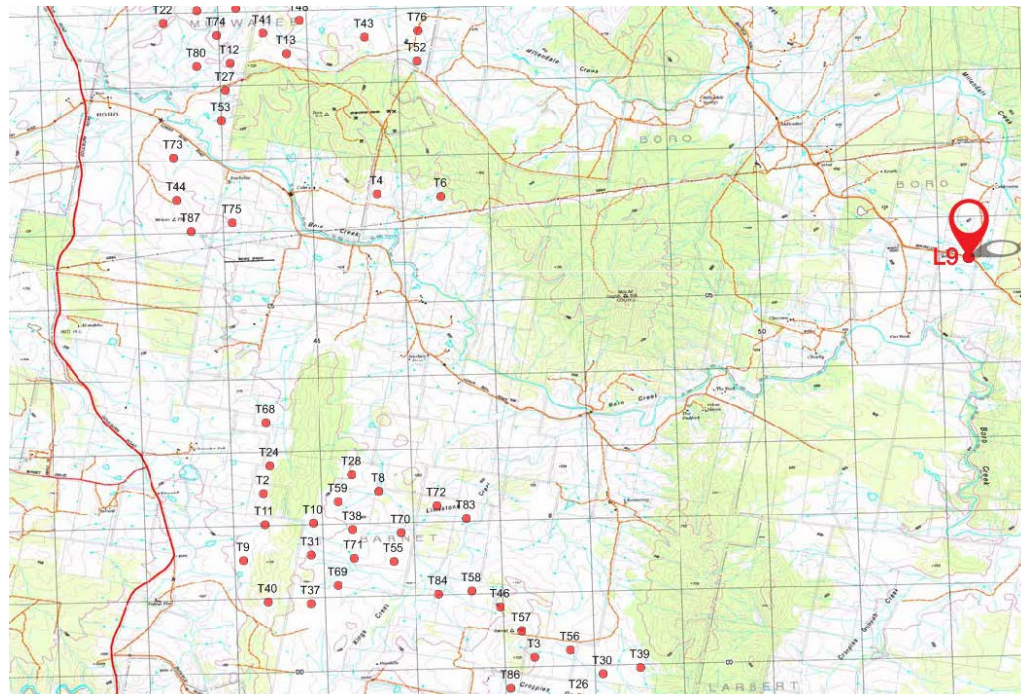
For these reasons, the overall visual impact would be assessed as **low-negligible**.

9.6.9 Viewpoint L9 – Mayfield Road

Viewpoint L9 is located on Mayfield Road to the east of the Project. The nearest wind turbine (T6) is approximately 5.9km west.

Figure 9.59

Viewpoint L9 (55H 752345, 6105440)



The landscape unit of Viewpoint L9 is Landscape Unit 2A 'The Plains' and is flat cleared farmland with scattered vegetation and hedgerows along boundaries. Figure 9.60 shows the view looking south west towards the Project.

Figure 9.60

Viewpoint L9 – view looking south west



This view is taken from a break in roadside vegetation that allows views through to the Project to the south west.

At a distance of approximately 5.9km the proposed turbines would be visible, but would not dominate the view. Existing vegetation along the roadside, within paddocks, along drainage lines and boundaries will assist at filtering views through to the proposed turbines.

For these reasons the overall visual impact would be assessed as **low-negligible**.

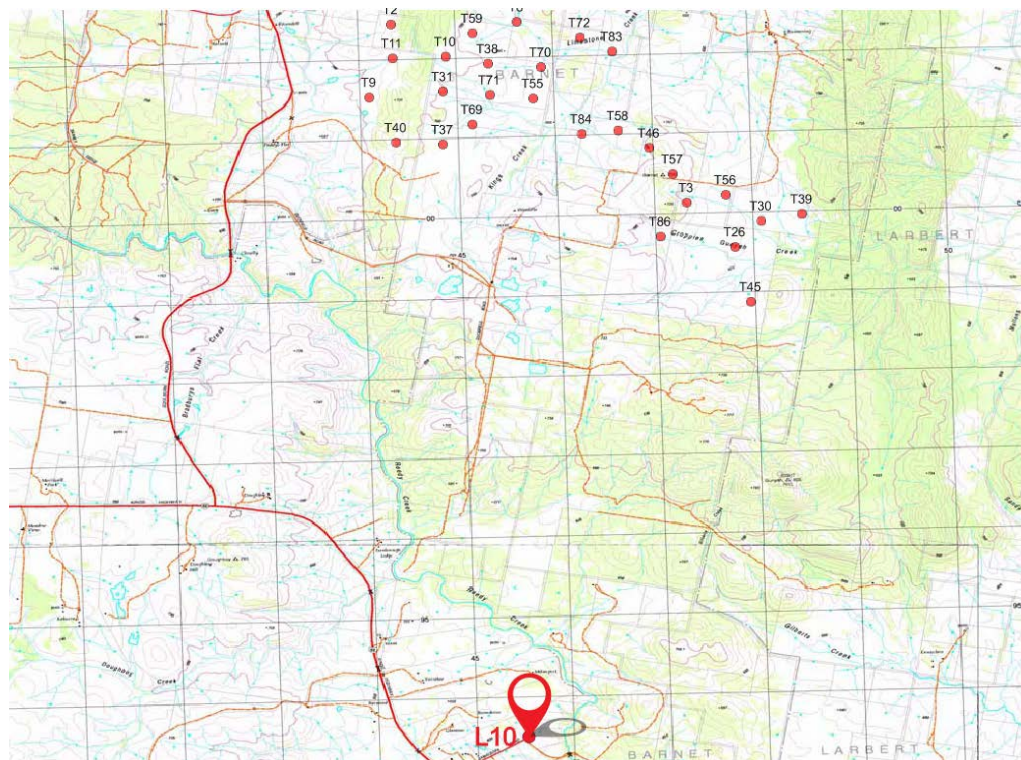
9.6.10

Viewpoint L10 – Jamaleopa Road

Viewpoint L10 is located on Jamaleopa Road to the south of the Project. Jamaleopa Road is a local sealed road which would be primarily used for access to private properties located along this road. The nearest wind turbine (T45) is approximately 5.9km north east.

Figure 9.61

Viewpoint L10 (55H 745525, 6093506)



Viewpoint L10 looks across Landscape Unit 3 – Vegetated Hill. Figure 9.62 shows the view looking north towards the Project.

Figure 9.62

Viewpoint L10 – view looking north



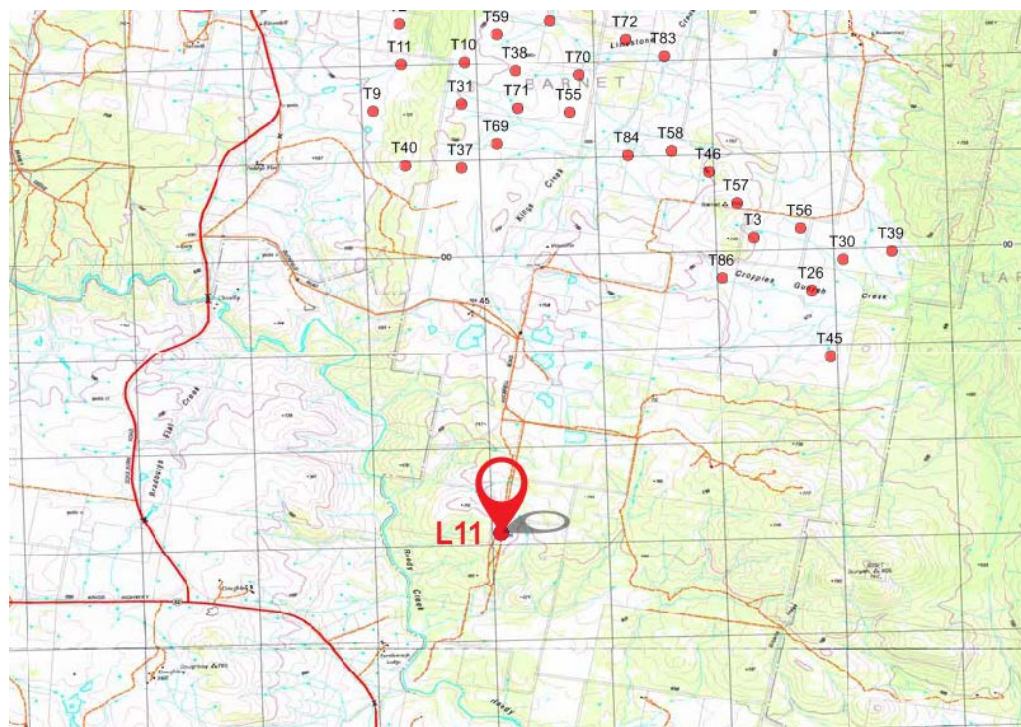
Viewpoint L10 is taken from a gap in Roadside vegetation, however there is extensive vegetation in the property to the north of the view that will filter or in some instances screen parts of the Project from this location.

For these reasons, the overall visual impact would be assessed as **Negligible**.

9.6.11 Viewpoint L11 – Duckfield Road

Viewpoint L11 is located on Duckfield Road to the south of the Project. Duckfield Road is a local gravel road which would be primarily used for access to private properties located along this road. The nearest wind turbine (T86) is approximately 3.2km north east.

Figure 9.63 Viewpoint L11 (55H 745076, 6097110)



The landscape unit of Viewpoint L11 is Landscape Unit 2A 'The Plains' and is flat cleared farmland with scattered vegetation and hedgerows along boundaries. Figure 9.64 shows the view looking north towards the Project.

Figure 9.64 Viewpoint L11 – view looking north



The nearest proposed wind turbine would be approximately 3.2km to the north east of this location. At this distance, turbines would be noticeable and have the potential to dominate views.

However these views are over a highly modified landscape which has a low sensitivity to further visual change.

For these reasons, the overall visual impact would be assessed as **low**.

9.6.12

Viewpoint L12 – Duckfield Road

Viewpoint L12 is located on Duckfield Road to the south of the Project. Duckfield Road is a local gravel road which would be primarily used for access to private properties located along this road. The nearest wind turbine (T37) is approximately 1.4km north west.

Figure 9.65

Viewpoint L12 (55H 744978, 6099464)

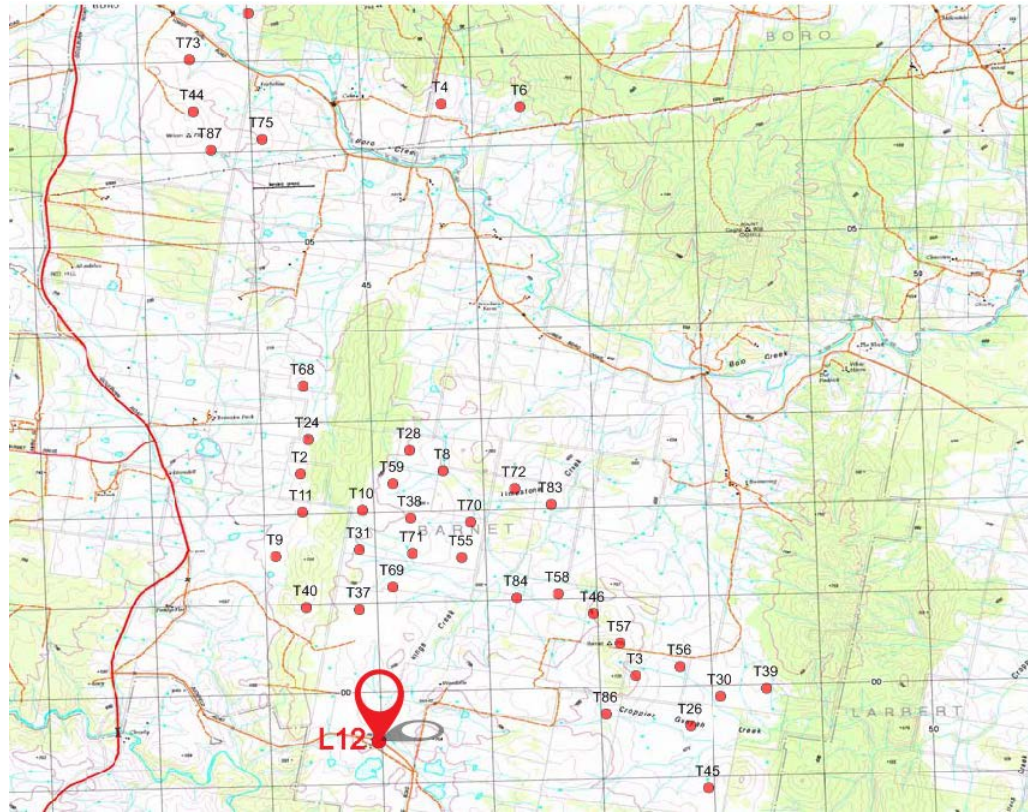


Figure 9.66 shows the view looking north west over Landscape Unit 3 – Vegetated Hills.

Figure 9.66

Viewpoint L12 – view looking north west



When travelling west along Duckfield Road the proposed wind turbines will be visible on the right of the road.

The proposed wind turbines will be approximately 1.4km north west of this location. At this distance the turbines will be highly visible and have the potential to dominate views. However, the undulating topography and existing vegetation will assist in filtering views to turbines from this location.

For these reasons, the overall visual impact is assessed as **Low-moderate**.

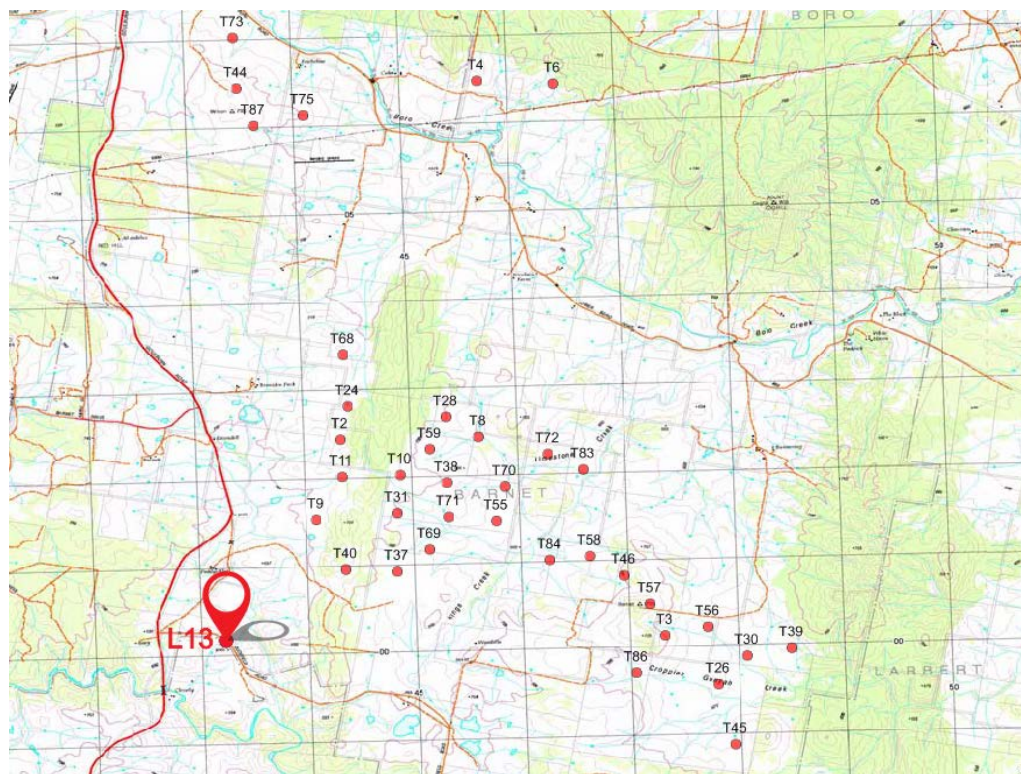
9.6.13

Viewpoint L13 – Duckfield Road

Viewpoint L13 is located on Duckfield Road to the south west of the Project. Duckfield Road is a local gravel road which would be primarily used for access to private properties located along this road. The nearest wind turbine (T40) is approximately 1.3km north east.

Figure 9.67

Viewpoint L13 (55H 743221, 6100179)



The landscape unit of Viewpoint L13 is Landscape Unit 2A 'The Plains' and is flat cleared farmland with scattered vegetation and hedgerows along boundaries. Figure 9.68 shows the view looking north east towards the Project.

Figure 9.68

Viewpoint L13 – view looking north east



The proposed turbines will be approximately 1.3km north east of this location. At this distance the turbines will be highly visible and may dominate most views.

As shown with the more established vegetation to the right of the image, the planting to the left of the image may grow and assist in filtering view through to the turbines from this location, however due to the elevated location of the view they will most likely still be noticeable.

For these reasons, the overall visual impact would be assessed as **low-moderate**.

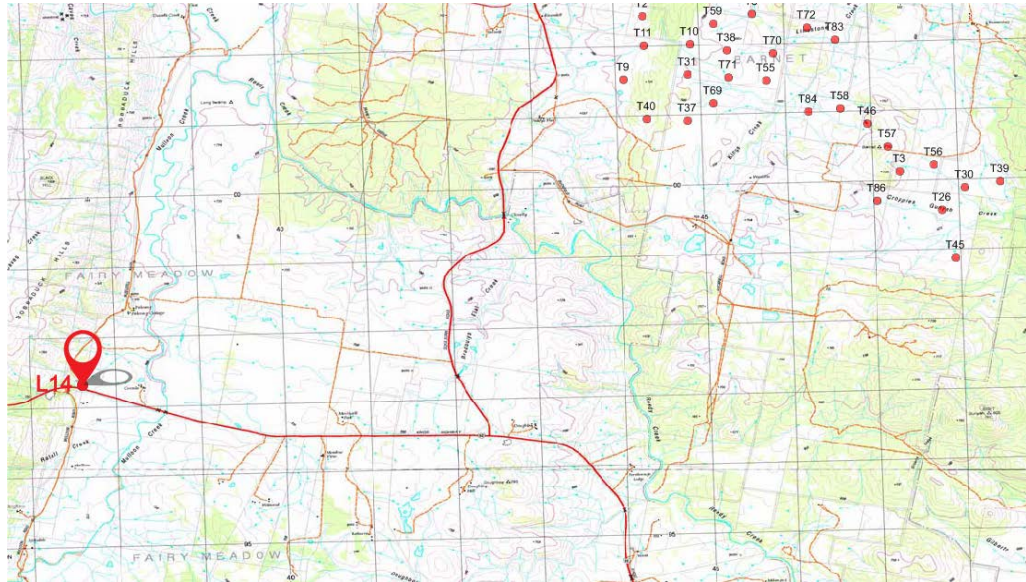
9.6.14

Viewpoint L14 – Hazeldell Road

Viewpoint L14 is located on Hazeldell Road to the south west of the Project. Hazeldell Road is a local gravel road which would be primarily used for access to private properties located along this road. The nearest wind turbine (T40) is approximately 7.6km north east.

Figure 9.69

Viewpoint L14 (55H 737616, 6097316)



The landscape unit of Viewpoint L14 is Landscape Unit 2A 'The Plains' and is flat cleared farmland with scattered vegetation and hedgerows along boundaries. Figure 9.70 is taken from a gap in roadside vegetation that allows views looking north east towards the Project.

Figure 9.70

Viewpoint L14 – view looking north east



At a distance of approximately 7.6km turbines may be visible, however would not dominate the view. Existing vegetation along roadsides, drainage lines and along boundaries within the properties between this view and the Project assist in filtering views to the proposed turbines.

For these reasons, the overall visual impact would be assessed as **Negligible**.

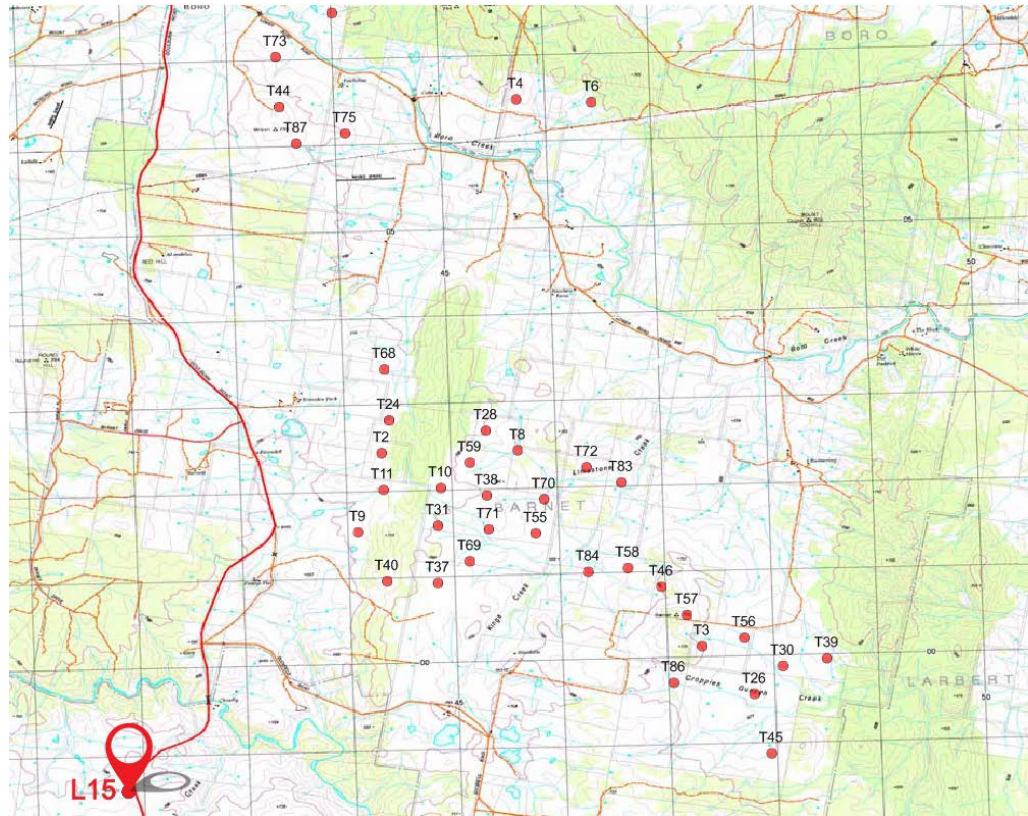
9.6.15

Viewpoint L15 – Dog Rocks Close

Viewpoint L15 is located on Dog Rocks Close to the south west of the Project. Dog Rocks Close is a local sealed court which would be used for access to private properties located off this court. The nearest turbine (T40) is approximately 3.4km north east.

Figure 9.71

Viewpoint L15 (55H 741847, 6098598)



Viewpoint L15 looks across Landscape Unit 2B - Stony Rises, with Landscape Unit 3 - Vegetated Hills in the background. Figure 9.72 shows the view looking north east towards the Project.

Figure 9.72

Viewpoint L15 – view looking north east



At a distance of approximately 3.4km the proposed turbines would be visible to the right of the image and have the potential to dominate views. However, views north towards the vegetated hills to the left of the image would remain clear of turbines.

Existing roadside vegetation along Goulburn Road and within the property to the north would assist in filtering views through to the proposed turbines.

For these reasons, the overall visual impact would be assessed as **low**.

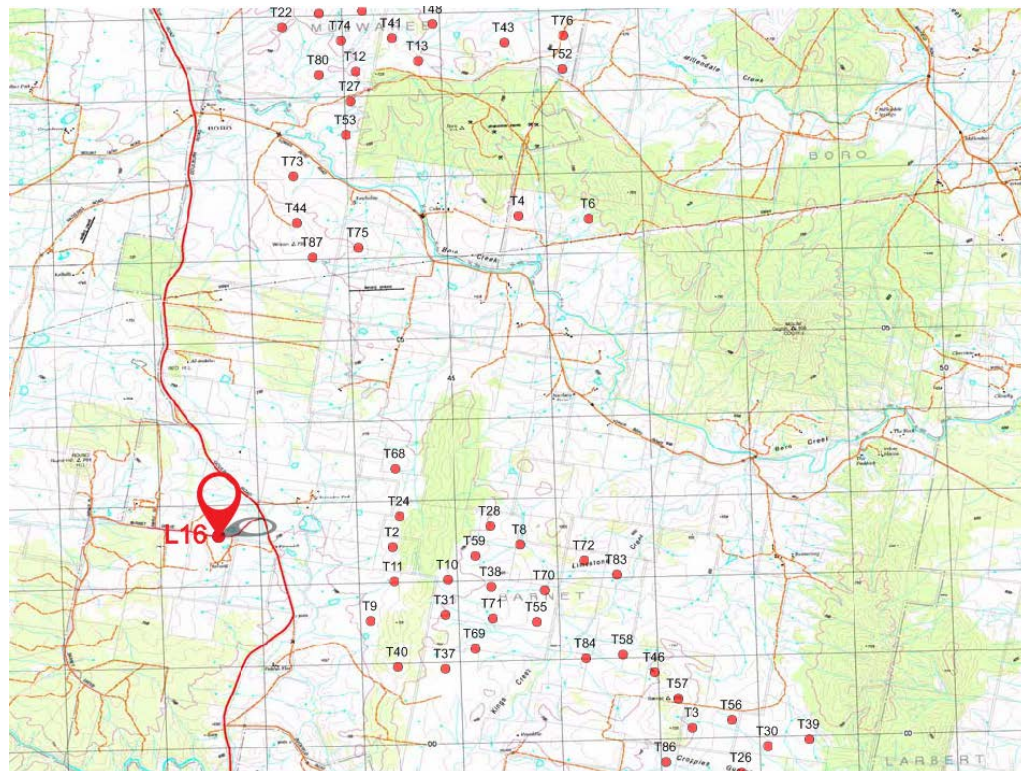
9.6.16

Viewpoint L16 – Barnet Drive

Viewpoint L16 is located on Barnet Drive to the west of the southern section of the Project. The nearest wind turbine (T2) is approximately 1.7km east.

Figure 9.73

Viewpoint L16 (55H 742589, 6102608)



The landscape unit of Viewpoint L16 is Landscape Unit 2A 'The Plains' and is flat cleared farmland with scattered vegetation and hedgerows along boundaries. Figure 9.74 shows the view looking east towards the Project.

Figure 9.74

Viewpoint L16 – view looking east



Figure 9.75 shows the same view looking east with a wireframe model of the proposed turbines superimposed into the view. This is not a photomontage.

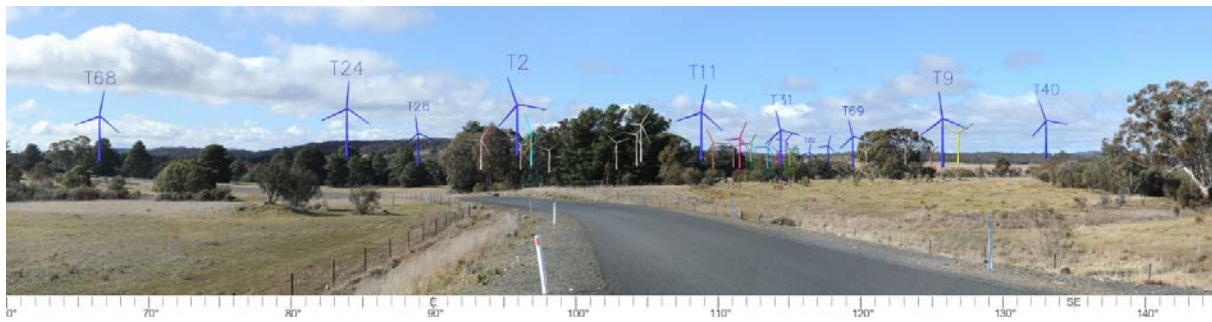
Figure 9.75

Viewpoint L16 – view looking east with WIREFRAME model



Figure 9.76 shows an enlargement of the wireframe view to where turbines would be visible.

Figure 9.76 Viewpoint L16 – WIREFRAME enlargement



At a distance of approximately 1.7km the proposed turbines will be a visually dominant element in the view.

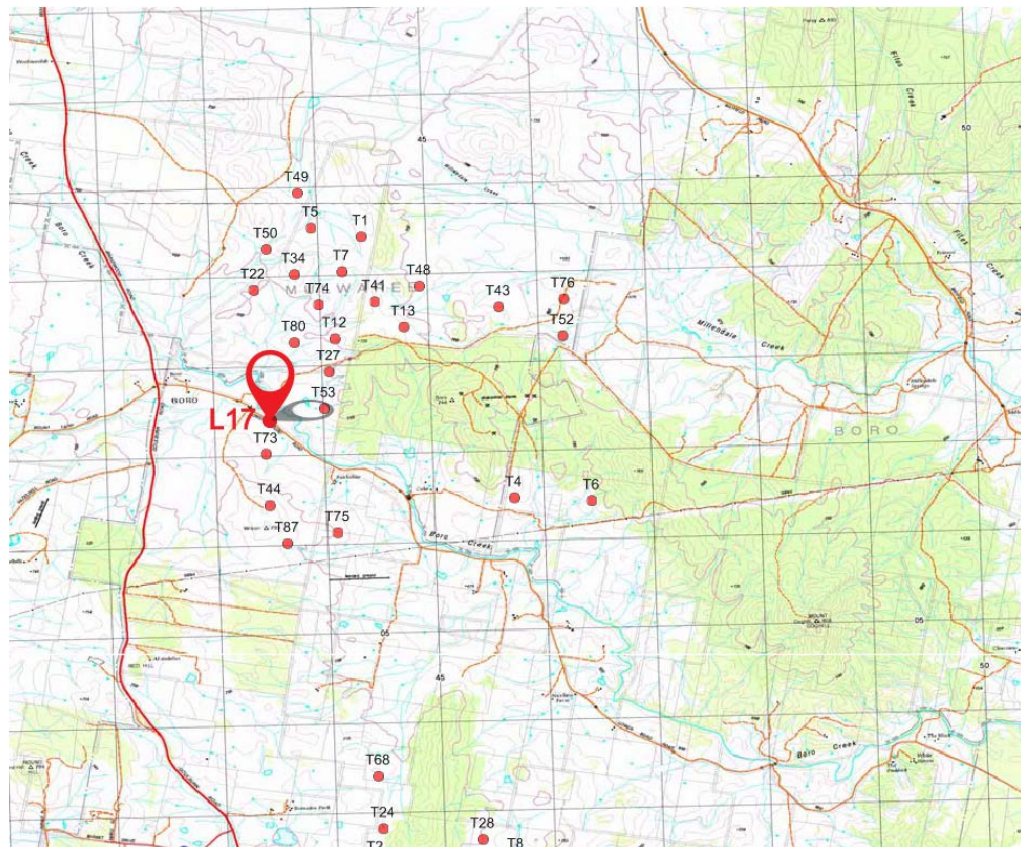
Although this location is in close proximity to the proposed wind farm, there are low viewer numbers and the view sits within a highly modified landscape which has a low sensitivity to further visual change. For these reasons, the overall impact would be assessed as **Low-moderate**.

9.6.17 Viewpoint L17 –Boro Road

Viewpoint L17 is located on Boro Road. Boro Road runs through the northern section of the Project. The nearest wind turbine (T73) is approximately 370m south.

Figure 9.77

Viewpoint L17 (55H 743509, 6107394)



The landscape unit of Viewpoint L17 is Landscape Unit 2A 'The Plains' and is flat cleared farmland with scattered vegetation and hedgerows along boundaries. Figure 9.78 shows the view looking south east towards the Project.

Figure 9.78

Viewpoint L17 – view looking south east



Boro Road runs through the middle of the Project. With the closest proposed wind turbine at approximately 370m the turbines will be a highly dominant feature within this view.

Although this location is in close proximity to the proposed wind farm, there are low viewer numbers and the view sits within a highly modified landscape which has a low sensitivity to further visual change. For these reasons, the overall impact would be assessed as **Moderate**.

9.6.18 Viewpoint L18 – Mt Fairy Road

Viewpoint L18 is located on Mt Fairy Road to the west of the Project. The nearest wind turbine (T73) is approximately 4.5km east.

Figure 9.79 Viewpoint L18 (55H 738911, 6107125)

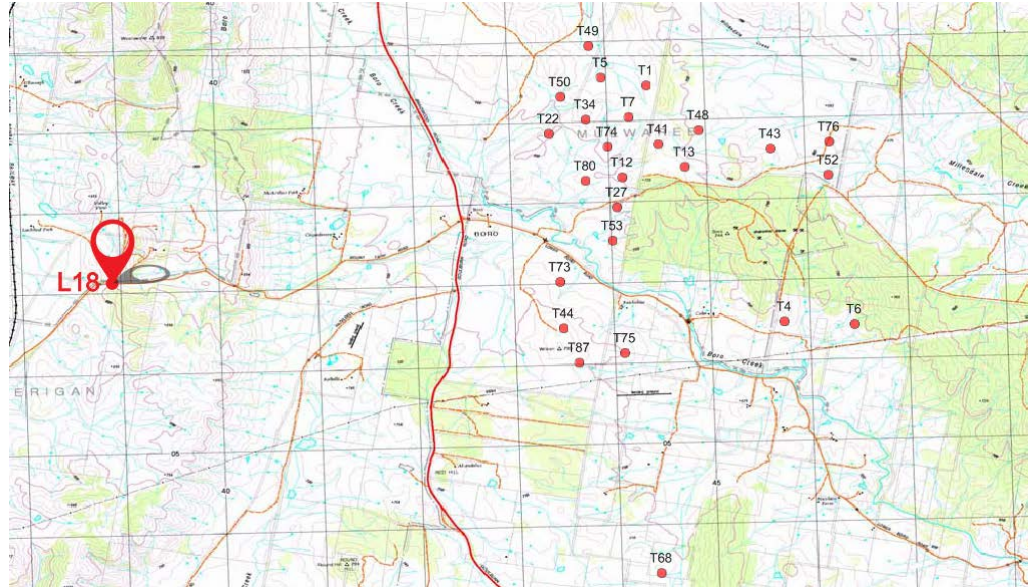


Figure 9.23 shows the view looking west away from the Project. Collector wind farm visible in the background. The closest turbine is approximately 7.5km west.

Figure 9.80 Viewpoint L18 – view looking west



Figure 9.81 shows the view looking east towards the project across Landscape Unit 3 – Forested Hills.

Figure 9.81 Viewpoint L18 – view looking east



The undulating topography and existing vegetation will most likely filtering views to turbines from this location. Therefore the overall visual impact would be assessed as **Negligible**.

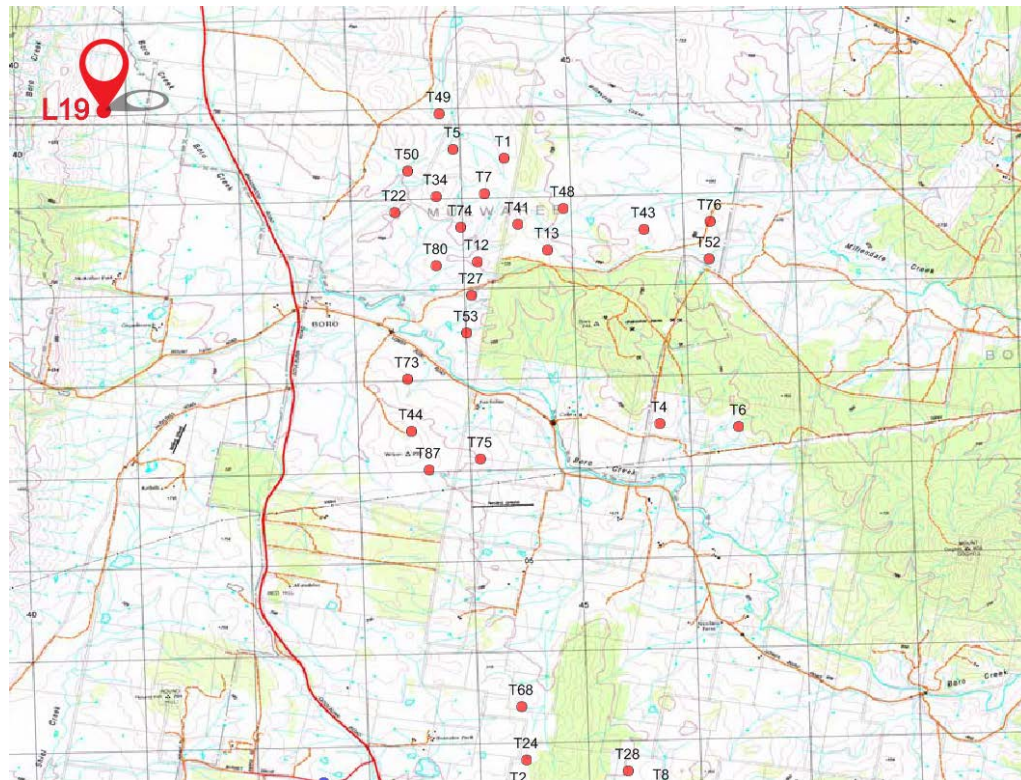
9.6.19

Viewpoint L19 – Roseview Road

Viewpoint L19 is located on Roseview Road to the north west of the Project. The nearest wind turbine (T50) is approximately 2.8km south east.

Figure 9.82

Viewpoint L19 (55H 740793, 6110055)



The landscape unit of Viewpoint L19 is Landscape Unit 2A 'The Plains' and is flat cleared farmland with scattered vegetation and hedgerows along boundaries. Figure 9.83 shows the view looking south east towards the Project.

Figure 9.83

Viewpoint L19 – view looking south east



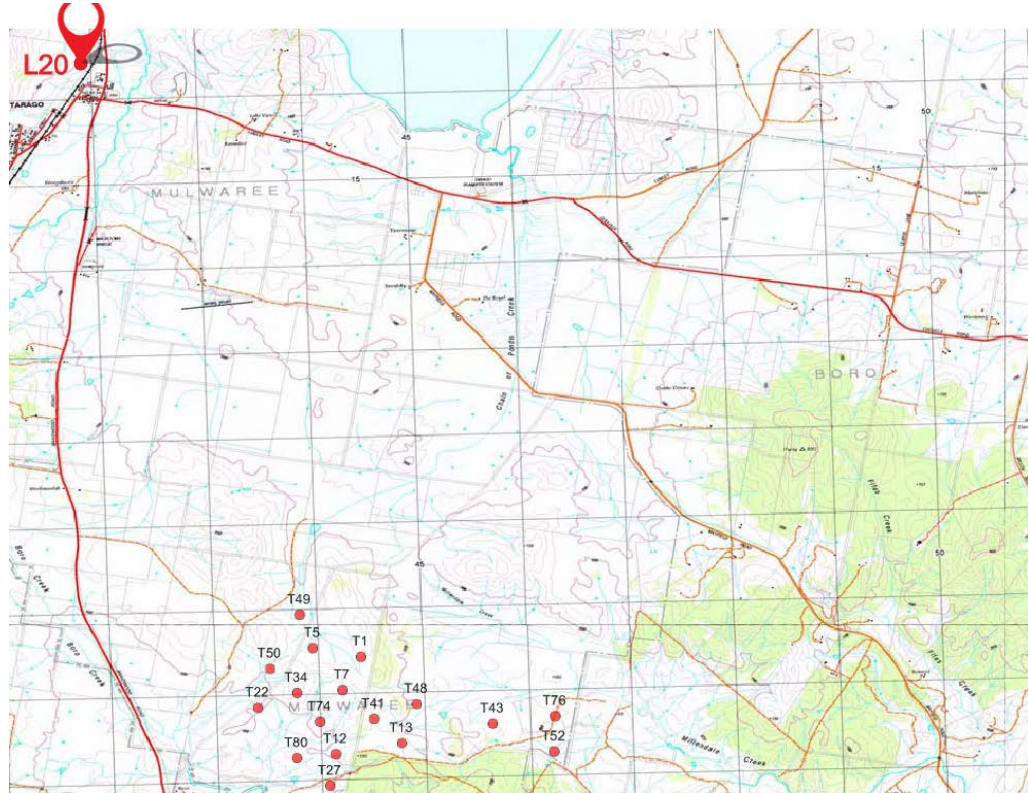
Several of the proposed turbines would sit behind the hill to the right of the roadside vegetation in Figure 9.83. While this might screen the base of the turbines, they will still be visible above the hill. Other turbines will be visible to the right of the image.

Although this location is in close proximity to the proposed wind farm, Roseview Road is a rural subdivision, which has fragmented the already highly modified landscape which has a low sensitivity to further visual change. For these reasons, the overall impact would be assessed as **Low-Moderate**.

9.6.20 Viewpoint L20 – Sherwins Ridge Subdivision

Viewpoint L20 is located at a new subdivision to the north of Tarago. The nearest wind turbine (T49) is approximately 6.9km south east.

Figure 9.84 Viewpoint L20 (55H 741870, 6116538)



Viewpoint L20 is located within the new rural residential estate to the north of Tarago. There are several elevated lots within the estate that have a view over the Tarago township towards the Project as shown in Figure 9.85.

Figure 9.85 Viewpoint L20 – view looking south east



Other lots within the estate sit lower in the landscape and have a view toward the project across the Tarago township as shown in Figure 9.86.

Figure 9.86 **Viewpoint L20 – Lower view looking south east (55H 741669, 6116343)**



At a distance of approximately 6.9km the proposed turbines would be visible but would not dominate views.

This location is not in close proximity to the proposed wind farm, has relatively low viewer numbers and the view sits within a highly modified landscape which has a low sensitivity to further visual change. For these reasons, the overall impact would be assessed as **Negligible**.

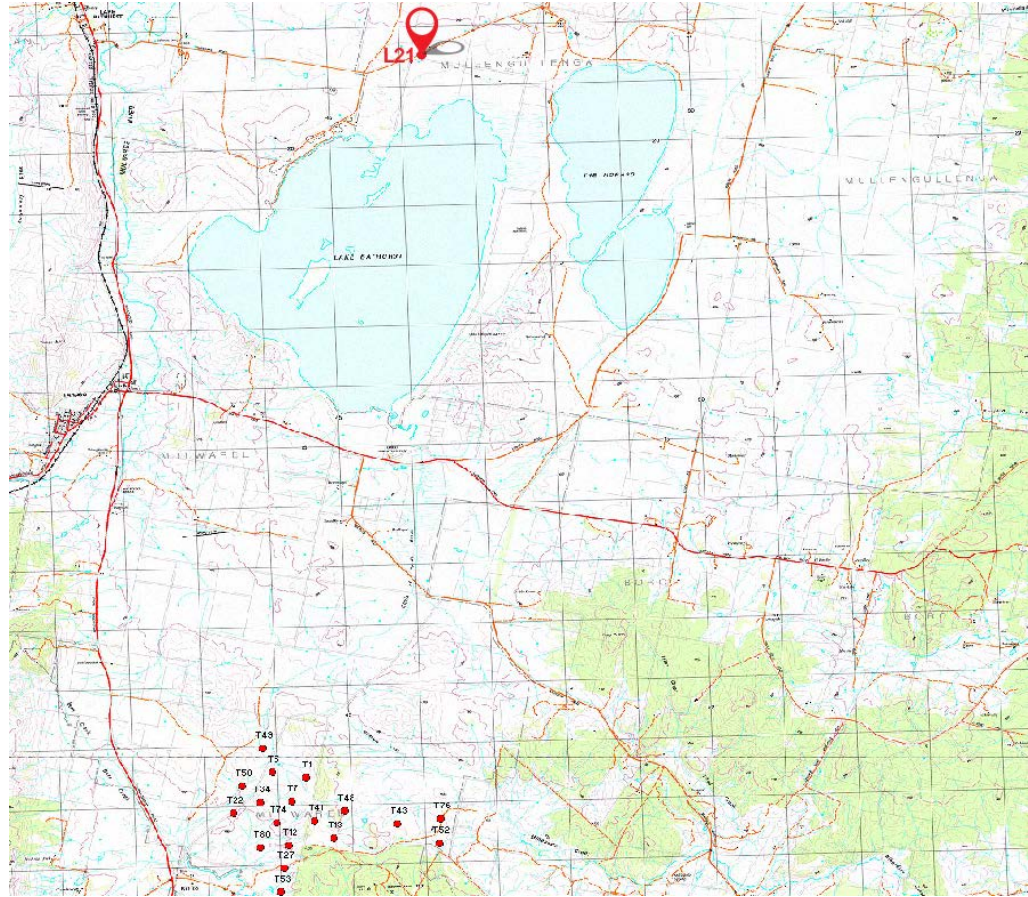
9.6.21

Viewpoint L21 – Glenovel Road

Viewpoint L21 is located on Glenovel Road to the east of Lake Bathurst township. The nearest wind turbine (T49) is approximately 12km south.

Figure 9.87

Viewpoint L21 (55H 746429, 6121599)



Viewpoint L21 looks over the Landscape Unit 2A – ‘The Plains’. It is a highly modified cleared landscape with small patches of vegetation within the view. Figure 9.88 shows the view looking south towards the Project.

Figure 9.88

Viewpoint L21 – view looking south



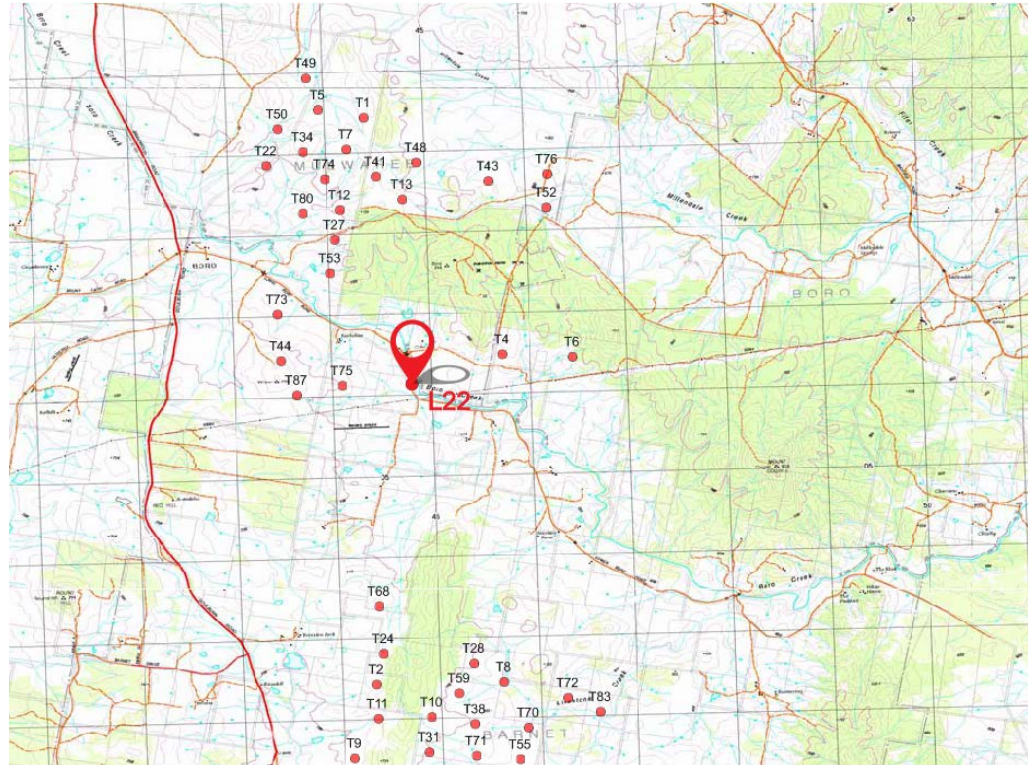
At a distance of approximately 12km, the proposed turbines are potentially noticeable, however they would not dominate the views. Intervening existing vegetation and minor topography would assist in filtering views to the Project.

For these reasons, the overall visual impact would be assessed as **Negligible - Nil**.

9.6.22 Viewpoint L22 – Boro Road (Substation Location)

Viewpoint L22 is located on Boro Road. The nearest wind turbine (T75) is approximately 690m west. This is the location of the proposed Substation.

Figure 9.89 Viewpoint L22 (55H 744776, 6106112)



Viewpoint L22 looks over Landscape Unit 2A 'The Plains'. It is an extensively modified cleared farmland landscape. Figure 9.90 shows the view looking south west towards the southern part of the project and the proposed substation facility.

Figure 9.90 Viewpoint L22 – view looking south west



To the right of the image is the location of the proposed substation which will include a short 330kV above ground transmission line connecting the on-site substation to the existing TransGrid 330kV transmission line. The existing TransGrid 330kV transmission line is visible in the middle of Figure 9.90.

The closest wind turbine (T75) will be visible to the far right of this image. At a distance of approximately 690m it will be a dominant element in the view. The closest turbine in the southern section of the Project is approximately 2.7km south.

Although this location is in close proximity to the proposed wind farm, there are low viewer numbers and the view sits within a highly modified landscape which has a low sensitivity to further visual change.

People's perceptions of substations are not as favourable as wind turbines. Whilst there will be some screening vegetation surrounding the proposed substation, it is likely to still be a dominant element within this view.

For these reasons, the overall impact would be assessed as **Moderate**.

9.6.1 Local Roads Overall Visual Impact

Local road, both sealed and unsealed, service the farms and residences of the local area. The majority of local roads are over cleared gently undulating farmland. Table 9.9 summarised the overall visual impact assessment for viewpoints on local roads.

Table 9.9 *Overall Visual Impact of Local Roads*

Viewpoint No.	Approximate distance and direction of nearest WTG	Visual Impact
L1 – Lumley Road	5.4km south west (T49)	Low-negligible
L2 – Tarago Road	7.4km south west (T49)	Low-negligible
L3 – Corner Lumley & Willow Glen Roads	6.3km south west (T76)	Negligible
L4 – Corner Millendale & Willow Glen Roads	5.8km south west (T76)	Negligible-Nil
L5 – Lakeview Road	1.7km south east (T76)	Low-Moderate
L6 – Lakeview Road	2.3km south west (T76)	Low-Moderate
L7 – Sandy Point Road	9.1km south west (T6)	Low-Negligible
L8 – Sandy Point Road	8.8km south west (T6)	Low-Negligible
L9 – Mayfield Road	5.9km west (T6)	Low-Negligible
L10 – Jamaleopa Road	5.9km north east (T45)	Negligible
L11 – Duckfield Road	3.2km north east (T86)	Low
L12 – Duckfield Road	1.4km north west (T37)	Low-Moderate
L13 – Duckfield Road	1.3km north east (T40)	Low-Moderate
L14 – Hazeldale Road	7.6km north east (T40)	Negligible
L15 – Dog Rocks Close	3.4km north east (T40)	Low
L16 – Barnet Drive	1.7km east (T2)	Low-Moderate
L17 – Boro Road	370m south (T73)	Moderate
L18 – Mt Fairy Road	4.5km east (T73)	Negligible
L19 – Roseview Road	2.8km south east (T50)	Low-Moderate
L20 – Sherwins Ridge Estate	6.9km south east (T49)	Negligible
L21 – Glenovel Road	12km south (T49)	Negligible - Nil
L22 – Boro Road	690m west (T75)	Moderate
OVERALL VISUAL IMPACT		LOW

All local road viewpoints assessed within this report are within 12km from the nearest WTG. Because these roads have low viewer numbers and the view is across a landscape that has a low sensitivity to change, the overall visual impact is assessed as **low**.

The following section examines visual impacts from residential properties.

10

IMPACT FROM RESIDENTIAL PROPERTIES

A key component of any visual impact is the consideration of views from residential dwellings. The assessment of visual impact from residential properties differs from that undertaken from publicly accessible viewpoints. For residential occupiers the view to the wind turbines may not be just a glimpse or a five minute experience as they drive around the local road network but, potentially, a permanent view from living areas or outside entertainment spaces of their homes. Landholders that farm the land may be impacted as they work on their property. The analysis of visual impact from residential properties is based on the following assumptions:

- An occupant of a residential dwelling will have a high degree of sensitivity to the change in their immediate landscape.
- Visitor numbers are not applicable to residences.
- Farmers may be able to see the wind turbines as they move around their property. These areas may be used as much in daylight hours as the living areas of their residences.
- Landscape can be designed to mitigate visual impact when located near a fixed viewpoint, such as a residence, with far greater ease than that can be achieved along the road network.

The Zones of Visual Influence discussed in Chapter 6 details the effect of distance and turbine visibility. For a turbine height of 173 m, the area of significant turbine visibility from residential properties occurs where wind turbines are within 2.0 km of a dwelling. However turbines at 173 m in height can be dominant out to 4.0km.

10.1

Requirements of the SEARS

The Project SEARs require visual impact from residential dwellings:

- *utilise recognised tools (such as photomontages and wireframes) at representative locations to adequately assess the visual impacts of the project, particularly for non-associated residences within 3 km of a proposed turbine;*
- *provide detailed consideration of the feasibility and effectiveness of the proposed mitigation measures, including consultation with all landowners of non-associated residences within 3 km of a proposed turbine where significant visual impacts are predicted to identify potential approaches to mitigate any adverse impacts, including consideration of negotiated agreements;*

There is no requirement in the SEARs to undertake a targeted assessment from each individual dwelling within 3.0 km of the proposed wind turbines. There is however a requirement to identify all dwellings which are predicted to have a significant or high level of visual impact.

ERM have provided a visual assessment from all dwellings where access was granted by the dwelling owners. Where possible, an approximate assessment of visual impact has been made from supporting material. An assessment made in this way has been clearly identified.

It is not possible to provide an accurate assessment from a dwelling when an owner has not responded to requests to conduct a full visual assessment from their property or access was not granted to the property. Any assessment made from an approximation of viewing locations, remote imagery or photographs provided by third parties is limited. Much criticism of this approach has been made by several submissions to the Project and for previous assessments. This is not one that is considered best practice by ERM.

An approximation of visual impact can also only be undertaken where practicable or where sufficient information is available.

Where an assessment has been made by an approximation of views, it is stressed that any assessment and proposal for landscape mitigation would need to be verified on site.

For the above reasons, ERM recommend that where there are concerns relating to a remote assessment of impacts to residential dwellings, that these be supplemented by a site visit arranged by the Department.

Further, should there be any concerns from the Department relating to an assessment of impacts from dwellings that have not been assessed within this report, the same approach be undertaken.

10.2 Visual Bulletin

The Visual Bulletin offers little further guidance for assessing residential dwellings. It is noted though that the viewer sensitivity for rural dwellings or in areas zoned RU1 is moderate.

For the reasons outlined earlier in this report, viewer sensitivity from any residential dwellings is always rated as high, before considering turbine visibility, proximity and landscape mitigation.

Both the SEARs and the Visual Bulletin require the assessment of visual impacts and the amenity of landholders and communities. Once the impacts are determined, both the SEARs and the Visual Bulletin require the suitability of mitigation measures manage impacts to be considered. This requirement is consistent with the visual assessment for all wind farm projects throughout New South Wales and Australia and global best practice for the Environmental Impact Assessment of any project.

One Mitigation measure that is available to manage visual impact from residential locations is the ability for vegetation or landscape screening to filter or screen the turbines. These are discussed in detail further in this section.

10.3 Residential Assessment Methodology

The area that has the potential for the greatest level of visual impact is within a 2.0 km radius of the proposed turbines and visually dominant to a distance of 4.0 km.

The SEARs require that the visual assessment for residential dwellings considers the area within a 3.0 km radius of the proposed turbines. The visual assessment methodology for residential impacts includes the following steps:

- Identify all residential dwellings within 3.0 km of a turbine
- Determine those dwellings that are likely to have a significant level of visual impact
- Assess dwellings utilising photomontages and wireframes at representative locations to assess the visual impacts for non-associated residences;
- where significant visual impacts are predicted, consider the feasibility and effectiveness of mitigation measures for adverse impacts

This methodology is supported by past Victorian Planning Panel decisions and recent New South Wales Land and Environment Court decisions.

In some instances, no mitigation measures may be required due to either screening afforded by topography, existing vegetation, built form or lack of views from key areas within proximity to the dwelling.

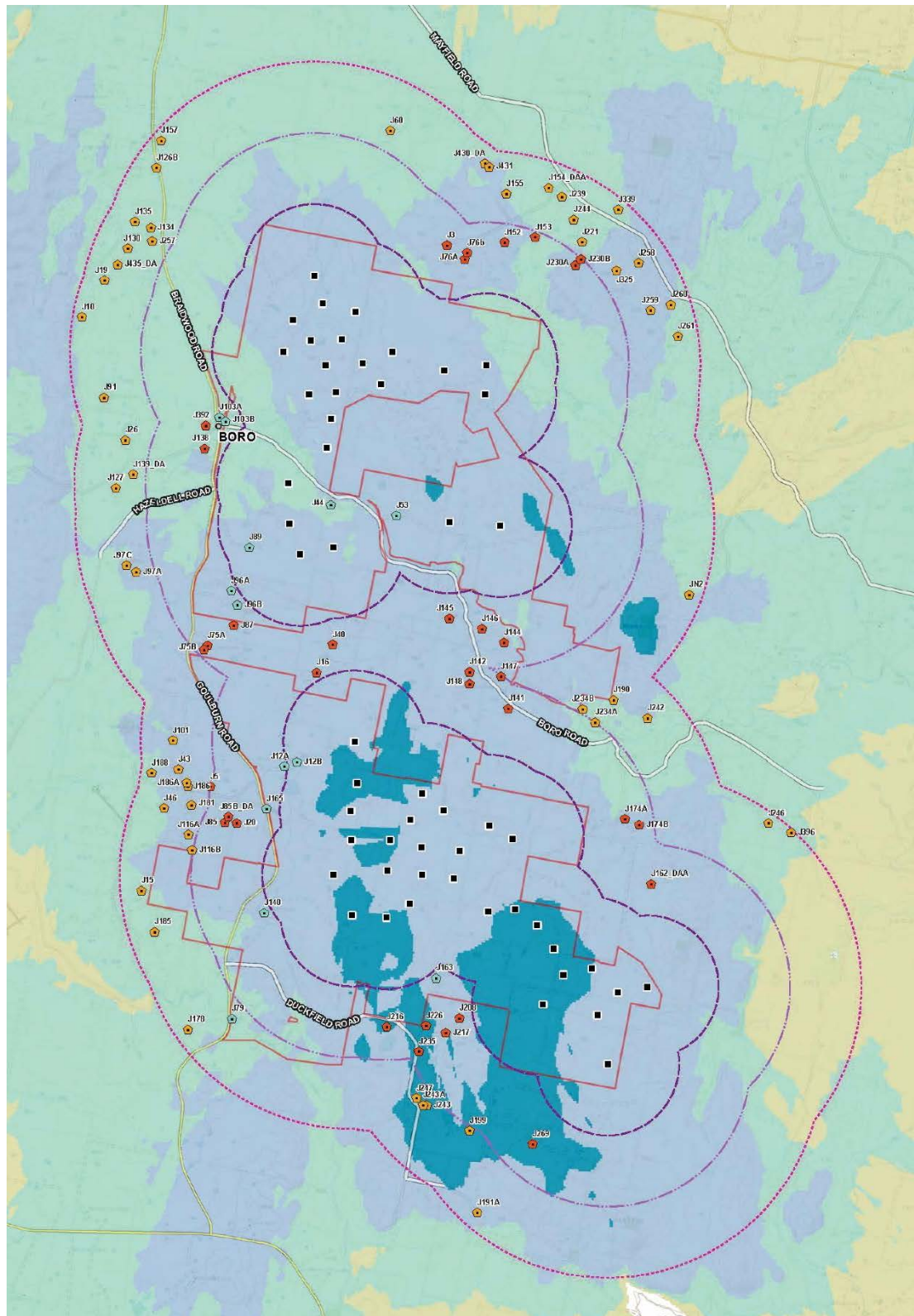
Table 10.1 Summarises dwellings within 3.0 km of the nearest visible wind turbine. The locations of participatory landowners' residences and non-participatory residences have been provided by EPYC.

Table 10.1***Non-participatory houses within 3.0 km of the nearest wind turbine***

Distance from house to its nearest wind turbine	Total number of houses	Total number of non-participatory houses
Within 1.0 km	4	0
1.0 km to 2.0 km	42	34
2.0 km to 3.0 km	55	54
TOTAL within 3km	101	88

There are 88 non-participatory residences within 3.0 km of the nearest wind turbine. Dwellings are predominately arranged in rural clusters around the wind farm.

Figure 10.1 Residential dwellings within 3.0 km of a turbine



Isolated dwellings associated with larger landholdings are generally to the north of the Project.

10.4 Residential Viewpoint selection

This section will describe and provide an assessment of the range of residential viewing scenarios and landscape settings for the Jupiter Wind Farm. This assessment will be based on properties where access has been granted and an understanding of visual impact gained from prior project experience. Where access has not been granted for the purposes of this assessment, an assessment has been based on proxy views from the surrounding road network or similar dwelling has been granted as required by the project SEARs and Visual Bulletin. For the latter, it must be recognised that this approach is by no means an accurate assessment; rather it serves to provide an overall assessment of the range of views towards the turbines.

The majority of residential dwellings within 3.0 km are located in clusters which surround the wind farm. From our site visits, there are nine identifiable clusters of residential dwellings identified based on proximity, viewing angle and distance to the proposed turbines. The groupings is by no means absolute, but rather provides a suitable way to determine the likely visual impact from residential dwellings that surround the Project. For the purposes of this report, the clusters are as follows:

- Braidwood Roseview Road to the north west
- Lakeview Mayfield Road to the north east;
- Mount Fairy/ Hazeldell, Boro Road and Barnet Drive to the west;
- Boro Road East, to the east; and
- Boro Road Central.

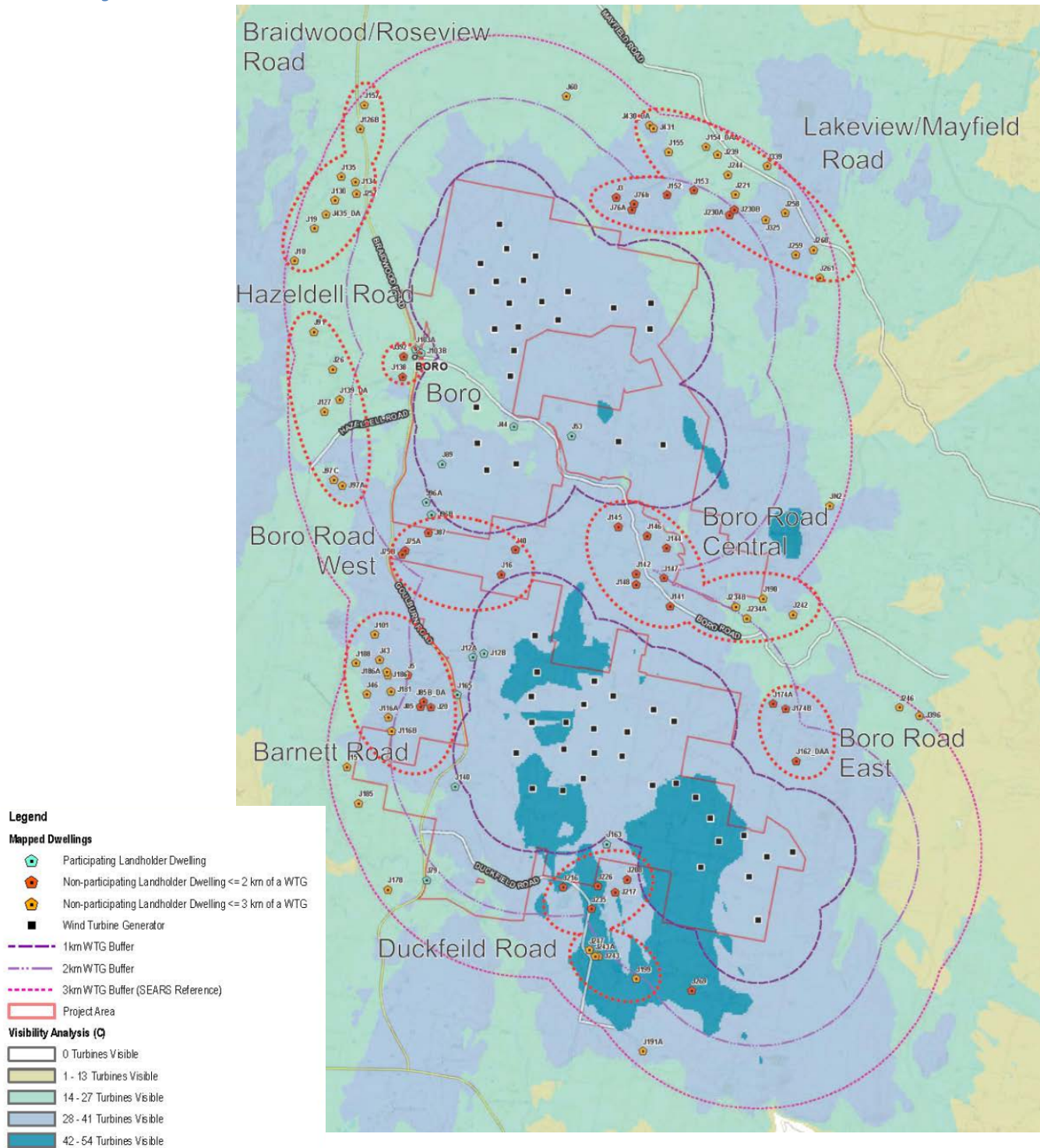
The nine residential clusters and dwellings within 3.0 km of a turbine are shown on Figure 10.2. To assist with understanding turbine visibility Figure 10.2 also shows the number of turbines that would be visible from the Nacelle and above. Turbine visibility is based on the Seen Area Analysis discussed at Section 7 of This report.

The selection of viewpoints on which to assess the visual impact on residential properties seeks to provide representative views from a broad range of residential dwellings that surround the Jupiter Wind Farm.

Several viewpoints from within each cluster have been selected to determine visual impact and mitigation options for dwellings within each cluster.

Figure 10.2

Residential Clusters



Before assessing the visual impact from residential dwellings, it is worthwhile understanding the role the landscape mitigation can play for screening views to turbines from affected dwellings.

10.5 LANDSCAPE MITIGATION

Landscape mitigation measures can be utilised to screen and filter views to the Project from residential locations. Such measures are also suitable for facilities such as the on-site substation facilities.

Landscaping is a mitigation option available for the majority of residential properties in proximity to the proposed Jupiter Wind Farm. As the viewing location is relatively fixed, planting may be designed to either screen the wind turbines from view, or significantly reduce the visual dominance of wind turbines through filtering.

Many of the more established residential dwellings that surround the Jupiter Wind Farm include extensive areas of canopy and screening vegetation. For these properties screening vegetation will assist to filter views to the proposed wind farm. They will also assist to protect these properties from winds whilst not affecting solar access.

Similarly, the landscape patterns of the area also include many areas of large and extensive wind break and hedgerow plantings within road reserves, along property boundaries and fence lines. It is clear from these examples that landscape mitigation is possible for the majority of residential dwellings in close proximity to the Project.

However, it is recognised that the landholder may not wish to establish boundary planting, due to the decrease in viable farmland, or for aesthetic reasons.

The desirability of landscape mitigation measures for houses to the south may be lower than for properties to the north. Such measures could affect the solar access to internal living areas or outdoor entertaining spaces. Landscape mitigation measures should be determined on a case by case basis in consultation with landholders to minimise adverse impacts.

Such a process has occurred in past projects, after approval of the wind farm with advice and funding being supplied by the proponent.

The directions within the judgement in the New South Wales, Land and Environment Court for the Taralga Wind Farm required the proponent (RES Southern Cross Pty Ltd) to undertake off-site landscape program works to a radius of 2km from the nearest wind turbine.

Here, three experts involved in the project (one for the proponent, one for the minister and one for the objectors) all agreed on a 2km radius as being a suitable distance to undertake off-site landscape mitigation works. This was also supported in the Ministers submission's to the hearing.

A similar process of landscape mitigation was proposed and upheld for affected residences within 3km of the Gullen Range Wind Farm. At that project, the proponent for the Gullen Range Wind Farm agreed to off-site landscape mitigation out to a distance of 3km.

10.5.1 Viewing Angle and Landscape Mitigation

Dwellings with the greatest potential to be impacted by any wind farm development are nearest to 1.0 km from a turbine.

Viewing angle is relevant to determining the heights that vegetation will be required to achieve when set back at various distances to a dwelling or viewing location. The view angle will change with distance. The greater the distance between a viewing location and a turbine the smaller the turbine will appear, similarly the closer the viewing location the larger the turbine will appear.

By analysing view angles for a 173 m it is possible to determine the approximate height that landscape mitigation would be required to achieve to ameliorate visual impacts from residential dwellings.

To be conservative, the following will describe view angle at a distance of 1.0 km from a turbine and how this translated to landscape mitigation. Figure 10.3 shows the view angle for a 173 m high turbine at 1.0 km.

Figure 10.3 View angle 173 m high turbine at 1.0 km

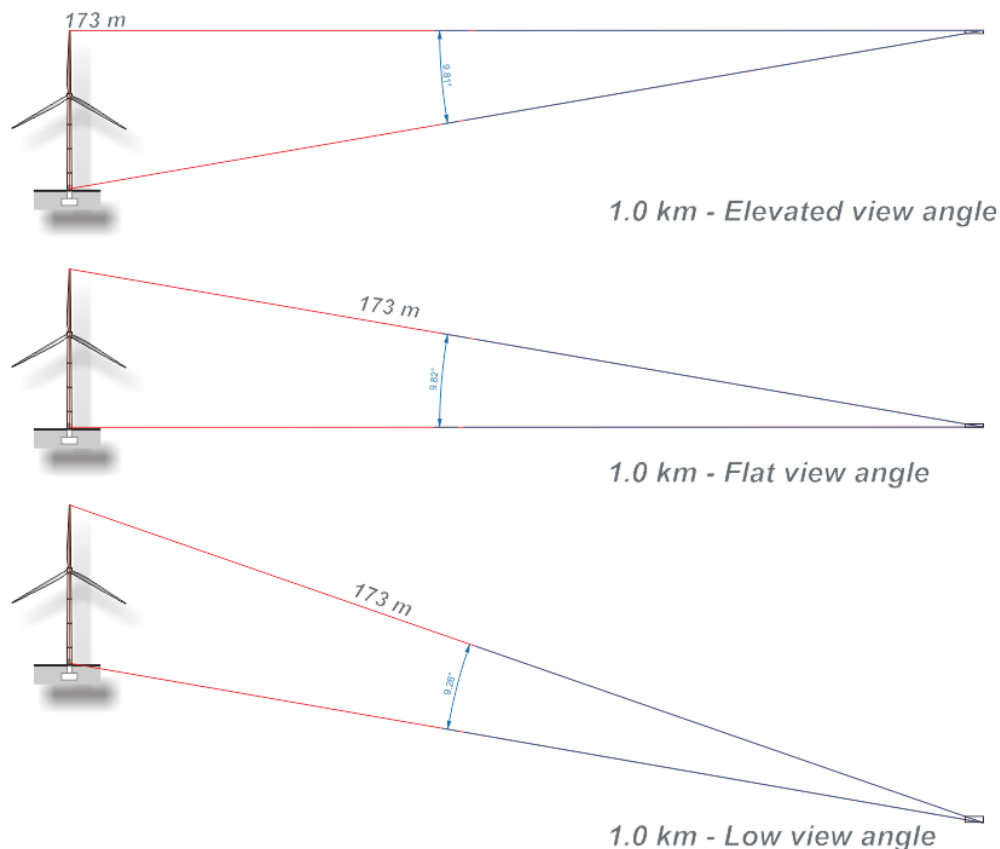


Figure 10.3 shows the view angle for a range of viewing opportunities including from elevated locations, across flat ground and from lower elevations. Regardless of the view situation, it is clear that the view angle for a 173 m high turbine is approximately 9° in the vertical field of view.

When considering view angle and the range of view settings from residential dwellings that surround the Jupiter Wind Farm landscape setting available it is reasonable to consider vegetation height requirements over several distances.

There is a requirement for new and recently constructed dwellings to establish an Asset Protection Zone (APZ) within the local area.

For this reason vegetation heights have been provided at distances of 40 m and 20 m setbacks from dwellings. These heights are shown in Table 10.2.

Table 10.2

Viewing angles and landscape mitigation

Turbine Height	View angle at 1.0 km Distance	Vegetation height at 40 m from dwelling	Vegetation height at 20 m from dwelling
173 m (Elevated)	9.81°	7.02 m+ Fall of land	3.46 +Fall of land
173 m (Flat)	9.82°	6.91 m	3.50
173 m (low Angle)	9.26°	6.92 m	3.52

Figure 10.4 shows the required vegetation heights described in Table 10.2. A height of 1.6 m has been assumed as a standing eye level and has been added to the graphics below. These distances recognising that landscape setting will vary from dwelling to dwelling, and a desire to set vegetation back from dwellings for either clutter or fire.

Figure 10.4

Landscape mitigation examples

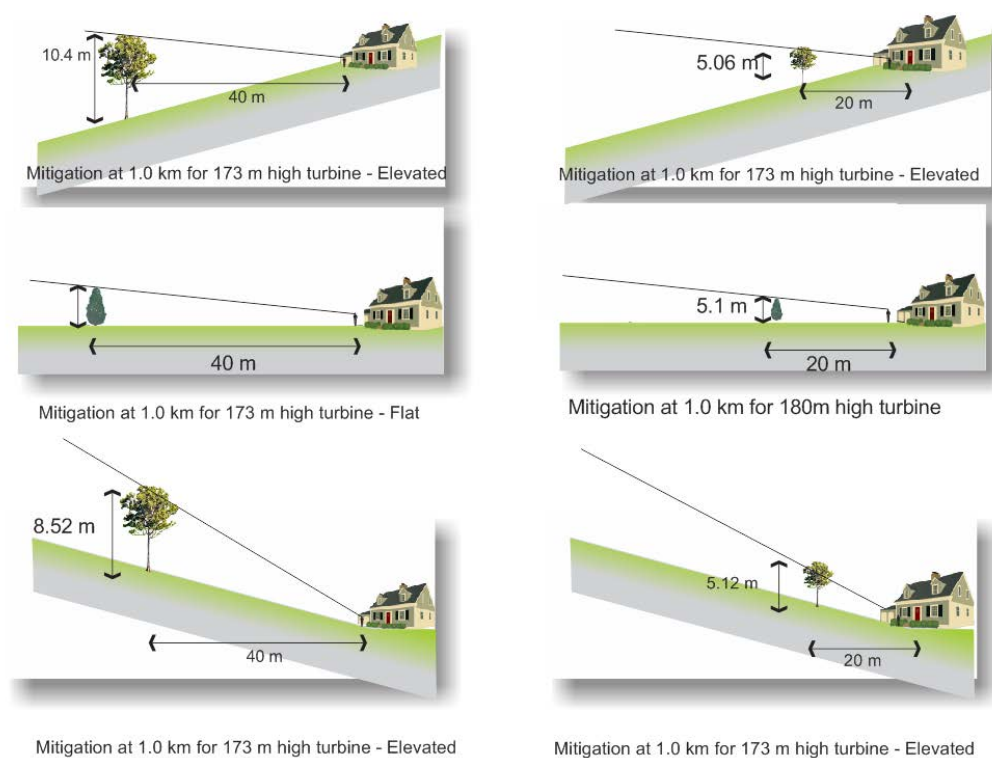
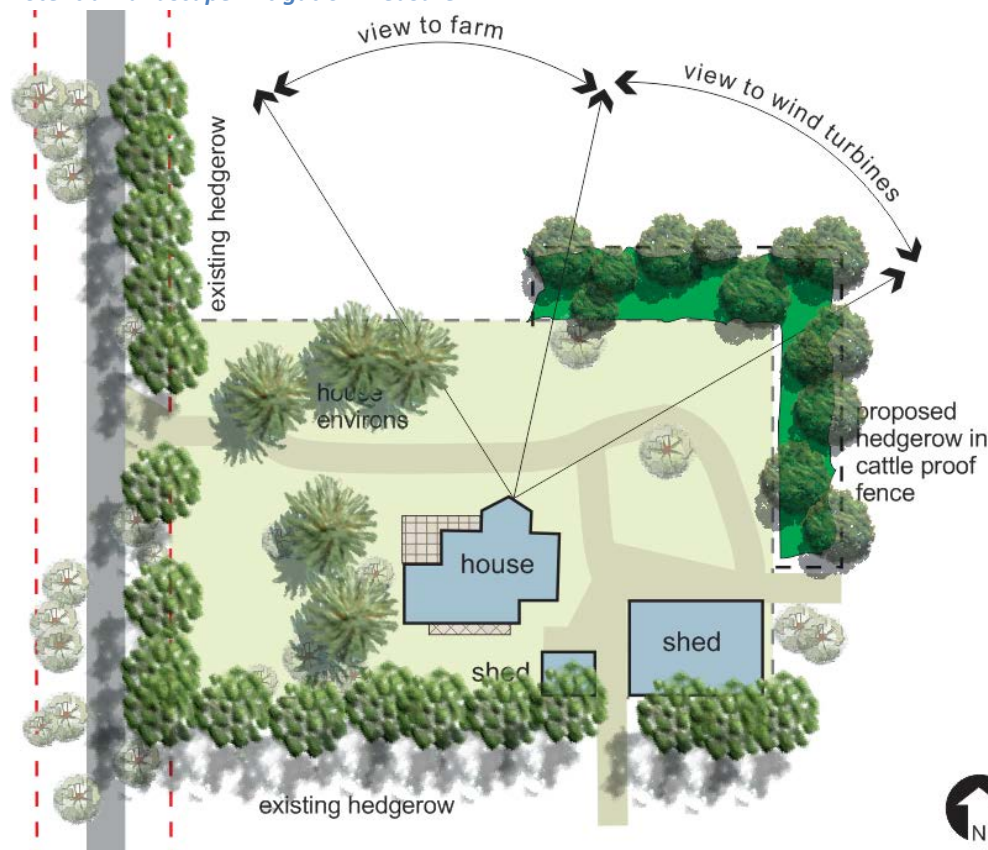


Figure 9.2 shows an example of landscape remediation for a dwelling. This example is based on the owner's desire that the views to the wind turbines should be screened or filtered.

Figure 9.2

Potential Landscape mitigation measure

It is clear from the preceding chapters, supporting photographs and photomontages that vegetation in the region is capable of exceeding the heights required to screen the proposed 173 m high turbines. This is for those dwellings that are potentially most affected being within 1.0 km of a turbine and at a low viewing angle.

It is logical that with greater the distance between turbines and the viewing location, the lower the viewing angle and height of screening vegetation would be required. Similarly the closer the vegetation to the viewing, vegetation can also be at a lower height to screen views to turbines. The latter is relevant to those locations where shadowing of private spaces or gardens may be an issue or for locations with limited gardens.

10.5.2 Process

A site visit would determine the extent of planting between the proponent and the resident.

Planting can be undertaken on residential properties within 3.0 km of turbine, after consultation and agreement with affected landowners. Recent projects requires any such offer to remain in place for a period of one (1) year after construction, to allow people time either to adjust or to decide that landscape filtering or screening is warranted.

10.5.3 Species selection

Species selection would be determined in consultation with landholders using advice from the local Landcare group.

It is important that seed of local provenance or plant material that is “hardened off” and acclimatised to the area to ensure that it is accustomed to the local climate of the area.

10.6 Landscape Mitigation for substation

Landscaping can have the potential to reduce visual impact of the proposed infrastructure such as the substations.

Perimeter planting can be undertaken to substations. Such planting will effectively screen the facility from its immediate environment. Figure 10.5 illustrates an indicative landscape concept for the on-site substation and switchyard.

Figure 10.5 *Indicative plan showing perimeter planting for off-site substation*



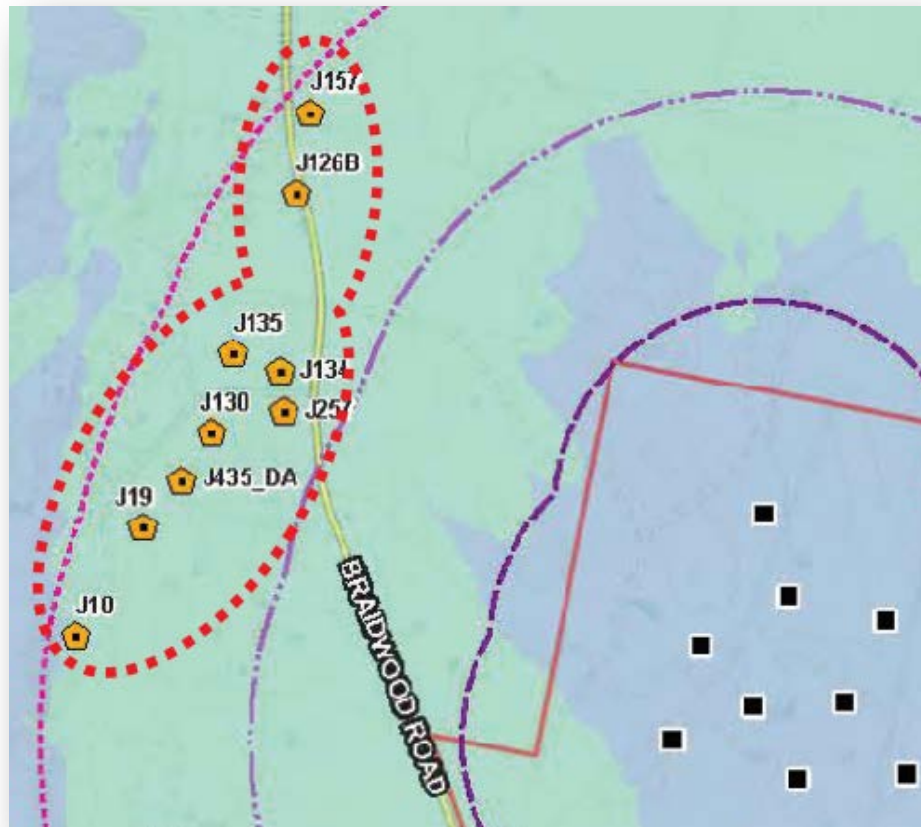
Indigenous vegetation can be planted within a revegetation area to the perimeter of the site. The revegetation area can vary in width such that upon establishment, this boundary planting will be similar in appearance to a remnant patch of vegetation or hedgerows commonly seen in the surrounding farming region.

10.7 Braidwood Roseview Road

The Braidwood – Roseview Road residential cluster is situated to the north west of the Jupiter Wind Farm. The majority of dwellings within this cluster have been recently constructed, under construction or awaiting permit approval.

Established Dwellings include J156 “Platinum Park” and J126.

Figure 10.6 *Braidwood - Roseview Road Dwellings*



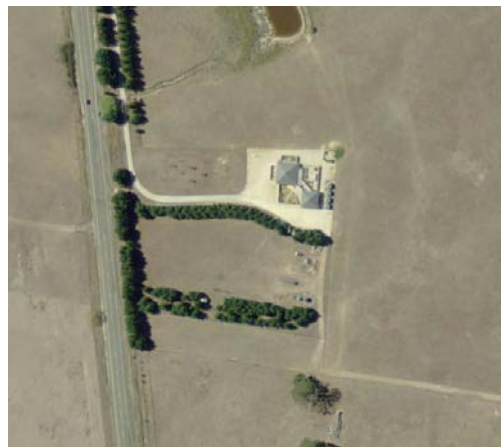
Dwellings within 3.0 km of a turbine and included within this assessment include J156, J126B, J135, J134, J130, J257, J 435_DA, J19 and J10.

Dwellings within this cluster have the potential to see the Nacelle and above for up to 27 turbines.

Dwelling J156

The assessment at this dwelling has been made from aerial imagery and roadside inspections.

Dwelling Layout (Six Maps)



View looking south east from Braidwood Road



Existing plantings indicate that landscape mitigation would be effective to screen views to turbines if required. Should mitigation be implemented, the visual impact at this dwelling would be negligible to Nil.

10.7.2

Dwelling J126 B

Dwelling J126B is located on the western side of Braidwood Road. Turbine T49 is approximately 2.6 km to the south east of this dwelling. The assessment for this dwelling has been made from aerial imagery and roadside inspections.

Figure 10.10

Proximity to turbines

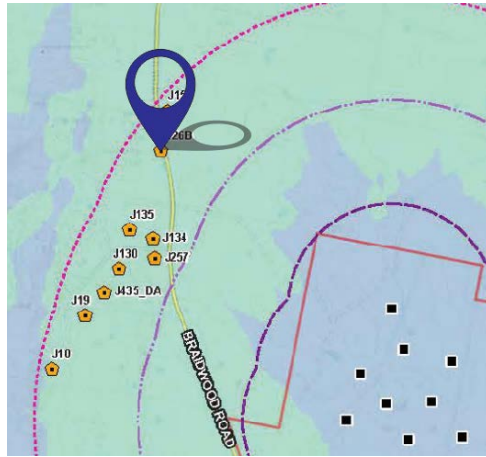


Figure 10.11

Dwelling Layout (Six Maps)



Sheds, farm structures and planting directly opposite the dwelling on the eastern side of Braidwood Road can be seen in the aerial photograph in Figure 10.11.

The dwelling is set back approximately 10 m from Braidwood Road behind a brick fence. Figure 10.12 shows the eastern façade which faces Braidwood Road.

Figure 10.12

Existing Dwelling - Eastern Facade



Figure 10.13 shows the view looking south east from Braidwood Road at the same location as Figure 10.12.

Figure 10.13

View looking south east from Braidwood Road



Views towards the wind farm from this dwelling would be filtered by existing vegetation or screened by farms sheds and other structures.

The visual impact from this dwelling would be low to negligible due screening afforded by existing plantings and structures between the dwelling and proposed turbines.

Existing plantings indicate that landscape mitigation would be effective to screen views to turbines if required.

10.7.3

Dwelling J135

J135 is to the west of Braidwood Road and north of Roseview Road. The lot is currently improved by a shed, water tanks and ancillary structures. Turbine T49 is approximately 2.6 km east- southeast of J135.

Figure 10.14 *Proximity to turbines*

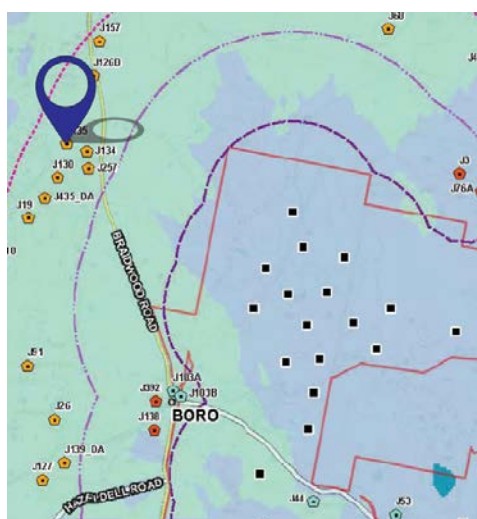
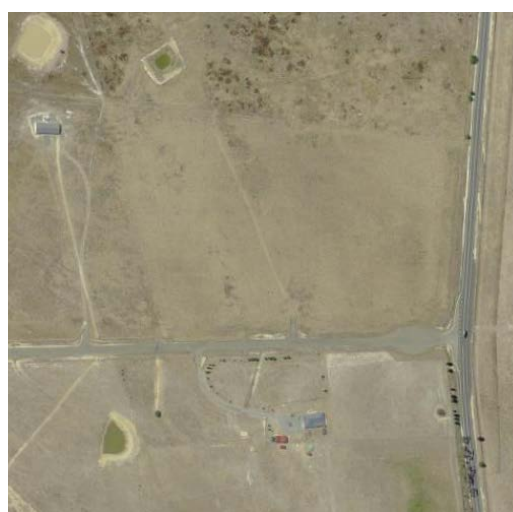


Figure 10.15 Dwelling Layout (Six Maps)



The dwelling is set back approximately 400 m from Braidwood and 200 m from Roseview Road. Figure 10.16 shows the eastern façade of the structure at this location.

Figure 10.16

Existing Dwelling – Southern and Eastern facades



Figure 10.17 shows the view looking south east towards the turbines.

Figure 10.17***View looking south east from structure***

Views towards the wind farm are over cleared flat farmland. Views to the turbines include dwelling, structures and plantings to the south of Roseview Road. Existing plantings within dwellings to the south demonstrate that landscape mitigation is an option for this dwelling.

There are clear views to the south east and south towards the proposed turbines. Visual impact would be moderate in the absence of landscape mitigation and considered design of the future dwelling.

Although the future layout and orientation of private open space and amenity is not known, these areas could be designed and oriented to enjoy the northerly exposure and sunlight, directing views away from turbines. Should these spaces be oriented towards the turbines, there is sufficient space and setback in which landscape mitigation could be implemented to screen views to turbines. Existing plantings indicate that landscape mitigation would be effective to screen views to turbines if required.

Visual impact from this location could be reduced to low to negligible through design of the future dwelling and implementation of landscape mitigation to the south east and south of the dwelling.

10.7.4

Dwelling J435_DA

J435_DA is approximately 650 m west Braidwood Road and 180 m south Roseview Road. A new dwelling is nearing completion at this location. Turbine T50 is approximately 2.5 km east-southeast.

Figure 10.18

Proximity to turbines

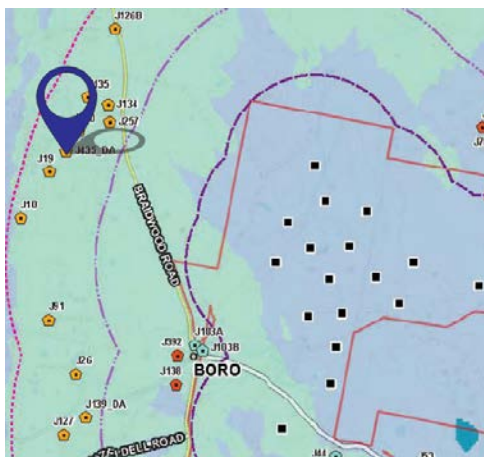


Figure 10.19

Dwelling Layout (Six Maps)



Figure 10.20 shows the eastern façade and alfresco area of the dwelling under construction.

Figure 10.20

Existing Dwelling – Southern and Eastern facades



Figure 10.21 Existing view looking east from veranda and alfresco area towards the proposed turbines.

Figure 10.21

Existing view looking east from veranda and alfresco area



Figure 10.22 View looking east from veranda and alfresco area with turbine WIREFRAME



Turbines would be clearly visible to the centre and right of this view. Clear views are also available to the northeast and north and clear of and proposed wind turbines. Visual impact from this dwelling would be moderate to high in the absence of landscape mitigation.

Visual impact from this location could be reduced to low to negligible with implementation of landscape mitigation to the east and southeast of the dwelling.

At a distance of approximately 2.5 km vegetation would be required to achieve a mature height of approximately 4.0 m to screen a 173 m high turbine when set back 30 m from a dwelling.

Existing vegetation in the area is demonstrated to exceed these heights. For this reason mitigation would be effective to screen views to turbines if required.

10.7.5

Dwelling J257

J257 is approximately 130 m west Braidwood Road and 70 m south Roseview Road. Turbine T50 is approximately 2.2 km to the southeast.

Figure 10.23 Proximity to turbines

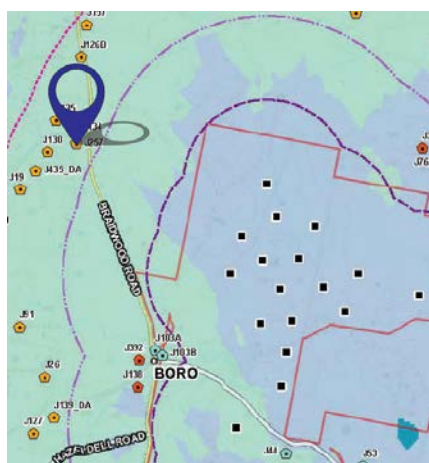


Figure 10.24 Dwelling Layout (Six Maps)



Figure 10.25 shows the southern façade and alfresco area facing the proposed turbines. .

Figure 10.25 Existing dwelling – Southern façade and alfresco



The outdoor dining area is located under the main veranda attached to the dwelling. Views from this location to the proposed turbines would be partially screened by the open air structure central to the lawn area.

Figure 10.26 towards the proposed turbines from the edge of the house yard, clear of any structures and new plantings to the east and south of the dwelling.

Figure 10.26 *View looking south east from edge of house yard*



Vegetation located along the western side of Braidwood Road can also be seen in this view. At this distance, this roadside vegetation is unlikely to screen views to the turbines, however it does serve as a guide to vegetation heights that might be achieved for the purposes of landscape mitigation.

Turbines would be partially screened, albeit visible to the east and south east from the outdoor entertaining areas at this dwelling.

Views directly to the east are partially screened by vegetation and structures however would be clear of turbines. For this reason, the visual impact from this dwelling would be low - moderate.

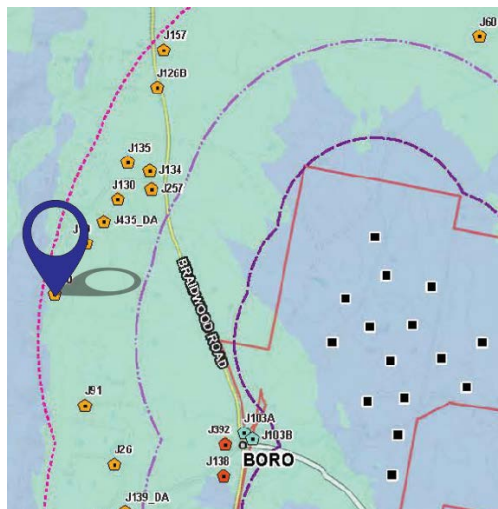
Visual impact from this location could be reduced to low to negligible with implementation of landscape mitigation to the east and southeast of the dwelling.

Existing vegetation seen along the western edge of Braidwood Road suggests that mitigation would be effective to screen views to turbines if required.

10.7.6 Dwelling J10

Dwelling J10 is approximately 1.4 km west of Braidwood Road and 700 m south west of Roseview Road. Turbine T22 is approximately 2.9km south east.

Access was not granted to this site therefore the assessment for this dwelling has been made from aerial imagery and other images provided.

Figure 10.27 Proximity to turbines**Figure 10.28 Dwelling Layout (Six Maps)**

From aerial imagery it appears that dwelling J10 is oriented towards the north east, away from the proposed wind farm. Extensive vegetation to the south east of the dwelling would screen views to the southern portion of the Project.

However it is likely that several turbines would be visible when looking directly east from the dwelling.

A photomontage of the original application was provided in the submission made by the residents at J10 as shown in Figure 10.29.

Figure 10.29 Photomontage provided in Submission

It is unclear who prepared or where this photomontage was prepared from. 11 turbines have since been removed from this view with the previous nearest turbine at 2.5km south east.

This dwelling sits approximately 50m higher in the landscape than the previously assessed dwellings on Roseview Road. This elevation and angle of slope surrounding the dwelling may make landscape mitigation harder. However without access to the property it cannot properly be assessed.

For these reasons, to be conservative the overall visual impact would be assessed as Moderate to High without the implementation of landscape mitigation.

10.7.7 Summary of Visual Impacts from residential dwellings at Braidwood – Roseview Road

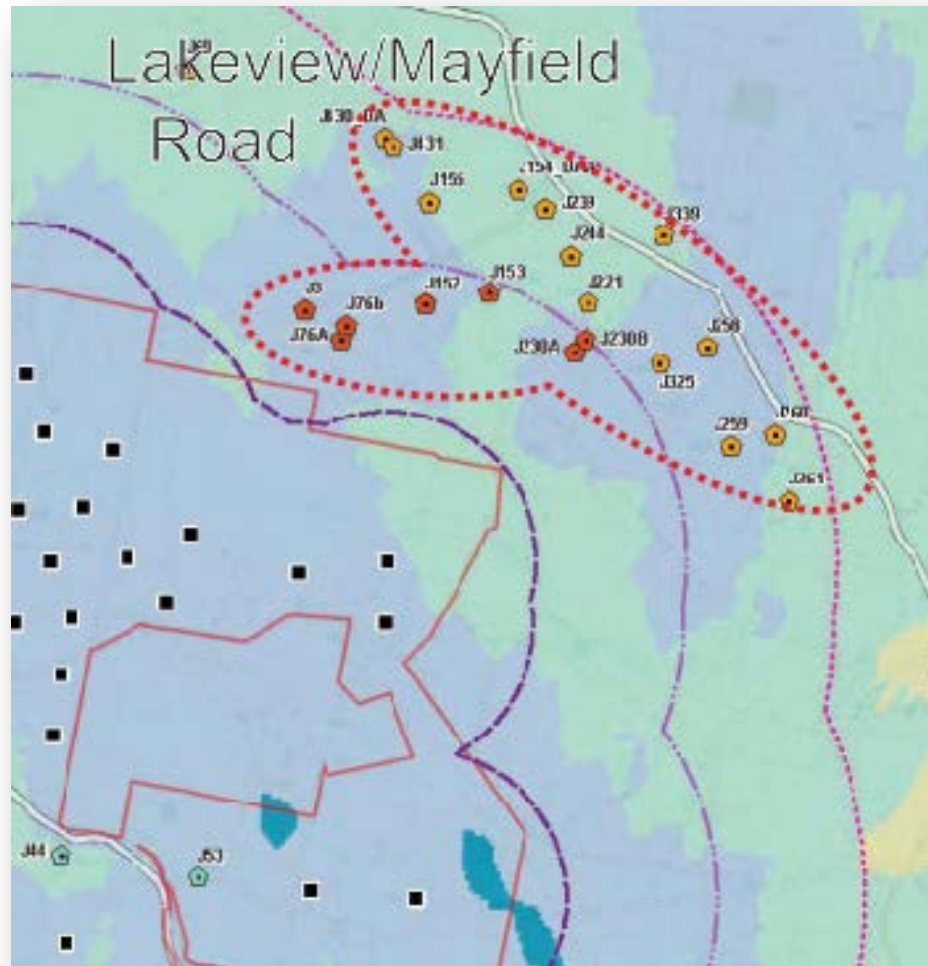
The majority of dwellings on Roseview road have views towards the wind farm over cleared flat farmland. Where clear views are afforded towards the Project the visual impact would be assessed as moderate to high in the absence of landscape mitigation

Existing vegetation within existing dwellings to the south suggest that mitigation would be effective to screen views to turbines for dwellings located on Roseview Road that sit lower in the landscape. Visual impact could be reduced to low to negligible for these dwellings with implementation of landscape mitigation.

10.8 Lakeview-Mayfield Road

The Lakeview-Mayfield Road residential cluster is located to the north east of the Jupiter Wind Farm. The majority of dwellings within this cluster have been recently constructed, under construction or awaiting permit approval. Figure 10.30 shows the proximity of the residential dwellings within this cluster to the northern turbine section.

Figure 10.30 Braidwood - Roseview Road Dwellings



Dwellings within 3.0 km of a turbine and included within this assessment include J30_DA, J430, J155, J154_DAA, J239, J244, J339, J221, J230B, J258, J259, J260, J261 which are between 2.0 – 3.0 km and dwellings J3, J76A, J76B, J152, J153, J230A and J230B which are between 1.0 and 2.0 km of a turbine.

Some dwellings within this cluster have the potential to see the nacelle and above for up to 41 turbines.

10.8.1

Dwelling J3

J3 is located at the western end of Lakeview Road and is the closest non-associated residential dwelling to the turbines in this cluster.

Turbine T1 is approximately 1.5 km to the south west and is the nearest turbine to this dwelling.

Figure 10.31

Proximity to turbines

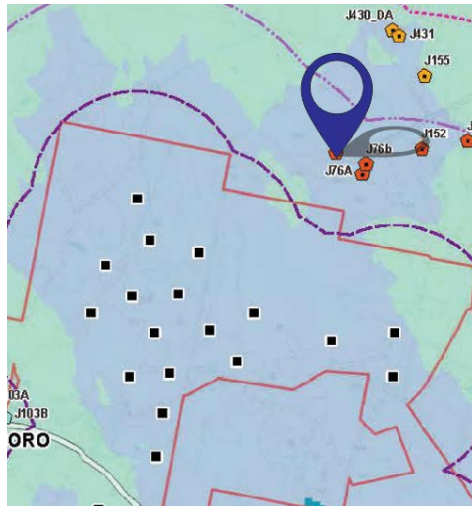


Figure 10.32

Dwelling Layout (Six Maps)



The dwelling is located towards the apex of a local hill with expansive views to the south towards the wind farm and the north.

Figure 10.25 shows the southern façade oriented towards the turbines and the first terrace.

Figure 10.33

Existing dwelling – Southern façade



Terraces have been established in the area to the south of the dwelling which cascade down slope.

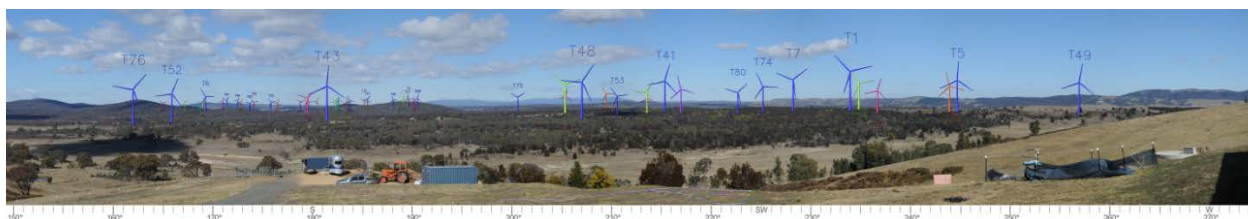
Figure 10.34 shows the view towards the proposed turbines from southern veranda.

Figure 10.34 Existing view looking south from southern veranda



Figure 10.35 shows the same view with a wireframe model of the proposed turbines superimposed into the view. This is not a photomontage.

Figure 10.35 Existing view with turbine WIREFRAME VIEW



Landscape mitigation would be required to be at a height of approximately 7 – 10 m when set back 30 m from the dwelling. This is because of the elevated location of the dwelling, terracing of the landscape on which mitigation would be installed, and distance to the nearest turbine. It is also noted that the relative height at the base of turbine T1 is only approximately 15 m lower than the dwelling.

Existing vegetation seen at the lower elevations in Figure 10.34 indicate that vegetation is capable of achieving heights required to filter views to the nearest turbines. It is recognised that due to the exposure of this location to higher winds, would mean that growth rates would likely to be slower than on flatter areas and may take some time to establish.

On clear days views to the south from this dwelling would include up to 41 turbines. Views to the north would not include turbines.

The visual impact from this location is assessed as moderate to high before landscape mitigation for views to the south. Overtime, landscape mitigation would reduce this visual impact to the south to low.

It is recognised that landscape screening would also screen views to the south and may not be desired by the dwelling owners.

10.8.2

Dwelling J76

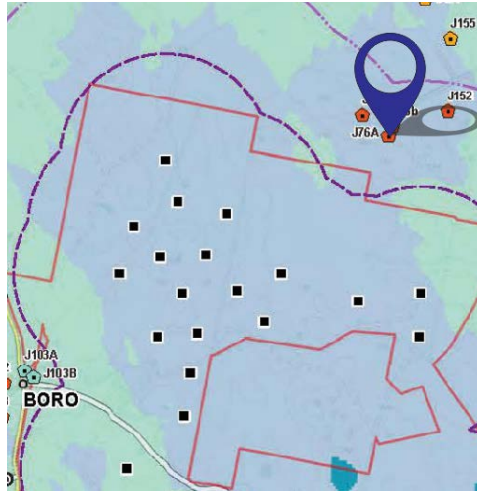
J76 is also located at the western end of Lakeview Road, approximately 300 m south west of J3. Turbine T76 is approximately 1.5 km to the south and is the nearest turbine to this dwelling.

Figure 10.36

Proximity to turbines

Figure 10.37

Dwelling Layout (Six Maps)



The dwelling is partway down the southern slope of a hill and generally south facing.

Figure 10.25 shows the southern orientation of the dwelling towards the turbines.

Figure 10.38

Existing dwelling – Southern façade



Although the house is elevated above the ground, it is set lower down the slope than the dwelling at J3 and has a flat landscape area immediately below the dwelling. The view from the veranda and the area immediately below the dwelling can be seen in Figure 10.39.

Figure 10.39 *View looking south from southern veranda*



Views to the south and south west from this dwelling would include up to 41 turbines.

Similar to the view at J3, landscape mitigation would be required to achieve a height of approximately 7 – 10 m when set back 30 m from the dwelling. This is because of the elevated location of the dwelling.

The visual impact from this location is assessed as high before landscape mitigation.

Existing vegetation in the area demonstrates that screening vegetation can exceed the heights required to filter views to turbines. Overtime, landscape mitigation would reduce the visual impact to low.

It is also recognised that landscape screening would also screen views to the south and may not be desired by the dwelling owners.

10.8.3

Dwelling J239

J239 is approximately 100 m south of Lakeview Road and 150 m west Mayfield Road. The dwelling has established with landscaped gardens, structures and other features. Turbine T76 is approximately 2.6 km to the southeast.

Figure 10.40 *Proximity to turbines*

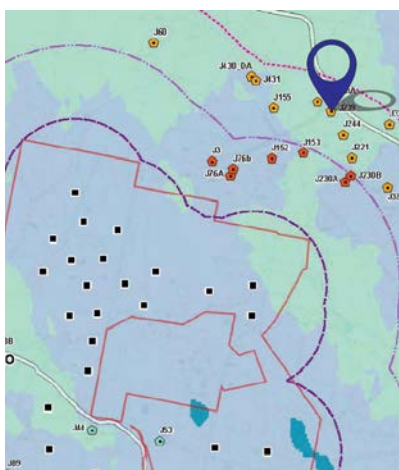


Figure 10.42 *Existing dwelling – Private open space*



A combination of planting and structures have been installed to protect the area of private open space from winds. These measures would filter or screen most views to turbines from these areas.

Figure 10.43 shows the view south west towards the proposed turbines. This view was taken from an area near the house yard, clear of structures and plantings installed along the western edge of the open space area.

Figure 10.43 *View looking south east from edge of house yard*



New and established plantings to the west of the dwelling seen to the right of Figure 10.43 provide guidance on landscape mitigation for this dwelling and others in this area.

From areas removed from the dwelling there would be clear views of the proposed turbines over cleared flat farmland.

Views from the private open space and entertaining areas would however be screened by existing structures and planting installed to improve amenity of these areas. For these reason, the visual impact at this dwelling would be low.

If required, visual impact from this location could be further reduced by supplementing the existing plantings seen in Figure 10.43.

10.8.4

Dwelling J154

J154 is approximately 100 m north of Lakeview Road and 250 m west Mayfield Road. The primary dwelling at this location is currently under construction. Turbine T76 is approximately 2.6 km to the southeast and is the nearest turbine to J154.

Figure 10.44

Proximity to turbines

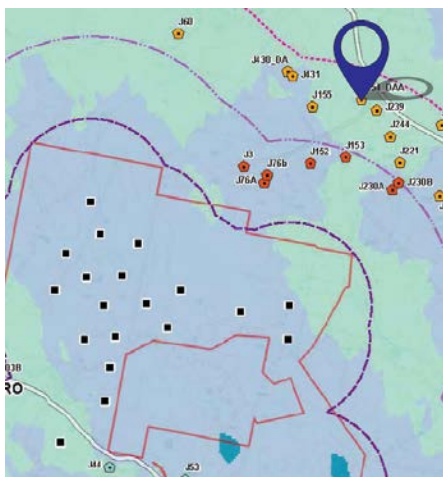


Figure 10.45

Dwelling Layout (Six Maps)



Figure 10.46 shows the view looking south from the finished floor level of the dwelling currently under construction.

Figure 10.46

View from finished floor level of primary dwelling



The dwelling has been oriented to take advantage of the northerly aspect and passive solar design. Turbines would however be clearly visible in views to the south from the new dwelling. Similarly clear views are also available to the northeast and north and clear of any proposed wind turbines.

Visual impact for views to the south would be moderate to high in the absence of landscape mitigation. Views to the north would be unchanged.

At a distance of approximately 2.6 km vegetation would be required to achieve a mature height of approximately 3.5 m to screen a 173 m high turbine when set back 30 m from a dwelling.

The assessment at dwelling J239, which is approximately 500 m to the south of dwelling J154 demonstrated that landscape can achieve mature heights in excess of the min 3.5 m height required to screen turbines.

The visual impact with landscape mitigation would be reduced to low to negligible.

10.8.5

Dwelling J155

J155 is approximately 300 m north of Lakeview Road and 800 m west Mayfield Road. The approved habitable building envelope is approximately 150 m to the south east of the temporary residence. The nearest turbine is T76, approximately 2.4 km to the south.

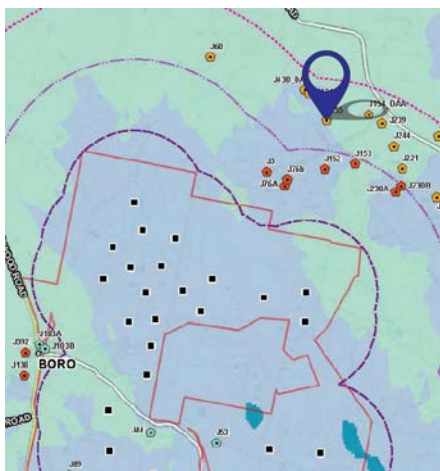
Figure 10.47**Proximity to turbines****Figure 10.48****Dwelling Layout (Six Maps)**

Figure 10.49 shows the northern elevation of the temporary residence at J155.

Figure 10.49**Northern elevation and private open space**

Private open space also seen in Figure 10.49 is located on the northern side of the dwelling.

Figure 10.50 shows the view looking south from the rear of the temporary residence.

Figure 10.50**View looking south**

Currently there are relatively un-interrupted views to the south over cleared farm land. These views are from the rear of dwelling and away from open space areas and primary views from the dwelling. Over time, these views would be filtered or screened by the new plantings established to the rear of the dwelling and along the entrance drive.

For these reasons, the visual impact at this location would be low.

Established wind break and boundary plantings seen in the aerial photo at Figure 10.48 can be seen in the background of this figure. This vegetation suggests that landscape mitigation can screen views from this location.

10.8.6

Summary of Visual Impacts from residential dwellings at Lakeview – Mayfield Road

Dwellings at the western end of Lakeview Road generally have elevated clear views towards the Project.

Landscape mitigation for these elevated dwellings would be required to be at a height of approximately 7 – 10 m when set back 30 m from the dwelling. This is because of the elevated location of the dwelling, terracing of the landscape on which mitigation would be installed, and distance to the nearest turbine.

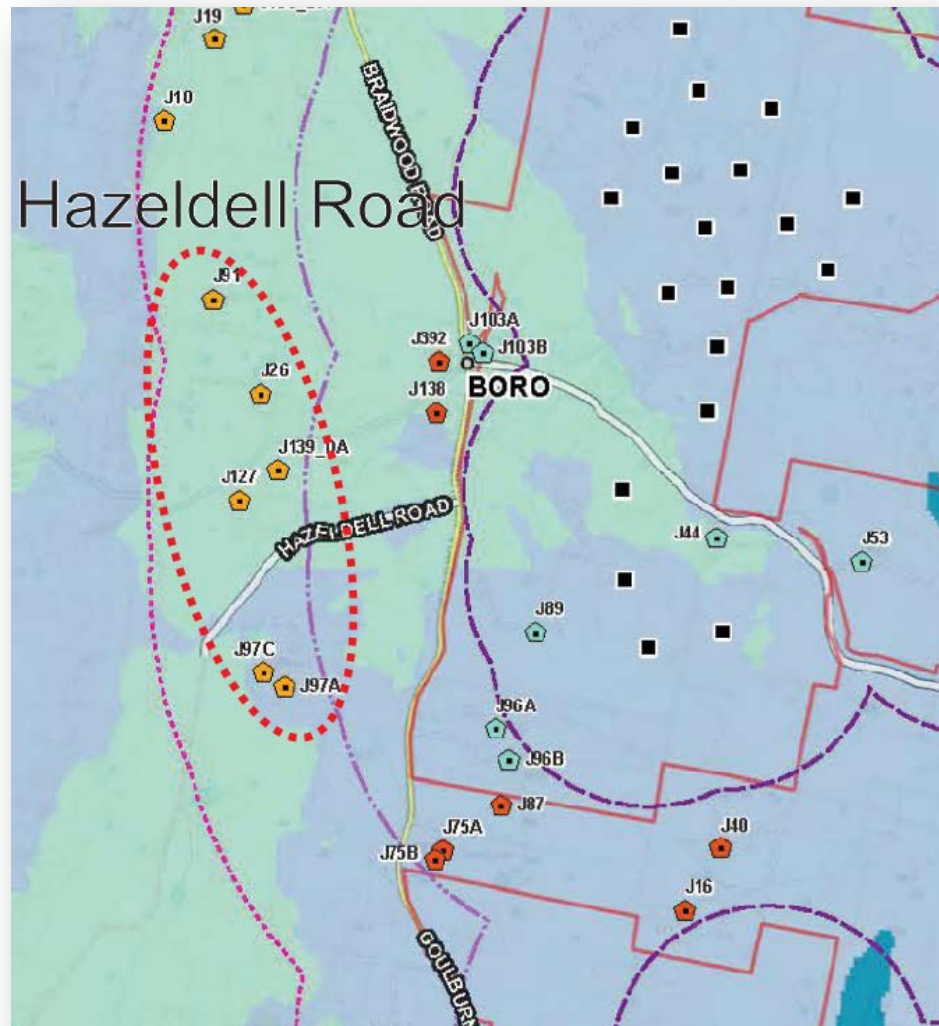
The visual impact from these locations is assessed as moderate to high before landscape mitigation for views to the south. Overtime, landscape mitigation would reduce this visual impact to the south to low.

Dwellings closer to Mayfield Road are located where the landscape flattens out and look over a flat cleared landscape. Several of these dwellings are orientated to take advantage of the northerly aspect and passive solar design. Turbines would however be clearly visible in views to the south from several of these dwellings. Similarly clear views are also available to the northeast and north and clear of any proposed wind turbines.

Visual impact for views to the south would be moderate to high in the absence of landscape mitigation. Views to the north would be unchanged. Landscape mitigation would reduce visual impact of views to the south to low.

10.9 Hazeldell – Mt Fairy Road

The Hazeldell – Mt Fairy Road residential cluster is located to the west of the northern group of turbines. The majority of dwellings within this cluster are typically well established.



Dwellings represented by this cluster include J91, J26, J139_DA, J127, J97C and J97A.

Significant and well established canopy vegetation surrounds the dwellings at J126, J97c and J97A screening views to the Project.

10.9.1

Dwelling J91

J91 is an elevated dwelling set amongst existing trees and canopy vegetation approximately 1.5 m west of Braidwood Road and 1.1 km north of Mount Fairy Road. Turbine T22 is the nearest turbine, approximately 2.6 km to the east.

Figure 10.51

Proximity to turbines

Figure 10.52

Dwelling Layout (Six Maps)

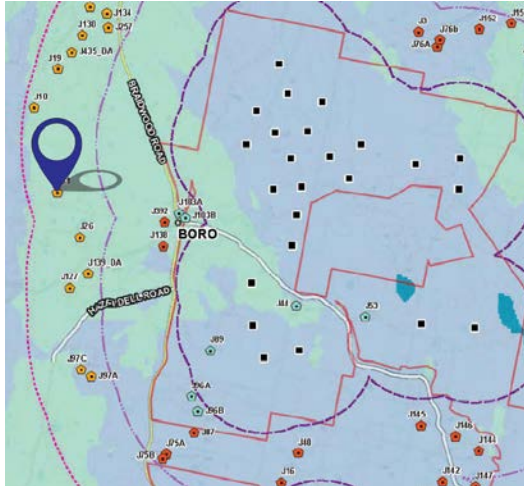


Figure 10.53 shows the northern elevation and undercover entertaining area attached to the north of the dwelling.

Figure 10.53

Northern elevation and private open space



Figure 10.54 shows the view looking north east to south east from the north east corner of the yard.

Figure 10.54 *View looking north-east to south-east*



As a result of turbines being removed from the northern section of the wind farm, turbine T49 would be the northern most turbine and would be situated behind existing vegetation seen in Figure 10.54.

For these reasons, to be conservative the visual impact at this location would be low to negligible.

10.9.2 Dwelling J139_DA

The dwelling at J139_DA has been constructed during the planning and application process for the Jupiter Wind Farm. The dwelling which has recently been completed is approximately 1.1 km west of Braidwood Road and 300 m south of Mount Fairy Road. The nearest turbine is Turbine T22 approximately 2.2 km directly east.

Figure 10.55 *Proximity to turbines*

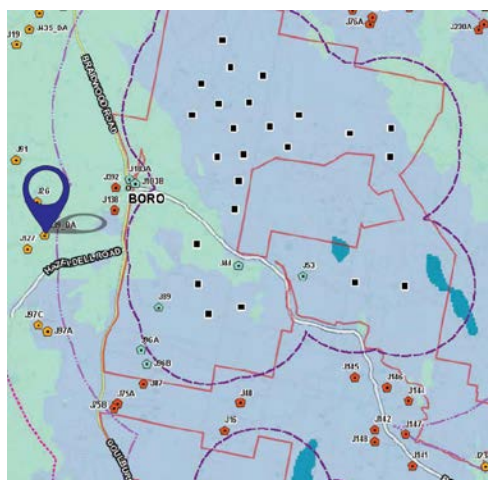


Figure 10.56 *Dwelling Layout (Six Maps)*



Figure 10.57 shows the view looking north-east to south-east from an undercover outdoor entertaining area attached to the dwelling.

Figure 10.57 *Existing View looking north-east*



Figure 10.58 shows the view looking east to south east.

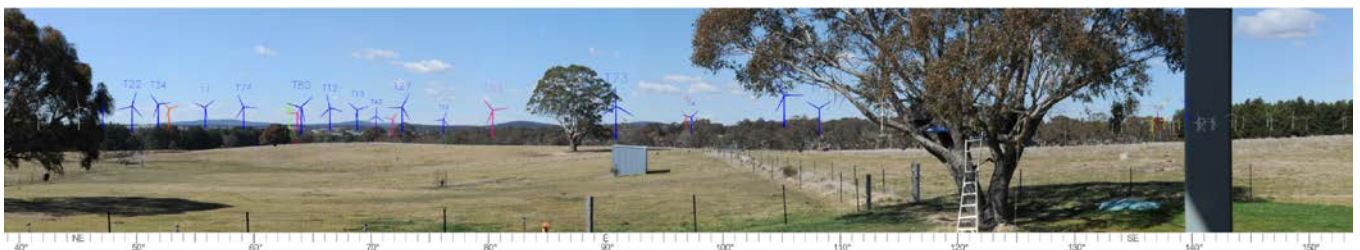
Figure 10.58 *Existing View looking east - southeast*



This view looking east to south east as seen in Figure 10.58 is shared by the main living areas within the dwelling.

Figure 10.59 shows the view directly east, which focuses on the visible turbines from dwelling J139_DA. A wireframe model of the turbines has been superimposed into the view.

Figure 10.59 *View east towards visible turbines*



Turbines in the northern section would be clearly visible over existing trees in the background of this view. Those turbines in the southern section would be screened by existing vegetation to the south. To be conservative, the visual impact is assessed as moderate to high without landscape mitigation.

Figure 10.59 shows the relative turbine height at approximately 2.3 km in relation to existing trees in the area. Recognising the height and scale of existing vegetation in the area, landscape mitigation would be an effective measure to screen views to visible turbines.

10.9.3 Dwelling J127 – Proxy Viewpoint

Access to the dwelling at J127 was not made available at the time of preparing this assessment. This assessment has is made based on aerial photography and approximated views.

Dwelling J127 is an established dwelling approximately 1.3 km west of Braidwood Road and 150 m south of Mount Fairy Road. The nearest turbine is Turbine T22 approximately 2.4 km to the east.

Figure 10.61 shows the layout of dwellings and structures at the property and proximity of existing vegetation.

Figure 10.60 *Proximity to turbines* **Figure 10.61** *Dwelling Layout (Six Maps)*

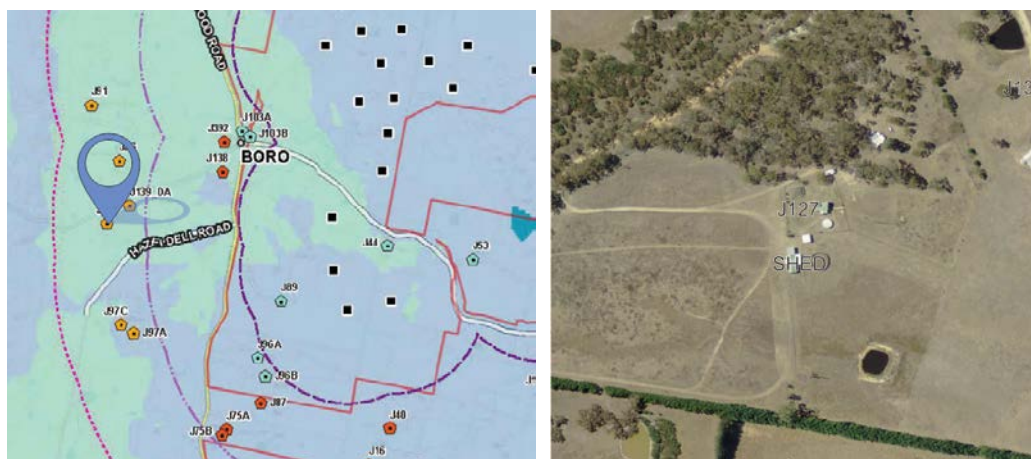


Figure 10.62 shows the view looking east over dwelling J127 from a publicly accessible area directly west of the dwelling.

Figure 10.62 Existing View looking north-east



Based on the aerial photography and the site visit, it is understood that the majority of the turbines in the northern section would be screened by existing vegetation. Turbines towards the southern edge of the southern turbine group would also be screened by existing vegetation along the southern boundary.

It is however likely that turbines towards the centre of the wind farm may be visible from the dwelling. It is not clear from the information available, whether these views to the centre of the Project would be from areas of high amenity such outdoor entertaining or primary living spaces within and around the dwelling.

To be conservative, the visual impact at this dwelling is assessed as moderate to high.

It is clear from the views at J139_DA (Figure 10.59) which shows the relative turbine height at approximately 2.3 km in relation to existing trees in the area that landscape mitigation would be an effective measure to screen views to turbines. This would reduce the visual impact to low-negligible.

10.9.4

Summary of Visual Impacts from residential dwellings at Hazeldell – Mt Fairy Road

The majority of dwellings in the Hazeldell – Mt Fairy Road area have views across land with a substantial amount of vegetation.

Where views are available through or over vegetation to be conservative, the visual impact is assessed as moderate to high without landscape mitigation.

However, it is clear from the above assessment, that landscape mitigation would be an effective measure to screen views to turbines. This would reduce the visual impact to low-negligible.

Access was not granted to the dwellings at J126, J97c and J97A, it is clear however from the aerial imagery there is extensive vegetation between the dwellings and all turbines.

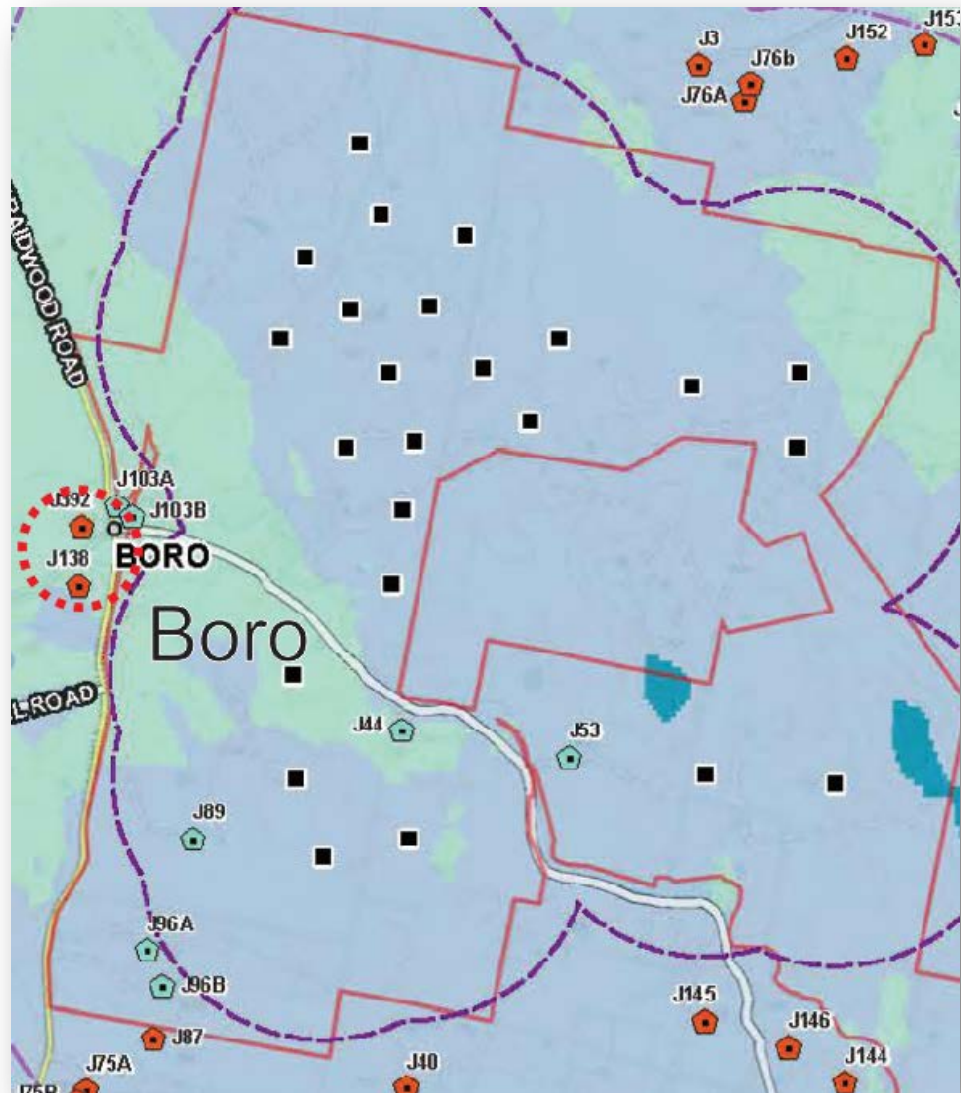
This imagery, in conjunction with analysis of other dwellings in the area shows that the vegetation would screen the majority of views to turbines from these dwellings. Without the benefit of a site visit and for these reasons the visual impact of these dwellings would be assessed as low to negligible.

However it is clear from the views at other dwellings, should turbines be visible landscape mitigation would be applicable.

10.10

Boro Locality

There are four residential dwellings within the Boro Road residential cluster. Dwellings J103A and J103B are located on the eastern side of Braidwood Road and are participating landowners.



Dwellings J392 and J138 are established dwellings to the west of Braidwood road. Access to undertake an on-site inspection at these dwellings was not received.

10.10.1 Dwelling J392 – Proxy Viewpoint

Access to the dwelling at J392 was not available at the time of preparing this assessment. This assessment is based on aerial photography and approximated views from Mount Fairy Road.

Dwelling J392 is an established dwelling approximately 170 m west of Braidwood Road and 130 m north of Mount Fairy Road. T80 approximately 1.5 km to the east and is the nearest turbine to this dwelling.

The seen area analysis suggests that the nacelle of up to 27 turbines would be visible from this dwelling, subject to screening afforded by existing vegetation.

Figure 10.64 shows the layout of dwelling, structures at vegetation near to the dwelling.

Figure 10.63 Proximity to turbines

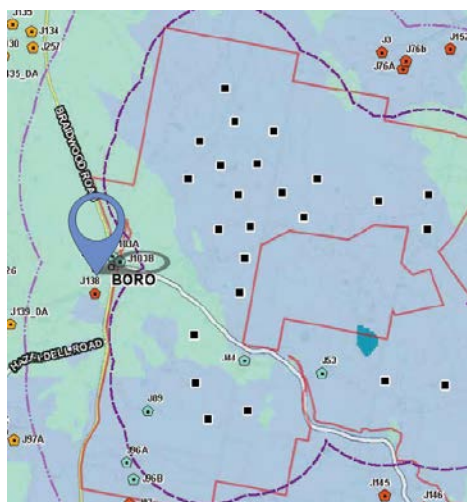


Figure 10.64 Dwelling Layout (Six Maps)



Figure 10.65 shows the eastern elevation of dwelling J392 from a Mount Fairy Road.

Figure 10.65 J392 Eastern Elevation



The height and scale of the mature plantings shown in Figure 10.64 can be seen along the entrance drive surrounding the dwelling. The eastern elevation which faces the wind farm is clear of intervening vegetation. The aerial imagery and view from Mount Fairy Road suggest that outdoor entertaining and private open space areas are to the northwest of the dwelling, this would need to be confirmed.

Figure 10.66 shows the view looking east from Mount Fairy Road adjacent to the entrance drive for J392.

Figure 10.66 *View from entrance to J392 looking east (Proxy)*



Existing wind break and hedgerow plantings along Braidwood Road are approximately 140 m to the east of the dwelling and well established. The powerline seen at break in vegetation suggests the trees along this edge are in the order of 15 m in height. Although the majority of the turbine structures would be screened from views, at these distances (140 m vegetation and 1.5 km turbines) and vegetation heights, the upper swept path of up to 27 turbines would still be potentially visible.

To be conservative, it has been assumed that primary views from within the dwelling are located along the eastern edge of the dwelling and those areas of external private open space are also to the east of the dwelling. The visual impact on views from these areas would moderate due to the existing screening afforded by vegetation along Braidwood and Mount Fairy Road.

Should these areas be on the western edge of the dwelling, the visual impact would be low – negligible as the dwelling would screen turbines from these views.

Existing vegetation in the area indicated that landscape mitigation can be established and would assist in screening views to turbines. Visual impact with landscape mitigation would be low – negligible.

10.10.2 Dwelling J138 – Proxy Viewpoint

Access to the dwelling at J138 was not available at the time of preparing this assessment. This assessment has therefore been made based on aerial photography and approximated views from Mount Fairy Road.

Dwelling J138 is an established dwelling approximately 140 m west of Braidwood Road and 110 m south of Mount Fairy Road. T73 approximately 1.2 km to the east and is the nearest turbine to this dwelling.

The seen area analysis suggests that the nacelle and above of up to 27 turbines would be visible from this dwelling, subject to screening afforded by existing vegetation.

Figure 10.68 shows the layout of dwelling, structures at vegetation near to the dwelling.

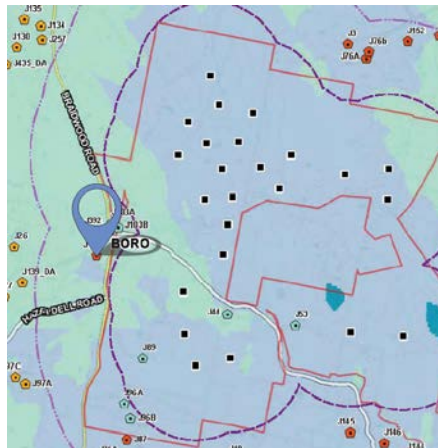
Figure 10.67 Proximity to turbines**Figure 10.68 Dwelling Layout (Six Maps)**

Figure 10.69 shows the northern elevation of dwelling J138 from a Mount Fairy Road.

Figure 10.69 J138 Eastern Elevation from Mount Fairy Road

The height and scale of the mature plantings along the property boundaries in Figure 10.68 can be seen beyond the dwelling and either side of the entrance.

Figure 10.70 shows the view looking east from Mount Fairy Road. This view is that same as that discussed within J392.

Figure 10.70 View from entrance to J392 looking east (Proxy)



Existing wind break and hedgerow plantings along Braidwood Road are approximately 140 m to the east of the dwelling and well established. The powerline seen at break in vegetation suggests the trees along this edge are in the order of 15 m in height. Although the majority of the turbine structures would be screened from views, at these distances (140 m vegetation and 1.5 km turbines) and vegetation heights, the upper swept path of up to 27 turbines would still be potentially visible.

It appears from aerial photography that the dwelling is orientated towards the north east. If this were the case the nearest turbine would be T22 approximately 1.8km away. However, it is difficult to discern the proximity of sensitive such as outdoor entertaining and private open space areas in proximity to this dwelling.

To be conservative, it has been assumed that primary views from within the dwelling are located along the eastern edge of the dwelling and those areas of external private open space are also to the east of the dwelling. The visual impact on views from these areas would moderate due to the existing screening afforded by vegetation along Braidwood and Mount Fairy Road.

Existing vegetation in the area indicated that landscape mitigation can be established and would assist in screening views to turbines. Visual impact with landscape mitigation would be low – negligible.

10.10.3 Summary of Visual Impacts from residential dwellings at Boro

Access to undertake an on-site inspection at these dwellings was not received. However, from aerial photography and a site visit to the surround area it is evident that existing wind break and hedgerow plantings would screen the majority of the turbine structures from views.

It appears from aerial photography that the dwellings appear to be orientated towards the north east. However, it is difficult to discern the proximity of sensitive such as outdoor entertaining and private open space areas in proximity to this dwelling.

To be conservative, it has been assumed that primary views from within the dwelling are located along the eastern edge of the dwellings and those areas of external private open space are also to the east of the dwelling. The visual impact on views from these areas would moderate due to the existing screening afforded by vegetation along Braidwood and Mount Fairy Road.

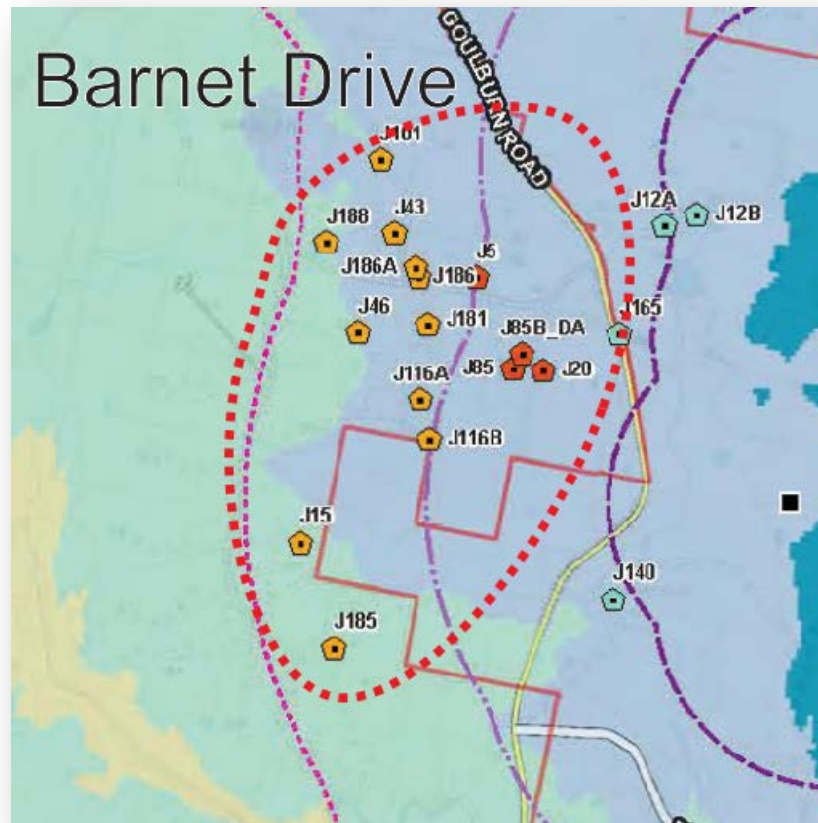
Existing vegetation in the area indicate that landscape mitigation can be established and would assist in screening views to turbines. Visual impact with landscape mitigation would be reduced to low – negligible.

10.11

Barnet Drive

The Barnet Drive residential cluster is to the west of the southern turbine grouping. The majority of dwellings within this cluster are well established and set amongst forested areas.

Access to properties was not granted at any dwellings in this cluster. This assessment is therefore required to be undertaken through aerial photography and approximated views.



Dwellings represented by this cluster include J101, J43, J188, J186, J186A, J46, J181, J116A, J116B, J15 and J185 which are between 2.0 and 3.0 km and J5, J85, J85B_DA and J20 between 1.0 and 2.0 km of the nearest turbine.

Dwelling at J85_DA is a new dwellings or active planning applications. From an inspection of the aerial photography, these dwellings appear to have little intervening vegetation to the east which would screen views to turbines.

Existing vegetation would limit turbine visibility to northern grouping and those at the southern end of the wind farm. Similar to previous viewpoints where access has not been granted, it is difficult to discern the proximity and orientation of key viewing locations from within and around the dwelling. For this reason, a conservative assessment for visual impact at this dwelling is moderate.

The height and scale of new and mature plantings shown in Figure 10.73 particularly when measured against the meteorological mast, demonstrate that landscape mitigation can assist in screening views to turbines. Visual impact with landscape mitigation would be low – negligible.

10.11.2

Dwelling J43 – Proxy Viewpoint

The dwelling at J43 is located on Kalbilli Close approximately 300 m north of Barnet Drive and 1.1 km west of Braidwood/Goulbourn Road.

The dwelling is one of several elevated dwellings located on the upper slopes or the apex of the hills in this area. This assessment is based on aerial photography and approximated views from the road. The closest turbine to this dwelling is T2, approximately 2.4 km to the east.

Figure 10.74 shows the proximity of the dwelling to the proposed turbines. Figure 10.75 shows existing vegetation in proximity to the dwelling.

Figure 10.74

Proximity to turbines

Figure 10.75

Dwelling Layout (Six Maps)



Figure 10.75 shows extensive vegetation both within the private allotment, surrounding road verges and landscape. Figure 10.76 shows the eastern edge of the dwelling, house yard and landscaping from Kalbilli Close.

Figure 10.76 *Dwelling J43*

Although the Seen Area Analysis shown in Figure 10.74 indicates that up to 41 turbines are potential visible from this dwelling, existing vegetation would screen the majority of turbines from views. The visual impact from J43 would be low to negligible.

It is worth noting that this area is at the top of a hill and therefore exposed to high winds and weather from the west and the east. This notwithstanding, vegetation both planted and natural have been successful and shows that landscape mitigation would be a viable option and can assist to screen views to turbines.

10.11.3 Dwelling J20 – Proxy Viewpoint

The dwelling at J20 is located off Barnet Drive approximately 300 m south of Barnet Drive and 450 m west of Braidwood/Goulbourn Road.

The dwelling is one of few dwellings located on the lower flat areas in Barnet Drive. This assessment is based on aerial photography and approximated views from the road. The closest turbine to this dwelling is T9, approximately 1.5 km to the south east.

Figure 10.77 shows the proximity of the dwelling to the proposed turbines. Figure 10.78 shows orientation of the dwelling and surrounding vegetation clusters.

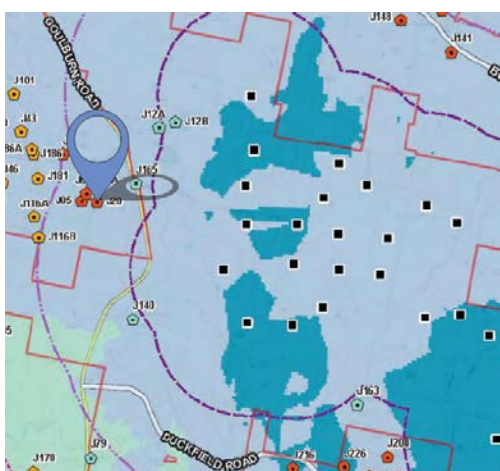
Figure 10.77 *Proximity to turbines*

Figure 10.79 shows the view looking east from Barnet Drive approximately 130 m to the west of the entrance road to Dwelling J20. This is the same view as assessed in the public viewpoint L16.

Figure 10.79 Proxy view from Barnet Drive – view looking east



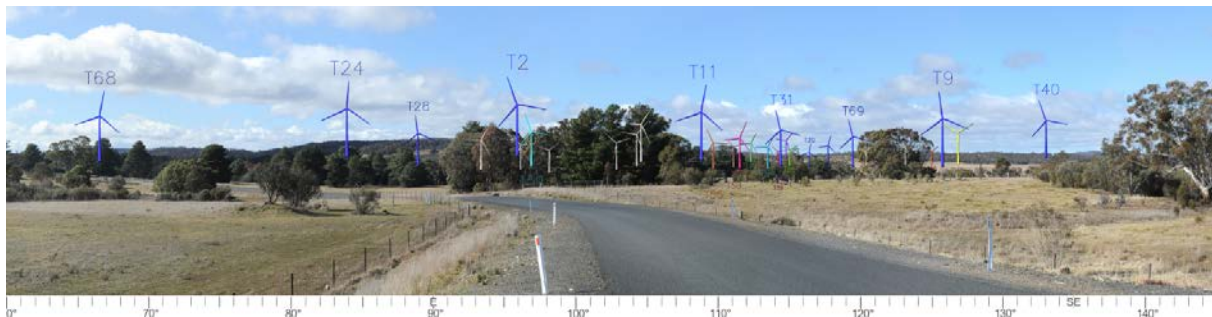
Figure 10.80 shows the same view where a wireframe model of the turbines has been superimposed into the view.

Figure 10.80 View looking east with WIREFRAME model



Figure 10.81 shows an enlargement of a view to where turbines are visible.

Figure 10.81 WIREFRAME enlargement



Currently the views to the east of the dwelling appear to be over cleared farm land with clustered vegetation and extensive roadside vegetation along Braidwood Road. However without access to the property it cannot properly be assessed.

Figure 10.81 shows that vegetation within the view filters views to several turbines. However, as this is a proxy view, to be conservative, without access to the dwelling at J20 the visual impact would be assessed as Moderate to High without the implementation of landscape mitigation.

Established wind break and clustered plantings seen in the area suggests that landscape mitigation can assist to screen views from this location.

10.11.4

Summary of Visual Impacts from residential dwellings at Barnet Drive

The majority of dwellings in Barnet Drive sit in an elevated, heavily vegetated setting. For these dwellings existing vegetation would limit turbine visibility to northern grouping and those at the southern end of the wind farm. As access has not been granted, it is difficult to discern the proximity and orientation of key viewing locations from within and around the dwellings. For this reason, a conservative assessment for visual impact of these dwellings is moderate.

The height and scale of new and mature plantings within the area demonstrate that landscape mitigation can assist in screening views to turbines. Visual impact with landscape mitigation would be low – negligible.

There are also a few dwellings to the eastern end of Barnet Drive that sit lower in the landscape and appear to have clearer views towards the Project. However, as discussed previously without access to the property it cannot properly be assessed.

For these reasons, to be conservative the overall visual impact would be assessed as Moderate to High without the implementation of landscape mitigation.

Established wind break and clustered plantings seen in the area suggests that landscape mitigation can assist to screen views from this location.

Duckfield Road

The residential cluster discussed within this section include dwellings J208, J216, J226, J217, J235 and J269 which are within 1.0 to 2.0 km of a turbine and dwellings J 247, J243A, J243B, J199 and J191A which are within 2.0 and 3.0 km of a turbine.

A map of the Duckfield Road area. The map shows a road network with several labeled points of interest. A red dotted line highlights a specific area. The text 'Duckfield Road' is overlaid on the map. Various points are labeled with codes such as J116A, J116B, J140, J170, J179, J163, J216, J226, J208, J217, J235, J247, J243, J243A, J243B, J199, J269, J191A, J162_DAA, and J174B. The map also shows a large blue area, possibly a lake or reservoir, and a green area, possibly a park or forest.

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Figure 10.84 also shows the scale and type of vegetation that is common many areas within the Duckfield Road residential cluster.

Figure 10.85 shows the view looking north from Kings Creek Lane, immediately east of J226.

Figure 10.85 *View looking north from Kings Creek Lane*



The roadside vegetation seen in the figure above and Figure 10.83 shows that the plantings continue north along Kings Creek Lane and past the dwelling. The height scale and density of this vegetation in conjunction with its proximity to the dwellings would screen the majority of the turbines in the northern section and many to the west of the southern turbine grouping.

The vegetation to the north and east of the dwelling seen in Figure 10.83 and Figure 10.84 suggests that views to the turbines would be filtered. A conservative assessment from this dwelling is a low – moderate visual impact.

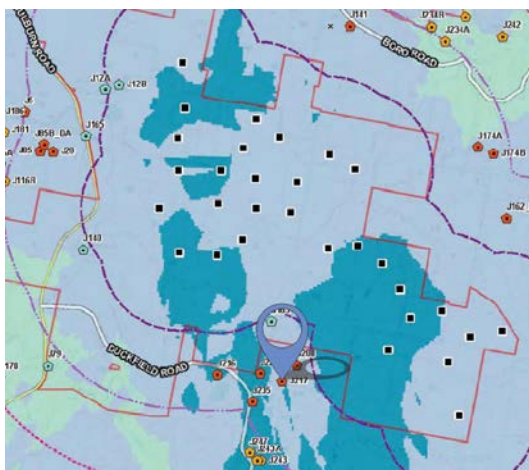
Landscape in the area demonstrates the ability for landscape mitigation to screen views to turbines. Visual Impact following the implementation of landscape mitigation would be low to negligible.

10.12.2 Dwelling J217 – Proxy Viewpoint

Dwelling J217 is approximately 300 m north of Duckfield Road, and 350 m east of Kings Creek Lane. The closest turbine is T86, approximately 1.6 km to the east.

This assessment is based on aerial photography and approximated views from Kings Creek Lane and the entrance drive to dwelling J208 as access was not permitted to J217 at the time of this assessment.

Figure 10.86 shows the proximity of the dwelling to the proposed turbines. Figure 10.87 shows existing vegetation in proximity to the dwelling.

Figure 10.86**Proximity to turbines****Figure 10.87****Dwelling Layout (Six Maps)**

Canopy vegetation within the private allotments of J226 to the west, and J208 to the north appears sparse.

Figure 10.88 shows the northern elevation of dwelling J217.

Figure 10.88**Northern elevation of J208**

It is also evident that the dwelling is slightly elevated and that existing vegetation in the area is well established and at sufficient height and scale to filter views to the proposed turbines. From this view and the aerial imagery, it is assumed that the dwelling and primary views are oriented towards the north. The nearest turbine northerly turbine is T84 at approximately 1.6 km.

Although turbines would theoretically be visible from north through to the east, these views would be filtered through existing vegetation. The visual impact from J217 is assessed as low to moderate.

Existing vegetation in the area indicates that landscape mitigation would be effective at this location. Mitigated visual impact would be low.

10.12.3

Dwelling J208

Dwelling 208 is situated to the south of the southern section of the Project and is approximately 500 m east of Kings Creek Lane. Primary access from Duckfield Road approximately 700 m to the south-west.

T86 is approximately 1.2 km to the north east and is the nearest turbine to this dwelling.

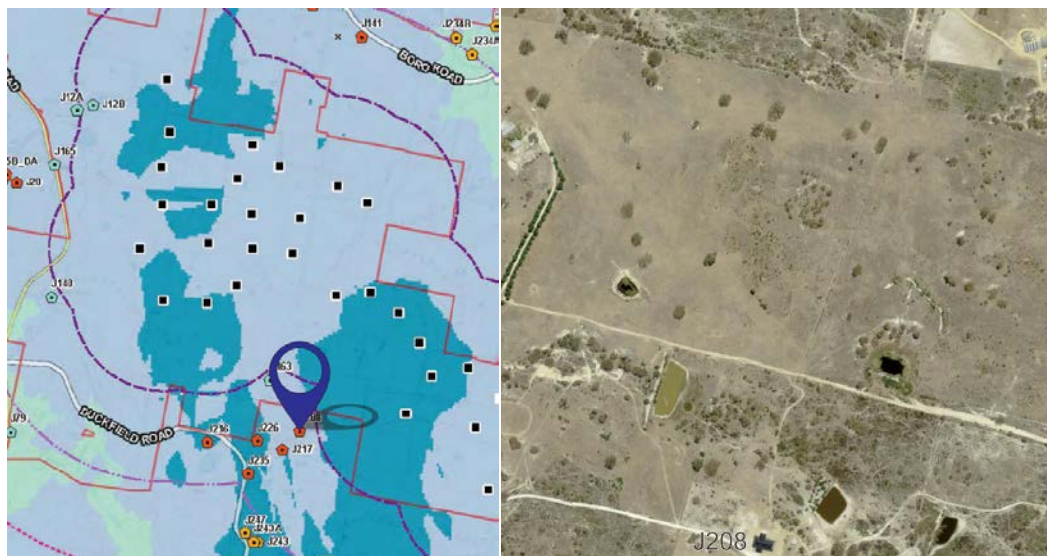
Figure 10.89 shows the proximity of the dwelling to the proposed turbines. *Figure 10.90* shows existing vegetation in proximity to the dwelling.

Figure 10.89

Proximity to turbines

Figure 10.90

Dwelling Layout (Six Maps)



The landscape to the west, north and east of this between the turbines and dwelling J208 includes a number of scattered trees.

Figure 10.91 shows the northern elevation and outdoor entertaining area of dwelling J208.

Figure 10.91

Dwelling J208



Primary views are oriented to the north and towards the southern turbine grouping. Figure 10.92 shows the view looking north from the edge of the outdoor entertaining area.

Figure 10.92 View looking north from entertaining area



Figure 10.93 shows the same view with a turbine wireframe layout super imposed into the view. Turbines that are visible either in part or whole are identified by their turbine id. Those turbines that are not visible are shown in white.

Figure 10.93 Turbine Visibility



The Seen Area Analysis shown in *Figure 10.89* indicates that up to 27 turbines are potentially visible from this dwelling. The wireframe view at *Figure 10.93* shows that approximately 19 turbines would be visible, the majority of which would be filtered in part by the existing scattered trees.

The nearest turbine, T86 is oblique to this view and largely screened by existing vegetation. Turbine T57, would be the nearest most visible turbine at approximately 1.6 km. Overtime, the existing vegetation seen in the foreground will screen this turbine view. To be conservative, the visual impact from this dwelling is assessed as moderate.

Landscape mitigation in the foreground may assist to screen turbines T40, T69 and T71 within shorter timeframes. Overtime, the visual impact from this dwelling would be low – negligible.

10.12.4 Dwelling J235

Dwelling J235 is south of the wind farm and approximately 50 m east of Duckfield Road.

Turbine T86 is approximately 1.6 km to the north-east and the closest turbine to this dwelling.

The viewpoint location and Seen Area Analysis shown in *Figure 10.94* indicates that the nacelles of each turbine would be visible from this dwelling. *Figure 10.95* shows existing vegetation in proximity to the dwelling.

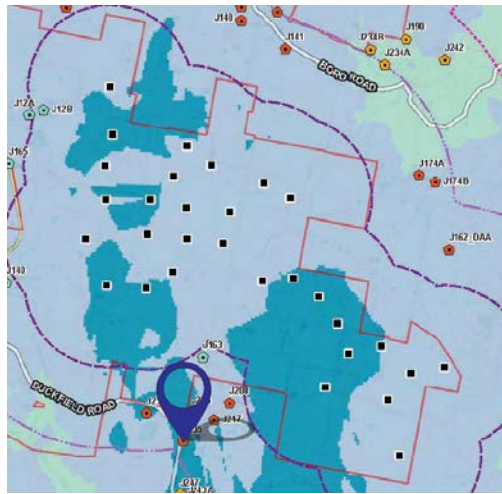
Figure 10.94 Proximity to turbines**Figure 10.95 Dwelling Layout (Six Maps)**

Figure 10.96 shows the northern and eastern elevation of dwelling J235 and the outdoor entertaining area.

Figure 10.96 Dwelling J235

A large tree, water tanks and covered area are to the east of the dwelling. These features will filter or screen views to the turbines to the east.

Figure 10.97 shows the view looking north-west to east from a location where clear views are permitted towards the turbines. When looking north, the nearest turbine is T37, approximately 1.8 km to the north.

Figure 10.97 View looking north-west to east



There are many large established trees in the landscape immediately north of the dwelling. This vegetation surrounds a large dam and follows Kings Creek which meanders generally to the north-west. This same vegetation would filter or screen views to the turbines to the north.

From this location, turbine T86 would be visible over the cleared area to the north east. The large tree to the east of the dwelling would filter views to this turbine from the dwelling and outdoor entertaining area.

The Seen Area Analysis indicates that the nacelle of each turbine would be potentially visible from this dwelling. Existing vegetation seen in Figure 10.97 and the aerial photograph at Figure 10.95 shows the majority of turbines would be filtered or screened in views to the wind farm. For this reason the visual impact would be low.

For turbines that are potentially visibly, landscape mitigation can assist to screen views to turbines. Visual impact following landscape mitigation would be low – negligible.

10.12.5 Dwelling J247

Dwelling J247 is south of the wind farm and approximately 70 m north-east of Duckfield Road. Access to this property was not granted at the time of writing this assessment. Therefore this assessment is made based on views from Duckfield Road and aerial imagery.

Turbine T86 is approximately 2.2 km to the north-east and the closest turbine to this dwelling.

The viewpoint location and Seen Area Analysis shown in Figure 10.98 indicates that the nacelles of each turbine would be visible from this dwelling. Figure 10.109 shows existing vegetation in proximity to the dwelling.

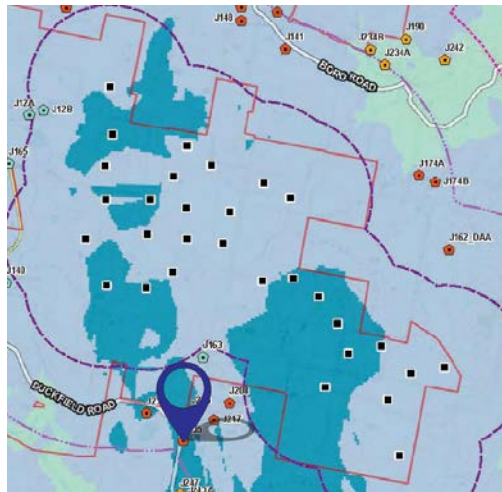
Figure 10.98 Proximity to turbines**Figure 10.99 Dwelling Layout (Six Maps)**

Figure 10.100 shows the southern elevation and general orientation of J247 from the entrance drive at Duckfield Road. The existing trees to the north of the dwelling seen in the aerial imagery are visible beyond the dwelling.

Figure 10.100 Dwelling J247 - southern elevation

The large tree and vegetation to the left of the image are south of the dwelling and will not screen views of the turbines from either the dwelling or outdoor entertaining areas.

Figure 10.101 shows a view from Duckfield Road approximately 220 m north-west of dwelling J247. This location has a similar view angle to the dwelling.

Figure 10.101 View from Duckfield Road north west of J247

Turbines in the north are approximately 2.5 km away. At this distance, turbines would be partially screened or filtered by vegetation in close proximity to the dwelling or along Duckfield Road. It is clear from both aerial imagery and the view in Figure 10.101 that there would be clear and largely uninterrupted views to several turbines along the eastern edge of the southern turbine group. To be conservative, the visual impact from this dwelling is assessed as moderate.

Existing vegetation in the area demonstrates that landscape mitigation could be effective to screen views to turbines to the north east of this dwelling. Visual impact following landscape mitigation would be low.

10.12.6 Summary of Visual Impacts from residential dwellings at Duckfield Road

The Seen Area Analysis of this area shows that up to 27 turbines are potentially visible from the dwellings in the Duckfield Road area. However an analysis of several of these dwellings indicate a lot would be filtered or screened in part by the existing scattered trees.

An analysis of aerial imagery for dwellings J191, J269, J199, show that they are located in areas of dense vegetation or many trees between the dwelling and turbines. Based on the above analysis of dwellings in the area, it is considered that views to turbines from these dwellings would be either filtered or completely screened.

For the same reasons, it can be concluded that where turbines may be visible landscape mitigation could effectively filter or screen turbines from views.

At the time of this assessment, access was not granted for the purposes of an updated visual assessment from the dwellings at J243 and J243A.

The nearest turbine to these dwellings is T86, approximately 2.1 km to the north east. Based on the aerial photography it is considered that existing vegetation will screen or filter views to all turbines.

The aerial photography shows that there is a cleared areas of vegetation to the north east of the dwelling towards turbine T86. We have the benefit of having reviewed the photomontage for the previous layout. This view shows that existing landscape between the dwelling and the dam will filter views to the majority of the proposed turbines. Given the distance and existing screening, the visual impact from this dwelling would be low.

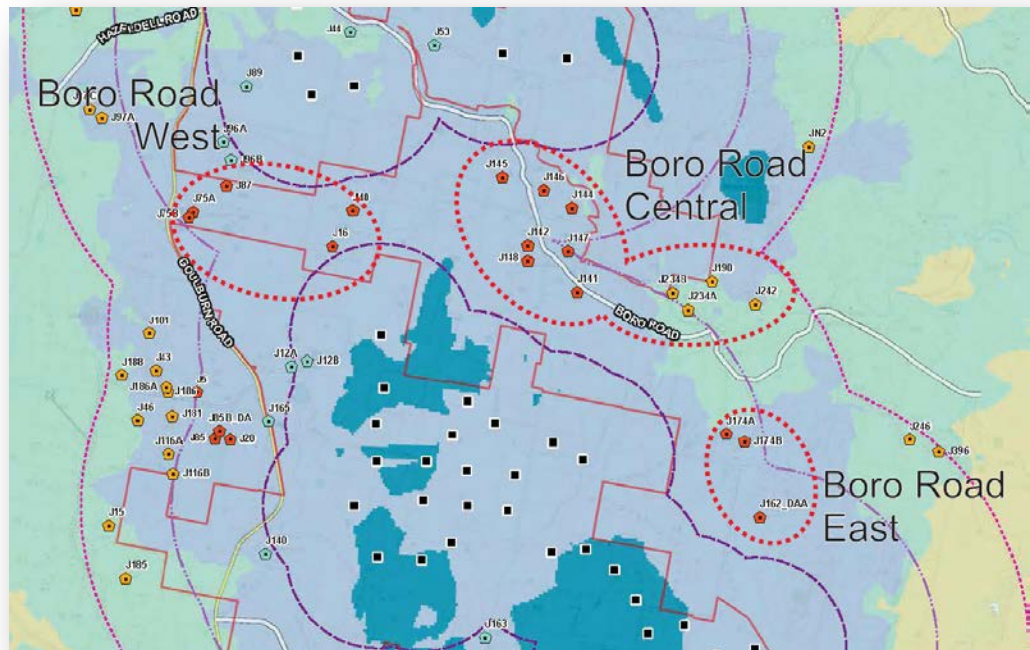
It is also clear from the vegetation and recent planting to the north of the dwelling, that landscape mitigation can screen views to the remaining turbines. Visual impact following mitigation would be negligible to low with landscape mitigation.

It is clear from this view, that landscape mitigation will be able to screen or filter views to those turbines visible from this dwelling.

10.13

Boro Road Cluster

The Boro Road residential cluster is located between the two precincts of the Project. The majority of dwellings within this cluster are typically established.



Dwellings represented by this cluster include Boro Road West Cluster J75A, J75B, J87, J40, J16, Boro Road Central Cluster J145, J146, J144, J142, J148, J147, J141, J234B, J234A, J190, J242 and Boro Road East Cluster J174A, J174B and J162_DAA.

10.13.1

Dwelling J40

The dwelling J40 is accessed off a driveway shared in part with J16. The dwelling is approximately 1.3km south west of Boro Road and 2.0 km east of Braidwood Road. The nearest turbine is Turbine T87 approximately 1.3 km to the north west. The nearest turbine to the south is T68 at a distance of approximately 1.4 km.

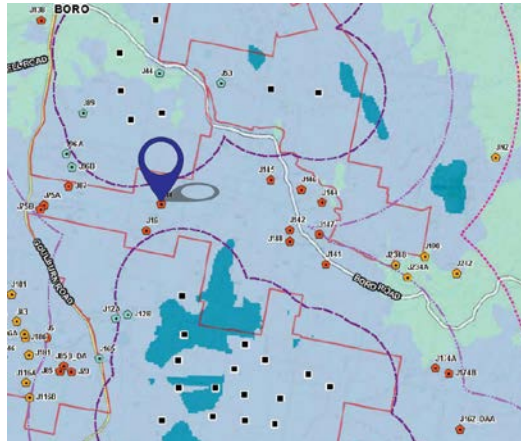
*Figure 10.102**Proximity to turbines**Figure 10.103**Dwelling Layout (Six Maps)*

Figure 10.103 shows the cleared farmland to the north and existing vegetation to the south. Figure 10.104 shows the eastern and northern dwelling elevations.

*Figure 10.104**Eastern and northern elevation*

The dwelling is oriented generally north-south with the long edge, entrance and main veranda facing east and away from the turbines.

Figure 10.114 shows the view looking north from the front of the dwelling.

*Figure 10.105**Existing view looking north*

The view to the north is over cleared, and generally flat farm land. Recent plantings and feature landscape has been recently installed along the northern boundary of house yard and around the solar panels.

Figure 10.106 shows the same view with a wireframe of the proposed northern turbines superimposed into the view. The view has been enlarged to the area of visible turbines.

Figure 10.106 Existing view a wireframe of turbines superimposed



When looking north, the towers and lower portion of the swept path would be screened by existing vegetation for the majority of the turbines. From some locations, turbines T87, T44 would be partially screened while turbine T75 would remain visible.

Given the distance of the turbines and proximity to primary views, the visual impact when looking north is assessed as moderate to high. Overtime, the landscape plantings seen in the foreground would reduce the visual impact to low to negligible.

Figure 10.107 shows the view looking south from the rear of the dwelling adjacent to the stables and sheds.

Figure 10.107 Existing view looking south



Existing vegetation is well established and near to the dwelling. A low hill also rises to the south west, behind the dwelling and farm buildings.

Farm buildings, topography and vegetation would screen views to the southern turbines from the dwelling and outdoor living areas. For these reasons, the visual impact to the south is negligible to nil.

Dwelling J16

Figure 10.108

Figure 10.109

Dwelling Layout (Six Maps)

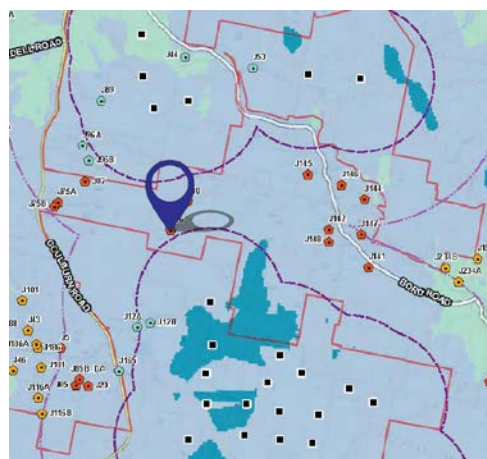


Figure 10.110

Existing View looking north



The visual impact with mitigation would be negligible.

Figure 10.111 shows the view looking south looking south from the rear yard of dwelling J16.

Figure 10.111 Existing View looking south

A low vegetated hill rises towards the south and behind the dwelling. Even at 1.1 km, turbines would be screening from southerly views. The visual impact for views to the south is assessed as nil.

10.13.3 Dwelling J145

The dwelling at J145 is accessed off a driveway approximately 200m to the west of Boro Road. The nearest turbine is Turbine T4 approximately 1.3 km to the north.

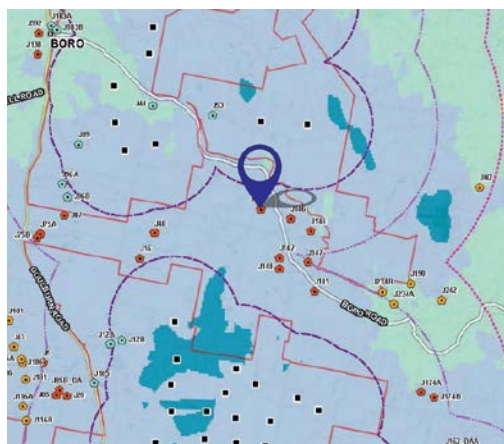
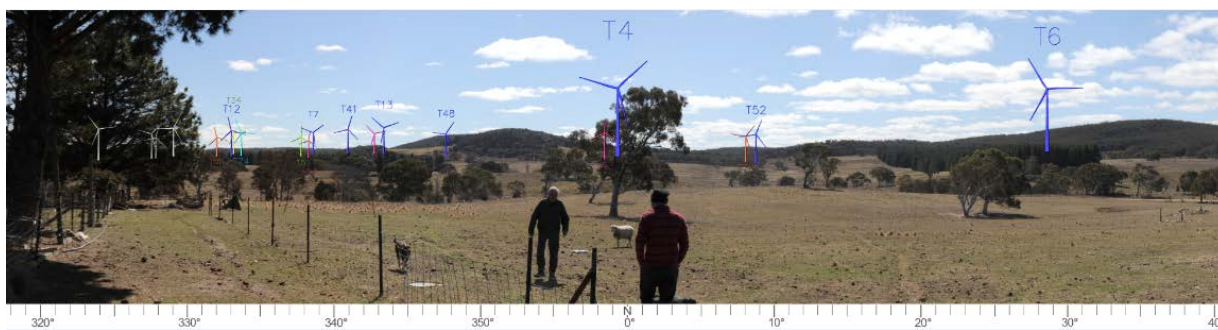
Figure 10.112 Proximity to turbines**Figure 10.113** Dwelling Layout (Six Maps)

Figure 10.113 shows the existing wind break planting northwest and south of the dwelling with relatively open views to the north. Sheds and other farm buildings are also directly south of the dwelling. Vegetation and farm structures will screen views to southern turbines from areas within and around the dwelling.

Figure 10.114 shows the view looking north from an area where there are clear views to the north.

Figure 10.114 Existing view looking north

Figure 10.115 shows the same view with a wireframe of the proposed turbines superimposed into the view.

Figure 10.115 Wireframe view with turbines super imposed

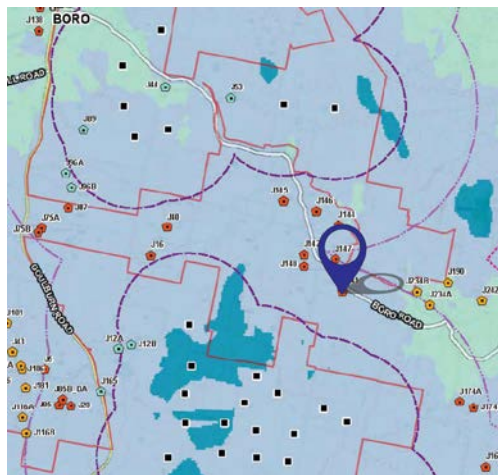
From this location, turbines to the north-west and north, including turbine T4 would be partially screened by either vegetation, topography or both. Several turbines would be screened completely from these views. Turbine T6 would be clearly visible low hills roughly north-north-east. To be conservative, the visual impact from J145 is assessed as moderate.

If desired by the owner, the visual impact could be reduced through landscape mitigation.

10.13.4 Dwelling J141

The dwelling at J141 is located approximately 70 m south of Boro Road. The nearest turbine is Turbine T72 approximately 1.6 km to the south. The nearest turbine when looking north is T06, at approximately 2.5 km.

The assessment from this dwelling has been made from aerial photography and views from Boro Road as access to the property was not provided at the time of writing this assessment. Figure 10.116 shows the proximity of J141 relative to the turbines to the north and south of Boro Road.

Figure 10.116 Proximity to turbines**Figure 10.117** Dwelling Layout (Six Maps)

An established wind break planting runs north south to the east of the dwelling. Figure 10.117 also shows the mature trees and other plantings that surround the dwelling. Figure 10.118 shows the landscaping north of the dwelling from Boro Road.

Figure 10.118 *View of dwelling from Boro Road*

Existing vegetation within the house yard would filter views to the west and north from the dwelling.

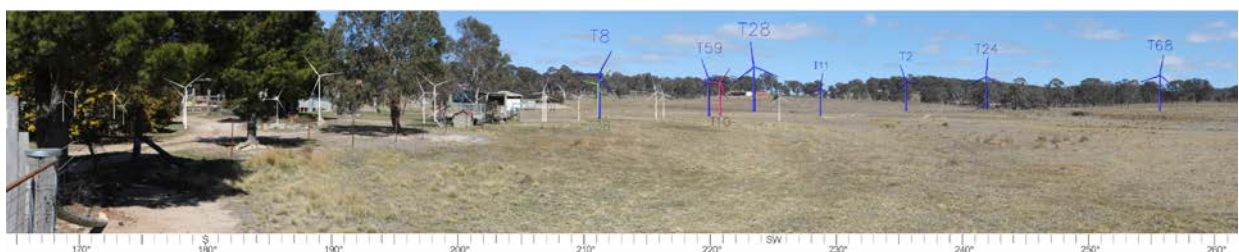
Figure 10.119 shows the view looking south through to north-east from Boro Road adjacent to the entrance to J141. This viewing location was selected for its proximity the dwelling and relatively clear views towards the proposed turbines.

Figure 10.119 *Existing view looking north west*

Figure 10.120 shows the same view with a wireframe of the turbines superimposed into the view.

Figure 10.120 *Wireframe view looking south to north*

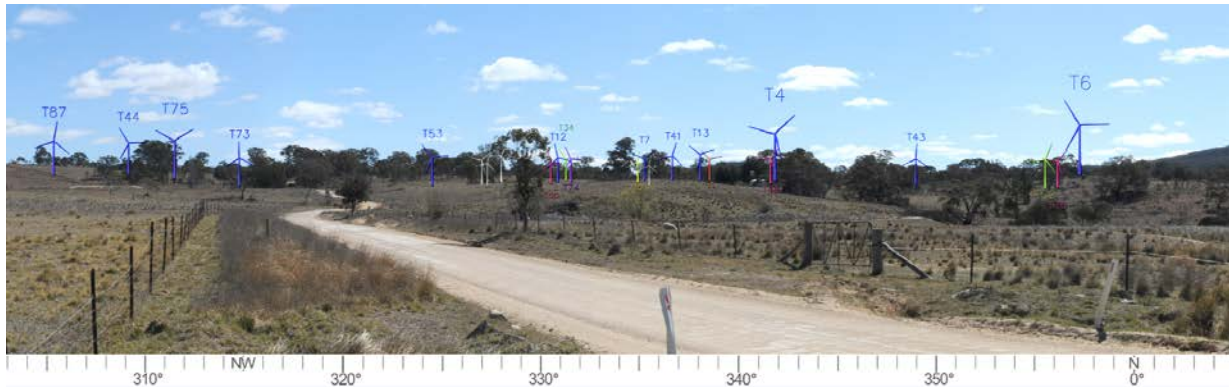
The break in turbines between the northern and southern sections is clearly noticeable in this view. Figure 10.121 shows an enlargement of the view to the southern turbine cluster.

Figure 10.121 *Wireframe view looking south*

Turbines shown white will not be visible from this location. Numbered turbines would be partially visible above the vegetation and low rise seen in the background of this view.

Figure 10.122 show and enlargement of the view towards the turbines in the northern cluster.

Figure 10.122 Wireframe view looking north-west to north



Similar to views towards turbines in the south, the majority of the turbine towers and super structure would be screened by existing vegetation and topography. Turbines T6 and T4 would be most prominent.

This viewing location is at a similar albeit slightly lower viewing angle to the dwelling at J141. It must be recognised however that this location is from the public road network and at a location clear of nearby screening vegetation.

Existing vegetation within the yard of J141 is both well established and close in proximity to the main dwelling. As seen in other viewpoints, it is considered that this vegetation would filter and or screen views to the majority of turbines. On this assumption, the visual impact is assessed as low to moderate.

It is apparent from existing vegetation in the area that landscape mitigation can screen views to turbines and would be effective at this location. The visual impact with established landscape mitigation would be low to negligible.

10.13.5

Dwelling J174A

The dwelling at J174 is located on Boro Road. The nearest turbine is Turbine T83 approximately 1.6 km to the south west. The nearest turbine in the northern cluster is T06 approximately 4.5 km to the north west.

Figure 10.123 Proximity to turbines

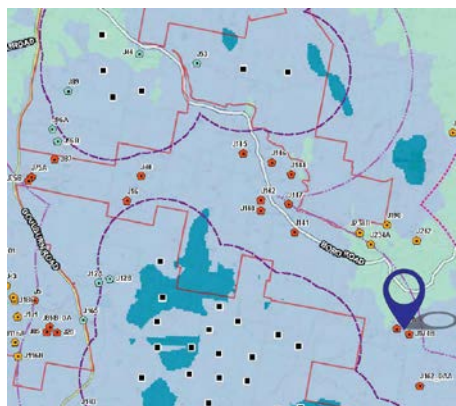


Figure 10.124 Dwelling Layout (Six Maps)



Figure 10.124 shows existing vegetation and wind breaks surrounding the property.

Figure 10.125 shows the view looking south-west to north-west from Boro Road.

Figure 10.125 Existing view looking south west to north

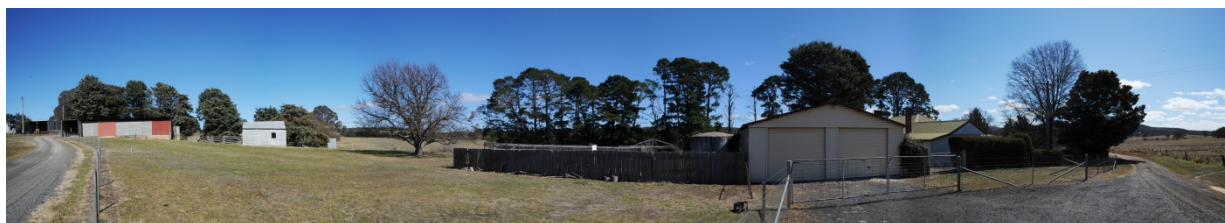


Figure 10.125 is taken from east of the dwelling on Boro Road. Existing vegetation both within the house yard and wind break further the west of the dwelling will screen views to the turbines.

To be conservative, the visual impact from dwelling J174A is negligible to low.

10.13.6

Dwelling J162_DAA

J162_DAA is located to the east of Lower Boro Road and east of the southern turbine cluster. Planning approval has recently been granted to construct a dwelling at this location. Turbines T56 and T39 are approximately 1.4 km to the south west and south.

Figure 10.126 Proximity to turbines

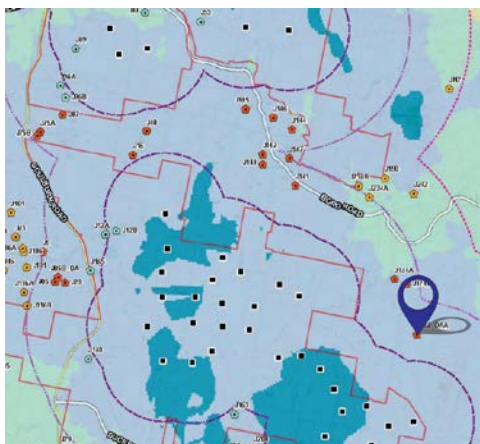


Figure 10.127 Dwelling Layout (Six Maps)



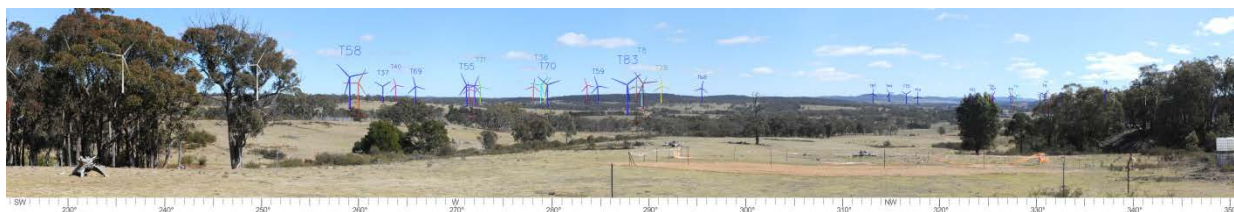
The dwelling will be set within existing vegetation to the north, east and south. Early works have commenced with installation of drainage infrastructure and levelling for the house pad. Figure 10.128 shows the view looking west from the upper, eastern edge of the house pad. The early works can be seen in the foreground.

Figure 10.128 Existing view looking south west to north



Figure 10.128 shows the clear views to the east. Figure 10.129 shows the same view with a wireframe of the proposed turbines superimposed.

Figure 10.129 Turbines Superimposed into the view



The wireframe shows that views from the dwelling would be through the central section of the wind farm over rolling, vegetated hills. Turbines to the north and south would be screened by existing vegetation. The visual impact from this new dwelling would be high.

Existing vegetation shows that landscape mitigation would be an effective measure to screen turbines from views to the east. Landscape could be designed to screen visible turbines whilst preserving the view through the central section, or to selectively screen those turbines nearest to the dwelling. The visual impact after mitigation would be low where turbines are retained and negligible to nil should the owner choose to screen them from views.

However it is recognised that the dwelling location has been selected to take account of these views, and that the owner may choose to retain views over the rolling vegetated hills inclusive of turbines.

10.13.7 Summary of Visual Impacts from residential dwellings at Boro Road

The Boro Road residential cluster is located between the two precincts of the Project.

The majority of dwellings within this precinct are located within a flat farmland landscape. In many instances, vegetation and existing structures with the properties screen or filter views to the Project.

It is apparent from existing vegetation in the area that landscape mitigation has the ability to filter or screen views to turbines and would be effective at many of these locations.

There is one cluster of dwellings to the north of Boro Road, roughly north east of the southern cluster of turbines that was not assessed in the above section. These include dwellings J234B, J441(J242), J190, and 234A.

Dwellings J234B, J441(J242) and J190 are located amongst a dense canopy of vegetation which on interrogation of the aerial imagery would screen views towards the turbines. For these dwellings as access was not granted an assessment based on an interrogation of aerial imagery only, a visual impact is expected to be low-negligible.

For the dwelling at J234A we have reviewed the previously prepared photomontage for the previous layout. It is clear from this view, that landscape mitigation will be able to screen or filter views to those turbines visible from this dwelling.

Prior to mitigation a conservative assessment would be moderate to high, however it is clear even from the small shrubs located around the rocky knoll that landscape will be an effective measure to screen views to those visible turbines. Landscape Mitigation may include tall clear trunked trees approximately 30m from the dwelling which would be roughly 15m from the edge of the dam. The use of tall clear trunked trees in this way would retain views under the tree canopy and through the trunks to the dam, whilst the canopy screens views to the turbines in the distance.

11 CUMULATIVE IMPACT

The presence of multiple wind farms in an area can create a cumulative visual impact. This can occur when either sequential and/or simultaneous views to wind turbines from publicly accessible viewpoints or from private viewing locations lead to a change in a community's, resident's or visitor's perception of a region.

Sequential views are those that occur when a viewer at one location observes a wind farm and then from a different location observes another wind farm. If for example multiple wind farms are located along a highway, then a series of sequential views can occur as a vehicle travels along the highway.

Simultaneous views are those where more than one wind farm is visible from the same location. This usually is defined as views within the same cone of view, that is multiple wind farms visible within say a 60 or 90 degree cone of view. However, a simultaneous view can also occur where a views needs to turn their head to see more than one wind farm from a single location.

11.1 Wind Farms in NSW/ACT Border Region

There are two existing wind farms located within the 20km viewshed of the proposed Jupiter Wind Farm. These are Capital Wind Farm which comprises 67 turbines and Woodlawn Wind Farm which comprises 23 turbines.

Table 11.1 lists the location and number of turbines for each of the wind farms that are existing or approved within the area.

Table 11.1 *Existing and proposed wind farms in the area*

Project	No. of Turbines	Distance and Direction(approx.)	Status
Capital	67	12km west	Operating
Woodlawn	23	9.0km north west	Operating
Capital II	41	17km west	Approved

The closest constructed wind farm is Woodlawn which comprised 23 turbines and is located approximately 9.0km north west of the Project.

11.2 Sequential Visual Impact

The development of wind farms may lead to a change in people's perception of a region and will be evident as they travel through the road network. Alteration to the perception of a landscape will occur when a visitor is able to view two or more wind farms.

11.2.1 Highways

The Kings Highway runs to the south of the Project and lies within the viewshed of the Project as well as the viewshed of both Capital and Woodlawn Wind Farms.

As discussed within Section 9.4 Highways, there are long sections of existing roadside vegetation along the Kings Highway that filter views to the Project. This same vegetation filters views to the existing Capital and Woodlawn Wind Farms.

While there will be sections of the Highway that afford views to either the proposed Jupiter Wind Farm or to the existing wind farms, these are few and fleeting.

For these reasons, the cumulative visual impact brought about by sequential views along the Kings Highway would be assessed as **Low- Negligible**.

11.2.2

Main Roads

There are two main roads within the viewshed. These are Goulburn/Braidwood Road that runs to the west of the Project and Tarago Road that runs along the north west of the Project.

Goulburn/Braidwood

Due to intervening topography and existing vegetation there are no views through to the existing Woodlawn or Capital Wind Farms from the southern end of Goulburn/Braidwood Road.

There is a small section of Braidwood Road before Tarago when driving north that the Woodlawn Wind Farm is visible.

For these reasons, the cumulative visual impact brought about by sequential views along Goulburn/Braidwood Road would be **Negligible**.

Bungendore/Tarago Road

There are several locations along Bungendore/Tarago Road where the existing Capital and Woodlawn Wind Farms are visible.

However, as shown in the Section 7 seen area analysis, there are very few locations along Bungendore/Tarago where the proposed Jupiter Wind Farm may be visible from.

For these reasons, the cumulative visual impact brought about by sequential views along Bungendore/Tarago Road would be **Negligible**.

11.2.3

Local Roads

In some instances, multiple wind farms will be visible from the local road network. For the users of these road there may be a degree of perception change. For those who find wind farms unattractive, this will be a negative change to their cognitive landscape. For those users who find wind farms attractive, this will be a positive change to their cognitive landscape. Apart from the variable sensitivity of users, the assessment also considers the low viewer numbers on local roads.

On balance, the cumulative impact brought about by sequential views to wind farms in the area is assessed as **Negligible** for local road users.

11.3

Simultaneous Visual Impact

Simultaneous views are those where more than one wind farm is visible from the same location. This usually is defined as views within the same cone of view, that is multiple wind farms visible within say a 60 or 90 degree cone of view. However, a simultaneous view can also occur where a views needs to turn their head to see more than one wind farm from a single location.

The potential for simultaneous visual impact to occur is limited to locations where the viewshed of two or more wind farms overlap. Given the extent of overlap of all three viewsheds, there is

the potential for many locations of simultaneous views. However when topography and existing vegetation are included there are only a few.

An example where all three windfarms will be visible in the one view is from a location of Lumley Road just to the east of Tarago as shown in Figure 11.1.

Figure 11.1 *Indicative Cumulative Viewpoint from Lumley Road (55H 742653, 6115897)*



From this location, one turbine from Woodlawn visible on the top of the hill to the right, several turbines from Capital visible in the middle of the image and the proposed Jupiter Wind Farm would be visible to the left of the image over the driveway.

From locations such as these the cumulative visual impact would be assessed as **Moderate**.

From other locations one wind farm may be visible in the view, however when the viewer turns in the other direction a different wind farm is visible. An example of this is shown in Figure 11.2 along Mt Fairy Road.

Figure 11.2 *Indicative Cumulative Viewpoint from Mt Fairy Road*



Capital Wind Farm is visible when looking west along Mt Fairy Road. If the viewer were to then turn around and look to the east it is possible there may be views to the Proposed Jupiter Wind Farm. However for this particular location this is unlikely due to vegetation as discussed in Viewpoint L18.

For locations such as these the cumulative visual impact would be assessed as **Low**.

11.4 Assessment of Cumulative Impacts

This assessment of the cumulative visual impact of the Project has concluded that there would be minimal cumulative visual impact and that the changes to peoples' perception of the surrounding area would not be significantly changed by the presence of multiple wind farms in the locality. This is supported by findings of the Community Perception Studies.

12 NIGHT LIGHTING ASSESSMENT

Night lighting trials undertaken at wind farms in Victoria will be used to benchmark the impact of night lighting at the Jupiter Wind Farm.

12.1 Previous Trials

The visual impact of hazard identification lights erected on wind turbines is little tested in NSW while some trials have been undertaken in Victoria to assess the possible impact of various forms of night lighting. Hazard identification lights have been temporarily erected at two Victorian wind farms to assess their visual implications.

12.1.1 Trial at Challicum Hills Wind Farm

Trial hazard identification lights were installed at the Challicum Hills Wind Farm by Pacific Hydro in 2005 to assess the potential loss of visual amenity caused by night lighting for the proposed Yaloak Wind Farm. The lights trialled were red flashing incandescent medium-intensity lights (2000cd). Challicum Hills Wind Farm is located on low lying cleared hills south of Ararat in central Victoria.

This trial demonstrated that the impact of this lighting configuration was high at ground level immediately adjacent to the tower on which the setup was installed particularly because of the light spill along the turbine blades which created a “strobing” effect which could be seen from some distance in the surrounding areas. There was little apparent diminution of visibility due to the horizontal baffles, which were fitted to the incandescent lights. The red glow was still visible against the darkened sky, even from immediately below the lights.

In a recent decision of Planning Panels Victoria, the Yaloak Panel came to the following conclusions after viewing a test site at Challicum Hills Wind Farm:

A night time inspection of the operating lights revealed that the obstacle lights are highly visible from distances of up to 25 kilometres with impact occurring from both the primary light source, and from reflection off the rear of the generator blades (thus increasing their impact). There was generally agreement at the site inspection that the amenity impacts of the lights is unacceptable and that the lights would have significant impacts on residents of the Parwan Creek valley. (Yaloak Planning Panel 2005)

However, this assessment was primarily based on an inspection immediately adjacent to the installed lights and more emphasis should have been placed on assessing the potential visual impact from greater distances where residents and travellers on the local road network were more likely to be located.

Since the trial at Challicum Hills Wind Farm other lighting options have been trialled to assess if they can reduce visual impact. One option was to replace the incandescent lights with light-emitting diodes (LED). LED's are a semiconductor device that emits incoherent narrow-spectrum light. These can be in any colour, including red. LED's are easier to baffle and as they are programmed to light to their peak intensity more slowly than incandescent lights, they seem to reduce the visual impact compared with that of incandescent lights, which immediately achieve full intensity when switched on.

12.1.2 Trial at Wonthaggi Wind Farm

Hazard identification lights of low-intensity (170cd) LED blinking type were erected at Wonthaggi Wind Farm in December 2005 and again in April 2006. Wonthaggi Wind farm is on the Victorian coast approximately 100km south east of Melbourne.

12.1.3 Trial #1 –Wednesday 14th December 2005

In December 2005, a blinking light was installed at the top of a single wind turbine on the Wonthaggi Wind Farm turbines on 14 December 2005 and photographs were taken to record the visual impact from various distances.

These lights blink in intervals in an irregular cycle. (ON for 1sec, OFF for 0.5sec, ON for 1sec, OFF for 1.5sec). The irregular cycles are considered best for safety and act as a deterrent to birds. These low-intensity lights currently meet air safety standards in some European countries.

Figure 12.1 *Low-intensity hazard identification lights and car lights at Wonthaggi Wind Farm*



Figure 12.1 illustrates the view from approximately 7.6km from the hazard identification lights. On the right of Figure 12.1 one can just discern the hazard identification lights visible in the distance. Although indistinct in this photo they were still quite clear when viewed against the night sky. In fact their visibility at this distance was a little surprising. The diminution of clarity of the lighting did not reduce with distance to the same extent that objects do during daylight. To the left of Figure 12.1 one can easily discern tail lights of moving traffic along the Bass Highway. It is evident that these car lights are much more prominent against the night sky than the hazard identification lights at this distance.

This trial demonstrated that the visual impact on the surrounding areas of the low-intensity hazard identification lights was low. Unlike the visual impact of the incandescent medium-intensity hazard identification lights seen at the Challicum Hills Wind Farm, the W-Red lights of 170cd trialled at Wonthaggi Wind Farm had reduced the visual impact and completely removed the “strobing effect” that was apparent in close proximity to the wind turbines seen at the earlier demonstration at Challicum Hills.

While the red glow of the light was visible against the dark sky, its intensity was comparable (and in many cases far less than) with lights on rural properties and on streetlights or vehicles.

At Wonthaggi Wind Farm trial the use of the lower intensity (170cd) hazard identification lights reduced the visual impact and resulted in the reduction in “strobing effect” of the lights on the wind turbine blades. The visual impact of this light from ground level is comparable to the lights within rural properties.

12.1.4

Trial #2, Wednesday 19th April 2006

A further trial was undertaken in April 2006. In this trial two different hazard identification lights were erected. One was a MB80 medium intensity obstacle marker (2000cd), while the other was a Sealite AV 200 low intensity obstacle marker (170cd).

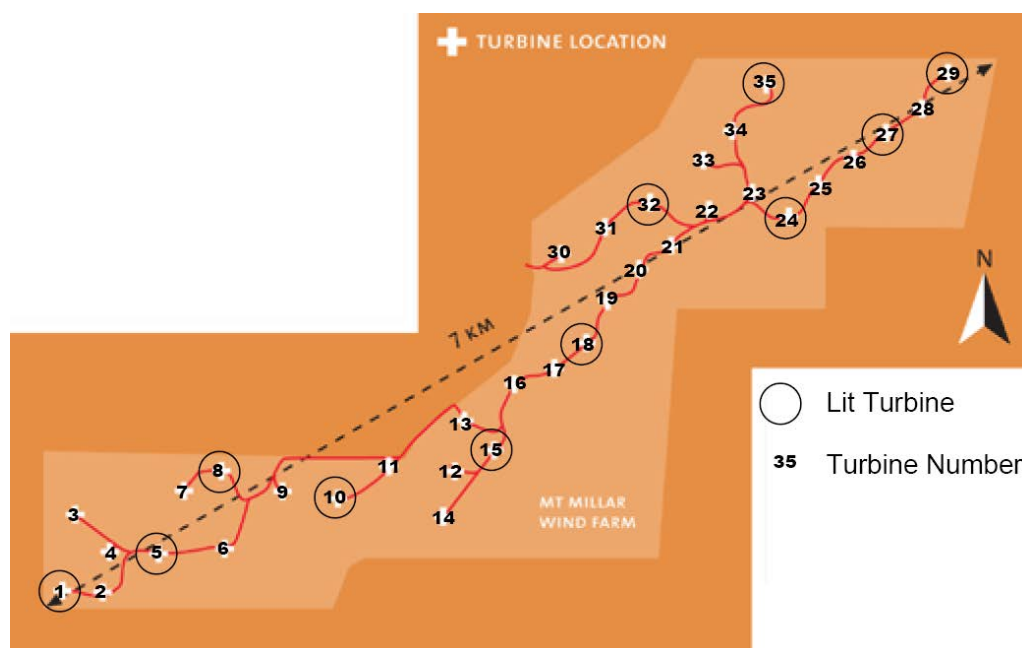
The low intensity light had less visual impact than the medium intensity light both were still less visible than local display lighting, street lighting and the lighting spill from domestic locations (*Wonthaggi Windfarm Obstacle Marker Light Evaluation for Sustainability Victoria, Robert J Showers and Associates, Lighting Consultants, May 17, 2006*). This report also commented on the narrow beam distribution and the lack of illuminance at ground level, which also agrees with the observations later in this report of medium density lights.

12.2

Installed Hazard Identification Lights at Mt Millar Wind Farm in South Australia

The Mt Millar Wind Farm is located on the Eyre Peninsula in South Australia, near the township of Cowell, which lies approximately 100km south of Whyalla. The hazard identification lights at the recently completed Mt Millar Wind Farm are medium intensity lights (2000cd).

Figure 12.2 The layout of the 35 turbines and the lit turbines at the Mt Millar Wind Farm

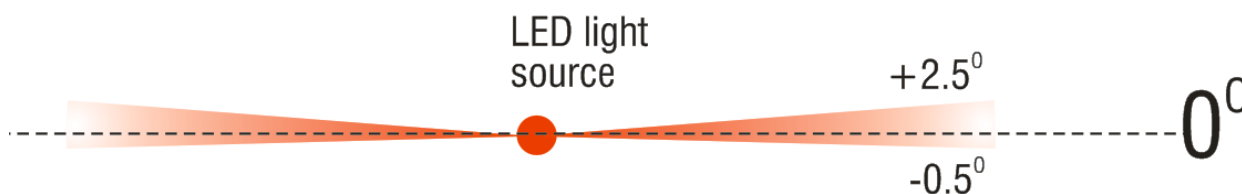


The 35 wind turbines are laid out along a ridge running from the north east to the south west. At the time of the site visit 9 wind turbines were lit with flashing red medium-intensity LED hazard identification lights. The lights were not synchronised. Subsequently two additional lights are operational, bringing the total number of wind turbines with night lighting to eleven.

The wind turbines were 2MW Enercon turbines, with a blade diameter of 71m and a turbine hub height of 85m giving an overall height of 120m.

However, unlike the medium intensity lights trialled at Challicum Hills Wind Farm in Victoria, these are LED lights which are baffled to ensure that the light spread is restricted to 3° as shown in Figure 12.3. The light spread is approximately -0.5° below the horizon line and approximately 2.5° above.

Figure 12.3 LED light spread



The LED lights are able to be baffled far more effectively than the earlier medium-intensity lights trialled at the Chalicum Hills Wind Farm and this has a major impact on the visual impact of the lights.

12.2.1 Site visit

The Mt Millar Wind Farm was visited in the evening of the 20th July 2006. It was a clear night, initially with some cloud cover on the horizon, and with very good visibility.

Figure 12.4 *Mt Millar Wind Farm at dusk*



When standing close to a lit wind turbine the difference between these lights and those used at the Chalicum Hills trial was immediately obvious. At a distance of 350-400m there was a glow around the lights and only the faintest strobing effect along the moving blades.

Figure 12.5 *Lighting on a Turbine at a distance of 250m*



The strobing effect in this picture is very indistinct and much less than was observed at Chalicum Hills.

A comparison with the security lighting at the substation also revealed that the lighting used at this facility was of a much greater intensity than that used on the wind turbines.

Figure 12.6 *Lighting on the substation and a turbine in the background*



The substation is in the foreground of Figure 12.6, with the two hazard warning lights on a turbine immediately behind the substation. The hazard identification lights are less of a visual impact than this facility that has similar lighting to many houses, sheds and farm structures.

At a distance of 1km to 1.5km the similarities between these lights and the trial lights at the Wonthaggi Wind Farm became obvious.

Figure 12.7 *Lighting on the wind turbines from a distance of 2.0km*



Although the Mt Millar lights are 2000cd medium-intensity hazard identification lights, at these distances there was no sign of any strobing along the blades and the visual impact was identical to that observed at Wonthaggi with W-Red lights of 170cd intensity at a similar distance. That

is, the lights were visible, but they had none of the eerie character of the Chalicum Hill lights at a similar distance.

12.2.2 Aviation Obstacle Lighting at Jupiter Wind Farm

The Aeronautical Impact Assessment for Jupiter Wind Farm prepared by Aviation Projects has been updated for the revised turbine layout.

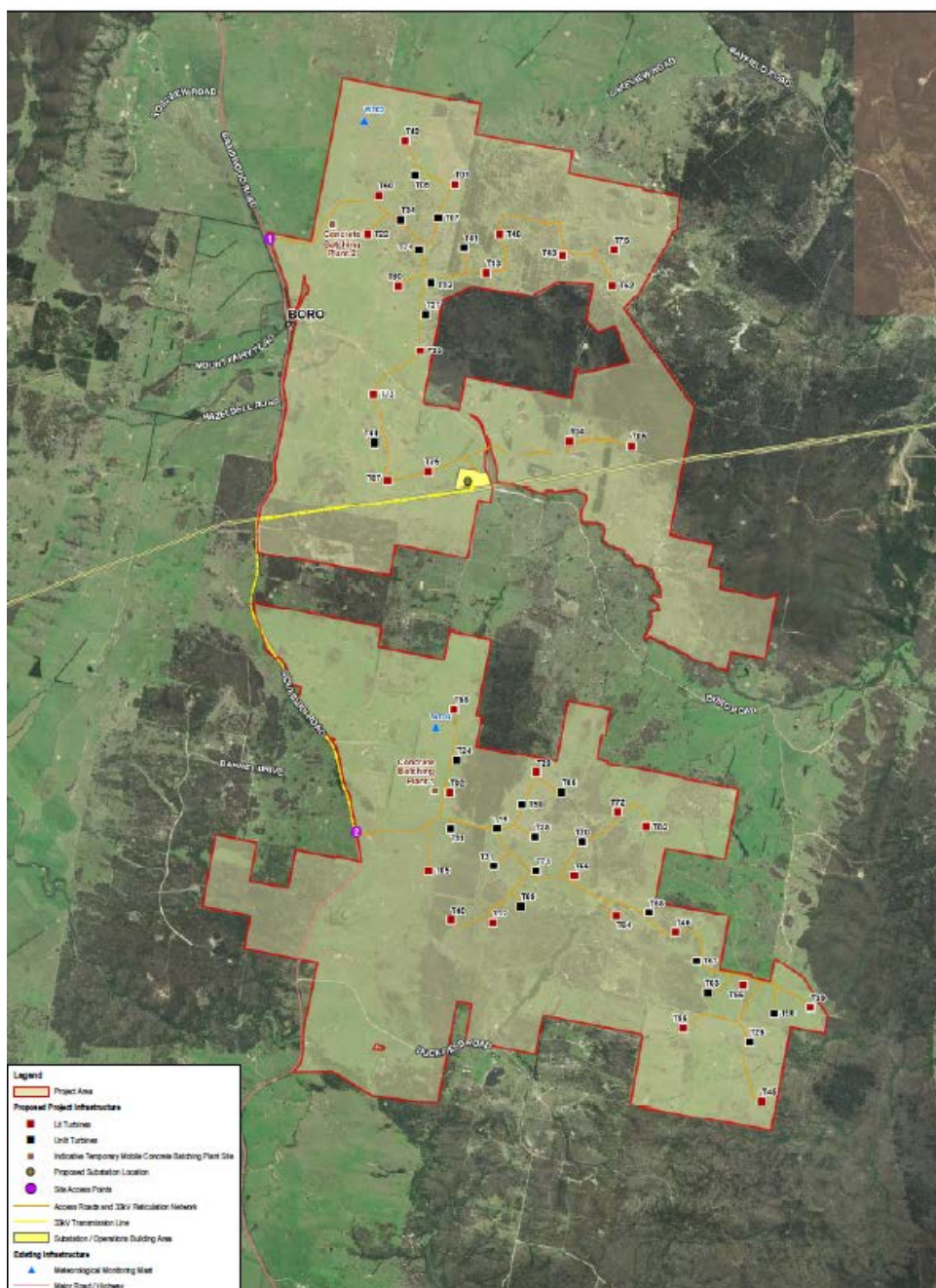
Should it be necessary to provide aviation lighting then CASA's current requirements for Aviation lighting are:

CASA recommends that the wind farm is lit with steady red low intensity lighting at night as per Section 9.4 of the CASA Manual of Standards Part 139. Characteristics of low intensity lights are stated in subsection 9.4.7.

Obstacle lighting would be requiring to be installed on 31 turbines of the 54 Turbines including 1, 2, 4, 6, 9, 13, 22, 28, 37, 39, 40, 43, 45, 46, 48, 49, 50, 52, 53, 56, 68, 72, 73, 75, 76, 80, 83, 84, 86, 87.

Turbines that are proposed to incorporate aviation obstacle lights are shown in red in Figure 4.4

Figure 12.8 *Aviation Obstacle Lighting*



The current night lighting recommended for the Jupiter Wind Farm is Aviation Obstacle Lighting is to be steady, low intensity lighting.

At the time of preparing this report, it is understood that CASA are exploring the use of Radar Activated Lighting which only activate lighting when aircraft are within 5.0 km of a turbine. This will reduce the hours of activated lighting and therefore the anticipated visual impact from aviation obstacle lighting.

The area around the Jupiter Wind Farm is not clear or lights in the night views. Lights are visible from road users, agricultural lighting and more recently the residential dwellings in areas of smaller allotments.

Figure 12.9 *Existing night lighting from Braidwood Road*



The proposed aviation lighting, would be visible both when activated and where view include the nacelle of a turbines. The preceding analysis of views from both public and private locations has determined that landscape mitigation would be effective at screening views of most turbines including the nacelle on which lighting would be mounted.

Should the Radar Activated Lighting System be implemented the visual impact of night lighting would be low where a turbine nacelle is visible or in absence of landscape screening and low to negligible where views are screened.

CONCLUSION

In summary, this landscape and visual impact assessment of the site demonstrates that the site and its surrounds within the Southern Table Lands have a low visual sensitivity to a wind farm development and is a suitable landscape for the construction of a wind farm.

This conclusion is supported by:

- Perception studies which continually show that the majority of viewers do not object to the construction of wind turbines on any but the most sensitive and localised landscapes. In this instance the wind farm is located in a rural landscape below elevated ridges and within an extensive plain.
- The majority of the landscape surrounding the Jupiter Wind Farm is a modified landscape that is predominantly used for agricultural or rural uses. Areas of relatively intact vegetation existing on the higher elevations and hilly areas to the north east and east. Views towards the turbines from within these areas are usually filtered or screened by extensive tree canopies.
- The landscape units in the viewshed are well represented across this area of the New South Wales. Further, the landscape in these are subject to change either through land use and agricultural practices or sub-division into smaller allotments, open cut mines and land fill operations such as those around Woodlawn. These activities suggest that through these interventions, the landscape surrounding the Jupiter Wind Farm can absorb other changes.
- Tarago is the only town within close proximity to the Jupiter Wind Farm with views of the proposed turbines. Views are limited from the edge of the residential areas along the Bungendore_ Tarago Road and the newly established Sherwins Ridge behind the town. From both locations views towards the Project include built form such as the town, railyards and train lines, roads and other infrastructure.
- There is minimal visibility from major roads. Kings Highway, which is the only major road in the region, is approximately 5.0 km to a turbine at its nearest point. Although there will be views from the highway, views are filtered by existing vegetation and will be all but glimpses. The visual impact from major roads will be low to negligible.
- There will be a visual impact on viewers using the minor roads within the region which run along the eastern and western edges of the wind farm as well as cross between the northern and southern sections. Visibility from these minor roads, which have fewer users than the highways and main roads, are also filtered by vegetation along roadsides, along property boundaries and creek lines as well as within private allotments and rural properties. It is considered that the visual impact will be low due in part to the low viewer numbers and the sensitivity of the landscape within these views to visual change.
- There are 88 non-participatory residences within 3km of the wind farm. Many of these existing residences have screening in the form of wind breaks. Newer dwellings to the north-west around Roseview Road and the north-east near Lakeview Road currently comprise little mature landscaping within proximity of views to the turbines. It is clear from the surrounding landscape and other properties in the area that landscape can be effective at screening views and can be readily established. Landscape mitigation can be effective in lessening the visual impact on residential properties.
- There are several elevated dwellings towards the northern end of the project which will have either direct or oblique views of turbines. The assessment for dwelling J3 determined that landscape mitigation may screen views to some but not all visible turbines. It is also apparent that landscape mitigation could take time to be effective. For this dwelling the visual impact would be high. This may also be the case for elevated residential dwellings at Roseview Road. Access was not granted at these dwellings at the time of ERM's site visits.

- There are few roads where multiple wind farms are visible, either sequentially or simultaneously. These viewing experiences can change peoples' perception of an area. Therefore the cumulative visual impact is considered to be low.
- The proposed aviation lighting, would be visible where views include the nacelle of a turbines and when activated. Should the Radar Activated Lighting System being considered by CASA be implemented the visual impact of night lighting would be low where a turbine nacelle is visible or in absence of landscape screening and low to negligible where views are screened.