Landscape Character and Probable Visual Effect Assessment

Watta Wella Renewable Energy Project

RES Australia Pty Ltd

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00 Executive Summary

The Watta Wella Renewable Energy Project (the Project) consists of up to 47 Wind Turbines Generators (WTG) with an overall height of up to 255 metres at the blade tip. The Project also includes a 170 hectare solar farm, 400MW/1200MWh Battery Energy Storage System (BESS) and other ancillary infrastructure. Note that this assessment is based on a 45 turbine configuration which existed prior to the latest design updates in May 2022, therefore subsequent project descriptions in this report refer to 45 turbines. The intention is to revise this assessment with the 47 turbine design following receipt of the EES referral outcome and prior to planning submission.

The project site is located on the floodplain of the Wimmera River. Surrounding the floodplain are several local ridgelines associated with the eastern escarpment of the Great Dividing Range. Topographic features such as the Pyrenees to the east, the Black Range to the south and Concongella Hill to the west form notable topographic features. The Grampians (Gariwerd) form a dominant landscape backdrop to the west, approximately 40 kilometers from the site.

The project site is defined by Stawell-Avoca Road to the north, the Wimmera Downs Road to the east, Joel South Road and Landsborough Road to the south, and Wyndarra Road to the west. Surrounding the site and within the assessment area are the existing wind turbines of Bulgana, Ararat and Crowlands Wind Farms.

The landscape assessment and Zone of Theoretical Visual Influence (ZTVI) analysis illustrate that the Project is located in a well-vegetated agricultural landscape that extends across the Wimmera River floodplain. The landform of the Pyrenees and Black Hill Ranges defined the visual envelope of the locality to the south, east and southwest. The local topography of the Concongella Hills to the west and the existing vegetation of the Wimmera River create visual frames and screens across the regional landscape.

While the Project forms a compact cluster of wind turbines within this visually contained agricultural landscape, the degree of visual change varies from substantial to the north and northeast through to moderate in the south and southwest and slight throughout the regional locality at distances greater than ten kilometres.

At distances greater than 15 kilometres, local ridgelines and tree belts screen the visual effects of the Project. The compact layout of the wind turbines, in combination with the topography and vegetation, reduces the visual effect significantly and is described as slight to negligible.

The associated infrastructure, substations and transmission lines, and the proposed solar farm will provide localised visual impacts within their immediate site localities. Local ridgelines and existing vegetation will reduce the visual effects (contained within specific viewsheds).

Similarly, the existing landscape character mitigates the cumulative visual effects associated with other wind farms in the area. The cumulative visual effect of the existing and proposed wind farms are experienced as defined clusters of wind turbines fragmented by the landscape character of the regional locality.

The visual effect associated with the Project appears as bands of visual change radiating from the proposed wind turbines. The consistent land use character of the rural landscape means that distance and visual absorption are the dominant variables that mitigate the potential visual effect of the Project.

01 Scope of Assessment

1.1 Introduction

This report has been prepared by Warwick Keates of WAX Design in association with Dr Brett Grimm of Brett Grimm Landscape Architect (BGLA) for RES Australia Pty Ltd (RES) and Umwelt Australia Pty Ltd. The purpose of the report is to assess the potential visual impact of the proposed Watta Wella Renewable Energy Project (the Project), which includes a wind farm, solar farm, battery energy storage facility and associated infrastructure. In addition, this report provides an evaluation of the existing landscape character and the degree of visual change that is likely to result from the proposed development within the regional locality.

The Landscape and Visual Impact Assessment (LVIA) comprises two separate assessments, a landscape character assessment and a visual impact assessment; these are interrelated processes as described in the Guidelines for Landscape and Visual Impact Assessment[1]. The landscape character assessment described in this report considers the existing character of the landscape within a 20 kilometre radius of the site locality. The site locality is considered the area around the Project from which the wind turbines and associated infrastructure are likely to be visible in the landscape, as described in section 1.3 below. The visual impact assessment evaluates and describes the likely effect of the proposed development on the physical landscape, with consideration of changes in its character and the resultant effects on visual amenity.

The potential visual impact will be assessed using the Grimke matrix methodology that involves on-site assessments, GIS modelling, consultation with relevant stakeholders and interested parties through RES, the preparation of photomontages and a detailed visual impact assessment to illustrate the predicted visual effect of the Project within the defined locality. The visual impact assessment forms the second stage of the LVIA process.

1.2 Project Description

RES proposes to develop the Project in Western Victoria. The central locality of the Study Area is approximately 16 kilometres northeast of Stawell, 16 kilometres west of Landsborough and 30 kilometres north of Ararat.

RES is one of the world's leading independent renewable energy companies, with the expertise to develop, engineer, construct, finance, and operate projects around the globe. RES has been developing renewable energy projects in Australia since 2004.

The Project will consist of the following components:

- Up to 45 (WTG)
- Overall height of turbines would be up to 255 metres at the blade tip
- 170 hectare, 85MWdc solar farm on single axis tracker tables
- Wind monitoring masts (permanent and temporary)
- Overhead and underground electrical cable reticulation
- A control building to provide facilities for operational and maintenance activities and storage of equipment
- Substation, compounds and buildings to house electrical switchgear400MW/1200MWh battery energy storage system (BESS)
- Onsite access tracks to service the turbines

[1] *Swanwick, C. (2013). Guidelines for Landscape and Visual Impact Assessment. 3rd ed. United Kingdom: Landscape Institute and Institute of Environmental Management and Assessment.*

- Hardstand areas for construction
- Temporary batching plant

The following image provides reference to the dimensions of the proposed turbine model that has been used for this visual impact assessment.

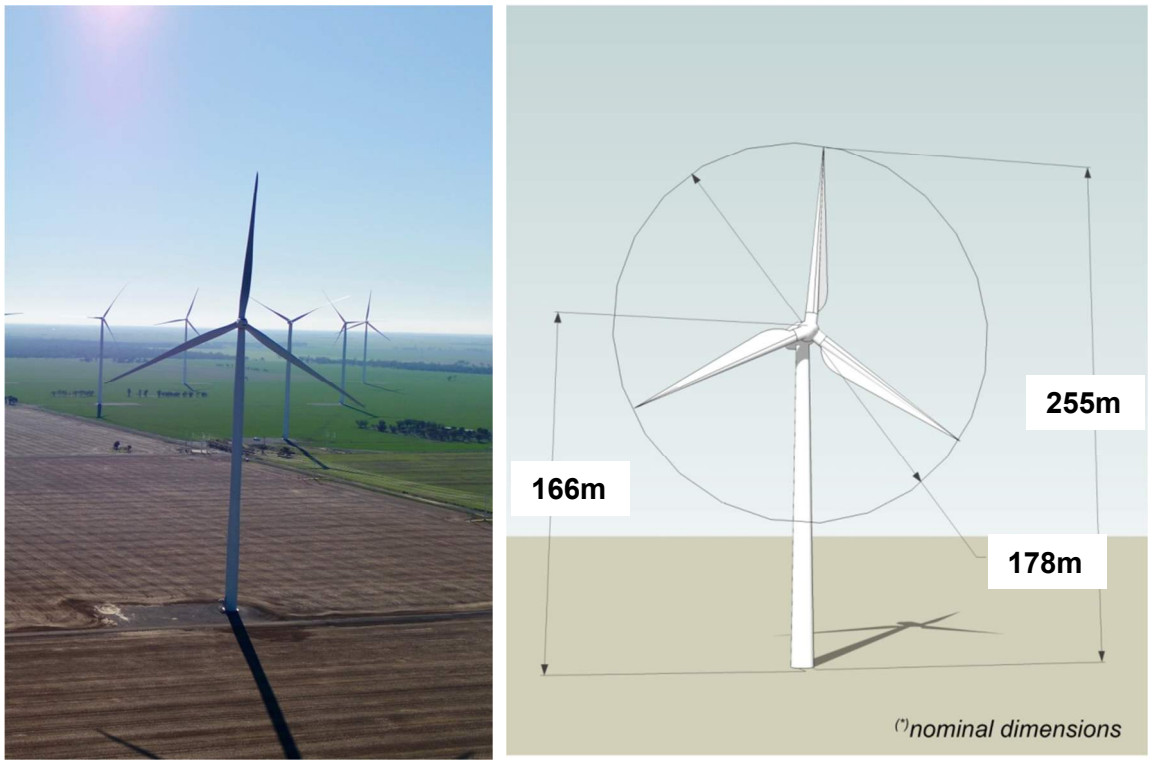


Figure 1: Example WTG (credit Murra Warra Wind Farm Project Co. Pty Ltd) and assessment turbine model dimensions

Figure 2: Typical single axis tracking system (Emerald Solar Park, Lighthouse Infrastructure)

1.3 Defined Assessment Area

A 20km site locality around the Project has been defined for assessment purposes. This locality is based on research and previous experience in defining thresholds for the degree and qualification of

visual effect. Most notably, the Thomas matrix[2] and Bishop (2002)[3] has provided guidance on this matter. Also, the extent of the site locality has been reviewed against the ZTVI mapping. This mapping provides a reference of the extent to which the Project is likely to be visible in the landscape and defines the viewshed resulting from the local topography (excluding vegetation and built form screening).

The landscape character assessment of the proposed wind farm consists of written descriptions and photographic surveys of the surrounding locality to articulate the character of the existing landscape that surrounds the project site in relation to the local (zero to three kilometres), sub-regional (three to 10 kilometres) and regional (greater than 10 kilometres) landscapes. This is followed by a discussion of the probable visual effect that is anticipated to occur across the regional landscape. The landscape character and visual assessment provide the basis on which to assess the suitability of the development in relation to the visual impact within the regional area (20 kilometres).

The site is defined by Stawell-Avoca Road to the north, the Wimmera Downs Road to the east, Joel South Road and Landsborough Road to the south, and Wyndarra Road to the west. Surrounding the site and within the assessment area are the existing wind turbines of Bulgana, Ararat and Crowlands Wind Farms. The presence of these wind farms provides an existing land use and infrastructure context that is described in Sections 3 and 7.

2 *Sinclair, G. (2001). The Potential Visual Impact of Wind Turbines in relation to distance: An approach to the environmental assessment of planning proposals. E.I.Services*

3 *Bishop, I. (2003). Determination of thresholds of visual impact: the case of the wind turbines: Environment and Planning B: Planning and Design: 707-718*

02 Approach and Methodology

2.1 Visual Assessment Approach

The aim of the LVIA methodology is to provide an objective, reliable, credible, replicable and measurable analysis of the potential visual impact when considered against the existing landscape character.

The process for the visual assessment is based on the recommendations of John Ginivan and Planning SA (2002)[4]

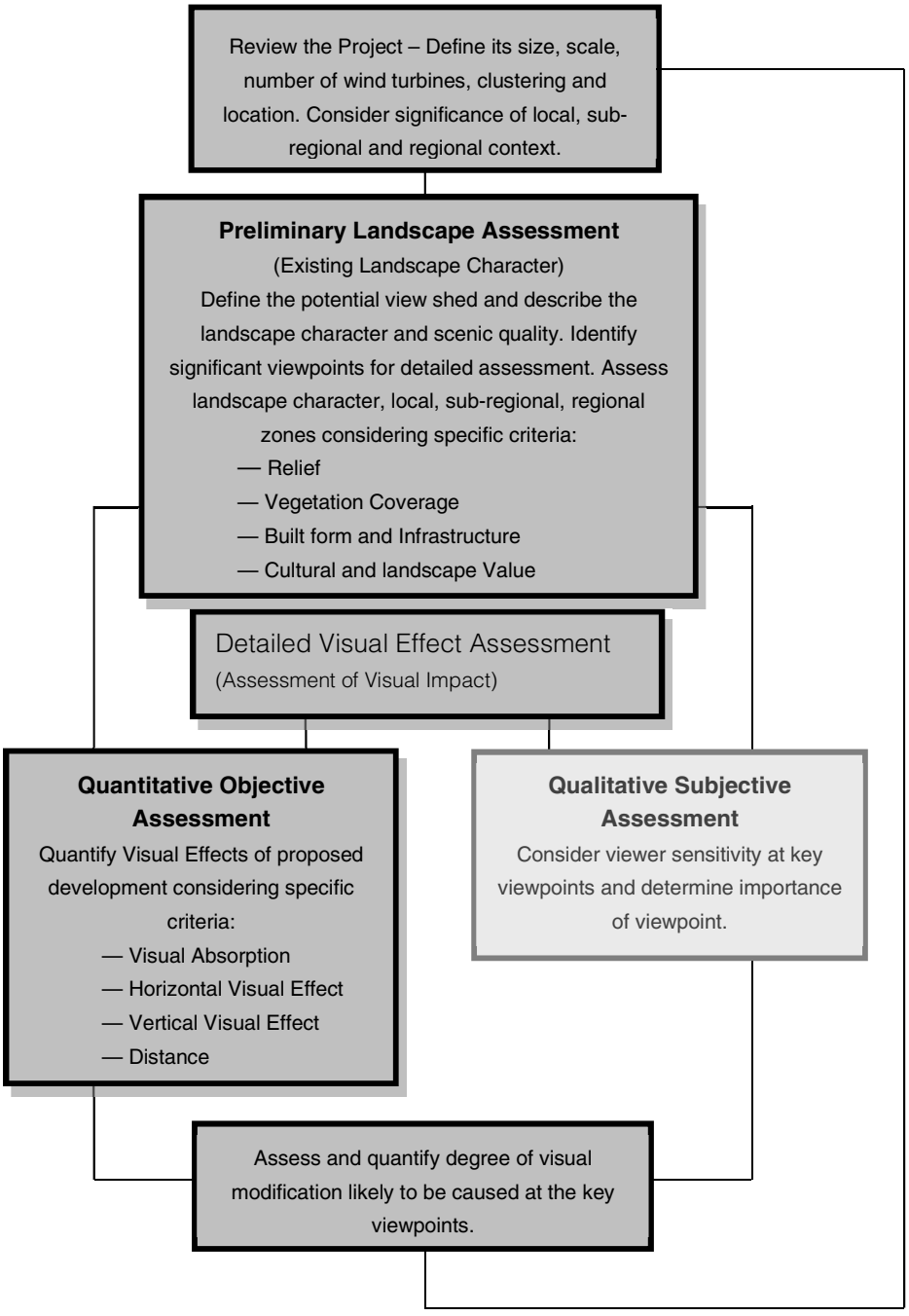


Figure 3: Detailed Visual Assessment Process

4 *Planning South Australia (2002). Advisory Notice Planning- Draft for Consultation 21 Wind Farms. S.A Adelaide*

2.2 Guidance and Best Practice

Currently, there is no formalised standard visual assessment methodology at local, state or federal government levels. While various guidelines and frameworks have been produced, they do not provide a definitive methodology or technique to be applied. A best practice methodology has been developed for the Project LVIA with reference to the following documents:

- Wind Farm Development Guidelines for Developers and Local Government Planners (2014), Central Local Government Region of South Australia[5];
- Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria (Department of Environment, Land, Water and Planning, November (2021)
- Solar Energy Facilities Design and Development Guidelines (Department of Environment, Land, Water and Planning, August 2019)
- Environment Protection and Heritage Council (2010) National Wind Farm Development Guidelines;
- Siting and Designing Wind Farms in the Landscape (version2)(2014) Scottish Natural Heritage;
- Guidelines for Landscape and Visual Impact Assessment (Third edition) (2013), Landscape Institute;
- Grimm, B (2009). Quantifying the Visual Effects of Wind Farms; A Theoretical Process in an Evolving Australian Visual Landscape. PhD Thesis Adelaide University;
- Australian Wind Energy Association and Australian Council of National Trusts (2007) Wind Farms and Landscape Values: National Assessment Framework;
- Visual Landscape Planning in Western Australia. (2007). A manual for evaluation, assessment, siting and design, Western Australian Planning Commission;
- Best Practice Guidelines for the Implementation of Wind Energy Projects in Australia (2006);
- Lothian, A. (2008). Scenic perceptions of the visual effects of wind farms on South Australian landscapes. Geographical Research, 46:2, 196 – 207;
- Swanwick, C. (2013). Guidelines for Landscape and Visual Impact Assessment. 3rd ed. United Kingdom: Landscape Institute and Institute of Environmental Management and Assessment;
- South Australian Wind Farms Planning Bulletin (2002);

[5] Source online (2015). http://www.lga.sa.gov.au/webdata/resources/files/2012.32%20-%20Windfarm%20Development%20Guidelines%20-%20Final%20Report.pdf. [Accessed 08 September 2015].

2.3 Methodology

The LVIA is based on two assessment stages with reference to the Guidelines for Landscape and Visual Impact Assessment and set out in Figure 2.

- Stage 1; Landscape Character Assessment identifies and assesses the importance of landscape characteristics and the existing landscape quality.
- Stage 2; The Visual Assessment aims to quantify the extent to which the development is visible and define the degree of visual change and the associated visual impacts using the photomontages, site observations and the Grimke Matrix.

The completed Landscape Character Assessment and Visual Impact Assessment are used to draw several observations and conclusions about the magnitude of the likely visual effects of the proposed development on the site locality.

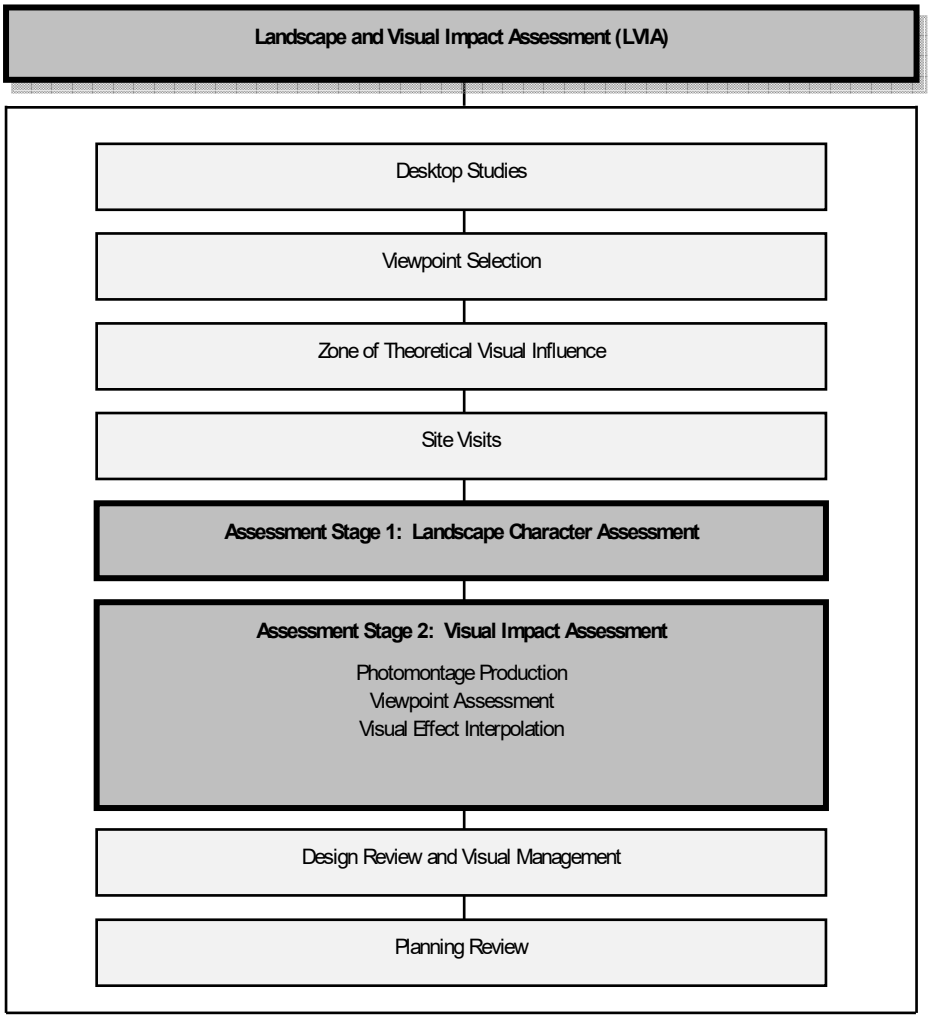


Figure 4: LVIA – Two Assessment Stages and Associated Tasks.

Figure 4 below outlines a detailed description of each process conducted within the methodology.

Desktop Studies

The Landscape Character Assessment for the Project includes reviews of the Project documentation, the proposed development location and infrastructure associated with the proposed development.

Analysis of GIS maps, landscape photography, aerial photographs and supporting literature was reviewed to establish a broad comprehension of the scope of the Project and the existing landscape character.

Viewpoint Selection

Viewpoint selection was conducted by WAX Design and BGLA as part of an initial site visit on the 18 and 19 March 2021 and interrogation of GIS desktop analysis mapping of topography, geographic features and public accessibility. The selection of the viewpoints provides locations from which a detailed visual assessment of the potential visual effect can be made as part of the Stage 2 assessment. The viewpoints are also selected based on being representative of the locality, publicly accessible, adjacent to areas of private land ownership and where a large proportion of the wind farm and associated infrastructure is visible.

A total of five (5) viewpoints were selected surrounding the Project during this site visit to understand the likely visual effect. In addition, a viewpoint was selected to present the potential visual effects associated with the proposed solar farm.

Viewpoint locations were identified using a preliminary ZTVI map, which illustrates the likely degree of visibility according to the underlying topography. The site assessment certified the evaluation of the ZTVI with reference to vegetation screening and local landforms not depicted in the ZTVI.

Each viewpoint represents a typical location where the most significant probable degree of visual change will be experienced due to the proposed development within the existing landscape. The five viewpoints were confirmed by RES and relevant stakeholders.

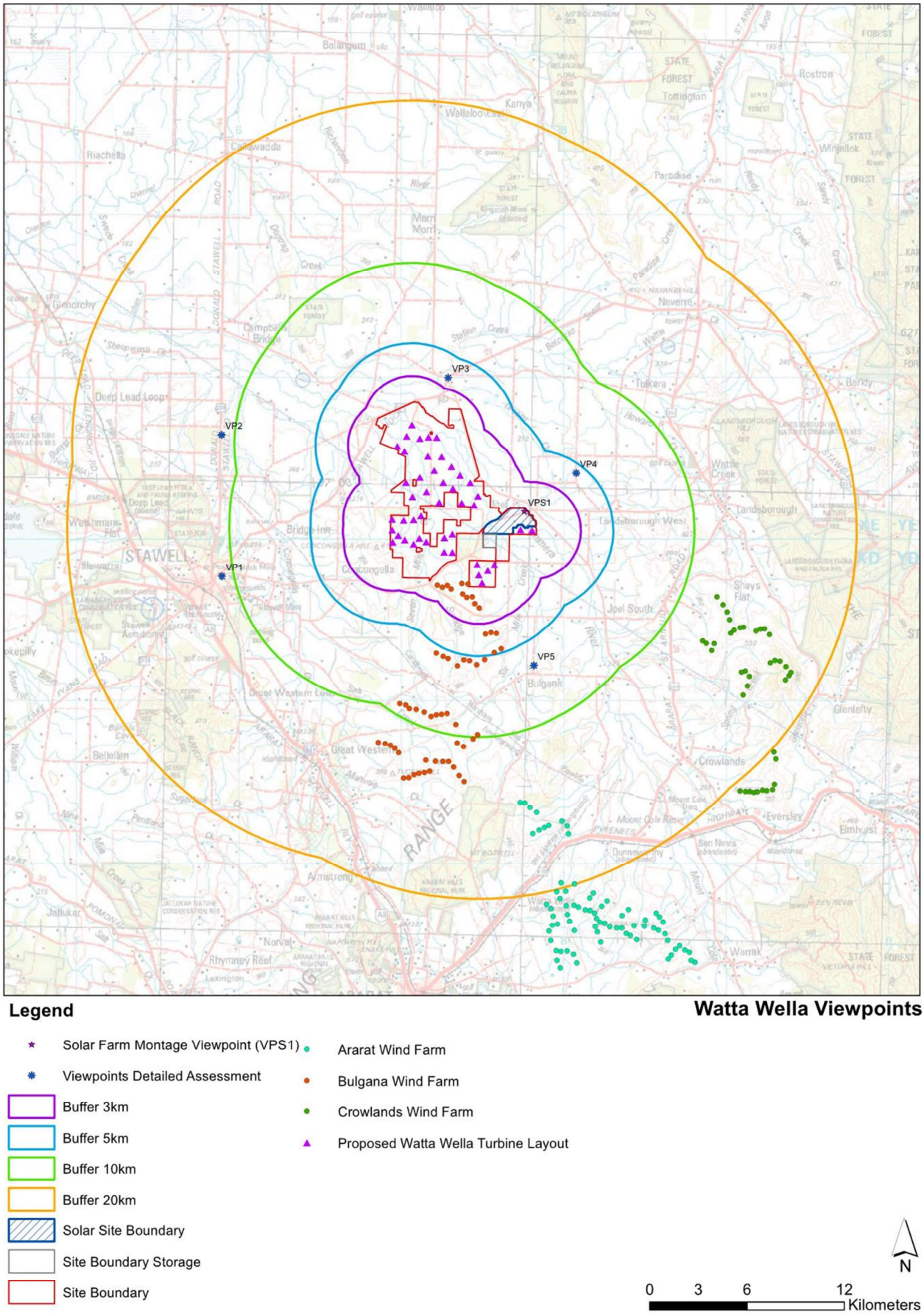


Figure 4: Viewpoint Locations

Zone of Theoretical Visual Influence

In order to gain an appreciation of where the Project will be visible from, ZTVI maps have been produced. The mapping provides an illustrative depiction of where the development may be seen within the landscape. The maps quantify the extent to which the wind turbines are likely to be seen, considering a maximum blade tip height of 255m and a hub height of 166m.

The analysis uses a digital terrain model and computer-generated models of the wind turbines to illustrate how many individual turbines would be visible from any location around the wind farm within the 20 kilometre regional landscape assessment area. It should be noted that the ZTVI does not consider the impact of local vegetation and buildings or localised landforms as it is based on a 10 metre contour data set. This means that theoretically, the visual impact of the wind turbines is evaluated within a landscape devoid of any screening vegetation or other features and represents a 'worst case' scenario.

Assessment Stage 1: Landscape Character Assessment

The assessment includes identification and description of landscape character (considering areas of defined landscape quality determined by topographic form, land use, vegetation association including patterning, colouration and textural relief). In addition, special landscape features and settlements are identified. Mapping and photographic surveys are undertaken and written commentary to describe the locality and existing landscape character of the site locality.

As part of the Landscape Character Assessment, the viewpoint selection was confirmed, and the base photography was taken for photomontage production.

The assessment was undertaken on 18 and 19 March 2021 to enable the project team to develop a good understanding of the existing landscape character.

Assessment Stage 2: Photomontage Production

Photomontages of the proposed development from each viewpoint were produced. The photomontages represent a 120-degree horizontal field of view with a 50mm lens digital equivalent photo capture. This has been proven to represent the human binocular field of view. Details of the methodology used to produce the photomontages are described in Appendix B and represents a best practice approach with reference to 'Photography and photomontage in landscape and visual impact assessment' (2011) Landscape Institute (advice note 01/11). For the purposes of the photomontage production, a neutral off white colour was used to represent the wind turbines. This colour selection was made to reflect the proposed colour of the turbines (RAL 7035, Light Grey) while allowing for variations in local light and environmental conditions. As part of the photomontage compositing process in Photoshop ™ adjustments where made to the contrast and luminosity levels of the wind turbine render. These adjustments were made to ensure that the proposed wind turbines are clearly visible in the photomontage. It is important to note the adjustments made to the photomontages do not alter the assessment process as all finding are validated by on-site observations and measurements.

WAX Design and BGLA checked the accuracy of the photomontages during a site visit on 22 and 23 April 2021. The combined photomontage assessment and on-site review ensures that issues typically associated with photographic simulations such as image compression and distortion are mitigated by assessing and measuring the visual effect in-situ using GPS and a bearing compass. This enables the photomontages to be ground-truthed for positional correctness and scale. Any minor distortion to the edge of the 120 degrees provided by the horizontal field extent and 2-dimensional image representations are reflected relatively in the simulated modelling overlay.

The photomontage images were used to inform the detailed viewpoint assessment.

Assessment Stage 2: Visual Impact Assessment

The assessment of the visual impact includes the production of photomontages to assist in the quantification and qualification of the potential visual effect. The viewpoints identified as part of the preliminary assessment stages were measured using a series of landscape and visual criteria. The assessment results were then mapped and interpolated to demonstrate the likely visual impact of the Project across the regional landscape.

The Stage 2 assessment was undertaken on the 22 and 23 April 2021. Site conditions were clear with some early morning fog that cleared to provide good visibility, extending several kilometres throughout the landscape character zone.

Assessment Stage 2: Viewpoint Impact Assessment

The viewpoint assessment of the Project uses a combination of visual assessment measurements and descriptive text. This comprises site observations with reference to prepared photomontages and a detailed assessment of the baseline landscape character and visual impact.

Initially, the baseline landscape character for each viewpoint was assessed regarding:

- Relief (the complexity of the land that exists as part of the underlying landscape character);
- Vegetation Cover (the extent to which vegetation is present and the potential to screen and filter views);
- Infrastructure and Built Form (the impact of development on landscape and visual character); and
- Cultural Sensitivity (existing cultural overlays, planning designations and any identified listing of heritage items and local sensitivities to landscape such as scenic drives and viewpoints).

A value was generated for the existing landscape relative to each viewpoint. This value formed the baseline assessment value. It is this baseline value that is modified by the impact of the development on the landscape, which in turn informs the degree of visual effect.

Following the landscape character assessment, each viewpoint was then assessed on the following visual effects:

- Percentage of landscape absorption (the landscape's ability to absorb and screen the development form);
- Horizontal visual effect (percentage spread of the development in the field of view);
- Vertical visual effect (vertical scale of the development as a percentage of the existing landscape scale within the field of view); and
- Distance of visual effect (distance between viewpoint and development).

The landscape character and visual effect measurements were combined to produce a quantified value for the degree of visual change that resulted from the Project at each viewpoint (refer to Appendix D for detailed assessment criteria and matrix methodology).

Assessment Stage 2: Visual Effect Interpolation

The findings of the visual impact assessment for each viewpoint were used to provide a percentage value to the degree of visual change. Each viewpoint was cartographically mapped in GIS, and the values were used in a weighted interpolation. The ZTVI was overlayed onto the visual effect interpolation map to define the extent of visibility. The combination of visual effect interpolation and ZTVI provided a map of likely visual impact experienced in the regional locality as a result of the Project. The map provides relativity to the possible experience of visual effect.

Design Review and Visual Management

Interrogation of the visual effect interpolation and likely areas with sensitivity to change provides further insight into the likely visual effect of the prosed wind farm layout.

Planning Review

A review of the landscape and visual impacts of the development from a planning context was also undertaken. The planning review included a review of the relevant frameworks and provisions of the Northern Grampians Planning Scheme.

In particular, the potential visual impact of the development has been reviewed and discussed against the relevant desired character statements with specific reference to landscape and visual considerations resulting from the development of the Project.

03 Landscape Character Assessment

3.1 The Site Locality

The regional landscape character is defined by the floodplain of the Wimmera River. The corridor forms a broad low lying landscape approximately 30 kilometres wide. Across the low lying riverine flood plain are several local ridgelines associated with the eastern escarpment of the Great Dividing Range. Topographic features such as the Pyrenees to the east, the Black Range to the south and Concongella Hill to the west punctuate the regional landscape forming defined land forms that contrast the uniform topography of the floodplain.

The underlying land use throughout the regional locality surrounding the project site is described as rural/agriculture with a farming land use. This is reflected in the land use arrangement of paddocks and fields for agricultural practices such as grazing and cropping. The cadastral boundaries associated with the rural land use are framed by established tree planting that form shelterbelts and vegetated screens across the regional landscape. The trees are typically eucalypt woodlands, including Red Stringybark, Yellow Box, River Red Gum and Blue Gum and reach 20 to 30 metres.

Throughout the locality surrounding the project site, the visual character is defined by open paddocks used for grazing and cropping with belts of mature eucalypt vegetation and isolated trees. This results in an attractive rural landscape character. Views extend across the agricultural land and undulating local landforms to distant features such as the Concongella Hills and other landforms in the regional landscape.

The Grampians (Gariwerd) form a dominant landscape backdrop to the west (approximately 40 kilometres from the project site), which defines the visual envelope of the regional locality. The scale and elevation of the Grampians and the vegetated character of the landscape provide a prominent natural backdrop of high scenic value.

Figure 5: View of the land use and land forms typical for the locality

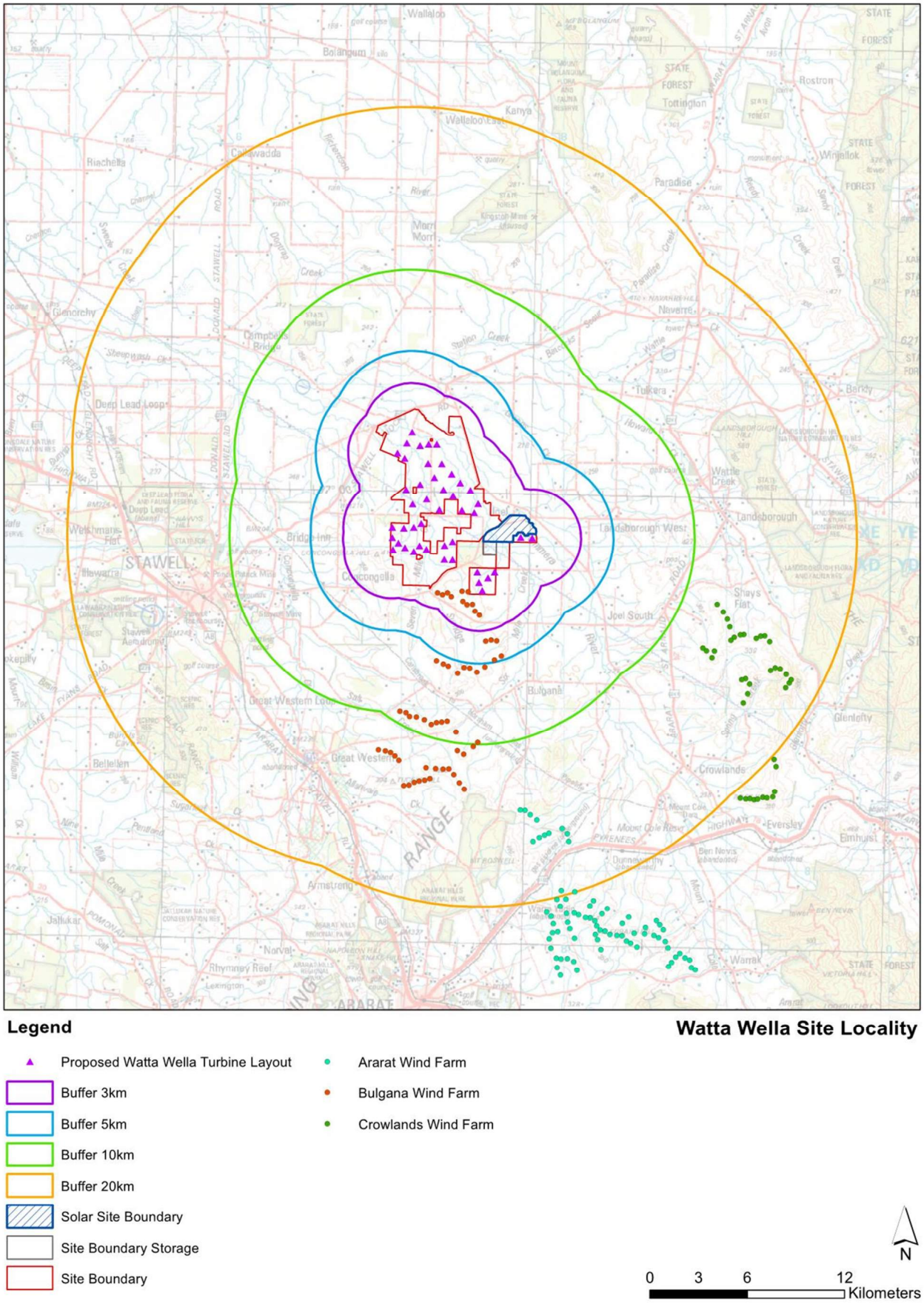


Figure 6: Proposed site location

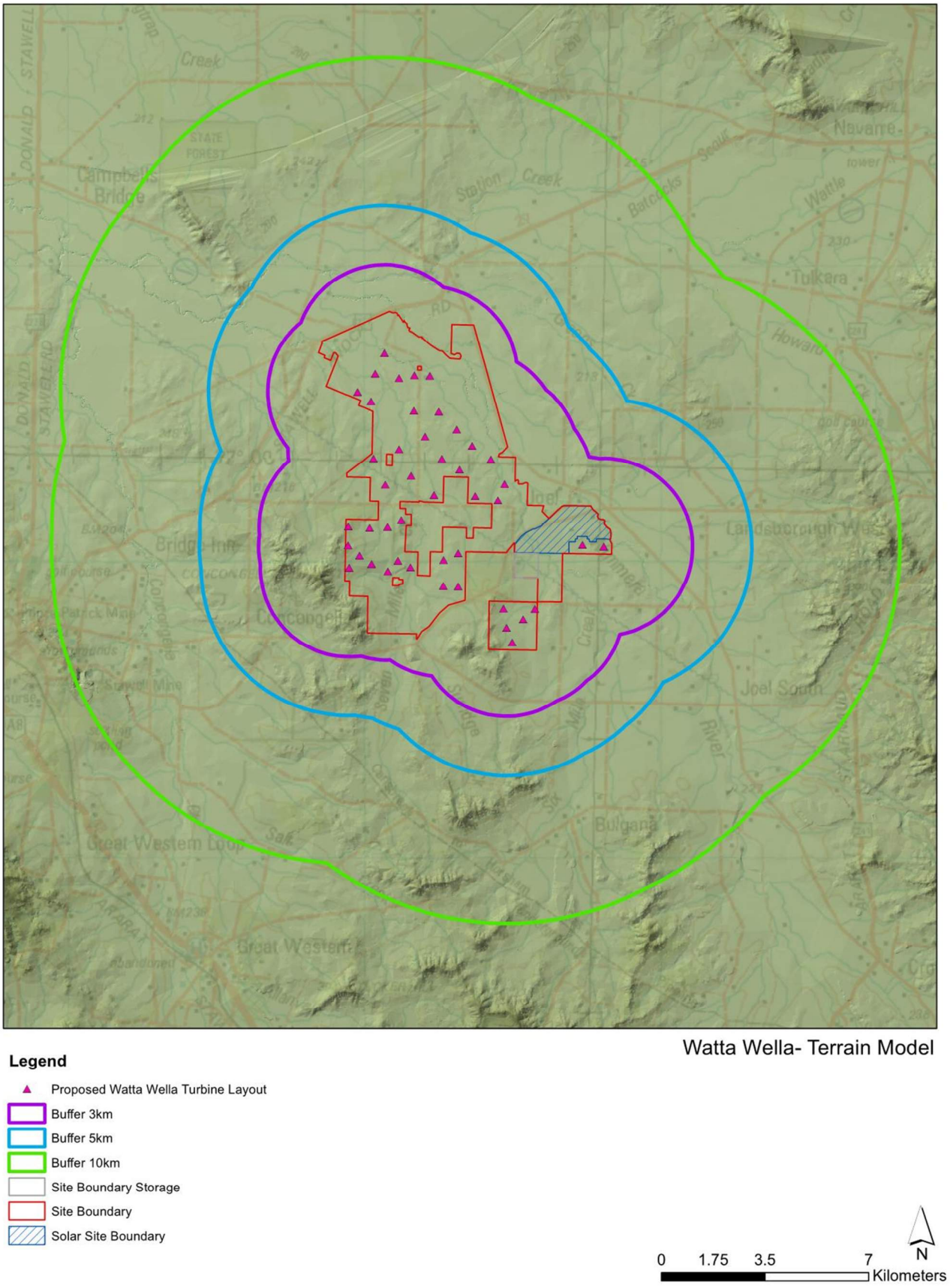


Figure 5: Topographic digital terrain model (10m contours)

3.2 Landform and Geomorphology

The regional locality surrounding the project site is defined by the two geomorphologic units.

- Western Uplands
- Northern Riverine Plains

The terrain associated with the Western Uplands is characterised by various bedrock formations that are expressed as differentially eroded landforms. The general topography and ridgelines are typically asymmetrical with gentle northern slopes and steeper southern slopes such as the Pyrenees Ranges and Ararat Hills. The western uplands support various habitats, including Heathy Dry Forest, Grassy Dry Forest, Herb-rich Foothill Forest, and Valley Grassy Forest.

The Wimmera River catchment dominates the Northern Riverine Plains. The river flows in a north-westerly direction towards Horsham. It is joined by several major tributaries that drain the northern slopes of the Grampians and the eastern slopes of the Pyrenees and extend across the Project's locality.

The Concongella Hills form the prominent topographic features with the Northern Riverine Plains, contrasting the flood plain and drainage features that are common within this geomorphologic unit. The topography to the eastern edge of the landscape unit is steep to moderately inclined, with the Pyrenees foothills extending across the floodplain of the Wimmera catchment, including hills east of Joel South, Wattle Creek and Howard Creek.

3.3 Landscape Character

The following assessment considers the underlying landscape character surrounding the project site. Consideration is given to the landscape and visual character to the north, east, south and west, as well as a description of prominent landscape features and settlements.

3.3.1 Northern Regional Landscape (northeast and northwest)

The existing landscape character to the north is defined by the low lying topography and pastoral land use of the Wimmera River catchment and Northern Riverine Plains. The landscape is punctuated by belts of vegetation that extend along local creek lines, cadastral boundaries and around farms and dwellings. The belts of vegetation form layered screening with views extending across paddocks typically (zero to three kilometres) defined as a local depth of field.

Distant views are defined by the elevated ridgelines of Concongella Hill and the Pyrenees to the southeast. These landforms form distant natural characters within the regional landscape character.

Along the Wimmera River corridor, mature trees form numerous vegetated layers, creating dense screens. As a result, views across the farming landscape are reduced to a few kilometres, and the height of the trees (20 to 30 metres) limits views to the broader landscape.

To the northwest, the flood plain of the Wimmera River broadens with several low hills around Campbell Bridge, forming notable elements in the landscape. The low lying landscape character provides an open visual context to the regional landscape. Across the flood plain to the north, views extend over several kilometres across arable and cropping areas framed by belts of vegetation that define the northern visual envelop of the regional landscape.

The existing wind turbines associated with the Crowlands and Bulgana Wind Farms are visible in the locality to the southeast. The height and location of the wind turbines result in numerous wind turbine blades and nacelles visible above local ridgelines and above the canopy of the trees.

Throughout the northern regional landscape, views to the south and west are dominated by the continuous ridgeline of the Black Range, which forms an elevated and distant natural landscape character. Further to the south, from some elevated viewpoints, the topography of the Grampians contrasts the low lying agricultural landscape character that surrounds the project site and the regional landscape more broadly.

Properties and farms are scattered throughout the agricultural landscape. The orientation and arrangement of individual dwellings vary depending on the local context. Often, farms and houses are surrounded by vegetation that provides shelter and shade and a degree of visual enclosure.

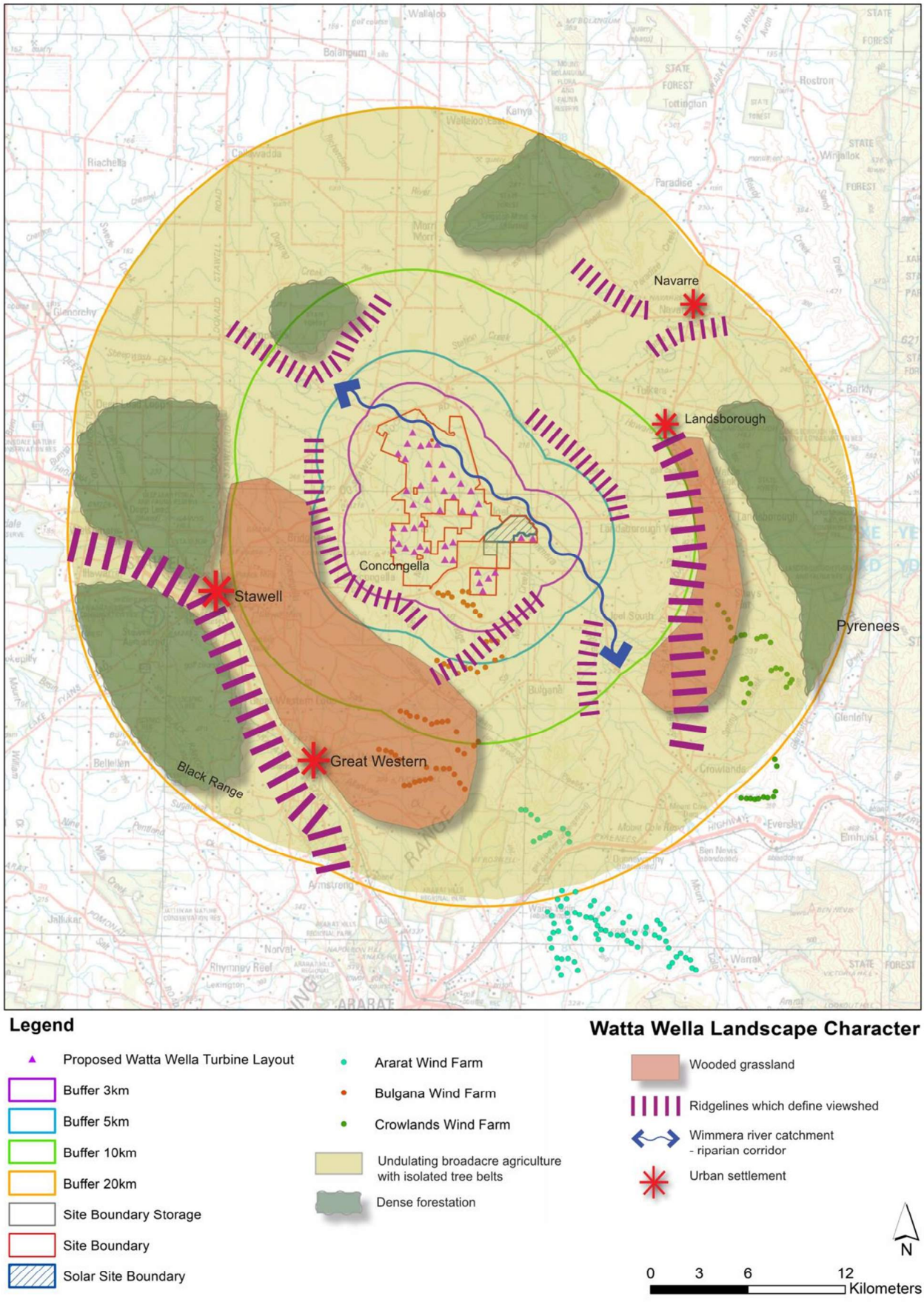


Figure 6: Landscape character mapping

3.3.2 Eastern Regional Landscape (foothills of the Pyrenees)

The eastern landscape character is defined by a broad agricultural basin that stretches between the Grampians and the Pyrenees. The agricultural landscape is punctuated with large belts of vegetation. Local ridgelines formed by the foothills of the Pyrenees extend across the agricultural landscape. Other ridgelines, such as Concongella Hills, Navarre Hill and Landborough Hill, form topographic features that screen and frame views, fragmenting the visual character of the regional landscape to the east and further south.

The eastern agricultural area is defined by a grazed land use character that stretches across the low lying flood plain catchment of the Wimmera River. Open views extend across fields and paddocks to belts of vegetation that stretch along creek lines. The regional locality also contains isolated and small clustered areas of rural farming dwellings.

The main tributary of the Wimmera River forms a notable landscape element with extensive areas of mature vegetation that define the edges of the river corridor. This riverine landscape, combined with the existing trees and agricultural land use, create an attractive rural landscape character.

Views extend across paddocks and undulating local landforms to dense vegetation belts or distant topographic features such as Concongella Hill, the Pyrenees or Grampians.

Existing wind farms provide a precedent scale of infrastructure that is proportional to the underlying topography.

Figure 7: Views across the landscape toward Concongella and the Wimmera River with layered vegetation belts

3.3.3 Southern and Western Regional Landscape

The landscape character to the south and west is defined by the underlying agricultural land use of the regional locality and low lying undulating landforms. The Wimmera River flood plain and associated vegetation extends across the southern landscape character. Belts of eucalypts extend along cadastral boundaries and creek lines. At the same time, isolated tree groups and individual trees are present within paddocks and throughout the farming landscape, creating a well-vegetated land cover.

Although there is an underlying rural character and farming land use, the landscape and visual characters to the south is modified by the Bulgana Wind Farm and the associated wind turbines that extend across local ridgelines and open agricultural landscape. Several transmission lines are also present in the landscape, reinforcing the infrastructure character of the landscape to the southeast and the associated renewable energy land use.

While visually prominent, the spacing and configuration of the wind turbines do not result in significant visual impacts. This is because the underlying agricultural character remains, and individual trees and belts of vegetation provide localised screens that mitigate the visual effect of the wind turbines. Consequently, the wind turbines are glimpsed within the agricultural landscape or occasionally viewed as small clusters.

To the southwest, the landscape character dominated by rolling agricultural land and the rising topographic variations and ridgelines associated with Concongella Hills. Belts of vegetation and tree groups occur across the agricultural landscape, creating an attractive rural character. The visual character varies from short-range views enclosed by local ridgelines to expansive elevated views across the broader regional landscape.

Several isolated farms and dwellings exist within the landscape. Typically, the dwellings are orientated towards the west to capitalise on existing views of the Grampians.

Figure 8: Views typical of areas around Bulgana, with the presence of existing wing turbines on adjacent ridgelines

3.3.4 Wimmera River Corridor

Running southeast-northwest through the centre of the project site and regional locality is the Wimmera River. The river corridor is formed by a flood plain crisscrossed by numerous tributaries and creeks, which spread over the landscape due to the low lying nature of the topography.

Figure 9: Typical views of the Wimmera River catchment with dense layered tree canopy vegetation

Through the centre of the regional landscape and running parallel to the Wimmera River corridor is a 220 kilovolt (kV) transmission line. In combination with the existing wind turbines and switching yards, the transmission line increases the infrastructure elements within the locality, reinforcing the productive and functional character of the existing farming landscape. Furthermore, the existing Bulgana Terminal station is located to the west of the Wimmera River corridor adjacent Vances Crossing Road.

3.3.5 Towns and Settlements

Within the regional landscape character are several towns and settlements that form locations of increased visitation or occupations by community members, visitors and individuals. All of the towns are located over 10 kilometres from the project site. These include;

- Stawell
- Navarre
- Landsborough
- Great Western

Stawell

Southwest of the project site is the town of Stawell. The town is located on the western escarpment of one of the many local ridgelines that form the Great Dividing Range. The underlying topography on which the town sits provides an elevated ridgeline that runs north/south to the western edge of the regional landscape.

The local topography creates various aspects to the town, which provide differing views to the east and west and oblique views north and south along the ridgeline.

The town's orientation capitalises on views of the eastern escarpment of the Grampians National Park to the west. The elevation and landscape character of the Grampians forms a defined natural backdrop with a significant serrated linear ridgeline forming the backdrop to the broader regional landscape. The orientation of numerous roads, open spaces and public places in the town is focused on the Grampians.

Figure 10: Views of the Main Street of Stawell looking south towards Black Range and the Grampians

To the east of the town centre is the Big Hill Lookout. The lookout is located at the peak of the ridgeline. At an elevation of 304 metres, the lookout provides 360-degree panoramic views across the wider regional locality. Views extend north across the Wimmera catchment, east to the Pyrenees, north to Deep Lead Flora and Fauna Reserve, and west to the Grampians.

The town is marked by numerous heritage and post-war buildings that reflect its colonial history and provide an attractive urban character. Large trees line the main street providing a degree of amenity within the town. It is important to note that the town is a significant tourist destination in terms of trips to the Grampians National Park and the Stawell Gift held at Easter annually.

Navarre

Navarre is located 18 kilometres to the northeast of the project site. This small town is orientated along the main street, with single-story dwellings scattered to either side. The scale of the town and the arrangement of dwellings present an enclosed visual character, with buildings looking out onto the main street and the open space in the centre of the town.

The town is surrounded by broad belts of vegetation that reinforce the sense of enclosure and visual screening. From the main street, views extend a few hundred metres before the layered effect of the existing vegetation blocks views to the broader landscape.

North of the township of Navarre is the Kara Kara State Park. The rising topography and natural vegetation cover creates an elevated landscape backdrop to the town and provides a defined visual envelope to the northeastern edge of the locality.

Figure 11: Views of the main street of Navarre looking south

Landsborough

Landsborough is located east of the project site. The town and settlement pattern has developed along the main street and is typical of townships within the regional locality. Buildings face onto the main street, and the vegetated character of the town creates a high degree of amenity. Further to the east and south, the rising landforms and ridgelines of the Pyrenees State Forest create a defined backdrop.

From Landsborough and surrounding areas to the south, the existing Crowlands Wind Farm is visible, forming a direct reference to the potential visual effect of the Project. Individual wind turbines extend across several local ridgelines, creating defined visual effects across the agricultural landscape.

Figure 14: View of Landsborough looking south to south east with the Pyrenees in the background

Great Western

The township of Great Western is located to the southwest of the project site. The township is orientated along the A8 highway that connects Stawell to Ararat, forming a major arterial transportation route. The township comprises several retail and hospitality buildings and residences with moderate amenity value due to their heritage character. To the northern edge of the mainstreet precinct is a dense forest with tree canopy structures preventing views further to the north. To the south is Black Range, which provides an enclosed visual catchment. The proposed development will not be seen from the township.

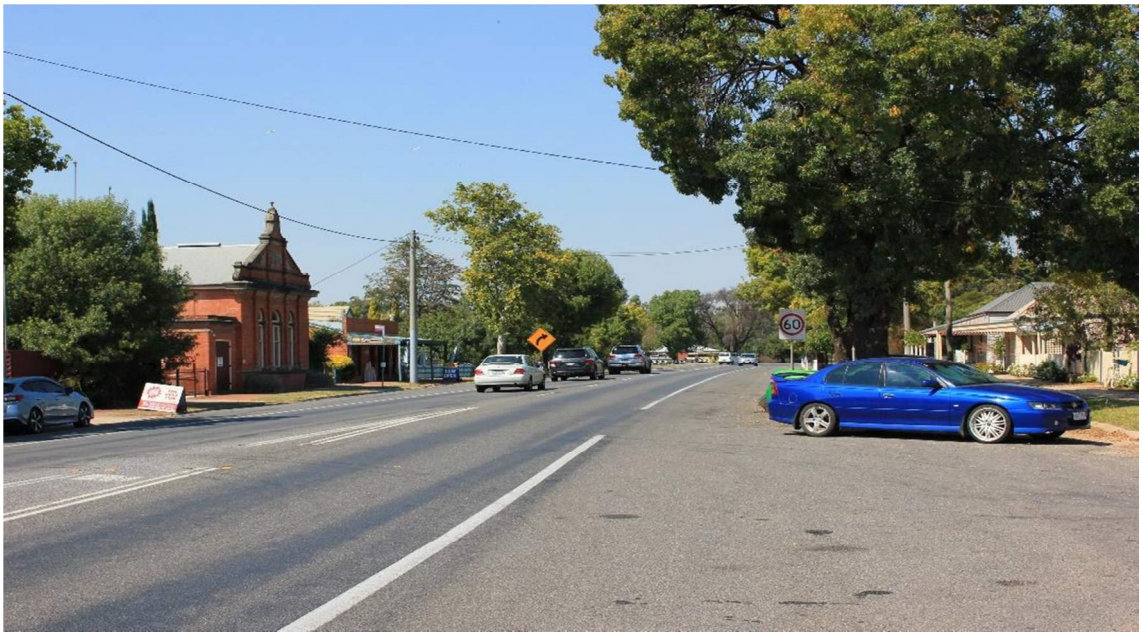


Figure 12: Views of the main street (A8) of Great Western looking north to north east

3.3.6 Existing Wind Farms

Within the regional landscape to the south and west are two existing wind farms. Immediately south of the proposed wind site is the Bulgana Wind Farm. This Project consists of 66 wind turbines with a tip height of 180 metres and a hub height of 114 metres. Further to the east is the Crowlands Wind Farm, with a tip height of 146.5 metres and a hub height of 100 metres. This wind farm has 45 wind turbines. Both wind farms signify the changing land use character of the locality and illustrate the visual effect of renewable energy production on the existing landscape character.

Figure 16: Views from the south eastern subregional locality towards Concongella and the Bulgana Wind Farm

04 Zone of Theoretical Visual Influence (ZTVI)

4.1 Methodology

The Zone of Theoretical Visual Influence (ZTVI) mapping illustrates where the proposed wind farm may be seen within the landscape. The mapping quantifies the extent and number of wind turbines which are likely to be seen in the broader landscape.

The ZTVI mapping is developed in GIS using 10 metre contour data that has been provided for a 20 kilometre radius of the project site. The ZTVI represents a 'worst case' scenario as it does not incorporate vegetation, built form or localised screening effects, which are assessed onsite.

Two ZTVIs were produced. One map is based on the entire wind turbine using a blade tip height of 255 metres, and the second is based on a wind turbine hub height of 166 metres.

The ZTVI indicates that the Project will be visible in the broader regional landscape with the topography of the Concongella Hills, the Black Ranges and the Pyrenees, creating visual envelopes to the southwest, south and east. However, an on-site assessment of the existing landscape and vegetation cover indicates a substantial amount of trees across the whole of the regional landscape. This vegetation will limit and, in some cases, screen the visibility of the proposed development mitigating the potential visual impacts considerably. The degree of visual absorption is discussed in Section 5.

04 Zone of Theoretical Visual Influence

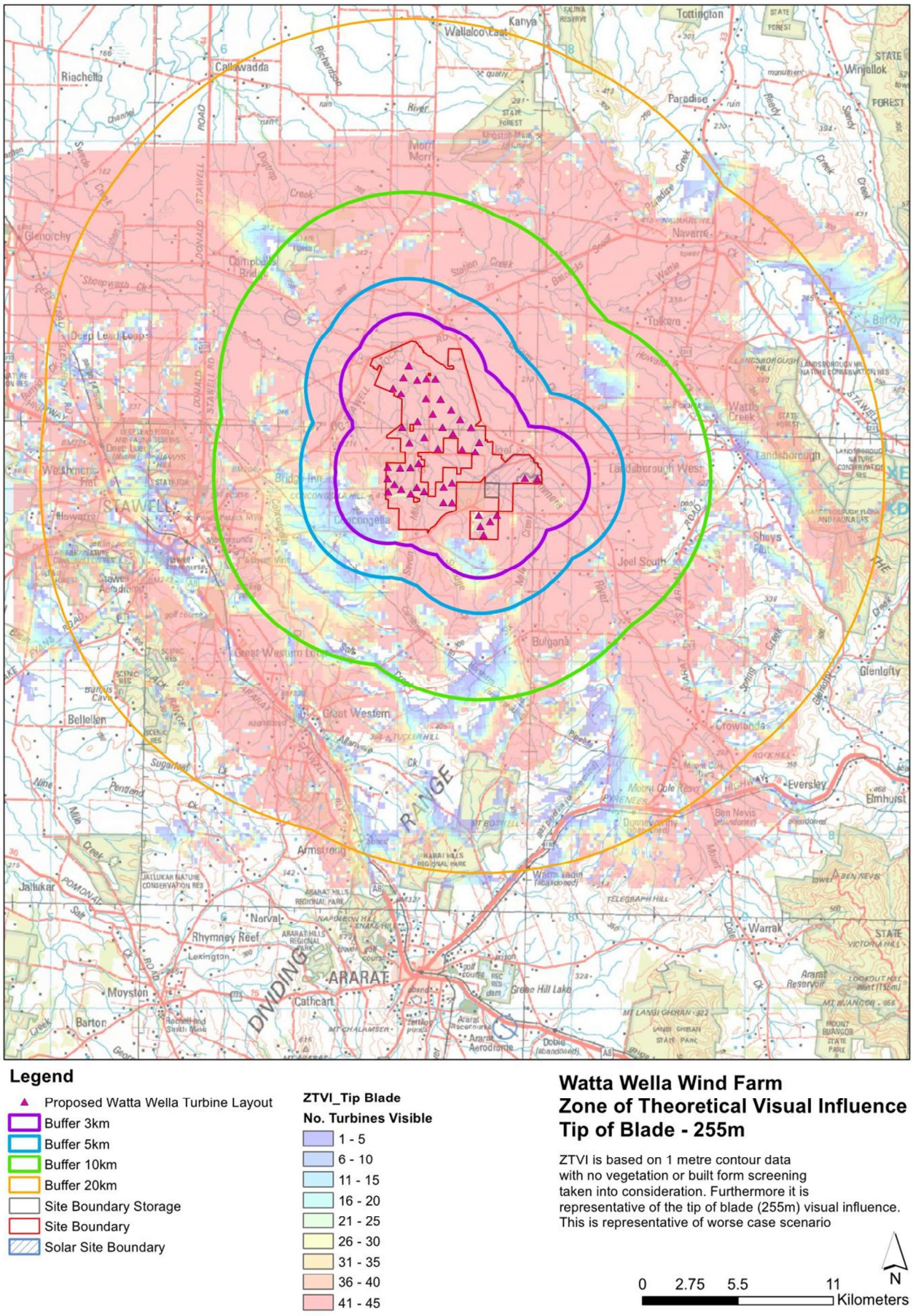


Figure 13: ZTVI map for the Watta Wella Wind Farm based on 255 metre turbine height

04 Zone of Theoretical Visual Influence

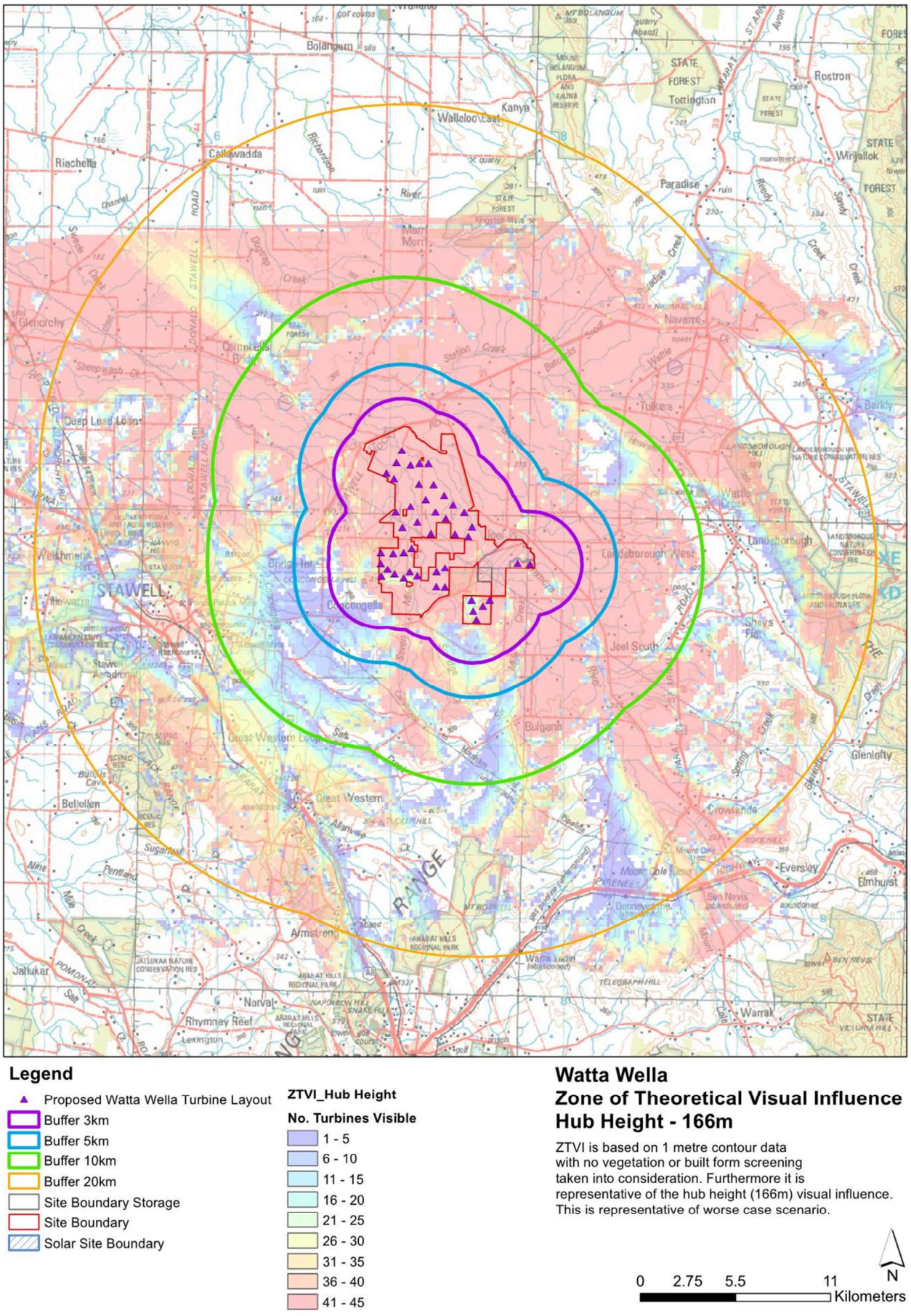


Figure 14: ZTVI map for the Watta Wella Wind Farm based on 166 metre turbine hub height

05 Visual Impact Assessment

5.1 Visual Assessment Scope

The Visual Impact Assessment was based on 45 wind turbines and the site locality as described in the Landscape Character Assessment to a radius of 20 kilometres of the Project.

The Visual Impact Assessment considered key aspects of the existing landscape such as relief, vegetation, built form and infrastructure, and cultural and scenic landscape values from each selected viewpoint. These critical aspects from each viewpoint were scored out of 5 to produce an assessment value out of 20. This enabled a baseline landscape value to be calculated against which the visual impact was assessed in relation to the degree of visual change likely to occur due to the introduction of the proposed development into the existing landscape.

The visual effect was assessed using a set of criteria that considered factors such as the degree of landscape absorption, horizontal and vertical effects and distance to the development from each viewpoint.

The visual effect was then expressed as a coefficient, which was applied to the baseline landscape value to produce a relative degree of visual change. That is to say, the extent to which the Project is likely to alter the existing landscape.

5.2 Visual Impact Assessment

Using the visual assessment matrix as described in Appendix D, the potential degree of visual change and resulting visual impact of each viewpoint was measured and evaluated against the following criteria:

- Baseline Landscape value is expressed as a value between 4 and 20;
- Visual Effect Assessment value is expressed as a value between 4 and 20;
- Coefficient of Visual Impact is produced by dividing the Visual Effect value by 20.
- Relative landscape visual effect is calculated by multiplying the Baseline Landscape value by the Coefficient of Visual Impact; and
- Degree of Visual Change is expressed as the Coefficient of Visual Impact multiplied by the Baseline Landscape Character value, expressed as a percentage.

This quantitative assessment provides a relative measure of the Degree of Visual Change as a measure of the Visual Effect of the Project on the Baseline Landscape. The visual assessment also includes a description of the viewpoint context in relation the landscape character that surrounds the viewpoint and the potential visual impact. This assessment is supported by photomontages of the development and wireframe illustrations of the relative wind turbine positions.

05 Visual Impact Assessment

The viewpoints selected for the visual impact assessment are listed below:

1. VP01 Big Hill lookout, Stawell (southwest - regional)
2. VP02 Stawell Donald Road (west - regional)
3. VP03 Stawell Avoca Road, Greens Creek (northeast – sub-regional)
4. VP04 Northeast of Joel Joel (east – sub-regional)
5. VP05 Settlement of Bulgana (southeast – sub-regional)

For clarity and legibility of the report, all reference maps and photomontages have been included in Appendix A and C at A3 paper size.

5.3 Viewpoint 1: Big Hill lookout, Stawell (southwest - regional)

Viewpoint Context

Viewpoint 1 represents the potential visual effect likely to be experienced from locations west of the proposed wind farm. Situated on the eastern edge of Stawell, the elevated viewpoint provides expansive views across the regional landscape.

Views extend north to Deep Lead Flora and Fauna Reserve and across the Wimmera River flood plain. South and east across the surrounding agricultural landscape and local ridgelines, and west over the township of Stawell to the prominent ridgeline of the Grampians and the associated natural landscape character of the area.

Views to the south are defined by the underlying topography formed by numerous local ridgelines that crisscross the regional landscape. The ridgelines form complex visual layers which define the southern visual envelope. The ridgelines are set behind one another, extending south as part of the Great Dividing Range.

Central to the view is the ridgeline formed by the Concongella Hills. The topography and vegetated land cover add to the amenity of the rural landscape and the regional landscape more broadly.

Several existing wind turbines associated with the Crowlands and Bulgana Wind Farms are visible to the southeast and extending east. These wind farms provide an existing renewable energy infrastructure context to the agricultural landscape.

These wind turbines are clustered along or behind local ridgelines creating a variety of visual effects. The elevated infrastructure elements of the wind farms are visible along local ridgelines with glimpsed views of the nacelle and towers set behind local ridgelines.

While the viewpoint offers 360-degree panoramic views, the focus of the lookout is primarily south west towards the Grampians and across the township of Stawell. Consequently, views to the east are less of a focus, a fact reinforced by the location of several pieces of infrastructure, including telecommunication towers, survey markers and water storage tanks to the eastern side of the lookout. The introduction of these pieces of infrastructure and other small scale items, such as telegraph poles and survey markers, reduces the visual amenity to the east.

Figure 15: Existing: Viewpoint 1

Figure 16: Digital Overlay showing all Turbines: Viewpoint 1

Figure 17: Absorption Capacity Calculations: Viewpoint 1

Viewpoint Assessment

Assessment	Value	Description
Relief	3	The elevated viewpoint of the Big Lookout provides panoramic views towards the north and northeast. Concongella provides a prominent ridgeline defining the mid ground and horizon edge whilst also running parallel to the proposed development site.
Vegetation Coverage	3	Within the viewshed, expanses of vegetation provide a layered effect to the foreground and mid ground with isolated belts to the distant ridgeline on the foothill of Concongella.
Infrastructure and Built Form	2	The presence of water tanks, electricity power lines and the existing Bulgana Wind Farm provide existing built form elements of considerable scale within the viewshed.
Cultural and Landscape Value	3	The viewpoint is associated with a scenic lookout. The primary view of the lookout is south west over the township of Stawell towards the Grampians. However, the 360-degree views do have some experiential qualities that contribute to cultural sense of place.
Baseline Landscape	**11**	
Landscape Absorption	4	From this viewpoint there is limited topographic forms to the foreground and mid ground. The development is noticeable within the landscape with limited absorption of 22 percent.

Horizontal	2	The horizontal effect is recorded as 40 degrees which represents 33 percent of the field of view.
Vertical	4	An increase in the overall vertical visual effect experienced from the viewpoint as a result of the combined vertical visual effect of the existing landscape character and the proposed development. The vertical scale of the existing landscape is referenced to Concongella with an elevation of 417 metres at a distance of 9.6 kilometres. The maximum elevation of the turbine tip of blade is 516 metres at a distance of 10.7 kilometres from this viewpoint.There will be an increase in vertical visual impact created by the development (α_2 / α_1 > 1) with a 72 percent proportional increase in visual effect.
Distance	3	The closest turbine is 10.71kilometres at a bearing of 79 degrees
Visual Effect	13	With limited absorption and significant vertical scale the proposed development will provide a moderate to increasing visual effect.
Coefficient	0.65	
Degree of Visual Change	**36%**	0.65x11= 7.15 Landscape visual effect 7.15/20= Degree of visual change
Moderate change in view: change will be distinguishable from the surroundings whilst composition and underlying landscape visual character will be retained.		

Description of potential visual impact

The proposed wind farm will form a defined cluster of infrastructure elements within the landscape. Several wind turbines will be set behind the Concongella Hills, reducing the number of visible wind turbines in the landscape. However, the wind turbines' position will potentially disrupt the natural landscape characteristics of the horizon line. The wind turbines will be visible, located on or just below the horizon line, with the dynamic visual impact of rotation blades seen above the ridgeline of the Concongella Hills.

More broadly, to the northwest, the existing landscape character contains little infrastructure and appears as a well-vegetated agricultural landscape. The development of the Project will increase the visual impact of infrastructure in the regional landscape, creating a potential visual effect similar to the effects produced by the Bulgana and Crowlands Wind Farm. In this regard, the degree of visual change is considered moderate and appears as an extension of the existing renewable energy land use context contributing to a cumulative visual effect.

The proposed wind turbines will alter the horizon line of the Pyrenees and the wooded farming landscape. The introduction of the wind farm will reduce the amenity and natural qualities of the rural landscape.

5.4 Viewpoint 2: Stawell Donald Road (west - regional)

Viewpoint Context

Viewpoint 2 is located on the Stawell-Donald Road. The viewpoint is representative of the northwestern landscape character. The viewpoint provides views across the agricultural landscape character towards the Concongella Hill as well as the local ridgelines that extend to the south and east from the viewpoint.

The viewpoint is surrounded by several dwellings and will reflect the potential visual effect associated with the proposed wind farm from properties to the northwest.

The proposed wind farm is located at a distance of over ten kilometres and represents the visual impact that is likely to occur across the sub-regional and regional characters.

Further to the northwest is the Deep Lead Flora and Fauna Reserve and Navvys Hill, which forms a natural landscape edge and dense visual screen. Views to the northwest extend over a few hundred metres before the density of the vegetation creates a defined visual envelope.

Views of the Grampians are absent from the viewpoint, and the visual character of the locality focus on views either along the road corridor or east across the agricultural landscape.

To the distance, the existing wind turbines associated with Crowlands and Bulgana Wind Farms are visible. These wind turbines form three defined clusters set in amongst the vegetation belts and local ridgelines. The visibility associated with the existing wind turbines varies from individual wind turbines visible on ridgelines to certain nacelles and blades glimpsed above existing ridgelines.

Figure 18: Existing: Viewpoint 2

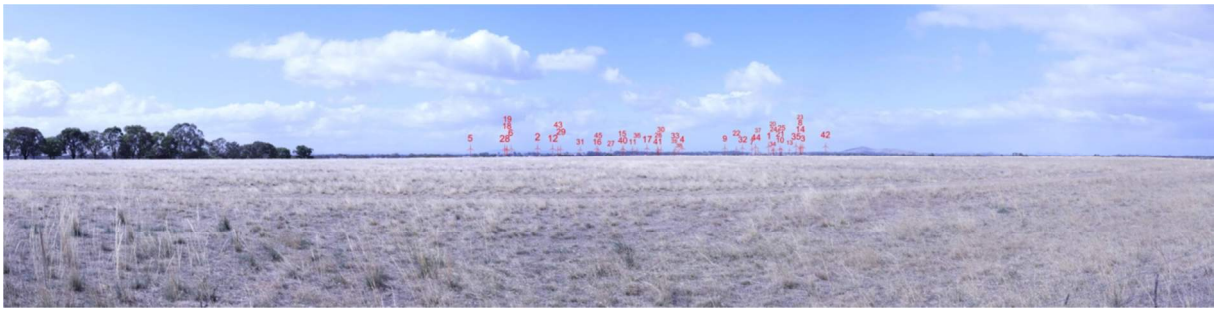


Figure 19: Digital Overlay showing all Turbines: Viewpoint 2

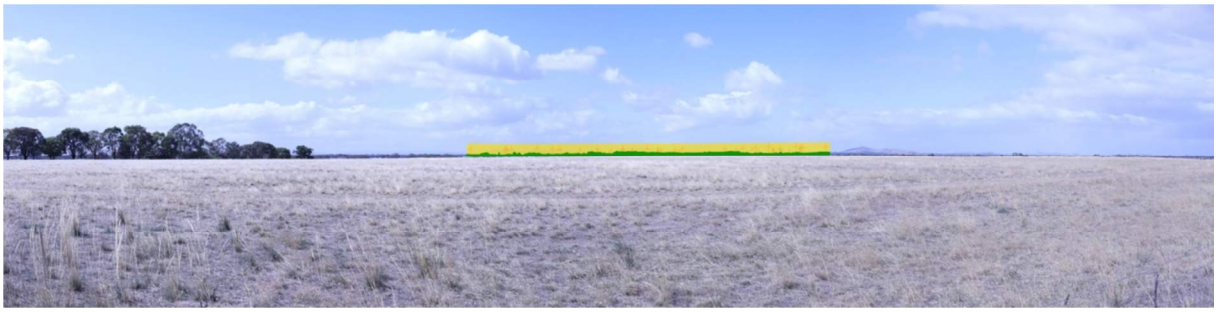


Figure 20: Absorption Capacity Calculations: Viewpoint 2

Viewpoint Assessment

Assessment	Value	Description
Relief	3	Limited foreground and mid ground topographic variation with a defined horizon edge associated to Concongella and the Pyranees to the background.
Vegetation Coverage	3	Defined open paddocks to the foreground with linear belts of mature tree line vegetation associated to the Wimmera river riparian corridor and drainage catchments to the background.
Infrastructure and Built Form	3	At a distance of over 11 kilometres, the Bulgana Wind Farm provides existing notable visual elements to the background of the viewshed. The turbines provide small clusters of elements proportional to the vertical scale of the existing natural landforms.
Cultural and Landscape Value	2	The viewpoint is associated with a transport corridor that connects regional townships within the locality. Local significance with moderate frequency of views.
Baseline Landscape	**11**	
Landscape Absorption	4	Vegetation associated to the Wimmera River riparian corridor and local drainage catchments provide limited absorption capacity of 29 percent.
Horizontal	2	The horizontal effect is recorded 35 degrees which represents 29 percent of the field of view
Vertical	3	An increase in the overall vertical visual effect experienced from the viewpoint as a result of the combined vertical visual effect of the existing landscape character and the proposed development. The vertical scale of the existing landscape is referenced to Concongella with an elevation of 417 metres at a distance of 11.8 kilometres. The maximum elevation of the turbine tip of blade is 516 metres at a distance of 12 kilometres from this viewpoint. There will be an increase in vertical visual impact created by the development ($\alpha_2 / \alpha_1 > 1$) with a 50 percent proportional increase from this viewpoint.

Distance	3	The closest turbine is 10.79 kilometres at a bearing of 93 degrees
Visual Effect	12	A moderate visual effect will be experienced from this viewpoint due to limited horizontal and distance.
Coefficient	0.6	
Degree of Visual Change	**33%**	0.6x11= 6.6 Landscape visual effect 6.6/20= Degree of visual change
Moderate change in view: change will be distinguishable from the surroundings whilst composition and underlying landscape visual character will be retained.		

Description of potential visual impact

The proposed wind farm is located within a defined agricultural landscape which is typical of the local sub-regional and regional landscape character. An open arable landscape extends across the field of view with a distant vegetated ridgeline running north/south demarcating the Wimmera River corridor. The distant topography of the Concongella Hills forms a defined ridgeline within the landscape with more distant ranges to the south, particularly associated with Black Range to the south and the Grampians to the southwest and the Pyrenees to the east.

Groups of wind turbines associated with the Bulgana Wind Farm are visible from the viewpoint. These wind turbines appear as visually diverse elements due to variations in elevation and layout. The proposed wind turbines are likely to be visible extending across the lower-lying ridgelines of the rural landscape to the east and will be perceived as a continuation of the existing wind farm. The relative position and height of the proposed wind turbines will be more pronounced when compared with the existing wind turbines and the vertical scale of the Concongella Hills.

The proposed wind turbines are likely to create a uniform visual effect within the landscape, with the tip of blade height of the wind turbines consistent across the field of view. The layout and scale of the wind turbines appear as a series of infrastructure elements visible above the existing tree line. The majority of the turbine towers will be screened by the vegetation, with the nacelles and blades forming the visual effect in the landscape.

While wind turbines 5 and 42 appear as slight outriggers, the clustering of the proposed wind farm will be uniform across the field of view with no distinct separations or presence of isolated elements.

It is anticipated that a significant number of the proposed wind turbines (1, 3, 4, 7, 8, 9,10, 13, 14, 20, 21, 22,24, 25, 32, 34, 37 and 44) will be positioned behind the Concongella Hills. The elevation of the landform will provide significant screening with small sections of the wind turbine blades visible above the horizon line. While a degree of screening will be provided by the relative position of the Concongella Hills, the existing horizon line formed by the natural profile of the ranges will be altered due to the visibility and dynamic visual effect of rotating wind turbine blades set on or behind the existing ridgeline.

While the visual impact along the ridgeline may be noticeable, this will appear as an accumulation of the existing visual effect that occurs to the south eastern escarpment of the ranges resulting from the Bulgana Wind Farm.

The proposed wind turbines will also disrupt the visual notability of the Pyrenees, creating a series of infrastructure elements in front of the elevated ridgeline. This will alter the visual amenity and landscape backdrop provided by the ranges.

Other wind farm elements are present throughout the landscape, either as prominent visual elements to the southwest associated with the Bulgana Wind Farm or distant visual elements on the escarpment of the Pyrenees associated with the Crowland Wind Farm. As previously discussed, the proposed wind farm will be seen as a continuation of the underlying renewable energy land use character with an increase in infrastructure elements, creating a cumulative visual effect.

5.5 Viewpoint 3: Stawell Avoca Road, Greens Creek (northeast – sub-regional)

Viewpoint Context

Viewpoint 3 is located to the northeast of the proposed wind farm development on the Stawell-Avoca Road, which forms the main arterial route between Navarre and Stawell and further north to St Arnaud. The viewpoint is typical of the visual effect that will be experienced to the northeast, particularly along the road corridor.

The development of the proposed wind farm will potentially increase the number and frequency of wind turbines visible in the landscape. The proposed wind turbines will be visible as renewable infrastructure elements in the landscape. The scale and proximity of several of the proposed wind turbines are likely to increase the degree of visual change and the potential visual effect of the proposed development on the locality of Viewpoint 3 and the northeast regional landscape more broadly.

The existing landscape character is dominated by the treed horizon line that extends across the farming land use. Landforms such as Concongella Hill are glimpsed between trees and appear as recessive elements.

Viewpoint 3 represents the visual effect that will be experienced by several dwellings in and around the viewpoint locality. The visual effect experienced at Viewpoint 3 will vary as people travel through the landscape. The relative visual impact will change in response to the screening provided by the adjacent roadside vegetation and the orientation of the road corridor.

The ridgelines of the Grampians are not visible from Viewpoint 3.

Figure 21: Existing: Viewpoint 3

Figure 22: Digital Overlay showing all Turbines: Viewpoint 3

Figure 23: Absorption Capacity Calculations: Viewpoint 3

Viewpoint Assessment

Assessment	Value	Description
Relief	3	Limited foreground and mid ground topographic variation with a defined horizon edge associated with the Pyrenees to the background.
Vegetation Coverage	3	Dense tree lined vegetation associated to the Wimmera river riparian corridor and drainage catchments provide layered landscape elements that moderate the viewshed to a local and sub-regional scale.
Infrastructure and Built Form	3	Road and property infrastructure provide a degree of landscape modification. At a distance of over 12 kilometres the Bulgana Wind Farm provides existing notable visual elements to the background of the viewshed.
Cultural and Landscape Value	2	The viewpoint is associated with a transport corridor that connects regional townships within the locality. Local significance with moderate frequency of views.
Baseline Landscape	**11**	
Landscape Absorption	4	Vegetation associated to the Wimmera River riparian corridor and local drainage catchments provide lower lying absorption capacity of 26 percent. Due to the vertical scale and proximity to the development the turbines are seen above the vegetation.
Horizontal	3	The horizontal effect is recorded 66 degrees which represents 55 percent of the field of view
Vertical	5	An increase in the overall vertical visual effect experienced from the viewpoint as a result of the combined vertical visual effect of the existing landscape character and the proposed development. The vertical scale of the existing landscape is referenced to the ridgelines adjacent Bulgana with an elevation of 354 metres at a distance of 12.7 kilometres. The maximum elevation of the turbine tip of blade is 459 metres at a distance of 3.7 kilometres from this viewpoint. There will be an increase in vertical

		visual impact created by the development (α_2 / α_1 > 1) with a percentage in excess of 100 percent from this viewpoint.
Distance	5	The closest turbine is 3.6 kilometres at a bearing of 217 degrees
Visual Effect	17	A moderate to high visual effect will be experienced from this viewpoint
Coefficient	0.85	
Degree of Visual Change	**47%**	0.85x11= 9.35 Landscape visual effect 9.35/20= Degree of visual change
Substantial change in view: which may involve partial obstruction of existing view or alteration of character and composition through the introduction of new elements. Composition of the view will alter. View character may be partially changed through the introduction of features.		

Description of potential visual impact

The proposed wind farm forms a distinct visual impact in the landscape, creating a dense cluster with a field of view of 66-degrees. The proposed wind farm is visible as a cluster of infrastructure elements within the landscape located behind the existing vegetated horizon line of the farming landscape character.

The clustering of the wind turbines extends uniformly across the field of view, with wind turbine clusters creating complex, overlapping visual impacts. Wind turbines 5, 6, 18 and 19 are particularly prominent visual elements. Wind turbines 38 and 39 appear as outriggers to the east, extending the horizontal visual effect and increasing the visual complexity associated with the proposed wind farm.

The location of the proposed wind turbines separated from the prominent land forms of Concongella Hill means that the visual envelope created by the land form is not impacted by the proposed wind turbines and retains the landscape qualities provided by Concongella.

The existing wind turbines associated with the Bulgana Wind Farm are visible behind the visual effect produced by the proposed wind farm.. As such, the cumulative visual effect, rather than being an extension of the horizontal or vertical visual impacts, will be experienced as an increase in the visual complexity created by the overlapping layout of each development.

While the wind turbines alter the horizon line of landscape character, the landscape remains predominantly agricultural with moderate screening provided by local belts of vegetation, particularly associated with the Wimmera River.

Throughout the northern sub-regional area, the visual effect will be similar to that experienced at Viewpoint 3. The proposed wind turbines will be visible within a wooded farming landscape, with the visibility of the wind turbines increasing due to proximity or decreasing due to mitigation provided by local vegetation belts and individual trees.

5.6 Viewpoint 4: Northeast of Joel Joel (east – sub-regional)

Viewpoint Context

Viewpoint 4 is located to the northeast of Joel Joel. The viewpoint is located on the unsealed road network that extends throughout the sub-regional locality. While the viewpoint is located away from

the main scenic road between Stawell and Landsborough, the selection of the viewpoint enables clear views of the proposed wind farms. It is typical of the visual effect that will be experienced to the east and northeast.

The viewpoint demonstrates the agricultural landscape character and undulating and rolling topography of the Wimmera River flood plain and Pyrenees foothills. Belts vegetation and groups of trees extend across the landscape, creating vegetated screens and isolated landscape elements. The visual character is open with views extending over several kilometres to local ridgelines such as Concongella Hill and Black Range or distant vegetation belts.

Across the ridgelines to the south, extend several clusters of wind turbines associated with the Bulgana and Crowlands Wind Farms. These represent an existing renewable energy infrastructure in the landscape and demonstrate the potential visual effect that the Project may create.

Several farm dwellings and other infrastructure associated with the agricultural land use exist within the landscape and are visible from the viewpoint. These agricultural elements reinforce the productive character of the landscape.

Figure 24: Existing: Viewpoint 4

Figure 25: Digital Overlay showing all Turbines: Viewpoint 4

Figure 26: Absorption Capacity Calculations: Viewpoint 4

Viewpoint Assessment

Assessment	Value	Description
Relief	2	Low lying foreground and mid ground topographic variation with limited variance in topographic scale.
Vegetation Coverage	3	Dense midground vegetation associated to the Wimmera river riparian corridor and drainage catchments.
Infrastructure and Built Form	3	At a distance of over 9 kilometres the Bulgana Wind Farm provides existing notable visual elements. The turbines provide small clusters of elements proportional to the vertical scale of the existing natural landforms.
Cultural and Landscape Value	2	Local significance to the viewpoint and eastern sub-regional locality surrounding Landsborough and Joel Joel, rural living areas.
Baseline Landscape	**10**	
Landscape Absorption	5	Due to the proximity of the development the vegetation and topography provides limited absorption capacity of 15 percent.
Horizontal	3	The horizontal effect is recorded 69 degrees which represents 56 percent of the field of view
Vertical	5	An increase in the overall vertical visual effect experienced from the viewpoint as a result of the combined vertical visual effect of the existing landscape character and the proposed development. The vertical scale of the existing landscape is referenced to Concongella with an elevation of 417 metres at a distance of 13.1 kilometres. The maximum elevation of the turbine tip of blade is 467 metres at a distance of 4.5 kilometres from this viewpoint. There will be an increase in vertical visual impact created by the development ($\alpha_2 / \alpha_1 > 1$) with a percentage in excess of 100 percent in front of this viewpoint.
Distance	4	The closest turbine is 4.5 kilometres at a bearing of 216 degrees
Visual Effect	17	A moderate to high visual effect will be experienced from this viewpoint
Coefficient	0.85	
Degree of Visual Change	**43%**	0.85x10= 8.5 Landscape visual effect 8.5/20= Degree of visual change
Substantial change in view: which may involve partial obstruction of existing view or alteration of character and composition through the introduction of new elements. Composition of the view will alter. View character may be partially changed through the introduction of features.		

Description of potential visual impact

The proposed wind farm will extend across the viewpoint and form a continuation of the existing wind turbines to the south, increasing the cumulative visual effects. The siting of the wind turbines results in the towers, nacelles and blades being positioned in front of the topography of the Concongella Hills. The foreground layering of the proposed wind turbines in front of the existing land form is likely to alter the farming and natural characteristics that define the visual envelope of the viewpoint and the locality to the east.

While the underlying farming landscape character will remain unchanged, the regional landscape context and visual envelope in relation to the visual prominence of the vegetated ridgelines will be altered. There will be an increased degree of infrastructure visible in the landscape extending across the regional landscape character and the visual envelope of the locality.

The introduction of the proposed development will result in the topographic profile of Concongella Hills becoming visually recessive as the horizon line will be punctuated by a series of infrastructure elements clustered across the rural landscape.

The proposed wind turbines form distinct infrastructure elements, separated into two defined clusters. To the north, wind turbines 13, 20, 23, 34, 37, 38 and 39 and south are turbines 13, 20, 34, 37, 38 and 39.

Wind turbines 24 and 25 appear as isolated infrastructure elements set in between two dominant clusters. Further to the northeast, the proposed wind turbines extend across the ridgeline of the Concongella Hills ridgeline, altering the visual character of the landscape and extending the cumulative visual effect of both the Project and the Bulgana Wind Farm. Further to the east, turbines 5, 6, 18, 19 and 28 form a distant visual effect set lower on the horizon and behind several local ridgelines.

The horizon line formed by Concongella Hill will be altered due to the presence of numerous wind turbines located in front of the ridgeline. This visual effect will be experienced throughout the eastern sub-regional locality with the existing ridgeline set behind a cluster of large infrastructure elements.

Due to the presence of the existing wind turbines associated with the Bulgana Wind Farm, the Project will appear as an extension of the infrastructure and renewable energy land use character overlay of the area. The number of turbines associated with the Project is similar to the number of wind turbines associated with the Bulgana Wind Farm. The layout and arrangement in the agricultural landscape provide similar characteristics and, therefore, the potential visual contrast between both developments.

Generally, the visual characteristics of the proposed wind turbines provide a degree of uniformity with the height and arrangement of the wind turbines relative to the horizon line. It is the visual impact associated with the wind turbines to the south and the potential visual effects on Concongella Hill that increases the potential visual effect.

The horizontal arrangement of the wind turbines will be uniform, with no discernible increases in height or scale between the existing and proposed wind turbines.

5.7 Viewpoint 5: Settlement of Bulgana (southeast – sub-regional)

Viewpoint Context

Viewpoint 5 is located south of the proposed development near a rural settlement of Bulgana. The viewpoint is typical of the landscape character to the south and the potential visual impact that will be experienced along the road network, both sealed and unsealed within the locality.

The existing wind turbines associated with the Bulgana Wind Farm create a defined infrastructure character within the rural landscape. The proposed wind turbines will appear as a continuation of the existing visual effect. The cumulative impact of the proposed wind turbines on the existing landscape

character and the local ridgelines will be limited because the majority of the wind turbines are positioned within the lower-lying flood plain of the Wimmera River and will be screened by existing belts of vegetation.

The resulting visual impact of the proposed development will be situated in front of a vegetated horizon line to the north. The uniformity of the horizon line will be impacted by the vertical clustering of the wind turbines. The visual impact resulting from the relativity and complexity of the visual effect produced by the arrangement of the turbines.

The presence of the Crowland Wind Farm further to the east on the foothills of the Pyrenees and the State Forest Park creates a sense of enclosure by wind turbines. This cumulative visual effect will be experienced from viewpoints to the south.

Figure 27: Existing: Viewpoint 5

Figure 28: Digital Overlay showing all Turbines: Viewpoint 5

Figure 29: Absorption Capacity Calculations: Viewpoint 5

Viewpoint Assessment

Assessment	Value	Description

Relief	3	Concongella provides a dominant ridgelines to the background at a distance of approximately 12 kilometres
Vegetation Coverage	2	A pastoral landscape to the foreground with moderate linear vegetated drainage catchments that connect to the Wimmera River riparian corridor
Infrastructure and Built Form	2	The Bulgana Wind Farm provides significant notable visual elements. The turbines provide a linear array of elements that extend across the mid ground providing a vertical scale above the horizon line.
Cultural and Landscape Value	2	Local significance to the viewpoint and southern sub-regional locality surrounding Bulgana rural living areas.
Baseline Landscape	**9**	
Landscape Absorption	5	Due to the proximity of the development the vegetation and topography provides limited absorption capacity of 14 percent.
Horizontal	3	The horizontal effect is recorded 48 degrees which represents 40 percent of the field of view
Vertical	2	An increase in the overall vertical visual effect experienced from the viewpoint as a result of the combined vertical visual effect of the existing landscape character and the proposed development. The vertical scale of the existing landscape is referenced to ridgelines adjacent Bulgana with an elevation of 370 metres at a distance of 2.96 kilometres. The maximum elevation of the turbine tip of blade is 506 metres at a distance of 6.02 kilometres from this viewpoint. There will be an increase in vertical visual impact created by the development ($\alpha_2 / \alpha_1 > 1$) with a 30 percent proportional visual increase which is limited.
Distance	4	The closest turbine is 6.02 kilometres at a bearing of 147 degrees
Visual Effect	14	A moderate to increasing effect will be experienced from this viewpoint
Coefficient	0.7	
Degree of Visual Change	**32%**	0.7x9= 6.3 Landscape visual effect 6.3/20= Degree of visual change
Moderate change in view: change will be distinguishable from the surroundings whilst composition and underlying landscape visual character will be retained.		

Description of visual impact

The presence of the existing wind turbines associated with Bulgana Wind Farm provides visual context. The proposed wind turbines form a distinct cluster within the farming landscape character. Consequently, the proposed wind farm is seen as an extension of the existing renewable energy infrastructure character to the northwest.

The proposed wind turbines are set within a narrow fifty-degree field of view compared to the broader spread of wind turbines produced by the Bulgana Wind Farm. The potential overlapping of individual wind turbines creates the potential for increased visual complexity.

Wind turbines 13, 20, 34 and 37 appear as prominent visual elements within the landscape; however, their notability and associated visual impact are mitigated by the infrastructure context provided by the Bulgana Wind Farm. In addition, several of the proposed wind turbines will be set behind the Concongella Hills.

The cumulative visual effect of the proposed wind farm and Bulgana Wind Farm creates a 160-degree field of view. However, the proposed wind farm contributes to a small proportion of the visual effect representing a minor increase in the overall visual effect.

In addition to the extension of the field of view provided by the Bulgana Wind Farm and the proposed wind farm is the adjacent visual effect of the Crowlands Wind Farm to the escarpment of the Pyrenees.

Wind turbines 38 and 39 will be visible as isolated infrastructure elements. These turbines are seen as distinct visual outriggers within the overall visibility of the proposed wind farm, and the visual separation increases the potential visual prominence within the landscape.

The proposed wind turbines appear as a vale of infrastructure elements visible above the existing vegetated horizon line of the agricultural landscape. While the wind turbines are likely to be set within a defined vegetated horizon line which is different to the landscape character of the existing Bulgana Wind Farm, the combination of the two wind farms appear as an extension across the farming landscape. The screening provided by the local landforms adjacent to the Bulgana Wind Farm help to mitigate the visual effect of the proposed wind farm, reducing the number of visible turbines and resulting in a moderate visual effect.

The scale and arrangement as well as the layered clustering of both the Bulgana Wind Farm and the proposed wind farm, are similar. The visual effect is consistent, and potential visual contrast in relation to layout, scale and design between the two wind farms is limited, minimising the cumulative visual effect of the proposed development.

5.8 Summary of Visual Impacts

The visual assessment of the five viewpoints demonstrates that a variety of visual impacts will be experienced within the local, sub-regional and regional landscapes that surround the proposed wind farm development. Typically, the visual effect associated with the wind farm will occur within a modified agricultural landscape that is contained by defined topographic and landscape features to north, south, east and west. The resulting landscape character creates a defined locality in which various visual effects are likely to occur.

The two tables below illustrate the degree of visual change recorded at each of the viewpoints and classification of the potential visual impacts. Of note are the key factors that will affect the visual impact which occurs at each viewpoint and in the wider landscape. They include:

Existing landscape character value and the presence or absence of significant vegetation or scenic value and or existing infrastructureThe degree of landscape absorption provided by the existing landscape;Degree of visual containment and resulting viewshed;Horizontal and vertical visual effects produced by the proposed developmentDistance to the proposed development.

As shown in Table 1 below, there is a notable degree of variation in the measured visual impacts, which ranges from moderate to the west and southeast, substantial to the north and northeast. The existing landscape character remains consistent with a measure value range of 9 to 11. This reflects the uniformity of the existing landscape character of the area with subtle variations depending on the extent of vegetation and the impacts of existing infrastructure elements. More significant is the screening and mitigation provided by the local topography and vegetation in relation to the degree of visual change throughout the site locality.

Viewpoints	Relief	Vegetation Coverage	Infrastructure	Cultural/Landscape Value	**Landscape Character**	Landscape Absorption	Horizontal	Vertical	Distance	**Visual Assessment**	**Degree of Visual Change**	Description of Visual Effect (sensitivity to Visual Change)
Viewpoint 1	3	3	2	3	**11**	4	2	4	3	**13**	**36%**	**Moderate**
Viewpoint 2	3	3	3	2	**11**	4	2	3	3	**12**	**33%**	**Moderate**
Viewpoint 3	3	3	3	2	**11**	4	3	5	5	**17**	**47%**	**Substantial**
Viewpoint 4	2	3	3	2	**10**	5	3	5	4	**17**	**43%**	**Substantial**
Viewpoint 5	3	2	2	2	**9**	5	3	2	4	**14**	**32%**	**Moderate**

Table 1: Summary of Visual Impacts

The following Table 2 is a summary of the classifications described in the GrimKe matrix, which provides additional information on the potential visual impact used to describe each viewpoint.

Percentage of Visual Change	Descriptive of Visual Impact	Descriptors – appearance in central vision field	Comments
80-100%	**Extreme**	*Commanding, controlling the view*	*Extreme change in view: change very prominent involving total obstruction of existing view or change in character and composition of the landscape and view through loss of key elements or addition of new or uncharacteristic elements which significantly alter underlying landscape visual character and amenity. The sensitivity of the underlying landscape character to change is unable to accommodate or mitigate the introduction of development, and the visual effect is highly adverse.*
60-80%	**Severe**	*Standing out, striking, sharp, unmistakable, easily seen*	*Severe change in view involving the obstruction of existing views or alteration to underlying landscape visual character through the introduction of new elements. Change may be different in scale and character from the surroundings and the wider setting or a severe change in the context of the existing landscape character.*
40-60%	**Substantial**	*Noticeable, distinct, catching the eye or attention, clearly visible, well defined*	*Substantial change in view: which may involve partial obstruction of existing view or alteration of underlying landscape visual character and composition through the introduction of new elements. Composition of the view will alter however the sensitivity of the underlying landscape character to change is low and the landscape has a capacity to mitigate and absorb the visual effects.*
20-40%	**Moderate**	*Visible, evident, obvious*	*Moderate change in view: change will be distinguishable from the surroundings while composition, and underlying landscape visual character will be retained. The sensitivity of the existing landscape to change is low.*
0-20%	**Slight**	*Lacking sharpness of definition, not obvious, indistinct, not clear, obscure, blurred, indefinite*	*Slight change in view: change barely distinguishable from the surroundings. Composition and character of view is substantially unaltered.*

Table 2: Classification of Visual Impacts

The landscape assessment and ZTVI highlight the defined visual envelope that contains the regional landscape. Ridgelines associated with the Pyrenees and Black Ranges' foothills define the eastern

and southern extents of the regional locality. To the southwest, the Stawell ridgelines and regional foothills of the Grampians limit the visual effect associated with the Project.

Local landforms and extensive belts of vegetation associated with the Wimmera River floodplain create a defined visual envelope to the north and west. Consequently, the proposed wind farm layout forms a single cluster of 45 wind turbines within the sub-regional locality.

The landscape and visual impact assessment, with reference to ZTVI mapping, demonstrates that the degree of visibility will be experienced within a contained viewshed. The layout of the proposed wind turbines will result in a single cluster of large infrastructure elements that form a concentrated visual effect. Travelling through the landscape, the underlying topography modifies views towards the proposed wind farm. The visibility of the proposed development changes due to the screening effects provided by the adjacent hills and ridgelines or areas of existing vegetation.

The visual assessment undertaken from the selected viewpoints demonstrates that a variety of visual impacts will be experienced within the local (zero to three kilometres), sub-regional (three to 10 kilometres), and regional (greater than 10 kilometres) landscapes that surround the proposed wind farm site. The potential visual effect reduces over distance, with the visual assessment illustrating visual effects as slight to moderate at a distance of more than fifteen kilometres.

To the north, within five kilometres of the proposed wind farm, the screening provided by local ridgelines and vegetation belts reduces due to the proximity of the viewpoint and the vertical scale of the proposed wind turbines. The wind farm and individual wind turbines are experienced as visually prominent elements in the farming landscape. The scale of the wind turbines is experienced relative to the scale of the rural landscape, increasing the visual effect, producing a degree of visual change in the order of 43 percent to 47 percent, which is described as substantial.

The visibility of wind turbines above the tree-line of the farming landscape or in front of the natural topography of the Concongella Hills alters the underlying visual character. However, the sensitivity of the underlying landscape character to change is considered low, especially when considering the impact of existing wind turbines within the regional farming landscape. In addition, the proposed wind turbines are not positioned on the landform of the Concongella Hills, and as such, there is no direct impact on the environmental significance overlay. Instead, the wind turbines provide a visually permeable veil of infrastructure elements to the foreground and background, with the landforms of the Concongella Hills remaining as a notable visual element

To the northwest and northeast from distances greater than five kilometres, the visual effect associated with the proposed development will result in individual wind turbines being seen behind belts of vegetation, local ridgelines and landforms. In these locations, the potential visual effect will result from the visibility of sections of the hub and blades above the vegetation and local topography.

To the south and east, the visibility and resulting visual impacts are viewed within the context of the existing Bulgana and Crowlands Wind Farms. The proposed wind turbines are seen as a continuation of the existing visual effect. The existing visual context lowers the sensitivity of the existing landscape character to changes, and the degree of visual change is calculated at 32 percent and is described as moderate. Further south and east, the topography of the Pyrenees and Black Hill Ranges create local ridgelines that fragment and screen the visual effect. Beyond fifteen kilometres, the visual effect will be negligible to slight.

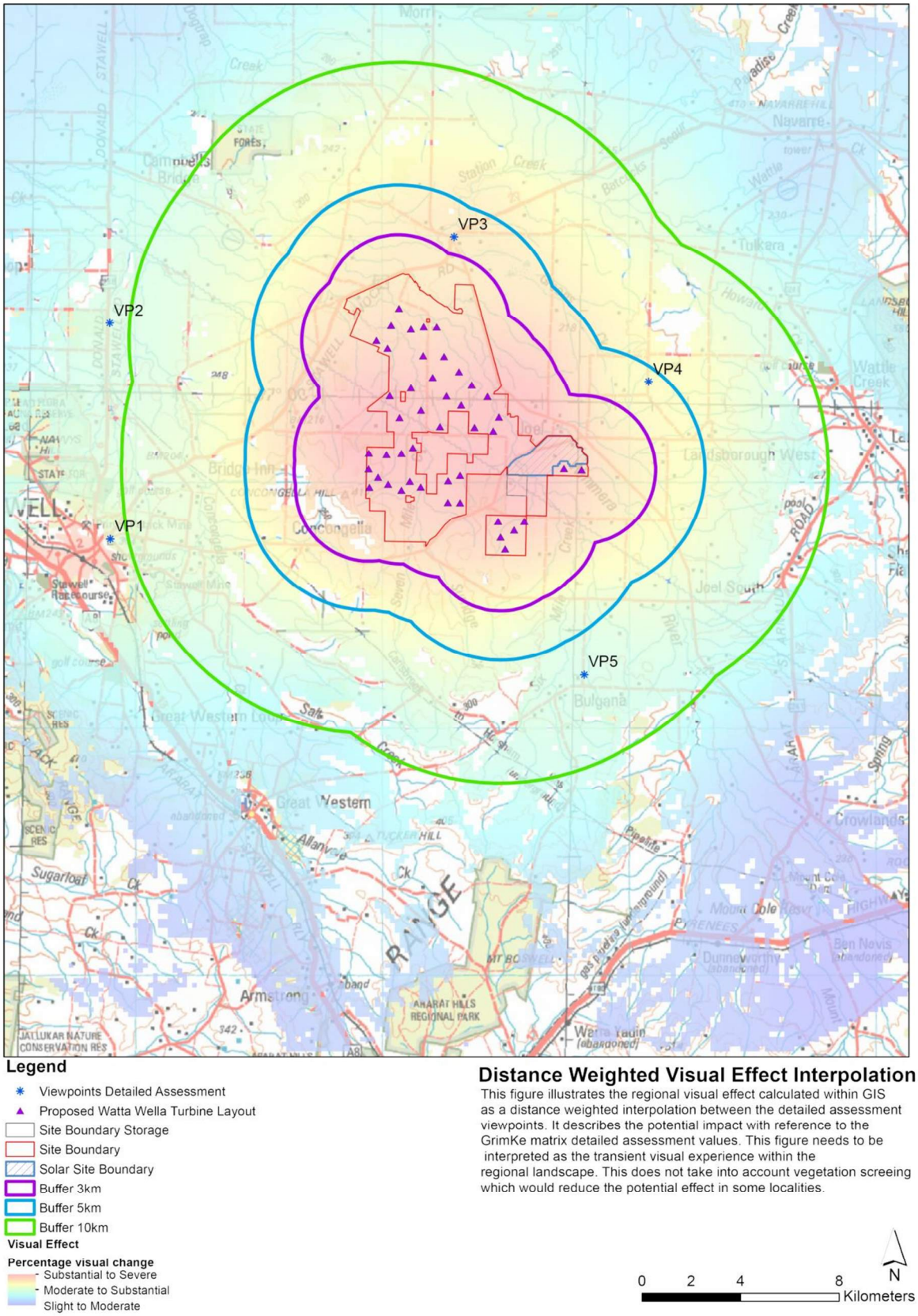


Figure 30: Summary of viewpoint visual effect

Viewed from the west, the proposed wind turbines will be positioned across the Wimmera River's low-lying floodplain. The scale of the landscape compared to the vertical height of the wind turbines means that towers, nacelles and blades appear above the tree-line of the rural landscape. The Concongella Hills create a significant visual envelope in the regional landscape, either partially or fully screening a large number of proposed wind turbines.

From locations and viewpoints further away from the proposed development, the topography and landscape character of the locality produces numerous visual screens that fragment or remove the visual effects of the proposed wind turbines. The increased visual absorption of landscape, topography and vegetation, and increased distances between the viewpoint and the proposed development reduce the visual effect.

Beyond ten kilometres, the degree of visual change reduces significantly, and the topography and vegetation of the locality provide increased levels of screening. From these locations, the degree of change is described as slight and the underlying visual character of the landscape will remain.

5.9 Solar Farm and Battery Energy Storage System (BESS)

The proposed solar farm will provide a large horizontal development form within a contained locality. The extent of visibility of the solar farm and BESS will be limited to a local (zero to one kilometres) context with potential glimpsed views from some elevated ridgelines to the east. However, the solar farm will appear recessive due to the colouration and scale of the development.

From the assessment viewpoint, the solar farm will extend across the local landscape to the south of Landsborough Road, occupying a considerable proportion of the field of view. Variations in the arrangement of the development are likely to occur due to the underlying topography, particularly the rising land further southwest. This change in topography will increase the visual effect that occurs, creating increased visibility of the infrastructure within the immediate locality.

The proposed development form, colouration, materiality and resulting visual effects will provide slight to moderate contrast to the rural landscape character within close proximity to the field of view, dependent on opportunities for foreground vegetation screening. The form of the development will change the underlying terrain and will likely require benching and hardstand coupled with the PV arrays and ancillary built forms.

Due to the homogenous form of the infrastructure and the contained locality, the solar farm will be seen as a moderate to substantial visual change to the existing character. However, as noted previously, this will only be evident from the immediate locality of less than 1 kilometre around the proposed solar farm.

Further southwest is the proposed location of the BESS. The compact layout and height of the batteries mean there are limited visual impacts on the existing landscape character. Local ridges south of Landsborough Road and the existing screening provided by roadside trees and the Joel Joel Nature Conservation Reserve's vegetation mitigated the limited visual effects.

Figure 31: Existing: Viewpoint (solar farm)

Figure 32: Proposed Solar Farm

From locations adjacent to the proposed solar farm out to a distance of two to three kilometres, the anticipated visual effect will be seen as a large collection of infrastructure elements that occupy a significant proportion of the broader landscape setting. From distances greater than three kilometres, the visual effect will be limited by the local topography and vegetation screening around the development..

The visual effect of the proposed solar farm results from the visual mass created by the solar arrays and the change of land use that results from the proposed development's impact on the existing farming landscape. Any potential mitigation techniques need to manage the visual mass of the proposed development in the landscape, effectively fragmenting the visual mass with localised screening around the periphery of the site compound.

Building on existing roadside vegetation and tree groups in the locality, additional visual mitigation could be achieved by creating a series of vegetation belts along the edge of the development. The belts of vegetation would respond to the landscape character, fragmenting the uniformity of the development's visual mass, while reducing the potential impacts of solar glare.

Given the low lying vertical scale of the development, vegetation groups and copse planting of small native trees will provide significant screening within the locality. A combination of landscape mitigation techniques has been considered to manage the degree of visual impact. These include;

- Scattered copse native eucalypt planting of trees along the existing solar farm and BESS project site boundaries..
- Trees to mature to eight to 10 metres as per existing vegetation that exists along boundaries.
- Retain existing trees on-site or to the edges to achieve immediate visual management of the development.
- Vegetation to be offset from the arrays to mitigate any shadow casting.
- Plant a denser screen along the major road corridors. Suggested buffer planting depth to be five to 10 metres to support a layered screening approach to planting, building on existing vegetation belts within the locality.

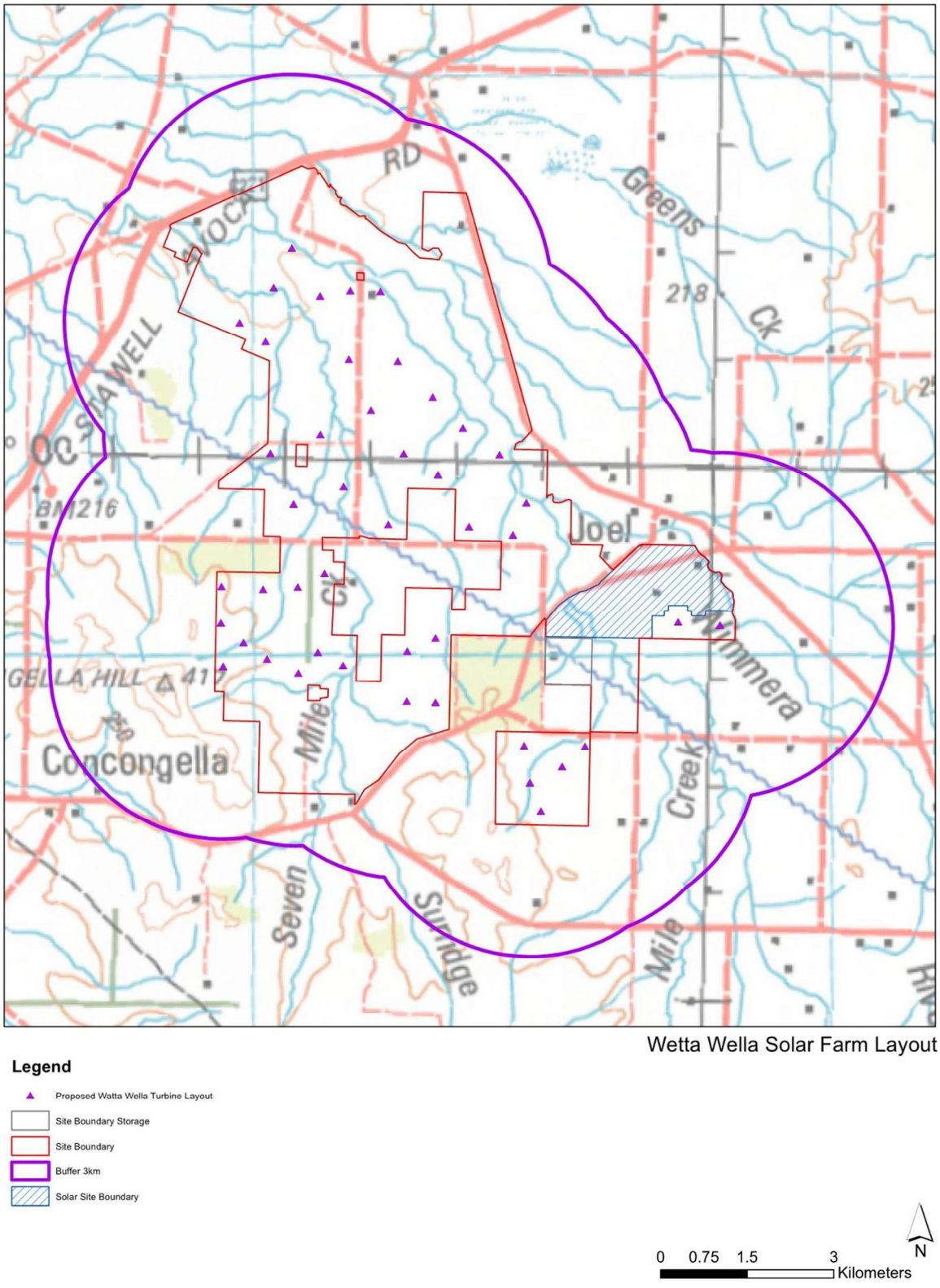


Figure 33: Solar Farm Layout

5.10 Site Substation, Control Buildings and Operational Maintenance Compound

The Project may require an individual on-site substation for each facility (Wind, Solar & BESS), including switching yards, associated electrical infrastructure, control buildings, staff facilities and car parks.

The sub-stations have been located to provide a short distance to the grid connection, thus reducing the extent of landscape impacted by ancillary infrastructure components. The scale of the on-site substations will be considerably less conspicuous than the wind turbines as it is proposed to be positioned in a lower lying area adjacent to the Wimmera River corridor.

The substation/switching yard compound will comprise of the following;

- Underground power line connections from the wind farm, solar farm and BESS to respective onsite substations
- Permanent overhead 220kV grid connections (on-site substations to Bulgana Terminal Station)
- Operations maintenance and control buildings and compounds with associated car parking

The vertical scale of the substation gantry (approximately 20 metres) is likely to be visible within the substation's locality. While the visual effect of the substation in relation to the overall effect of the existing Bulgana Terminal Station, existing turbines and the proposed wind turbines is limited, from local viewpoints along Landsborough Road, the degree of visual change within the agricultural landscape will slightly increase. The substations will be a noticeable development form, especially given the existing vegetation screening to the north between the proposed substation and Landsborough Road. However, the substation would represent a continuation of the existing electrical infrastructure in the area (Bulgana Terminal Station, Bulgana Wind Farm Substation and Switching Station).

To mitigate the potential visual effect of the substations and operational maintenance compounds, landscape treatments could be provided to the perimeter of the respective compounds, although it is noted that there is no existing vegetative screening for the Bulgana Wind Farm Substation and Switching Station. The landscape treatment would be a combination of local provenance screening tree groups and shrubs suitable for the conditions in which the infrastructure associated with the wind development is located. Any screening will need to be undertaken in line with electrical code best practice. Planting should be considered in copse form rather than linear to correlate with the natural vegetation patterns in the area of stands of copse plantings surrounded by grazed paddocks.

Distant views of the lattice towers and gantry will become recessive, limiting the visual presence and effect of the substation infrastructure. While the lattice construction of the gantry will not remove the visual effect completely, this visually permeable form of construction will mitigate to a certain degree the potential visual impact of the infrastructure associated with the substation.

5.11 Transmission Line and Substation Connection to Existing 220kV Line

Several infrastructure connections are required as part of the Project. These connections vary depending on the location and proximity to existing infrastructure connections such as the Bulgana Terminal Station.

The BESS may require its own dedicated high-voltage overhead transmission line corridor that runs east-west for up to 600metres (in parallel with the existing 220kV transmission line) over the agricultural landscape of the locality connecting the BESS to the existing substation. The short infrastructure corridor reduces the visual effect.

As part of the infrastructure provision for the Project, an overhead transmission line will be required to link the wind/solar farm substation with the existing transmission corridor over a relatively short length (less than 100 metres). The infrastructure corridor runs approximately north-south following the alignment of the Six Mile Creek.

The introduction of the transmission line within the landscape will produce a variety of minor visual effects that result from the introduction of individual poles stays as they traverse the landscape. . While individual poles create localised points of visual effect, the visibility of the transmission line as a whole is seen within the context of the broader agricultural landscape, existing infrastructure and the proposed wind farm.

In addition, the existing landscape character of Six Mile Creek to the northeast provides siginificant landscape screening. As a result, the potential visual effect of the proposed transmission line will be limited, seen as another piece of infrastructure in the broader landscape.

5.12 Access tracks

As part of the proposed development, a series of compacted gravel tracks will be required to access the wind turbine locations off public access roads. The tracks developed across private land areas will typically be up to 7.5 metres (including required erosion and sediment controls either side) during the construction period. Public road access tracks will be limited to five to six metres in width and will be widened where required in consultation with the relevant authority

Wherever possible, the proposal will utilise existing access track and road connections. In addition, the form, materiality and colour of the new tracks will be in keeping with other tracks and roads in the area. While the proposed tracks will appear as new development, post-construction, these tracks will not appear out of character within the wider farming landscape. The track surface will be crushed rock sourced either on-site or from a local supplier.

Finally, the visibility of the tracks needs to be assessed relative to the other development forms associated with the wind farm proposal. The proportional effect of the tracks will always be a secondary or partial visual element when considered against the degree of visual change produced by wind turbines. In this regard, the visual effect of the track is described as negligible and will progressively diminish over time.

5.13 Underground cable routes

The undergrounding of cable as part of the proposal limits visual impact. Trenching will be typically 0.45 metres wide by one metre deep. All trenches will be backfilled to meet existing surface levels limiting associated visual impacts and should be considered in context with the access tracks and overall visual effect of the entire development. Cable trenches will predominantly be located immediately adjacent to access tracks, thereby avoiding additional site and visual impacts associated with separate trenching.

The absence of significant areas of vegetation within the anticipated cable routes means that the potential vegetation clearance will be limited, and the resulting visual effect will be negligible.

07 Assessment of Residential Properties

06 Review of Northern Grampians Planning Scheme

6.1 Introduction

The following section details the relevant planning provisions under the Northern Grampians Planning Scheme (the Planning Scheme) that have been considered in relation to the potential visual effect of the Project and associated infrastructure.

The intent of the review is to provide clarity as to the relevance and consistency with particular clauses of the Planning Scheme in relation to the development of the wind farm and associated infrastructure, visual impacts, and the effects on the landscape character and amenity.

Following a review of the Planning Scheme, consideration has been given to the following planning provisions and controls that directly relate to the Project and visual and landscape matters.

- Clause 19.01-2S – Renewable Energy
- Clause 35.07 – Farming Zone
- Clause 42.01 – Environmental Significance Overlay (Schedule 1)
- Clause 52.32 – Wind Energy Facility

6.2 Clause 19.01-2S Renewable Energy

The objective of Clause 19.01-2S is to promote the provision of renewable energy in a manner that ensures appropriate siting and design. From a landscape and visual impact assessment, there are no specific provisions that would indicate that the proposed development is not appropriate for the proposed location.

6.3 Clause 35.07 Farming Zone

The project site is located within the Farming Zone. The purpose of Clause 35.07 (Farming Zone) is to encourage the retention of productive land by ensuring non-agricultural uses do not adversely affect the use of the land for this purpose. The wind turbines are sited to minimise the impact on farming. Where possible they are sited to the edge of a land parcel and infrastructure is aligned with typical cropping directions. Tracks are designed to prevent islanding of arable land and are also aligned with typical cropping directions where possible. It is anticipated land not required to be utilised for the proposed wind farm and solar farm infrastructure will be able to continue its current use.

6.4 Clause 52.32 Wind Energy Facility

Clause 52.32 (Wind Energy Facility) seeks to facilitate the establishment and expansion of wind energy facilities in appropriate locations, with minimal impact on the amenity of the area. Clause 52.32-2 (use and development of land) specifies locations where the use and development of a wind energy facility is prohibited unless particular conditions are met. Specifically, a wind farm is prohibited on land where any turbine is located within one kilometre of an existing dwelling (unless the requirements of Clause 52.32-3 are met). However, WTGs have been located to be at least 1.5 kilometres from non-associated dwellings for this Project and are therefore compliant.

6.5 Clause 42.01 Environmental Significance Overlay

The purpose of Clause 42.01 (Environmental Significance Overlay) is to identify areas where the development of land may be affected by environmental constraints and to ensure that development is compatible with identified environmental values. Schedule 1 of the Environmental Significance Overlay (ES01) relates to significant ridge environs and in relation to the proejct site is associated with the Concongella Ranges, which is lcoated to the south-west of the project site. The statement of environment significance acknowledges that there are significant ridges in the municipality, with

development to maintain the natural beauty of the ridge system and to maintain the landscape qualities of the ridge system, especially when viewed from surrounding areas.

The Concongella Ranges (affected by the ES01) provide a significant backdrop to the proposed development when viewed from the northeast and east. Two turbine are proposed to be located within the outer extent of the ESO1 as well as asscіated hardstanding areas, access tracks and underground cabling. It is noted the proposed infrastructure will be located approximately one kilometre from the peak of the Concongella Ranges.

07 Cumulative Visual Effect

7.1 Description of Cumulative Visual Effect

Cumulative visual effects can be defined as the additional changes caused by a proposed development in conjunction with other similar developments in the landscape or site locality or as the combined effect of a set of developments, taken together. The following assessment has considered the cumulative effects of other existing wind farms in the regional locality of the Project.

To understand the degree of cumulative visual effect, the following descriptions have been provided to depict the different types of cumulative visual effects

- Combined Visibility:
  When a proposed wind farm is located adjacent to existing developments, the observer from a particular viewpoint may be able to see more than one form of development.
- Succession:
  When the observer has to turn to see the various developments from the same viewpoint. The developments cannot be seen at the same time; they are in a different arc of view. However, the cumulative visual impact will have a degree of perceptive value.
- Sequential Effects:
  When the observer has to move or travel through the landscape to view the various developments within the same field of view. Sequential effects should be assessed for travel along regularly used routes (major roads). Different degrees of sequential effect will be evident
- Frequent Effects:
  Frequent sequential effects occur when the developments appear within the same field of view regularly with short time periods in between. The speed of travel and distance between large scale infrastructure developments will be determinants of the significance of the effect.

7.2 Discussion of Cumulative Visual Effect

The regional locality contains several wind farms located to the south and southwest of the Project. With regards to cumulative effects, the Project will provide visual experiences of combined visibility, in particular from viewpoints to the east and northwest looking south. Various localities will provide the experience of viewing the Project in succession and sequential due to the nature of geographic siting.

In general, due to the regional landscape character area being contained to a viewshed of approximately 20 kilometres by surrounding ranges and ridgelines and extensive vegetation, the cumulative effects of the development will be fragmented and seen within a sub-regional (three to 10 kilometres) context. Across the 20 kilometres regional locality, the scale of the underlying landscape and distances between townships further mitigate the cumulative visual effects.

08 Viewer Sensitivity

The preceding assessment considers the visual effect of the Project from various locations having regard to the existing landscape quality and the degree of visual change on the existing environment. It does not measure the extent to which a viewer's response or sensitivity to landscape changes and how this influences the perception of visual effect.

The *Wind Farms Planning Bulletin Planning SA* (2002) identifies potential viewers and the possible sensitivity that may be experienced by the public, ranging from the eco-tourist, who may experience a devaluing of the landscape, to members of the local community, who might stand to benefit from the development. However, the Planning Bulletin also concedes that "Given the potential impact on the visual amenity of an area, a diverse range of public responses can be expected".

Fundamental to the viewer's sensitivity is the degree to which visual change is perceived or experienced and whether this is seen as a positive or negative visual effect. Although it is likely that local residents, who are most familiar with the landscape, will experience an increased degree of visual change, the presence of existing wind turbines means that the change is experienced as a proportional increase, rather than a visual change in land use or landscape character.

Whether the change is perceived as positive or negative will depend on the viewer's opinions. It is evident that many people like the look of wind turbines, considering them sculptural and majestic or positive signs of climate change action. At the same time, some view them as an industrial blight.

Most tourists may perceive no change and see the wind farm as part of the existing visual environment.

The truth may be that within all user groups, be they locals, tourists, walkers or weekenders, a spectrum of opinions can be expected based on differing views on the receiving landscape, the visual appeal of turbines and renewable energy itself. The final level of viewer sensitivity becomes the viewer's personal preference as to whether the visual change is positive or negative, as an assessment of social or demographic groups can only be subjective; it does not form part of this discussion.

09 Conclusion

The landscape assessment and ZTVI illustrate that the Watta Wella Renewable Energy Project will be developed in the farming landscape of the Wimmera River floodplain. The topography of the Great Dividing Range, Pyrenees and Black Hill Ranges create a defined visual envelope to the south, east and southwest of the proposed development farm. To the west, the local topography of the Concongella Hills and the existing belt of vegetation associated Wimmera River limit the visibility of the proposed wind farm, creating screens and visual frames across the regional landscape.

Throughout the regional locality and specifically around the proposed wind farm, the existing land use is agricultural, with dense belts of vegetation defining the farming land use pattern. The proposed layout of the proposed wind farm component forms a compact cluster of 45 wind turbines within this visually contained agricultural landscape.

There is a degree of variance in visual impact associated with the proposed wind farm ranging from substantial in areas to the north and northeast to moderate south and southwest and slight throughout the regional locality at distances greater than ten kilometres.

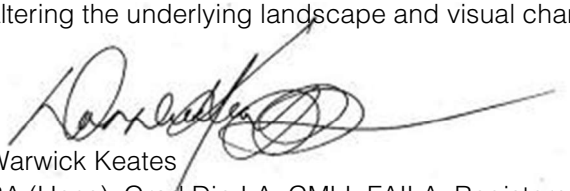
At distances exceeding ten to 15 kilometres, local ridgelines and tree belts create visual screens that fragment or remove the visual effects of the proposed wind turbines. The combination of topography and vegetation increases the screening, reducing the visual effect.

At distances of over fifteen kilometres, the visual effect reduces significantly and is describe as slight to negligible.

The associated infrastructure, substations and transmission lines, and the proposed solar farm will provide localised visual impacts to their immediate site localities. These visual effects will be limited (contained within specific viewsheds) by the screening provided by existing vegetation and landforms. Transient experiences will be experienced along local roads around the Project. Depending on the viewpoint, the local landforms and existing vegetation will provide varying degrees of visual screening. The visual assessment and visual effect interpolation mapping illustrates the relationship between distance and visual effect and the significance of local ridgelines and vegetation in reducing the visibility of the proposed wind farm in the wider locality. The visual effect is represented as bands of visual change radiating from the proposed wind farm. The consistency of the existing landscape character means that distance and visual absorption are the dominant variables in mitigating the visual effect.

Similarly, the cumulative visual effects are mitigated by the local topography and existing vegetation. The cumulative visual effect of the existing and proposed wind farms are experienced as defined clusters of wind turbines fragmented by the landscape character of the regional locality.

Although the visual effect is likely to be moderate to substantial, decreasing to slight, within the subregional and regional areas, the containment of the visual impact can be attributed to the visual character of the landscape coupled with the uniformity of the agricultural character. Consequently, the proposed Watta Wella Renewable Energy Project can be accommodated without significantly altering the underlying landscape and visual character.



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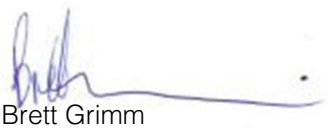

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Landscape Character and Probable Visual Effect Assessment - Appendices

Watta Wella Renewable Energy Project

RES Australia Pty Ltd

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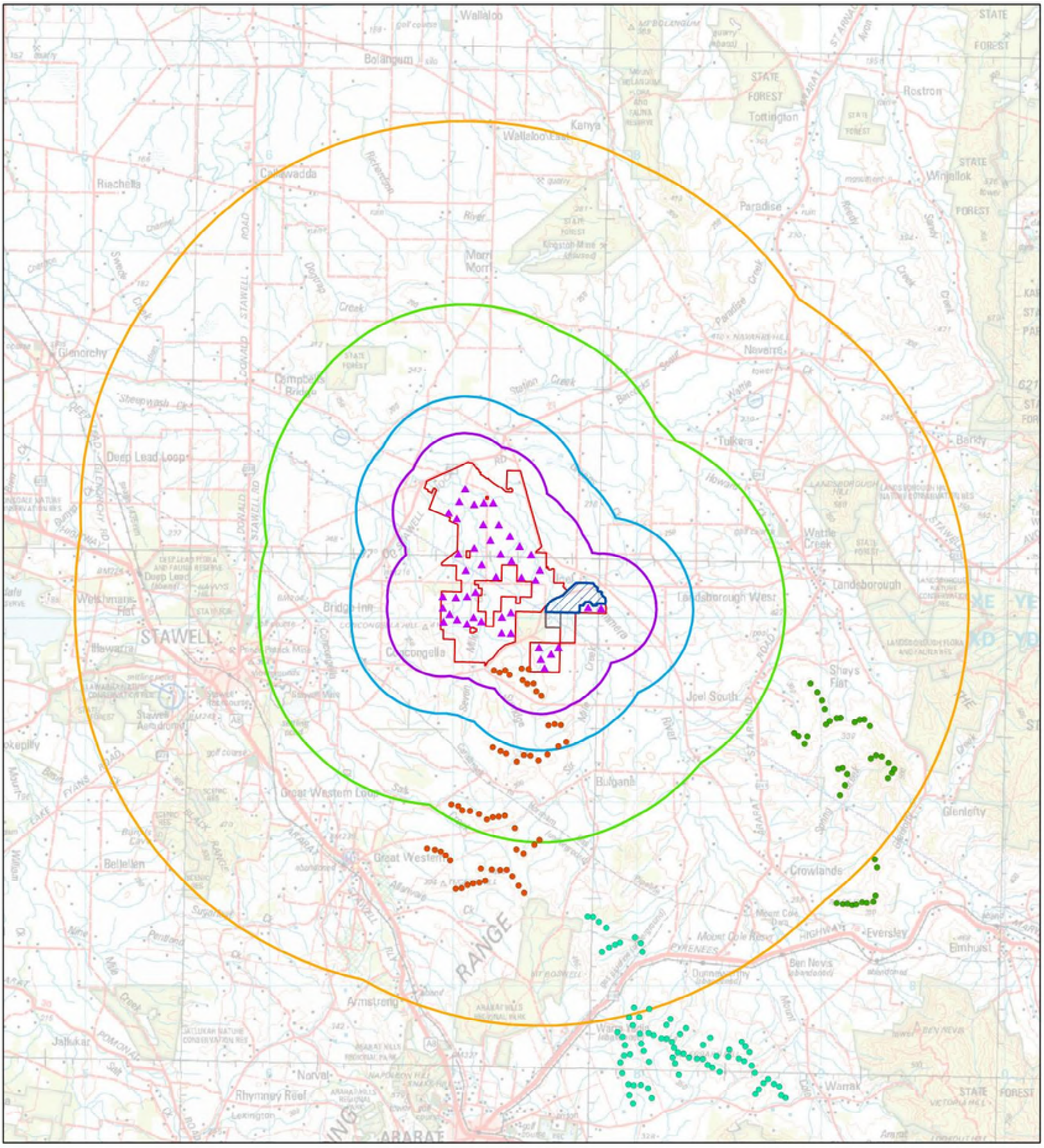
Appendix A
Assessment Mapping



Legend

- Proposed Watta Wella Turbine Layout
- Buffer 3km
- Buffer 5km
- Buffer 10km
- Buffer 20km
- Solar Site Boundary
- Site Boundary Storage
- Site Boundary
- Ararat Wind Farm
- Bulgana Wind Farm
- Crowlands Wind Farm

Watta Wella Site Locality

N

0 3 6 12 Kilometers

VP3
VP2
VP4
VPS1
VP1
VP5

Legend

- Solar Farm Montage Viewpoint (VPS1)
- Viewpoints Detailed Assessment
- Buffer 3km
- Buffer 5km
- Buffer 10km
- Buffer 20km
- Solar Site Boundary
- Site Boundary Storage
- Site Boundary
- Ararat Wind Farm
- Bulgana Wind Farm
- Crowlands Wind Farm
- Proposed Watta Wella Turbine Layout

Watta Wella Viewpoints

N

0 3 6 12
Kilometers

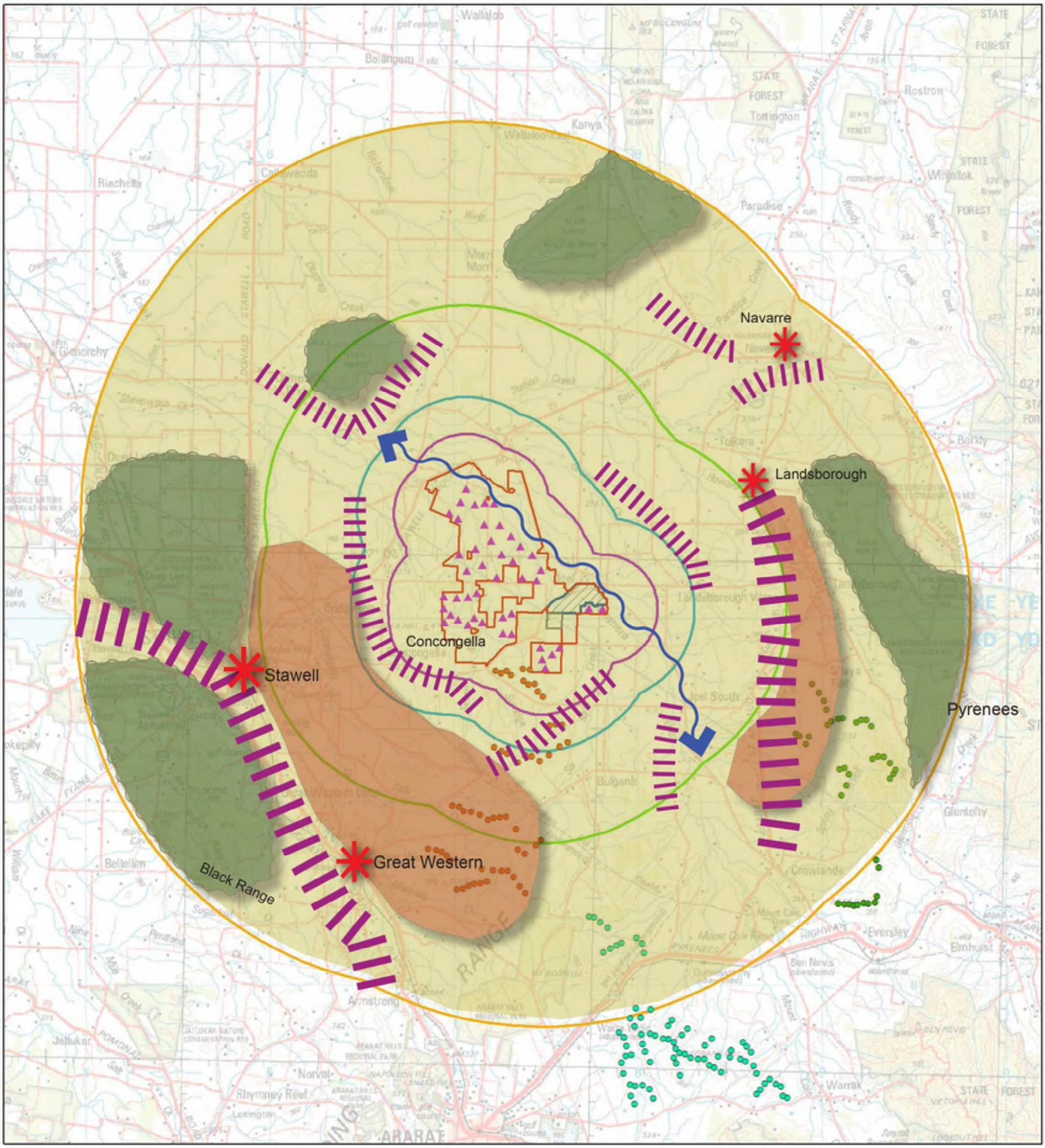
Watta Wella- Terrain Model

Legend

- Proposed Watta Wella Turbine Layout
- Buffer 3km
- Buffer 5km
- Buffer 10km
- Site Boundary Storage 20210824
- Site Boundary 20210824
- Solar Site Boundary

0 1.75 3.5 7 Kilometers

N



Legend

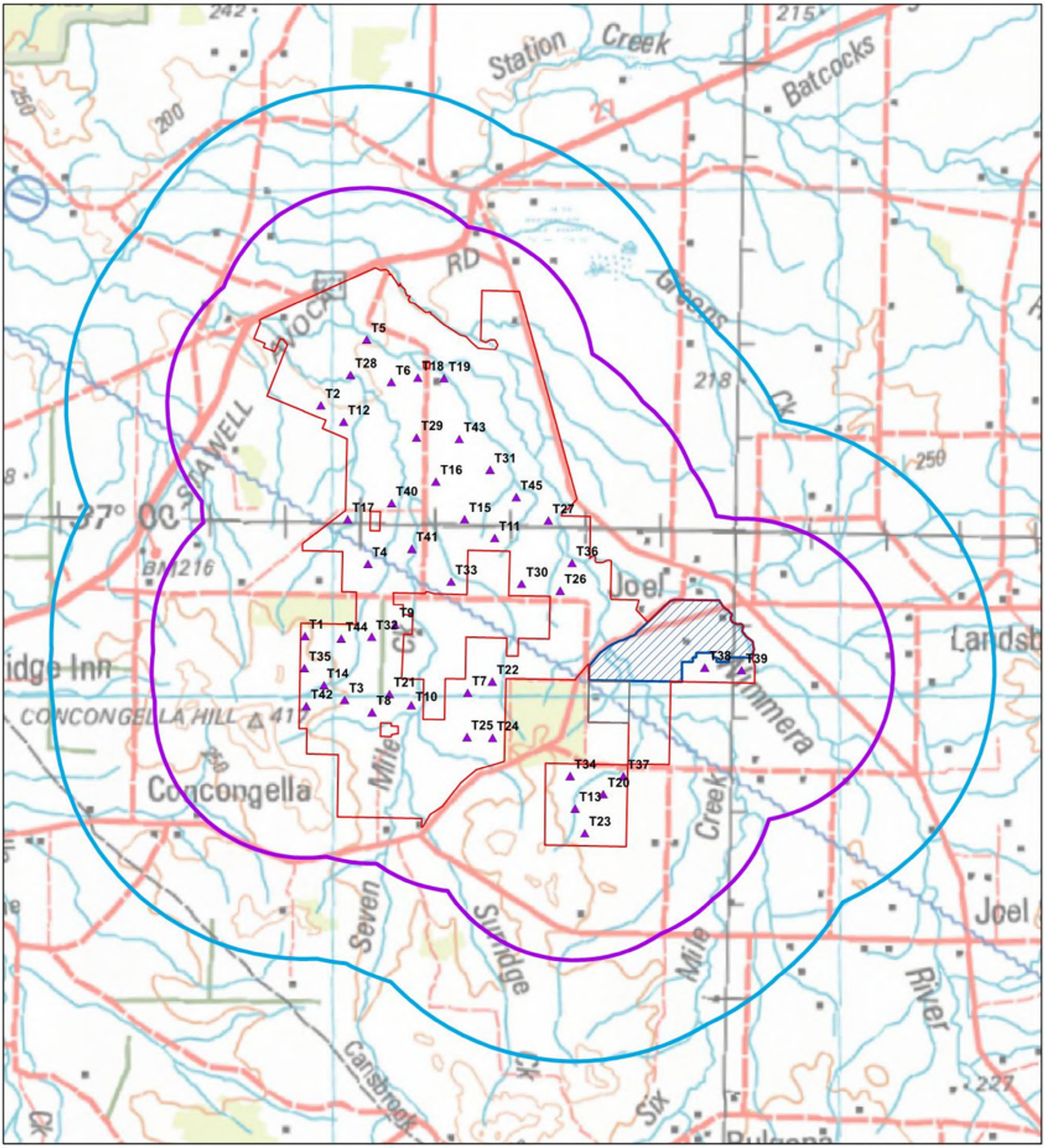
- Proposed Watta Wella Turbine Layout
- Buffer 3km
- Buffer 5km
- Buffer 10km
- Buffer 20km
- Site Boundary Storage 20210824
- Site Boundary 20210824
- Solar Site Boundary
- Ararat Wind Farm
- Bulgana Wind Farm
- Crowlands Wind Farm
- Undulating broadacre agriculture with isolated tree belts
- Dense forestation

Watta Wella Landscape Character

- Wooded grassland
- Ridgelines which define viewshed
- Wimmera river catchment - riparian corridor
- Urban settlement

N

0 3 6 12 Kilometers



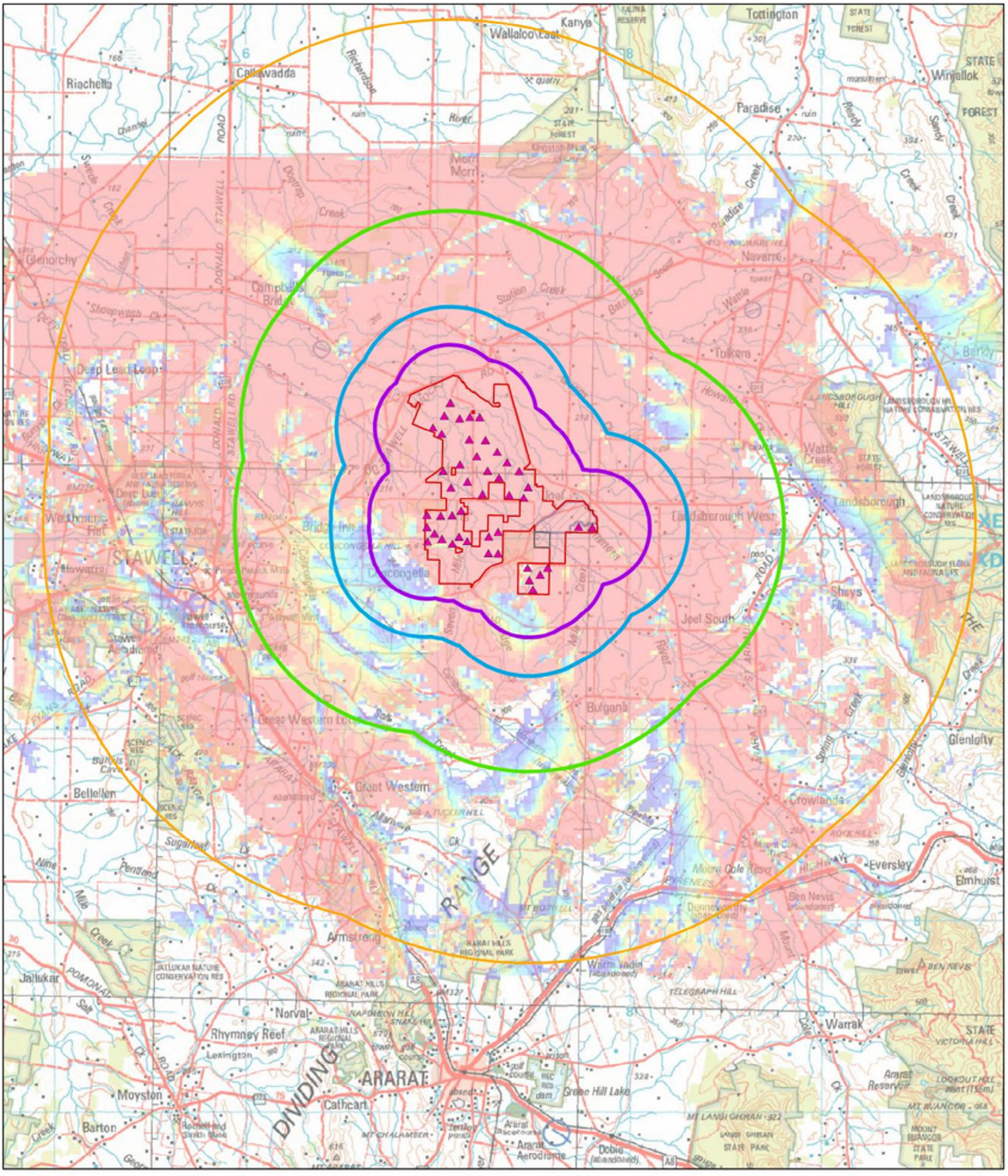
Legend

Wetta Wella Turbine Layout

- Proposed Watta Wella Turbine Layout
- Buffer 3km
- Buffer 5km
- Site Boundary Storage
- Site Boundary
- Solar Site Boundary

N

0 1 2 4 Kilometers



Legend

- Proposed Watta Wella Turbine Layout
- Buffer 3km
- Buffer 5km
- Buffer 10km
- Buffer 20km
- Site Boundary Storage
- Site Boundary
- Solar Site Boundary

ZTVI_Tip Blade
No. Turbines Visible

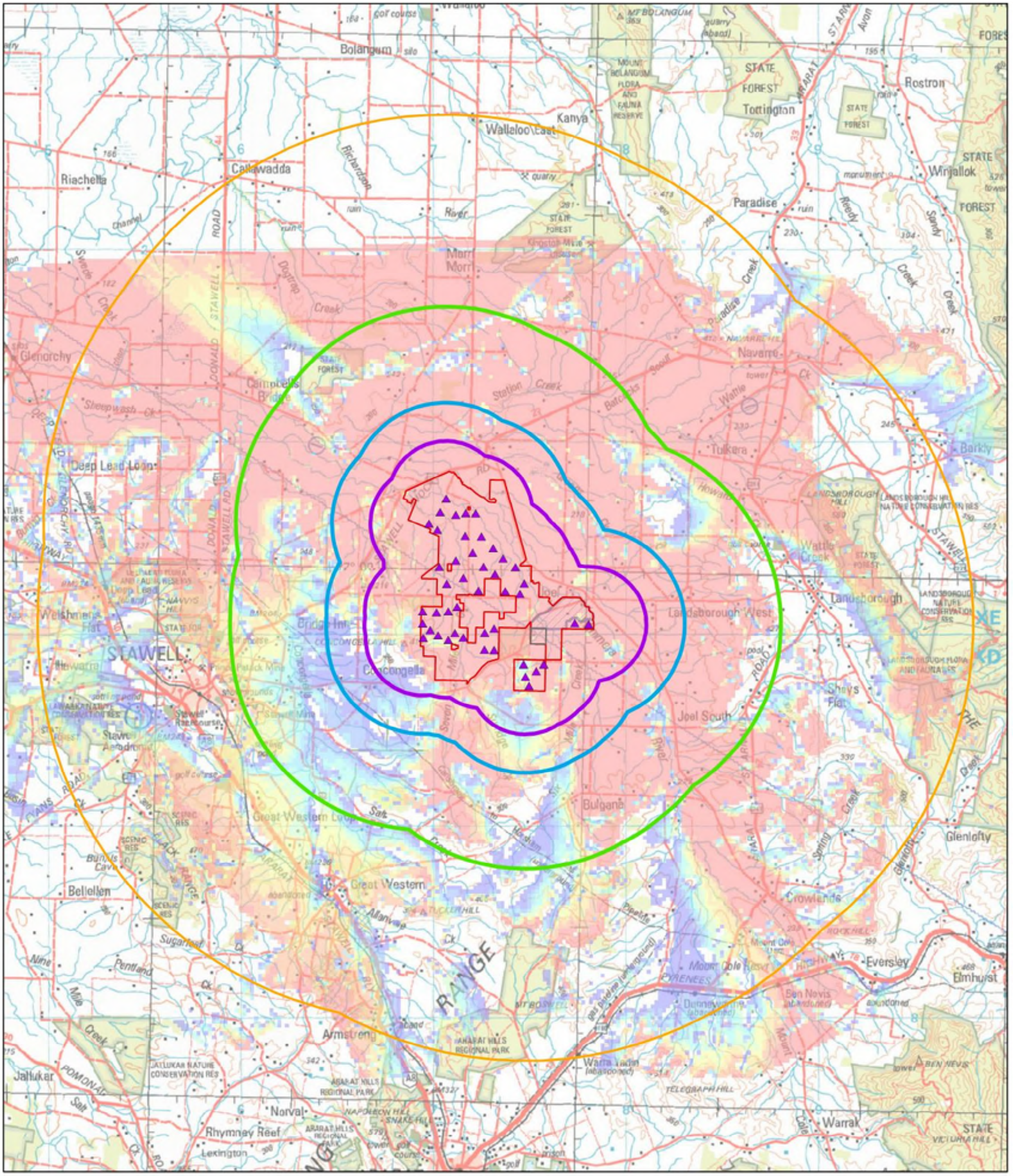
- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 30
- 31 - 35
- 36 - 40
- 41 - 45

Watta Wella Wind Farm
Zone of Theoretical Visual Influence
Tip of Blade - 255m

ZTVI is based on 1 metre contour data with no vegetation or built form screening taken into consideration. Furthermore it is representative of the tip of blade (255m) visual influence. This is representative of worse case scenario

N

0 2.75 5.5 11 Kilometers



Legend

- Proposed Watta Wella Turbine Layout
- Buffer 3km
- Buffer 5km
- Buffer 10km
- Buffer 20km
- Site Boundary Storage
- Site Boundary
- Solar Site Boundary

ZTVI_Hub Height

No. Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 30
- 31 - 35
- 36 - 40
- 41 - 45

Watta Wella
Zone of Theoretical Visual Influence
Hub Height - 166m

ZTVI is based on 1 metre contour data with no vegetation or built form screening taken into consideration. Furthermore it is representative of the hub height (166m) visual influence. This is representative of worse case scenario.

N

0 2.75 5.5 11 Kilometers

VP1
VP2
VP3
VP4
VP5

Legend

- Viewpoints Detailed Assessment
- Proposed Watta Wella Turbine Layout
- Site Boundary Storage
- Site Boundary
- Solar Site Boundary
- Buffer 3km
- Buffer 5km
- Buffer 10km

Visual Effect

Percentage visual change

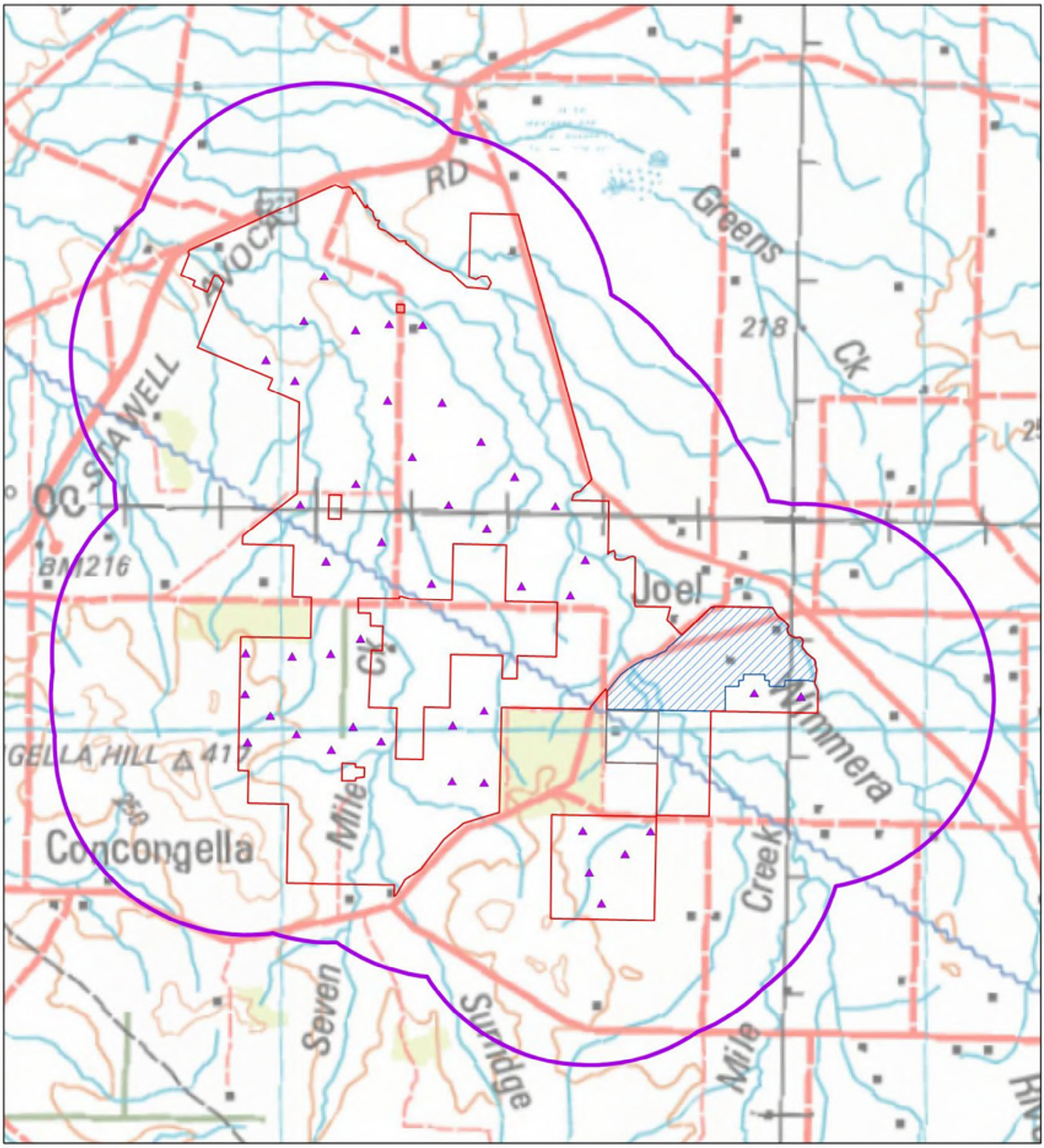
- Substantial to Severe
- Moderate to Substantial
- Slight to Moderate

Distance Weighted Visual Effect Interpolation

This figure illustrates the regional visual effect calculated within GIS as a distance weighted interpolation between the detailed assessment viewpoints. It describes the potential impact with reference to the GrimKe matrix detailed assessment values. This figure needs to be interpreted as the transient visual experience within the regional landscape. This does not take into account vegetation screeing which would reduce the potential effect in some localities.

N

0 2 4 8 Kilometers



Wetta Wella Solar Farm Layout

Legend

- Proposed Watta Wella Turbine Layout
- Site Boundary Storage
- Site Boundary
- Buffer 3km
- Solar Site Boundary

N

0 0.75 1.5 3 Kilometers

Appendix B
Photographic Methodology (produced by Convergen)

The method consists of 6 stages. The following summarises the stages;

1. Viewpoints are identified using a Zone of Theoretical Visibility map, site assessment and in consultation with the client and residents in the area. The viewpoints are selected to represent the worse case scenario i.e. the maximum number of turbines visible within the field of view. The locations of viewpoints are typically representative of the regional landscape character units or identified by residents. The locations represent a diverse range of views from around the wind farm at a variety of directions and distances.

2. Photos are taken onsite using a 32mm lens digital SLR camera (50mm equivalent analogue). Numerous research papers have concluded that this is most representative of the human eye for depth of field. Photos are taken on a mounted tripod and the height recorded to eye level. In addition the elevation of the viewpoint is recorded Above Sea Level (ASL) using the barometric measure on a handheld GPS device. The weather and time of day are also recorded to enable computer model rectification in stage 4 and 6 of the process.

3. The centre of the field of view is equated onsite using a bearing compass and GPS to the projected centre of the development. A field of view of 60 degrees to either side of centre is established onsite to provide the full 120 degrees. The extent of the field of view is recorded and evaluated onsite using the GPS and bearing compass. 6 photos are taken for each viewpoint with 1/3 overlap of each to enable photo stitching. The bearing to centre of each photo is recorded to enable cross reference to the next phase of developing a computer model. During the site photography numerous fixed known visual markers are recorded with a GPS location and bearing from the viewpoint. These markers provide reference points within the computer modelling for due diligence.

4. To generate the panoramic photographs the individual photographs are stitched together using PTGui software.

5. The next stage of the process involves the computer generation of a wire frame perspective view of the wind farm, which incorporates the topography from each viewpoint. Using the Wind Farmer™ software the wire frame is produced using a digital terrain model with 10 metre contour intervals. This creates the topography and positions the turbines at the correct coordinates and elevation within the wire frame. The correct field of view is established by matching the viewing centre of the view angle to the camera and lens used for the photography with the wire frame. This ensures that the image size and angle of view of the wire line matches the photos taken. The wire line is then superimposed on the stitched panoramic photograph and matched in accordance to reference markers and landscape features.

6. A second site visit is conducted with the preliminary wire lines to certify the correct locations of the turbines using a GPS and bearing compass. Minor alterations are marked up on the drafts to mitigate the effects of photographic warping to the periphery of the stitched panorama. Ground truthing the turbine locations, provides rigour to the process. Typically if any amendments are required they are within 1-5 degrees.

7. Once the wire frame and photograph have been lined up the rendered image of the turbines are created. The rendered model is created in Wind Farmer™ using the correct sun angle for

the date and time of the day that the photograph was taken. The rendered model is exported to Photoshop™ for final matching with the photograph. The rendered image is edited, masking turbines or parts their off that are screened by vegetation and other elements to the foreground. Additional visual effects are applied to match the lighting effects of shadow imposed by vegetation etc.

Viewing of Photomontages

Given that the objectives of photography and photomontage are to produce printed images of a size and resolution sufficient for use in assessment work in the field, the exact dimensions of these images will depend on the characteristics of the field of view.

All photographs, whether printed or digitally displayed, have a unique, correct viewing distance - that is, the distance at which the perspective in the photograph correctly reconstructs the perspective seen from the point at which the photograph was taken. The correct viewing distance is stated for all printed or digitally displayed photographs and photomontages, together with the size at which they should be printed.

The viewing distance and the horizontal field of view together determine the overall printed image size.
Photographs and photomontages should be printed or published digitally at an appropriate scale for comfortable viewing at the correct distance, noting the limitations of the printing process particularly with regards to colour and resolution. Guidance is provided on viewing the image in order to best represent how the proposal would appear if constructed, such as the required viewing distance between the eye and the printed image. Panoramic images should be curved so that peripheral parts of the image are viewed at the same intended viewing distance. The ‘before’ photograph and the ‘after’ photomontage should be presented on the same page and/or at the same scale to allow comparison if practicable.

References

Landscape Institute Photography and photomontage in landscape and visual impact assessment (March 2011)

Landscape Institute and IEMA (2002) Guidelines for landscape and visual impact assessment (2nd ed). London: Spon.

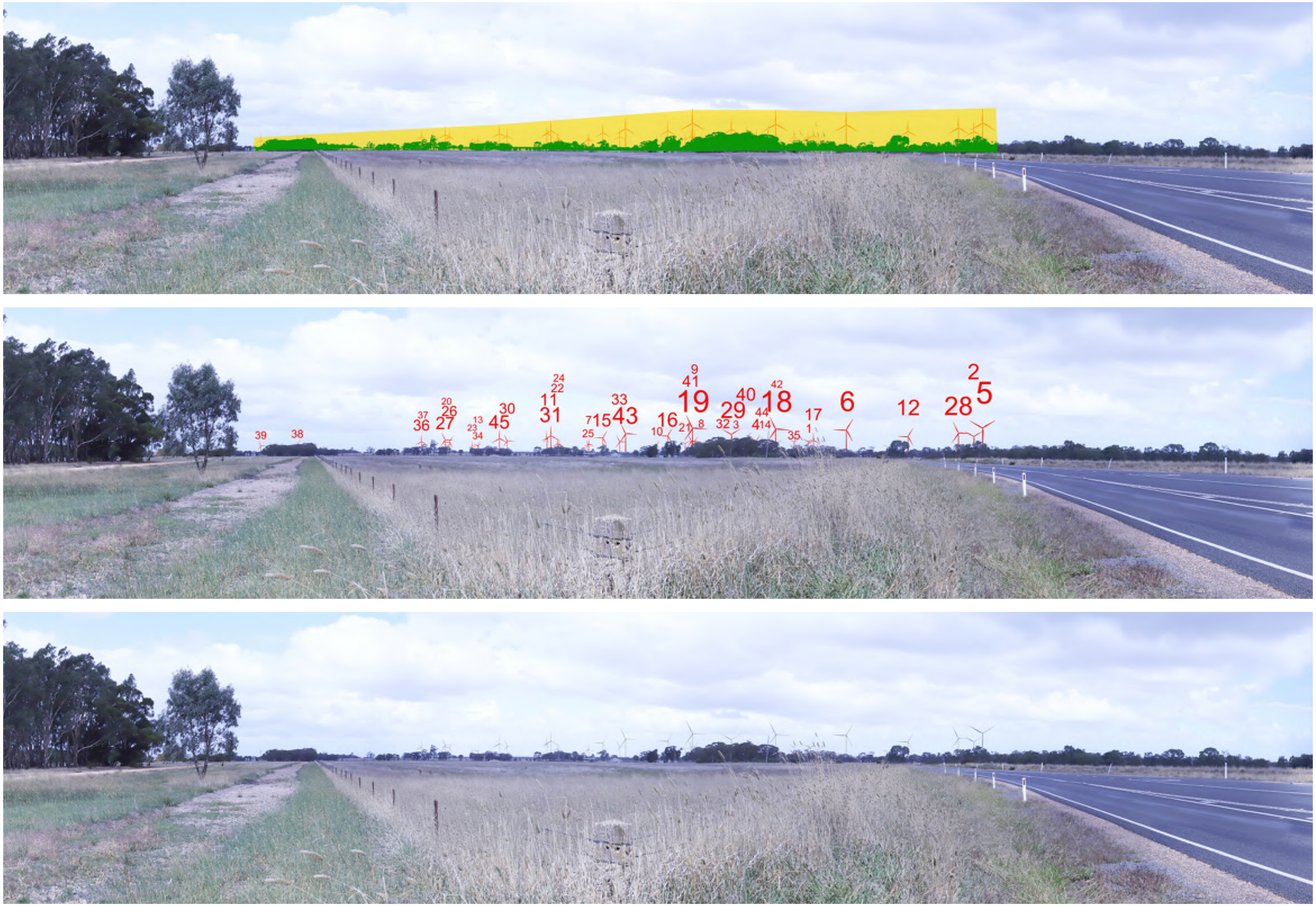
Scottish Natural Heritage (2006) Visual representation of windfarms: good practice guidance. Inverness: Scottish Natural Heritage. SNH report no. FO3 AA 308/2

Appendix C

Photomontages

VIEWPOINT 1 - BIG HILL LOOKOUT, STAWELL (SOUTHWEST

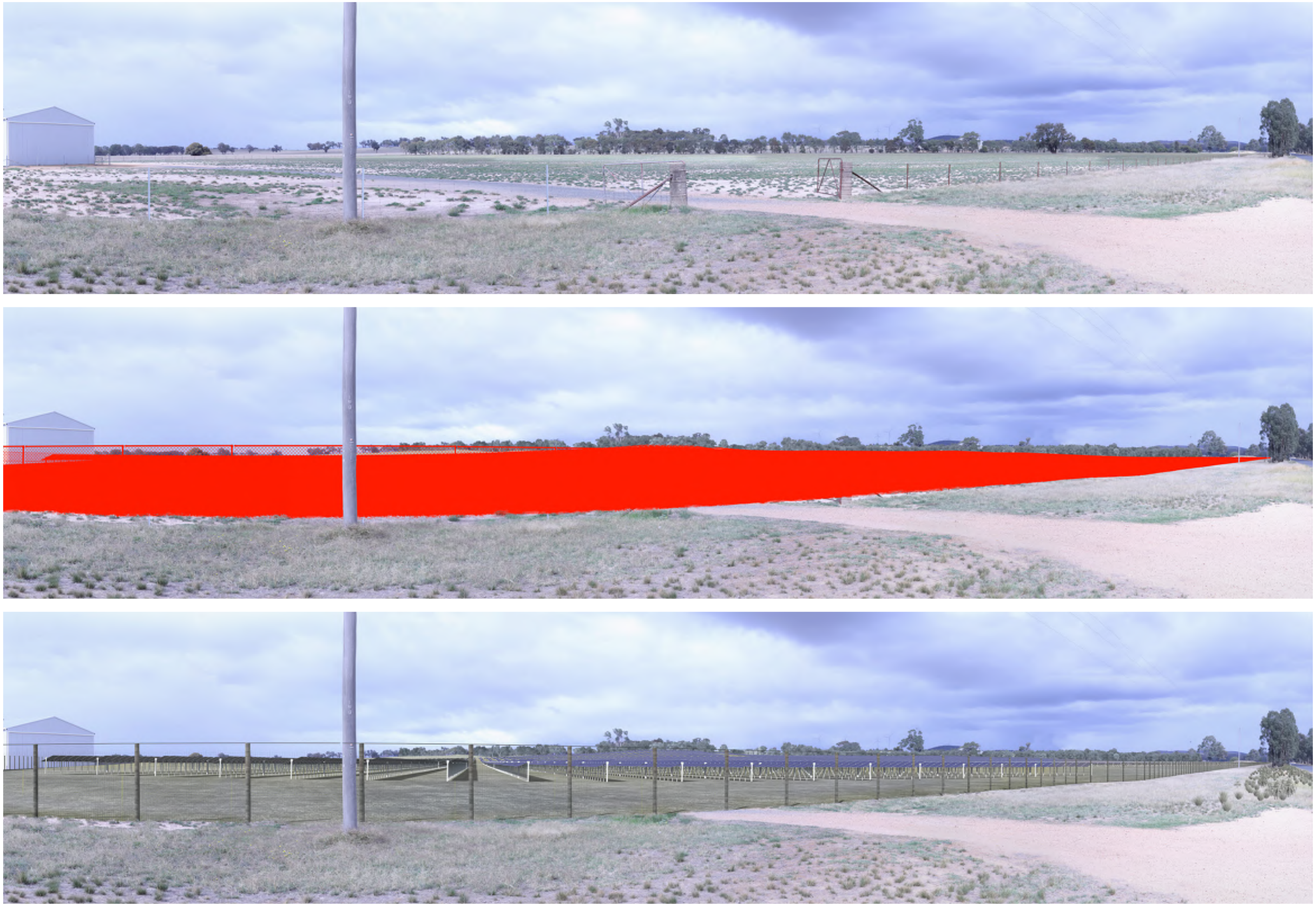
VIEWPOINT 2 - STAWELL DONALD ROAD (WEST - REGIONAL)



VIEWPOINT 3 - STAWELL AVOCA ROAD, GREENS CREEK (NORTHEAST – SUB-REGIONAL)

VIEWPOINT 4 - NORTHEAST OF JOEL JOEL (NORTH – SUB-REGIONAL)

VIEWPOINT 5 - SETTLEMENT OF BULGANA (SOUTHEAST – SUB-REGIONAL)



VIEWPOINT 6 - SOLAR FARM

Appendix D
GrimKe Assessment Matrix

The GRIMKE Matrix has been based on the WAX (2006) and HASSELL Matrix (2005), and with reference to The Visual Management System (VMS) produced by Litton (1968) primarily used for the U.S. Forest Service (1973) and the US Bureau of Land Management (1980). These models are based on a professional consultant (Landscape Architect) quantifying potential changes to landscape composition through "forms, lines, colours and textures and their interrelationships"1. Other factors such as compositional qualities, dominance, variety, animation and sensitivity to potential receptors are also considered.

The extent of visual impact was identified on site, using a GPS with a Wide Area Augmentation System (WAAS) that provides positional accuracy to within 3 metres.i Using the GPS, the location and extent of the development was plotted as 'waypoints', using longitude and latitude, elevation and distances to provide geographic referenced data. The surrounding area was then surveyed with the GPS and a SILVAii bearing compass to calculate the bearing and distance between the viewpoint and the subject area. This methodology was used to assess where the development is in the landscape and whether it is visible.

The GrimKe Matrix considers two key aspects in terms of understanding visual impact and the resulting visual assessment. The initial assessment is a quasi-objective measurement, where a landscape architect considers the landscape character of the site and particularly in relation of this landscape to the viewpoints that have been selected as part of the assessment criteria. Each viewpoint is then assessed in terms of:

- Relief (the complexity of the land that exists as part of the underlying landscape character)
- Vegetation Cover (the extent to which vegetation is present and its potential to screen and filter views)
- Infrastructure and Built Form (the impact of development on landscape and visual character)
- Cultural and Landscape Value (quantification of recognised planning overlays)

Assessing each viewpoint and the regional context (cultural and landscape value) a quantified value is generated for landscape character. This value then forms the baseline assessment value, which will be modified by the impact of the development within the landscape, which in turn will be measured as part of the visual assessment.

This two-tiered assessment methodology ensures the degree of visual impact is assessed against a quantified landscape character value enabling, the GrimKe Matrix to accurately quantify the degree of visual impact that is experienced as a result of implementing the development.

The assessment considers the landscape as three distinct zones based on the distance from the proposed development. The three zones were defined as; local (0-1km), sub-regional (1-5km) and regional (5-30km). (Planning South Australia, 2002). Specific landscape characters are also identified to provide a complete assessment of the landscape context.

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[1] *Daniel, T C & Vining, J (1980) p49*

1. Landscape Character Assessment

1.1 Relief

This is an assessment of the landscape complexity in terms of the underlying topography. The relationship of relief assists in defining the landscape and the visual character of an area. This is relevant in terms of the position and elevation of a proposed development within the landscape and the viewpoint.

The topography is assessed both on site (from each viewpoint) and as part of a desktop review (topography mapping). The assessment considers the topographical complexity in terms of local, sub-regional and regional. Within each zone an assessment is made of the topography and the complexity of landscape features.

The assessment is concerned with landscape complexity and how it impacts on the visual character. The assessment considers landform patterns, dominant elements and other distinguishing topographical features that will impact on the visual context.

Relief (expressed as percentage)	Value	Description of Landscape Relief
80-100%	5	Substantial landscape relief. The landscape possesses significant topographic variations, features and prominent elements creating a dynamic landscape context.
60-79%	4	Increasing relief. Due to the scale of the topography and frequency of features.
40-59%	3	Moderate relief. Medium level of change to the landscape. Occasional landscape features and topographic variation.
20-39%	2	Limited relief. Small amount of topographic variation in the landscape.
0-19%	1	No or minor relief within the landscape. The landscape is considered feature less, without noticeable elements or patterns.

1.2 Vegetation Coverage

Vegetation coverage is a measurement of the extent, character and frequency of vegetation that exists at each viewpoint and within the local, sub-regional and regional zones. The extent of vegetation provides the potential for screening and to reduce the visual effect of development. Conversely, a lack of vegetation results in an increase in the visual significance of a development.

This measurement responds to the potential visual absorption of the landscape as measured by the visual matrix. Again, this assessment considers the dominant vegetation patterns within each zone and in relation to each viewpoint.

Vegetation Coverage (expressed as percentage)	Value	Description of Vegetation Coverage
80-100%	5	Natural or non-harvested commercial forests. Significant areas of treed vegetation creating an arboreal landscape.
60-79%	4	Bushland or woodlands. Major areas of vegetation that define the landscape character of an area
40-59%	3	Tree groups, copse, screens, shelter belts. Defined areas of vegetation creating a layered landscape character.
20-39%	2	Sporadic trees producing a punctuated vegetation character.
0-19%	1	No trees scrub or low ground cover. Limited vegetation cover.

1.3 Infrastructure and Built Form

This assessment considers the interrelationship of landscape character and human development. The assessment considers how development and infrastructure can create a counterpoint to the existing landscape character (vegetation and topography). Alternatively, development within the landscape may assist with the assimilation of development.

Infrastructure and Built Form (expressed as percentage)	Value	Description of Infrastructure and Built Form
0-19%	5	No objects within the landscape. The landscape has a high natural or remote rural character.
20-39%	4	Isolated objects in the landscape. Single elements with limited visual impact on the landscape. Small farm building, telephone towers or houses.
40-59%	3	Small clusters of development. Increasing presence of development within the landscape.
60-79%	2	Medium scale linear infrastructure or development. More significant development within the landscape. Minor roads, culverts, warehouses, transmission lines and residential

		areas.
80-100%	1	Large scale infrastructure. The landscape is significantly affected by development. Freeways, power stations and opencast mining

1.4 Cultural Sensitivity Value

The cultural and landscape value assessment is a survey of the regional area around the development up to 20 kilometres. The measurement considers the recognised cultural, heritage, natural and social overlays that exist within the landscape. This assessment is predominantly a desktop survey and only measures recognised designations.

The measurement is then represented as a percentage based of the area of designation compare to the area occupied by the regional zone.

The landscape value is the aggregate value from each of the assessment criteria. Either, as a value for each viewpoint or as a baseline value for the landscape surrounding the development. This Landscape Value in then used to assess the percentage of visual change created by the introduction of development within the landscape.

Cultural and Landscape (expressed as percentage)	Value	Description of Cultural and Landscape Value
80-100%	5	Majority of regional zone is affected by planning designations or overlays. Highly valued culture, natural and social landscape.
60-79%	4	Planning designations impacts a significant area of the regional zone. Valued culture, natural and social landscape
40-59%	3	Moderate impact from planning designations. Valued community or social landscape
20-39%	2	Limited effect
0-19%	1	None to negligible effect of planning designations

1.5 Landscape Character Assessment

The aggregate of relief, vegetation, infrastructure and cultural sensitivity values determines the base line landscape character value. The following table summarises the definition of Landscape Character Values

Landscape Character Value	Value	Description of Landscape Relief

16-20	High	Landscape quality is of high value with significant areas of scenic quality provided by varied topography, large areas of natural beauty and obvious presence of cultural sensitivity to change.
12-16	Moderate to increasing	Moderate to increasing landscape character value experienced through a layered landscape of natural qualities, scenic beauty and cultural sensitivity.
8-12	Moderate	Moderate landscape character value experienced by small clusters of natural landscape and cultural sensitivity.
4-8	Limited	Limited landscape character value experienced. The landscape is monotonous with little visual interest through topography or vegetation and heavily modified.

2. Visual Assessment

Each viewpoint was then assessed with respect to the following aspects of visual effect

- Percent of landscape absorption (the landscape's ability to absorb and screen the development form).
- Horizontal visual effect (percentage spread of the development in the field of view).
- Vertical visual effect (height of the development as a percentage of the field of view).
- Distance of visual effect (distance between viewpoint and development).

Using the following GRIMKE matrix formula, the development was quantified and aggregated to provide an assessment of the visual effect for each viewpoint.

2.1 Percent of Visual Absorption (PVA)

This is an assessment of the landscape's ability to absorb or screen the visual effect. Due to the comprehension of the landscape and wind farm development being holistic, the area that is visually affected includes the space between the turbines.

Using photomontages of the proposed development and Adobe Photoshop™ the amount to which the landscape screens the development is described as a percent of pixel absorption. Foreground contrasting pixels are selected within the vertical and horizontal extents of the development (area A), figure 6. This area is divided by the total area occupied by the

development within the active field of view (area B) and expressed as a percentage of visual absorption. The assessment takes into consideration, visual sky lining and screening from existing vegetation and other physical forms.

Figure 1 Photo with wire line model draped on top. Courtesy Wind Farm Developments (2004)

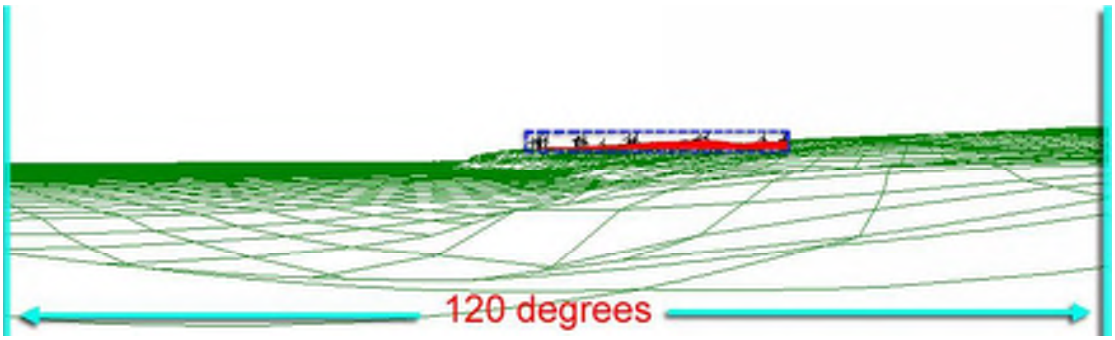

Figure 2 Wire line of showing extent of photomontage. Adapted from Wind Farm Development (2004)

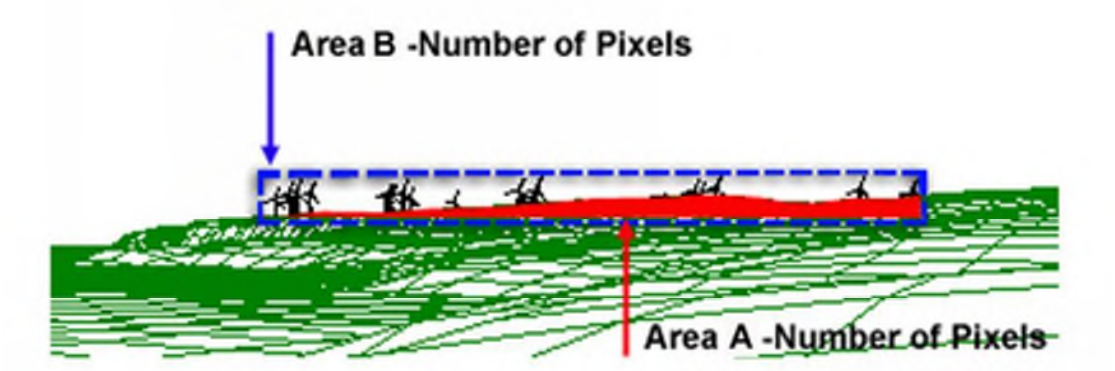

Figure 3 Detailed view of the landscape absorption (area A) and development extents (area B).

Adapted from Wind Farm Development (2004)

Percent of Visual Absorption (expressed as percentage of change)	Value	Description of Visual Absorption
80-100%	1	Substantial landscape absorption capacity. The landscape possesses sufficient vegetation and topography to screen any effect of the development, maintaining the visual character.
60-79%	2	Increasing absorption capacity. Due to the scale of the topography and density of vegetation the landscape is able to screen the development.
40-59%	3	Moderate absorption capacity. Medium level of change to the landscape. The landscape is less able to absorb change due to the scale, distance and extent of the development.
20-39%	4	Limited absorption. The development is noticeable within the landscape; however through vegetation and topography the landscape fragments and filters views of the development.
0-19%	5	No or minor absorption within the landscape. The development is considered to be prominent within the visual landscape.

2.3 Horizontal Visual Effect (HVE)

The field of vision (FOV) experienced by the human eye is described as an angle of 200-208 degrees horizontallyiii. This field of view includes the peripheral (monocular) vision, which is described as 40 degrees to each eye; within this zone colour and depth of field are not registered. For the purposes of the assessment the angle of peripheral vision has been subtracted from the field of view producing a binocular, 'active field of view' of 120 degrees.

Using this fixed visual reference, an assessment of the possible impact of development within this measurable area is undertaken. The centre of the development is established and an angle of 60 degrees each side is defined. The overall assessment is made of the entire development, rather than of the individual objects that may form the proposal. The angle is measured using a GPS and a bearing compass with known waypoints (geographic coordinates). Using GPS the extent of the horizontal visual field is calculated by the difference in bearing between the widest waypoints from a particular viewpoint. This measurement of effect is then described as a percentage of the 120 degrees active field of view

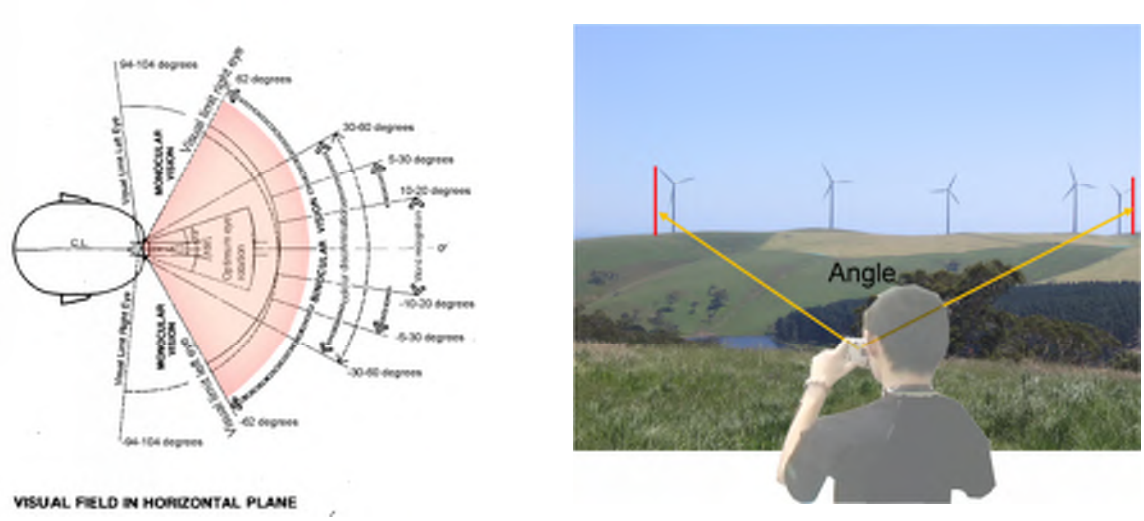

Figure 4 Active field of view is defined as the binocular field equating to 120-124 degreesiv. On the right is an illustration of horizontal measured angle as percent of active field 120 degrees. Photo Brett Grimm

Degree of Horizontal Visual Impact (expressed as an angle of impact and percentage of change)	Value	Description of Visual Modification
80-100% of the panorama measure at 120˚FOV)	5	Substantial horizontal visual impact. Visual impact throughout the entire active field of view.
60-80% of the panorama measure at 120˚FOV)	4	Increasing visual effect. A large proportion of the active field of view is affected.
40-60% of the panorama Measure at 120˚FOV	3	Moderate visual effect.
20-40% of the panorama measure at 120˚FOV)	2	Limited effect. The visual impact is a small part of the active field of view.
0-20% of the panorama measure at 120˚FOV)	1	No or minor visual effect.

2.4 Vertical Visual Effect (VVE)

The vertical visual effect evaluates the proportional scale of the development with reference to the vertical character of the existing landscape, as seen within the field of view of the assessed viewpoints.

The process of assessment is undertaken in 3 stages:

Stage 1:

The first stage of the process is to determine the vertical scale of the existing landscape. The baseline landscape scale is calculated using the photomontage viewpoint elevation (A) as a known reference height. The elevation of the viewpoint is recorded using a GPS. Using contour data, a second value (B) is recorded representing the highest topographic elevation within the field of view. Finally, the horizontal distance (C) between the viewpoint and the highest topographic feature is recorded. The vertical angle of view α_1 is then given as:

$\alpha_1 = \tan^{-1}((B-A)/C)$

as shown in Figure 6 below.

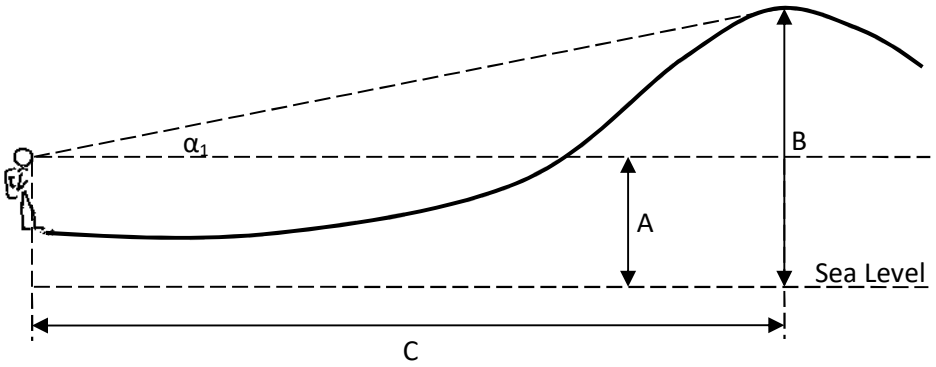

Figure 6: Vertical Scale of Existing Landscape

Stage 2:

The second stage of the process is to determine the vertical scale of the landscape modification, namely that of the apparent maximum turbine tip height as viewed from the viewpoint. Using the known turbine height (E), ground elevation (F) and its distance from the viewpoint (G), the vertical angle of view α_2 is then given by:

$\alpha_2 = \tan^{-1}((E+F - A)/G)$

as shown in Figure 7 below.

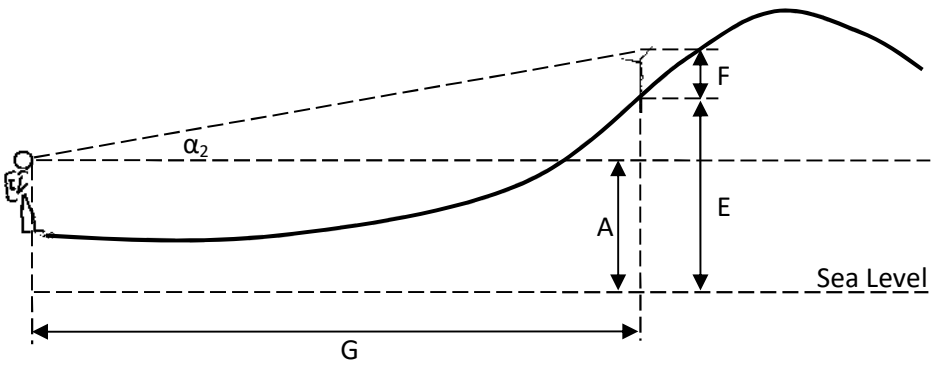

Figure 7: Vertical Scale of Landscape Modification

Stage 3:

The final stage of the process is to determine the overall proportion of the vertical scale of the development with reference to the existing landscape scale by taking the ratio of the two angles α_2 and α_1. Depending on the relative size of the vertical angles of view occupied by the existing and modified landscapes respectively, the ratio α_2 / α_1 will determine the nature and scale of the visual impact.

Depending on the relative scale of the angle of view occupied by the landscape and/or the development, the two vertical angles will depict whether there will be an increase in vertical visual impact created by the development ($\alpha_2 / \alpha_1 > 1$) or conversely the visual effect will be experienced as a vertical visual effect relative to the existing landscape scale ($\alpha_2 / \alpha_1 < 1$).

The vertical visual effect assessment will result in one of the following conditions:

- an increase in the overall vertical visual effect experienced from the viewpoint as a result of the combined vertical visual effect of the existing landscape character and the proposed development, or;

- a limited vertical visual effect as a result of the scale of the development being less than the existing landscape vertical scale when assessed from a viewpoint. This may be created by backdrop landforms or large ravines, valleys depicting a scale that within the field of view is greater than the development.

Either, the turbines or parts of the turbines are seen above ridgelines or landforms within the field of view and the effect will result in an increase in vertical visual effect, or the viewpoint contains large escarpments or deep valleys within the field of view and the vertical scale of the proposed wind turbines are likely to be seen as a proportion of the existing landscape scale resulting in a limited vertical visual effect.

In the first case (i.e. where $\alpha_2 / \alpha_1 > 1$), the proportional vertical visual impact should be assessed using Table 1 below. In the second case, the proportional vertical visual impact is considered minor and is assigned a value of 1.

Table 1 Proportional Vertical Visual Effect in existing landscape scale ($\alpha_2 / \alpha_1 > 1$)

Vertical Visual Impact (expressed as percentage increase (α_2 / α_1 - 1) x 100)	Value	Description of Visual Modification
80-100%	5	Substantial visual impact.
60-80%	4	Increasing visual impact
40-60%	3	Moderate visual impact.
20-40%	2	Limited impact

0-20%	1	No or minor visual impact within the landscape.

2.5 Distance of Visual Effect

This is a measurement of how visual impact is modified by distance. The effect of scale, topography, vegetation and weather, changes with distance, and in turn changes the degree of visual effect. The distance to the development from each viewpoint is recorded using the GPS. Standing onsite at each viewpoint the exact distance can be calculated by selecting the closest waypoint function (all the turbine locations are stored as waypoints in the GPS).

The distance categories outlined in the table below have been based on empirical research University of Newcastle (2002), Sinclair (2001), Bishop (2002).

Location of Development (from viewpoint)v	Value	Description
0 to 4 km (80-100%)	5	Adjacent: Dominant impact due to large scale, movement, proximity and number
4 to 8 km (60-80%)	4	Foreground: Major impact due to proximity: capable of dominating landscape
8 to 13 km (40-60%)	3	Middle ground: Clearly visible with moderate impact: potentially intrusive
13 to 18 km (20-40%)	2	Distant middle ground: Clearly visible with moderate impact becoming less distinct
18 km and greater (0-20%)	1	Background: Less distinct: size much reduced

2.6 Landscape Absorption Assessment

The aggregate of landscape absorption, horizontal and vertical effects and distance values determines the base visual impact value form the viewpoint. The following table summarises the definition of Visual Impact values

Visual Impact Value	Value	Description of Landscape Relief
16-20	High	High visual impact within the field of view
12-16	Moderate to increasing	Moderate to increasing visual impact within the field of view
8-12	Moderate	Moderate visual impact within the field of view
5-8	Limited	Limited visual impact within the field of view

3. Degree of Visual Impact (Percentage of Visual Change)

Degree of Visual Impact

The degree of Visual Impact is expressed as a coefficient of visual change to the baseline Landscape Value (general or viewpoint specific). This calculation directly expresses the effect of the development on the landscape, the change to the visual character and the reciprocal visual impact.

- Baseline Landscape Character : express as a value between 4 and 20)
- Coefficient of Visual Impact : calculated as the 20 divided by visual assessment value

Calculation of degree of Visual Impact

Coefficient x landscape character value expressed as a percentage = Visual Impact on Landscape Character

Example:

(a) Visual Impact Assessment

Horizontal visual effect	3
Vertical visual effect	1
Absorption capacity	3
Distance	2
Total visual effect	9 (0.45)

*9/20 equated to a coefficient of **0.45***

(b) Landscape Character Assessment

Relief	3
Vegetation coverage	3
Infrastructure built form	2
Cultural landscape overlays	2
Total landscape character	10

(c) 10 x 0.45 = 4.5

(d) 4.5/20 = 0.225

(e) 0.225 x 100 = 22.5% Visual Change to the Landscape

3.1 Final Aggregated Visual Effect

Percentage Value of Visual Change	Descriptive Qualification of Visual Effect	Comments
80-100%	Extreme	Extreme change in view: change very prominent involving total obstruction of existing view or change in character and composition of view through loss of key elements or addition of new or uncharacteristic elements which significantly alter underlying landscape visual character and amenity
60-80%	Severe	Severe change in view involving the obstruction of existing views or alteration to character through the introduction of new elements. Change may be different in scale and character from the surroundings and the wider setting. Resulting in a perceived increase in proportional change to the underlying landscape visual character.
40-60%	Substantial	Substantial change in view: which may involve partial obstruction of existing view or alteration of character and composition through the introduction of new elements. Composition of the view will alter. View character may be partially changed through

		the introduction of features.
20-40%	Moderate	Moderate change in view: change will be distinguishable from the surroundings whilst composition and underlying landscape visual character will be retained.
0-20%	Slight	Very slight change in view: change barely distinguishable from the surroundings. Composition and character of view substantially unaltered.

Appendix E
Glossary[2]

[2] *Visual Analysis of Windfarms Good Practice Guidance, Scottish Natural Heritage (2005)*

Active Field of View:	The field of view excluding peripheral vision, which is described as 40° to each eye, within this zone colour, shapes and forms are not registered. The active field of view removes the angle of peripheral vision from the field of view producing an angle of 120 - 160°
Assessment (landscape):	An umbrella term for description, classification and analysis of landscape.
Depth of Field:	The distance between the nearest point (viewpoint) and farthest objects (visual envelope) which is visible within the field of view.
Element:	A component part of the landscape or visual composition.
Effect (landscape or visual):	These occur as a broad culmination of one or more impacts, incorporating professional judgement to extrapolate and/or generalise on the nature of these.
Horizontal Visual Effect:	This term is used to describe the field of view occupied by the visible part of a wind farm.
Impact (landscape or visual):	Impacts occur to a particular element of the environment and they can be described factually by the nature and degree of change.
Landscape:	Human perception of the land conditioned by knowledge and identity with a place.
Landscape character:	The distinct and recognizable pattern of elements that occurs consistently in a particular type of landscape, and how people perceive this. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement. It creates the particular sense of place of different areas of the landscape.
Landscape feature:	A prominent eye-catching element, for example, wooded hilltop, isolated trees or grain silo.
Mitigation:	Measures, including any process, activity or design to avoid, reduce, remedy or compensate for adverse landscape and visual impacts of a development project.
Panorama:	A view, covering a wide field of view.
Photomontage:	A visualisation based on the superimposition of an image onto a photograph for the purpose of creating a realistic representation of proposed or potential changes to a view. These are now mainly generated using computer software.
Sensitivity:	The extent to which a landscape or visual composition can accommodate of a particular type and scale without adverse effects on its character or value.
Visual Amenity:	The value of a particular area or view in terms of what is seen.
Visual Envelope:	Extent of potential visibility to or from a specific area, viewpoint or feature.

Appendix F
Endnotes

[i] The GPS used was a Garmin X12 which differential-ready 12 parallel channel receiver continuously tracks and uses up to twelve satellites to compute and update a position

[ii] The SILVA precision M80 with a parallax free prismatic magnification-bearing compass. A magnetic bearing compass with a ± 0.5˚ from true magnetic course.

[iii] Pirenne, M.H. (1967). Vision and the Eye. London: Chapman and Hall

[iv] Panero, J. & Zelnik, M. (1979) Human Dimension & Interior Space- A source Book of Design Reference Standards. The Architectural Press Ltd. London.

[v] The distance zones have been developed Sinclair Thomas Matrix, which has cited field observations of the visual extents. The classification zones have been based on projected 90-100m high turbines.