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Macorna Wind Farm

Landscape and Visual Impact Assessment

30 April 2026

THIS REPORT HAS BEEN PREPARED FOR COGENCY ON BEHALF OF ATMOS RENEWABLES ON BEHALF OF THE MACORNA SPV – ATMOS MWV PTY LTD AS TRUSTEE FOR THE ATMOS MHV TRUST.

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Table of Contents

Table of Figures

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Quality Assurance

File Name	Version	Version Date	Details	Reviewed and Approved	
Macorna WF LVIA_Final_20260430B	Final	30th April 2026	For issue	Peter Haack	

Contact Details

Peter Haack

Director

Peter Haack Consulting

2/10 Waltham Place, Richmond 3121

Telephone No: 0409 946 938

Email: peter@peterhaack.com.au

Web: www.peterhaack.com.au

1 INTRODUCTION

Atmos Renewables (Atmos) on behalf of the Macorna SPV – Atmos MWV Pty Ltd as trustee for the Atmos MHV Trust (Proponent), intend to submit the EES referral and associated planning and environmental approval processes for the development of a wind farm, the Macorna Wind Farm (the Project), at Macorna in north central Victoria.

The Project is located approximately 210 kilometres (km) north northwest of Melbourne and approximately 4.5km south southeast of the Kerang town centre (refer to ***Figure 1***). The approximately 23,000 hectare (ha) Project Area extends approximately 20km to the east of the Loddon Valley Highway, which defines its western frontage.

The Project Area is located on predominately cleared agricultural land utilised for mixed farming, dairying and cropping. An existing substation, the Kerang Terminal Station and the recently constructed Kerang Solar Farm are located approximately 3km to the north and northwest. Agricultural land extends to the north, south, east and west of the Project Area.

The Project would involve the construction of 114 wind turbine generators (WTG), access tracks and up to four collector substations, an electrical switching station and a battery energy storage system (BESS), as well as a connection to the adjacent proposed Tragowel VNI West substation.

This Landscape and Visual Impact Assessment (LVIA) has sought to understand the landscape and its features and undertaken an assessment of the potential landscape and visual impacts of the Project from representative viewpoints. Prior to submitting final approval documentation, a detailed viewpoint assessment will be undertaken for each individual receiver within 7.5 km to identify appropriate amelioration.

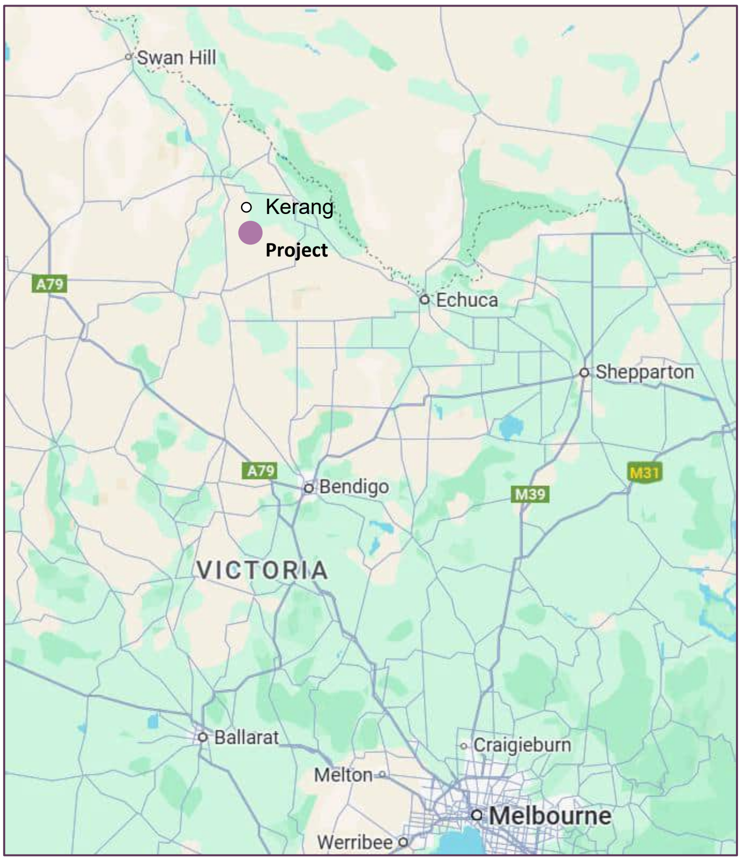

Figure 1 - Project location (Source: Google Maps).

1.1 Study objectives

The objective of the assessment is to determine the landscape and visual impact of the proposed development with regard to relevant legislation and policy. The project methodology is derived from existing best practice in landscape and visual impact assessment with reference to:

- Local Policy Framework and zoning for Gannawarra Shire Council and Loddon Shire Council ;
- Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria (2023);
- Best practice guidelines for implementation of wind energy projects in Australia (Auswind, 2006);
- Wind Farms and Landscape Values: National Assessment Framework (Australian Wind Energy Association and Australian Council of National Trusts, 2007); and
- *The Planning and Environment Act 1987*.

The landscape and visual amenity assessment will be undertaken in two stages:

- An assessment of landscape significance to inform the wind farm design process; and
- A detailed assessment as part of the planning and approvals process.

1.2 Study Requirements

The requirements for the detailed assessment phase of the study include the following:

- Undertake a detailed desktop analysis to assess the landscape and its features and to define key viewing patterns;
- Define the catchment for potential visual and landscape impact for the proposal (e.g. including initial review of current literature on distance thresholds for visual intrusion of WTG);
- Review existing landscape studies, National and State policies and guidelines;
- Undertake a landscape analysis of the site and surrounds through on-site assessment and survey as well as analysis using GIS software. Provide analysis of:
  - Landscape character types and areas;
  - Significant landforms and scenic features; and
  - Culturally significant landscape elements.
- Define landscape character types and cultural landscape significance;
- Undertake a Zone of Visual Impact (ZVI) based on the proposed layout;
- Identify dwellings nearby to the proposed wind farm site;
- Identify and categorise dwellings and sensitive viewing locations based on the presence of surrounding vegetation of varying densities;
- Review and assess at a regional level the potential cumulative impact;
- Define the ‘pattern of viewing’ of sensitive viewpoints to the wind farm site (e.g. roads / touring routes, townships, dwellings, parks and recreational areas / tourism locations etc.) within the viewshed;
- Preparation of photographic montages of the proposal to assist with the assessment of landscape and visual impacts; and

- Detailed assessment of a range of representative sensitive viewpoints of varying distances from the proposed development and aspect.

2 METHODOLOGY

2.1 Approach

While there are no specific legislative requirements for the methodology of an assessment such as this in Victoria, the profession typically refers to the guidance offered by:

- Guidance for Landscape and Visual Impact Assessment (GLVIA), Third Edition, Landscape Institute and Institute of Environmental Management and Assessment (2013).
- Guidance Note for Landscape and Visual Assessment, Australian Institute of Landscape Architects (AILA) (2018).
- Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria (2023);

The methodology used for this Project, described below, conforms generally to the direction offered by the above guidelines as well as other proven assessment methodologies.

This preliminary assessment report assesses the landscape and visual impact of the Project, that is the day-to-day visual effects on people's views.

The method to measure visual impacts is based on the combination of the sensitivity of viewers to the proposed change and the magnitude of the Project on that visual setting or view.

The following study components were included as part of this assessment:

- Review the Project with regard to potential visual impacts.
- Characterisation of the existing landscape and visual setting.
- Qualitatively assess:
  - Visual modification at key viewpoints – How would the Project contrast with the landscape character of the surrounding setting?
  - Visual sensitivity at key viewpoints – How sensitive would viewers be to the Project?
  - Potential night-lighting impacts.
- Propose visual impact mitigation and management measures.

2.2 Assessment of landscape and visual impacts

The landscape and visual impact assessment is based on a detailed analysis of the landscape and visual setting and an assessment of the potential impacts of the Project on its viewshed.

The critical issues considered for this LVIA were:

- The number and location of sensitive viewing locations;
- The duration of the view – either static (generally long term - > 1 hour) and mobile (generally short term continually moving and static for no longer than 5 minutes);
- The degree to which the proposed works would be visible;
- The quality of the landscape setting; and
- The degree to which the Project contrasts or is compatible with the visual character of the setting – the visual modification level.

- The effectiveness of amelioration to reduce the initial impact and achieve a lower level of residual impact.

The assessment process is shown in ***Diagram 1***.

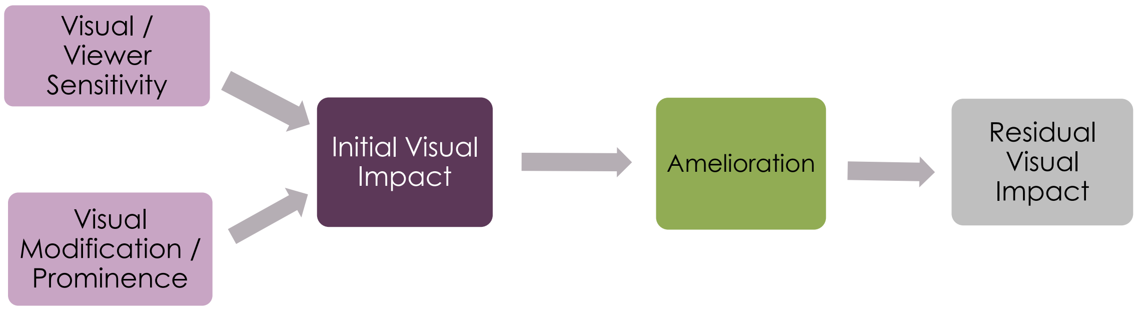

Diagram 1 - Visual impact assessment process.

2.2.1 Visual sensitivity

In this report, the approach to the visual sensitivity is consistent with the USDAFS visual management system[1].

The visual sensitivity of development depends on a range of viewer characteristics. The primary characteristics used in this report include:

- Land use;
- Distance of the development from viewers; and
- Visibility from sensitive land use areas.

Visual sensitivity is a measure of how critically a change to the existing environment would be viewed from various land uses (refer to ***Table 1***). Different activities have different sensitivity levels. For example, tourists on holiday would generally view changes to a landscape more critically than industrial workers in the same area. Similarly, individuals would view changes to the visual setting of their homes more critically than changes to the broader area in which they travel or work.

The next critical component to rating the visual sensitivity is the distance of the development from the identified visual use area. There are three viewing situations to consider:

- foreground (0 - 5 km);
- midground (5 km – 10 km); and
- background (> 10 km).

As the distance increases from a proposed development to a sensitive land use area, the level of viewer sensitivity decreases based on a perceptual dis-association based on a reduction in relative

[1] Landscape Aesthetics – A Handbook for Scenery Management, Agricultural Handbook No. 701. United States Department of Agriculture Forest Service (1995).

proximity[2]. It is important to note that the threshold distances for visual sensitivity are different to those use for visual prominence, but the height of a WTG and its resulting level of visual prominence does have an influence on the visual setting distances used in the viewer sensitivity table. For example, the visual sensitivity setting distances have changed over time as WTG heights have increased.

Visual Use Area	Foreground		Midground		Background
	Local Setting		*Sub–Regional Setting*		*Regional Setting*
	0–2.5km	2.5-5km	5–7.5km	7.5–10km	>10 km
Residences	H	H	H	M	L
National/State Parks	H	H	H	M	L
Tourism and Accommodation	H	H	H	M	L
Recreation Reserves	H	H	H	M	L
"B" Category Roads *(Loddon Valley & Murray Valley Hwys)*	M	M	L	L	VL
Conservation Reserves	M	M	L	L	VL
"C" Category Roads	M	L	L	L	VL
Passenger Rail	M	L	L	L	VL
Sporting Reserves	M	L	L	VL	VL
Local Roads	L	L	L	VL	VL
Agricultural Areas	L	L	L	VL	VL
Industrial Areas	VL	VL	VL	VL	VL
Freight Rail	VL	VL	VL	VL	VL

Table 1 - Typical Viewer (visual) Sensitivity.

2.2.2 Visual modification to the existing setting

The level of visual modification resulting to a setting from a proposed development, or the degree to which the setting is modified, can be best measured as an expression of the visual interaction, or the level of visual contrast between the project and the existing visual environment.

A high level of magnitude, or a high degree of visual modification, will result if the major components of the project contrast strongly with the existing landscape.

A low level of magnitude, or a low degree of visual modification, will occur if there is little or minimal visual contrast and a high level of integration of form, line, shape, pattern, colour or texture values between the proposed development and the environment in which it sits. In this situation, the

[2] *Assessing Visual Landscape Sensitivity towards Wind Turbines with a Distance Decay Effect: An Exploration of Different GIS Approaches, Fisher and Roth. Journal of Digital Landscape Architecture 6-2021.*

proposed development may be noticeable, but does not markedly contrast with the existing, already modified landscape (refer to ***Table 2***).

The degree of magnitude or modification would generally decrease as the distance from the Project to various viewing locations increases.

The presence of the existing power related infrastructure, including the terminal station, solar farm and surrounding powerlines, provides the Project with a significant degree of visual fit within the already modified landscape setting, for viewpoints to the northwest.

However, given their scale and appearance, it is highly likely that WTG will contrast with their setting.

Modification Level	Description
High	The proposal is highly visible and intrusive regarding the size, scale and geographical extent, and would disrupt views currently experienced from sensitive land use areas and/or strongly contrasts with the existing landscape setting which has limited capacity for change.
Moderate	The proposal partially intrudes regarding the size, scale and geographical extent or somewhat obstructs current views from sensitive land use areas and/or a noticeable compositional change to the existing landscape setting in which there is moderate capacity for change.
Low	The proposal is barely perceptible resulting in minor deterioration to the view currently experienced from sensitive land use areas; and/or results in a small change to the existing landscape setting in which change is possible without harm.
Very Low	There is minimal compositional contrast and a high level of integration of form, line, shape, pattern, colour or texture values between the proposal and the environment in which it sits. In this situation, the proposal may be noticeable but does not markedly contrast with the existing landscape setting.
Not Visible	There are no views of the proposal components and as such, there is no impact.

Table 2 - Typical scenarios for determining the visual modification level.

2.2.3 Occupied field of view – Visual prominence

To assist with the assessment of visual prominence, this report defines several viewsheds which are based on distance from the Project. The methodology is based on the reduction of impact with an increase in distance between a given viewpoint and the project. The potential visual impact of the Project will also, to a large extent, depend on how much of the central field of vision it occupies (refer to **Figure 2**).

Throughout the visual catchment, the degree of visual prominence will generally decrease as the distance from the Project to various viewing locations increases.

The quantitative assessment of visual prominence, i.e., how much is potentially visible, is intertwined with the distribution, height and density of vegetation as well as topography throughout the visual catchment, elements which can screen views of a development from a particular viewpoint. Visual prominence helps inform the process of determining the visual modification level as previously outlined in the above section.

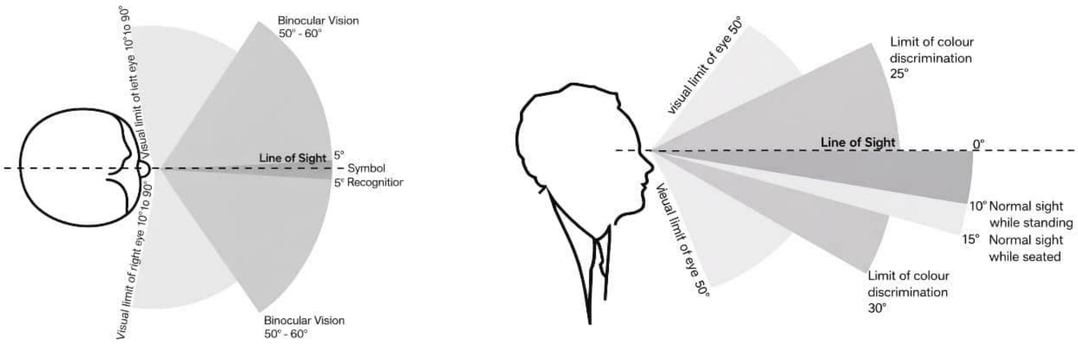

Figure 2 – Horizontal and vertical field of view [3].

2.2.3.1 Vertical field of view

In areas of flat topography, where not screened by vegetation, the vertical field of view of a 252m high WTG will be (refer to ***Table 3*** and ***Figure 3***):

- greater than 2.5 degrees, or potentially dominant (or of high visual prominence), in viewing distances between 0km and 5.7km;
- between 0.5 to 2.5 degrees, or potentially noticeable (or of moderate visual prominence), in distances between 5.7km and 29km;
- less than 0.5 degrees, or insignificant (or of low visual prominence) in distances beyond 29km; and
- less than 0.25 degrees, or barely discernible (or of very low visual prominence) in distances beyond 58km.

Degrees of Field of View Occupied	Potential Visual Prominence – Vertical Field of View
0° - 0.25°	***Barely Discernible – Very Low Visual Prominence*** A very thin line in the landscape visible only theoretically.
0.25° - 0.5°	***Insignificant - Low Visual Prominence*** A thin line in the landscape typically not readily visible given the presence of intervening vegetation and topography.
0.5° – 2.5°	***Potentially Noticeable – Moderate Visual Prominence*** The development may be noticeable. The degree that it intrudes on the view will be dependent on how well it integrates with the landscape setting.
Greater than 2.5°	***Potentially Dominant – High Visual Prominence*** The development will be highly noticeable, although the degree of visual intrusion will depend on the landscape setting and the width/spread of the object.

Table 3 - Vertical line of sight – Visual impact / visual prominence.

[3] *Human Dimension and Interior Space, Julius Panero & Martin Zellnik, Witney Library of Design (1979).*

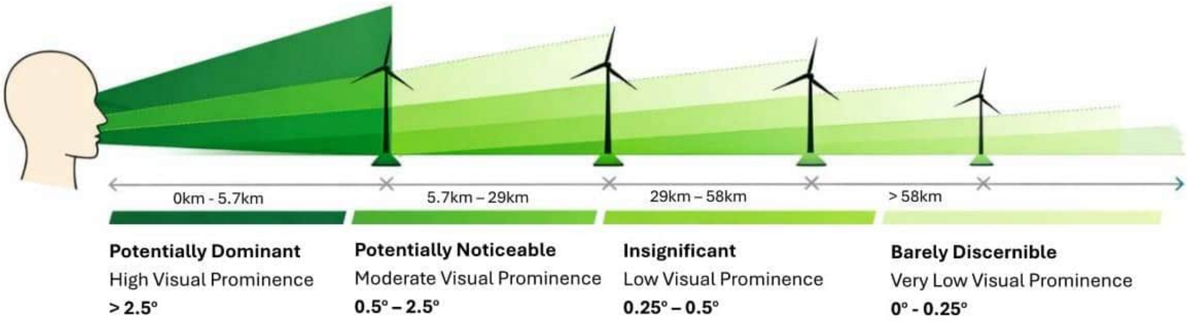

Figure 3 – Vertical angle of field of view and the effect of distance on diminishing visual prominence – based on WTG height of 252m.

2.2.3.2 Horizontal field of view

The horizontal field of view occupied by the Project's WTGs will vary based on proximity (refer to ***Table 4***). With a total distance of approximately 28km north to south, and distance of 21km east to west, the horizontal visual prominence will remain high in distances up to 45km.

However, the number and extent of WTGs visible will be dependent on the presence of vegetation in the landscape and its location in relation to the sensitive viewpoint. At distances beyond 5.7km, the vertical field of view of the WTG's, which is a key determinant of overall visual prominence, will have dropped to potentially noticeable/moderate visual prominence, meaning that high overall visual impacts will progressively reduce.

Degrees of Field of View Occupied	Potential Visual Prominence – Horizontal Field of View
Less than 5°	***Insignificant – Low Visual Prominence*** The development may not be highly visible in the view unless it contrasts strongly with the background.
5° – 30°	***Potentially Noticeable – Moderate Visual Prominence*** The development may be noticeable. The degree that it intrudes on the view will be dependent on how well it integrates with the landscape setting.
Greater than 30°	***Potentially Dominant – High Visual Prominence*** The development will be highly noticeable.

Table 4 - Horizontal line of sight – Visual impact / visual prominence.

2.2.3.3 Determination of overall visual prominence.

To determine the overall potential level of visual prominence, the values from the vertical and horizontal prominence calculations are combined (refer to ***Table 5***).

The vertical angle value has a weighting applied that is double that of the horizontal angle value. This reflects that fact that the human eye is accustomed to a strong horizontal line within the visual landscape. Any strong vertical element is therefore more visually prominent or apparent in views and horizontal elements are more influenced by the screening effects of intervening vegetation between the viewer and the object subject to assessment.

		Vertical Angle of View (Weighted Value x 2)			
		H (6)	M (4)	L (2)	VL (1)
Horizontal Angle of View	H (3)	H (9)	H (7)	M (5)	L (4)
	M (2)	H (8)	M (6)	L (4)	L (3)
	L (1)	H (7)	M (5)	L (3)	VL (2)

VL = Very Low (Barely Discernible)
- Total score = 1 - 2
L = Low (Insignificant)
- Total score = 3 - 4
M = Moderate (Potentially Noticeable)
- Total score = 5 - 7
H = High (Potentially Dominant)
- Total score = 8 - 9

Table 5 - Determination of overall visual prominence.

2.2.4 Initial impact

To determine the overall potential level of visual impact, the rating for viewer sensitivity and visual prominence/modification are combined. The assessment method assumes that if the Project would not be seen, there is no impact (refer to ***Table 6***).

Initial Visual Impact		***Visual/Viewer Sensitivity***		
		High	Moderate	Low
Level of Visual Modification to the Setting/Level of Visual Prominence	High	High	High	Moderate
	Moderate	High	Moderate	Low
	Low	Moderate	Low	Low
	Very Low	Low	Very Low	Very Low
	Not Visible	No Impact	No Impact	No Impact

Table 6 - Visual impact determination matrix.

2.2.5 Residual impacts

The effectiveness of the measures proposed in mitigating the landscape and visual impacts resulting from the Project is demonstrated by comparing the visual impact during initial operation with the residual impact when the proposed landscape measures have mostly matured, which is typically seven to ten years following initial establishment.

Generally, residual impacts would be reduced by at least one level where landscape measures have been proposed and have matured, as a result of the filtering of, or inhibiting views to the Project.

2.2.6 Cumulative impact

2.2.6.1 Simultaneous cumulative impact

Simultaneous cumulative impact refers to occurrences where an impact may result from several potential visual intrusions being visible from an individual location at the one time.

2.2.6.2 Sequential cumulative impact

Sequential cumulative impact refers to occurrences when the viewer must move to another viewpoint to see different developments. Sequential cumulative impacts most typically apply to road users as they traverse the landscape along major roads.

2.2.7 Lighting impacts

AS-NZS-4282-2023 Control of the Obtrusive Effects of Outdoor Lighting provides standards for the assessment and limitation of lighting impacts. The standard identifies four environmental zones for exterior lighting which are categorised by the degree of artificial lighting within an area. For example, national parks would be categorised as an intrinsically dark landscape (Category A1), whereas a city centre with high levels of night-time activity would be categorised as a high district brightness area (Category A4).

The standard is aimed at the minimisation of light spill. Regardless of the existing brightness of a particular setting, it is a widely accepted principle that light spill, particularly upward light spill, be minimised wherever possible.

At this stage, it is unlikely that aviation lighting will be required. However, lighting will be required for the four BESS / substations.

2.2.7.1 Lighting impact scenarios

Glow
Light glow is typically an upward projection of light that results in illumination of the night sky above a lighting source. It is intensified, or more visually apparent when foggy or cloudy as the light reflects or disperses of water droplets in the atmosphere. Glow is visible over significant distances.

Spill
Spill is light that falls on adjacent sensitive surfaces, both vertical and horizontal, and is most intrusive where it illuminates private open spaces or spills through windows.

Hot spots
Hot spots relate to concentrated areas of bright light in an otherwise less well illuminated setting. Hot spots will be most visible where are elevated.

Kinetic / movement
Lights that change colour or flash can draw the attention of a viewer. As the speed of the colour change or blink increases in speed, so too will its prominence of ability to draw attention. This is of relevance should aviation lighting be required.

2.3 Landscape Assessment

2.3.1 Landscape Values

The identification of landscape values for the study area is driven by the project specific community perception studies and consultation and engagement with the local community. This is also supported by the outputs of the cultural heritage studies and seeks to identify the connection between the community and the landscape.

Benchmarking of landscape values is undertaken by reviewing project specific results with the results of previous regional, State and National community perception studies.

2.3.2 Landscape Units and Absorptive Capability

Landscape units for the region are defined based on physical characteristics such as:

- Topography.
- Vegetation.
- Drainage patterns.
- Geology.
- Land use patterns.

The definition of landscape absorptive quality is an assessment of how well a landscape setting is able to accommodate change or a development. The key factors considered in determining absorptive capability are topography and vegetation.

2.3.3 Landscape Scenic Quality

The scenic quality of the setting was assessed to assist with the determination of potential landscape impacts. The scenic quality of landscapes generally increases with an increase in:

- Topographic variation.
- The presence of geological features.
- The presence of permanent water bodies.
- The patterning of vegetation texture and density.

2.4 Limitations of the assessment

There are these following limitations associated with this assessment:

- The LVIA process aims to be objective and, as such, seeks to describe any changes factually. Potential changes resulting from the Project have been defined. However, the significance of these changes requires qualitative (subjective) judgements to be made. Therefore, the conclusions to this assessment combine both objective measurement and subjective professional interpretation. This assessment has attempted to be objective, however, it is recognised that visual assessment can be highly subjective, and individuals are likely to have different visual experiences of the study area;
- The impact assessment is focused on the current land uses and zoning; and
- Methodology of the construction works are currently unknown and dependent upon planning approvals. However, we have assumed that the impacts during construction would

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result in a similar degree of visual impact to that of the operational phase assessment findings, pre-amelioration.

3 COMPONENTS OF THE PROJECT

3.1 Key features

As illustrated in ***Figure 4***, the Project involves the development of a wind farm on the approximately 23,000ha Project Area. The Project Area is the total of all landholdings on which the Project components will be located

Of this total area, the temporary construction footprint will occupy approximately 750ha and include components from both the construction and operations phases.

3.1.1 Construction

The construction components of the Project include:

- Construction compounds and laydown areas, including crane hardstand, crane boom laydown, blade laydown and a rotor assembly area.
- Concrete batching plants.
- A construction workers accommodation facility.
- A site office.
- Potential communications towers.

3.1.2 Operation

The operational components of the Project include:

- 114 WTG with a hub height of 166m and maximum tip height of 252m mounted on concrete foundations.
- Up to four collector substations with associated battery energy storage systems (BESS).
- An on-site electrical switching station, constructed, owned and operated by the electricity provided.
- Underground cabling between the WTG, BESS facilities and switching station.
- A transmission connection to the adjacent proposed, Victoria to New South Wales Interconnector (VNI) West Tragowel terminal station.
- Up to seven permanent meteorological masts.
- Operational and maintenance facilities.
- An access point on the Loddon Valley Highway and unsealed internal maintenance tracks, approximately 6.5m wide
- Fencing, gates and signage.
- Security lighting is required around the BESS facilities, particularly substations and switching stations. Any lighting will be designed in accordance with AS-NZS-4282-2023 Control of the Obtrusive Effects of Outdoor Lighting.
- The need for aviation lighting will be determined during the Project design development and assessment phase.

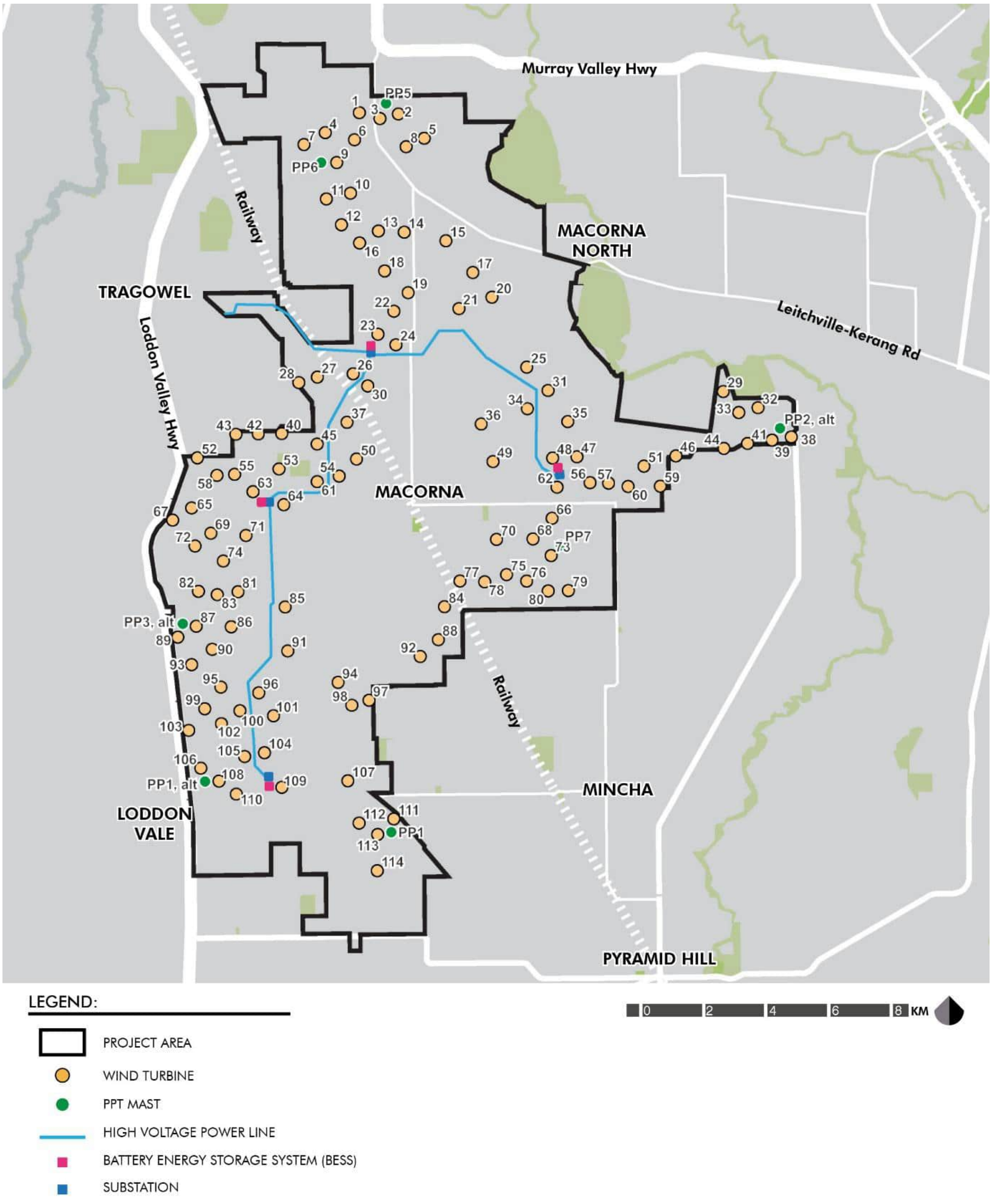

Figure 4 – Indicative layout plan.

3.2 Detail of project components

The most visible components of the Project that may result in visual impacts to surrounding sensitive receptors are outlined below.

3.2.1 WTGs

114 Vestas V172 7.2 MW WTGs are proposed with a hub height of 166m and a maximum blade tip height of approximately 252m. The rotor diameter will be approximately 172 metres (refer to ***Figure 5***, ***Figure 6*** and ***Table 7***).

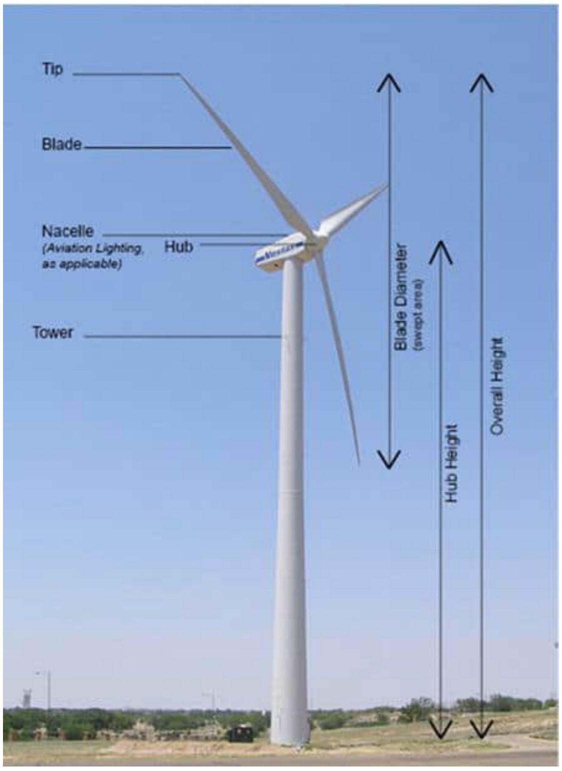

Figure 5 - Components of a wind turbine.

For the purposes of the landscape assessment, the following dimensions have been assumed.

Vestas V172 7.2 MW	
Component	***Number / Size***
Number of WTG	114 (max)
Hub Height (centre of rotor)	166 m (max)
Rotor Diameter	172 m
Tower – Tapered tubular steel	~4.0 m dia.
Height to Blade Tip (maximum)	252 m

Table 7 - WTG specifications.

Figure 6 – Hub and nacelle detail.

3.2.2 Meteorological Masts

A total of seven meteorological masts are proposed, with equipment including anemometers for monitoring weather conditions. Overall height will be approximately 130m (refer to ***Figure 7***).

Figure 7 - Typical meteorological tower. (Source: Atmos).

3.2.3 BESS facility

The four BESS facilities will be approximately 4ha in area (indicatively 200m x 200m) The batteries would be housed inside BESS containers constructed of steel, with indicative dimensions of 6.1 metre (m) (length) x 1.7m (width) x 2.9m (height) (refer to ***Figure 8***).

3.2.4 Substation

Typical substation and associated hardstand areas with a footprint of approximately 200m x 200m, an average height of 8m and a maximum height of approximately 12m (refer to ***Figure 8*** and ***Figure 9***).

Figure 8 – Typical BESS facility with switching substation.

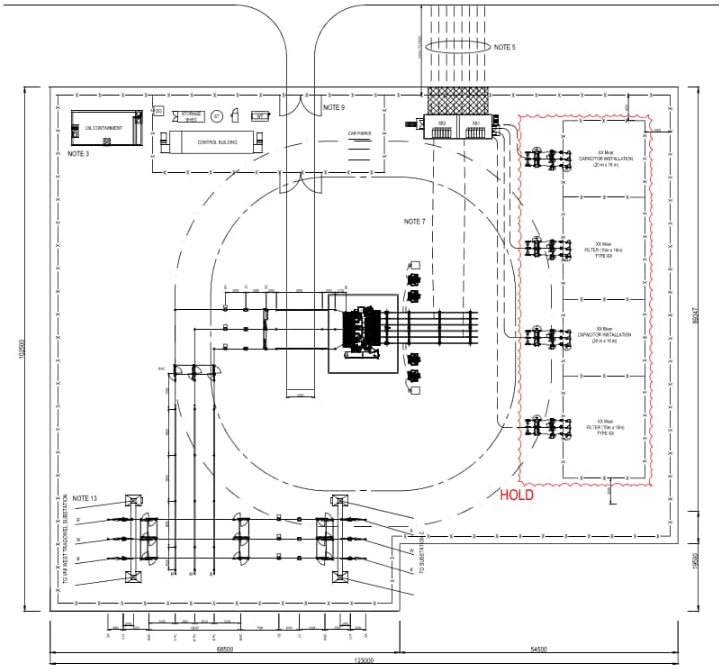

Figure 9 – Indicative substation layout (Source: Atmos).

3.2.5 Connecting powerlines

Underground 33kV cables approximately 250km in length, generally follow existing roads and access tracks, connecting the WTGs to the internal substations.

An approximately 30km section of overhead powerline is required to connect the Project substations to the main grid at the adjacent proposed VNI West Tragowel terminal station.

3.2.6 Other Elements

The site development will also contain smaller elements that combine together to provide an overall visual character. These are:

3.2.6.1 Internal roads

Gravel access roads will be installed to provide access to each tower. Road length and the area of disturbance will be kept to a minimum and primarily serve as service access roads following construction. The access road width may be narrowed following construction to accommodate a standard vehicle width.

3.2.6.2 Hardstand

An area of compacted gravel, with a total extent of approximately 60m x 200m, will be prepared to provide a stable foundation for crane operation during erection.

3.2.6.3 Control Building

A control building will be constructed close to the edge of the BESS area. It will be designed to blend in with the local environment through choice of cladding material colouring.

3.2.6.4 General Site Clearing / Foundations

This component of the development will involve the clearing of a footprint of approximately 17 m x 17 m for each tower base. Excavation and earthworks for tower bases and road works will be minimal as the site is relatively flat.

The foundation of each tower will be constructed from concrete and steel. The foundation type appropriate for each tower site will be determined by geotechnical survey and designed to withstand extreme loads.

Some additional clearing may be required for the hardstand and substation / control building and an all – weather maintenance track will be developed between WTG.

All disturbed areas will be reinstated with grass after completion of the works.

3.2.6.5 Site Development Staging

The construction of the Project will occur over approximately 3.5 years.

3.2.7 Aviation lighting

Turbine lighting is not proposed as part of the planning application. It is unlikely that lighting to prevent plane strike will be required. The proponents will undertake a risk assessment to determine the level of aviation safety risk and any mitigation measures required.

4 POLICY, PLANNING AND GUIDELINES

4.1 Policy Considerations

4.1.1 State Government

4.1.1.1 Planning Policy Framework (PPF)

Clause 19.01 of the PPF sets out the planning policies for renewable energy with the objective of the policy being to *"support the provision and use of renewable energy in a manner that ensures appropriate siting and design considerations are met".*

The strategies for Clause 19.01 are:

- *Facilitate renewable energy development in appropriate locations.*
- *Protect renewable energy infrastructure against competing and incompatible uses.*
- *Set aside suitable land for future renewable energy infrastructure.*
- *Consider the economic, social and environmental benefits to the broader community of renewable energy generation while also considering the need to minimise the effects of a proposal on the local community and environment.*
- *Support wind energy facilities in locations with consistently strong winds over the year.*

4.1.1.2 Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria (2023)

The Guidelines outline for authorities, proponents and the community the suitability of sites to accommodate wind energy facilities and the process and considerations for facility design and planning. The Guidelines aim to provide:

- A framework for a consistent and balanced approach to the assessment of wind energy projects across the state;
- A set of consistent performance standards to inform the assessment and operation of a wind energy facility project;
- Guidance for conformity with permit application requirements;
- Guidance as to locations in the state that are not appropriate to locate wind energy facilities; and
- Provide a framework to ensure proposals for wind energy facilities are thoroughly assessed, including where necessary the need for an Environment Effects Statement (EES).

The Guidelines state:

- *Wind energy facilities should not lead to unacceptable impacts on critical environmental, cultural or landscape values. The degree of landscape and visual impact of a wind energy facility depends on the extent of the change to the landscape caused by the development, taking into account:*
    - *the visibility of the development (including all components: turbines, office compound, construction compound(s), substation(s) and power lines to connect to the electricity network)*
    - *the locations and distances from which the development can be viewed*

- *the significance of the landscape as described in the planning scheme (including in an overlay, a relevant strategic study or landscape features referenced in the planning scheme)*
- *landscape values associated with nearby parks described in a schedule to the National Parks Act 1975 or Ramsar wetlands*
- *landscape values associated with nearby land included in the schedule to Clause 52.32-2 of the planning scheme, such as specified areas of landscape and environmental significance, specified coastal locations and areas identified to accommodate future population growth of regional cities and centres*
- *the sensitivity of the landscape features to change.*

Wind energy facilities will have a degree of impact on the landscape. A responsible authority needs to determine whether or not the visual impact of a wind energy facility in the landscape is acceptable. In doing so, they should consider planning scheme objectives for the landscape, including whether the land is subject to an Environmental Significance Overlay, Vegetation Protection Overlay, Significant Landscape Overlay or a relevant strategic study that is part of the relevant planning scheme. These have been considered in ***Section 4.1.2***.

The Guidelines, identify the features of the landscape which include:

- the topography of the land;
- the amount and type of vegetation;
- natural features such as waterways, cliffs, escarpments, hills, gullies and valleys;
- visual boundaries between major landscape types;
- the type, pattern, built form, scale and character of development, including roads and walking tracks;
- flora and fauna habitat;
- cultural heritage sites; and
- the skyline.

Where applicable, these features have been described and assessed in ***Section 6***.

Mitigation measures have been incorporated into the design principles of the Project and are outlined in ***Section 9***).

4.1.2 Local Government

The Project is located within the Loddon and Gannawarra Shire Council areas and are subject to the Loddon and Gannawarra Planning Schemes. The majority of the Project Area is zoned Farming Zone (FZ) (refer to ***Figure 10*** and ***Figure 10***).

There are no specific landscape and visual related objectives for the zone, however, siting and design issues for consideration include:

- *The impact of the siting, design, height, bulk, colours and materials to be used, on the natural environment, major roads, vistas and water features and the measures to be undertaken to minimise any adverse impacts.*
- *The impact on the character and appearance of the area or features of architectural, historic or scientific significance or of natural scenic beauty or importance.*

Areas subject to Public Park and Recreation Zone (PPRZ) and Public Conservation and Resource Zone (PCRZ) are of relevance whether or not they are located on or outside of the Project Area as these zonings can be reflective of public recreational activities considered to be of higher levels of visual, or viewer sensitivity (refer to ***Table 1***). There three small parcels of PPRZ/PCRZ within the Project Area, however none have been developed to provide for visitor access.

There are no overlays of direct relevance to landscape and visual matters, such as Significant Landscape Overlays (SLO).

Small, scattered areas subject to Vegetation Protection Overlay Scheule 1 (VPO1) are located to the south of the Project Area within the Loddon Shire (refer to ***Figure 12***). While the statement of nature and significance of vegetation to be protected states the following, it is recognised that vegetation, particularly canopy species, contribute to landscape character:

- *As substantial areas of Loddon have been modified as a result of agriculture and urban development, the remaining areas of native vegetation are significant for habitat, biodiversity and the land management benefits they provide, such as erosion control and water table regulation.*

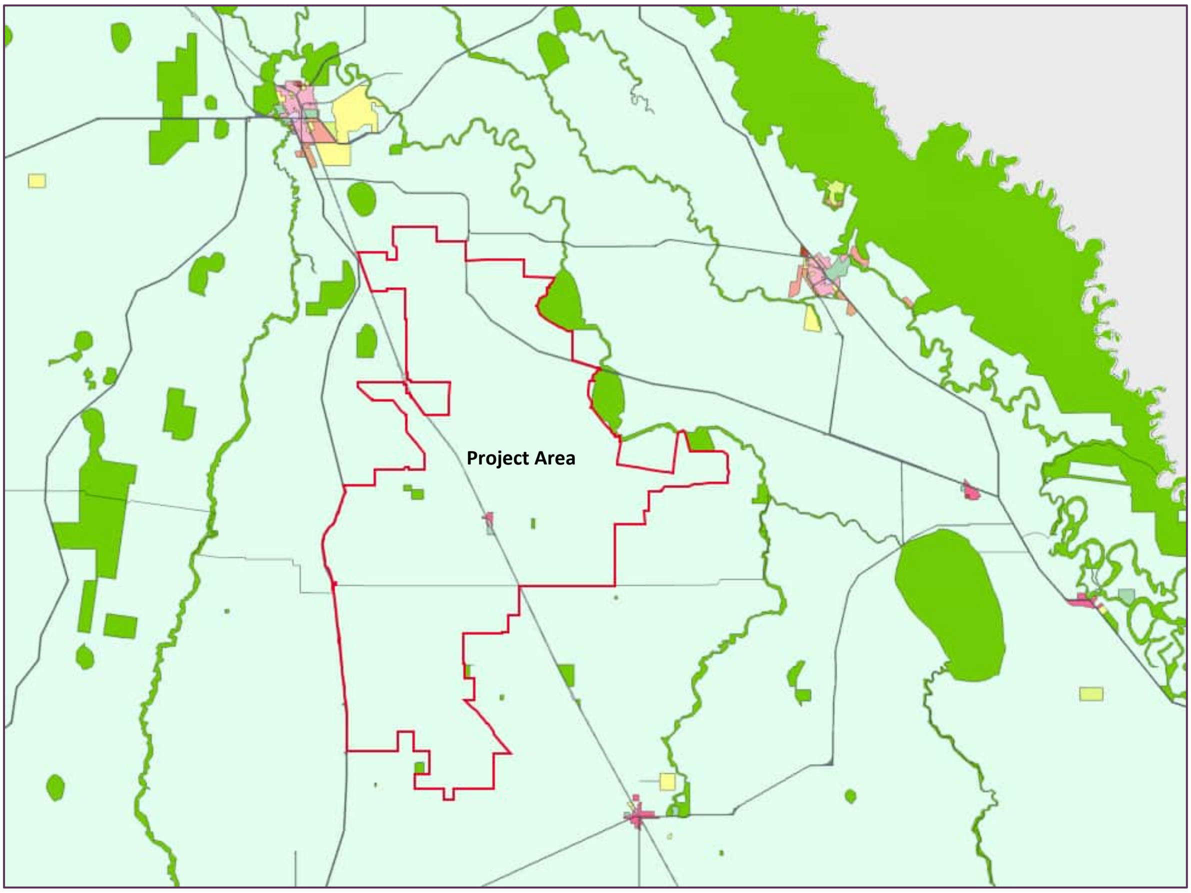

Figure 10 – Zoning of the broader region surrounding the Project Area (Source: Vicplan).

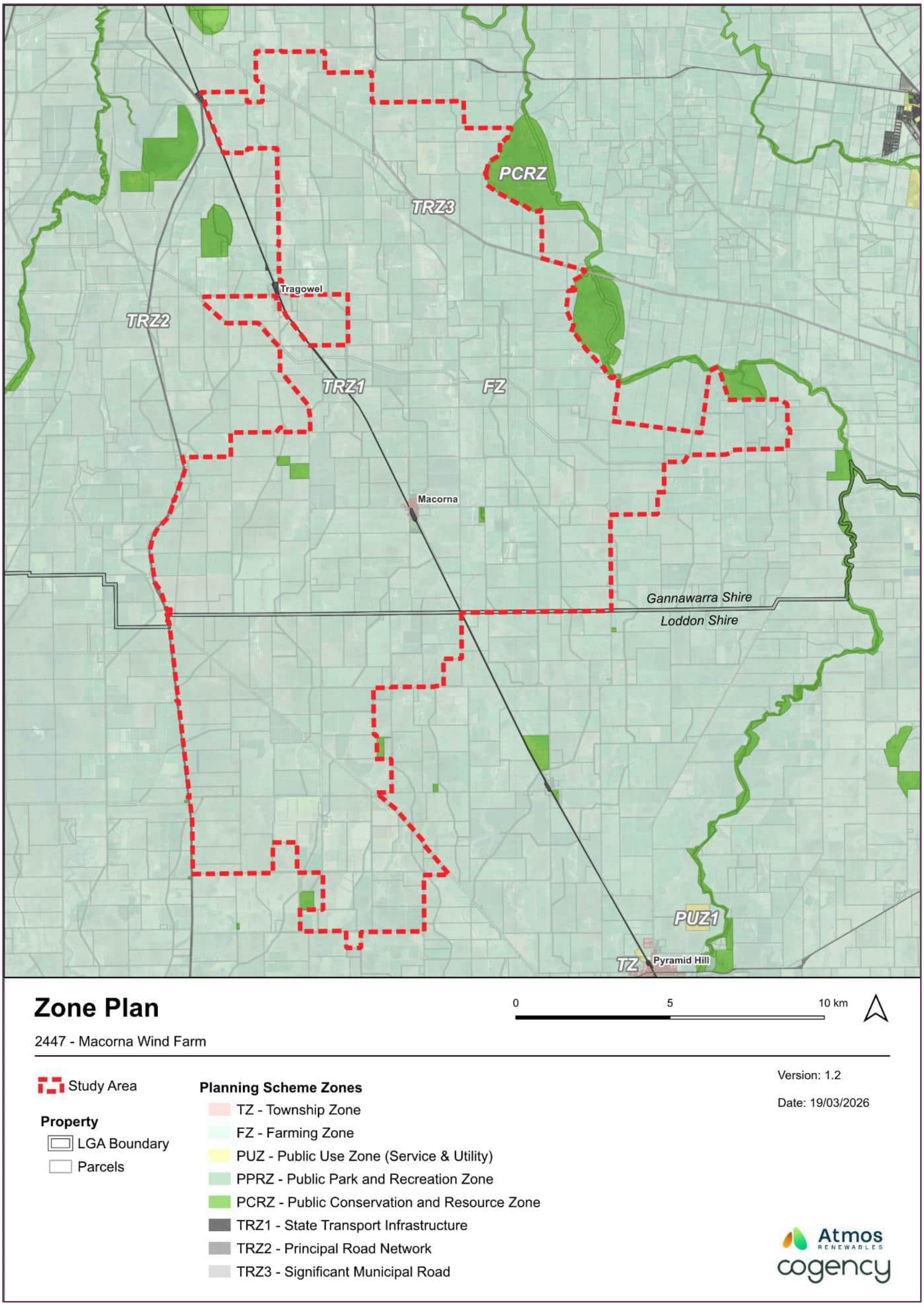

Figure 11 – Zoning in the vicinity of the Project (Source: Cogency).

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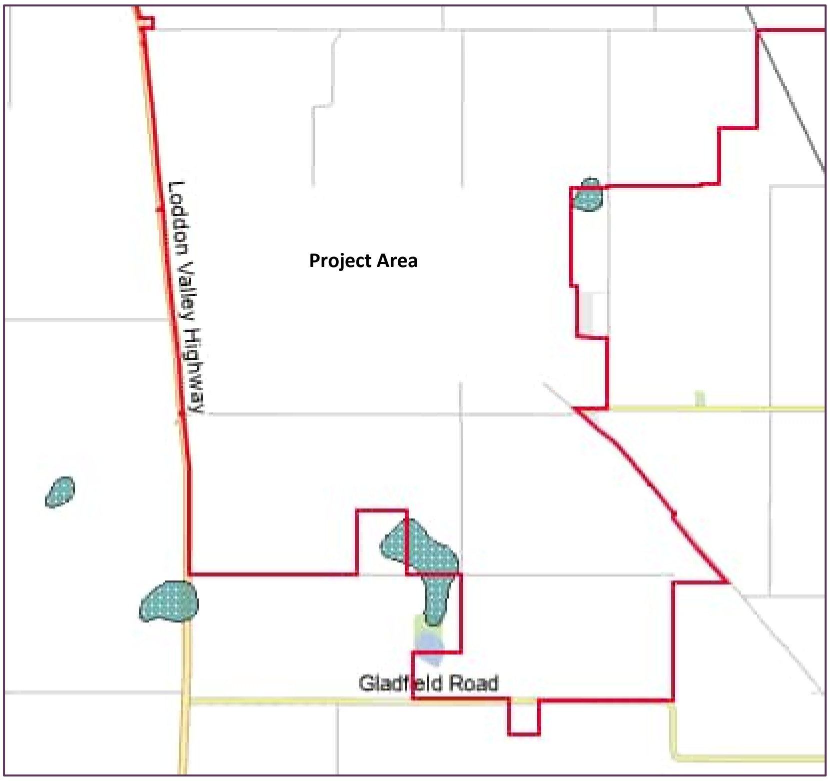

Figure 12 – Extent of VPO1 within the Loddon Shire (Source: Vicplan).

4.2 Guidance

4.2.1 Wind Farms and Landscape Values National Assessment Framework (2007)

The recognition of the value placed by the local community on the natural and cultural landscape is the intended focus of the National Assessment Framework (NAF). The study was commissioned by the National Trust (Australia) and Auswind. Broad consultation was undertaken with State and Local Government as well as potentially affected communities with the recommended methodology developed in response to issues raised.

The methodology applied in this study is consistent with the goals of the NAF.

4.2.2 Assessment methodologies

As there are no specific legislative requirements for the methodology of an assessment such as this in Victoria, guidance offered by the following:

- Guidance for Landscape and Visual Impact Assessment (GLVIA), Third Edition, Landscape Institute and Institute of Environmental Management and Assessment (2013).
- Guidance Note for Landscape and Visual Assessment, Australian Institute of Landscape Architects (AILA) (2018).

The methodology applied in this study is generally consistent with these guidelines.

5 PROJECT CONTEXT AND SETTING APPRAISAL

5.1 Project context

The approximately 23,000ha Project Area is situated between the Loddon Valley Highway in the west, and the Murray Valley Highway in the east (refer to ***Figure 13***).

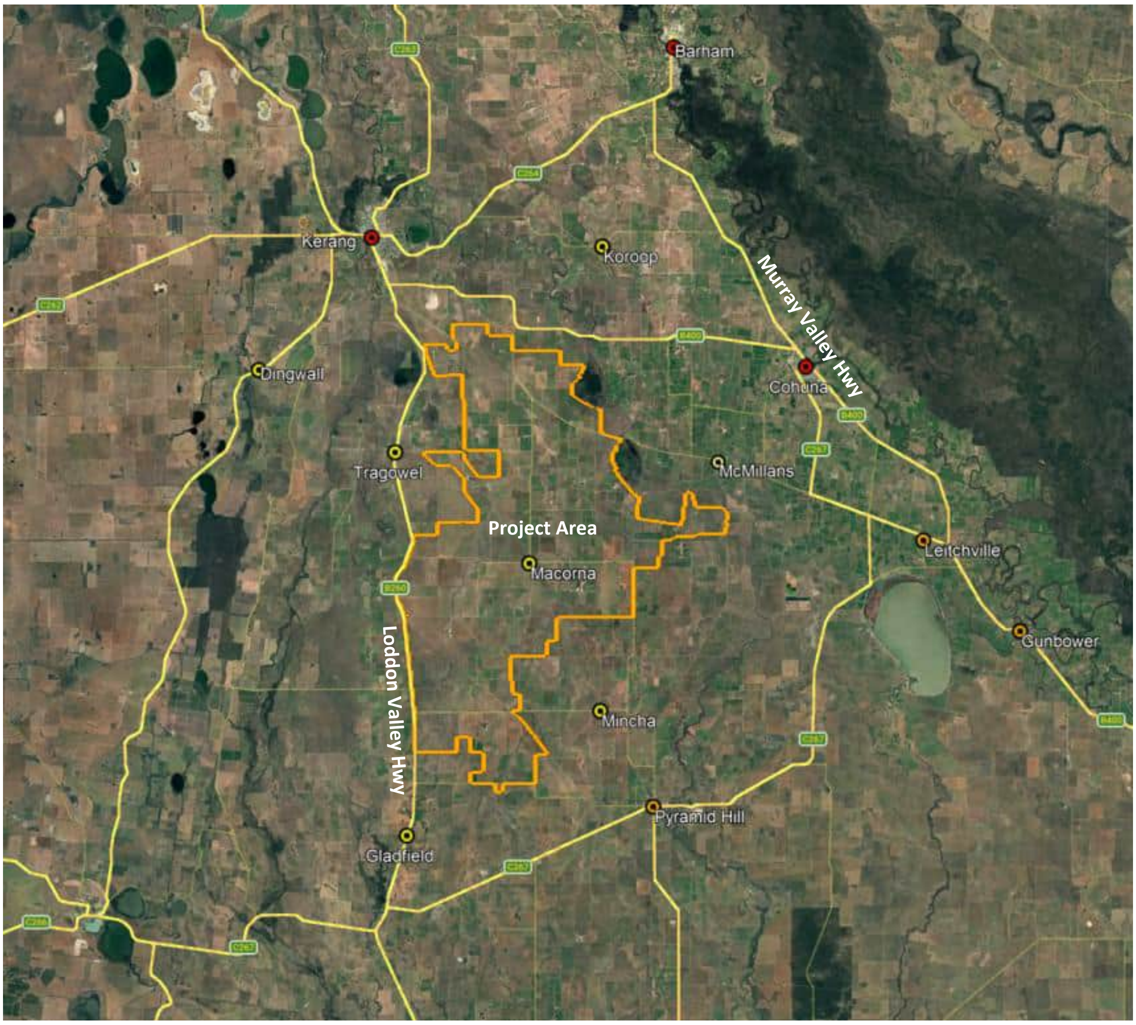

Figure 13 - Project context (Source: Google Earth).

5.2 Land use

5.2.1 Agriculture

The Project Area and broader surrounds consists predominantly of grazing and cropping, with isolated areas of intensive animal husbandry, such as dairies and piggeries (refer to ***Figure 13*** and ***Figure 14***).

Figure 14 – Typical agricultural land use in the study area.

5.2.2 Energy Infrastructure

The Project is located within the North West Renewable Energy Zone (REZ).

The Kerang Power Station and Terminal Station is located approximately 3.2km to the northwest and the Kerang Solar Farm approximately 2.6km to the northwest of the Project Area (refer to ***Figure 15, Figure 16*** and ***Figure 17***).

Other electrical infrastructure elements in the setting include the HV lines that extend south from the substation (refer to ***Figure 18***).

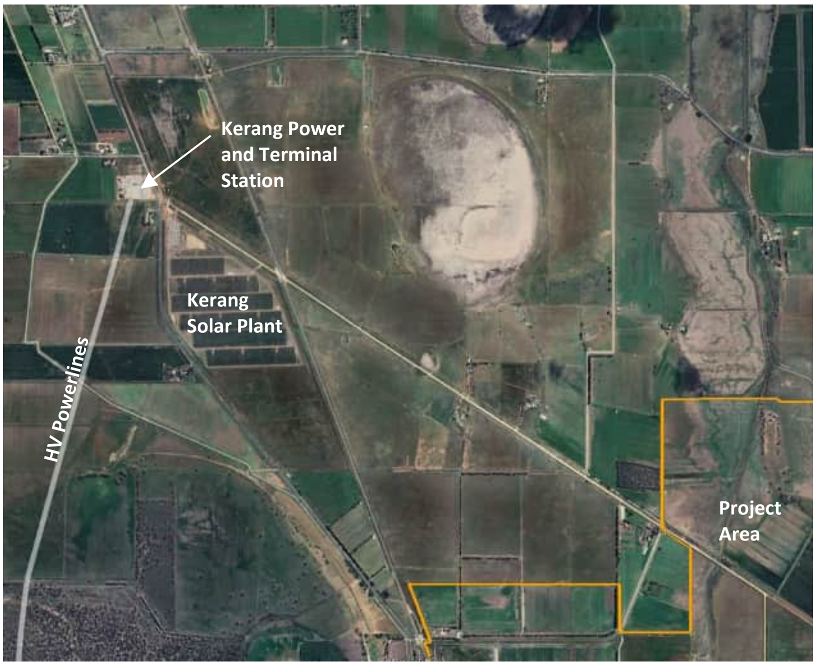

Figure 15 – Kerang existing energy infrastructure (Source: Google Earth).

Figure 16 – The Kerang Power Station and Terminal Station, as viewed from the Loddon Valley Highway.

Figure 17 – The Kerang Solar Plant as viewed from the Loddon Valley Highway.

Figure 18 - HV Powerlines connecting to the Kerang Terminal Station traverse the landscape to the west of the Project Area.

5.2.3 Towns and settlements

The following towns and settlements are located within 10km of the closest WTG (refer to Figure 19):

- Macorna: located centrally within the Project Area is a small population, with approximately 70 across the broader area encompassed by the Project area, with a sporting reserve.
- Tragowel: adjacent to the Project Area (to the west northwest) is a very small settlement of with a population of approximately 80 across the broader locality.
- Kerang/Kerang North: ~9km northwest of the closest WTG is the major town in the region with a population of approximately 4,000. The southern edge of Kerang is comprised lower density residential uses and other non-residential uses, including an industrial area that extends south from the town along the Loddon Valley Highway and a tourist accommodation park (refer to ***Figure 20, Figure 21*** and ***Figure 22***).
- Mincha: ~5km southeast of the closest WTG is a settlement of 5 houses and a population of approximately 60 spread over a broader area.
- Pyramid Hill: ~9km east southeast of the closest WTG is a small town with a population of approximately 400. Land uses on the northwestern side of the township include grain handling facilities, a treatment plant, a school and a sporting reserve (refer to ***Figure 23***).
- Gladfield: ~8km south southwest of the closest WTG is a settlement with a population of approximately 30.
- Koorop: ~ 9km northeast is the closest WTG is a very small settlement of with a population of approximately 70.

Between 10km and 20km of the of the closest WTG are the following towns.

- Cohuna: ~ 13km northeast of the is a significant town in the region with a population of approximately 3,200. Land on the western side of the town includes industrial uses and low density residential (refer to ***Figure 24***).
- Leitchville: ~13km east of the closest WTG is a township with a population of approximately 560
- Dingwall: ~13.5km west of the closest WTG is a settlement with a population of approximately 100.
- Gunbower: ~19km west southwest of the closest WTG is a township with a population of approximately 580.
- Barham (VIC and NSW): ~20km northeast of the closest WTG is a town with a population of approximately 1,600.

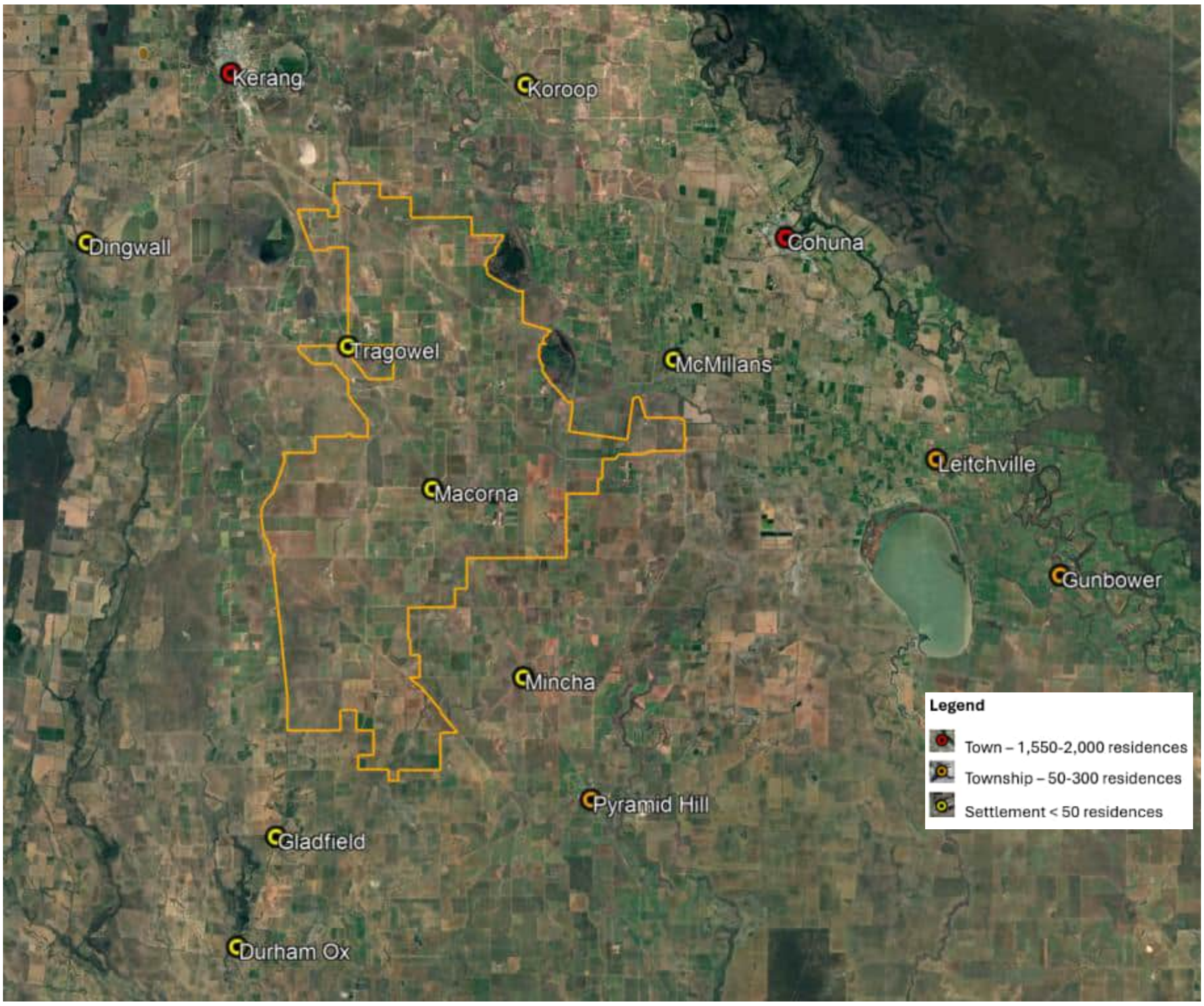

Figure 19 – Towns, townships and settlements within 20km of the Project Area boundary.

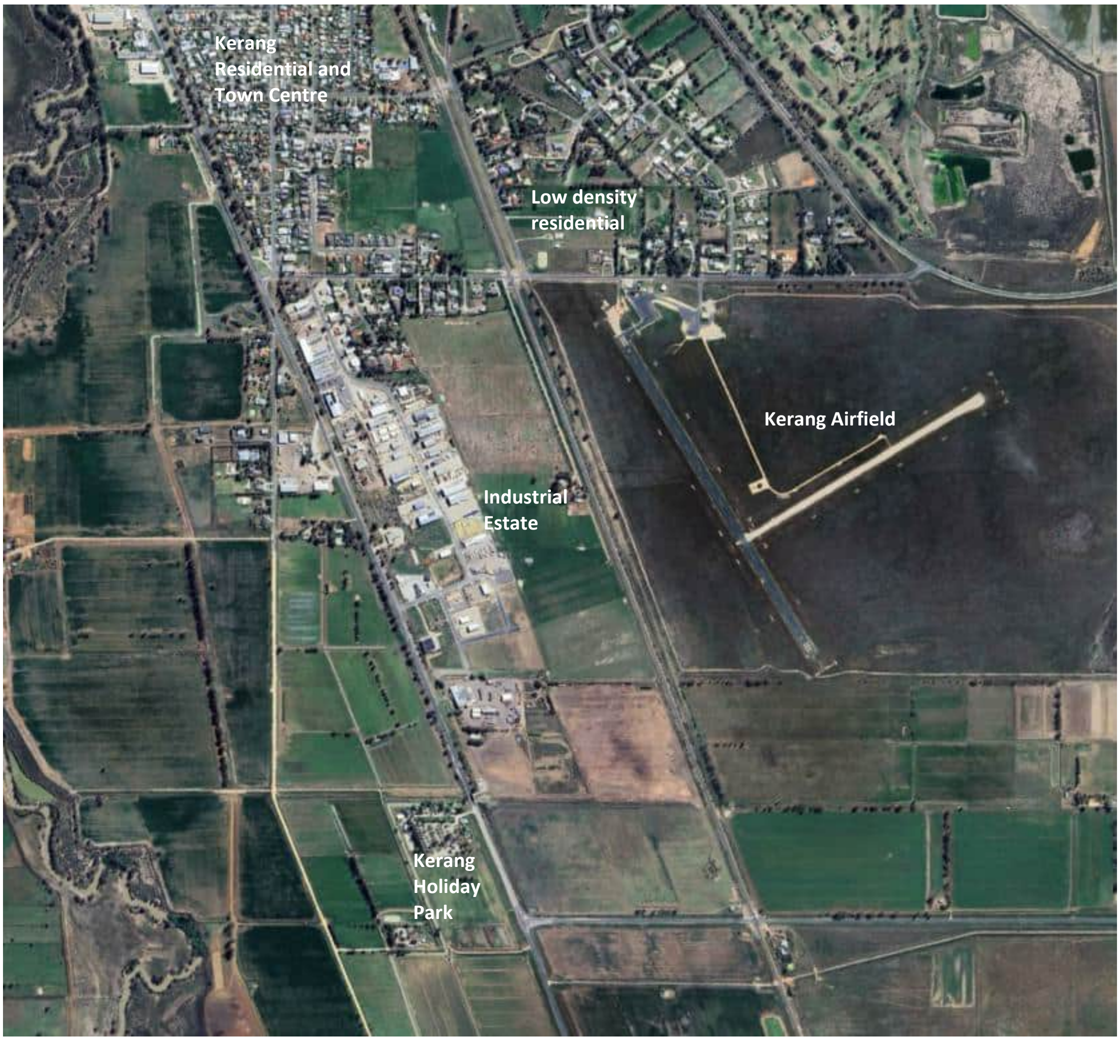

Figure 20 – Existing Kerang land uses near Project interface (Source: Google Earth).

Figure 21 - View of the industrial area at the southern edge of Kerang.

Figure 22 – Kerang Holiday Park on the southern edge of the town.

Figure 23 – Existing Pyramid Hill land uses near Project interface (Source: Google Earth).

Figure 24 - Existing Cohuna land uses near Project interface (Source: Google Earth).

5.2.4 Parks and reserves

5.2.4.1 Nature and conservation

The majority of the conservation and wildlife reserves do not contain visitor facilities. However, the National and State Parks have a range of facilities such as camping areas and picnicking.

Nature and conservation uses of note within 10km of the Project Area include (refer to ***Figure 25***):

- Pyramid Creek Nature Conservation Reserve (~3.6km north).
- Tragowel Swamp Nature Conservation Reserve (~770m northwest).
- Johnson Swamp Wildlife Reserve (immediately adjacent to the northeast).
- Hird Swamp Wildlife Reserve (immediately adjacent to the east).
- Rowland Nature Conservation Reserve (immediately adjacent to the east).
- Flannery Nature Conservation Reserve (immediately adjacent to the east).
- Bullock Creek Streamside Reserve (~6km southeast).
- Kow Swamp (~6.7km east).

- Leaghur State Park (~9.5km west). Contains limited visitor facilities.
- Mount Hope Nature Conservation Reserve (~10km southeast), including Mount Hope summit (refer to ***Figure 26*** and ***Figure 27***). Contains visitor facilities.

The following reserves are located between 10km to 20km from the Project Area (refer to ***Figure 25***):

- Terrick Terrick National Park (~17km southeast). Mount Terrick Terrick, Bennetts Rock and Reigels Rock are greater than 20km from the Project Area (refer to ***Figure 28*** and ***Figure 29***). Contains visitor facilities.
- Gunbower National Park (~14km east). Contains numerous visitor facilities such as camping, picnicking and toilets.

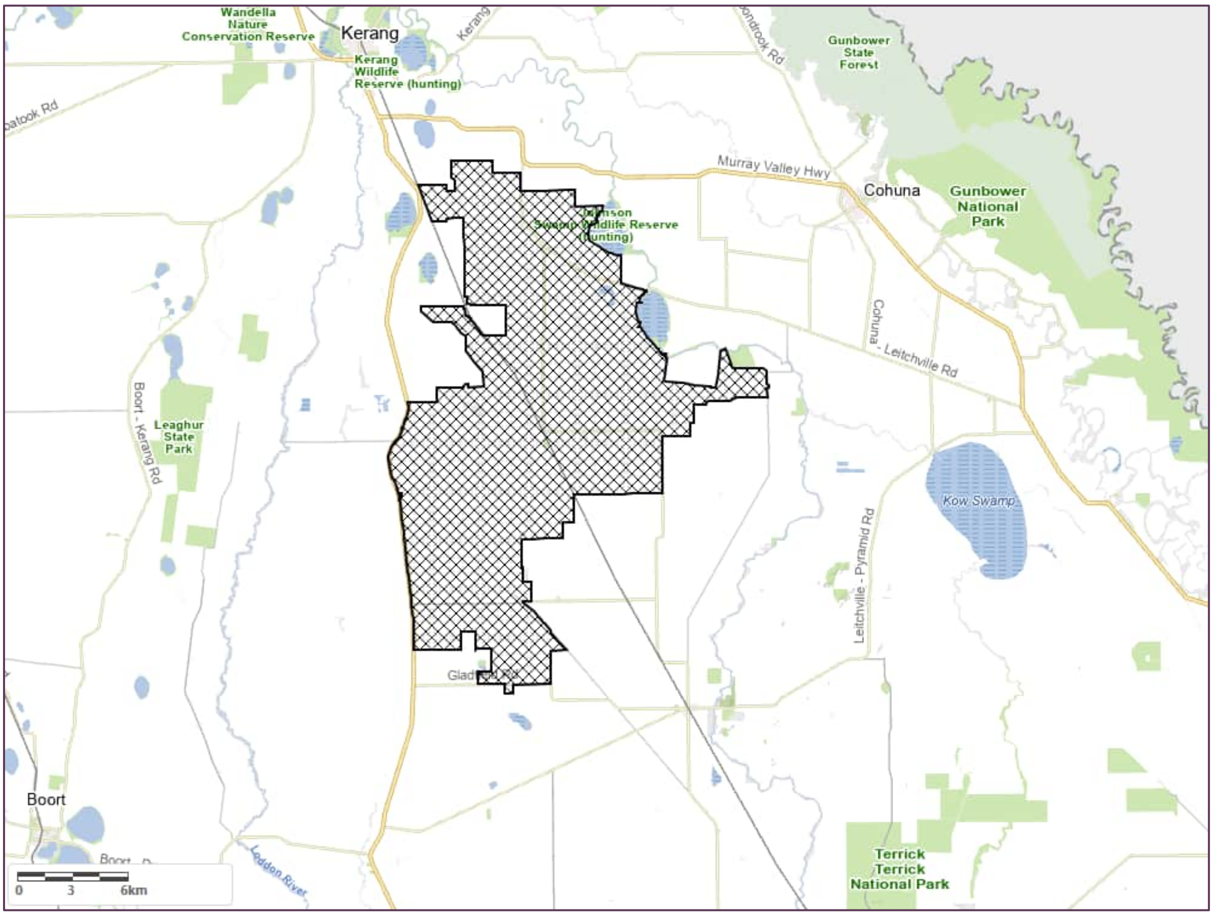

Figure 25 - Key nature and conservation reserves within 20km of the Project (Source: Mapshare).

Figure 26 – Mount Hope, elevation ~202m AHD, within Mount Hope Conservation Reserve.

Figure 27 – View from Mount Hope.

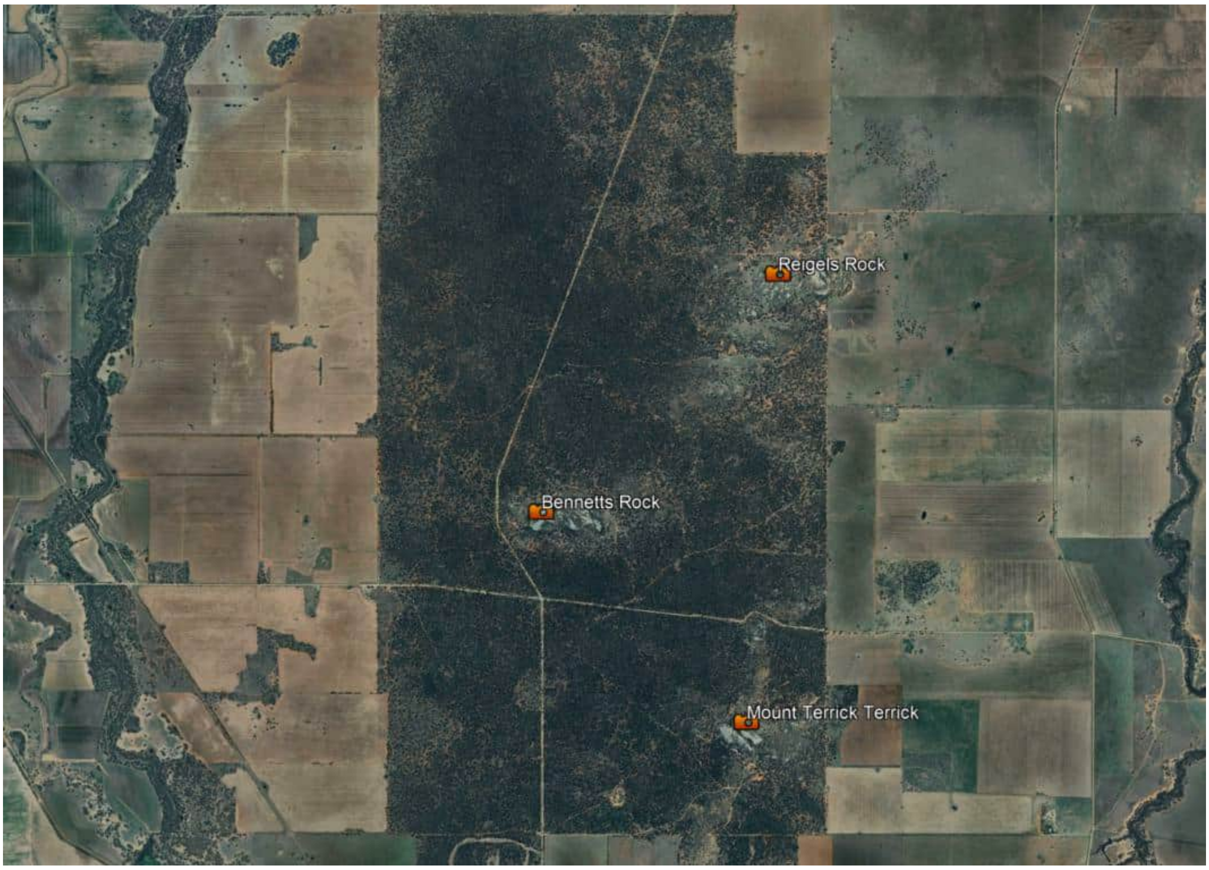

Figure 28 – Mount Terrick Terrick (197m AHD), Bennetts Rock (172m AHD) and Reigels Rock (204m AHD), within Terrick Terrick National Park.

Figure 29 - View from Mount Terrick Terrick.

5.2.4.2 Sporting and recreation reserves

The following sporting and recreational parks are located within 10km of the Project Area:

- Macorna Recreation Reserve, primarily a sporting facility, is located within the Project Area (refer to ***Figure 30***).
- Mitchell Park (Pyramid Hill) (~6.6km southeast) is primarily a sporting reserve (refer to ***Figure 31***).
- Pyramid Hill summit, within the Pyramid Hill Recreation Reserve (golf course) (~9.5km southeast). Pyramid Hill summit is of note as it is a rare opportunity in the otherwise flat landscape where elevated views can be experienced (refer to ***Figure 32, Figure 33*** and ***Figure 34***).

Figure 30 – Macorna Recreation Reserve, primarily a sporting facility, is located within the Project Area.

Figure 31 - Mitchell Reserve is located on the northwestern outskirts of Pyramid Hill township.

Figure 32 – Pyramid Hill summit rises to 187m AHD and sit approximately 70m above surrounding ground level

Figure 33 – Pyramid Hill within the golf course at Pyramid Hill Recreation Reserve.

Figure 34 – View from Pyramid Hill summit.

5.2.5 Transport routes

5.2.5.1 Road

The most significant roads within the viewshed of the Project Area are the Loddon Valley Highway (2630 movements), immediately to the west, and the Murray Valley Highway (2570 movements), approximately 9km to the east, which are both designated by the Department of Transport and Planning (DTP) as "B" category highways.

The DTP define "B" category roads as:

- *B' roads are sealed roads, wide enough for two traffic lines, with good centre line and edge line marking, shoulders, and a high standard of guidepost delineation.*
- *'B' roads provide the primary link for major regions not served by 'A' roads and for highly significant tourism regions.*

The DTP define "C" category roads as:

- *'C' roads are generally two lane sealed roads with shoulders.*
- *'C' roads provide important links between population centres and between these centres and the primary transport network.*

"C" category roads include:

- C262 – Kerang-Quambatook Road.
- C263 – Kerang-Murrabit Road.
- C264 – Kerang-Koondrook Road (5578 movements).
- C265 – Cohuna-Quandrook Road.
- C266 – Boort-Kerang Road.
- C267 – Cohuna-Leitchville Road.

- C267 – Leitchville-Pyramid Road.
- C267 – Boort-Pyramid Road.
- C336 – Bendigo-Pyramid Road.

Refer to ***Figure 35***.

5.2.5.2 Rail

The only railway line in the study area is the Melbourne to Swan Hill line which operates both passenger and freight services. The line runs in a southeast to northwest direction through the Project Area (refer to ***Figure 35***).

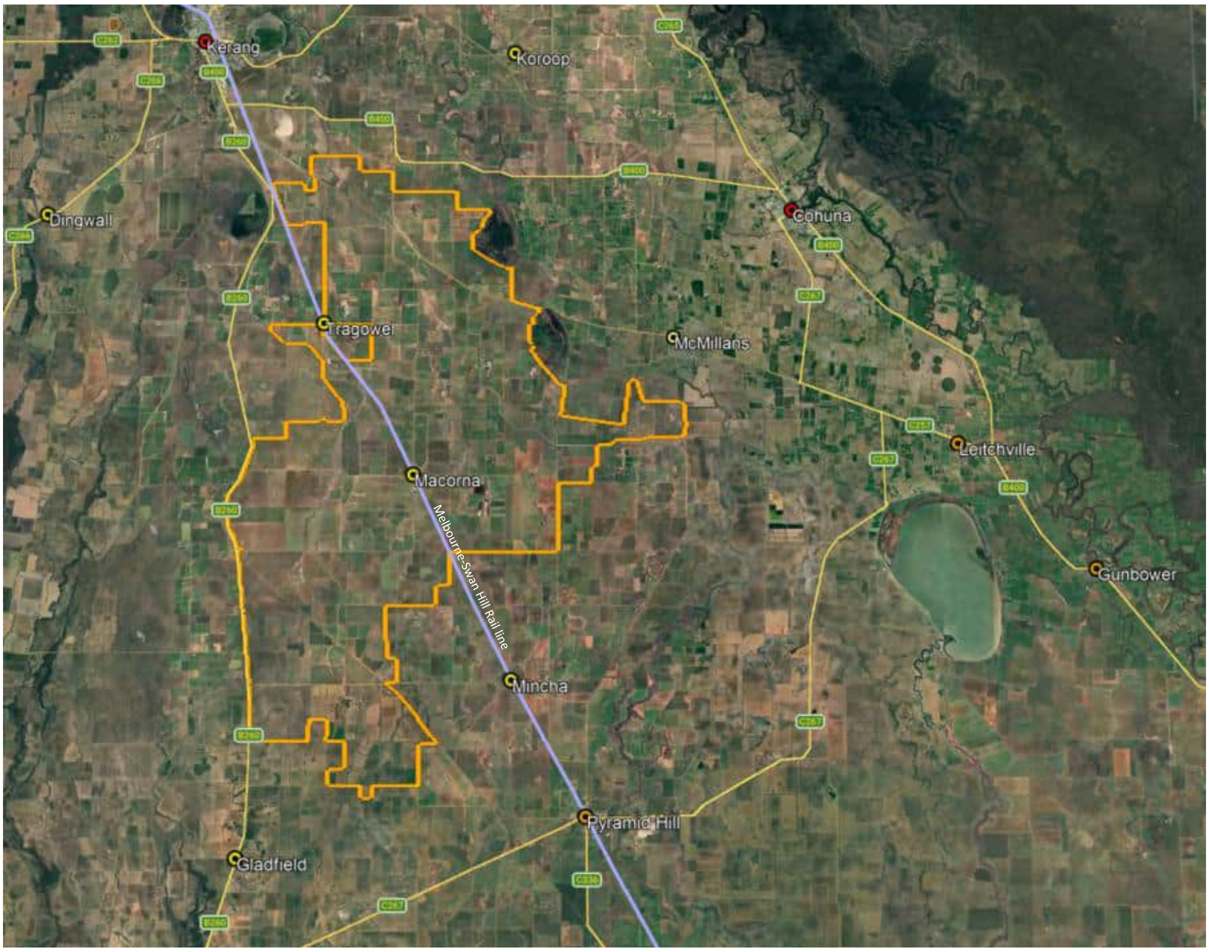

Figure 35 – Major roads and railway lines within the Study Area (Source: Google Maps).

6 THE LANDSCAPE SETTING

6.1 Vegetation and landscape form

6.1.1 Vegetation

The Project Area and the surrounding area is primarily a flat landscape comprised of open pasture or cropping land, occasionally visually compartmentalised by rows of trees and tall shrubs along roadways, paddock boundaries and irrigation channels. Vegetation is primarily comprised of native species, predominantly Eucalyptus species.

The Project Area is located between the Loddon River to the west and the Murray River to the east. While the Loddon River is lined with a thin, sinuous band of vegetation, the Murray River sits within a relatively broad area of flood plain forest which includes Gunbower National Park (refer to ***Figure 36***).

Large blocks of tall and dense vegetation are located to the southeast at Terrick Terrick National Park, and to the west at Leaghur State Park.

Numerous wetland reserves are located in the broader region surrounding the Project Area, particularly to the east nearer the Murray River. While fringed with canopy vegetation, the wetter main bodies of the reserves are typically vegetated with lower growing wetland sedge and shrub species (refer to ***Figure 37*** and ***Figure 38***). These reserves include:

- Pyramid Creek Nature Conservation Reserve.
- Tragowel Swamp Nature Conservation Reserve.
- Johnson Swamp Wildlife Reserve.
- Hird Swamp Wildlife Reserve.
- Rowland Nature Conservation Reserve.
- Flannery Nature Conservation Reserve.
- Bullock Creek Streamside Reserve.
- Kow Swamp.

Throughout the Project Area, canopy vegetation is mostly lacking apart from the immediate vicinity of rural residences and along some roadways (refer to ***Figure 39*** and ***Figure 40***).

Residences in and surrounding the Project Area are typically set within a well treed setting, that often contains shrubs in the “home yard” adjacent to the residence itself (refer to ***Figure 41*** and ***Section 8.3***).

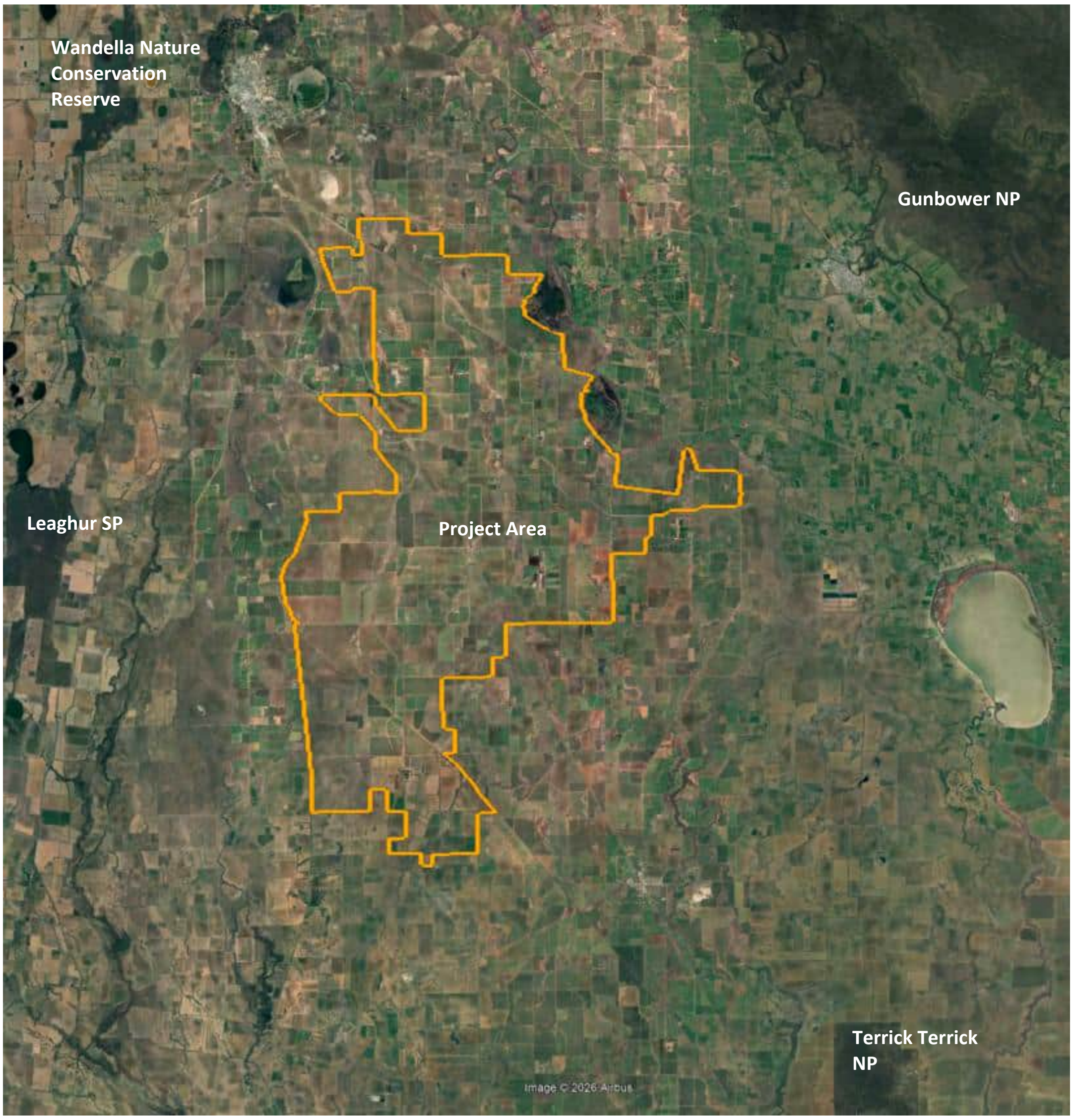

Figure 36 – Broad vegetation patterns of the Project Area and broader surrounds (Source: Google Earth [2024]).

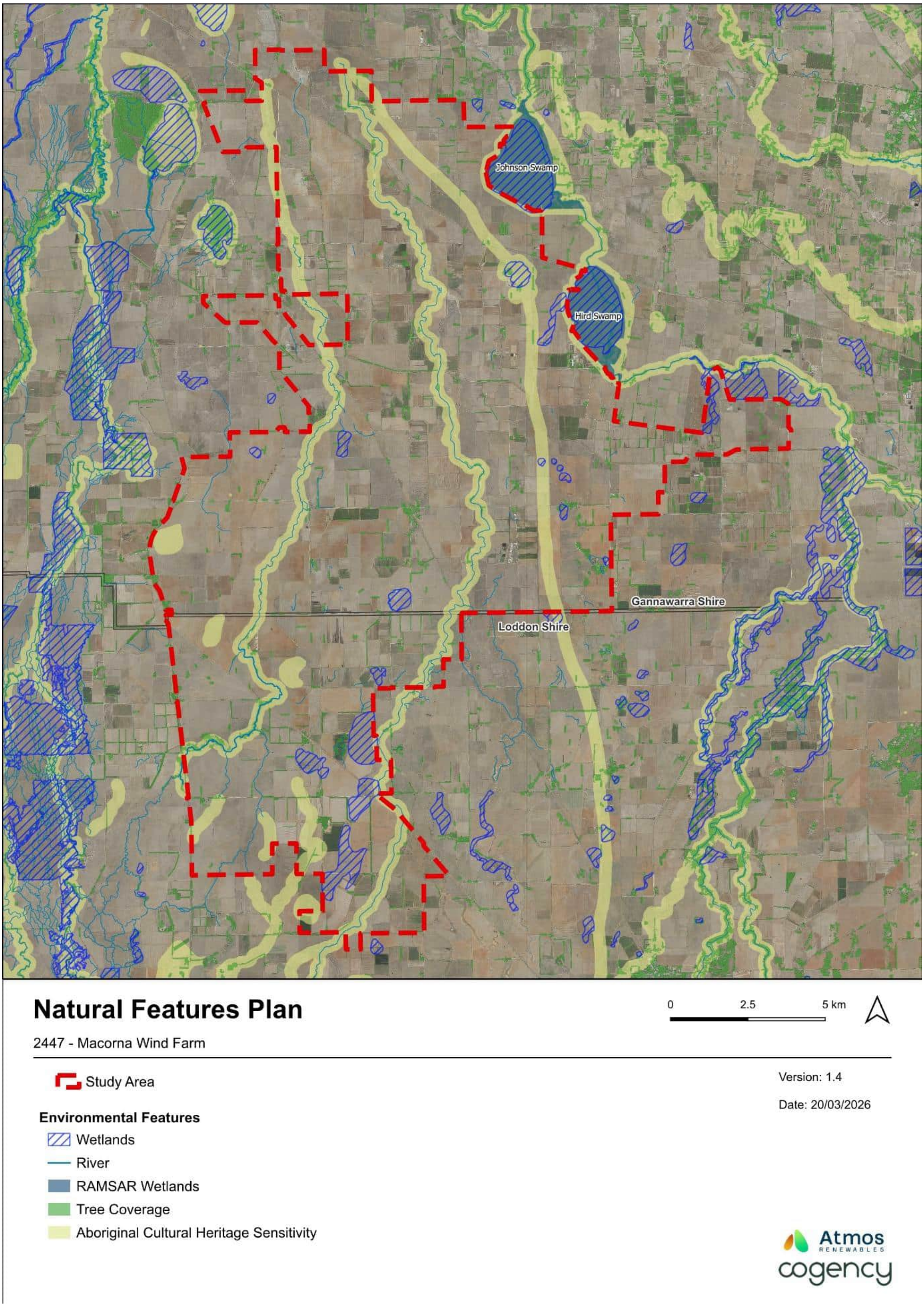

Figure 37 – Numerous wetlands are located around the northern boundary of the Project Area (Source: Cogency).

Figure 38 – Scattered tall vegetation in the Tragowel Swamp Nature Conservation Reserve with dense vegetation in the distance lining the Loddon River.

Figure 39 – Typically sparse vegetation in the northern part of the Project Area.

Figure 40 – Dense vegetation along the Loddon Valley Highway to the west of the Project Area.

Figure 41 – Typical vegetation surrounding a residence.

6.1.2 Landscape form

The Project Area is located on the Murray Plains, the broader valley of the Murray River and its tributaries, which includes the Loddon River which is located approximately 2.5km to the west (refer to ***Figure 42*** and ***Figure 43).***

The topography of the region is very flat with waterways and rivers being lightly incised and swamps being in broad, shallow depressions. Elevation range is mostly minimal, from approximately 75m AHD along the waterways and deeper swamps, to approximately 82m AHD.

The town of Kerang is located on the Loddon River near its confluence with Pyramid Creek, reaching a maximum elevation of approximately 83m AHD. The Murray River is located approximately 20km to the east.

The elevation of the Project Area has minimal variation, ranging from approximately 79m AHD at its northern boundary, to approximately 86m AHD on the southern boundary to 80m AHD on the northern boundary. Average gradients across the Project Area are less than 1 percent.

Localised highpoints in the regional setting of the Project include (refer to ***Figure 43***):

- Mount Hope, elevation ~202m AHD – Mount Hope Conservation Reserve
- Mount Terrick Terrick (197m AHD), Bennetts Rock (172m AHD) and Reigels Rock (204m AHD) Terrick Terrick National Park
- Pyramid Hill summit rises to 187m – Pyramid Hill Recreation Reserve.

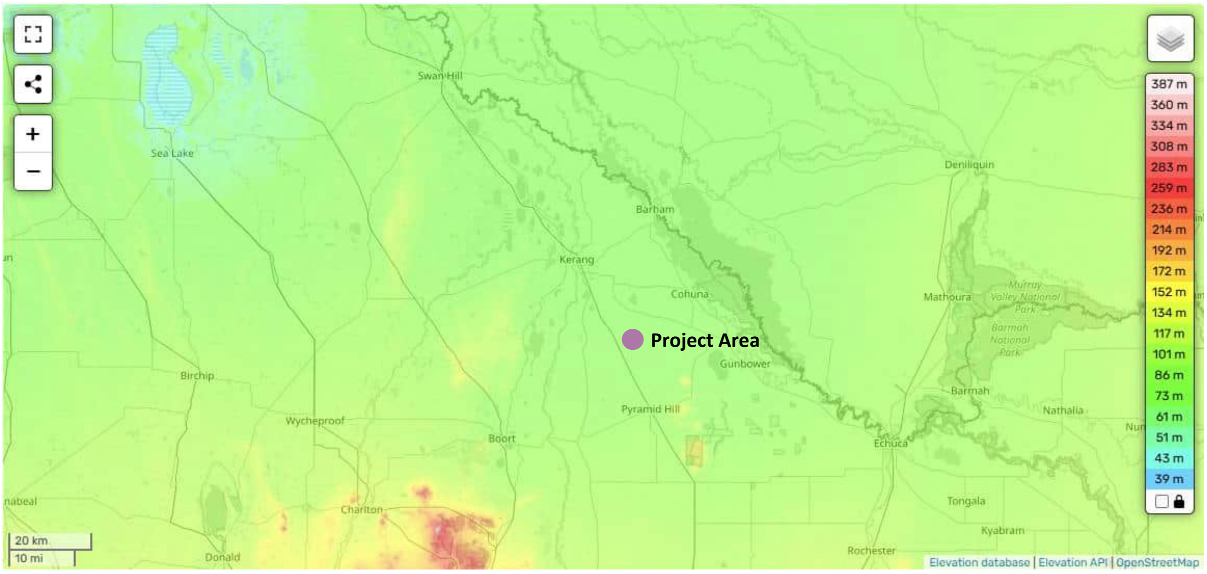

Figure 42 - Topographical elevation of the regional setting of the Project Area (Source: ESRI).

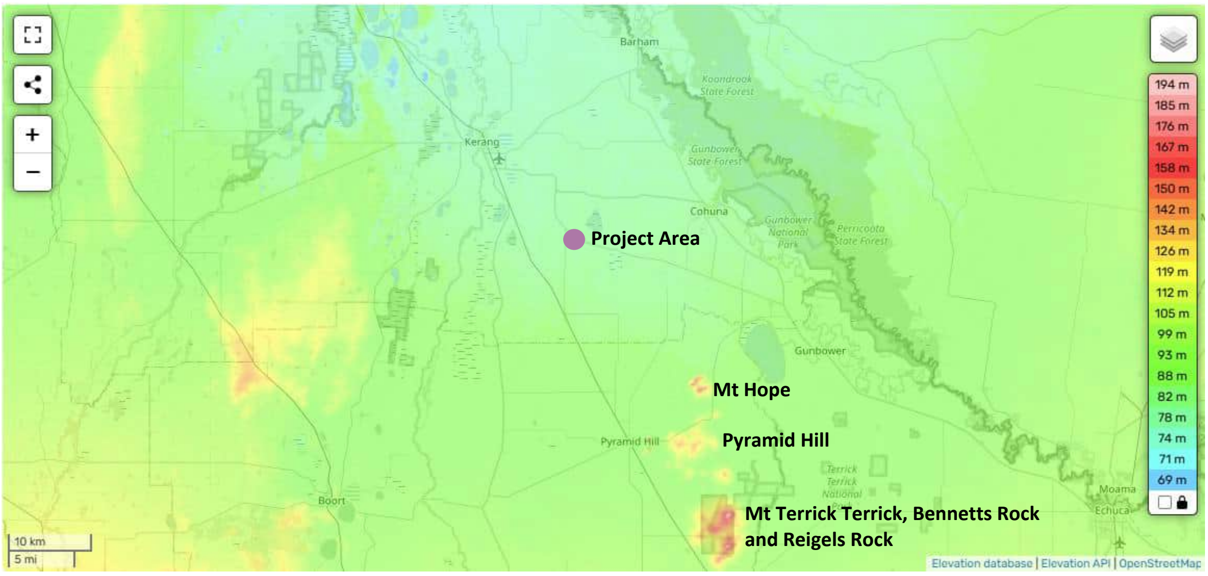

Figure 43 - Elevation of the Project Area and immediate surrounds (Source: ESRI).

6.2 Landscape character type

Within the regional setting of the Project Area the landscape character type has been identified using the classification system devised by Leonard and Hammond (1984)[4]. The landscape character type is described below:

Murray Basin Plains (type a) – Northern District Plains Subtype

The landscape type extends about 320 kilometres from Wodonga to the Avoca River. It sits to the north of "West Central Hills" and "Foothills" landscape types and to the west of "Wimmera" landscape type. The Murray River border with New South Wales creates the northern edge of this landscape type (refer to ***Figure 44***).

To the east of this sub type the land surface is virtually flat with the flood plains of a complex stream network that experience seasonal volume variations flowing into the Murray River. To the west of this sub-type, the topography remains flat, and the streams are less complex.

The mostly agricultural landscape contains very small pockets of remnant native grassland and woodland in roadside reserves and on steeper slopes. The agricultural areas of fruit and vegetable growing are under irrigation and there are few retained trees (red gum and grey box eucalytpts).

[4] Leonard, M., Hammond, R., (1984). Landscape Character Types of Victoria.

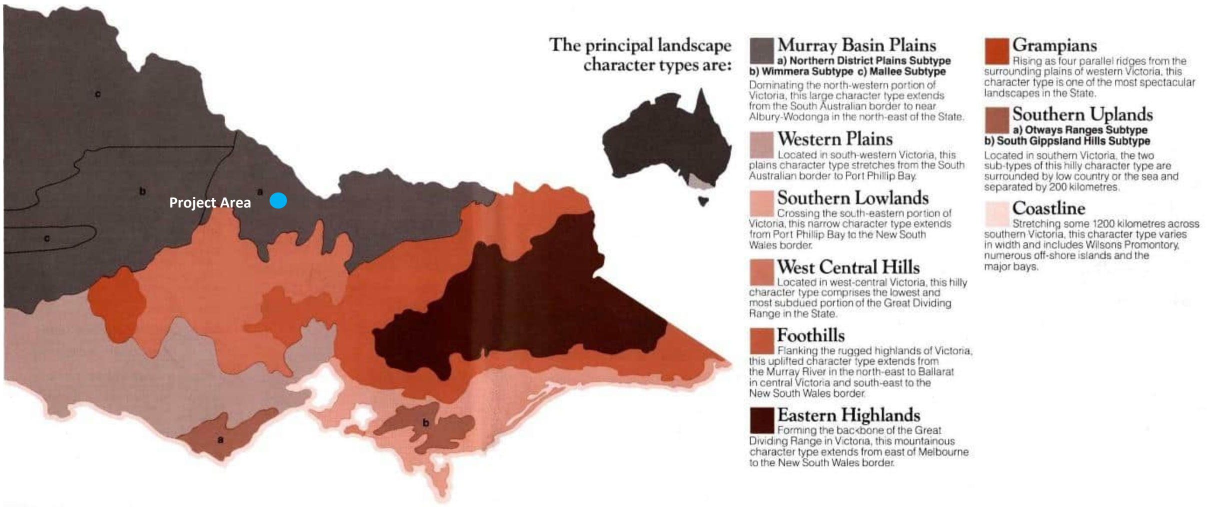

Figure 44 – Landscape Character Types of Victoria Map (Leonard and Hammond, 1984, pgs. 6 and 7).

Figure 45 - Landscape character of Project Area as viewed from the Loddon Valley Highway to the northwest.

Figure 46 – Landscape character of agricultural landscape to the east of the Project Area.

Figure 47 – Irrigation channels traverse the landscape and often lined with indigenous and exotic deciduous vegetation.

6.3 Scenic Quality

Scenic quality is somewhat subjective but typically is a combination of a range of factors that have been found to contribute to the human appreciation of landscape. These factors are:

- Topographic variation and ruggedness;
- Strong patterning of vegetation; and
- The presence of water.

Agricultural landscapes are particularly subject to divergent opinions as to what constitutes scenic values. However, basic principles relating to diversity of topography, patterning of vegetation and the presence of water remain contributing factors to a higher level of scenic quality.

Leonard and Hammond describe attributes for high, moderate and low levels of scenic quality within the Murray Basin Plains (type a) – Northern District Plains Subtype landscape character type. The scenic quality attributes for the Project Area are consistent with the attributes of low scenic quality (refer to ***Table 8***).

Description	Low Scenic Quality
Landforms	Vast expanses of indistinctly dissected landforms that provide little illusion of spatial definition or landmarks with which to orient.
Vegetation	Extensive areas of similar vegetation. Few, if any trees. Very limited variation in colour and texture.
Waterforms	Permanent waterforms mostly absent

Table 8 – Scenic quality of the Project Area (Source: Leonard and Hammond).

However, to the west of the Project Area, there are discrete areas that have attributes of moderate to high scenic quality. These include the Tragowel Swamp Nature Conservation Reserve and the Loddon River, as well as the localised highpoints within nature parks or reserves, such as Pyramid Hill summit.

6.4 Absorptive Capability

The definition of landscape absorptive quality is closely related to that of visual modification levels. It is generally applied at a broader scale than visual modification and is an assessment of how well a landscape setting can accommodate change or a development.

The key factors considered in determining absorptive capability are topography and vegetation. In areas of flatter topography, overlooking is not possible and even a low and thin band of vegetation is able to screen views to a development from a given viewpoint. In areas of undulating or elevated topography, overlooking can occur and vegetation needs to be higher and denser to achieve effective screening. Intervening undulating topography also has the potential to block views in certain landscapes.

The landscape setting of the Project Area and surrounds is very flat and, apart from the wetland and riparian landscape to west, comprised of sparse vegetation confined to a rectilinear pattern reflecting property boundaries and roads. Within this landscape, overlooking is generally not possible from most sensitive viewpoints, and even relatively low vegetation (up to eye-height) is effective at screening views.

Topography – High capability due to flat to slightly undulating topography, with minimal potential for overlooking.

Existing Vegetation – Generally low for highly cleared agricultural areas. Moderate to high capability where vegetation exists, particularly around residences.

The overall absorptive capability is low to moderate given the vertical scale of the Project.

7 PERCEPTIONS OF SCENIC QUALITY

This LVIA report takes a precautionary approach to the definition of visual sensitivity, assuming that WTG are perceived negatively, like other infrastructure as HV lines.

While the visibility of a proposed wind farm from specific vantage points can be measured, the impact on viewers is largely shaped by individual perceptions of change.

Research into community case studies has shown that acceptance of wind farms varies significantly depending on personal preferences and biases. Residents and users of the surrounding landscape exhibit diverse sensitivities to such developments. Despite this, earlier studies have demonstrated strong support for wind farms across both affected and unaffected communities.

The below studies by Dr Andrew Lothian cover a period from 2008 to 2019 and indicate a visual preference for WTG in lower quality landscape setting.

7.1 Visual Impact Assessment of some developments in South Australia, Lothian (2008).

A study by Lothian[5] of perceptions of scenic quality and the influence of infrastructure found that, in agricultural landscapes with the attributes of lower scenic quality, wind farms had the effect of increasing the level of scenic quality as perceived by the viewer, as they added an element of visual interest to the otherwise relatively featureless landscape setting. This finding should be considered when evaluating viewer sensitivity as it would have the effect of reducing the level of sensitivity.

In the following ***Figure 48***, the tested respondents gave an agricultural setting without a wind farm a lower landscape quality rating than they gave the same setting with a wind farm present (Inland Scene 47 – the far-right column on the graph).

[5] *Lothian, Dr Andrew, Scenic Solutions, Visual Impact Assessment of some developments in South Australia, Australian Planner, Volume 45, Number 4, December 2008.*

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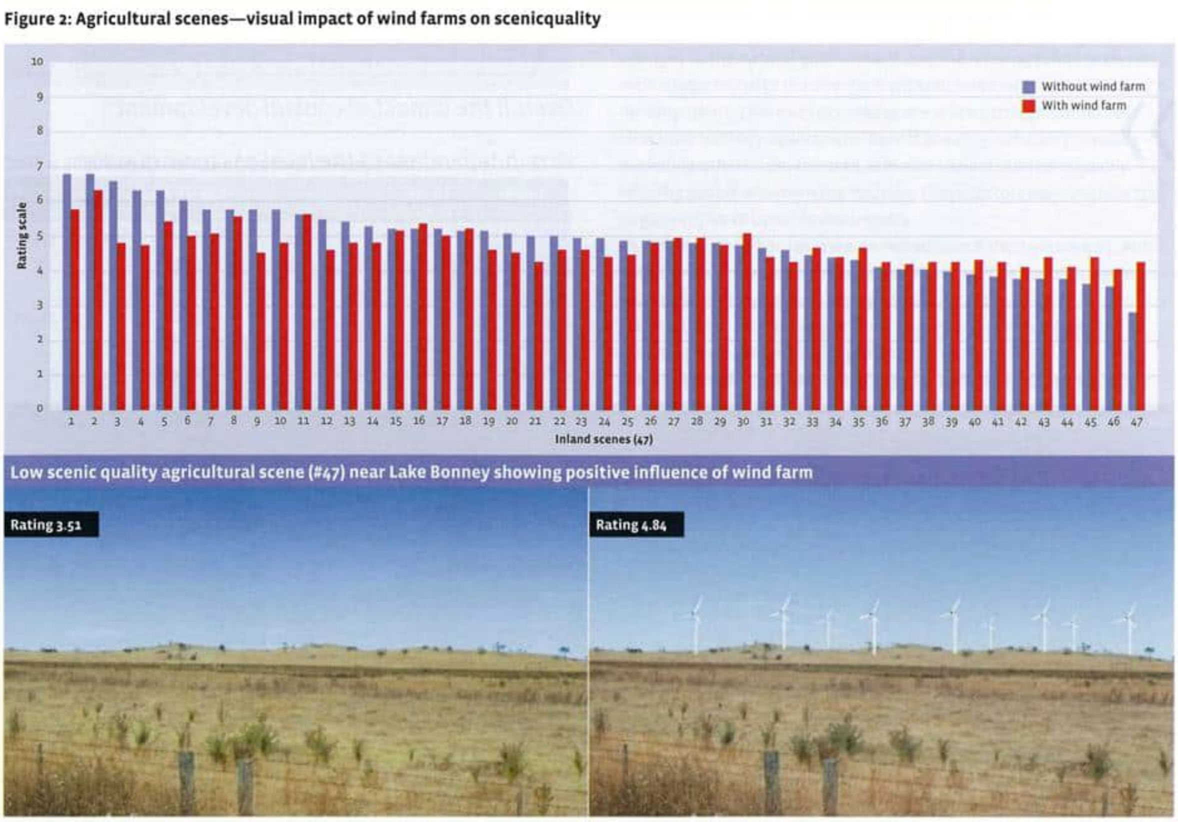

Figure 48 - Scenic Preference – Influence of Wind Farms (Source: Lothian – Australian Planner).

7.2 A survey of the visual impact and community acceptance of wind farms in Australia, Lothian (2019).

A survey was undertaken by Dr Andrew Lothian to understand if the increase in the number of wind farms in Australia up to 2019 had resulted in changes to previously assessed positive perceptual responses from communities (refer to ***Appendix C***).

49 images of 17 operating wind farms and ten hypothetical sites of varying landscape types as well as 49 images of varying landscape types without WTG were prepared for the Survey Monkey hosted survey.

Participants were asked to rate the scenic quality of each scene with and without the wind farm on a ten-point scale (one low, ten high). For scenes with wind farms, on the same sheet, respondents were also asked to indicate the degree of acceptability of the wind farm in the landscape on a five-point scale: very acceptable, acceptable, neutral, unacceptable, very unacceptable.

779 usable data sets people from across Australia were received. Lothian found:

'In the survey, prior to rating the scenes, participants were asked about their familiarity with wind farms and their attitude towards them. All but a handful had seen wind farms, 53% had seen a few and 45% had seen many. Nearly 70% were in favour of wind farms and only 7% were against them, similar figures to those from previous Australian surveys. A further 24% were equivocal – "it depends".'

'In the survey, the rating of acceptability followed immediately after rating the scenic quality of the landscape. The majority of respondents found them acceptable or very acceptable. What was

particularly surprising was that this applied to virtually all scenes including those of high scenic quality, in other words, regardless of the scenic quality of the landscape, participants generally considered the wind farms acceptable, including in virtually all high-quality coastal landscapes.'

Only one scene, that of Kangaroo Island elicited an unacceptable response.

In summary, the survey found that the presence of wind farms did impact the scenic quality of the landscapes in which they were located. However, the participants found that the visual impact was acceptable in all but one location.

8 VISUAL IMPACT ASSESSMENT

8.1 Visibility of the Project

8.1.1 Theoretical zone of visual influence (TZVI)

The viewshed or theoretical zone of visual influence (TZVI) is the area from which views of a particular proposed development may be possible based on the potential screening effects of topography. Therefore, the TZVI could be considered to be a worst-case scenario.

The impacts of vegetative or building screening were not taken into account on the model and the results of the analysis, therefore, include many areas that may not have a view due to intervening screening vegetation or buildings, as demonstrated within the following analysis.

A TZVI analysis would typically be undertaken for a wide radius, however it is evident by the very flat topography that the Project components, at 252m in height, would be potentially visible for a significant distance, where not screened by vegetation.

The TZVI was calculated based on a 3D digital elevation model that had a resolution of 10m (based on 10m horizontal grid) with a blade tip height of 252m and a viewer eye-height of 1.5m.

However, it is important to distinguish between theoretical visibility and actual visual impact. While WTG may be visible at distances beyond 20km under clear atmospheric conditions, at these distances they would appear as small-scale elements within the broader landscape and would not result in a material change to visual amenity.

For the purposes of this assessment:

- The area within 0–5 km is considered to have the potential for higher visual impacts, where WTG may be more prominent in the field of view.
- The area within 5–20 km represents a zone of progressively diminishing visual prominence, where WTG are visible but typically form an increasingly minor component of the landscape.
- Beyond 20 km, visibility may occur under optimal conditions, but visual impact is negligible.

The TZVI mapping illustrating the number of potentially visible WTG within a 5km radius is presented in ***Figure 49***, with warmer colours indicating a greater number of WTG theoretically visible.

The absorptive capability of the landscape of the broader setting, as described in ***Section 6.4***, indicates that the presence of vegetation within a generally flat landscape, even scattered vegetation, results in a reduction of visibility.

PETER HAACK
CONSULTING

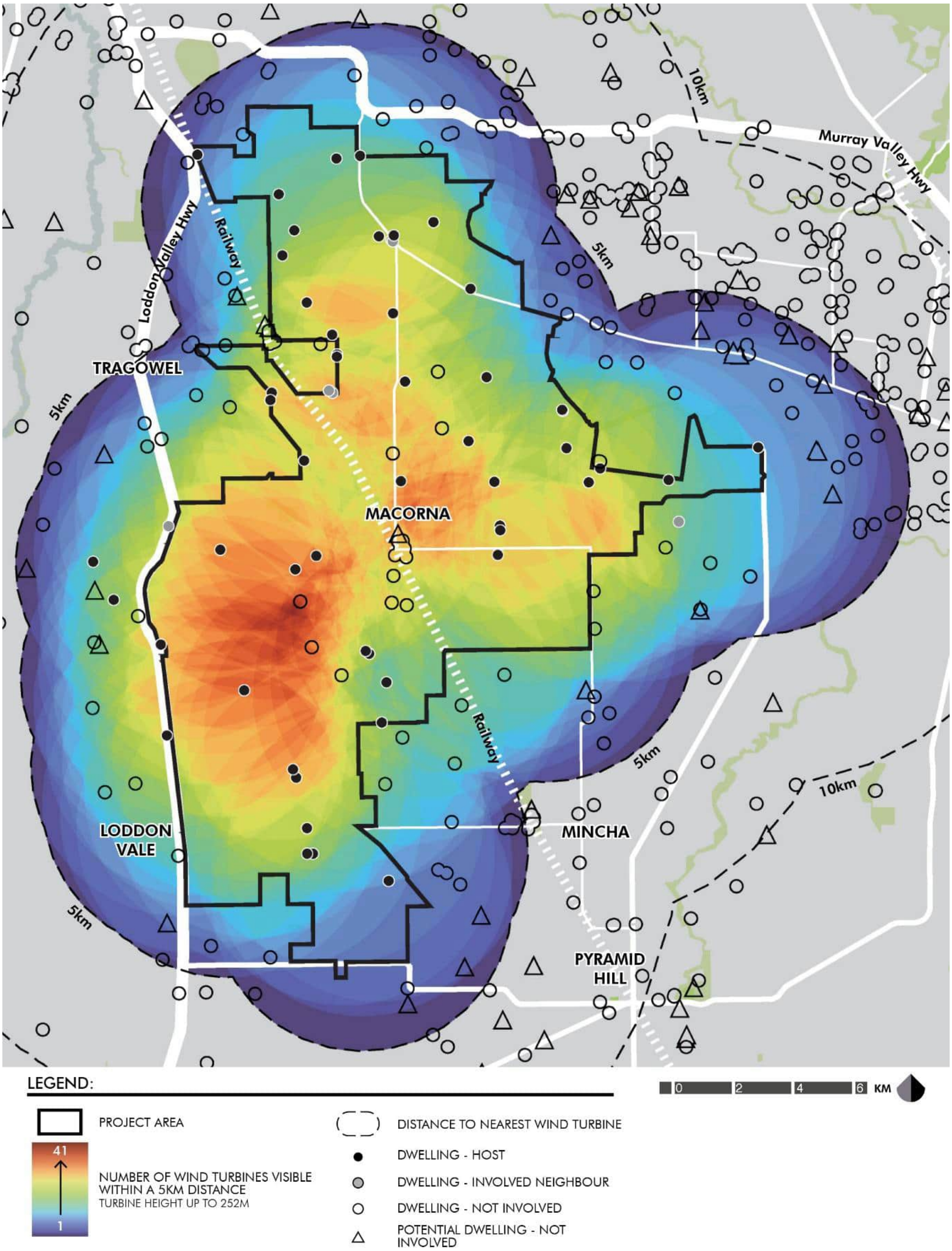

Figure 49 – TZVI showing proximity to WTG within 5km.

8.2 Summary of Potentially Affected Viewers

8.2.1 Quantification of Number of Dwellings

The local (up to 5 km from a WTG) and sub-regional settings, (up to 10km from a WTG), are generally the visual catchment in which the level of visual impact is highest, beyond which it starts to gradually diminish for the most sensitive of land use types and user groups.

The following tables show data collected through the study process to quantify the potential impact of the Project on the surrounding area. Dwellings subject to wind farm agreements have not been included. The assessment relates to the extent of WTGs.

Figure 50 shows the locations of involved and non-involved rural dwellings within a 10km radius.

Table 9 summarises the number or residences within a 10 km radius of any WTG, including settlements.

Table 10 summarises the number of dwellings in towns/townships up to a 15 km radius of any WTG. The number of residences is based on an average household size of 2.15 for the Cohuna - Leitchville and District area of Gannawarra. Settlements with dispersed dwellings have not been included as they have been included in the identification of individual dwellings in ***Table 9***.

Table 11 summarises the length of, as well as the number of vehicles per day using the road network within a 5km and 10km radius of any WTG. The assessed limit is 10km radius given the significant reduction in visual sensitivity levels in distances beyond 10km.

Table 12 summarises the length of railway line within a 5km and 10km radius of any WTG.

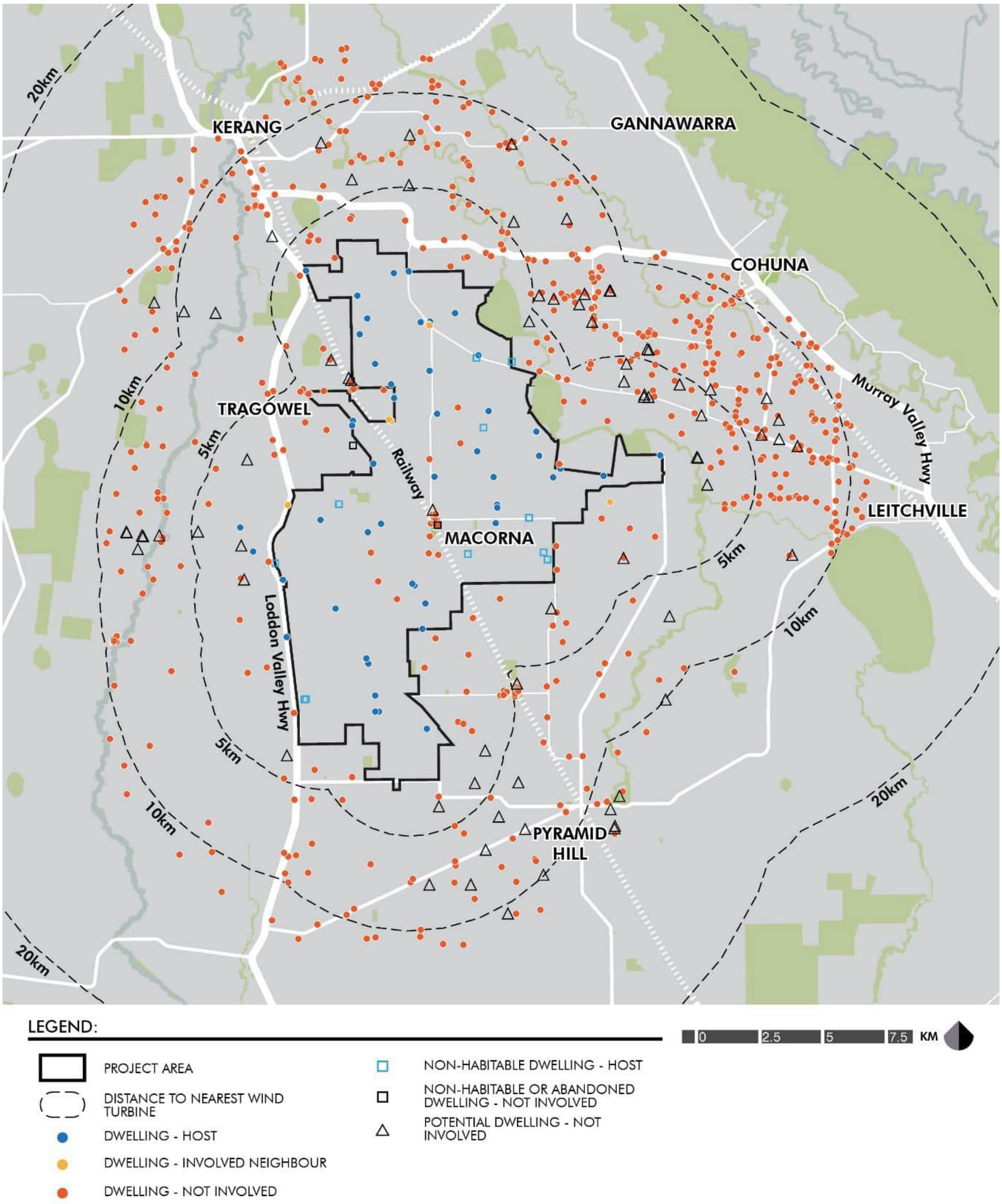

Figure 50 - Locations of involved and non-involved rural dwellings within 10km of any WTG (Note: excludes towns and townships).

Distance from Closest WTG	Number of Existing Dwellings	Number of Potential Dwelling
0 - 5km	**176**	**25**
5 and 10km	**394**	**41**
- Excludes non habitable, abandoned and involved dwellings - Excludes towns		

Table 9 - Numbers of non-involved existing and potential rural residences within the Local (5km) and Sub-Regional Setting (10km) of closest WTG.

Towns / Townships	Number of Residences	Distance From Closest WTG	Direction
Kerang/Kerang North	1,993[6]	10km	N
Pyramid Hill	186 (based on pop. of 400)	9.4km	ESE
Cohuna	1,488 (based on pop. of 3,200).	10.5km	NE
Leitchville	260 (based on pop. of 560)	12km	E

Table 10 - Township Residences within the Local, Sub-Regional and Regional Setting of the Project WTG (up to 15 km Radius).

Road	Route no.	Average daily vehicles	Length (km) within 5km proximity or less of nearest wind turbine	Length (km) between 5km and 10km proximity of the nearest wind turbine
"B" Category				
Bendigo Road	**B400**	4800	0.0	0.2
Loddon Valley Highway	**B260**	1600-2200	26.4	11.6
Murray Valley Highway	**B400**	1400	11.1	11.8
TOTAL "B" CATEGORY			**37.5**	**23.6**
"C" Category				

[6] https://profile.id.com.au/gannawarra/population?WebID=110

Road	Route no.	Average daily vehicles	Length (km) within 5km proximity or less of nearest wind turbine	Length (km) between 5km and 10km proximity of the nearest wind turbine
Barber Street	C336	660	0.0	0.8
Boort-Pyramid Road	C267	350	0.0	13.2
Cohuna-Leitchville Road	C267	750-890	0.0	6.8
Durham Ox - Pyramid	C267	350	0.0	0.5
Durham Ox Road	C267	370	0.0	0.1
Kerang-Koondrook Road	C264	1800-4800	0.0	7.5
Leitchville-Kerang Road	C257	1200	0.0	0.9
Leitchville-Kerang Road	C267	890-1200	0.0	3.9
Leitchville-Pyramid Road	C267	1000	0.0	10.4
Victoria Street	C267	370-1000	0.0	0.5
TOTAL "C" CATEGORY			8.8	44.7

Table 11 – Extent of "B" and "C" category roads within 5km and 10km of the Project Area.

Distance to nearest WTG	Kilometres of railway line
0 - 5km	25.8
5 - 10km	13.8

Table 12 - Extent of railway line within 5km and 10km of WTG.

8.3 The effect of rural residential vegetation on visual screening

In order to provide protection from the influences of the environment, particularly sun and wind, Australian rural residential gardens have traditionally developed a dense band of vegetation to surround an intimate and protected home yard. The effect of this in many instances has been to effectively contain the viewshed from the house and surrounding yard itself, screening distant views. The presence of foreground vegetation has a direct impact on the visibility of the Project and the context in which it will be viewed.

Vegetation within the landscape more distant from the residence that may provide additional screening of views is not considered at this time. However, it is considered as part of the detailed viewpoint assessment.

8.3.1 Rural residential viewpoint landscape setting typologies

Throughout the visual catchment, the majority of residences sit within a landscape that is comprised of medium to tall vegetation, with varying levels of density depending on either the extent of clearing or extent of planting.

The height and density of vegetation have a direct relationship to the visual exposure of the residence to the proposed development.

The following three setting typologies have been developed to assist the understanding of the influence of vegetation on the screening of views from residences.

The assessment has considered the overall screening effect of vegetation as it relates to the direction of views towards the Project. For example, if the vegetation at the perimeter of the residence is sparse on the side away from the direction of views to the Project and dense on the side where there may be potential views, the effect of screening vegetation reflects the side with views. The same applies for the converse situation.

8.3.1.1 Typology 1 – Minimally screened

Views to external areas are minimally to partially filtered by scattered vegetation.

Influence on visibility and potential impact
Partial to open views of the proposed development will be possible over open pasture or below and between tall, scattered trees. The potential exists for visual impact (refer to ***Figure 51***).

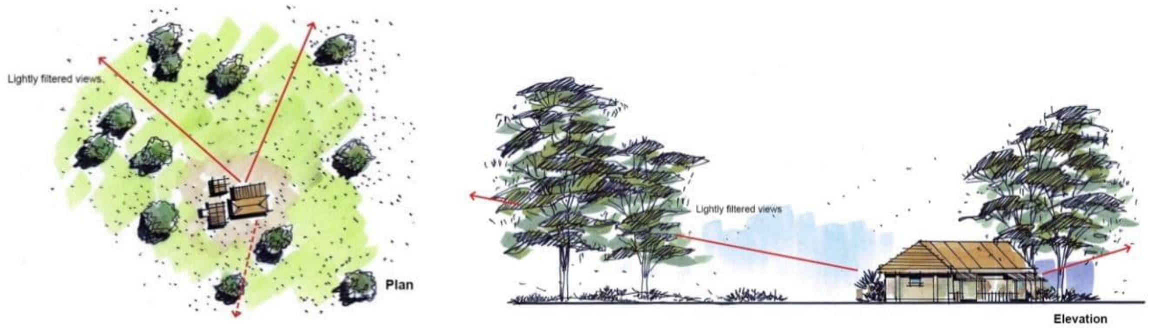

Figure 51 - Typology 1 – Minimally screened. Typical plan and elevation.

8.3.1.2 Typology 2 – Partially screened

Views to external areas are partially to heavily screened by vegetation.

Influence on visibility and potential impact
Partial to fully screened views of the proposed development will only be possible where limited breaks in vegetation occur. The potential for visual impact is significantly reduced (refer to ***Figure 52***).

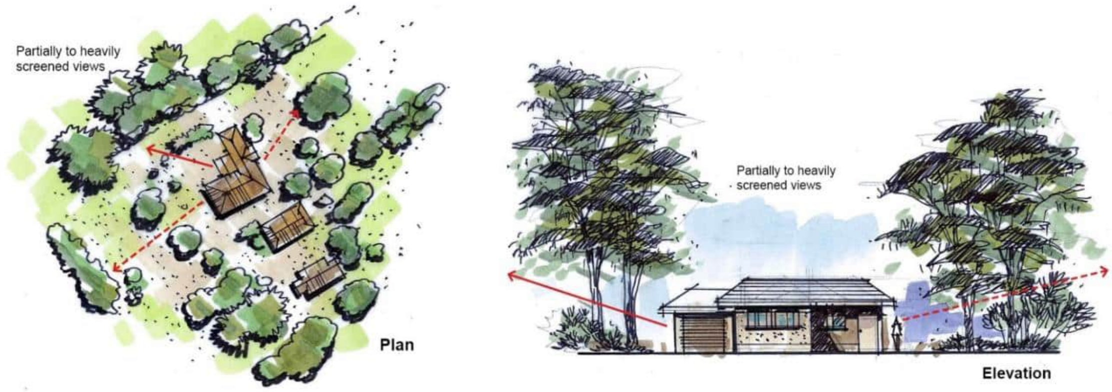

Figure 52 - Typology 2 – Partially screened. Typical plan and elevation.

8.3.1.3 Typology 3 – Heavily screened

Views to external areas heavily to fully screened by dense vegetation.

Influence on visibility and potential impact
Views of the proposed development will not be possible and therefore any impacts are highly unlikely (refer to ***Figure 53***).

Figure 53 - Typology 3 – Heavily screened. Typical plan and elevation.

8.3.2 Overview assessment of the effects of vegetation screening on views from residences

An initial assessment of the likely impact of the Project was undertaken at a desktop level, based on aerial photography and Google Streetview imagery, as well as experience from other projects as to the typical percentages of screening found through detailed assessment.

The potential degree of visibility and resulting impact on rural residences surrounding the Project, considered the following factors:

- The level of viewer sensitivity based on distance from the Project.
- Proximity to the Project:
  - Within 0-5 km and 5-10km of the Project Area boundary.
- Degree of vegetation present around the residence, either:

- Heavily screened,
- Partially screened, or
- Minimally screening.

The effects of vegetation on screening of views for residences in towns or townships have not been included in this exercise due to the existing modified landscape character of the setting, including screening from built form and fencing.

The number of existing rural residences up to 10km from the Project Area is based on ***Table 9***.

The typical percentage breakdown of the residential screening types, based on previous experience, would be:

- Minimally screened – 10%
- Partially screened – 50%
- Highly screened – 40%

The initial assessment findings for the level of potential visual impact are presented in ***Table 13.***

Visual Setting	Screening	No. of Residences	Potential Visual impact
Local (0-5 km)	Highly Screened	71	No impact to Low
	Partially Screened	57	Moderate to High
	Minimally screened	17	High
Sub-Regional (5-10km)	Highly Screened	157	No Impact to Very Low
	Partially Screened	198	Moderate
	Minimally screened	39	Moderate to High

Note: Local includes non-involved dwellings within the project
Note: The visual sensitivity levels are based on those outlined in ***Table 1***.
Note: Based on distance from any project WTG.

Table 13 - Potential visual impact for residences based on vegetation screening.

8.4 Detailed assessment of representative sensitive viewpoints

A detailed assessment of representative viewpoints has been undertaken based on the following considerations:

- viewpoints of a high or moderate level of sensitivity;
- viewpoints at varying distances within a 10km radius, where higher levels of visual prominence would potentially result in higher initial impacts;
- towns, such as Cohuna, which were on the fringe of the 10km radius;
- viewpoints with varying aspects to the Project; and
- viewpoints with varying levels of vegetation that would influence the level of visibility.

Low sensitivity settings of viewpoints have not been considered. Refer to ***Figure 54*** for the location of assessed representative viewpoints.

The assessment utilises a combination of both qualitative and qualitative approaches.

The quantitative assessment process has focussed on the Potential Visual Impact that may result on views for the most sensitive visual settings / land uses, applying the visibility method as described in ***Section 2***. The quantification of visual prominence of the vertical angle is based on the height of the tallest element of the proposed development (the blade tip).

Perceptual responses of viewers to visual change are based on proximity to the proposed development and potential visibility. Viewer perception has not been adjusted to account for general community acceptance of wind farms that may be between 60% and 70%. In all cases it is assumed that the viewer has a low level of acceptance. The assessment therefore presents a conservative or "worst case" scenario.

The presented site photos have been taken at the closest publicly accessible location adjacent to the sensitive viewpoints, the local road network. The following assessment has been prepared based on the likely view possible from the sensitive viewpoint and, therefore, takes into account the effects of screening of views to the proposed development by surrounding vegetation and farm buildings. Only representative locations with a higher level of visual sensitivity have been assessed (refer to ***Appendix A***).

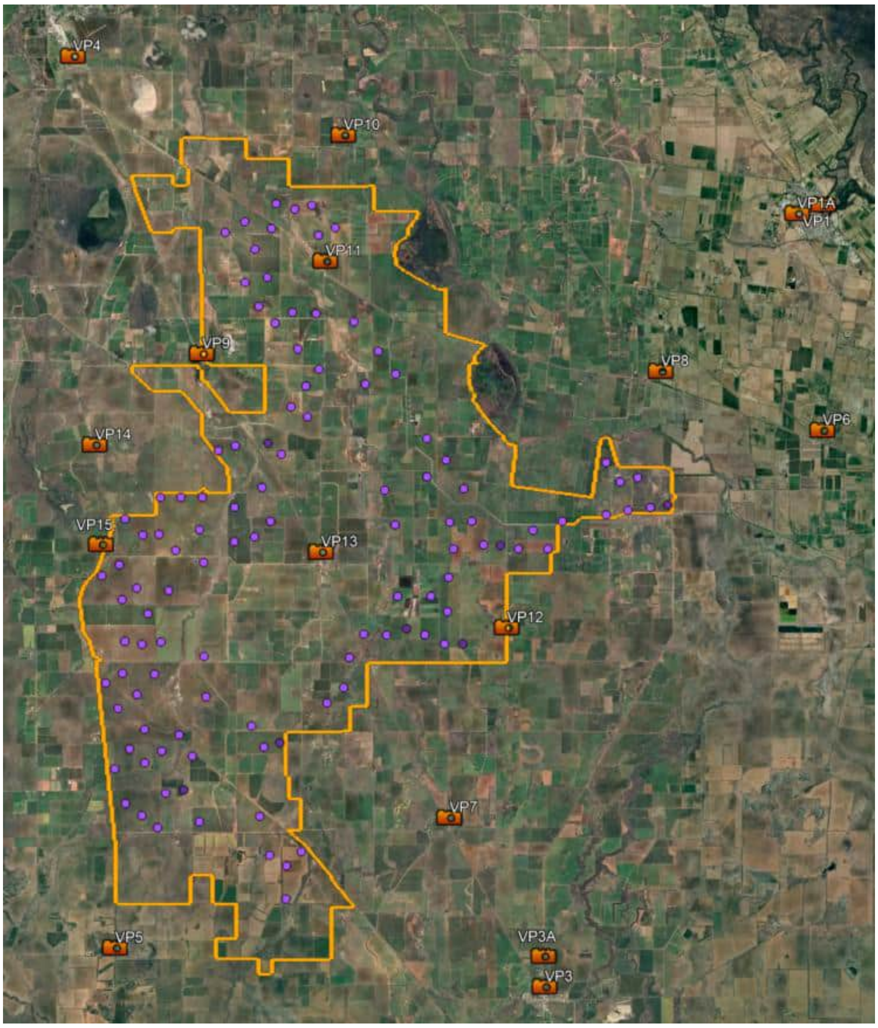

Figure 54 - Location of assessed viewpoints (VPs).

8.4.1 Photosimulations

The photosimulations have been prepared based on images captured by a full frame sensor DSLR with a 50mm lens. The 90-degree horizontal field of view shown is achieved by overlapping individual images by approximately 30 percent to minimise distortion.

The photosimulations have been prepared by inserting a 3D model of the Project into a LiDAR pointcloud surface model, which includes both topography and vegetation, to allow for accurate alignment of the photographic image with the 3D model. Photosimulations for nine viewpoints are included in the detailed representative viewpoint analysis and larger format photosimulations and wireframe verification models are included in ***Appendix B***.

For viewpoints where much of the proposed Project is likely to be screened, photo-simulations have been enhanced with a blue outline to illustrate proposed WTG that are above existing topography but screened behind existing vegetation and buildings.

8.4.2 Visual impacts

Many of the residences in the area have a dense band of vegetation surrounding an intimate and secluded garden / living area. The effect of this has been to effectively contain the viewshed from the house and surrounding living area itself, blocking more distant views. From the majority of residences, including towns and settlements, views to the Project will either not be possible or will be heavily filtered by existing vegetation.

Of the 570 residences within 10km of any WTG, 17, or 0.3% would experience a high initial impact and 96, or 17% would experience a moderate to high initial visual impact. Off-site amelioration would potentially reduce the residual impact in most instances to low.

Lightly scattered roadside vegetation along the Loddon Valley and Murray Valley Highways reduces the level of visibility of road users. However, given the Project would be located between approximately 500m and 1.2km from the Loddon Valley Highway for a distance of approximately 10km, which at 100kmh would be traversed in approximately 6 minutes, considering the relative lack of screening by vegetation a high initial visual impact would result.

For “C” category roads, the Project has been assessed as mostly having a moderate to high initial visual impact within 2.5km, reducing to low to moderate in distances between 2.5km and 5km.

A summary of all viewpoints assessed in detail is shown in ***Table 14***.

Viewpoint (VP)#	Distance from Project	Visual Sensitivity	Potential Visual Prominence	Visual Modification Level	Potential Impact	Residual Impact
VP 1 – Cohuna Town Centre	11.2km	L	H	NV	NV	NV
VP 1A – Cohuna Residential Fringe	10.4km	VL - L	H	VL	VL	VL
VP 2 – Kerang Town Centre	11.2km	L	H	NV	NV	NV
VP 3 – Pyramid Hill Town Centre	9.6km	M	H	NV	NV	NV
VP 3A – Pyramid Hill Residential Fringe	9.3km	M	H	L - VL	L	L
VP 4 – Intersection Murray Valley Hwy & Loddon Valley Hwy	7.7km	L	H	M - H	M	M
VP 5 – Intersection Loddon Valley Hwy & Gladfield Rd	4.8m	M	H	M - H	M - H	M - H
VP 6 – Rural Residences - Leitchville-Kerang Rd & Cohuna-Leitchville Rd	5.9m	H	H	NV - M	NV - H	VL - L
VP 7 – Mincha	5.2km	H	H	NV - L	NV - M	VL - L
VP 8 – McMillans	3.4km	H	H	NV - M	NV - H	VL - L
VP 9 – Tragowel	2.8km	H	H	NV - M	NV - H	VL - L
VP 10 – Rural Residences - Murray Valley Hwy	2.2km	H	H	NV - M	NV - H	VL - L
VP 11 – Rural Residences – Leitchville-Kerang Rd	1.3km	H	H	VL - M	L - H	VL - L
VP12 – Rural Residences – Macorna-Pyramid Rd	1.5km	H	H	VL - M	L - H	VL - L
VP13 – Macorna	2.2km	H	H	VL - M	L - H	VL - L
VP14 – Rural Residences - Loddon Valley Hwy	2.4km	H	H	L - M	M - H	VL - L
VP15 – Loddon Valley Hwy	690m	M	H	H	H	H

Note: Where a range of values is given, the colour rating represents the higher level.

H	High	M	Moderate	L	Low	VL	Very Low	NV	Not Visible

Table 14 – Summary of detailed viewpoint visual impact assessment.

8.4.3 Landscape character impacts

The Project will change the landscape of the setting at the local, sub regional and, to a lesser extent, the regional level.

The landscape character of the broader setting exhibits a range of scenic qualities from low to moderate, with the Project area occurring predominately within a landscape characterized by broad, cleared agricultural plains with few topographic variations, which is assessed as having a low level of scenic quality.

The towns and settlements are generally classified as being of moderate scenic quality due to their urban character, particularly those areas with historic built form and mature vegetation.

8.4.4 Visual impact of associated infrastructure

Given the BESS facilities have a small footprint and are typically in the order of 3m to 4m maximum height, with the associated sub/switching stations and transmission lines having isolated elements up to approximately 8m to 12m in height, the potential visual prominence will be of a lower order. The potentially noticeable threshold distance for vertical visual prominence is for angles to be less than 2.5°. At 4m in height, the BESS components will be less than 2.5° at distances more than 90m.

The low profile of the components ensures that onsite mitigation will be highly effective in significantly reducing any initial visual impacts in a relatively short period of time.

The siting of the BESS and associated facilities away from non-involved residences and higher category roads, results in low initial visual impacts. The closest non-involved residence is more than 2km from any BESS/substation. Recent experience has indicated that at this distance, the initial visual impact prior to amelioration would be low.

The underground powerlines connecting WTGs will only result in short term impacts to the surface ground cover.

8.5 Cumulative Visual Impact

The landscape and visual impact of the Project cannot be considered in isolation, as the Project Area is located within a regional setting that includes a number of projects of varying scale and type that are either currently under construction, or approved projects that may commence construction in the near future.

Two types of cumulative impact have been assessed. These are:

- Simultaneous cumulative impact refers to occurrences where an impact may result from a number of potential visual intrusions being visible from an individual location at the one time; and
- sequential cumulative impact refers to occurrences when the viewer has to move to another viewpoint to see different developments or projects. Sequential cumulative impacts most typically apply to road users as they traverse the landscape along major roads.

Within the broader setting, three wind energy projects have been identified to the northwest of the Project.

8.5.1 Precedents for assessment of cumulative impact

With regard to the assessment of cumulative impact, Scottish National Heritage (2005) identified what it considered was appropriate to include in the assessment of cumulative impact. This included existing projects, projects being built, projects approved and projects going through the planning and positioning phase. Other United Kingdom jurisdictions often rely on this report as the starting point for their assessments. North American jurisdictions also follow similar approaches.

In the definition of what projects are included in a cumulative impact assessment, the question of 'reasonable foreseeable future actions' should be considered in defining which projects are included in the cumulative impact assessment. That is, some approved projects could be shown to have little or no prospect of being developed and could be excluded from the assessment process.

8.5.2 Projects/proposals for consideration

Adjacent operating, approved or lodged projects within the wider region surrounding the Project Area are shown in ***Figure 55*** and ***Table 15***.

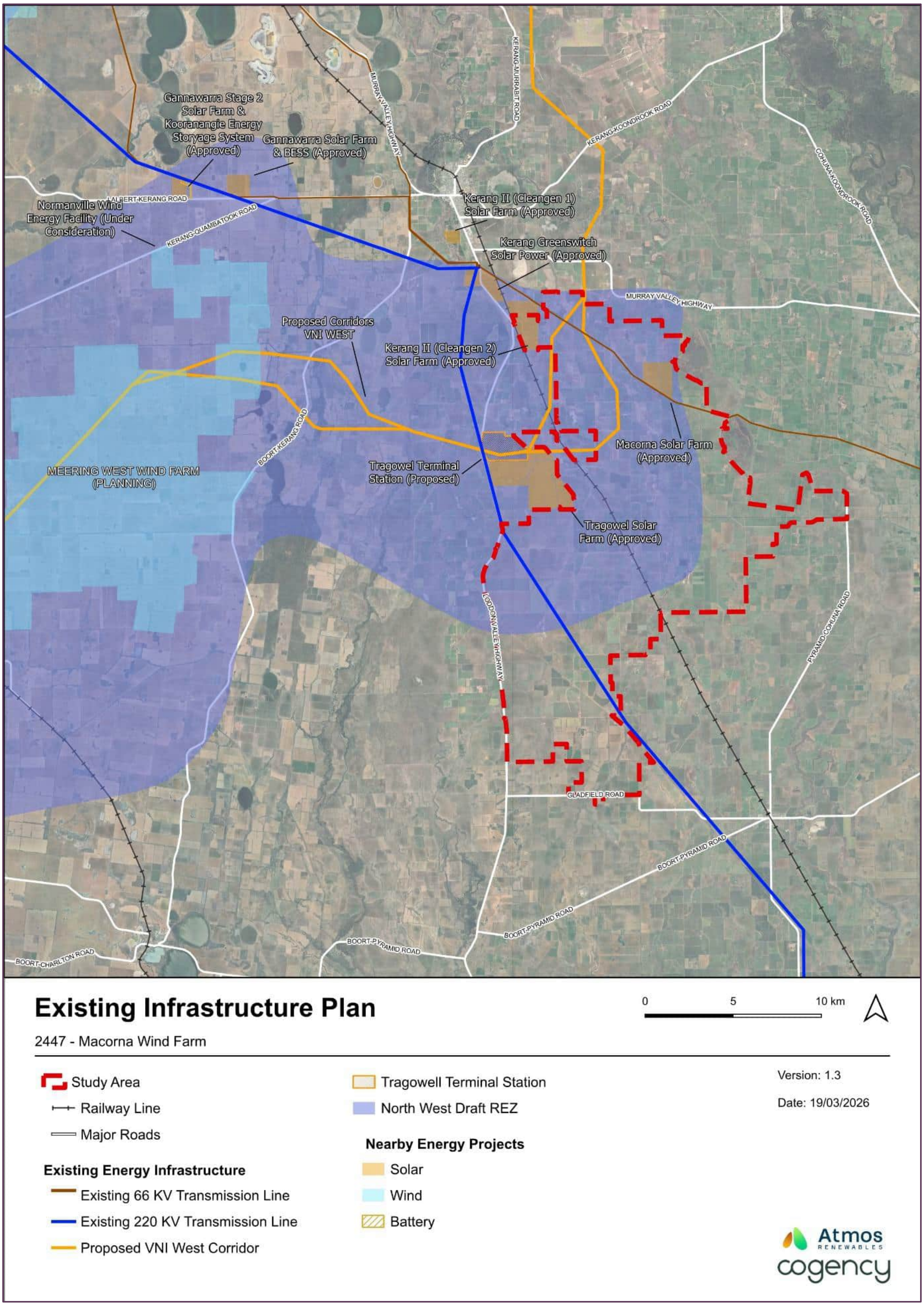

Figure 55 – Renewable energy and transmission projects - operating, approved and subject to approvals process (Source: Cogency*).*

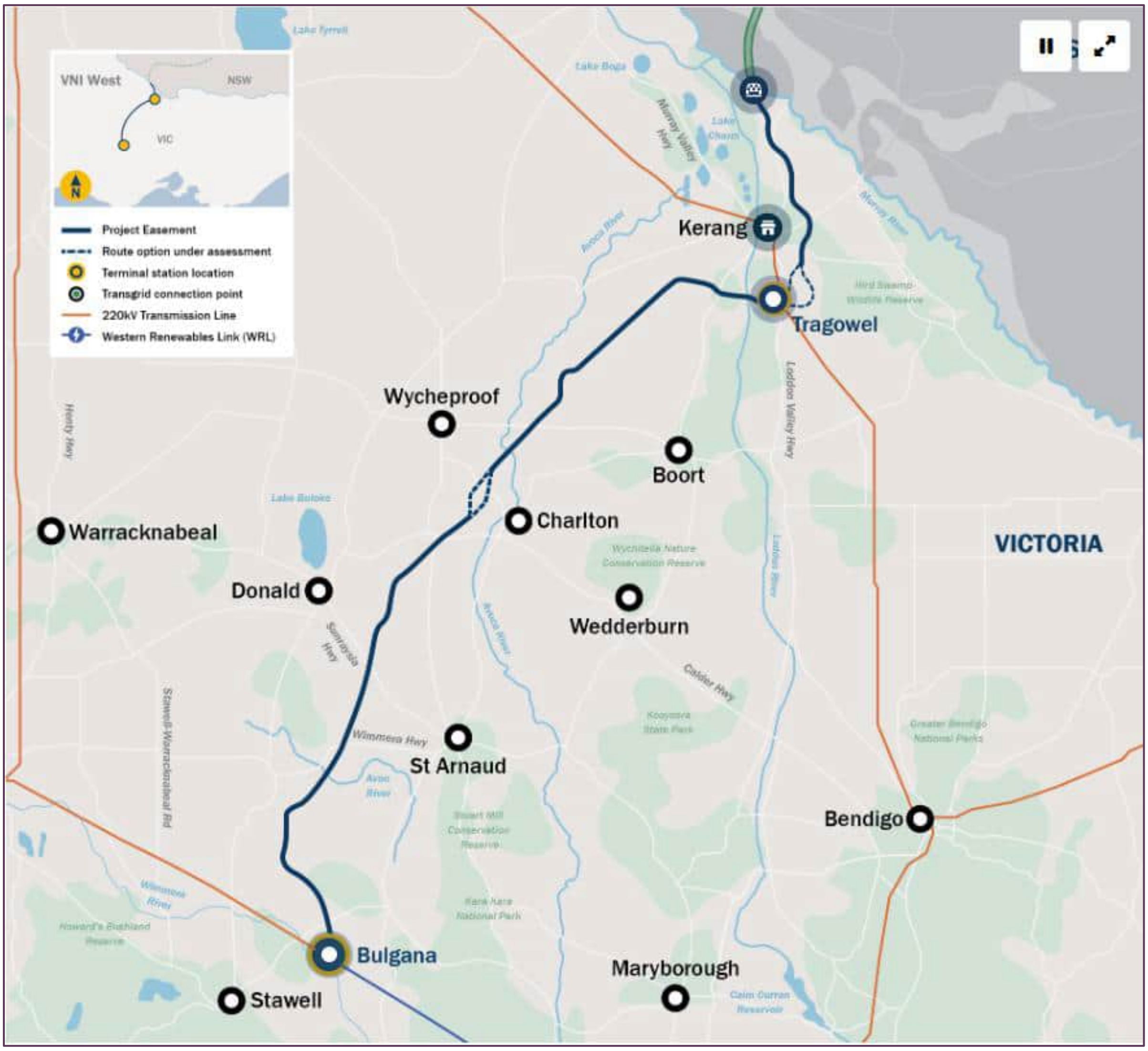

Figure 56 – Location of VNI West (Source: https://vniwproject.com.au/).

Table 15 - Operating approved and proposed projects in the broader region.

Project	Status	Area (ha)	Distance and direction (from closet Project WTG)
Cannie Wind Farm	EES required - Scoping requirements finalised	14,000 (174 WTG to 280m	34 km NW
Meering West Wind Farm	Permit application lodged and process underway	20,000 (164 WTG up to 300m	15 km WNW
Normanville Energy Park (Wind Farm)	Permit application lodged and process underway	1,933 (17 WTG up to 280m)	17 km WNW
VNI West (Powerline)	EES required - Scoping requirements finalised	Approx 70m wide and 240km long	Traverses the site
Gannawarra Solar Farm	Operating	132	20 km NW
Gannawarra Stage 2 Solar Farm	Approved	Unknown	23 km NW
Kerang Cleangen 1 Solar Farm	Approved	220	6.5 km NW
Kerang Cleangen 2 Solar Farm	Approved	Unknown	1.8 km NNW
Kerang Greenswitch Solar Power	Operational	64	5.3 km NW
Tragowel Solar Farm	Approved	1,002	0.1 km W
Macorna Solar Farm	Approved	Unknown	1 km NE
Cohuna Solar Farm	Operating	82	5 km E
Prairie Solar Farm	Approved	950	25 km SSE
Charlton Solar Farm	Approved	Unknown	57 km SW
Gannawarra BESS	Operating	Part of Solar Farm	20 km NW
Koorangie Energy Storage System	Under construction	2.5	23 km NW

8.5.3 Visual prominence and distance

Cumulative impact is based on the potential visibility of a number of projects and, in the case of the typically flat landscape character type of the Project and broader region, is particularly related to the level of vertical visual prominence (refer to ***Section 2.2***).

The typical heights of identified projects are outlined in Table 16, including the threshold distance at which they would transition from being potentially visually dominant to potentially noticeable, based on them occupying less than 2.5° of the vertical field of view.

Table 16 - Vertical visual prominence of lodged, approved and operating projects.

Project type	Typical height of components	Potentially noticeable threshold distance - vertical visual prominence <2.5°
Solar farms and BESS	3 - 4m	90m
Wind farms	250m (to blade tip)	5,500m
HV powerlines	50m	1,150m

8.5.4 Simultaneous cumulative impact

Simultaneous cumulative impact refers to occurrences where an impact may result from a number of potential visual intrusions being visible from an individual location at the one time.

8.5.4.1 Towns and settlements

Kerang is the only town that could be potentially subject to simultaneous cumulative impacts. However, its residential fringe is located:

- ~2km from the VNI West alignment;
- 9km from the Project;
- 10km from Normanville Energy Hub/wind farm;
- 14km from Meering West Wind farm; and
- 24km from Cannie Wind Farm.

While the three other projects are located in a rough group to the west of Kerang, the Project is located to the south southeast.

Settlements that may experience simultaneous cumulative include:

- Dingwall – 13km from the Project, 21km from Cannie West WF, 4km from Meering WF and 7km from Normanville Energy Hub.
- Lake Charm - 28km from the Project, 11km from Cannie West WF, 18km from Meering WF and 18km from Normanville Energy Hub.

However, given the significant distances involved, and the lower levels of visual sensitivity for distances beyond 7.5km, the anticipated cumulative visual impacts are expected to be low.

8.5.4.2 Rural residences

At the closest point, the Project and the Meering West Wind Farm are located approximately 15km apart. This results in there only being three rural residences that would be located within the highest sensitivity zone (7.5km) of both projects (refer to ***Figure 57***).

The height of the VNI West pylons is such that only residences within 1,150m of its alignment, within 5.7km of the Project WTGs and approximately 5.5km of any other WTG would experience higher level cumulative impacts.

8.5.5 Sequential cumulative impact

Sequential cumulative impact refers to occurrences when the viewer has to move to another viewpoint to see different development activities. Sequential cumulative impacts most typically apply to road users as they traverse the landscape along major roads.

“B” category roads include:

- B400 - Murray Valley Highway.
- B260 - Loddon Valley Highway.

“C” category roads include:

- C336 - Bendigo-Pyramid Road, Mitiamo - Kerang Road.
- C257 - Leitchville-Kerang Road.

- C262 - Kerang-Quambatook Road.
- C263 - Kerang-Murrabit Road.
- C264 - Kerang-Koondrook Road.
- C266 - Boort-Kerang Road.
- C267 - Leitchville-Pyramid Road, Boort-Pyramid Road, Leitchville-Kerang Road, Cohuna-Leitchville Road, Cohuna - McMillans Road.

In all instances, the visual sensitivity of users of B and C class roads is moderate, with sensitivity reducing with distance. Additionally, the roads in the area, outside of the towns, are traversed at 100kmh.

The most potentially impacted route from a sequential impact perspective, which includes the project, is the north-south journey along the B260 - Loddon Valley Highway.

At the closest point, the Project and the Meering West Wind Farm are located approximately 15km apart (refer to ***Figure 57***). The B260 would be approximately 14km from the Meering West Wind Farm at its closest point, with the distance being such that the level of visual sensitivity of users would be very low. Therefore, anticipated sequential cumulative impact for the B260 would be very low to low.

Given the relatively low level of visibility of solar farms and BESS projects in the region as a result of their small footprint and limited height, the only elements likely to result in cumulative impacts are the wind farms and the VNI West.

Only roads within 1,150m of the VNI West alignment and within 5.7km of the Project WTGs would experience higher level cumulative impacts.

However, given the spacing between other wind farms projects and the Project, and the associated low levels of visual sensitivity, the cumulative impacts are expected to be low.

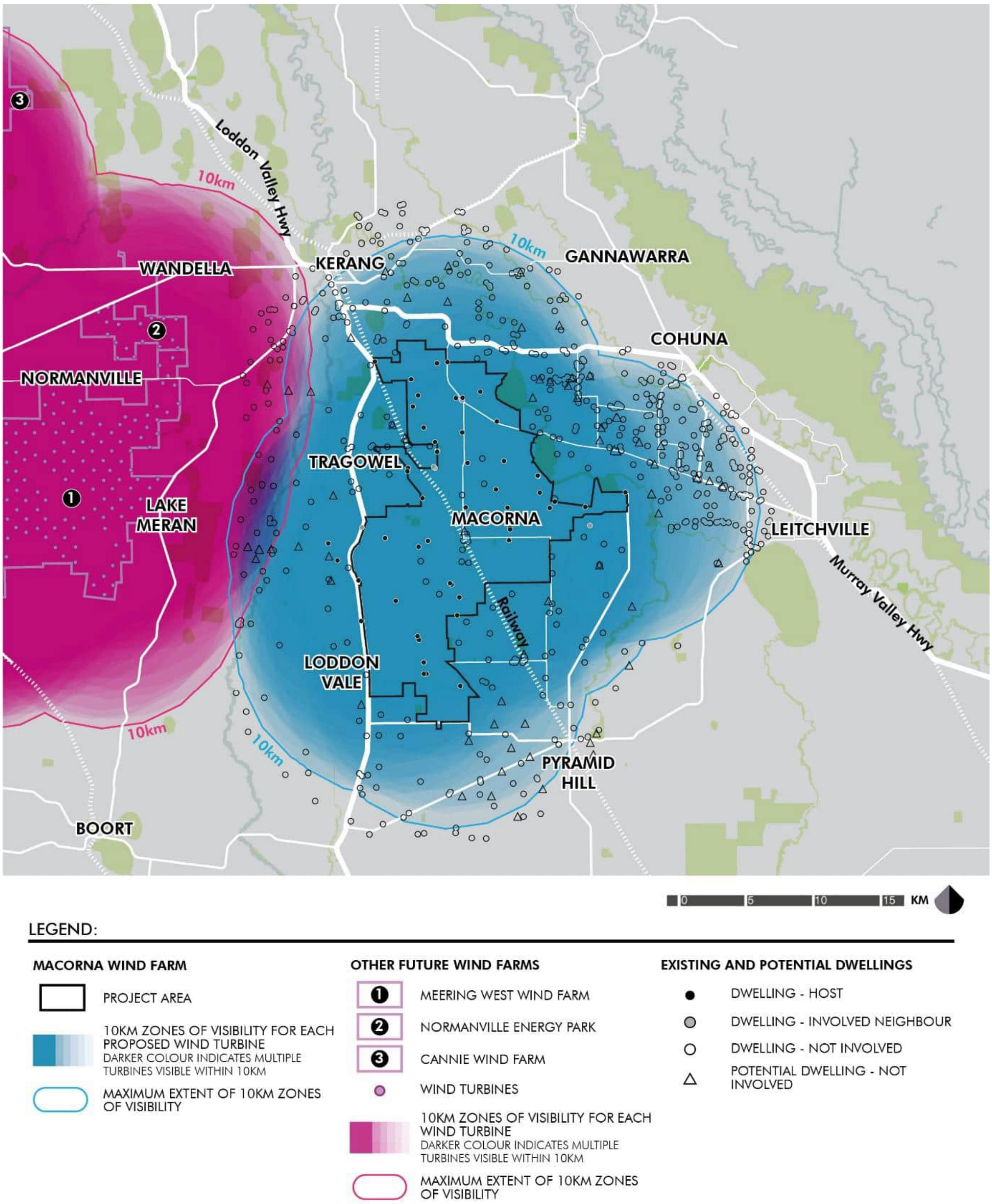

Figure 57 – Cumulative impact – the Project and adjacent approved wind farms – 10km from any WTG.

8.6 Lighting impacts

The applicable environmental lighting zone, based on AS-NZS-4282-2023 for the Project Area and broader setting with dispersed rural dwellings, is Category A3, which is a low district lighting area, which is applicable to rural residential areas and areas with secondary and local roads.

The environmental lighting zone of Kerang, Cohuna and Pyramid Hill is Category A2, medium district lighting area.

It is likely that the batteries and substations, which are located more than 1km from any non-involved residence, will require security lighting. However, typically this will be shielded and directional. As a result, hot spots and light spill are likely to be minimised.

The need for aviation lighting is yet to be determined but would only result in dispersed points of lighting without any glow.

9 AMELIORATION STRATEGIES

Actions exist to potentially ameliorate the landscape and visual impacts of the Project. These are outlined in the following sections.
The WTG will have a uniform design, rotational direction and speed, colour, height and rotor diameter to assist in achieving visual consistency throughout the wind farm. Visual uniformity assists in developing harmony between the landscape and the WTG.

9.1 On-site actions

On-site actions relate to initiatives which can be undertaken within the boundaries of the Project Area (refer to ***Table 17***).

9.1.1 Project design and layout

Arranging the non-WTG components of the Project so that they respond to sensitive, visually exposed interfaces, is a proactive measure to reduce visual impacts from the outset and lessen the reliance on amelioration measures. During the design process, a number of WTGs were relocated or removed to reduce the potential impacts on views from residences and other sensitive areas, where possible.

Siting has minimised the removal of existing vegetation and has also utilised existing vegetation where possible to mitigate views from sensitive locations.

The placing and size of wind farms is very important in terms of the impact created on the landscape. Fewer and more widely spaced WTGs present a more pleasing appearance than tightly packed arrays. The spacing of the Project WTGs is generally regular to give a consistent and repetitive pattern.

The undergrounding of internal powerlines reduces localised visual impacts, with trenching and backfilling resulting in short term impacts only.

9.1.2 Perimeter screen planting

The most effective way to ameliorate views from high sensitivity viewpoints is to establish screen planting around the perimeter of the non-WTG components where existing vegetation is lacking. The proposed screen planting should comprise perimeters of varying densities, utilising a mixture of:

- shrubs to 2m in height;
- tall shrubs to 4m in height; and
- trees ranging in height from 6m-12m in height.

The relatively low-profile form of the BESS component of the Project will ensure that planting will be able to provide screening within a relatively short period of time.

Being taller elements, it will take longer for planting to ameliorate the impacts of the sub/switching stations, however they can still be successfully ameliorated by perimeter planting.

9.1.3 Material selection

A light grey or off-white non-reflective colour works best for WTGs in temperate climates, where sky is the dominant background, and blades, nacelle and tower should all appear the same colour, so the wind turbine appears visually balanced.

The BESS units and buildings that result in an aggregated visual mass should be ameliorated through the use of a non-reflective finish of a natural or neutral colour, as found in the landscape of the setting.

The more slender and articulated form of the components of the switching substation do not require amelioration through the use of non-standard colours, as the standard “grey” finish is visually recessive against sky backdrops and is readily integrated though the use of only tall, sparse planting (refer to ***Figure 58***).

9.1.4 Lighting

Security lighting throughout the wind farm and the BESS/substations should be minimised to decrease the contrast with the night - time landscape of the area. Motion detectors should be used to activate night - time security lighting when required.

Air navigation lights are not likely to required given the distance of the project from airfields.

9.1.5 Reflection / Glinting

Glinting of the blades may occur when the sun reflects off them, depending on sun angle and viewing location. Glinting is significantly reduced when non - reflective paints are used. The connection points between the blades and the hubs can also potentially glint and these should be finished with non – reflective paint also.

9.2 Off-site actions

In areas of high visual sensitivity, such as close to residences and other areas where amelioration of views to the wind farm may be required, planting may be able to be implemented close to the viewer location. Planting should be placed between the viewing location and the source of intrusion, to achieve effective screening. Planting to screen views of the wind farm should attempt to avoid impeding the existing views to the broader landscape, as this action in itself may result in a visual impact or negative change in views from a sensitive viewpoint. It should be recognised that given the scale, particularly the height of wind generators, that visual screening within a setting is most effective when the screening is close to viewing points. Typically, off-site amelioration would be offered to residences with an assessed moderate to high initial visual impact (refer to ***Table 17***).

Table 17 – Recommended amelioration/mitigation measure for inclusion within a Project EMP.

Mitigation Measure	Relevant Work Area	Phase
Offsite landscape screening Soft landscape works (tree and shrub planting) will be installed at non-involved dwellings within 7.5km of WTG where the Project would result in Moderate - High to High visual effects. Landscape works will aim to filter or screen views toward WTG. The landscaping works will consider any zone and/or overlay planning requirements (including requirements of any Bushfire Management Overlay where applicable). The implementation of landscaping works will be based on a reasonable and feasible approach to provide substantive screening of WTG, and to offer property owners the opportunity to opt in, or out of landscaping mitigation works to cater for individual visual mitigation preferences. Off-site landscape works will be facilitated through an off-site landscaping program, which will be prepared as part of the EMF. The off-site landscaping program will:	All areas	Design

Mitigation Measure	Relevant Work Area	Phase
• Include a methodology for determining: • The type of landscaping treatments to be proposed • A timetable for establishing and maintaining the landscaping for at least two years. • Include a process for making offers to affected landowners to undertake landscaping on the landowner's land. • Include a process for recording: - Offers that have been made to landowners - Whether or not the offers are accepted - When and how offers are actioned following acceptance. - Include a process for the preparation and provision of progress reports regarding the implementation of the off-site landscaping program to be provided to the responsible authority. The off-site landscaping program: • Must be implemented to the satisfaction of the responsible authority • Must not be altered or modified without the written consent of the responsible authority.		
On-site landscaping plan Development of an on-site landscaping plan to screen substations, buildings and lower infrastructure, as well as BESS facilities and associated substations This plan would include details of plant species to be used, and a maintenance and monitoring program.	All area	Design
Infrastructure design and materials Electrical infrastructure, and associated buildings and structures would be designed to have non-reflecting surface finishes and appropriate colour finishes that considers the existing visual backdrops.	All areas	Design
Lighting Permanent project lighting associated with the operations and management facility and terminal station, BESS facilities and associated substations and temporary lighting associated with construction areas is to be installed in accordance with Australian Standard AS 4282: Control of the obtrusive effects of outdoor lighting. These measures include: • ensuring lighting is baffled and directed to the ground • installing motion-trigger mechanisms to reduce the duration of lighting. • installing perimeter landscaping to intervene in views to lighting from identified sensitive receptors (residential dwellings).	All areas	Construction Operation
Non-reflective coating All wind turbine blades must be coated with a non-reflective finish to avoid possible effects of blade glint on surround dwellings in accordance with the Victorian Department of Transport and Planning *Policy and Planning Guidelines for the Development of Wind Energy Facilities in Victoria*, and to the satisfaction of the responsible authority.	Wind farm site	Design

Figure 58 - Example of canopy vegetation providing visual integration of substation infrastructure.

10 CONCLUSION

10.1 Perceptions of change

Whilst the degree to which a development the scale of the Project is visible from certain vantage points can be quantified, the degree to which the viewers will be impacted is influenced by an individual's perceptions of what change will bring.

A study by Lothian (2008) of perceptions of scenic quality and the influence of infrastructure found that, in agricultural landscapes with the attributes of lower scenic quality, wind farms had the effect of increasing the level of scenic quality as perceived by the viewer, as they added an element of visual interest to the otherwise relatively featureless landscape setting. This finding should be considered when evaluating viewer sensitivity as it would have the effect of reducing the level of sensitivity.

A survey by Lothian (2019) found that where the presence of wind farms did impact the scenic quality of the landscapes in which they were located, the visual impact was acceptable in all but one location. Based on recent experience, the findings of both the 2008 and 2019 studies are considered to be relevant.

10.2 Landscape and visual impact

The Project will change the landscape of the setting at the local, sub regional and, to a lesser extent, the regional level.

The landscape character of the broader setting exhibits a range of scenic qualities from low to moderate, with the Project area occurring predominately within a landscape characterized by broad, cleared agricultural plains with few topographic variations, which is assessed as having a low level of scenic quality.

The towns and settlements are generally classified as being of moderate scenic quality due to their urban character, particularly those areas with historic built form and mature vegetation.

Many of the residences in the area have a dense band of vegetation surrounding an intimate and secluded garden / living area. The effect of this has been to effectively contain the viewshed from the house and surrounding living area itself, blocking more distant views. From the majority of residences, including towns and settlements, views to the Project will either not be possible or will be heavily filtered by existing vegetation.

Of the 570 residences within 10km of any WTG, 17, or 0.3% would experience a high initial impact and 96, or 17% would experience a moderate to high initial visual impact. Off-site amelioration would potentially reduce the residual impact in most instances to low.

Lightly scattered roadside vegetation along the Loddon Valley and Murray Valley Highways reduces the level of visibility of road users. However, given the Project would be located between approximately 500m and 1.2km from the Loddon Valley Highway for a distance of approximately 10km, which at 100kmh would be traversed in approximately 6 minutes, considering the relative lack of screening by vegetation a high initial visual impact would result.

For "C" category roads, the Project has been assessed as mostly having a moderate to high initial visual impact within 2.5km, reducing to low to moderate in distances between 2.5km and 5km.

10.2.1 Visual impact of BESS facilities

Given the BESS facilities have a small footprint and are typically in the order of 3m to 4m maximum height, with the associated sub/switching stations having isolated elements up to approximately 8m in height, the potential visual prominence will be of a lower order. The potentially noticeable threshold distance for vertical visual prominence is for angles to be less than 2.5°. At 4m in height, the BESS components will be less than 2.5° at distances more than 90m.

The low profile of the components ensures that onsite mitigation will be highly effective in significantly reducing any initial visual impacts in a relatively short period of time.

The siting of the BESS facilities away from residences and higher category roads results in low initial visual impacts. The closest non-involved residence is more than 2km from any BESS/substation. Recent experience has indicated that at this distance, the initial visual impact prior to amelioration would be low.

The underground powerlines connecting WTGs will only result in short term impacts to the surface ground cover.

10.2.2 Lighting impacts

The applicable environmental lighting zone, based on AS-NZS-4282-2023 for the Project Area and broader setting with dispersed rural dwellings, is Category A3, which is a low district lighting area, which is applicable to rural residential areas and areas with secondary and local roads.

The environmental lighting zone of Kerang, Cohuna and Pyramid Hill is Category A2, medium district lighting area.

It is likely that the batteries and substation will require security lighting. However, typically this will be shielded and directional. As a result, hot spots and light spill are likely to be minimised.

The need for aviation lighting is yet to be determined but would only result in dispersed points of lighting without any glow.

10.2.3 Cumulative impact

10.2.3.1 Simultaneous cumulative impact

10.2.3.1.1 Towns and settlements

Kerang is the only town that could be potentially subject to simultaneous cumulative impacts. However, its residential fringe is located 9km from the Project and 10km from the closest approved project, the Normanville Energy Hub/wind farm.

Settlements that may experience simultaneous cumulative impacts include Dingwall and Lake Charm. However, these are at their closest 13km from the Project and 4km from the Meering Wind Farm.

10.2.3.1.2 Rural residences

At their closest point, the Project and the Meering West Wind Farm are located approximately 15km apart. This results in there only being a relatively small number of rural residences that would be located within the highest sensitivity zone (7.5km) of both projects.

10.2.3.2 Sequential cumulative impact

Sequential cumulative impacts most typically apply to road users as they traverse the landscape along “B” and “C” category roads. Of note are the B400 - Murray Valley Highway and B260 - Loddon Valley Highway.

The visual sensitivity of users of B and C category roads is moderate, with sensitivity reducing with distance. Additionally, the roads in the area, outside of the towns and settlements, are traversed at 100kmh, reducing the exposure time to any project.

The most potentially impacted route is the north-south journey along the B260 - Loddon Valley Highway. At their closest point, the Project and the Meering West Wind Farm are located approximately 15km apart. The B260 would be approximately 14km from the Meering West Wind Farm at its closest point. However, at this distance the level of visual sensitivity of users would be very low. Therefore, the anticipated sequential cumulative impact for the B260 would be very low to low.

10.3 Effectiveness of amelioration measures

The amelioration measures incorporated into the design process, such as the design of access tracks to ensure minimisation of track length, in conjunction with recommended actions such as screen planting at sensitive residential viewpoints and around substations, will have a positive effect on reducing the visual impact of the proposed wind farm, particularly sensitive static viewpoints such as residences lacking screening provided by existing vegetation.

Appendix A – Detailed representative viewpoint assessment.

VIEWPOINTS 1 and 1A – COHUNA TOWN CENTRE and RESIDENTIAL FRINGE	
Photo Location	VP1 – Corner of King George St (B400) and Cohuna Island Rd. VP1A – Corner of Sampson St and Cohuna Leitchville Rd (C267). (refer to ***Figure 59*** and ***Figure 60***).
Coordinates Easting / Northing	VP1 - 35°48'35.17"S / 144°13'22.11"E VP1A - 35°48'45.08"S / 144°12'45.67"E
Viewing Distance	VP1 – 11.2km to WTG no. 32. VP1A – 10.4km to WTG no. 32.
Visual Setting	Regional
Landscape Character	As the Project is not visible from VP1, this assessment focusses on VP1A. Cohuna's urban setting is comprised of generally older, single and double storey buildings and a scattered tree cover of exotic evergreen, deciduous and native trees (refer to ***Figure 61***). Views from the main streets of the town centre to the project are fully screened by buildings and canopy vegetation (refer to ***Figure 62***). The town's urban centre is surrounded by the residential area which, at its outer fringe, has rear fences backing onto the surrounding rural land. Vegetation is located within rear yards as well as the adjacent external area (refer to ***Figure 63***).
Landscape Unit / Scenic Quality	Rural township area – Moderate scenic quality. Murray Basin Plains (type a) – Northern District Plains Subtype - Low scenic quality.
Residential Viewpoint Landscape Setting Typology	Partially screened.
Duration of View and Frequency of View	**Roadway:** - Duration: Moving. - Frequency: Moderate. **Residential:** - Duration: Static. - Frequency: Low.
Visual Land use type	"C" category Road Residential area.
Visual Sensitivity	**Roadway** – Very Low based on distance greater than 10km. **Residential area** – Low based on distance greater than 10km.
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 56 deg - Potentially Dominant (H). **Vertical angle (max) –** 0.9 deg - Potentially Noticeable (M). **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**VERY LOW –** Based on vegetation screening in the landscape.
Potential Visual Impact (accounting for existing vegetation and built-form)	**VERY LOW -** Given the distance from the Project, the minimal topographic variation that prevents overlooking, and the scattered vegetation along the township perimeter as well as the intervening landscape that provides screening, views to the Project would be unlikely. A very low potential visual impact would result (refer to ***Figure 64***, ***Figure 65*** and ***Figure 66***).
Proposed Amelioration	**None Required** – Amelioration is not required to mitigate views from this viewpoint.
Residual Impact	**VERY LOW -** The residual visual impact would remain very low.

Figure 59 – VP1 and VP1A location

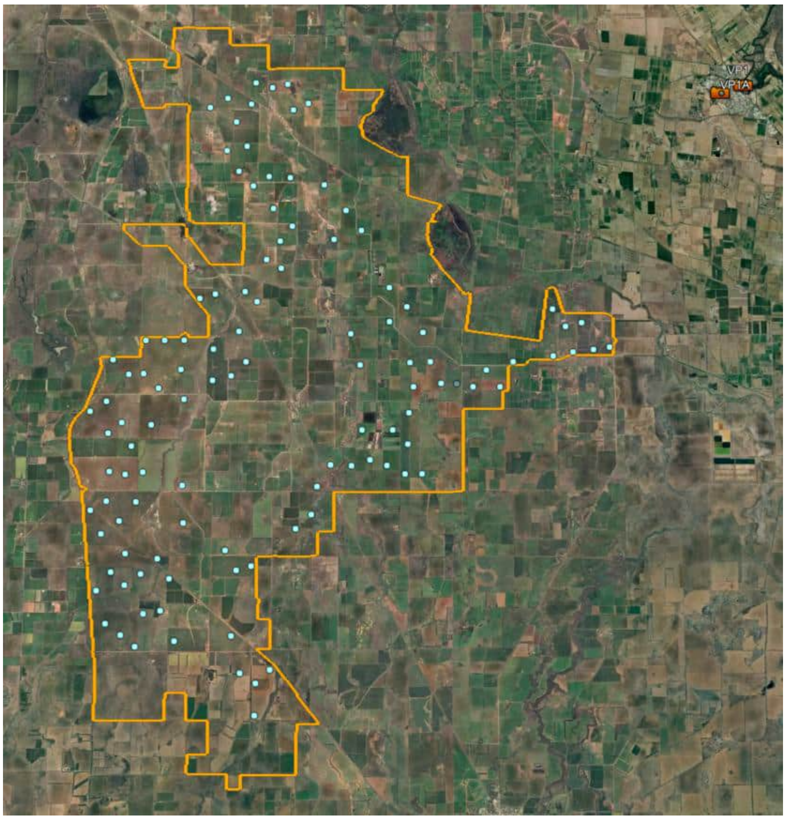

Figure 60 – VP1 and VP1A location in relation to Project.

Figure 61 – VP1 – Landscape setting.

Figure 62 – VP1 – View towards Project Area.

Figure 63 - VP1A – Landscape setting.

Figure 64 - VP1A – Existing view towards Project Area.

Figure 65 – VP1A – Photosimulation view towards Project.

Figure 66 – VP1A - 3D wireframe model overlay of view towards the Project.

VIEWPOINT 2 – KERANG TOWN CENTRE	
Photo Location	Victoria St, 150m north of Kerang-Koondrook Rd (refer to ***Figure 67*** and ***Figure 68***)
Coordinates Easting / Northing	35°44'1.45"S / 143°55'13.01"E
Viewing Distance	11.2km to WTG no. 7.
Visual Setting	Regional
Landscape Character	Rural town urban setting with generally older, single and double storey buildings and relatively dense tree cover of exotic evergreen, deciduous and native trees (refer to ***Figure 69***). Views from the main streets of the town centre to the project are fully screened by buildings and canopy vegetation (refer to ***Figure 70***).
Landscape Unit / Scenic Quality	Rural township area – Moderate scenic quality.
Residential Viewpoint Landscape Setting Typology	N/A urban area.
Duration of View and Frequency of View	Duration: Static and moving. Frequency: Moderate to high.
Visual Land use type	Township/Urban area.
Visual Sensitivity	Low – based on distance greater than 10km.
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 44 deg - Potentially Dominant (H). **Vertical angle (max) –** 0.85 deg - Potentially Noticeable (M). **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**NOT VISIBLE -** Based on built form and vegetation screening in the landscape.
Potential Visual Impact (accounting for existing vegetation and built-form)	**NO IMPACT -** As the Project will not be visible from the central part of the town, there will be no visual impact.
Proposed Amelioration	**None Required** – Amelioration is not required to mitigate views from this viewpoint.
Residual Impact	**NO IMPACT** – As the Project will not be visible from the central part of the town, there will be no visual impact.

Figure 67 - VP2 location

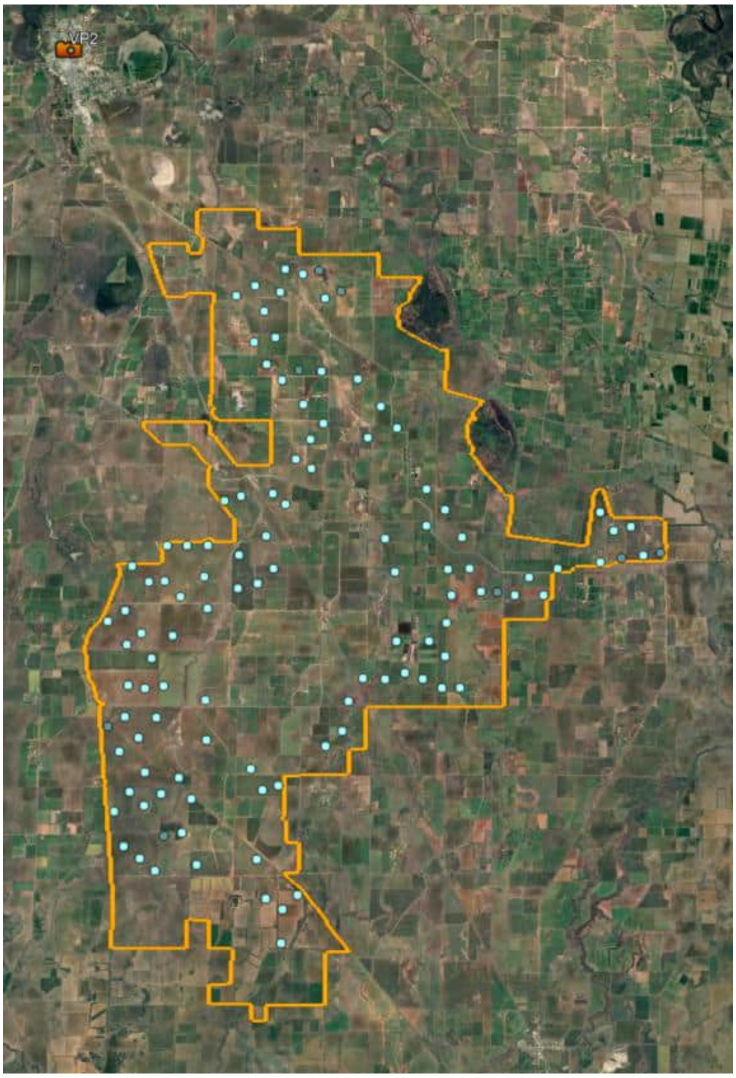

Figure 68 – VP2 location in relation to Project.

Figure 69 – VP2 – Landscape setting.

Figure 70 – VP2 – View towards Project Area.

VIEWPOINTS 3 and 3A – PYRAMID HILL TOWN CENTRE and RESIDENTIAL FRINGE	
Photo Location	VP3 – Corner of Kelly St and Victoria St/Boort-Pyramid Rd (C267). VP3A – Kelly St/Pyramid-Micha Rd. (refer to ***Figure 71*** and **Figure 72**).
Coordinates Easting / Northing	VP3 - 36° 3'17.89"S / 144° 6'54.47"E VP3A - 36° 2'43.40"S / 144° 6'52.95"E
Viewing Distance	VP3 – 9.6km to WTG no. 114. VP3A – 9.3km to WTG no. 114.
Visual Setting	Sub-Regional.
Landscape Character	As the Project is not visible from VP3, this assessment focusses on VP3A. Pyramid Hill's urban setting is comprised of older, single storey buildings and a scattered tree cover of primarily native trees. Views from the two main streets to the Project are fully screened by buildings and canopy vegetation (refer to ***Figure 73***). The town's urban centre is surrounded by the residential area which, at its outer fringe, has rear fences backing onto the surrounding rural land. Vegetation is located within rear yards as well as the adjacent external area (refer to ***Figure 74***).
Landscape Unit / Scenic Quality	Rural township area – Low to moderate scenic quality. Murray Basin Plains (type a) – Northern District Plains Subtype - Low scenic quality.
Residential Viewpoint Landscape Setting Typology	Partially to heavily screened.
Duration of View and Frequency of View	Duration: Static. Frequency: Low.
Visual Land use type	Residential area.
Visual Sensitivity	Moderate based on distance greater than 7.5km.
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 82 deg - Potentially Dominant (H). **Vertical angle (max) -** 1 deg - Potentially Noticeable (M). **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**LOW to VERY LOW -** Given the presence of existing landscape and other infrastructure elements visible.
Potential Visual Impact (accounting for existing vegetation and built-form)	**LOW** - Given the distance from the Project, the minimal topographic variation that prevents overlooking, and the scattered vegetation along the township perimeter and in the intervening landscape that provides screening, views to the Project would be restricted distant views of the upper parts of the WTGs, viewed in the context of power poles and a communications tower (refer to ***Figure 75*** and ***Figure 76***) . A low potential visual impact would result.
Proposed Amelioration	**None Required** – Amelioration is not required to mitigate views from this viewpoint.
Residual Impact	**LOW -** The residual visual impact would remain low.

Figure 71 – VP3 and VP3A Location

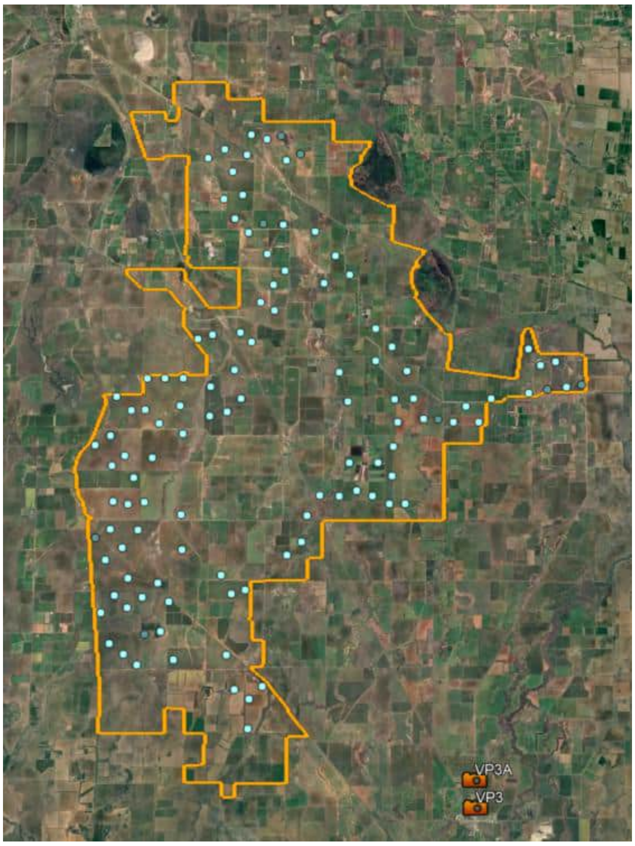

Figure 72 – VP3 and VP1A location in relation to Project.

Figure 73 – VP3 – Landscape setting and view towards Project Area.

Figure 74 – VP3A – Landscape setting.

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Figure 75 – VP3A – Existing view towards Project Area.

Figure 76 – VP3A – Photosimulation view towards Project.

VIEWPOINT 4 – INTERSECTION OF MURRAY VALLEY HWY and LODDON VALLEY HWY	
Photo Location	Intersection of Murray Valley Hwy (B400) and Loddon Valley Hwy (B260) (refer to ***Figure 77*** and ***Figure 78***).
Coordinates Easting / Northing	35°45'47.03"S / 143°55'58.25"E
Viewing Distance	7.7km to WTG no. 7.
Visual Setting	Sub-Regional
Landscape Character	The highway at this location is set within the typically open landscape of the region, with very sparse vegetation in the foreground and bands of mostly low vegetation in the midground (refer to ***Figure 79***). The taller components of the switching station at the Kerang Solar farm are visible to the west near the Loddon Valley Highway (refer to ***Figure 80***. The Project extends to the east of the highway, and the closest group of WTG will be visible, albeit at a distance of over 7km.
Landscape Unit / Scenic Quality	Murray Basin Plains (type a) – Northern District Plains Subtype - Low scenic quality.
Residential Viewpoint Landscape Setting Typology	N/A
Duration of View and Frequency of View	Duration: Moving. Frequency: Moderate.
Visual Land use type	"B" category road.
Visual Sensitivity	Low – based on distance greater than 5km.
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 59 deg - Potentially Dominant (H). **Vertical angle (max) –** 1.3 deg - Potentially Noticeable (M). **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**MODERATE to HIGH -** Given the lack of vegetation in the foreground of the view but considering the presence of other visible infrastructure elements in the foreground.
Potential Visual Impact (accounting for existing vegetation and built-form)	**MODERATE -** Given the relative lack of screening by vegetation, the majority of the Project will be visible, resulting in a moderate potential visual impact (refer to ***Figure 81***).
Proposed Amelioration	**None Required** – It is not feasible to mitigate views from this viewpoint.
Residual Impact	**MODERATE** – The residual visual impact would remain moderate.

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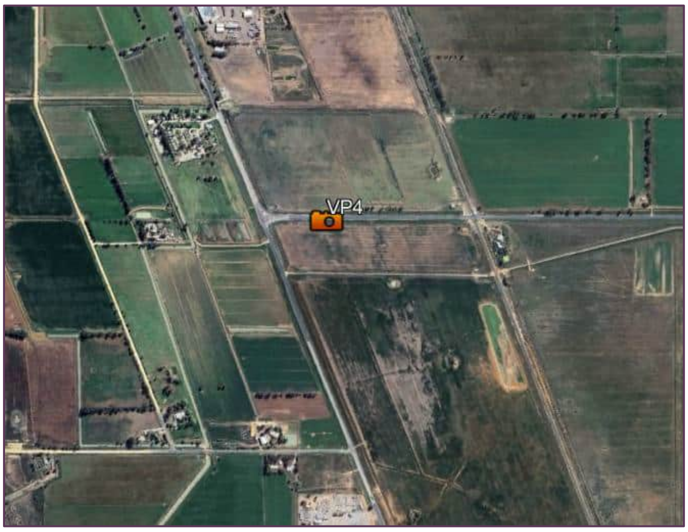

Figure 77 – VP4 location

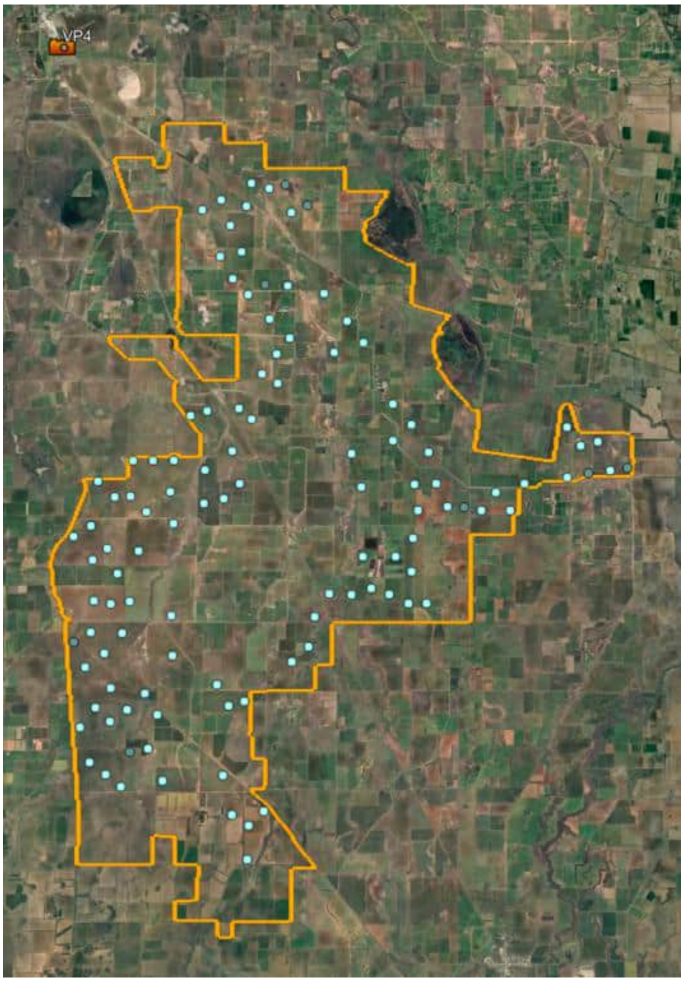

Figure 78 – VP4 location in relation to Project.

Figure 79 – VP4 – Landscape setting.

Figure 80 – VP4 – Existing view towards Project Area.

Figure 81 – VP4 – Photosimulation view towards Project.

VIEWPOINT 5 – INTERSECTION OF LODDON VALLEY HWY and GLADFIELD RD	
Photo Location	Intersection of Loddon Valley Hwy (B260) and Gladfield Rd (refer to ***Figure 82*** and ***Figure 83***).
Coordinates Easting / Northing	36° 2'33.76"S / 143°56'54.93"E
Viewing Distance	4.8km to WTG no. 110.
Visual Setting	Local
Landscape Character	The highway at this location is set within the typically flat and open landscape of the region, with intermittent bands of vegetation of varying heights and density lining the road (refer to ***Figure 84*** and ***Figure 85***).
Landscape Unit / Scenic Quality	Murray Basin Plains (type a) – Northern District Plains Subtype - Low scenic quality.
Residential Viewpoint Landscape Setting Typology	N/A
Duration of View and Frequency of View	Duration: Moving. Frequency: Moderate.
Visual Land use type	"B" category road.
Visual Sensitivity	Moderate – based on distance less than 5km.
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 79 deg - Potentially Dominant (H.) **Vertical angle (max) -** 2 deg - Potentially Noticeable (M.) **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**MODERATE to HIGH -** Given the presence of vegetation in the fore and middle ground of the view.
Potential Visual Impact (accounting for existing vegetation and built-form)	**MODERATE to HIGH** – The intermittent bands of vegetation lining the road provide screening of any WTG offset from the direction of travel. WTG will be visible in the direction of travel to the north, albeit at a distance of over 5km (refer to ***Figure 86***).
Proposed Amelioration	**None Required** – Amelioration is not required to mitigate views from this viewpoint.
Residual Impact	**MODERATE to HIGH** – The residual visual impact would remain moderate to high.

Figure 82 – VP5 location.

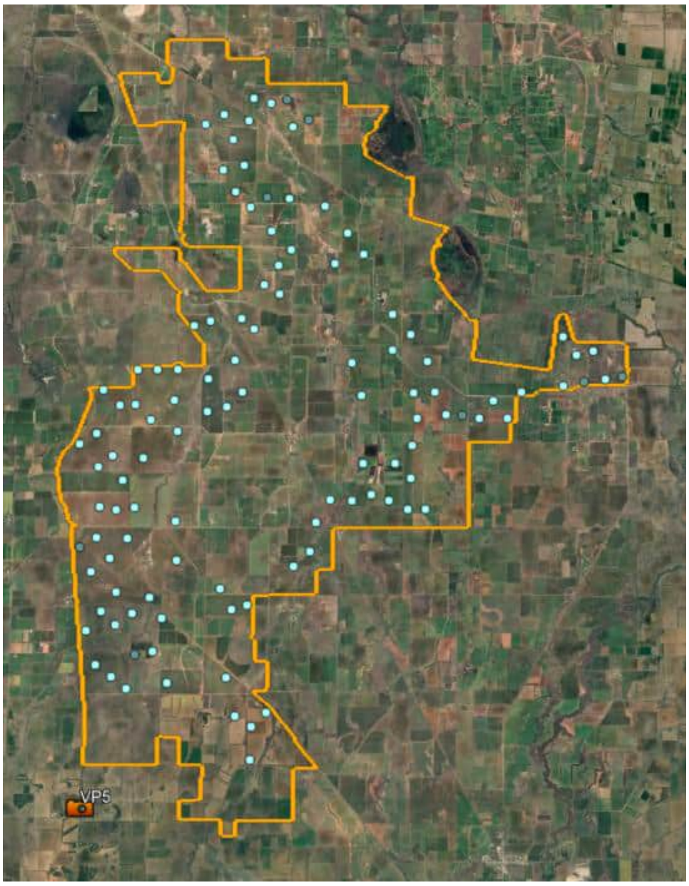

Figure 83 – VP5 location in relation to Project.

Figure 84 – VP5 – Landscape setting.

Figure 85 – VP5 –Existing view towards Project Area.

Figure 86 – VP5 - Photosimulation view towards Project.

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VIEWPOINT 6 – RURAL RESIDENCES - LEITCHVILLE-KERANG RD and COHUNA-LEITCHVILLE RD	
Photo Location	Intersection of Leitchville-Kerang Rd (C267) and Cohuna-Leitchville Rd (C267) (refer to ***Figure 87*** and ***Figure 88***).
Coordinates Easting / Northing	35°52'49.67"S / 144°13'21.00"E
Viewing Distance	5.9km to WTG no. 38.
Visual Setting	Sub-Regional
Landscape Character	The residences are located in a flat, open agricultural landscape. Intermittent rectilinear bands of native and exotic vegetation of varying heights and densities line paddock boundaries and roads. The residences are surrounded by vegetation which provides varying degree of screening of views outward (refer to ***Figure 89***). The Cohuna Solar Farm is located adjacent to two residences and is visible from the road (refer to ***Figure 90***).
Landscape Unit / Scenic Quality	Murray Basin Plains (type a) – Northern District Plains Subtype - Low scenic quality.
Residential Viewpoint Landscape Setting Typology	Partially screened.
Duration of View and Frequency of View	**Roadway:** - Duration: Moving. - Frequency: Low to Moderate. **Rural residential:** - Duration: Static. - Frequency: Low.
Visual Land use type	Rural residential "C" category road.
Visual Sensitivity	**Rural residential** – **HIGH** - based on distance less than 7.5km
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 65 deg - Potentially Dominant (H). **Vertical angle (max) –** 1.6 deg - Potentially Noticeable (H). **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**NOT VISIBLE to MODERATE -** Given the presence of vegetation and built form in the fore and middle ground of the view, as well as existing energy infrastructure.
Potential Visual Impact (accounting for existing vegetation and built-form)	**NO IMPACT - HIGH** – Given the distance from the Project and the relatively minimal topographic variation that limits overlooking, existing screening vegetation around the residences and along roadsides would result in views to the Project being limited to potentially only to blade tips. In these instances, there will be no to very low impact. Where unimpeded views may be possible from residences, a high potential visual impact may result.
Proposed Amelioration	**Offsite amelioration –** An offer of offsite amelioration could be made to non-involved residences with exposed views to the Project.
Residual Impact	**VERY LOW to LOW -** The residual visual impact would reduce to very low to low.

Figure 87 – VP6 location

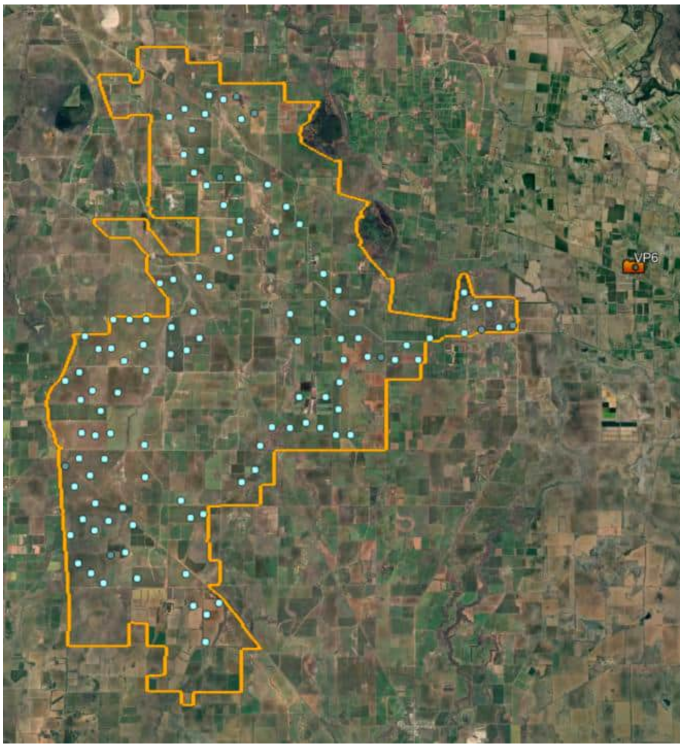

Figure 88 – VP6 location in relation to Project.

Figure 89 – VP6 – Landscape setting.

Figure 90 – VP6 – View towards Project Area.

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VIEWPOINT 7 – MINCHA	
Photo Location	Intersection of railway line and Pyramid-Mincha Rd. refer to ***Figure 91*** and ***Figure 92***).
Coordinates Easting / Northing	36° 0'7.01"S / 144° 4'41.50"E
Viewing Distance	5.2km to WTG no. 110.
Visual Setting	Sub-Regional.
Landscape Character	The residences within the settlement are set within vegetation of varying densities that provides filtering or screening of views to surrounding areas. The settlement is surrounded by a flat and open agricultural landscape that has intermittent rectilinear bands of native and exotic vegetation, of varying heights and densities, lining paddock boundaries and roads (refer to ***Figure 93***). Dense vegetation, which lines the western side of the rail line and the northside of Pyramid-Mincha Road, screens views to the closest WTGs to the west. Open vegetation to the north along the rail line affords views from the roadway to WTGs 6km to the northwest (refer to ***Figure 94***).
Landscape Unit / Scenic Quality	Murray Basin Plains (type a) – Northern District Plains Subtype - Low scenic quality.
Residential Viewpoint Landscape Setting Typology	Partially to heavily screened.
Duration of View and Frequency of View	Duration: Static. Frequency: Low.
Visual Land use type	Rural residential
Visual Sensitivity	High - based on distance less than 7.5km.
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 156 deg - Potentially Dominant (H). **Vertical angle (max) –** 1.8 deg – Potentially Noticeable (M). **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**NOT VISIBLE to LOW -** Given the presence of vegetation and built form in the fore and middle ground of the view.
Potential Visual Impact (accounting for existing vegetation and built-form)	**NOT VISIBLE to MODERATE** – Given the distance from the Project, the lack of topographic variation and the presence of vegetation around the residences that provides varying degrees of screening, views to the project will be limited. In these instances, the Project will either not be visible or there would be a resultant very low to low visual impact. Where views from the residences are possible through breaks in vegetation, a moderate potential visual impact would result (refer to ***Figure 95***).
Proposed Amelioration	**Offsite amelioration** – An offer of offsite amelioration could be made to non-involved residences with exposed views to the Project.
Residual Impact	**VERY LOW to LOW -** The residual visual impact would reduce to very low to low.

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Figure 91 – VP7 location

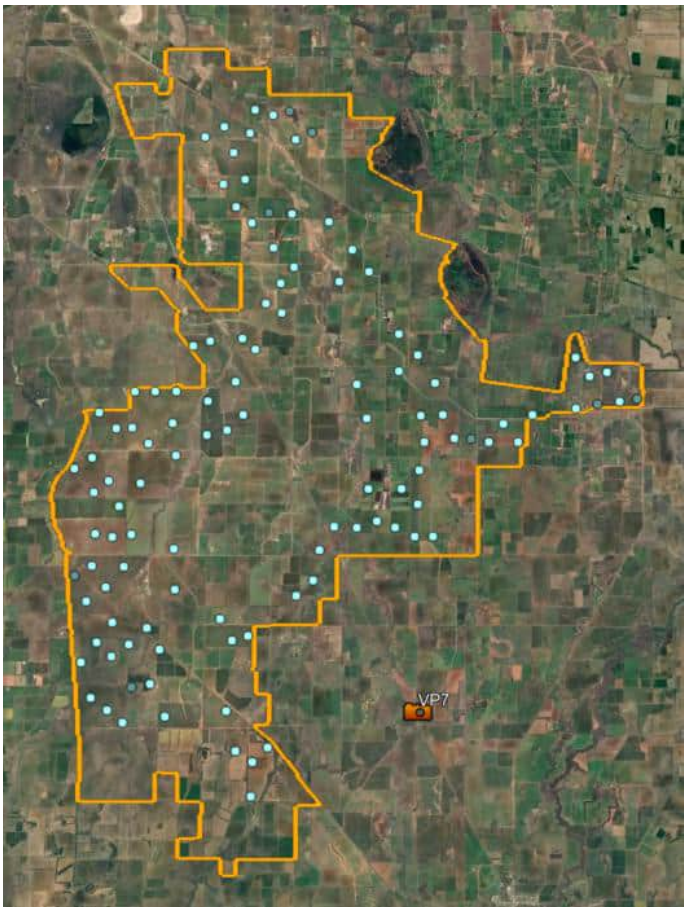

Figure 92 – VP7 location in relation to Project.

Figure 93 – VP7 – Landscape setting.

Figure 94 – VP7 – Existing view towards Project Area.

Figure 95 – VP7 – Photosimulation view to Project.

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VIEWPOINT 8 – MCMILLANS	
Photo Location	Leitchville-Kerang Rd (C267), 110m east of Majors Rd (refer to ***Figure 96*** and ***Figure 97***)
Coordinates Easting / Northing	35°51'43.26"S / 144° 9'35.83"E
Viewing Distance	3.4km to WTG no. 29.
Visual Setting	Local.
Landscape Character	The residences within the settlement are set within vegetation of varying densities that provides filtering or screening of views to surrounding areas (refer to ***Figure 98***). The settlement is surrounded by a flat and open agricultural landscape that has intermittent rectilinear bands of native and exotic vegetation, of varying heights and densities, lining paddock boundaries and roads (refer to ***Figure 99***).
Landscape Unit / Scenic Quality	Murray Basin Plains (type a) – Northern District Plains Subtype - Low scenic quality.
Residential Viewpoint Landscape Setting Typology	Partially to heavily screened.
Duration of View and Frequency of View	Duration: Static. Frequency: Low.
Visual Land use type	Rural residential
Visual Sensitivity	High - based on distance less than 7.5km
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 122 deg - Potentially Dominant (H). **Vertical angle (max) –** 2.8 deg - Potentially Dominant (H). **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**NOT VISIBLE to MODERATE -** Given the presence of vegetation and built form in the fore and middle ground of the view.
Potential Visual Impact (accounting for existing vegetation and built-form)	**NOT VISIBLE to HIGH** – The lack of topographic variation and the presence of vegetation around the residences that provides varying degrees of screening, results in views to the Project being limited. In these instances, the Project will either not be visible or there would be a resultant very low to low visual impact. Where views from the residences are possible through breaks in vegetation, a moderate to high potential visual impact will result (refer to ***Figure 100***).
Proposed Amelioration	**Offsite amelioration** – An offer of offsite amelioration could be made to non-involved residences with exposed views to the Project.
Residual Impact	**VERY LOW to LOW -** The residual visual impact would reduce to very low to low.

Figure 96 – VP8 location

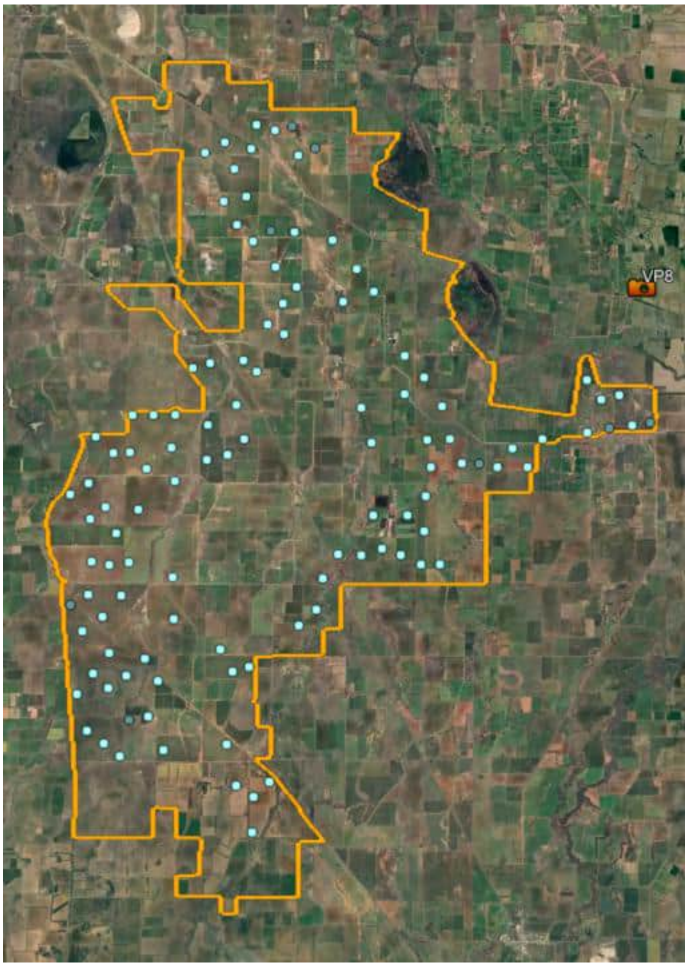

Figure 97 – VP8 location in relation to Project.

Figure 98 – VP8 – Landscape setting.

Figure 99 – VP8 – View towards Project Area.

Figure 100 – VP8 – Photosimulation view towards the Project.

VIEWPOINT 9 – TRAGOWEL	
Photo Location	Intersection of railway line and Tragowel Rd. refer to ***Figure 101*** and ***Figure 102***).
Coordinates Easting / Northing	35°51'23.30"S / 143°58'57.27"E
Viewing Distance	2.8km to WTG no. 12.
Visual Setting	Local
Landscape Character	The residences to the south of the settlement are set within relatively dense vegetation that provides screening of views to surrounding areas (refer to ***Figure 103***). A number of residences to the north of the settlement are surrounded by scattered vegetation that provide some filtering of views. The settlement is surrounded by a flat and open agricultural landscape that has intermittent rectilinear bands of native and exotic vegetation, of varying heights and densities, lining paddock boundaries and roads (refer to ***Figure 104***).
Landscape Unit / Scenic Quality	Murray Basin Plains (type a) – Northern District Plains Subtype - Low scenic quality.
Residential Viewpoint Landscape Setting Typology	Partially to heavily screened.
Duration of View and Frequency of View	Duration: Static. Frequency: Low.
Visual Land use type	Rural residential.
Visual Sensitivity	High - based on distance less than 7.5km.
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 199 deg - Potentially Dominant (H). **Vertical angle (max) -** 3.5 deg - Potentially Dominant (H). **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**NOT VISIBLE to MODERATE -** Given the presence of vegetation and built form in the fore and middle ground of the view.
Potential Visual Impact (accounting for existing vegetation and built-form)	**NOT VISIBLE to HIGH** – The lack of topographic variation and the presence of dense vegetation around the residences to the south results in views to the Project being very limited. In these instances, the Project will either not be visible or there would be a resultant very low to low visual impact (refer to ***Figure 105***). Where views from the residences to the north are possible through breaks in vegetation, a high potential visual impact will result.
Proposed Amelioration	**Offsite amelioration** – An offer of offsite amelioration could be made to non-involved residences with exposed views to the Project.
Residual Impact	**VERY LOW to LOW -** The residual visual impact would reduce to very low to low.

Figure 101 – VP9 location

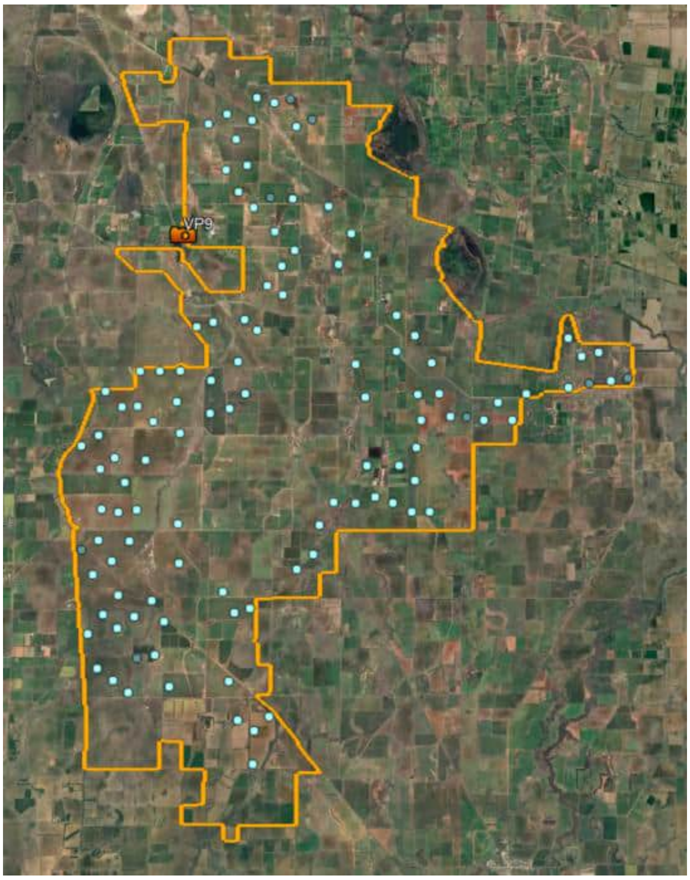

Figure 102 – VP9 location in relation to Project.

Figure 103 – VP9 – Landscape setting.

Figure 104 – VP9 – Existing view towards Project Area.

Figure 105 – VP9 – 3D wireframe model overlay of view towards the Project.

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VIEWPOINT 10 – RURAL RESIDENCES - MURRAY VALLEY HIGHWAY	
Photo Location	Murray Valley Hwy (B400) (refer to ***Figure 106*** and ***Figure 107***).
Coordinates Easting / Northing	35°47'16.75"S / 144° 2'14.49"E
Viewing Distance	2.2km to WTG no. 2.
Visual Setting	Local
Landscape Character	The dispersed residences along the highway are set within vegetation of varying densities that provides filtering or screening of views to surrounding areas (refer to ***Figure 108***). The residences are set within a flat and open agricultural landscape that has intermittent rectilinear bands of native and exotic vegetation, of varying heights and densities, lining paddock boundaries and roads (refer to ***Figure 109***).
Landscape Unit / Scenic Quality	Murray Basin Plains (type a) – Northern District Plains Subtype - Low scenic quality.
Residential Viewpoint Landscape Setting Typology	Primarily partially to heavily screened.
Duration of View and Frequency of View	**Roadway:** - Duration: Moving. - Frequency: Moderate. **Rural residential:** - Duration: Static. - Frequency: Low.
Visual Land use type	Rural residential “B” category road.
Visual Sensitivity	**Rural residential** – High - based on distance less than 7.5km **Roadway** - Moderate – based on distances less than 5km
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 100 deg - Potentially Dominant (H). **Vertical angle (max) –** 4.3 deg - Potentially Dominant (H). **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**NOT VISIBLE to MODERATE -** Given the presence of vegetation and built form in the fore and middle ground of the view.
Potential Visual Impact (accounting for existing vegetation and built-form)	**NOT VISIBLE to HIGH** – The lack of topographic variation and the presence of vegetation around the residences that provides varying degrees of screening, results in views to the Project being limited. In these instances, the Project will either not be visible or there would be a resultant very low to low visual impact. Where views from the residences are possible through breaks in vegetation and gaps between outbuildings, a high potential visual impact will result (refer to ***Figure 110***).
Proposed Amelioration	**Offsite amelioration** – An offer of offsite amelioration could be made to non-involved residences with exposed views to the Project.
Residual Impact	**VERY LOW to LOW -** The residual visual impact would reduce to very low to low.

Figure 106 – VP10 location

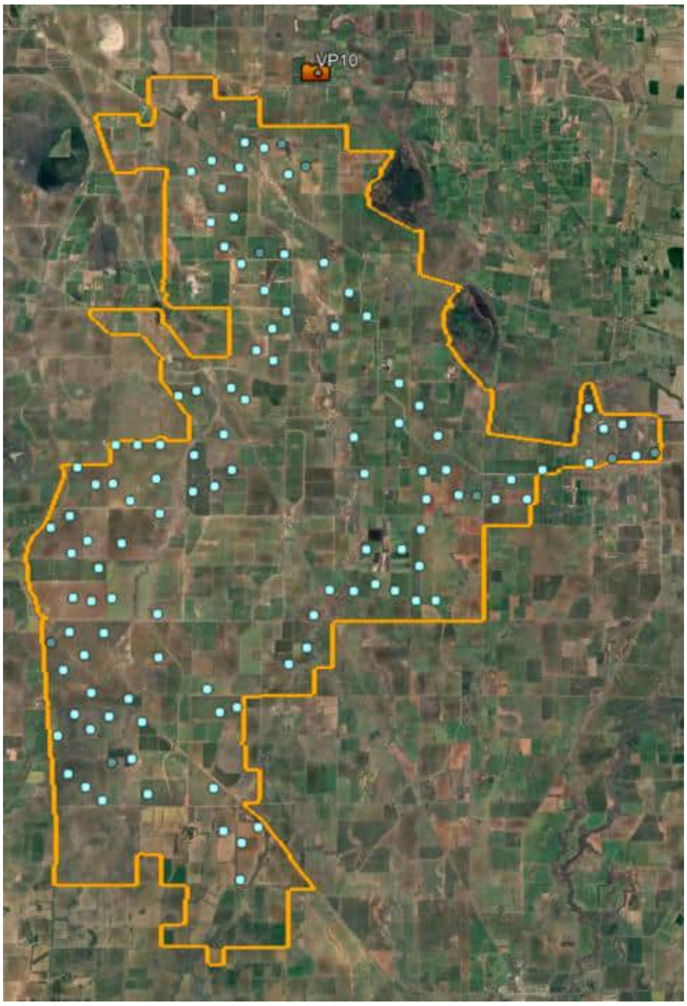

Figure 107 – VP10 location in relation to Project.

Figure 108 – VP10 – Landscape setting of residence.

Figure 109 – VP10 – Existing view towards Project Area.

Figure 110 - VP10 – Photosimulation view towards the Project.

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VIEWPOINT 11 – RURAL RESIDENCES – LEITCHVILLE-KERANG RD	
Photo Location	Intersection of Leitchville-Kerang Rd and Kerang – Macona Rd (refer to ***Figure 111*** and ***Figure 112***).
Coordinates Easting / Northing	35°49'38.98"S / 144° 1'49.28"E
Viewing Distance	1.3km to WTG no. 8.
Visual Setting	Local
Landscape Character	The dispersed residences along the highway are set within vegetation of varying densities that provides filtering or screening of views to surrounding areas (refer to ***Figure 113***). The residences are set within a flat and open agricultural landscape that has intermittent rectilinear bands of native and exotic vegetation, of varying heights and densities, lining paddock boundaries and roads.
Landscape Unit / Scenic Quality	Murray Basin Plains (type a) – Northern District Plains Subtype - Low scenic quality.
Residential Viewpoint Landscape Setting Typology	Partially screened
Duration of View and Frequency of View	Duration: Static. Frequency: Low.
Visual Land use type	Rural residential
Visual Sensitivity	High - based on distance less than 7.5km
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 241 deg - Potentially Dominant (H). **Vertical angle (max) –** 7.3 deg - Potentially Dominant (H). **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**VERY LOW to MODERATE -** Given the presence of vegetation and built form in the fore and middle ground of the view.
Potential Visual Impact (accounting for existing vegetation and built-form)	**LOW to HIGH** – The lack of topographic variation and the presence of vegetation around the residences that provides varying degrees of screening, results in views to the Project being limited. In these instances, the Project will either not be visible or there would be a resultant very low to low visual impact. Where views from the residences are possible through breaks in vegetation and gaps between outbuildings, a high potential visual impact will result (refer to ***Figure 114***).
Proposed Amelioration	**Offsite amelioration** – An offer of offsite amelioration could be made to non-involved residences with exposed views to the Project.
Residual Impact	**VERY LOW to LOW -** The residual visual impact would reduce to very low to low.

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Figure 111 – VP11 location

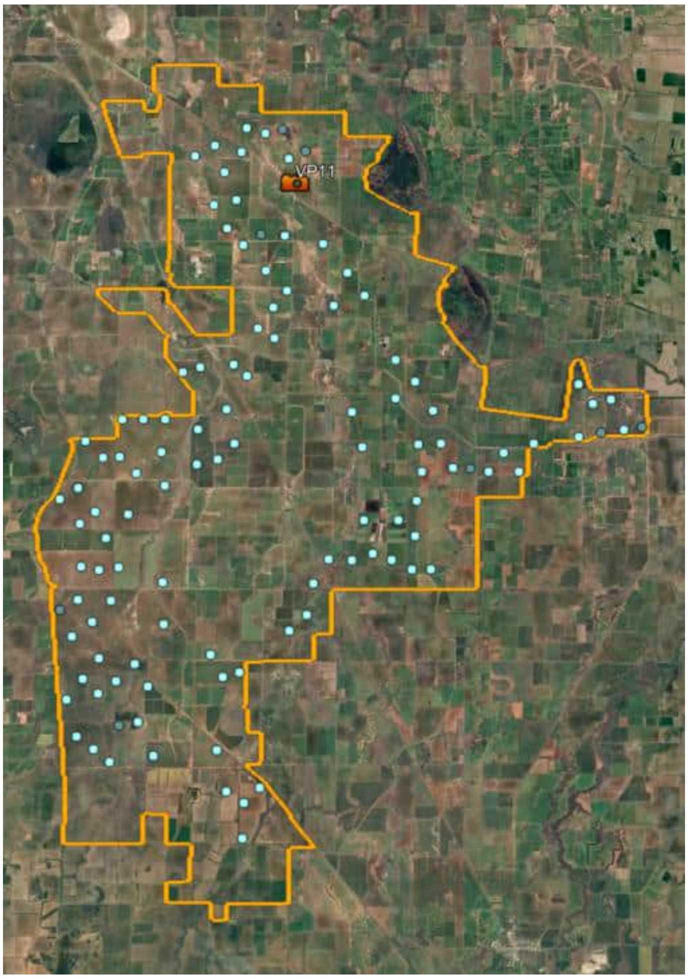

Figure 112 – VP11 location in relation to Project.

Figure 113 – VP11 – Landscape setting.

Figure 114 – VP11 – View towards Project Area.

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VIEWPOINT 12 – RURAL RESIDENCES – MACORNA-PYRAMID RD	
Photo Location	Macorna-Pyramid Rd, 815m north of Campbells Rd (refer to ***Figure 115*** and ***Figure 116***).
Coordinates Easting / Northing	35°56'32.56"S / 144° 6'1.72"E
Viewing Distance	1.5km to WTG no. 79.
Visual Setting	Local
Landscape Character	The dispersed residences along the highway are set within vegetation of varying densities that provides filtering or screening of views to surrounding areas (refer to ***Figure 117***). The residences are set within a flat and open agricultural landscape that has intermittent rectilinear bands of native and exotic vegetation, of varying heights and densities, lining paddock boundaries and roads.
Landscape Unit / Scenic Quality	Murray Basin Plains (type a) – Northern District Plains Subtype - Low scenic quality.
Residential Viewpoint Landscape Setting Typology	Primarily partially to heavily screened.
Duration of View and Frequency of View	Duration: Static. Frequency: Low.
Visual Land use type	Rural residential
Visual Sensitivity	High - based on distance less than 7.5km km.
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 198 deg - Potentially Dominant (H). **Vertical angle (max) -** 6.3 deg - Potentially Dominant (H). **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**VERY LOW to MODERATE -** Given the presence of vegetation and built form in the fore and middle ground of the view.
Potential Visual Impact (accounting for existing vegetation and built-form)	**LOW to HIGH** – The lack of topographic variation and the presence of vegetation around the residences that provides varying degrees of screening, results in views to the Project being limited. In these instances, the Project will either not be visible or there would be a resultant very low to low visual impact. Where views from the residences are possible through breaks in vegetation and gaps between outbuildings, a high potential visual impact would result (refer to ***Figure 118***).
Proposed Amelioration	**Offsite amelioration** – An offer of offsite amelioration could be made to non-involved residences with exposed views to the Project.
Residual Impact	**VERY LOW to LOW -** The residual visual impact would reduce to very low to low.

Figure 115 – VP12 location

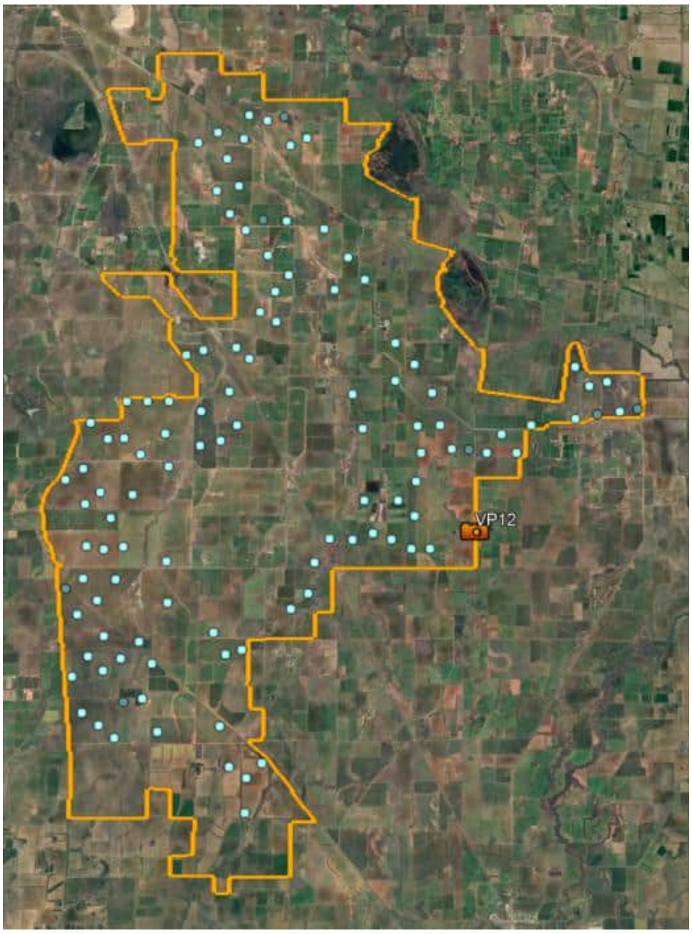

Figure 116 – VP12 location in relation to Project.

Figure 117 – VP12 – Landscape setting.

Figure 118 – VP12 – View towards Project Area.

VIEWPOINT 13 – MACORNA	
Photo Location	Intersection of Macorna-Pyramid Rd and railway line (refer to ***Figure 119*** and ***Figure 120***).
Coordinates Easting / Northing	35°55'7.24"S / 144° 1'43.01"E
Viewing Distance	2.2km to WTG no. 50.
Visual Setting	Local
Landscape Character	The residences to the south of the settlement are set within relatively dense vegetation that provides screening of views to surrounding areas (refer to ***Figure 121***). A number of residences to the north of the settlement are surrounded by scattered vegetation that provide some filtering of views. The settlement is surrounded by a flat and open agricultural landscape that has intermittent rectilinear bands of native and exotic vegetation, of varying heights and densities, lining paddock boundaries and roads. Open vegetation along the rail line affords views from the roadway to WTGs 2.2km to the northwest (refer to ***Figure 122***).
Landscape Unit / Scenic Quality	Murray Basin Plains (type a) – Northern District Plains Subtype - Low scenic quality.
Residential Viewpoint Landscape Setting Typology	Primarily partially to heavily screened.
Duration of View and Frequency of View	Duration: Static. Frequency: Low.
Visual Land use type	Rural residential
Visual Sensitivity	High - based on distance less than 7.5km.
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 360 deg - Potentially Dominant (H). **Vertical angle (max) –** 4.3 deg - Potentially Dominant (H). **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**VERY LOW to MODERATE -** Given the presence of vegetation and built form in the fore and middle ground of the view.
Potential Visual Impact (accounting for existing vegetation and built-form)	**LOW to HIGH** – The lack of topographic variation and the presence of dense vegetation around the residences to the south of the settlement, particularly south of Macorna-Pyramid Road, results in views to the Project being very limited. In these instances, the Project will either not be visible or there would be a resultant very low to low visual impact. Where views from the residences to the north are possible through breaks in vegetation, a high potential visual impact will result (refer to ***Figure 123***).
Proposed Amelioration	**Offsite amelioration** – An offer of offsite amelioration could be made to non-involved residences with exposed views to the Project.
Residual Impact	**VERY LOW to LOW -** The residual visual impact would reduce to very low to low.

Figure 119 – VP13 location

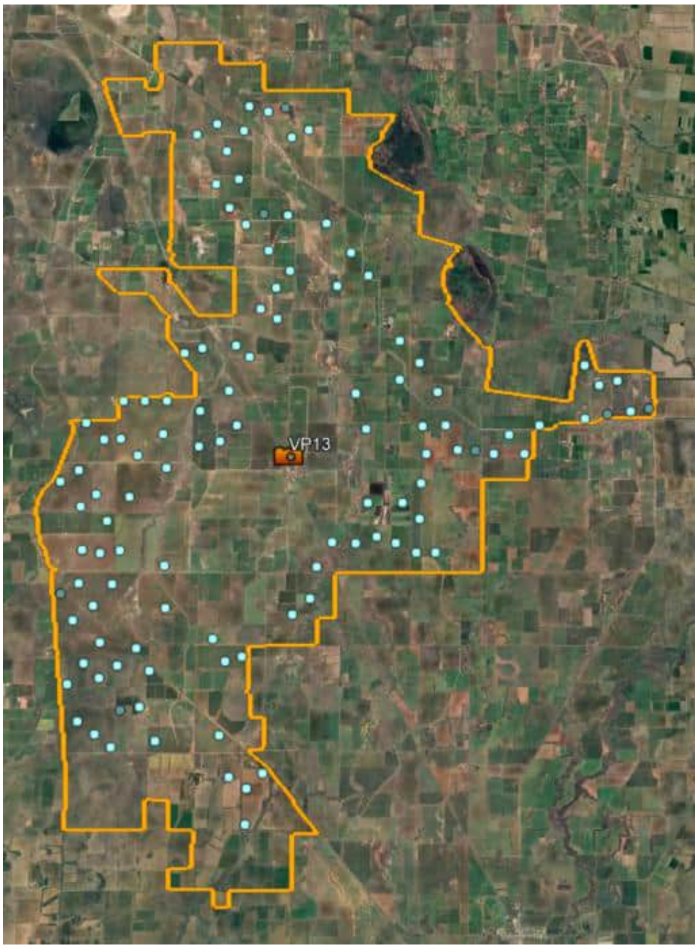

Figure 120 – VP13 location in relation to Project.

Figure 121 – VP13 – Landscape setting.

Figure 122 – VP13 – Existing view towards Project Area.

Figure 123 - VP13 – Photosimulation view towards the Project.

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VIEWPOINT 14 – RURAL RESIDENCES - LODDON VALLEY HIGHWAY	
Photo Location	Loddon Valley Hwy, 200m north of McDiarmid Rd (refer to ***Figure 124*** and ***Figure 125***).
Coordinates Easting / Northing	35°53'5.92"S 143°56'27.92"E
Viewing Distance	2.4km to WTG no. 43.
Visual Setting	Local
Landscape Character	The dispersed residences along the highway are set within vegetation of varying densities that provides filtering or screening of views to surrounding areas (refer to ***Figure 126***). The residences are set within a flat and open agricultural landscape that has intermittent rectilinear bands of native and exotic vegetation, of varying heights and densities, lining paddock boundaries and roads (refer to ***Figure 127***). HV powerlines are visually prominent along the edge of the highway.
Landscape Unit / Scenic Quality	Murray Basin Plains (type a) – Northern District Plains Subtype - Low scenic quality.
Residential Viewpoint Landscape Setting Typology	Partially to heavily screened.
Duration of View and Frequency of View	**Roadway:** - Duration: Moving. - Frequency: Moderate. **Rural residential:** - Duration: Static. - Frequency: Low.
Visual Land use type	Rural residential "B" category road.
Visual Sensitivity	**Rural residential** – High - based on distance less than 7.5km **Roadway** - Moderate – based on distances less than 5km
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 151 deg - Potentially Dominant (H). **Vertical angle (max) –** 4.3 deg - Potentially Dominant (H). **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**LOW to MODERATE -** Given the presence of vegetation in the fore and middle ground of the view.
Potential Visual Impact (accounting for existing vegetation and built-form)	**MODERATE to HIGH** – The lack of topographic variation and the presence of vegetation around the residences that provides varying degrees of screening, results in views to the Project being limited. In these instances, the Project will either not be visible or there would be a resultant low visual impact. Where views from the residences are possible through breaks in vegetation, a moderate to high potential visual impact will result (refer to ***Figure 127***).
Proposed Amelioration	**Offsite amelioration** – An offer of offsite amelioration could be made to non-involved residences with exposed views to the Project.
Residual Impact	**VERY LOW to LOW -** – The residual visual impact would reduce to very low to low.

Figure 124 – VP14 location

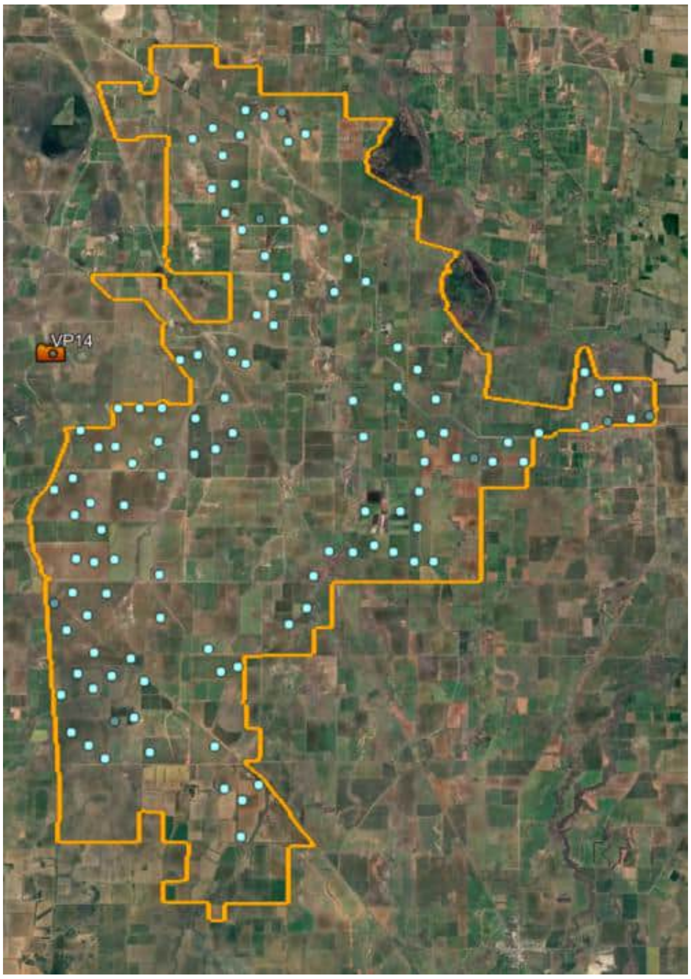


Figure 125 – VP14 location in relation to Project.

Figure 126 – VP14 – Landscape setting.

Figure 127 – VP14 – View towards Project Area.

VIEWPOINT 15 – LODDON VALLEY HIGHWAY	
Photo Location	Intersection of Loddon Valley Hwy and Macorna Rd (refer to ***Figure 128*** and ***Figure 129***).
Coordinates Easting / Northing	35°54'58.31"S / 143°56'36.43"E
Viewing Distance	690m to WTG no. 67.
Visual Setting	Local
Landscape Character	The highway at this location is set within the typically open landscape of the region, with very sparse vegetation in the foreground and bands of mostly low vegetation in the midground (refer to ***Figure 130***). The Project will be offset to the east of the highway at a shallow angle, and a number of WTG will be highly visible, with only occasional screening provided by roadside and other intervening vegetation in the paddocks beyond the road (refer to ***Figure 131***).
Landscape Unit / Scenic Quality	Murray Basin Plains (type a) – Northern District Plains Subtype - Low scenic quality.
Residential Viewpoint Landscape Setting Typology	N/A
Duration of View and Frequency of View	Duration: Moving. Frequency: Moderate.
Visual Land use type	"B" category road.
Visual Sensitivity	Road - Moderate – based on distance less than 5km.
Potential Visual Prominence (assumes no vegetation or buildings)	**Horizontal angle (max) -** 180 deg - Potentially Dominant (H). **Vertical angle (max) –** 13.5 deg - Potentially Dominant (H). **Overall Potential Visual Prominence -** High Visual Prominence.
Visual Modification Level	**HIGH -** Given the lack of vegetation in the fore and middle ground of the view.
Potential Visual Impact (accounting for existing vegetation and built-form)	**HIGH -** Given the relative lack of screening by vegetation, the moderate sensitivity combined with a high visual modification level will result in a high potential visual impact (refer to ***Figure 132***). The Project will be located between approximately 500m and 1.2km from the highway for a distance of approximately 10km. At 100kmh, this distance would be traversed in approximately 6 minutes.
Proposed Amelioration	**None Required** – It is not feasible to mitigate views from this viewpoint.
Residual Impact	**HIGH** – The residual visual impact would remain high.

Figure 128 – VP15 location

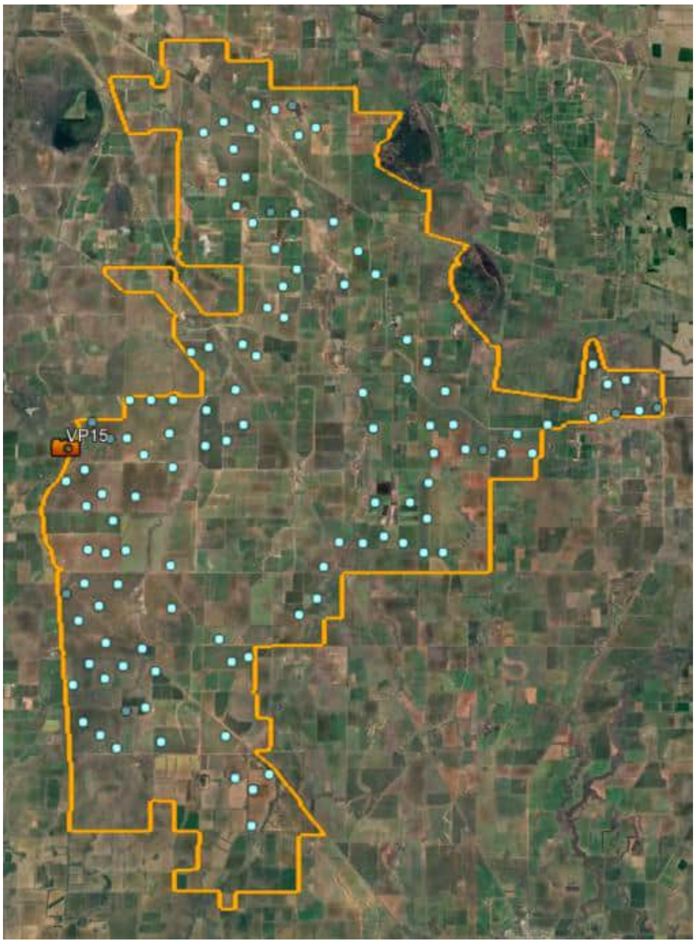


Figure 129 – VP15 location in relation to Project.

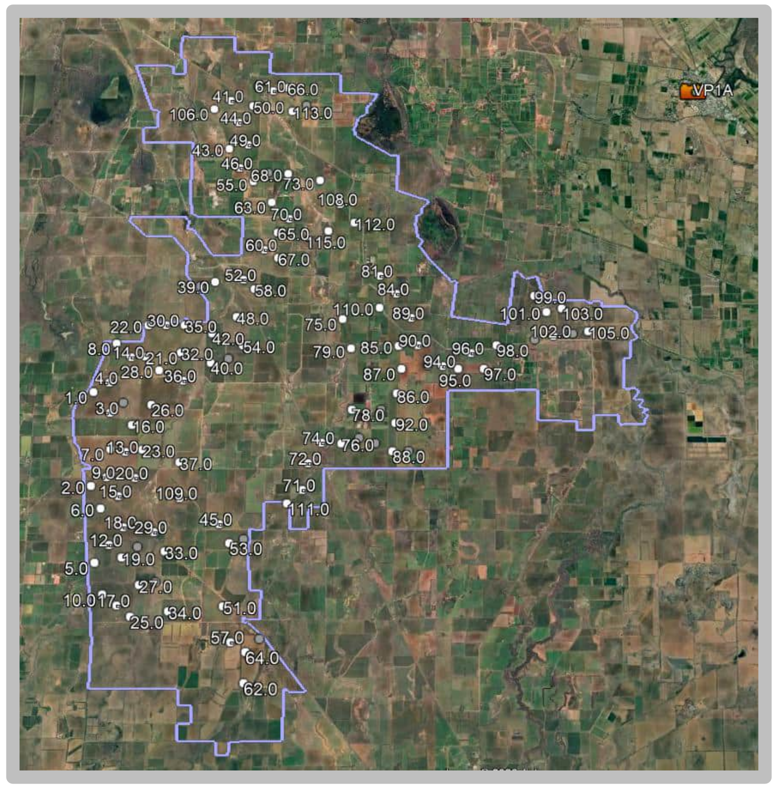
Figure 130 – VP15 – Landscape setting of the highway looking northwards.

Figure 131 – VP15 – Existing view towards Project Area looking southeast.

Figure 132 - VP15 – Photosimulation view towards the Project.

Appendix B - Photosimulations

Appendix A – Photomontages / Wireframe 3D model overlays



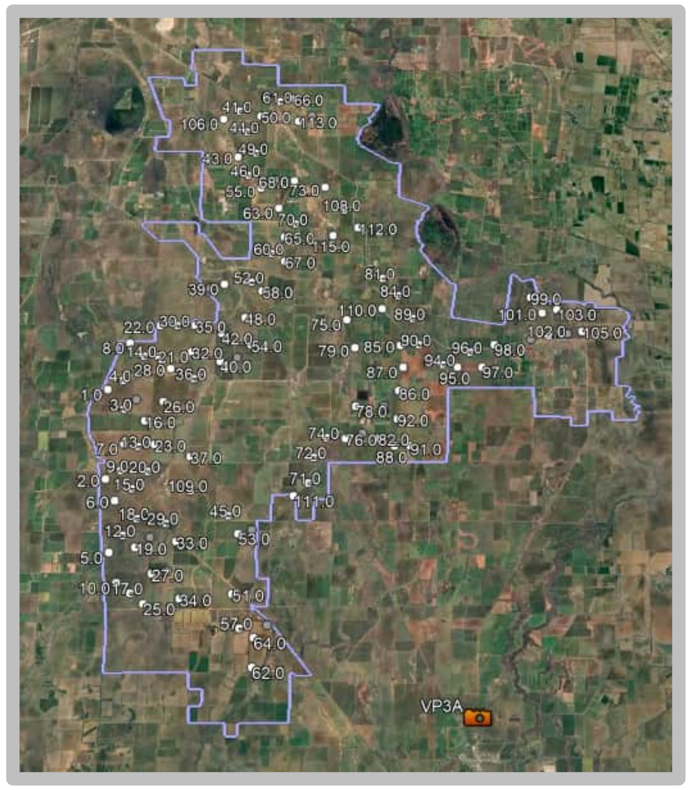
Viewpoint coordinates: 35°48'45.08"S / 144°12'45.67"E

10.4km to closest WTG no. 32

VP1A – Existing view towards Project.

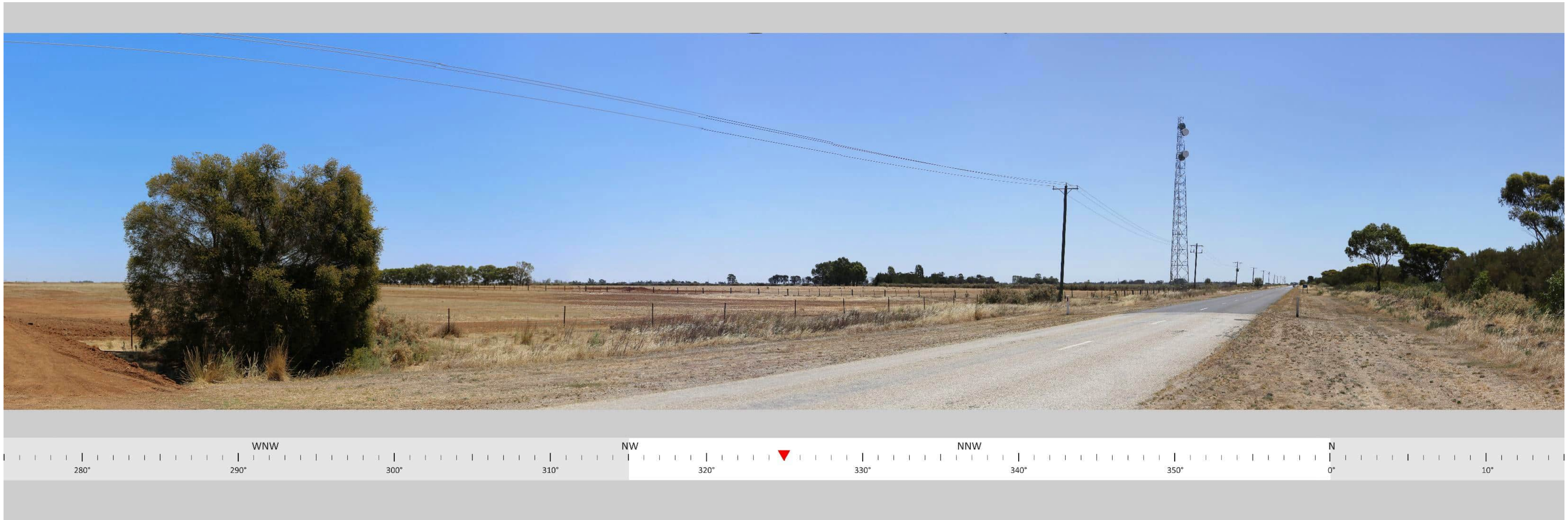
VP1A - Photosimulation view towards Project.

VP1A - Wireframe 3D model overlay view.

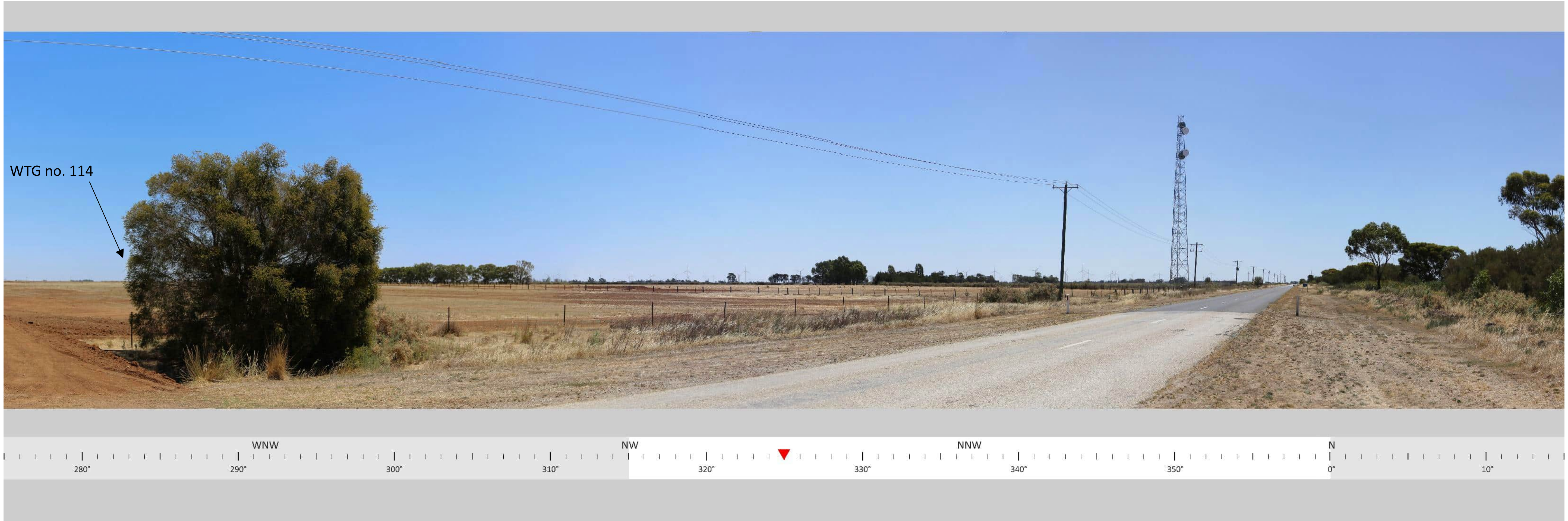


Viewpoint coordinates: 36° 2'43.40"S / 144° 6'52.95"E

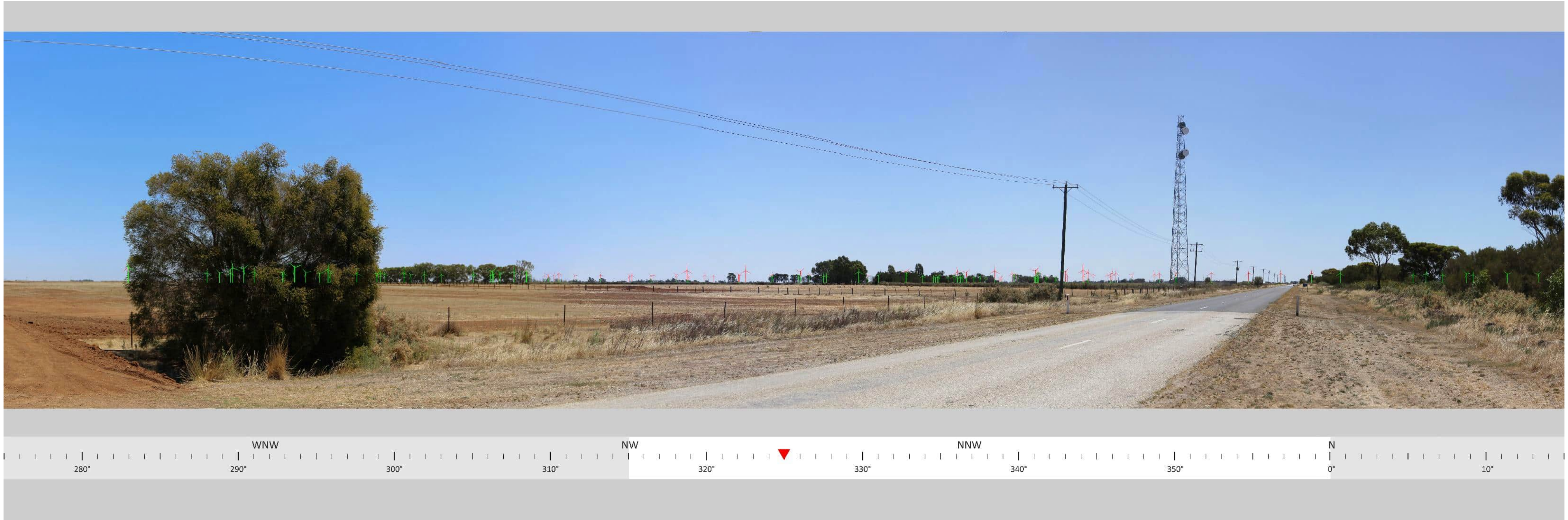
9.3km to closest WTG no. 114.



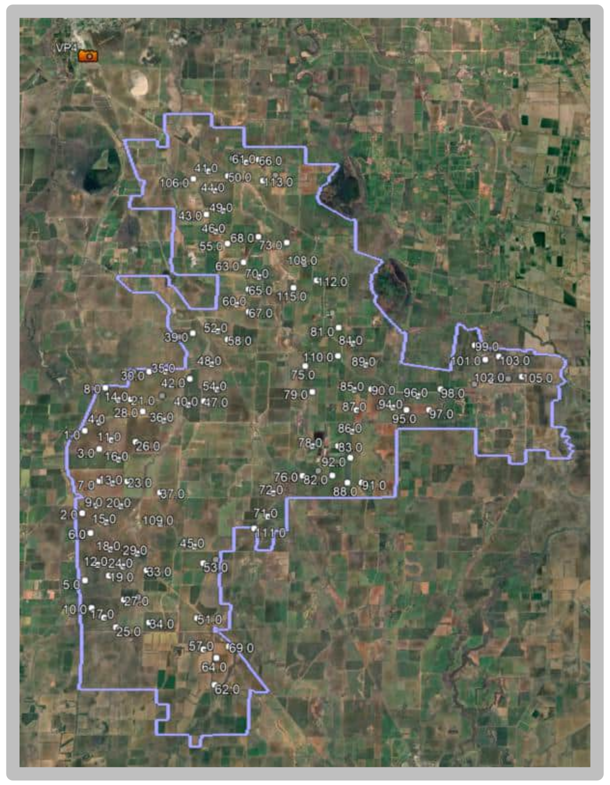
VP3A – Existing view towards Project.



VP3A - Photosimulation view towards Project.

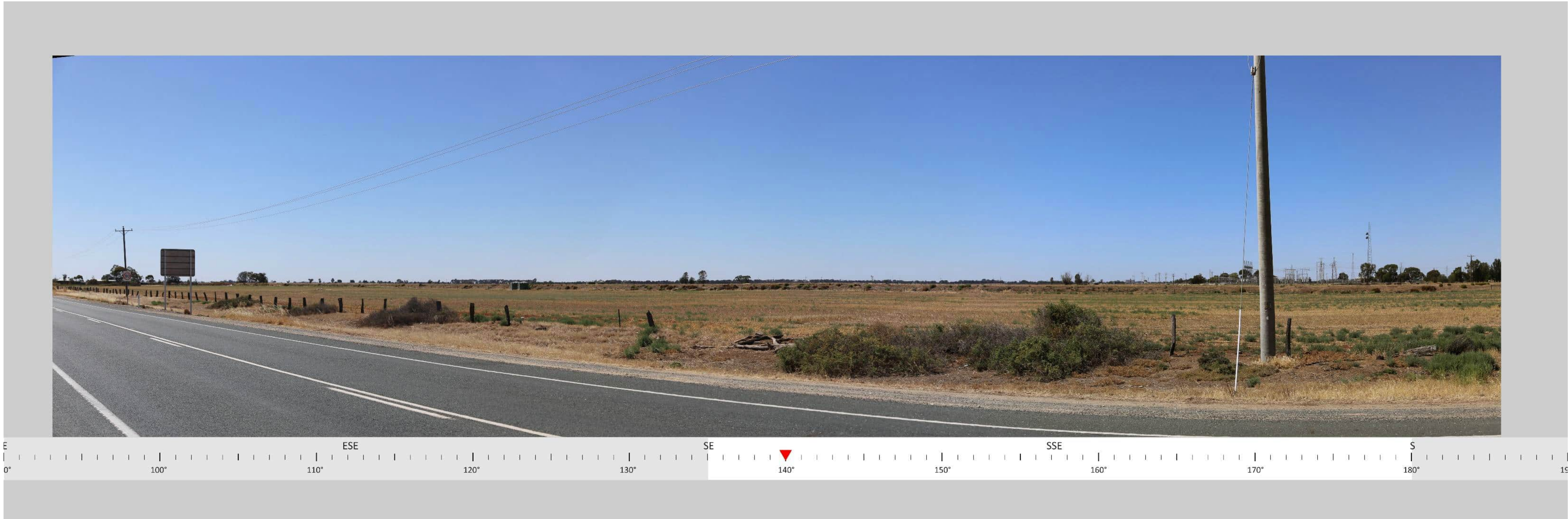


VP3A - Wireframe 3D model overlay view.



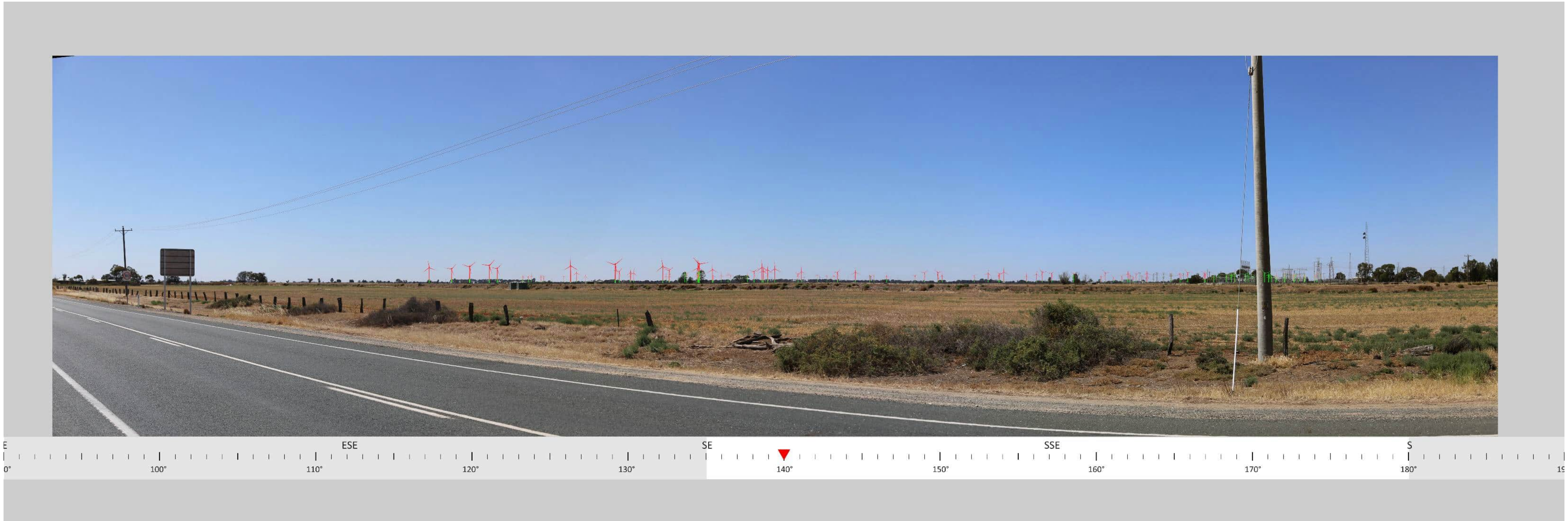
Viewpoint coordinates: 35°45'47.03"S / 143°55'58.25"E

7.7km to closest WTG no. 7.

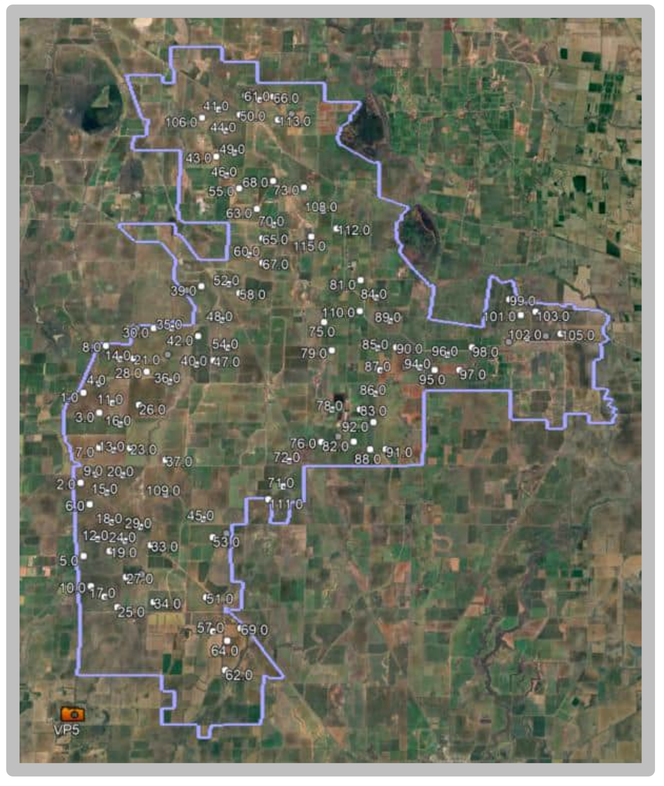


VP4 – Existing view towards Project.

VP4 - Photosimulation view towards Project.



VP4 - Wireframe 3D model overlay view.



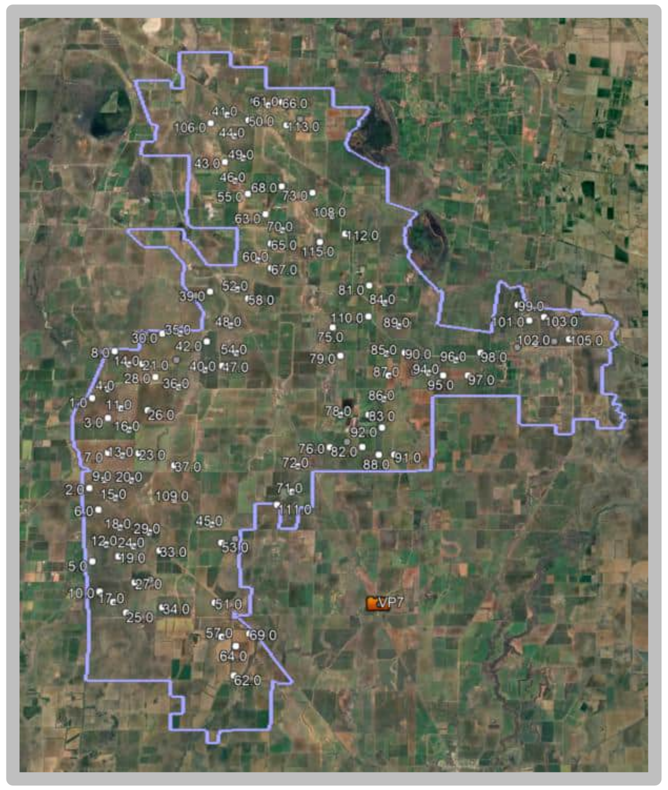
Viewpoint coordinates: 36° 2'33.76"S / 143°56'54.93"E

4.8km to closest WTG no. 110.

VP5 – Existing view towards Project.

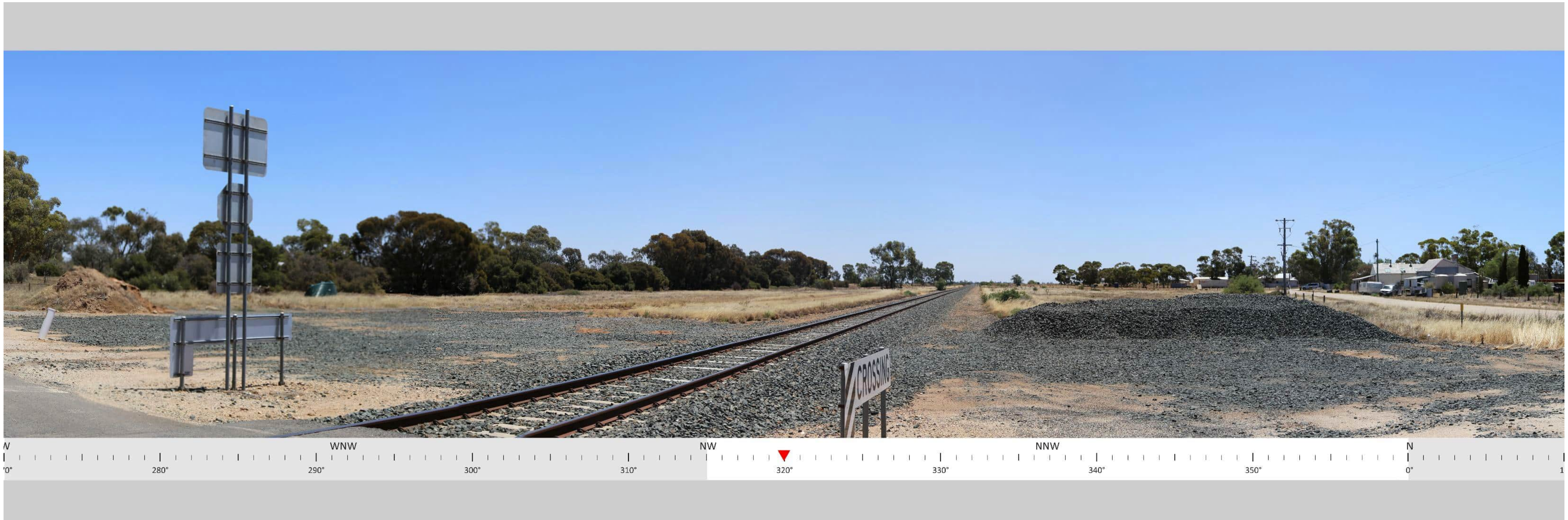
VP5 - Photosimulation view towards Project.

VP5 - Wireframe 3D model overlay view.

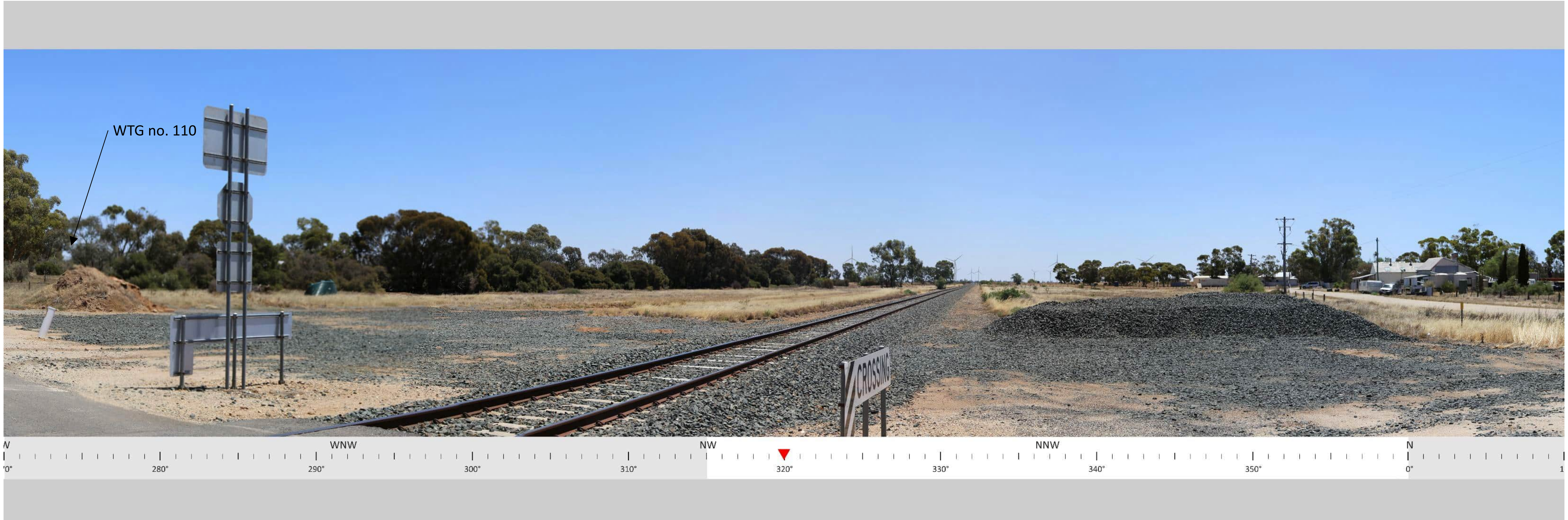


Viewpoint coordinates: 36° 0'7.01"S / 144° 4'41.50"E

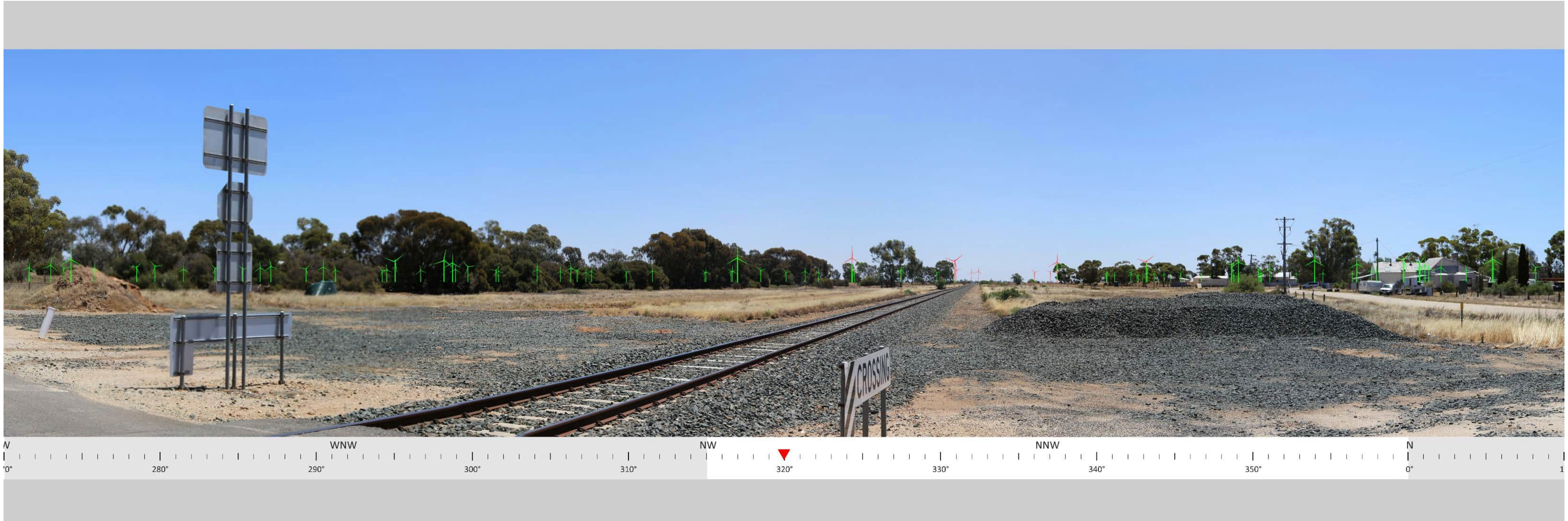
2km to closest WTG no. 110.



VP7 – Existing view towards Project.



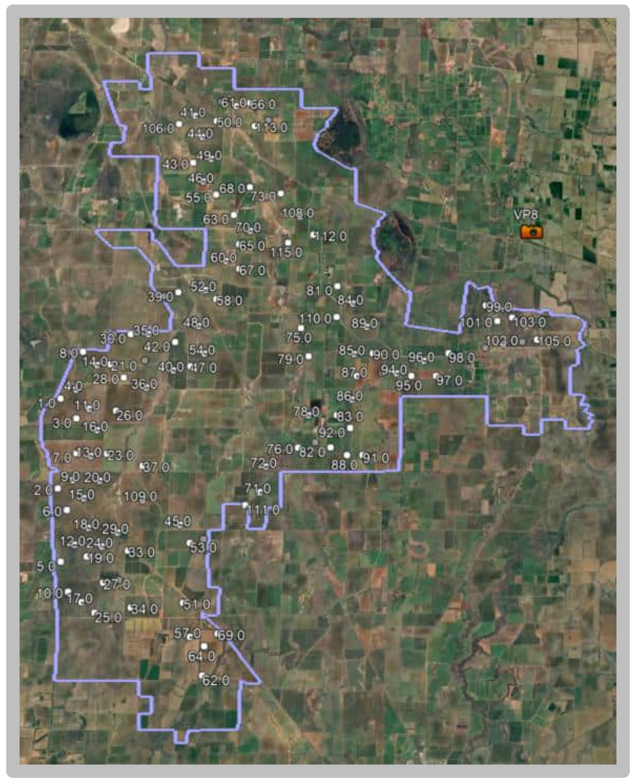
VP7 - Photosimulation view towards Project.

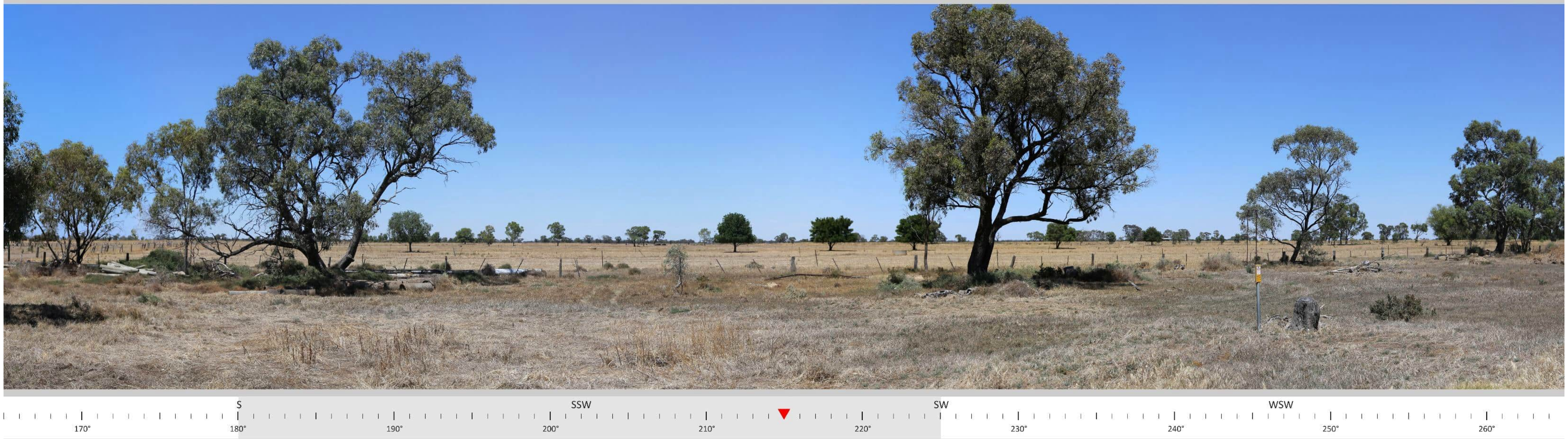


VP7 - Wireframe 3D model overlay view.

Viewpoint coordinates: 35°51'43.26"S / 144° 9'35.83"E

3.4km to closest WTG no. 29.





VP8 – Existing view towards Project.

VP8 - Photosimulation view towards Project.

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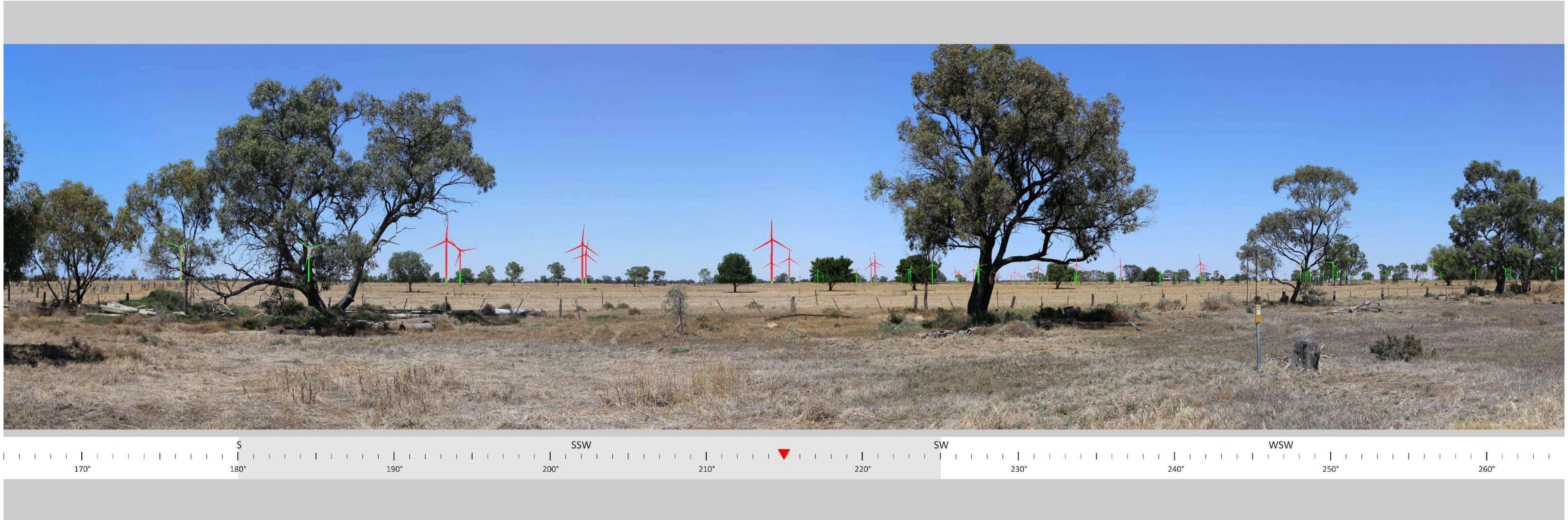
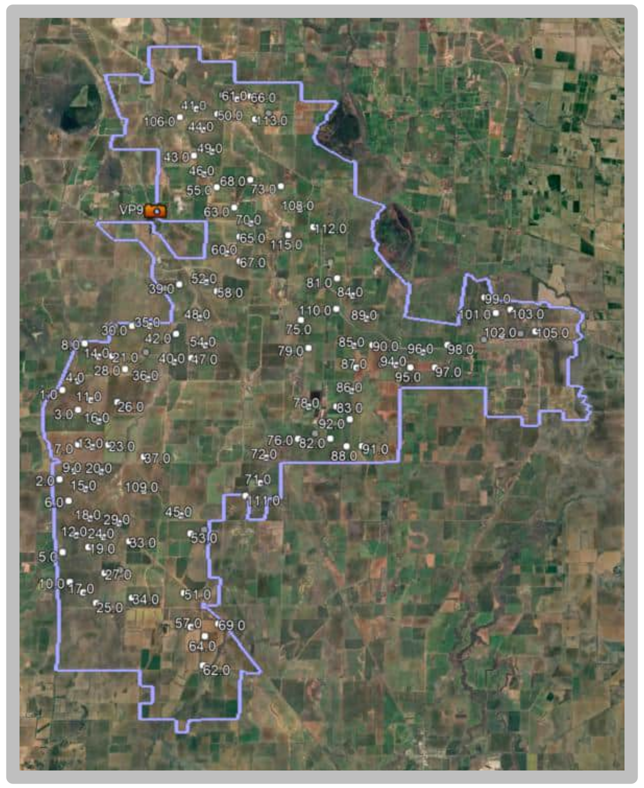
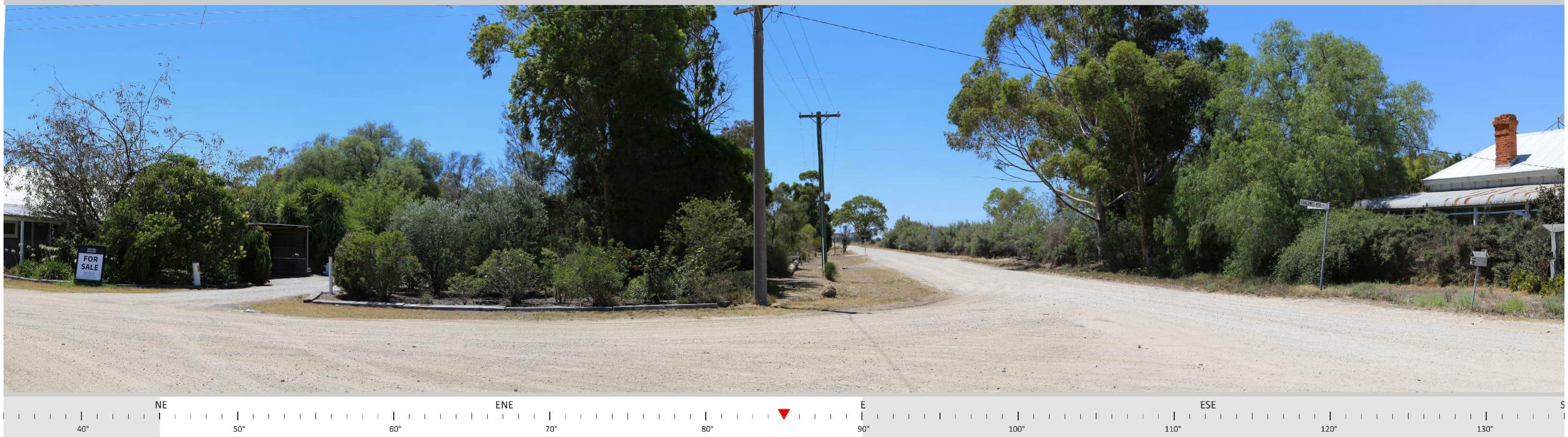


VP8 - Wireframe 3D model overlay view.



Viewpoint coordinates: 35°51'23.30"S / 143°58'57.27"E

2.8km to closest WTG no. 12.



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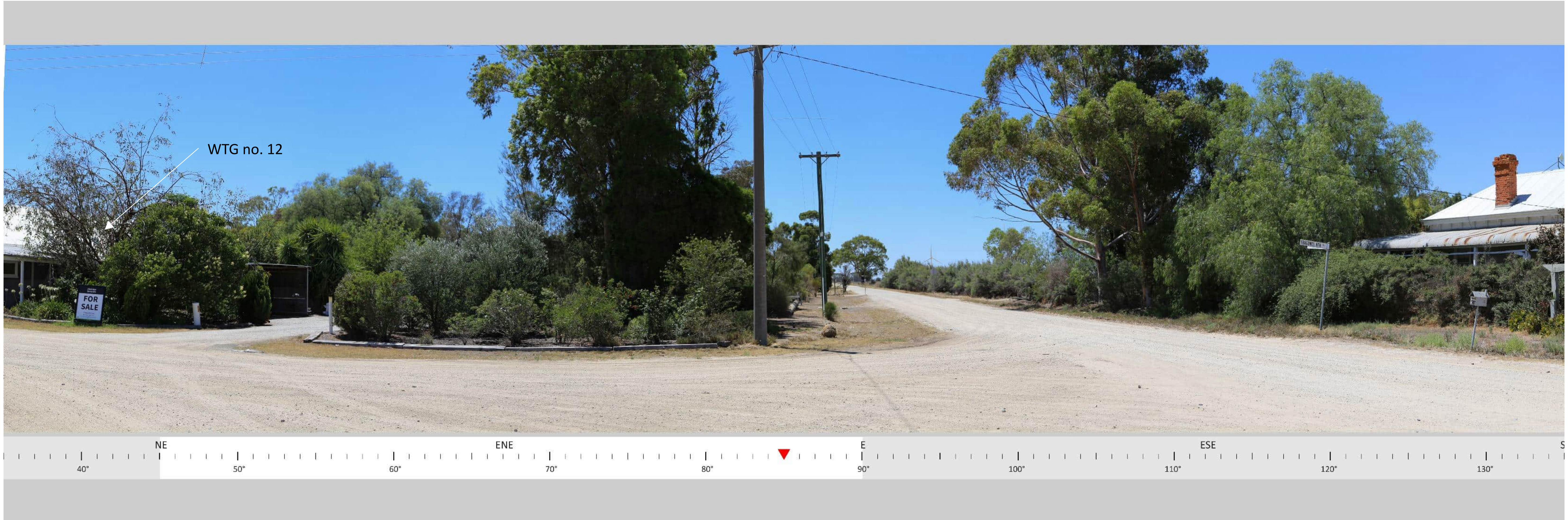
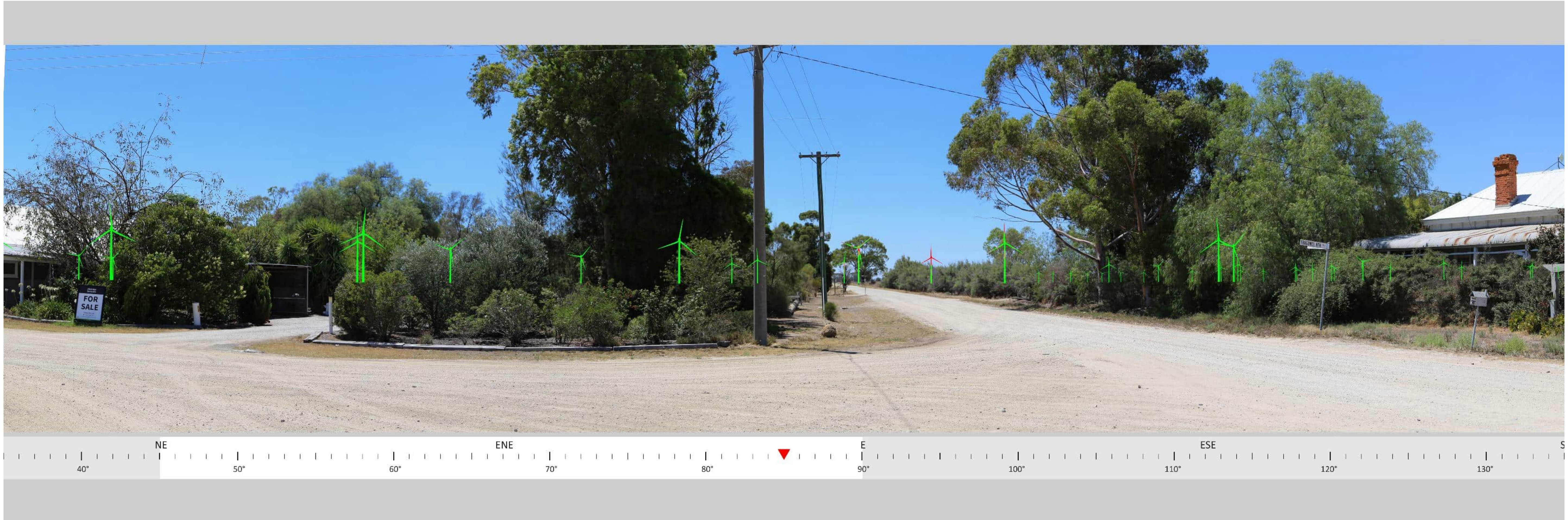
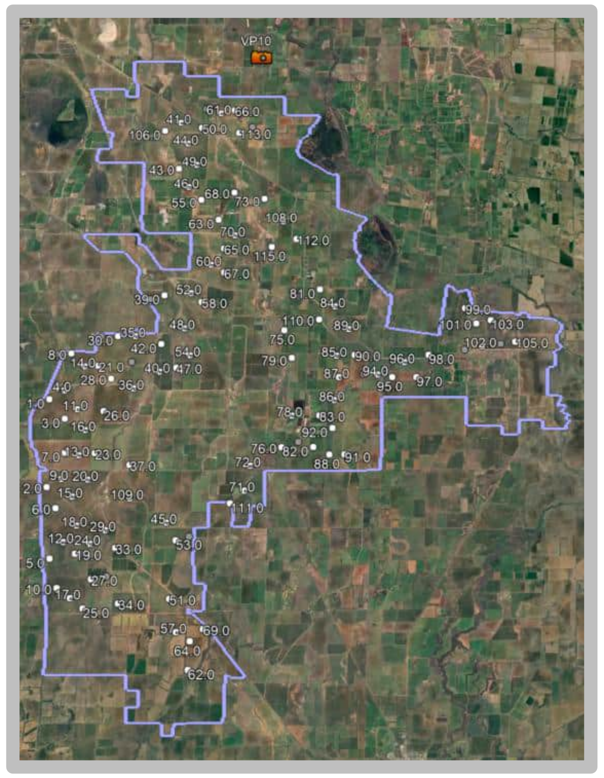


VP9 - Photosimulation view towards Project.

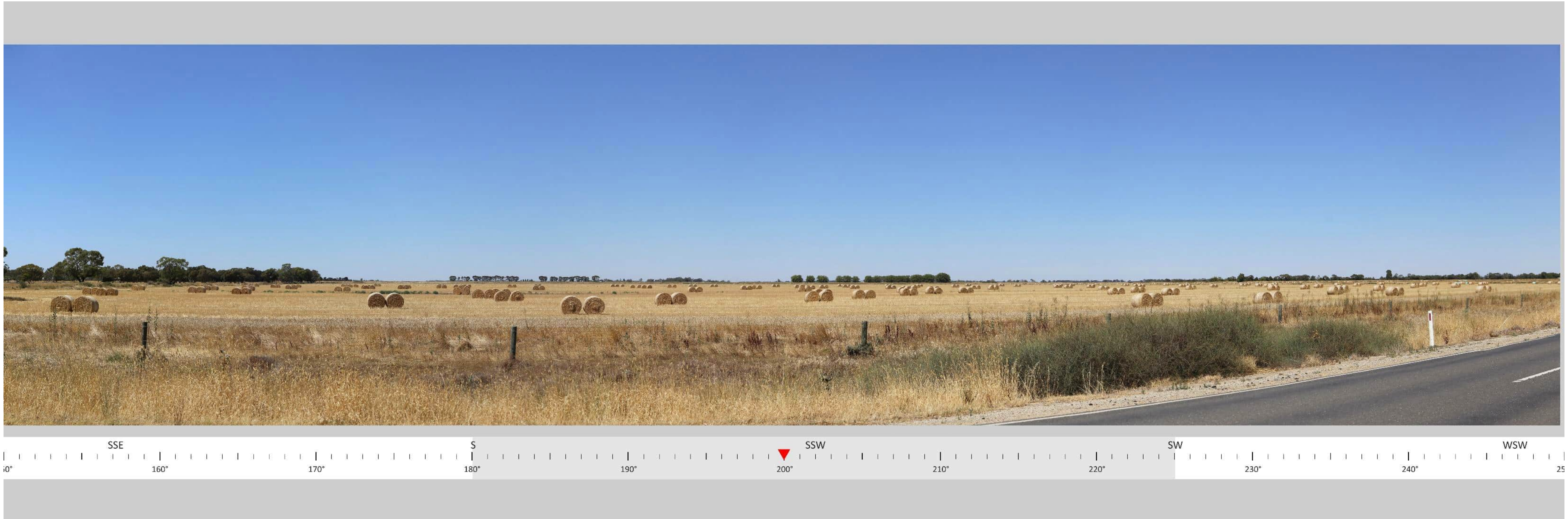


VP9 - Wireframe 3D model overlay view.



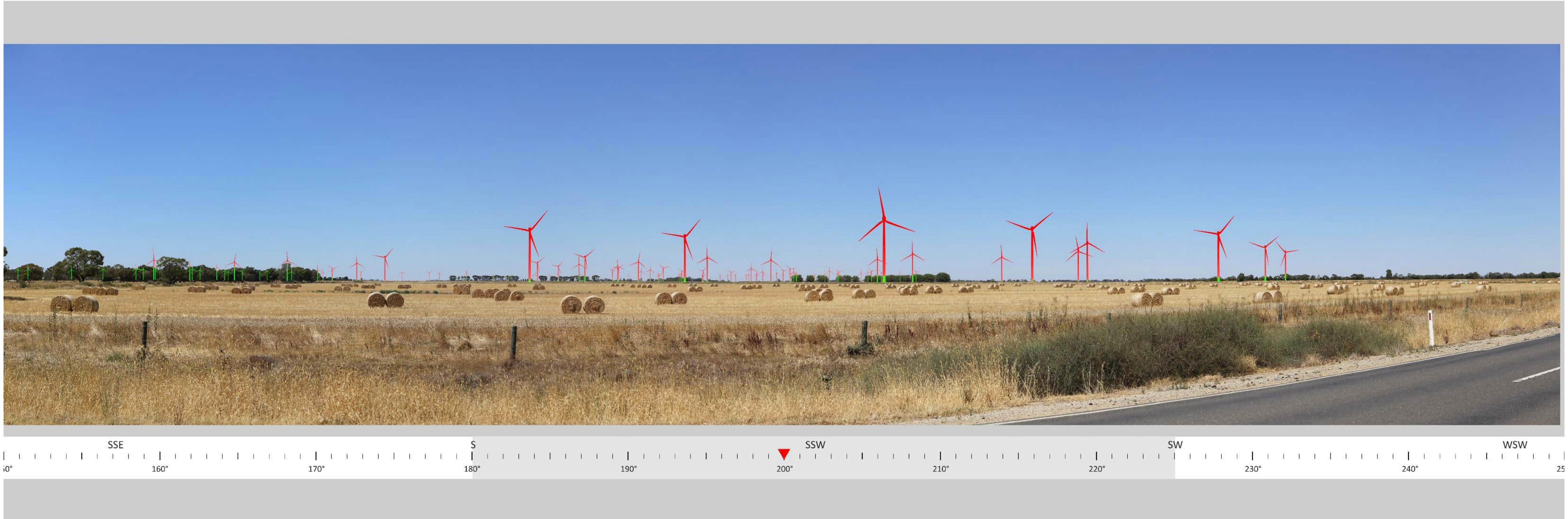
Viewpoint coordinates: 35°47'16.75"S / 144° 2'14.49"E

2.2km to closest WTG no. 2.



VP10 – Existing view towards Project.

VP10 - Photosimulation view towards Project.



VP10 - Wireframe 3D model overlay view.

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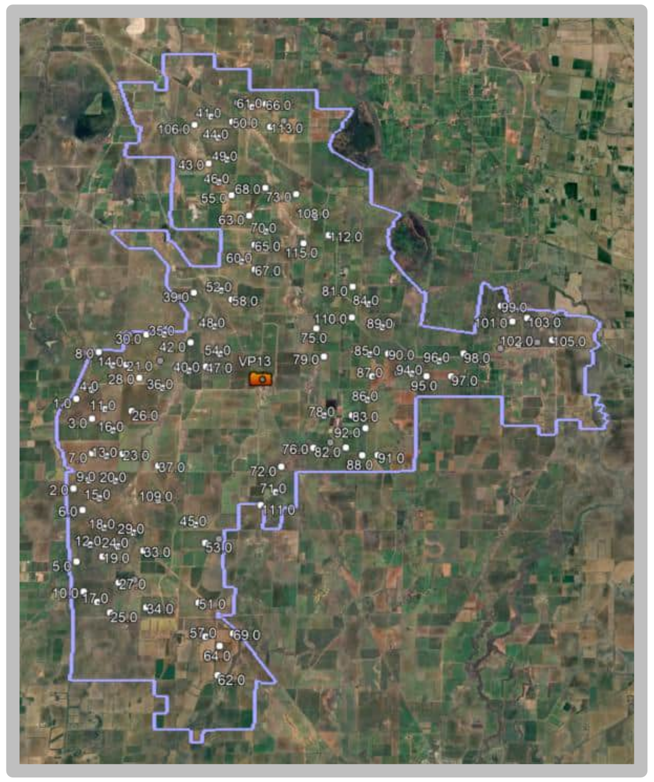
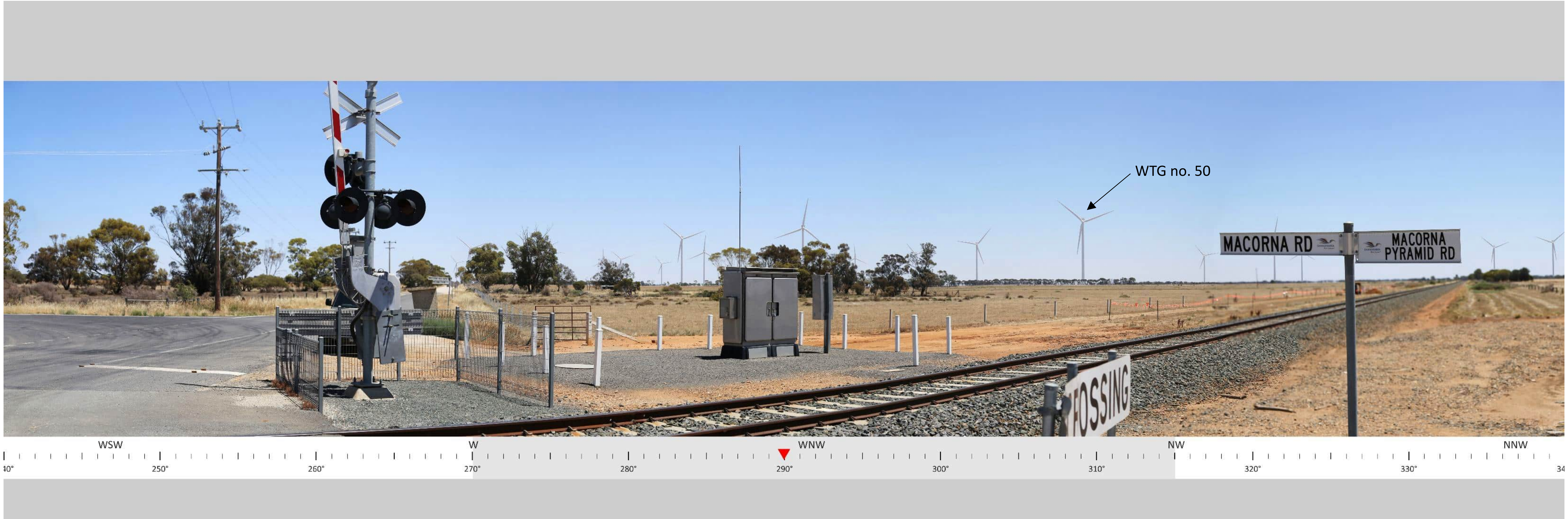


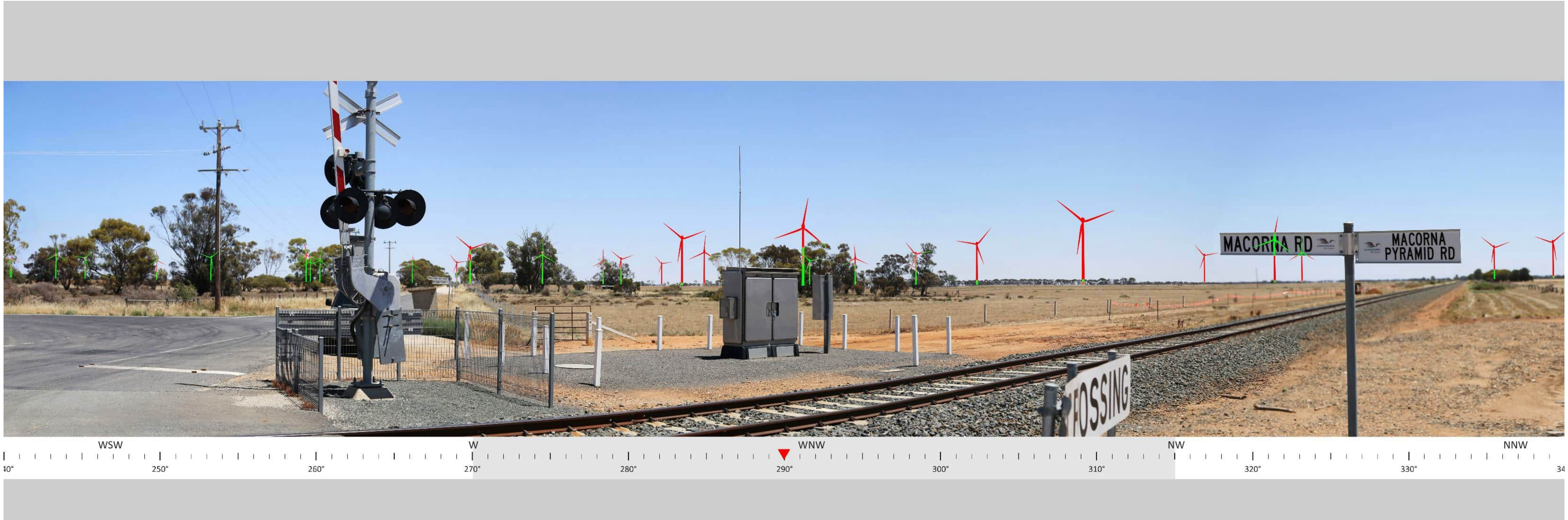
Viewpoint coordinates: 35°55'7.24"S / 144° 1'43.01"E

2.2km to closest WTG no. 50.

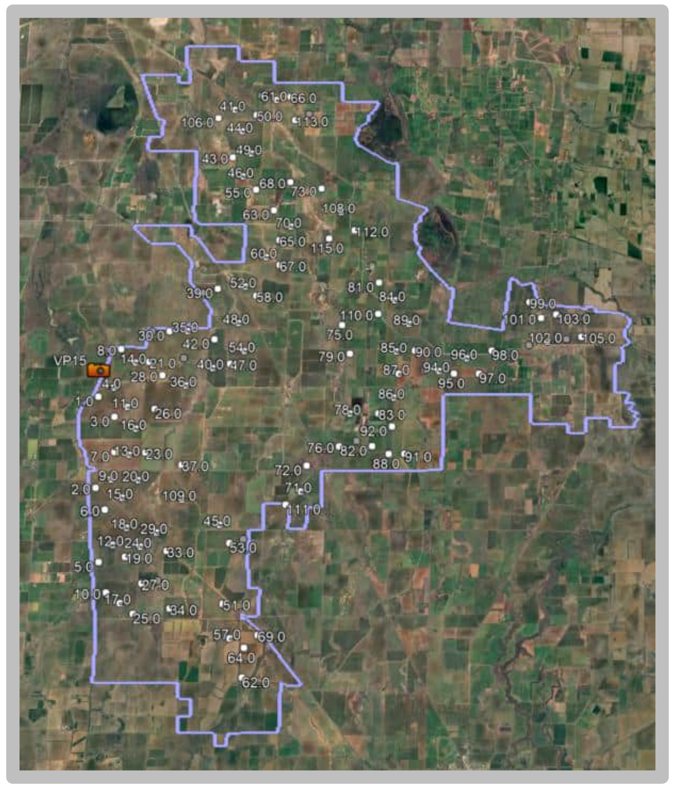
VP13 – Existing view towards Project.



VP13 - Photosimulation view towards Project.



VP13 - Wireframe 3D model overlay view.



Viewpoint coordinates: 35°54'58.31"S / 143°56'36.43"E

690m to closest WTG no. 67.

VP15 – Existing view towards Project.

VP15 - Photosimulation view towards Project.

VP15 - Wireframe 3D model overlay view.

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Appendix C - A survey of the visual impact and community acceptance of wind farms in Australia, Lothian (2019).

A survey of the visual impact and community acceptance of wind farms in Australia

Article *in* Australian Planner · July 2020

DOI: 10.1080/07293682.2020.1819355

1 author:

Andrew Lothian
University of Adelaide

A survey of the visual impact and community acceptance of wind farms in Australia

Dr Andrew Lothian
Scenic Solutions

Key words

Wind farms; Australia; visual impact; acceptability of wind farms; scenic quality rating; landscape quality.

Abstract

Although overall support for wind farms in Australia is strong, the rapid growth in their number and size has led to concerns about their visual impact, as evidenced by organised opposition and litigation.

In March 2018, an Australia-wide Internet survey mainly of clubs and councils was conducted which asked respondents to rate the scenic quality of the landscape with and without a wind farm, and also to rate the acceptability or otherwise of the wind farm in scenes with the wind farm. Photographs of wind farms in NSW, Victoria and SA were used. From the response of nearly 800 participants a sample of 556, weighted to be representative of the Australian population, was analysed.

While the respondents rated the scenic quality of landscapes with wind farms lower than scenes without them, they rated wind farms acceptable in virtually all landscapes, including high scenic quality coastal scenes. The finding suggests that the community is very tolerant of the visual impact of wind farms. Results are presented for 18 wind farms.

This survey is unique in that it not only asked participants to rate the landscape with and without wind farms but it also asked them to rate the acceptability of the wind farm in each scene. To the author's knowledge, this had not been accomplished previously in Australia.

INTRODUCTION

Wind farms have grown rapidly in number over the past few decades, from virtually none in 2000 to 102 by end 2019. Accordingly, the pressure has grown on planners in State and Local Authorities to assess their impacts, consult with their communities, and determine whether or not to approve them together with defining any conditions that might be attached to approvals.

Following a review of the dimensions of wind farms and opinion surveys regarding wind farms, this paper describes a survey of nearly 800 people from across Australia that asked respondents to rate the scenic quality of the landscape with and without a wind farm, and also to rate the acceptability or otherwise of the wind farm in scenes with the wind farm. The results can provide planners with an objective assessment of the likely visual impact and acceptability of wind farms in their localities.

SCALE OF THE ISSUE

In response to Government incentives since 2000, together with the Renewable Energy Target, renewable energy projects have proliferated including domestic photovoltaic, large scale photovoltaic, hydro, bioenergy and extensive wind farms. The electricity produced by wind farms contributed 8.5% of Australia's electricity in 2019, generating 6,300 MW of electricity (Clean Energy Council 2020).

Wind farms are located mainly in southern Australia, where the winds are strongest and most consistent (Figure 1).

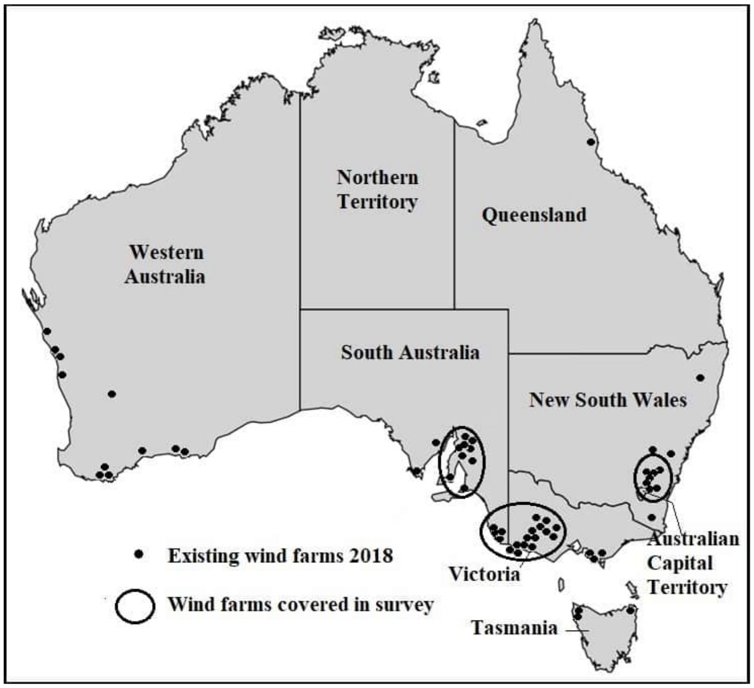

Figure 1 Wind farms in Australia, 2018
Source: Paragon Media, Wind Farm Map of Australia, 2018

However, it is not just the number of wind turbines that have grown, but also their scale. During the 1990s, wind turbines were less than 50 m in height to the top of the hub with 10 – 15 m blades. By 2015, turbines had grown to nearly 100-m with 55-m blades. These are very sizeable structures in the landscape, far larger than electricity transmission towers. Overseas, former 50-m turbines are being replaced by 150-m high turbines in a process called repowering.

Land owners generally enter into a long-term agreement with the wind farm developer - 25 years is common with renewal options. They are paid either $8,000 - $10,000 per year per turbine or an amount dependent on the generating capacity – the modern large turbines result in fewer being installed. As the National Wind Farm Commissioner points out, the land may then be treated as industrial and be no longer exempt from land tax and may be subject to higher council rates.

Over the past forty years, the cost of wind turbines has dropped – in the early 1980s it was 30 cents/kWh and is now 5 c/kWh. A 2 MW turbine costs $3 – 4 million installed, with approximately 75% of the cost being the turbine and the rest covering its concrete foundation, land rent, grid connection, roads and control systems. Wind farms in south-east Australia have a capacity factor of 30 – 35%, some as high as 40%. This is the proportion of the year that it would generate electricity. By comparison, the capacity factor for a nuclear power plant is 77%, coal-fired power station 55%, gas-fired power station 45% and solar PV 25%.

Wind energy's carbon footprint is about 12 grams/kWh compared with 870 for coal and 464 for gas (J.D. Rhodes, University of Texas, Austin's Energy Institute). The payback time for a wind turbine to cover the energy used in its manufacture and construction is six to eight months (Wind Measurement International).

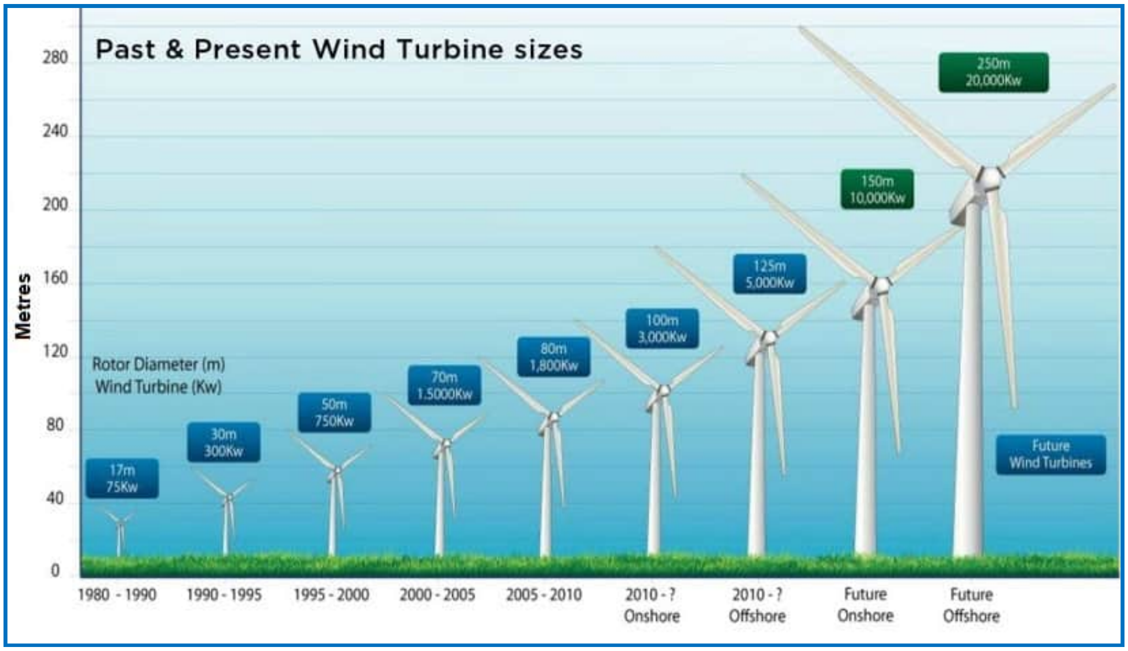

Figure 2 Growth of wind turbine size
Source: www.ucsusa.org/clean-energy/renewable-energy/

Attitudes of Australians towards wind farms

Australians appear to have a polarized love-hate relationship with wind farms. In July 2006, Federal Treasurer Peter Costello stated, "Well if you are asking me my view on wind farms, I think they are ugly, -…I wouldn't want one in my own back yard." (Hudson 2017). A later Federal Treasurer, Joe Hockey, described the wind farm on Lake George near Canberra as "utterly offensive, I think they're just a blight on the landscape." (ABC.net.au 2 May, 2014).

Surveys of Australians, however, have consistently shown that renewable energy, and wind farms in particular, have overwhelming support. Table 1 summarises 21 surveys of the community taken over the past decade. The surveys covered a total of 20,500 Australians. The average overall support for wind farms was 75% and 81% for renewable energy. Opposition to wind farms averaged 11% and 6.5% against renewable energy.

Table 1 Community attitude surveys of wind farms, Australia, 2006 – 2018

Date	Location	N	% support	% against	Source
2003	Australia	1,027	Support wf 95% Need wf for electricity 91% Increase RE a lot 67% Increase RE a bit 21% Strongly support wf 67%	Decrease RE a lot 1% Decrease RE a bit 1% Oppose wf 3%	AWE, 2003
2006	Australia	900	Support growth of wf in Australia 63%		Ashworth, ***et al,*** 2006
2006	Tourist centres, Qld & SA	280	Tourist accommodation should have RE 86%		Dalton, ***et al***, 2008
2007	Australia	1,007	Governments should boost wind power 78% 89% want electricity to be min. 25% RE	Govts should boost nuclear 25%	Global Market Insite
2008	Western		Majority think of a wind farm	2% oppose wf	Bond, 2008

	Australia		in positive terms. 89% not concerned about visual intrusion.		
2008	Upper Lachlan Council	4,822	58% support more wf. (Crookwell wf in area)	24% against more wf	Electoral Comm. of NSW *Ramblings
2010	Australia	1,085	80% support for wind 11% neither wind or solar	4.6% against wind	Bird ***et al***, 2014
2010	NSW	2,022	85% support wf in NSW 79% support wf within 10 km 60% support wf within 1-2 km	13% against wf in NSW or within 1-2 km.	NSW Office Env Climate Change & Water, 2010
2011	NSW, Victoria, SA	1,000	National 83% support NSW 77% support Victoria 84% SA 90%	National 14% opposed	Qdos for Pacific Hydro.100 people in 10 electorates. *Ramblings
2011	Waterloo, SA	358	77% support wf 69% for local wf		TRUEnergy *Ramblings
2012	Bungendore, NSW	234	Benefits env. 75%	No benefit 10%	QDos Research *Ramblings
2012	Australia	1,907	Support: wind 38%, solar PV 37%, solar thermal 33%		Hobman ***et al,*** 2012
2012	Australia	1,101	78% support for wind 10% neither wind or solar	8.6% against wind	Bird ***et al***. 2014
2014	NSW	2,000	RE support 91% 83% want more RE 81% support wf.	3% want less RE 11% current levels of RE	NSW Office Env & Heritage, 2015
2014	Australia		88% in favor wind & solar 95% RE a 'good idea'	8% against wind & solar 2% RE not a good idea	Newspoll 20/8/14 *Ramblings
2014	Australia		>80% support wind & solar	35% prefer coal	Moss, ***et al***, 2014
2016	Australia		Support state RE targets 76%	Against state RE targets 7%	Australia Institute
2017	Hunter Valley NSW		Govt. should invest in RE 59%	Govt. should invest in coal 34% (Coal mining area)	Australia Institute *Ramblings
2017	Australia	1,420	Support state RE targets 77% Keep current Federal RE target 26% Increase Fed. RE target 52% Higher 2030 target 73%	Against state RE targets 10% Reduce Federal RE target 9% Not higher 2030 target 12%	Australia Institute
2017	Australia	1,421	Support Clean Energy Target for more RE 77% Want wind and solar 81%	Don't support CET 11% Want coal-fired power 16%	Australia Institute
2018	SA		Australia should switch to solar & wind 62%		ReachTEL survey Anon, 2018

Note: wf = wind farms, RE = renewable energy. Some surveys provided no data on the number of people surveyed.
*Ramblings – see https://ramblingsdc.net/Australia/WindPower.html#Opinion_surveys

Opponents of wind farms, such as landscape guardian groups, have been surveyed by Hindmarsh (2010) who found strong resentment against "outsiders" sacrificing the local landscape for external electricity users. Hall (2014) reviewed articles in 19 Australian newspapers and found they reported opposition to wind farms far more than articles of support. She found rural communities often had "underlying cultural or ideological concerns" including being politically neglected by urban centres and opposition to a 'green' political agenda. Chapman, ***et al***. (2013) reviewed complaints about wind farms between 1993 and 2013, a total of 51 wind farms and found no complaints for 33 while 18 had been subject to at least one complaint.

Opposition resulting in litigation has occurred in some instances. Table 3.4 summarizes the 17 wind farm cases that have been considered by the courts and only two of these were rejected, one to be later approved in an amended form. Litigation as a weapon of opposition therefore does not appear effective.

Table 2 Wind farm proposals reviewed by courts

Year	Location	State	Turbines	Court	Outcome
1995	Cape Bridgewater	Vic	95	Civil & Admin. Tribunal	Rejected*
2001	Toora, South Gippsland	Vic	12	Civil & Admin. Tribunal	Approved
2007	Taralga	NSW	69	Land & Env. Court	Approved
2007	Hepburn	Vic	2	Civil & Admin. Tribunal	Approved
2007	Sale, South Gippsland	Vic	7	Civil & Admin. Tribunal	Approved
2008	Cooramook	Vic	13	Civil & Admin. Tribunal	Approved
2008	Port Campbell	Vic	15	Civil & Admin. Tribunal	Approved
2010	The Sisters, Mortlake	Vic	12	Civil & Admin. Tribunal	Approved
2010	Gullen Range	NSW	73	Land & Env. Court	Approved
2010	Bald Hills, Sth Gippsland	Vic	52	Civil & Admin. Tribunal	Approved
2010	Hallett	SA	33	Env. Resources & Dev. Court	Approved
2011	Allendale	SA	46	Env. Resources & Dev. Court	Rejected
2012	Woolsthorpe	Vic	20	Civil & Admin. Tribunal	Approved
2013	Seymour	Vic	16	Civil & Admin. Tribunal	Approved
2014	Tothill	SA	35	Env. Resources & Dev. Court	Approved
2018	Palmer	SA	114	Env. Resources & Dev. Court	Approved
2020	Rokewood	Vic	228	Supreme Court	Approved

*Note: A larger proposal at Cape Bridgewater was approved by the Minister in 2002 after a thorough review.

State and Territory Governments are responsible for approvals in Qld, NSW, ACT, Vic, WA and NT, while local government in SA and Tasmania review applications with provision for State Government involvement. The National Wind Farm Commissioner maintains up-to-date information on the regulation of wind farms in Australia (www.nwfc.gov.au/planning-and-regulation).

In an attempt to address the visual impacts of wind farms, the industry group, Austwind, partnered with the Australian Council of National Trusts in preparing a framework for landscape values assessment - ***Wind Farms and Landscape Values: A National Assessment Framework*** (Austwind 2007). The framework provided a comprehensive process for assessing, evaluating and managing the visual impacts of wind farms but left it up to the developers to decide the actual technical methods, tools and techniques they would use.

SURVEY OF VISUAL IMPACT AND ACCEPTABILITY OF WIND FARMS

The survey was conducted as a follow-up on an earlier survey by the author in 2003, before many wind farms had been established (Lothian 2008). That survey assessed the visual impact of hypothetical wind farms in 21 coastal and 47 inland locations of South Australia. Scenes with and without the wind farm were rated by over 300 participants on a 1 (low) – 10 (high) scale. The research determined that wind farms diminished scenic quality in all coastal locations. For inland areas, in areas where the prevailing landscape quality was low (< 5.1), the presence of a wind farm actually enhanced scenic quality through introducing interest in an otherwise flat and barren landscape.

In addition to rating the scenic quality of the landscape, as in the previous survey, the current survey also asked participants to score the acceptability of the wind farm in the particular landscape.

Photographs were taken in August, 2017 of 31 wind farms in SA, Victoria and NSW. From these, 17 wind farms were selected plus an additional ten hypothetical sites on the SA coast, which had been used in the previous survey. The photographs were of horizontal format at 50 mm focal length which approximates the human eye. Being winter, the ground cover was green in all scenes except for some of the coastal scenes which were of summer straw. Survey participants were asked to rate the scenic quality of the scene with and without the wind farm on a ten-point scale (one low, ten high). Nothing in the survey instrument sought to bias the results one way or another. The survey randomised the scenes anew for each participant. For scenes with wind farms, on the same sheet, respondents were also asked to indicate the degree of acceptability of the wind farm in the landscape on a five-point scale: very acceptable, acceptable, neutral, unacceptable, very unacceptable. The survey comprised 49 scenes with wind farms and 49 without, a total of 98 scenes for the survey. Over 800 turbines were shown in the images. The dimensions of the wind farms used in the survey are listed in the Appendix.

Using Survey Monkey (www.surveymonkey.com), the survey was launched on the Internet in March 2018 for 31 days. Invitations to participate were emailed to local government councils in SA, Victoria and NSW and to clubs throughout Australia including outdoor, car, caravanning, gem and mineral clubs, members of whom were considered likely to have seen a wind farm. Internet access for Australian households in 2016/17 was 86% with little difference between rural and city locations (ABS, 2018).

Nearly 850 people participated in the survey, of these, 69 failed to rate any scenes, leaving a data set of 779 participants. However the survey sample varied substantially from the Australian population so in order that the sample be representative, the data was weighted to reflect the Australian population. The weightings were performed on-line by a Dutch company, Spinnaker Research, which weighted the sample data by all four characteristics. Table 3 shows the resulting means and standard deviations.

Table 3 Means of unweighted and weighted data

Data	Wind farm	Unweighted ratings	Weighted ratings
Mean	With wf	5.7	6.2
	Without wf	6.9	7.3
Standard Deviation	With wf	0.4	0.4
	Without wf	0.9	0.8

Participants from every State and Territory were included: Qld 76, NSW 170, ACT 22, Vic 111, Tas 11, SA 142, WA 19, NT 2 and 3 unknowns.

FINDINGS

In the survey, prior to rating the scenes, participants were asked about their familiarity with wind farms and their attitude towards them (Table 4). All but a handful had seen wind farms, 53% had seen a few and 45% had seen many. Nearly 70% were in favour of wind farms and only 7% were against them, similar figures to those from previous Australian surveys. A further 24% were equivocal – “it depends”.
.

Table 4 Familiarity and attitude towards wind farms

	Never seen one	Seen a few	Seen many	Total	%
Against	1	12	26	39	7.1
In favour	5	203	172	380	68.8
It depends	4	79	50	133	24.1
Total	10	294	248	552	100.0

%	1.81	53.26	44.93	100.00	

Figure 3 indicates that those against wind farms increased with the number seen, while those in favour fell slightly with increasing numbers seen. Those who said, “it depends” also decreased with greater familiarity. Overall it suggests that support falls with growing numbers of wind farms.

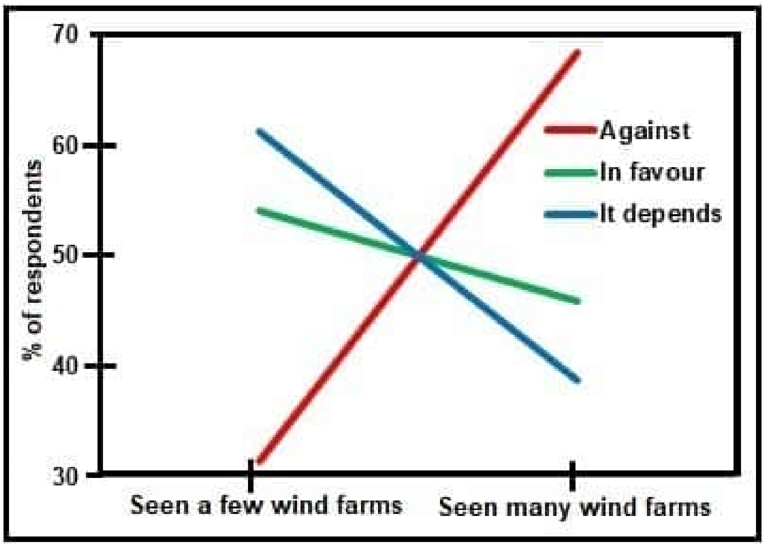

Figure 3 Change of attitude with increased familiarity of wind farms

Table 5 compares attitudes by State and Territory and indicates strong support in NSW, Victoria and South Australia, the states with the most wind farms.

Table 5 Wind farm attitude State & Territory (%)

%	Against	In favour	It depends	Total
Qld	13	70	17	100
NSW	11	66	23	100
ACT	6	67	28	100
Vic	5	71	24	100
Tas	6	88	6	100
SA	6	64	30	100
WA	4	75	21	100
NT	0	100	0	100

Figure 4 shows the ratings of all scenes with and without the wind farms. In all scenes, the rating of the scene with the wind farm was lower than the landscape scene without the wind farm. The difference was most marked for the ten coastal scenes on the right-hand side of the graph. Ratings of the scenes with and without wind farm were significantly different: $t = -10.15$, $df = 48$, $p < 0.0000$.

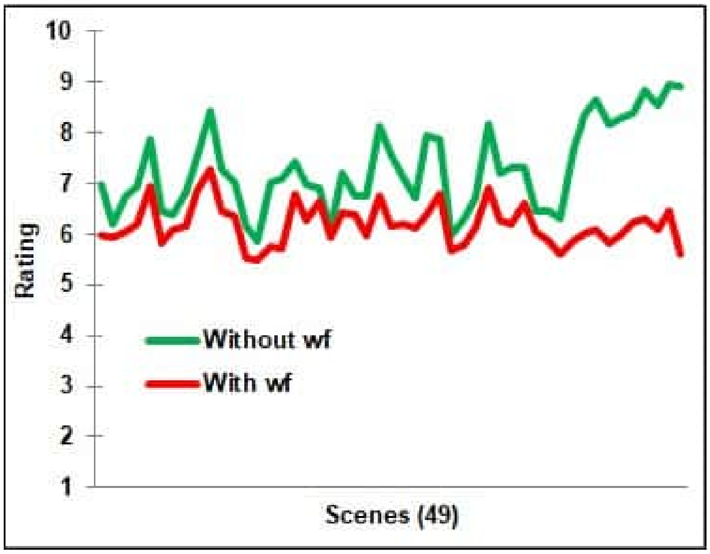

Figure 4 Ratings of scenes with and without wind farms

Omitting the ten hypothetical coastal scenes, the mean for scenes without wind farms was 6.99 and with wind farms, 6.22, a difference of 0.77 (including coastal scenes: without wind farm 7.29, with 6.19, difference 1.1).

In the survey, the rating of acceptability followed immediately after rating the scenic quality of the landscape. The majority of respondents found them acceptable or very acceptable (Figure 5). What was particularly surprising was that this applied to virtually all scenes including those of high scenic quality, in other words, regardless of the scenic quality of the landscape, participants generally considered the wind farms acceptable, including in virtually all high-quality coastal landscapes.

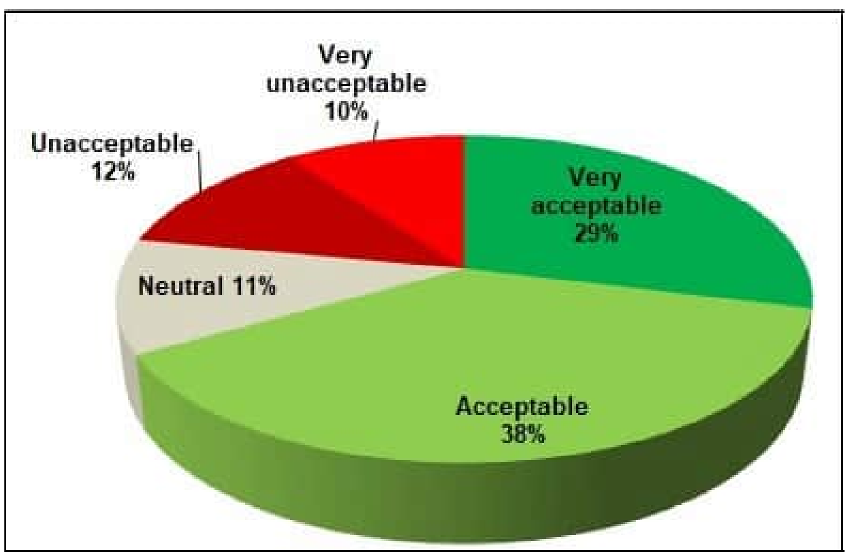

Figure 5 Acceptability of all wind farms

The only scene in which wind farms were considered unacceptable was scene 97 of Pennington Bay on Kangaroo Island in which 60.6% of participants found the wind farm unacceptable or very unacceptable compared with 35.6% who found it acceptable or even very acceptable.

Figure 6 Pennington Bay, Kangaroo Island with hypothetical wind farm

Interestingly, Figure 6 (without the wind farm) was the top-rated coastal scene in the author's 2005 Coastal Viewscapes project of coastal landscapes in South Australia (Lothian 2005).

Figure 7 shows the acceptability ratings for all 49 scenes. Pennington Bay is the final scene on the right-hand side.

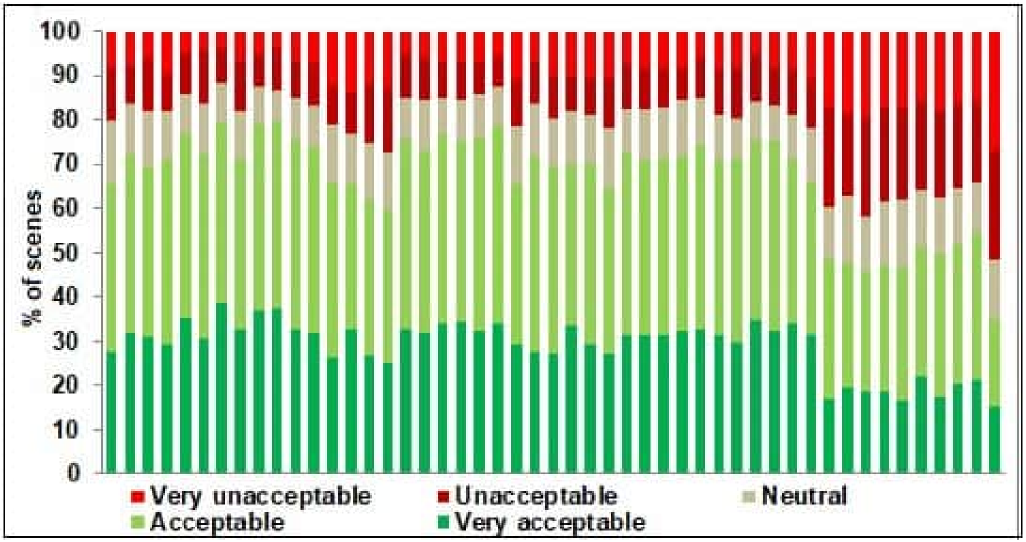

Figure 7 Acceptability of wind farms by scene

Most wind farms were represented in the survey by more than one scene and Table 6 provides the average acceptability rating for each wind farm in the three States and Figure 8 summarises the ratings for each State.

Table 6 Percent acceptability rating of wind farms by State

				Average percent per wind farm				
State	Wind farm	Scenes	Mean rating	Very Acceptable	Acceptable	Neutral	Unacceptable	Very Unacceptable
NSW	Cullerin	3	6.0	30.2	38.8	12.9	11.0	7.2

	Range							
	Gullen	2	6.6	32.4	41.6	9.9	8.9	7.2
	Capital	2	5.9	34.6	41.3	10.2	9.7	4.2
	Taralga	1	6.2	35.0	40.1	9.7	9.7	5.9
Vic	Ararat	2	7.1	37.3	42.1	7.7	8.4	4.5
	Cape Nelson	1	6.5	32.5	43.0	9.6	8.4	6.5
	Challicum Hills	1	6.3	31.6	42.3	9.1	9.5	7.4
	Macarthur	2	5.5	29.4	36.2	12.4	9.2	12.8
	Mt Mercer	2	5.7	25.8	35.2	12.7	14.0	12.3
	Waubra	4	6.4	33.1	42.0	9.7	8.7	6.5
	Yambuk	2	6.4	33.1	44.2	9.3	7.5	5.8
SA	Bluff Range	1	6.0	29.2	36.2	13.2	10.7	10.6
	Hornsdale	6	6.4	29.4	40.4	11.4	9.5	9.3
	L Bonney	3	5.9	31.6	39.9	11.7	8.5	8.2
	Starfish Hill	1	6.9	32.7	41.9	10.3	9.6	5.5
	Waterloo	3	6.4	32.1	40.4	9.3	10.9	7.3
	Wattle Pt	3	5.8	32.6	38.1	10.2	9.8	9.3
	Coast	10	6.0	18.7	29.1	13.3	20.8	18.2

Mean rating is of scenes with the wind farm

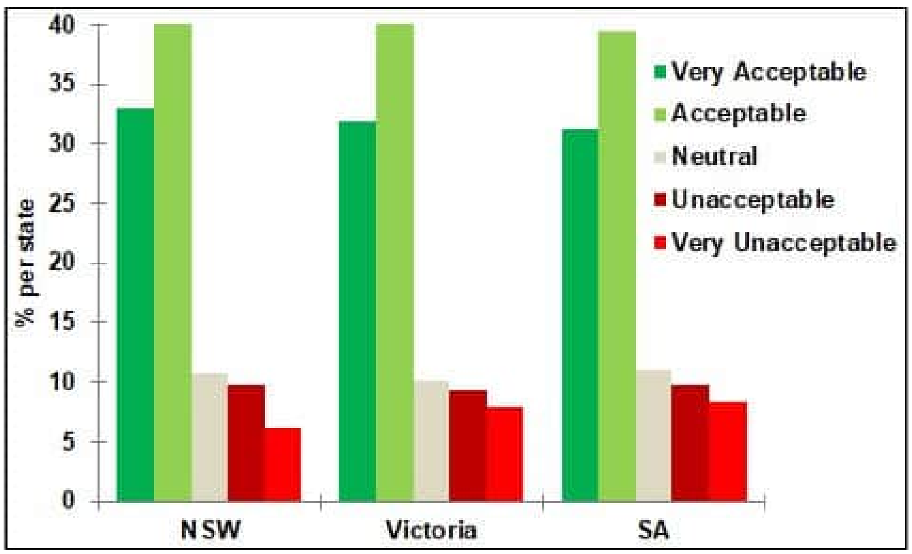

Figure 8 Average ratings by State

Note: Excludes ten coastal scenes in SA

The influence of various factors on the ratings was examined using multiple regression analysis. For the scenes with wind farms, it found the following:

- The presence of dense vegetation increased ratings by 0.39.
- The hillier the land, the higher the ratings, by 0.22 for scenes comparing flat land with hilly land.
- Ratings decreased slightly with an increasing number of turbines, increasing the number from 10 to 50 reduced scenic quality ratings by only 0.20.
- Placing turbines linearly along ridges increased ratings by 0.26 compared with random layouts.
- The height of turbines had virtually no influence on ratings; increasing the height from 100 m to 150 m actually increased ratings by 0.19.

- The highest ratings were for the largest turbines; increasing them from 1.5 MW to 3 MW lifted ratings by 0.10.
- With greater distance to the turbines, ratings increased by 0.37 at mid-distance compared with those nearby, and by 0.42 for the distant turbines.

These suggest that people prefer a smaller number of turbines and for turbines to be placed in an orderly arrangement such as linearly rather than in random layouts. Their height and generating capacity had little influence on scenic quality ratings. Both height and number are highly visible attributes, whereas only specialists would discern the difference in the size of the generators.

Assessing the influence of the height, number and generating capacity of wind turbines on their acceptability is somewhat more complex. Unlike scenic quality for which a single integer between one and ten was available, acceptability was judged by participants on a five-point Likert scale: very acceptable, acceptable, neutral, unacceptable, very unacceptable. A single integer can be derived, however, using the following algorithm:

Acceptability score = (2 X very acceptable + 1 X acceptable) – (1 X unacceptable + 2 X very unacceptable)

Thus, the sum of the unacceptable and very unacceptable ratings was subtracted from the sum of the very acceptable and acceptable ratings. It is assumed here that very acceptable is twice a good as acceptable, and the same for very unacceptable compared with unacceptable. The figure could be much greater or lesser, but in the absence of contrary knowledge, twice is adopted.

Example: Scene 29, Mt Mercer wind farm (Victoria) (Figure 9)
Very acceptable 139, acceptable 185, neutral 67, unacceptable 70, very unacceptable 61.
Acceptability score = (2 X 139 + 185) – (70 + 2 X 61) = 271

Figure 9 Mt Mercer wind farm

Figure 10 compares the acceptability score with the scenic quality rating of the landscape. The bulk of wind farms appear at the acceptable end of the scale. Curiously the trend suggests that the higher the scenic quality rating, the greater their acceptability, which is counterintuitive. It was expected that the acceptability would decline in higher quality landscapes. However, the results indicate that despite rating the scenic quality as high, participants found the wind farm acceptable.

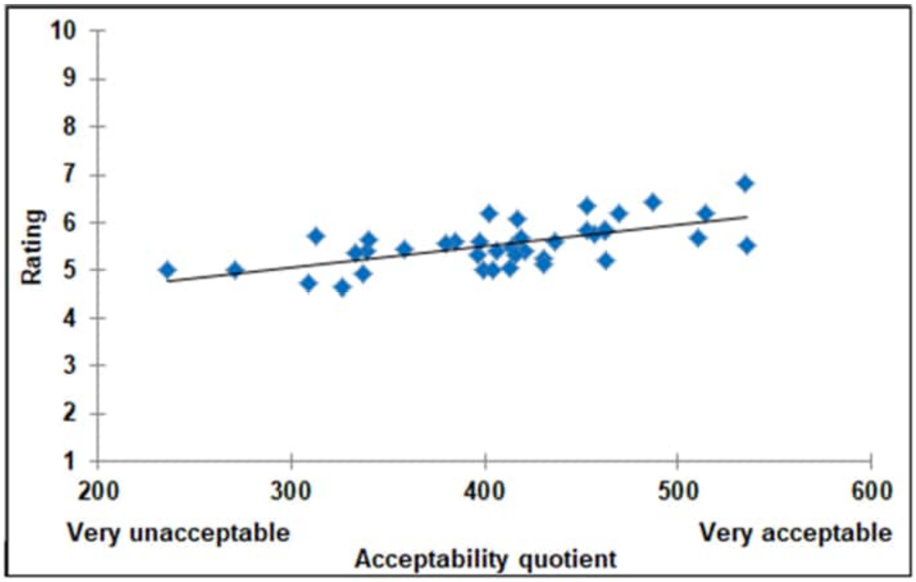

Figure 10 Acceptability scores vs ratings (excluding coastal scenes)
Trend line: $y = 0.0044x + 3.77$, $R^2 = 0.39$

DISCUSSION

The results of this survey support the findings of opinion polls over the past decade or so that the community is very tolerant of wind farms. The unique finding of this survey was that this support exists even in reasonably high scenic quality landscapes. Protests about wind farm proposals are more likely to be about their intrusion into a rural community, their possible effects on land values, concerns about noise and impacts on wildlife.

Many comments from participants in the survey related to clean energy and wind farms being an alternative to coal which fulfils Hall ***et al.*** (2012) finding that the community view wind farms as a means of taking action against climate change by reducing greenhouse gas emissions.

The wind farm industry may be commended that in their development of wind farms they have achieved such strong community endorsement. Providing information days and tours of wind farms has communicated well with the public. Over time, the community's concerns have been alleviated by seeing wind farms and finding them acceptable.

Participants preferred a smaller number of turbines than a large number, and for turbines to be arranged in an orderly arrangement rather than scattered randomly.

For local and state governments regulating the industry the findings suggest that while care needs to be taken with the layout, number and appearance of wind farms, and proponents need to meet all conditions of approval, the public is far more tolerant of the presence of turbines than governments might assume. This does not mean that the regulatory requirements should be relaxed; indeed, the current good standing of wind farms may be partly attributed to the care with which governments have regulated the industry.

From a community viewpoint, the findings should not cause dismay, except for those implacably opposed to wind farms – the comments provided in the survey indicate that opponents participated. There are always some for whom every wind farm must be opposed. For those who might find a wind farm being proposed in their vicinity, the findings suggest that resorting to public opinion or litigation may not be their best courses of action. Rather they should seek to work with the developer and government in reaching outcomes which minimise the adverse impacts.

The author's focus lies with the Australian landscape. If the findings are seen as providing ***carte blanche*** to site wind farms in high quality landscapes, then this will be disastrous and may well turn the public against the industry. The challenge for spatial planners is to ensure that wind farms are located in areas without significant visual or other impacts. Early discussions between developers and planners are essential for this to be achieved. With rural communities often desperate for the employment that wind farms can provide over the long term, achieving an optimal balance between the environment, the economy and the local community can be very challenging.

The industry should concentrate wind farms in the lower quality landscapes – the flat land devoid of tree cover, or low ridges with trees or low-lying coastal areas. Australia has large areas of such suitable land with good wind resources.

CONCLUSION

A survey of more than 550 participants in Australia found that while participants rated wind farms as impacting the scenic quality of landscapes in which they were located, this visual impact was acceptable in virtually all cases. Given the high level of support for wind farms that the Australian community has expressed through opinion surveys, the finding is perhaps not surprising. The balancing between achieving low emissions green energy and protecting landscape quality is weighed towards the former.

While protests against wind farms by affected communities and landowners are likely to continue, it is hoped that the finding of this survey may enable Australians to reach solutions that are agreeable and beneficial to the entire community.

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No wind farm company sponsored or participated in this survey. The author is not aware of any conflicts of interest.

APPENDIX

Wind farms photographed in New South Wales, Victoria and South Australia, 2017

	Turbines	Hub/ blade m	Total height m	Turbine MW	Total MW	Year
NEW SOUTH WALES						
Capital	67	80/44	124	2.1	140.7	2010
Crookwell	8	45/22	67	0.6	4.8	1998
Cullerin Range	15	80/46	126	2	30	2009
Gullen Range	56	80/50	130	2.5	140	2014
Gullen Range	17	85/41	126	1.5	25.5	2014
Gunning	31	80/35	115	1.5	46.5	2011
Taralga	21	80/50	130	2	42	2015
Taralga	21	80/45	125	1.8	37.8	2015
Taralga	9	80/45	125	3	27	2015
Woodlawn	23	80/44	124	2.1	48.3	2011
Total New South Wales	**268**				**402**	
VICTORIA						
Ararat, Vic	75	83.5/51.5	135	3.2	240	2017

Cape Bridgewater, Vic	29	69/41	110	2.05	59	2009
Cape Nelson south, Vic	22	69/41	110	2.05	44	2009
Cape Sir William Grant/ Cape Nelson north, Vic	23	80/46.5	126.5	2.05	47.2	2015
Challicum Hills, Vic	35	68/32	100	1.5	52.5	2003
Codrington, Vic	14	50/31	81	1.3	18.2	2001
Macarthur, Vic	140	85/56	141	3	420	2013
Mt Mercer, Vic	64	85/46.25	131.25	2	131	2014
Oaklands Hill, Vic	32	80/44	124	2.1	63	2012
Waubra, Vic	128	70-82	110-120	1.5	192	2009
Yambuk, Vic	20	70/36	106	1.5	30	2005
Total Victoria	**582**				**1301**	
SOUTH AUSTRALIA						
Canunda	23	67/39	107	2	46	2005
Cathedral Rocks	32	60/40	100	2	66	2005
Clements Gap	27	79/47.5	126.5	2.1	56.7	2010
Hallett #1 Brown Hill Range	45	80/44	124	2.1	94.5	2008
Hallett #2 Hallett Hill (Bald Hill Range)	34	80/44	124	2.1	71.4	2009
Hallett #4 North Brown Hill	63	80/44	124	2.1	132.3	2011
Hallett #5 Bluff Range	25	80/44	124	2.1	52.5	2011
Hornsdale #1	32	92.5/55	147.5	3.2	100	2017
Hornsdale #2	32	92.5/55	147.5	3.2	100	2017
Hornsdale #3	35	92.5/55	147.5	3.2	109	2017
Lake Bonney, Stage 1	46	60/33	99	1.75	80.5	2005
Lake Bonney, Stage 2	53	80/45	125	3	159	2008
Lake Bonney, Stage3	13	80/45	125	3	39	2010
Snowtown #1	47	80/44	124	2.1	100.8	2008
Snowtown #2	10	80/49	129	3	30	2014
Snowtown #2	80	80/53	133	3	240	2014
Starfish Hill	22	68/32	100	1.5	33	2003
Waterloo #1	37	80/44	124	3	111	2010
Waterloo #2	6	80/44	124	3	18	2016
Wattle Point	55	68/41	109	1.65	90.8	2005
Total South Australia	**665**				**1622**	

Peter Haack Consulting

2/10 Waltham Place

Richmond

Victoria 3121

www.peterhaack.com.au

ABN 15 235 313 089