Rye Park Wind Farm

View north from Rye Park-Dalton Road toward the proposed Rye Park Wind Farm

LANDSCAPE & VISUAL IMPACT ASSESSMENT

Prepared for:

RYE PARK WIND FARM PTY LTD

Prepared by:

GREEN BEAN DESIGN
landscape architects

November 2013

Project:	Rye Park Wind Farm
Project Number:	12-158
Report Title:	Landscape and Visual Impact Assessment
Revision:	Revision V4 – Final Issue
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Date	November 2013

Green Bean Design – Capability Statement

Green Bean Design is an experienced landscape architectural consultancy specialising in landscape and visual impact assessment. As an independent consultancy GBD provide professional advice to a range of commercial and government clients involved in large infrastructure project development.

GBD owner and Principal Landscape Architect Andrew Homewood is a Registered Landscape Architect and member of the Australian Institute of Landscape Architects and the Environmental Institute of Australia and New Zealand.

Andrew has over 20 years continuous employment in landscape consultancy and has completed numerous landscape and visual impact assessments for a variety of large scale and State significant infrastructure and renewable energy projects, including wind energy and solar power developments.

Green Bean Design has been commissioned for twenty one wind energy projects across New South Wales, Victoria, South Australia and Tasmania including assessments for:

Silverton Wind Farm	Boco Rock Wind Farm	Collector Wind Farm
Crookwell 3 Wind Farm	Sapphire Wind Farm	Willatook Wind Farm
Eden Wind Farm	Birrema Wind Farm	Rye Park Wind Farm
Paling Yards Wind Farm	Port Kembla Wind Farm	Bango Wind Farm
Deepwater Wind Farm	White Rock Wind Farm	Liverpool Range Wind Farm
Conroy's Gap (Mod 4)	Mt Emerald Wind Farm	Granville Harbour Wind Farm

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Executive summary

Green Bean Design (GBD) was commissioned by Rye Park Wind Farm Pty Ltd (the Proponent), a wholly owned subsidiary of Epuron Pty Ltd, to undertake a Landscape and Visual Impact Assessment (LVIA) for the Rye Park wind farm and associated development infrastructure (the project).

The project would have up to 126 wind turbines, and for the purpose of this LVIA, the proposed wind turbines have been assessed with a maximum blade tip height of 157 m from ground level to tip of blade and a maximum rotor size of up to 112 m. Associated electrical works include a proposed 330 kV overhead powerline connection to an existing 330 kV powerline to the south of the project site.

This LVIA involved desktop studies and site inspections to collect and analyse information to describe and define the characteristics of the landscape in which the project would be located. This LVIA has determined that the landscape surrounding the project has an overall medium/medium to high sensitivity to change. The existing landscape character is reasonably typical of landscape character areas that are commonly found in the surrounding areas of the New South Wales Southern Tablelands and the NSW/ACT Border Region Renewable Energy Precinct.

As a landscape with an overall medium/medium to high sensitivity to change, some recognisable characteristics of the landscape character will be altered by the proposed project, and result in the introduction of visually prominent elements that will alter the perceived characteristics of the landscape; however, the degree of alteration may be partially mitigated by existing landscape elements and features within the landscape. The main characteristics of the landscape, patterns and combinations of landform and landcover will still be evident.

The Rye Park wind farm visibility was determined within the 10 km project viewshed and illustrated by a series of panoramic photographs and 3 Zone of Visual Influence (ZVI) diagrams (up to a distance of 20 km). The ZVI diagrams demonstrate the influence of topography on visibility and identify areas from which the wind farm turbines would be visible.

Executive summary

This LVIA assessed the potential visual significance of the Rye Park wind farm for uninvolved and involved residential dwellings within the projects 10 km viewshed, as well as potential visual impacts from publically accessible areas in the surrounding landscape.

A total of 51 involved and uninvolved residential dwellings have been identified within 2 km of the proposed Rye Park wind turbines. Ten residential dwelling locations within the 2 km viewshed have been determined to have a low visual significance, and ten with a low to medium visual significance. Twelve residential dwellings within the 2 km viewshed have been determined to have a medium visual significance, and seventeen a medium to high visual significance (comprising eight involved and nine uninvolved residential dwellings). Two residential dwellings locations would have a high visual significance (comprising one involved and one uninvolved residential dwelling). The uninvolved residential dwelling (R1) is involved with the proposed Rugby wind farm project to the north of the Rye Park wind farm site boundary.

This LVIA assessed the potential visual impact associated with the proposed 330 kV powerline, three substations and associated electrical infrastructure. The LVIA determined that the overall visual significance of these elements would be low due to their location relative to existing residential locations together with the screening influence of surrounding topography and vegetation.

A cumulative assessment identified two proposed wind farm developments (the Bango and Rugby wind farm projects) within the Rye Park wind farm 10 km viewshed. This LVIA determined that there would be some level of wind turbine intervisibility between the Rye Park wind farm and other wind farm developments with potential 'direct' and 'indirect' visibility within the Rye Park wind farm viewshed from residential dwellings, and 'sequential' views from some surrounding road corridors.

Night time obstacle lighting, if implemented, would have the potential to create a visual impact on residential dwelling locations surrounding the Rye Park wind farm. This LVIA notes that further to the withdrawal of the CASA Advisory Circular there are no guidelines by which to define criteria for wind farm night time obstacle lighting. This LVIA notes that night time lighting has been determined as not required for the Gullen Range wind farm, and that obstacle lighting has also been removed from the Cullerin wind farm adjoining the Hume Highway to the east of Yass.

Executive summary

Although some mitigation measures are considered appropriate to minimise the visual effects for a number of the elements associated with the wind farm, it is acknowledged that the degree to which the wind turbines would be visually mitigated is limited by their scale and position within the landscape relative to surrounding view locations.

Introduction

Section 1

1.1 Introduction

This LVIA addresses one of the key requirements of the Rye Park wind farm Environmental Assessment (EA) to be submitted and assessed under Part 3A of the Environmental Planning & Assessment Act 1979 (EP&A Act).

This LVIA methodology adopted by GBD has been applied to a number of similar LVIA for large scale infrastructure projects prepared by GBD, which have been assessed and approved by the New South Wales Department of Planning under Part 3A of the EP&A Act.

This LVIA addresses and responds to the Director General's Requirements (DGR's) dated 14th February 2011, for the assessment of potential landscape and visual impacts of the project. **Table 1** outlines the relevant landscape and visual impact assessment requirements of the DGR's and the corresponding section in which they are addressed within this LVIA report.

Table 1 Director General's Requirements

DGR's	Report Reference
• provide a comprehensive assessment of the landscape character and values and any scenic or significant vistas of the area potentially affected by the project, including an assessment of the significance of landscape values and character in a local and regional context. This should describe community and stakeholder values of the local and regional visual amenity and quality, and perceptions of the project based on surveys and consultation.	Refer LVIA **Sections 6** and **14**
• assess the impact of shadow "flicker", blade "glint" and night lighting from the wind farm.	Refer Rye Park wind farm EA **Section 14**,
• identify the zone of visual influence including consideration of night lighting (no less than 10 kilometres) and assess the visual impact of all project components on this landscape.	Refer LVIA **Sections 7** and **11**.
• Include an assessment of any cumulative visual impacts from powerline infrastructure.	Refer LVIA **Section 9**.
• include photomontages of the project taken from potentially affected residences (including approved but not yet developed dwellings or subdivisions with residential rights), settlements and significant public view points, and provide a clear description of proposed visual amenity mitigation and management measures for both the wind farm and the powerline. The photomontages	Refer LVIA **Sections 10** and **15**.

DGR's	Report Reference
must include representative views of turbine night lighting if proposed.	
• provide an assessment of the feasibility, effectiveness and reliability of proposed mitigation measures and any residual impacts after these measures have been implemented.	Refer LVIA **Section 15**.

The Rye Park wind farm would be located across three Local Government Areas:

- Boorowa Shire;
- Yass Valley Shire; and
- Upper Lachlan Shire Council.

Although not directly applicable to the Rye Park EA, GBD has also reviewed the Upper Lachlan Shire Council's Development Control Plans (DCP) for Wind Power Generation and GBD confirm that this LVIA addresses a number of key DCP requirements with regard to consideration of visual assessment, including provision for:

- the assessment of visual impact and scenic value;
- the assessment of cumulative impact;
- shadow flicker assessment;
- viewshed mapping; and
- photomontages.

The assessment of potential visual impact associated with shadow flicker has been assessed and included in **Section 14** of the EA.

GBD is not aware of any landscape areas within the immediate wind farm viewshed that are subject to any Local, State or Federal statutory designations for high landscape values or scenic quality and/or scenic protection.

GBD is cognisant of the Australian Wind Energy Association and Australian Council of National Trust's publication Wind Farms and Landscape Values National Assessment Framework, June 2007, and have encompassed the general assessment framework outlined in the National Assessment Framework

within the LVIA methodology. In addition to the National Assessment Framework, the preparation of this LVIA has also included a review of the Draft NSW Planning Guidelines Wind Farms (December 2011)

This LVIA involved a comprehensive evaluation of the landscape character in which the Rye Park wind farm and ancillary structures would be located, and an assessment of the potential landscape and visual impacts that could result from the construction and operation of the wind farm, taking into account appropriate mitigation measures. This LVIA is based on technical and design information provided by the Proponent to GBD.

1.2 Draft NSW Planning Guidelines Wind Farms (December 2011)

The NSW DoP&I issued the Draft Planning Guidelines Wind Farms (NSW Draft Guidelines) in December 2011, which provide guidance and information for wind farm applicants, consent authorities as well as communities and stakeholder groups. The NSW Draft Guidelines set out key considerations for the upfront assessment of landscape and visual impact for residential dwellings within a 2km radius of proposed wind turbines (through the Gateway Process and Site Compatibility Certification) and specific assessment requirements that may be set out in the NSW DoP&I Director Generals Requirements on a project by project basis. The Draft Guidelines also set out a comprehensive framework for the assessment of landscape and visual impacts including residential dwellings within 2 km proximity of proposed wind turbines.

The Draft Guidelines were placed on public exhibition between December 2011 and March 2012; however, had not been finalised or formally adopted by the New South Wales Government prior to completion of this LVIA.

Whilst no supplementary DGRs have been issued for the Rye Park wind farm requiring compliance with the NSW draft guidelines, this LVIA has considered and given regard to the NSW draft guidelines to the extent practicable, including information and issues outlined in the NSW draft guidelines Appendix A – 'Meeting assessment requirements, landscape and visual amenity'. This LVIA has included the preparation of photomontages from 22 uninvolved residential dwellings located within 2 km of the proposed Rye Park wind turbines. Three landowners with residential dwellings within 2 km of the Rye Park wind farm turbines chose not to have a photomontage.

1.3 National Assessment Framework

GBD is cognisant of the Australian Wind Energy Association and Australian Council of National Trust's publication Wind Farms and Landscape Values National Assessment Framework (NAF), June 2007, and have encompassed the general assessment framework outlined in the NAF within the LVIA methodology. **Table 2** outlines the relevant requirements of the NAF and the corresponding section in which they are addressed within this LVIA report.

Table 2 NAF Recommendations

NAF Tasks (through Steps 1 to 4)	LVIA Reference/Response
Step 1 Assess the Landscape Values **1A Preliminary Landscape Assessment** • 1A.1 Desktop Review • 1A.2 Seek information from Local Authority • 1A.3 Identify potential community and stakeholder interests • 1A.4 Site survey • 1A.5 Preliminary assessment of landscape values **1B Full Landscape Assessment** • 1B.1 Define the study area for assessment, including the zone of visual influence • 1B.2 Landscape Character Analysis • 1B.3 Natural and cultural values analysis • 1B.4 Involve communities and stakeholders in identifying landscape values • 1B.5 Document values and analyse significance	This LVIA has been prepared through a comparable methodology to that outlined in the NAF and has included a desktop review (pre site inspection) to determine potential view locations as well as establishing the extent and types of landscape characteristics within the 10km viewshed. Early telephone discussions with the relevant Local Authorities determined that no additional wind farm developments were current other than those notified on the DoP&I website: (http://majorprojects.planning.nsw.gov.au/page/project-sectors/transport--communications--energy---water/generation-of-electricity-or-heat-or-co-generation/) Community and stakeholder interests have been identified by an ongoing process of direct consultation between the Proponent and relevant stakeholders. The results of the consultative process are included in this LVIA as well as other relevant sections of the **EA**. Site survey and preliminary assessment work has been undertaken and incorporated into this LVIA. The preparation of a separate preliminary assessment of landscape values is not a requirement under the NSW DoP&I DGR's. This LVIA addresses the requirements of Step 1B and presents an analysis of key considerations included in

NAF Tasks (through Steps 1 to 4)	LVIA Reference/Response
	the NAF.
Step 2 Describe and Model the Wind Farm in the Landscape • 2.1 Describe the development • 2.2 Model the development • 2.3 Prepare a visual assessment report	This LVIA has described and modelled the Rye Park wind farm development and selected view points from a range of view locations including uninvolved residential dwellings and road corridors within the 10km viewshed.
Step 3 Assess the Impacts of the Wind Farm on Landscape Values • 3.1 Seek community input to potential impacts • 3.2 Identify and describe impacts • 3.3 Identify potential cumulative impacts • 3.4 Identify other relevant factors • 3.5 Evaluate impacts	Community and stakeholder interests have been identified by an ongoing process of direct consultation between the Proponent and relevant stakeholders. The results of the consultative process are outlined and included in this LVIA as well as other relevant sections of the **EA**. This LVIA has identified and described potential landscape and visual impacts associated with the Rye Park wind farm development as well as potential cumulative impacts resulting from other wind farm projects within the NSW/ACT Border Region Renewable Energy Precinct.
Step 4 Respond to Impacts • 4.1 Changes to location or siting of the wind farm or ancillary infrastructure • 4.2 Layout and design considerations • 4.3 Minor changes and mitigation measures • 4.4 Recommend changes to the development	The development of the Rye Park wind farm turbine layout has been reviewed and adjusted throughout the preparation of this LVIA. Changes to the layout have occurred as a result of stakeholder consultation and specific concerns directed toward the visual impact of the wind farm from surrounding view locations. Significant changes have occurred throughout the development of the preferred design layouts including the removal and repositioning of turbines within site boundary.

The NAF is noted by its authors as a framework document and does not set out a detailed or prescribed method to undertake an assessment of landscape values. This LVIA has; however, followed the majority of techniques and has tested and determined outcomes for the principal issues that have been raised in the NAF.

1.4 Auswind Best Practice Guidelines (December 2006)

The Auswind Best Practice Guidelines were developed to assist wind farm proponents to implement best practice in regards to the location and siting of wind energy facilities and to conduct wind farm investigations and impact assessments. The guidelines have been subject to revisions following technical reviews and consultation with both industry and broader stakeholder input.

The Guidelines, developed between (the former) Auswind and the National Trust, provide a landscape assessment approach to describe, assess and evaluate the potential landscape and visual impact of a proposed wind energy project. A summary of the approach includes:

- Consultation with experts in the analysis of the environments visual characteristics e.g. Landscape Architects;
- Preparation of 'Zone of Visual Influence' or 'Seen Area Diagrams';
- Preparation of photomontages (also referred to as Visual Simulations);
- Determination of cumulative impact from existing wind energy projects;
- Investigation of impacts with associated infrastructure elements, including substation, service roads and power lines; and
- Assessment of Shadow Flicker.

The Auswind Best Practice Guidelines offer best practice advice and are not a mandatory requirement for wind farm developments within Australia and have been incorporated into this LVIA.

1.5 Methodology

This LVIA methodology included the following activities:

- desktop study addressing visual character and identification of view locations within the surrounding area;
- fieldwork and photography;
- preparation of ZVI diagrams;
- assessment and determination of landscape sensitivity;
- assessment of significance of visual impact; and
- preparation of photomontages and illustrative figures.

1.6 Desktop study

A desktop study was carried out to identify an indicative viewshed for the Rye Park wind farm. This was carried out by reference to 1:25,000 scale topographic maps as well as aerial photographs and satellite images of the project area and surrounding landscape. A preliminary ZVI diagram was also produced prior to the commencement of fieldwork in order to inform the likely extent and nature of areas within the nominated 10km viewshed of the proposed wind farm.

Topographic maps and aerial photographs were also used to identify the locations and categories of potential view locations that could be verified during the fieldwork component of the assessment. The desktop study also outlined the visual character of the surrounding landscape including features such as landform, elevation, landcover and the distribution of settlements.

1.7 Preparation of ZVI diagrams

The Proponent prepared ZVI Diagrams to illustrate the potential visibility of the wind turbines within the Project 10km viewshed. ZVI Diagrams included visibility from tip of blade, hub height and whole turbine. The ZVI are illustrated in **Figures 24, 25**, and **26** and detailed in **Section 7** of this LVIA.

1.8 Fieldwork and photography

GBD undertook a total three and a half days of fieldwork associated with the Rye Park wind farm development:

- two days of general site inspections to determine and confirm the potential extent of visibility of the project and ancillary structures, and to identify landscape characteristics surrounding the wind farm site, and along the proposed powerline; and
- one and a half days of site photography for the public photomontages locations.

The Proponent undertook separate fieldwork to capture panorama photographs from residential dwellings within 2 km of the proposed wind turbine locations.

1.9 Assessment of landscape sensitivity

The potential impact of the project on the sensitivity of the landscape surrounding the wind farm would result primarily from the capability of the landscape to integrate with, or to accommodate the wind farm.

The capability of the landscape to accommodate the wind farm would result primarily from the nature and degree of perceptual factors that can influence interpretation and appreciation of the landscape, including landform, scale, topographic features, landcover and human influence or modifications.

1.10 Significance of visual impact

The potential significance for visual impact of the project on surrounding view locations would result primarily from a combination of the potential visibility of the wind turbines and the characteristics of the landscape between, and surrounding, the view locations and the wind farm. The potential degree of visibility and resultant visual impact would be partly determined by a combination of factors such as:

- category and type of situation from which people could view the wind farm (examples of view location categories include residents or motorists);
- visual sensitivity of view locations surrounding the wind farm;
- potential number of people with a view toward the proposed wind farm from any one location;
- distance of visual effect (between view locations and the wind farm); and
- duration of time people could view the wind farm from any particular static or dynamic view location.

An underpinning rationale for this LVIA is that if people are not normally present at a particular location, such as agricultural areas, or they are screened by landform or vegetation, then there is likely to be a nil visual impact at that location.

If, on the other hand, a small number of people are present for a short period of time at a particular location then there is likely to be a low visual impact at that location, and conversely, if a large number of people are present then the visual impact is likely to be higher.

Although this rationale can be applied at a broad scale, this LVIA also considers, and has determined, the potential visual impact for individual view locations that would have a higher degree of sensitivity to the wind farm development, including the potential impact on individual residential dwellings

situated in the surrounding landscape. The determination of a visual impact is also subject to a number of other factors which are considered in more detail in this LVIA.

Whilst this LVIA addresses a number of static elements associated with the project, the assessment acknowledges and has considered the potential visual impact associated with the movement of the wind turbine rotors.

1.11 Photomontages

Photomontages have been prepared from 32 locations to illustrate the potential visibility of the Rye Park wind farm following construction. The photomontages locations included uninvolved residential dwellings within 2 km of the Rye Park wind turbines, in accordance with the requirements of the NSW Draft Guidelines.

The public photomontage locations were selected and photographed by GBD. The public photomontage locations were selected to provide representative views from the vicinity of residential dwellings as well as publically accessible areas and road corridors. The public photomontage locations are illustrated in **Figure 31** and the public photomontages in **Figures 32** to **40**. The photomontages prepared for uninvolved residential dwellings within 2 km of the Rye Park wind turbines are illustrated in **Figures 41** to **62** and located in **Figures 28a** and **28b**. The heights of proposed turbines within the photomontages prepared by the Proponent were subject to peer review and verification by GBD. The photomontage methodology verification is illustrated in **Figures 63** and **64**.

1.12 Shadow flicker & blade glint

The Proponent prepared a shadow flicker assessment and report for the Rye Park wind farm. The results of the shadow flicker assessment are included in **Section 14** of the EA.

Location

Section 2

2.1 Location

The Rye Park wind farm would be located on the edge of the Southern Tablelands and the South West Slopes in the NSW/ACT Border Region Renewable Energy Precinct.

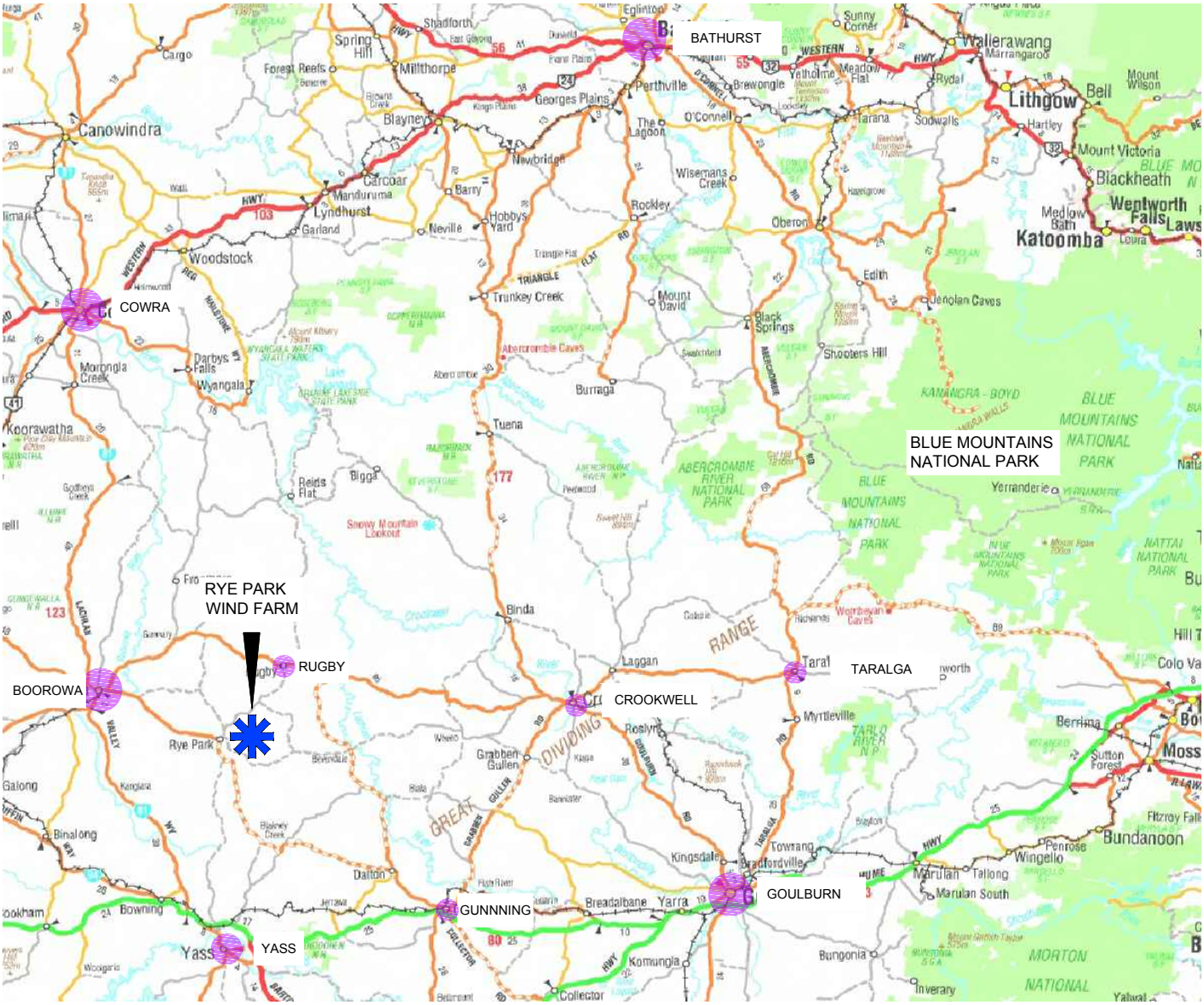
The project would extend in an approximate north south alignment along a series of hills and ridgelines between 700 to 800 m in elevation. The project area would incorporate around 40 participating rural residential and farming properties covering an area around 14,800 hectares portions of the Upper Lachlan Shire, Yass Valley Shire and Boorowa Shire Local Government Areas.

A small number of towns and localities occur within and beyond the 10 km viewshed and include:

- Rye Park (approximately 3.3 km to the west)
- Rugby (approximately 9.3 km to the north east)
- Yass - outlying north east portion (approximately 9.3 km to the south west)
- Bevendale (approximately 8.5 km to the east); and
- Jerrawa (approximately 6.9 km to the south east).

The Main Southern Railway and Hume Highway corridors extend east to west below the south boundary of the project site.

The location of the Rye Park wind farm is illustrated in **Figure 1**.



RYE PARK WIND FARM -
LOCATION PLAN, REGIONAL CONTEXT (Not to scale)

RYE PARK WIND FARM -
LOCATION PLAN, STATE CONTEXT (Not to scale)

Figure 1
Location Plan

Rye Park Wind Farm Pty Ltd

RYE PARK WIND FARM

Project description

Section 3

3.1 Project description

The key visual components of the Rye Park wind farm would comprise:

- up to 126 wind turbines;
- up to 126 individual 33kV external kiosk transformers and switchgear with associated control systems to be located in the vicinity of the wind turbine towers (in some turbine models transformer equipment will be integrated within the tower or nacelle);
- underground and overhead electrical and communication cable network linking turbines to each other within the project boundary;
- a new 330 kV wind farm connection substation located adjacent to the existing TransGrid 330 kV powerline (Yass – Bannaby) that traverses the southern section of the site;
- up to two new 22 or 33/330 kV collection substations located across the wind farm;
- a new overhead powerline approximately 35 km in length, rated at up to 330 kV (nominal) capacity, running north-south along the length of the wind farm site to the two collection substations. The new powerline would be mounted on a single pole type structure and may be single-circuit or double-circuit as required;
- up to 6 permanent wind monitoring masts. The permanent monitoring masts may be either static guyed or un-guyed structures and will be to a minimum height of the wind turbine hubs;
- on site access tracks for construction, operation and ongoing maintenance; and
- Rye Park wind farm signage and maintenance facilities.

Temporary works associated with the construction of the wind farm that may be visible during construction and operational phases include:

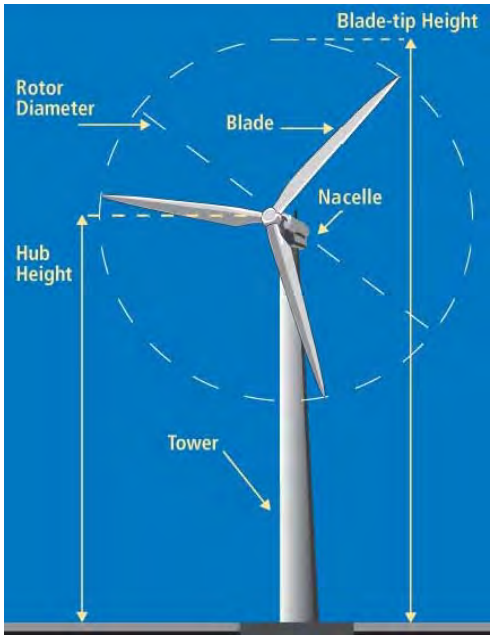
- crane hardstand areas; and
- mobile concrete batching plant and rock crushing facilities.

3.2 Wind turbines

The specific elements of the wind turbines comprise:

- concrete foundations;
- tubular tapering steel or concrete towers;
- nacelles at the top of the tower housing the gearbox and electrical generator;
- rotors comprising a hub (attached to the nacelle) with three blades; and
- three fibreglass / carbon fibre blades attached to each hub.

The following diagram identifies the main components of a typical wind turbine:



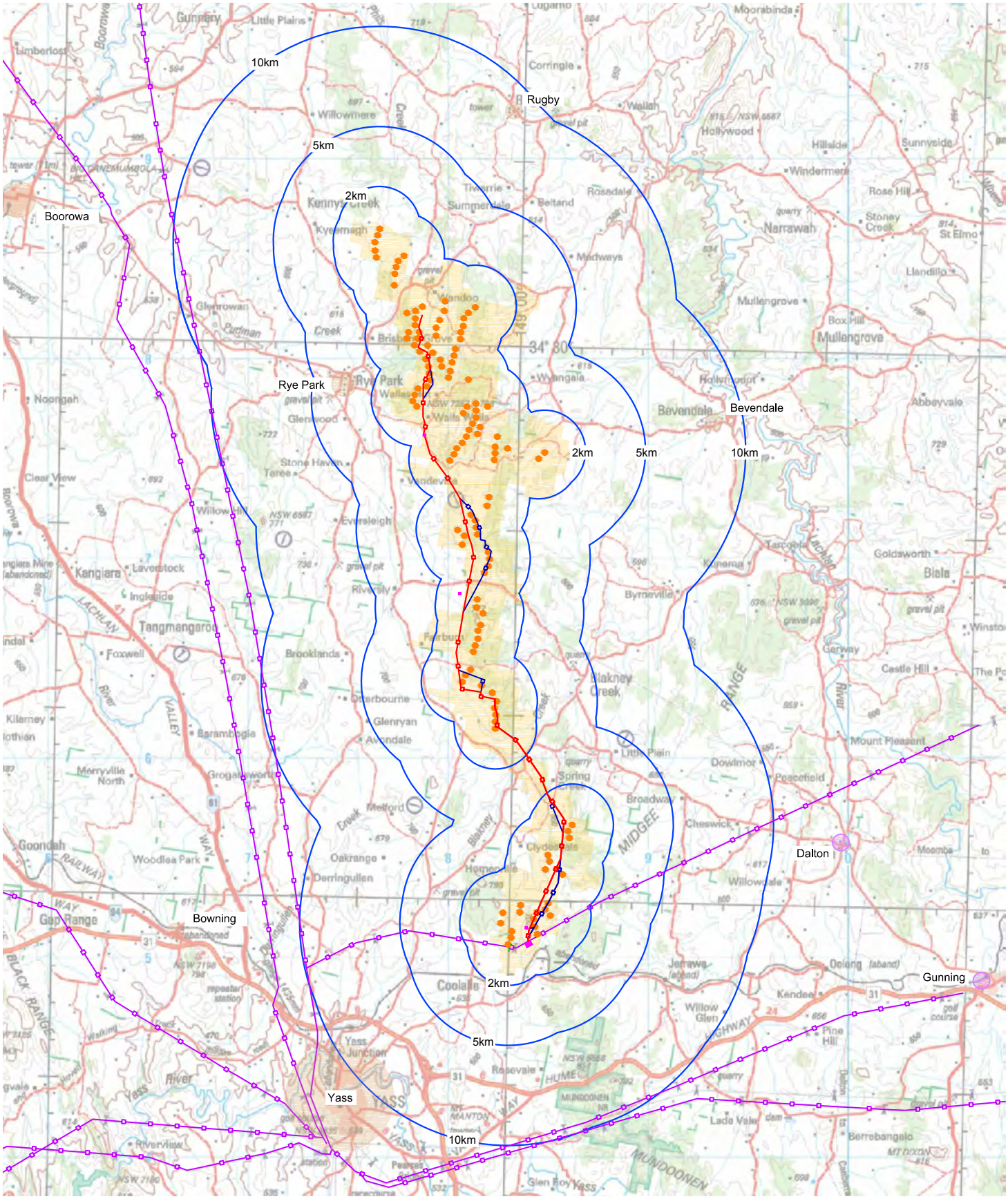
Configuration and components of a typical wind turbine

Table 3 outlines the main design parameters for the proposed Rye Park wind turbine layout:

Table 3 Rye Park wind turbine details:

Element	Description
Tower height	101 m
Rotor Diameter	112 m
Overall height from ground level to tip of blade	157 m
Proposed number of Rye Park wind turbines	**126 turbines**

As new turbines come onto the market, it is possible that the final turbine selected may exceed, in minor respects, the assessed maximum turbine envelope. The indicative Rye Park wind farm design layout is illustrated in **Figure 2.**



Legend

- Rye Park wind farm project area
- Distance from proposed Rye Park wind turbine
- Proposed Rye Park wind turbine (indicative layout)
- Existing powerline
- Preferred 330 kV powerline route
- Alternative 330 kV powerline route

0 km 5 km

Figure 2
Site layout

EPURON
Rye Park Wind Farm Pty Ltd

RYE PARK WIND FARM

GREEN BEAN DESIGN
landscape architects

3.3 Wind monitoring masts

Up to 6 permanent wind monitoring masts would be installed on-site, extending to a minimum height of the wind turbine hubs (around 101 m in height). The wind monitoring masts would be of a guyed or un-guyed, narrow lattice or tubular steel design. The wind monitoring masts would be unlikely to create a significant visual impact, and are similar in scale, or smaller than a number of surrounding communication masts visible in the landscape surrounding the wind farm project area.

3.4 On-site access tracks

On-site access tracks would be constructed to provide access to turbine locations across the site during construction and operation. During construction the majority of access tracks would be up to 5-6 m wide (wider at bends) to allow for vehicle manoeuvring. Post construction, these access tracks would be partially rehabilitated up to 6 m width to facilitate access for maintenance vehicles during the operational phase. The final access track design would be developed on a number of environmental grounds, including minimising the potential for visual impact by considering:

- overall length and extent;
- need for clearing vegetation;
- potential for erosion;
- extent of cut and fill; and
- potential to maximise rehabilitation at the completion of the construction phase.

3.5 Electrical works

The majority of cabling works, including the installation of control cables linking the turbines to the control building would be installed underground. For electrical reasons some cabling may be required to be installed on medium voltage overhead powerline supported by single low profile tubular poles.

Grid connection would be achieved via a connection to the existing 330 kV powerline which bypasses the southern portion of the wind farm site. The wind farm turbines would be connected to on-site substations, control room and facilities for the grid connection.

The proposed electrical works are described in **Section 12** and illustrated in **Figures 68** and **69**.

Local environmental factors

Section 4

4.1 Climatic and atmospheric conditions

Local climatic and atmospheric conditions have the potential to influence the visibility of the project from surrounding view locations, and more significantly, from distant view locations. The climate of the New South Wales South Eastern Highlands Bioregion is characterised by a temperate climate of warm summers and no dry season, with elevated areas in the north and south of the bioregion experiencing milder summer conditions in montane climate zones.

Meteorological data collected over the past 113 years at Yass (Linton Hostel) indicates that there are:

- 92 clear days (annual mean average);
- 109 cloudy days (annual mean average); and
- 74 days of rain (annual mean average).

Rainfall would tend to reduce the level of visibility from a number of view locations surrounding the project with the degree of visibility tending to decrease over distance. Rain periods would be likely to reduce the number of visitors travelling through the areas from which the project could be visible, and potentially decrease the duration of time spent at a particular public view location with a view toward the project.

Cloud cover would also tend to reduce the level of visibility of the project and lessen the degree of contrast between the wind turbine structures and the background against which the wind turbines would be visible.

On clear or partly cloudy days, the position of the sun would also have an impact on the degree of visibility of the project. The degree of impact would be largely dependent on the relationship between the position and angle of the sun relative to the view location. Late afternoon and early evening views toward the west would result in the wind turbines silhouetted above the horizon line, and with increasing distance would tend to reduce the contrast between the wind turbine structures and the surrounding landform.

The extent to which local weather conditions can influence visibility toward turbine structures is illustrated in **Figure 3**.

4.2 Topography and drainage

The topography of the landscape within the New South Wales Southern Highlands Bioregion covers a broad area of the dissected ranges and plateaus of the Great Dividing Range extending east toward the Great Escarpment and the western slopes of the inland drainage basins. The project would be located on portions of plateau remnants and low rolling hills cut by drainage lines.. The elevation of the wind farm site falls gently from the north to the south. A number of ephemeral drainage lines occur across the project site, draining to broader valleys west and east of the wind farm site.

Landform elevation within and surrounding the project site is illustrated in **Figure 4**.

4.3 Vegetation

A detailed survey of existing vegetation has been carried out as part of the biodiversity assessment for the project EA and is summarised in the **Section 11** of the EA.

In general the landscape within the project site contains vegetation associated with woodland, drainage lines, small ponds/dams and cleared land for pasture and agricultural crop cultivation. Stands of remnant woodland occur within the wider context of a modified landscape which continues to be managed through a variety of farming activities.

Timbered areas have some potential to provide partial or full screening toward the project area from surrounding public and residential view locations. The screening potential tends to increase when combined with the local topography of hills and undulating landform. The distribution of timbered areas within and beyond the project site is illustrated in **Figure 5**.

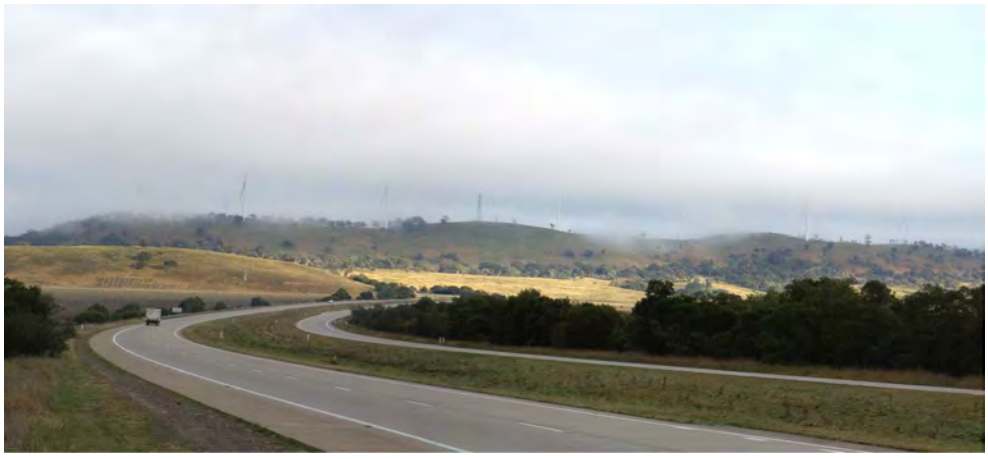
The landscape within and surrounding the project site is illustrated in the panorama photographs presented in **Figures** 12 to 2**7.**

PHOTOGRAPH A - DAY TIME VIEW FROM HUME HIGHWAY TOWARD CULLERIN WIND FARM AT AROUND 3.5KM (13th June 2010)

PHOTOGRAPH A
Illustrates the visibility of wind turbines against a clear and blue sky backdrop with sunlight from above and to the right of the wind turbines creating a shadow line along the left hand side of the towers as well as portions of the rotor blades.

PHOTOGRAPH B - DAY TIME VIEW FROM HUME HIGHWAY TOWARD CULLERIN WIND FARM AT AROUND 3.5KM (10th June 2010)

PHOTOGRAPH B
Illustrates the visibility of wind turbines against a partly cloudy and overcast backdrop. The wind turbines in cloud shadow appear off white to grey in colour.



PHOTOGRAPH C - DAY TIME VIEW FROM HUME HIGHWAY TOWARD CULLERIN WIND FARM AT AROUND 3.5KM (7th July 2010)

PHOTOGRAPH C -
Illustrates the visibility of wind turbines in fog/low cloud cover.

Figure 3
Visibility & weather

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RYE PARK WIND FARM

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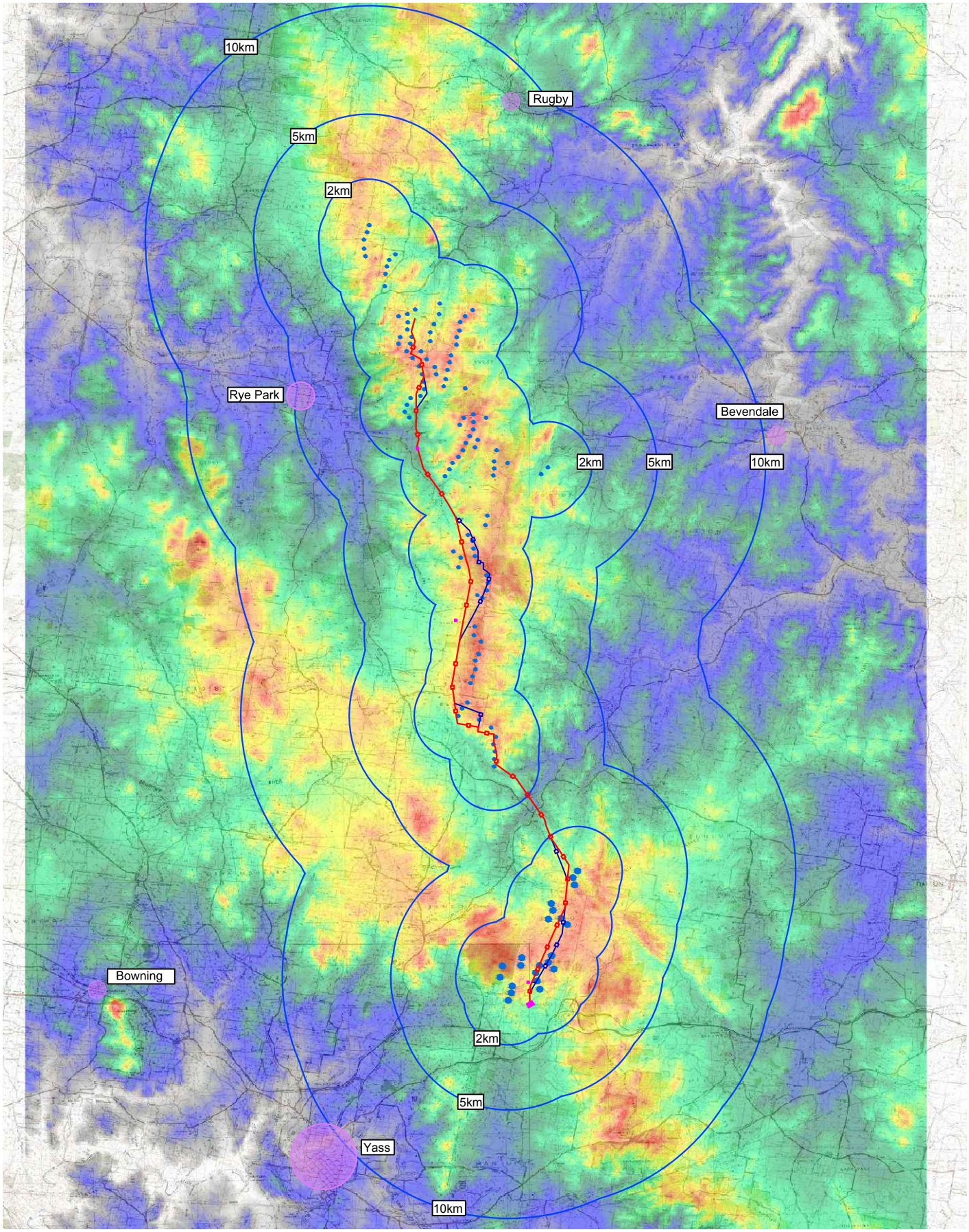

Legend

Elevation

- 800 m
- 760 m
- 700 m
- 670 m
- 640 m
- 600 m
- 560 m
- 500 m

Proposed Rye Park wind turbine (indicative layout)

Distance from proposed Rye Park wind turbine

Preferred 330 kV powerline route

Alternative 330 kV powerline route

0km 5km

Figure 4
Topography

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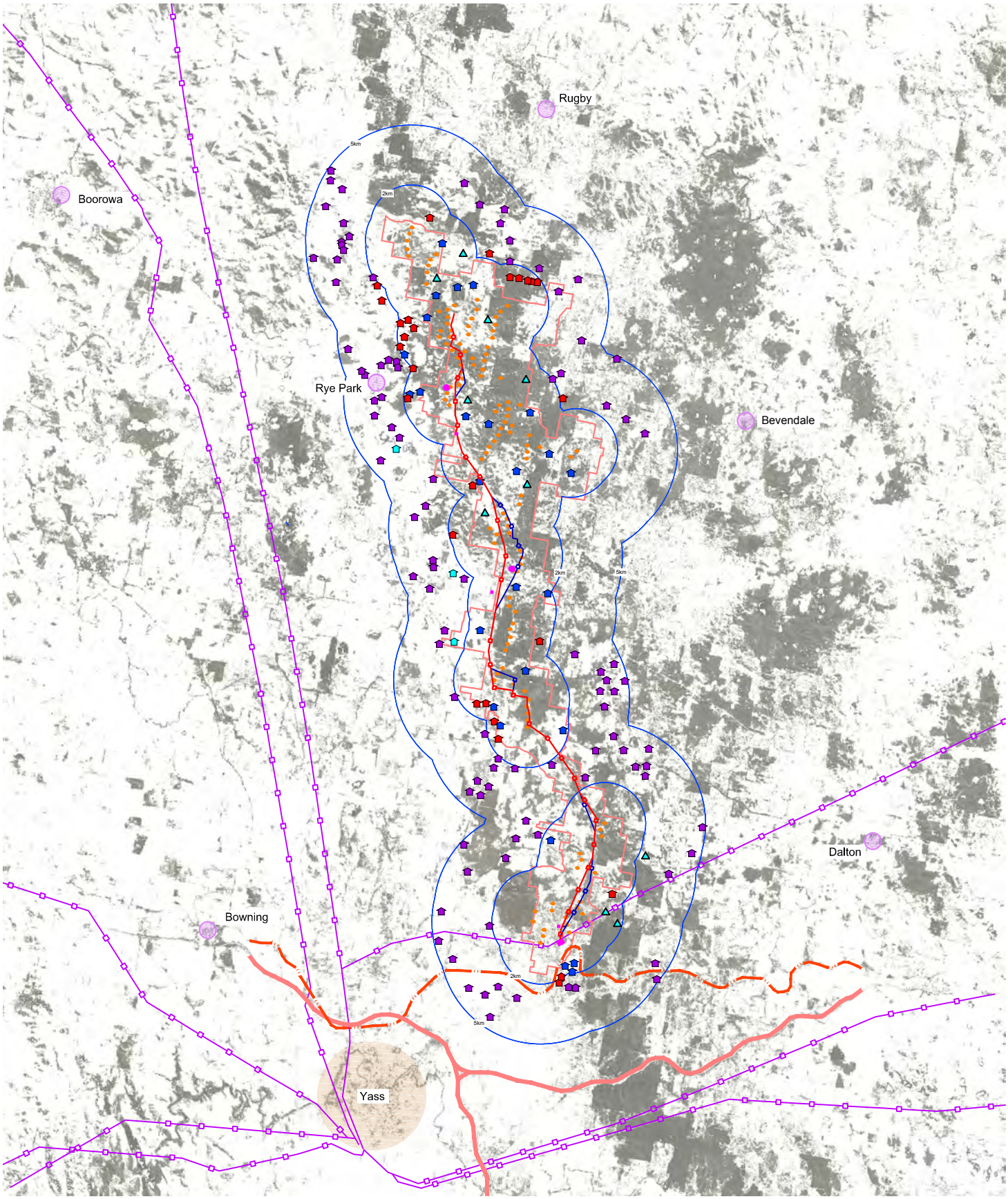
RYE PARK WIND FARM



Legend

- Associated residential dwelling within 2 km of wind turbine
- Non associated residential dwelling within 2 km of wind turbine
- Residential dwelling between 2 km and 5 km of wind turbine
- Non residential structure
- Proposed Rye Park wind turbine (indicative layout)
- Proposed 330 kV power line (preferred route)
- Proposed 330 kV power line (alternative route)
- Distance from proposed Rye Park wind turbine
- Existing transmission line
- Hume & Barton Highway
- Main Southern Railway
- Tree cover

0 km 5 km

Figure 5
Indicative tree cover within 10 km viewshed

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Panoramic photographs

Section 5

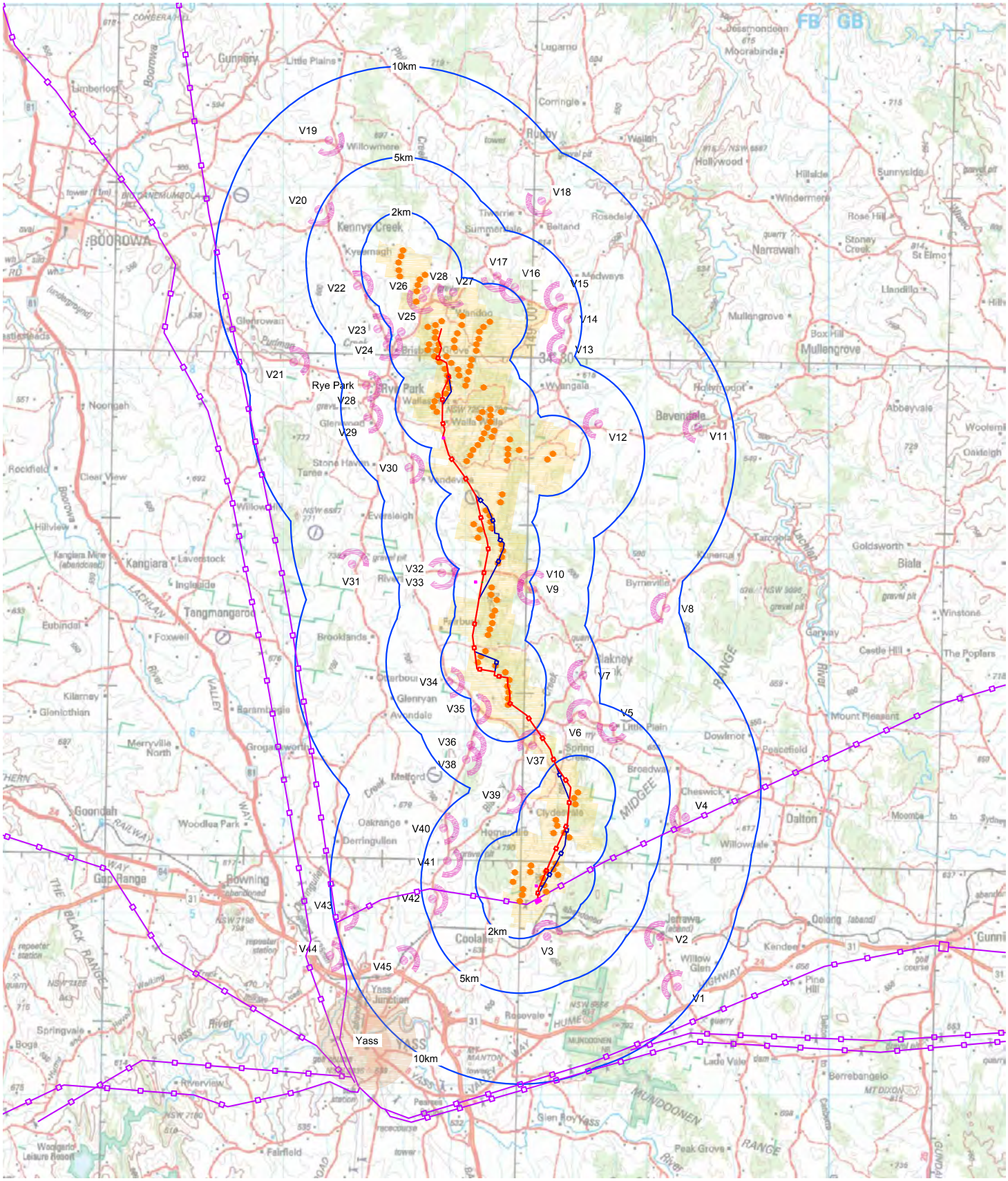
5.1 Panoramic Photographs

A series of digital photographs were taken during the course of the fieldwork to illustrate existing views in the vicinity of a number of view locations inspected and assessed as part of this LVIA. Individual photographs were digitally stitched together to form a segmented panorama image to provide a visual illustration of the existing view from each photo location.

The panoramic photographs presented in this LVIA have been annotated to identify key features or structures located within the existing view. They also indicatively illustrate the general extent and location of potentially visible wind turbines or portions of turbine structures for the project.

The panoramic photograph locations are illustrated in **Figure 6**, and the panoramic photographs illustrated in **Figures 7** to **22**.

The panoramic photographs are not to be confused with the photomontages. The panoramic photographs do not include a representation or model of the wind turbine structures. The photomontages are discussed in **Section 10** of this LVIA, and are illustrated in **Figures 31** to **62**.



Legend

- Proposed Rye Park wind turbine
- Rye Park wind farm project area
- Existing powerline
- Distance from proposed Rye Park wind turbine
- Photograph location (from publicly accessible area) (refer figures 7 - 22)
- Preferred 330 kV powerline route
- Alternative 330 kV powerline route

0km 5km

Figure 6
Photograph locations (from publicly accessible areas)

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RYE PARK WIND FARM

Photo Location V1- View north west Jerrawa Road (Approximate distance to closest wind turbine 8.7 km)
Photo coordinate Easting:691330 Northing:6146330

Photo Location V2- View north west from Coolalie Road (Approximate distance to closest wind turbine 6.6 km)
Photo coordinate Easting:690794 Northing:6148863

Photo Location V3 - View west to north from Coolalie Road toward southern extent of Rye Park wind farm (Approximate distance to closest wind turbine 2 km)
Photo coordinate Easting:684403 Northing:6149148

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 7
Photo Sheet 1

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RYE PARK WIND FARM

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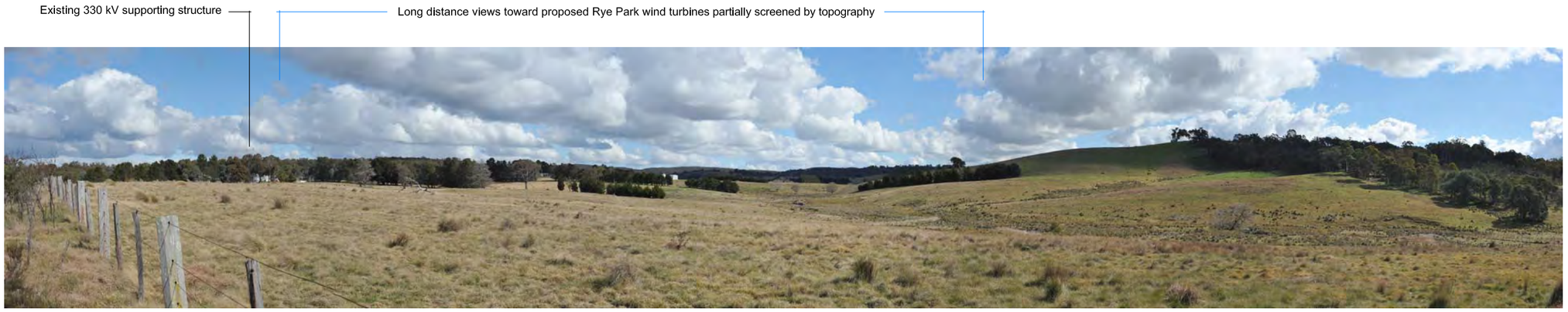

Photo Location V4- View south west to west from Flacknell Creek Road (Approximate distance to closest wind turbine 5.8 km)
Photo coordinate Easting:691757 Northing:6155403

Photo Location V5- View west from Rye Park-Dalton Road (Approximate distance to closest wind turbine 4.3 km)
Photo coordinate Easting:688018 Northing:6160381

Photo Location V6- View north west from Rye Park-Dalton Road (Approximate distance to closest wind turbine 4.1 km)
Photo coordinate Easting:686557 Northing:6160902

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 8
Photo Sheet 2

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Photo Location V7- View south from Blakney Creek North Road/Little Plains Road (Approximate distance to closest wind turbine 4.2 km)
Photo coordinate Easting:686436 Northing:6163108

Photo Location V8 - View south to west from Blakney Creek North Road (Approximate distance to closest wind turbine 9.5 km)
Photo coordinate Easting:690909 Northing:6166715

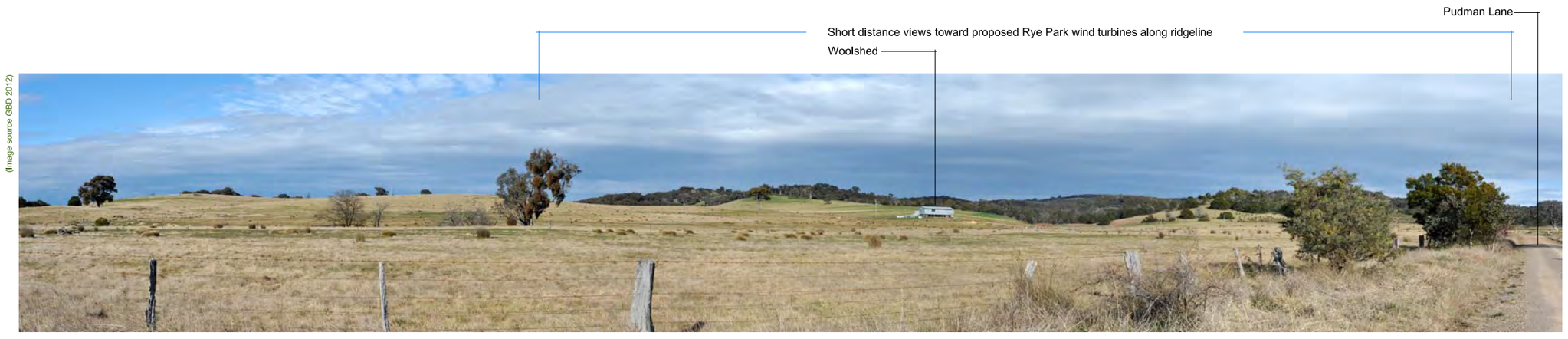

Photo Location V9 - View west from Pudman Lane (Approximate distance to closest wind turbine 2 km)
Photo coordinate Easting:683685 Northing:6167805

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 9
Photo Sheet 3

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RYE PARK WIND FARM

Short distance views toward proposed Rye Park wind turbines (middle cluster)

Pudman Lane

Associated dwelling

(Image source GBD 2012)

Photo Location V10 - View west to north west from Pudman Lane (Approximate distance to closest wind turbine 2.4 km)
Photo coordinate Easting:683685 Northing:6167805

Long distance views toward proposed Rye Park wind turbines blocked by topography and vegetation

(Image source GBD 2012)

Photo Location V11- View west from unamed road (Approximate distance to closest wind turbine 8.1 km)
Photo coordinate Easting:692476 Northing:6176356

Short to mid distance views toward proposed Rye Park wind turbines (middle cluster)

(Image source GBD 2012)

Photo Location V12- View west from unamed road (Approximate distance to closest wind turbine 2.9 km)
Photo coordinate Easting:687550 Northing:6176712

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 10
Photo Sheet 4

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RYE PARK WIND FARM

Mid distance views toward proposed Rye Park wind turbines (north cluster)

(Image source GBD 2012)

Photo Location V13- View west from unamed road (Approximate distance to closest wind turbine 4.8 km)
Photo coordinate Easting:685228 Northing:6178967

Mid distance views toward proposed Rye Park wind turbines (north cluster)

(Image source GBD 2012)

Photo Location V14 - View west from unamed road (Approximate distance to closest wind turbine 4.3 km)
Photo coordinate Easting:685630 Northing:6181304

Mid distance views toward proposed Rye Park wind turbines (north cluster)

(Image source GBD 2012)

Photo Location V15- View west from unamed road (Approximate distance to closest wind turbine 4 km)
Photo coordinate Easting:684474 Northing:6183209

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 11
Photo Sheet 5

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RYE PARK WIND FARM

Short distance views toward proposed Rye Park wind turbines (north cluster) largely screened by topography and woodland vegetation

(Image source GBD 2012)

Photo Location V16 - View south from unamed road (Approximate distance to closest wind turbine 2.2 km)
Photo coordinate Easting:682919 Northing:6184033

Short distance views toward proposed Rye Park wind turbines (north cluster) largely screened by topography and woodland vegetation

(Image source GBD 2012)

Photo Location V17- View south from unamed road (Approximate distance to closest wind turbine 2.3 km)
Photo coordinate Easting:682117 Northing:6184510

Short distance views toward proposed Rye Park wind turbines (north cluster)largely screened by topography and woodland vegetation

(Image source GBD 2012)

Photo Location V18 - View south to south west from the Rugby - Rye Park Road (Approximate distance to closest wind turbine 7 km)
Photo coordinate Easting:684327 Northing:6188644

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 12
Photo Sheet 6

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RYE PARK WIND FARM

Photo Location V19- View south from Rye Park - Frogmore Road (Approximate distance to closest wind turbine 6.8 km)
Photo coordinate Easting:673026 Northing:6192062

Photo Location V20 - View south to south east from Rye Park - Frogmore Road (Approximate distance to closest wind turbine 4.8 km)
Photo coordinate Easting:672472 Northing:6188468

Photo Location V21- View north to east from Boorowa Road (Approximate distance to closest wind turbine 7.3 km)
Photo coordinate Easting:671077 Northing:6180163

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 13
Photo Sheet 7

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