Yass Valley Wind Farm Submissions Report

Landscape and Visual Impact Assessment

For: Yass Valley Wind Farm Pty Ltd

0092376 RPT2 Final#2

April 2014

Environmental Resources Management Australia Pty Ltd

This page left intentionally blank

FINAL#2

Yass Valley Wind Farm Submissions Report

Landscape and Visual Impact Assessment

For: Yass Valley Wind Farm Pty Ltd

0092376 RPT2

April 2014

For and on behalf of
Environmental Resources Management Australia

Approved by: Allan Wyatt
Position: *Partner*
Signed:

Date: 24 April 2014

Revision Table			
Revision	**Date**	**Description**	**Reviewed**
0.0	17 December 2012	Final Report	Allan Wyatt (ERM)
0.1	24 July 2013	Final Report	Allan Wyatt (ERM)
0.2	24 April 2014	Final Report	Allan Wyatt (ERM)

Environmental Resources Management Australia
Level 3, Tower 3, World Trade Centre
18-38 Siddeley Street, Docklands
Victoria 3005, Australia
Telephone +61 3 9696 8011
Facsimile +61 3 9696 8022
www.erm.com

FINAL#2

Yass Valley Wind Farm Submissions Report

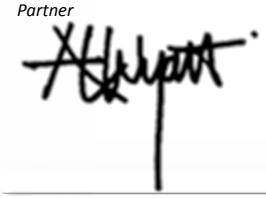
Landscape and Visual Impact Assessment

For: Yass Valley Wind Farm Pty Ltd

0092376 RPT2

April 2014

For and on behalf of
Environmental Resources Management Australia

Approved by: Allan Wyatt
Position: *Partner*
Signed: 

Date: 24 April 2014

Revision Table			
Revision	**Date**	**Description**	**Reviewed**
0.0	17 December 2012	Final Report	Allan Wyatt (ERM)
0.1	24 July 2013	Final Report	Allan Wyatt (ERM)
0.2	24 April 2014	Final Report	Allan Wyatt (ERM)

Environmental Resources Management Australia
Level 3, Tower 3, World Trade Centre
18-38 Siddeley Street, Docklands
Victoria 3005, Australia
Telephone +61 3 9696 8011
Facsimile +61 3 9696 8022
www.erm.com

This page left intentionally blank

Contents

Annex

Figures

Tables

1 INTRODUCTION

The Yass Valley Wind Farm proposal is for the development of a wind farm in the Southern Tablelands region of NSW, approximately 30 km west of Yass and around 300 km west of Sydney.

An application for the wind farm proposal was lodged with the NSW Department of Planning on 2 December 2008 by Yass Valley Wind Farm Pty Ltd (YVWF) and Director General's Requirements were issued to the YVWF on 12 January 2009 to guide the work required in assessing the proposed wind farm application.

The final revision of the Environmental Assessment (EA) for the Yass Valley Wind Farm, consisting of up to 152 wind turbines (EA Application), which addressed the issues raised in the Director General's Requirements, was lodged in November of 2009 and placed on exhibition by the Department from 13 November 2009 to 14 December 2009.

1.1 EA Application

The EA Application sought Development Approval of the Coppabella Hills and the Marilba Hills Precincts only. A future Development Approval was to be sought for the Carrols Ridge Precinct making the overall number of wind turbine to up to 182 wind turbines (including those in Carrolls Ridge).

ERM prepared the landscape and visual impact assessment (LVIA) component of the EA Application of Coppabella Hills and the Marilba Hills precincts as well as the Carrolls Ridge precinct in July 2009. This assessment formed part of EA Application to the Part 3A Major Project, under the New South Wales Environment Planning and Assessment Act 1979.

1.2 Submissions

Twenty two submissions were received in response to the exhibition of the Environmental Assessment of the wind farm, ten of which were from government agencies. Table 1-1 summarises the submissions relevant to the landscape and visual amenity impacts.

Table 1-1 Submissions summary of landscape and visual amenity impacts

Item	*Submissions raised*
1	***Loss of visual amenity and rural character***
	adverse impacts on tourism and traveller amenity and on potential for rural residential development
2	***Size and scale of wind farm***
	the unprecedented size and scope of the project in NSW and the consequent impact on the hosting district, including 90 non-involved residences within 5 km of the proposed wind farm precincts, several villages, two towns and the visual gateway to the Yass Shire along the Hume Highway from the Riverina
	… people find it difficult to comprehend the imposing size and scale of a modern industrial wind turbine in the landscape.
3	***Cumulative visual impact***
	flawed analysis of the pervasive cumulative visual impact, especially relating to poor presentation of visual impacts of giant wind turbines at close viewing distances along public roadways
	It is inevitable that there will be a large cumulative visual impact on the immediate vicinity (in particular, at distances under 5 km) due to the high number of wind stations proposed. The turbines are inherently conspicuous structures that have been intentionally located in prominent positions. The visual effect of the wind turbines will be pervasive in the district to the south of Binalong, along the Hume Highway, along NSW state road Burley Griffin Way to Harden, minor sealed roads (Illalong) and numerous unsealed routes.
4	***Night lighting***

Item	*Submissions raised*
	insufficient information given in relation to obstacle lighting, preventing assessment of the adverse impact of night obstacle lighting on traffic, and in causing degradation of the night sky
	CASA have advised the project that about 50 aircraft obstacle lights may be needed to fulfil its safety requirements. This is roughly one strobing high-powered obstacle light for approximately every third wind station.
5	***Viewpoint selection***
	Instead, the proponent generates a selective shortlist of locations and uses photomontages with an unusual choice of aspect ratios, camera lens angles, and printing formats to support its arguments that the visual impact is "low to medium" at every viewing location in the affected district.
	Locations chosen are highly selective and sometimes hard to understand. The visual impact over more than 20 kilometres of Burley Griffin Way is represented by only a few photomontage locations.
6	***Photomontages***
	… the photomontages understate the probable visual impact of the wind turbine arrays
	If there are no conditions under which visual impact would be unacceptable, a genuine judgment cannot be made
7	***Residential viewpoints***
	We find it unacceptable that your assessment concludes there were no areas where the wind farm would create unacceptable visual impacts. I am unable to find an area in the report where you define unacceptable, in our view the visual impacts from Viewpoint RVPS (House #C34) will be unacceptable if the towers are to be lit in the same fashion as the Gunning towers.
	…Gunning has 15 turbines and the Impact of 15 red flashing lights at night time is substantial. We point out that this DA application proposes up to 200 turbines and that number of red flashing lights spread across such a large area will have an enormous impact. Anyone living within a line of sight of these turbines will be forced to have special window treatments to block out these lights if installed, no mention of support or compensation for this action.

In response to the submissions, some wind turbine locations and the associated infrastructure have been revised by Yass Valley Wind Farm Pty Ltd (YVWF). A response to the submissions raised in discussed in Chapter 8.

1.2.1 Request for further information

The Submissions Report was provided to the New South Wales Department of Planning and Infrastructure (DP&I) for review in December 2012. The DP&I in its preliminary review (dated 23 January 2013) requested for further information on the Yass Valley Wind Farm application. Relevant landscape and visual impact concerns are quoted below:

- *The visual impact assessment is to be updated to include additional photomontages of the revised turbine layout from the north, east and south of the project (in particular from all non-associated receivers with a dwelling within 2km of a turbine in addition to the residential viewpoints identified in Table 9.2 of the EA, where no written agreement exists, and sequential viewpoints SVP-05, SCP-06, SCP-07, SVP-08, SVP-09 and SVP-11) (reproduced on A3 sized pages).*
- *The visual impact assessment is to include a table of all receivers within 8.5km of the revised turbine layout (being the zone identified in the EA where the greatest visual impact of the wind farm will occur within, inclusive of R04) that includes the distance to the nearest turbine, number of visual turbines (tips and hubs), and assessment of visual impact. Table 5-2 of the PPR does not provide an adequate visual impact assessment of the revised turbine layout on all potentially affected receivers, merely a select few.*
- *A map is to be provided that identifies all dwellings within 8.5km of a turbine that clearly distinguishes between associated and non-associated dwellings. The map must include reference numbers that relate to the visual impact assessment table and be provided on A3 sized paper.*
- *The additional photomontages and table are to be inclusive of the approved Conroys Gap wind farm turbines (i.e. the Department notes and concurs with the statement within the EA that it would be difficult to differentiate between the Yass Valley and Conroys Gap wind turbines and they would therefore appear as the one farm).*
- *The visual impact assessment on publicly accessible viewpoints (Table 5-1) is to be updated to include the cumulative impact of the Conroys Gap wind farm turbines. A selection of photomontages from the North/East/South and West of the project reproduced on A3 sized pages is also required.*

- *The "seen area analysis" maps provided in Annex A are to include a title to identify the maps purpose.*
- *The visual impact assessment is to be updated to include an assessment of the revised transmission line route.*
- *The closest turbine to the "Naranghi" property (viewpoint R5) is incorrectly identified in the revised photomontage as COP74, as this turbine no longer exists and additional turbines appear to have been located closer to this property.*

A further information request from DP&I in March 2014 required that the assessment of visual impact from non-involved residences located within 1km of the proposed transmission line be undertaken.

In response to the above concerns, this report will provide additional information in relation to the Current Proposal. A further site visit was undertaken on 25 and 26 March 2013 to assess the following:

- Assess visual impact from all residences within 2 km of the proposed wind farm (Chapter 5);
- Assess the visual impact of the proposed transmission line (Chapter 6).
- Assess the cumulative visual impact of the proposed wind farm and the approved Conroys Gap Wind Farm (CGWF) from selected locations (Chapter 7);

In order to provide a holistic view on the landscape and visual impacts and to retain clarity, the response to the concerns raised is included within this revised and updated Submissions Report.

1.3 The Current Proposal

As presented in the Environmental Assessment, the Yass Valley Wind Farm proposal would involve the construction and operation of a wind farm. The Submissions Report initially discussed a 148 wind turbines layout. Following a review, a revised layout was prepared with a further reduction by one turbine in the Marilba precinct bringing the overall number of wind turbines to 147.

Since the previous submission to the DP&I, in consultation with the stakeholders involved, the layout of the wind farm has been further revised to remove three wind turbines from Coppabella precinct (107, 108 and 109). Furthermore, in consultation with the residents, the route of the transmission line has been altered to minimise impact on affected landowners. This has also necessitated a modification to the location of grid connection and the off-site substation.

The Current Proposal now includes:

- Up to 144 (previously 147) wind turbines across the Coppabella and Marilba precincts;
- Internal site access tracks and minor upgrades to existing public roads required for the installation and maintenance of the wind turbines;
- Electrical connection between the wind turbines and on-site substations using a combination of underground and overhead transmission lines;
- Overhead transmission lines connecting the on-site substations to the nearby TransGrid transmission lines; and
- An onsite operation and maintenance facility;
- Additional temporary construction activities and infrastructure such as a temporary construction compound, concrete batching plant and storage areas would be required during the construction and refurbishment phases.

The proposed wind turbine specifications for the Current Proposal remain consistent with those within the EA Application. The following report will discuss the change in the landscape and visual impact for the Current Proposal and respond to relevant submissions.

1.4 LVIA Methodology

The methodology adopted as part of the original LVIA within the EA Application has not been changed to assess the Current Proposal. The methodology is reproduced below.

The visual components of the Yass Valley Wind Farm

Describing the visual components of the Yass Valley Wind Farm. These include, but are not limited to, wind turbines, substations and access roads.

Statutory context

Describing the planning policies and plan provisions that apply to the site and the surrounding areas.

Perception studies

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

The viewshed and zones of visual influence

Defining the viewshed of the Yass Valley Wind Farm based upon the parameters of human vision. The rationale behind the definition of the viewshed is appended to this report (Refer Annexure B of the original EA) which also describes the parameters of human vision, which assists in defining the viewshed.

A copy of the parameters of human vision is included in Annex C of this report.

Landscape units and sensitivity

Landscape Units are based on the physical characteristics of the area within the viewshed. The characteristics that assist in defining the Landscape Units include geology, vegetation, topography and drainage patterns as well as the extent of man-modifications and urban development.

The sensitivity of the landscape units is primarily an assessment of the extent to which the landscape units can accept further change. Generally, the greater the extent of existing man-modifications, the lesser the sensitivity.

However when assessing residential properties the landscape sensitivity is always rated as high.

Seen area analysis

The Geographical Information Systems software (GIS) can map those areas from which wind turbines, whole or in part, are visible. This is referred to as a Seen Area Analysis.

Assessment of publicly accessible viewpoints

The visual impact of a development is affected by:

- *the distance of the viewer from the development;*

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

Accordingly, the overall effect of the development of the proposed wind farm on each viewpoint has been assessed by evaluating the value of each of those criteria, ranking those as being either ***low, medium****, or* ***high,*** *and subsequently making an assessment as to the overall effect by balancing each of those criteria and deriving an overall visual impact along a scale of effects.*

*The scale of effects that has been used to describe the overall visual impact (****low, medium or high****) is discussed in Chapter 7 'Assessment of the visual impact from publicly accessible viewpoints'.*

As assessment of the visual impact from indicative viewpoints within the public domain is partly based on photomontages which show the view of the existing landscape and the alteration to this view to include the proposed wind farm. These have also been used to show a range of sequential impacts on viewers travelling along the Hume Highway, along Burley Griffin Way and near the Hume & Hovell Walking Track to the south of the Hume Highway.

Mitigation measures for publicly accessible viewpoints

Mitigation measures are also considered if such measures may be appropriate in reducing the visual impact from a publicly assessable viewpoint. For example, roadside planting along a section of highway may significantly reduce the visual impact.

Residential Viewpoints

Locating and assessing the visual impact from residential properties. Residences are usually selected that are representational of properties within precincts around the wind farm (with priority given to those that are closest to the wind farm) or who have expressed particular concerns.

*The assessment of visual impact from residences is different to one undertaken from publicly accessible viewpoints. An assessment of visitor numbers is not applicable. The landscape sensitivity is always rated as "****high****", as it must be recognised that people feel most strongly about the view from their house and from their outdoor living spaces.*

Mitigation measures for residential viewpoints

Mitigation measures have also been considered and these will be evaluated to see how they may reduce the visual impact from residences.

Cumulative visual impact

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

Implication of night lighting

Discuss the implication of night lighting and assess the level of impact based on past studies.

1.4.2 Photomontages

In order to evaluate the change in landscape and visual impact and respond to the further information request by DP&I, photomontages were prepared by YVWF based on the photographs included in the LVIA as well as from photographs taken during further site visits.

Several photomontages have been prepared to illustrate the Current Proposal. All photomontages within this report were prepared by the YVWF.

The photographs shown within this report were taken by ERM personnel during a site visit on 25 and 26 March 2013 using Nikon D3 SLR camera. Further photographs were also taken by YVWF using D90 digital single-lens reflex (SLR) cameras. A 50 mm focal length prime lens was attached to the D90 SLR cameras for preparation of photomontages.

The photomontages for the following viewpoints were created using photographs taken with the Nikon D3 camera based on photos taken on 25 and 26 March 2013:

- Viewpoints - M24, G16 and C01.

The photomontages for the following viewpoints were created using photographs taken with the Nikon D90 camera by YVWF:

- Viewpoints - VP35, VP36, CVP4, CVP1, M20, M42, C67, G14.
- Transmission line residential viewpoints – M9 and C67

Further, all photomontages prepared in the LVIA have been revised to include the Current Proposal.

2 PROJECT DESCRIPTION

The Yass Valley Wind Farm is located west of Yass and to the north and south of the Hume Highway. The Current Proposal consists of two precincts the Coppabella Hills Precinct (west) and the Marilba Hills Precinct (east) as shown in Figure 2-1. For comparison Figure 2-2 shows the EA Application.

Figure 2-1 *Site layout – Current Proposal*

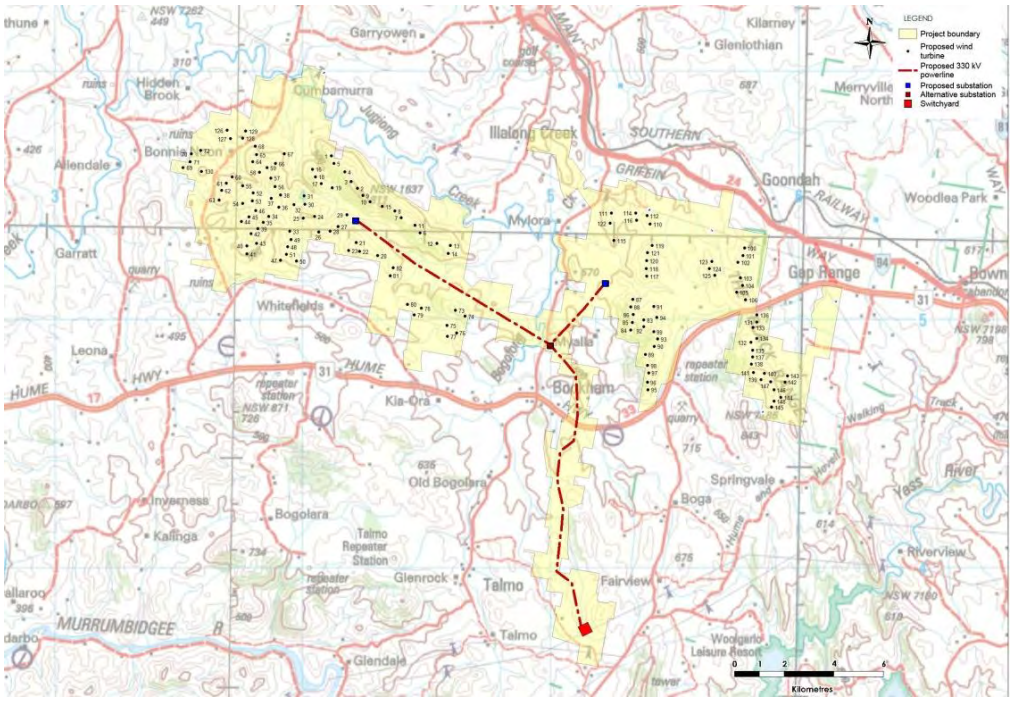
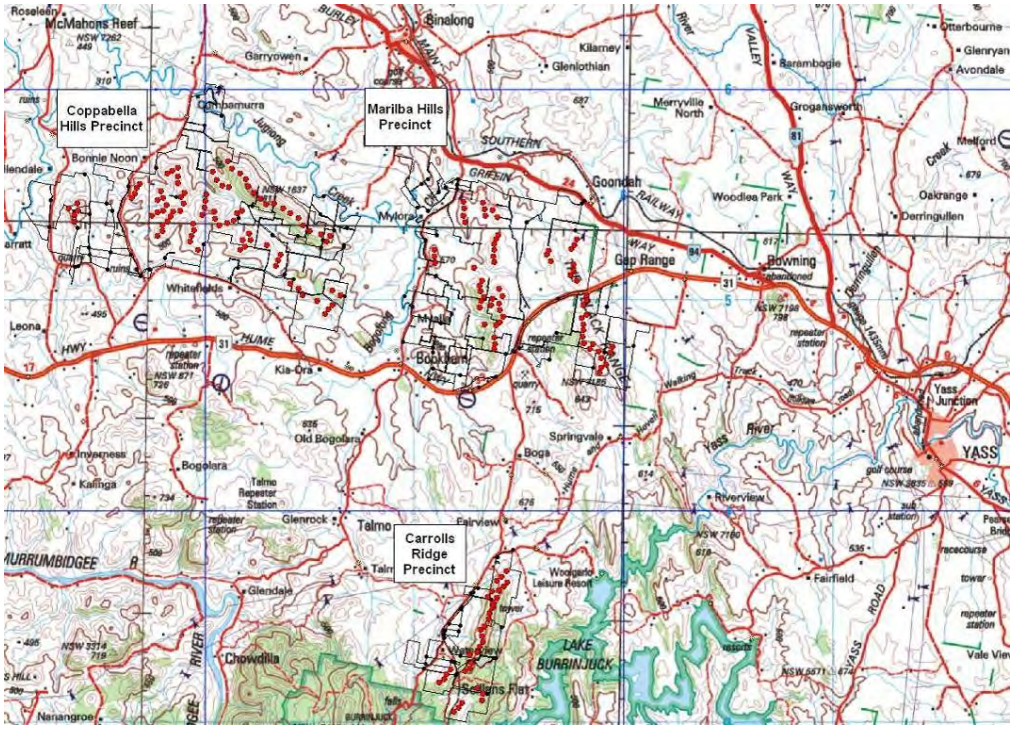


Figure 2-2 *Site layout - EA Application*



The wind turbines proposed at Carrolls Ridge Precinct in the EA Application are not part of this Current Proposal.

The main implication for the Current Proposal is the reduction in the overall number of wind turbines from 152 (EA Application) to 144 (Current Proposal) for the Coppabella Hills and the Marilba Hills Precincts. Table 2-1 compares the number of proposed wind turbines in the EA Application and the Current Proposal.

Table 2-1 Comparison of number of wind turbines proposed

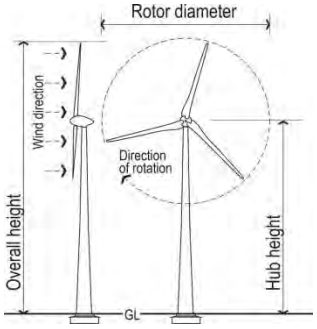
	Coppabella Hills Precinct	Marilba Hills Precinct
	Number of wind turbines proposed	
EA Application	86	66
Current Proposal	84	60

The wind turbine locations have been optimised for the two precincts with one additional wind turbine proposed within the Coppabella Precinct and six fewer wind turbines proposed in the Marilba Hills Precinct.

2.1 Visual components of the Current Proposal

The wind turbines are the most visually apparent element of a wind farm. The wind turbines within the Current Proposal are consistent with the specifications shown in the EA Application and are reproduced in Figure 2-3.

Figure 2-3 Indicative wind turbine



ITEM	Values
Hub Height	100 metres (Approx.)
Rotor Diameter	100 metres (Approx.)
Max Tip Height	150 metres
Proposed number of turbines	144 wind turbines

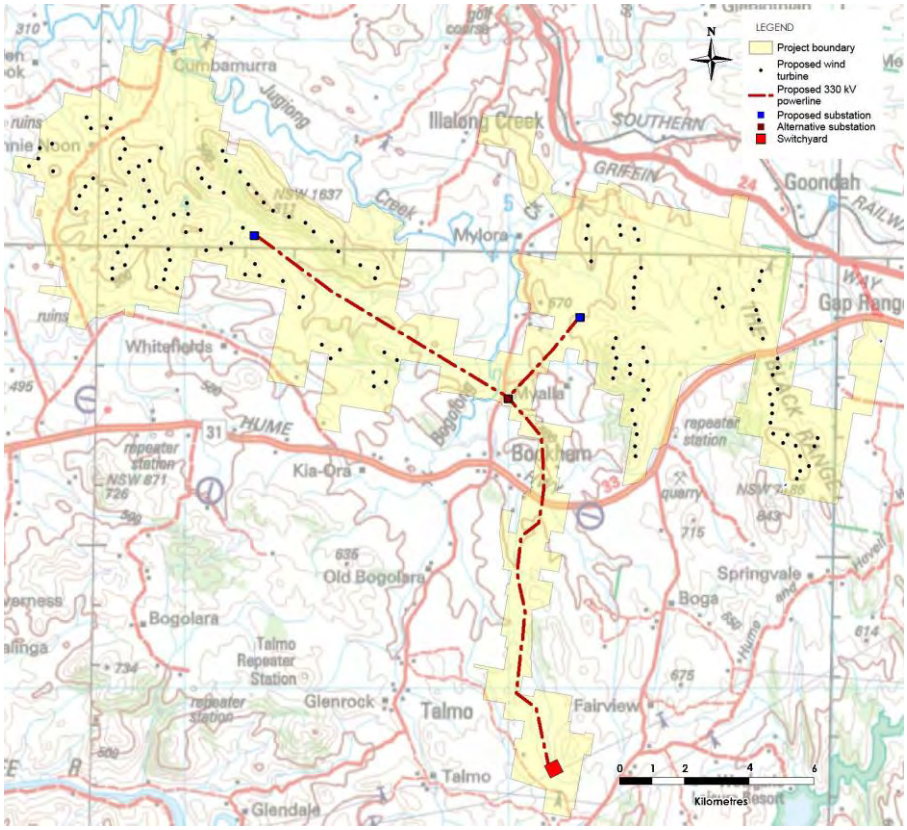
2.1.1 Access tracks, ancillary operations areas

There will be a number of access tracks, approximately 6 to 10 m wide that will allow for the construction of the turbines and provide access for ongoing maintenance. Where practicable, these access tracks will utilise existing farm tracks. Cabling to each wind turbine will be underground and will generally follow the access tracks.

2.1.2 Transmission line and associated infrastructure

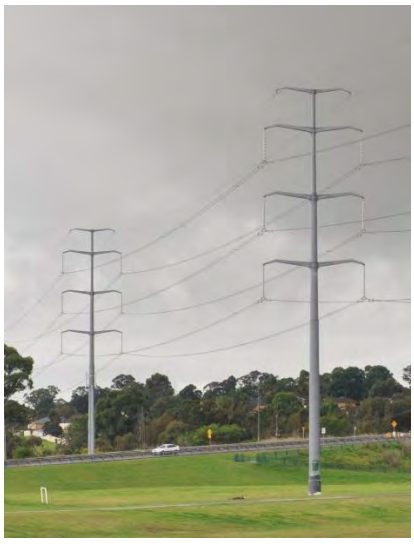
External overhead transmission lines will be supported on mono pole structures built of timber, steel or concrete.

Figure 2-4 Site layout – Current Proposal



The proposed transmission line will have two branch lines, one each to the Coppabella and Marilba precincts. These will join near Illalong Road north of Bookham and continue southwards to connect to the existing grid near Talmo. Figure 2-5 shows a typical high voltage pole structures.

Figure 2-5 Transmission line pole appearance examples (Source: YVWF)



330kV double circuit steel poles

132kV single circuit concrete poles

Although the detailed design has not been finalised at this time, it is anticipated that the transmission line for the development will be a double circuit line on single poles operating at a voltage of up to 330 kV The poles used will be approximately 45 m in height. Typical pole spacing will be approximately 300 m for the 45 m high pole. Spacing of poles may vary depending upon ground conditions and existing vegetation.

It is important to recognise that the proposed transmission line is not carried on lattice towers, but simple pole structures. Switchyard and Substation(s)

Currently there are two options being considered for the on-site substations. The Current Proposal includes

- Option 1: two on-site substations located within the site, one each at the Coppabella and Marilba precincts.

  Or
- Option 2: A single on-site substation at the junction to the Coppabella and Marilba branch lines;

  And
- One off-site switchyard near the termination of the proposed transmission line to the south of the wind farm near Talmo.

The substation compounds would be approximately 100 m x 100 m and enclosed by a 2.4 m high security fence and perimeter screen planting. Most structures will be less than 6 m high with the highest structure would be less than 12 m high

The terminal switchyard will house a substation, switchyard, operations and maintenance facilities and a small car park and associated access and maintenance tracks. It will occupy an area of approximately 200 m x 200m. Buildings and structure within the facility will be of similar scale and height to other existing rural infrastructure such as farm sheds.

Some boundary planting will be included around the perimeter of the facility that will filter views of the facility from surrounding. The height of planting in locations under or immediately adjacent to the overhead wires will be determined by the electricity supply authority.

2.1.3 Aviation obstacle lighting

In the EA Application it was expected that up to 40 turbines may have required aviation obstacle lighting. It is noted that the installed aviation obstacle lighting on the nearby Cullerin Range Wind Farm has been recently decommissioned.

Given the withdrawal of the CASA circular in force at the time of the original EA in 2009, it is now expected that there will be no requirement of aviation obstacle lighting. Therefore, there is no requirement for a visual impact assessment of night lighting.

3 THE VIEWSHED OF THE WIND FARM

As in the LVIA, the viewshed of the Current Proposal is based on the overall height of the proposed wind turbines and the parameters of human vision. Given that the overall height of the wind turbines remains at 150 m, the viewshed will extend to a distance of 17 km wherein a wind turbine will take up 5% of the vertical field of view. Refer to Annex C and the LVIA within the EA Application for a more detailed explanation.

3.1 The Zones of Visual Influence

Within the viewshed there are differing Zones of Visual Influence (ZVI). Table 3-1 lists the ZVI described within the LVIA.

Figure 3-1 Zones of Visual Influence for the Current Proposal

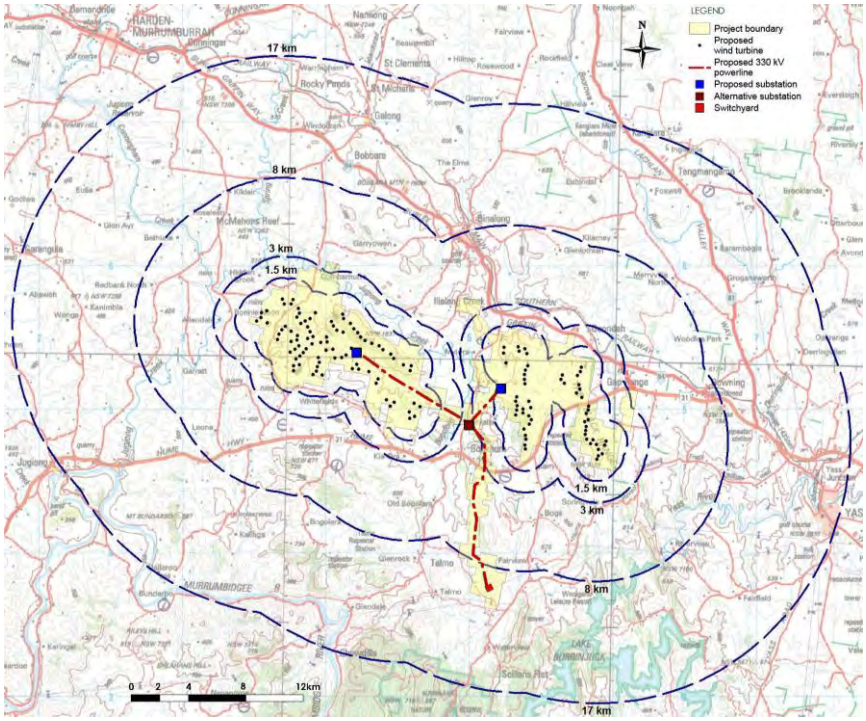


Table 3-1 Zones of Visual Influence

Distance of observer to nearest wind turbine	Zones of Visual Influence
>17km	*Outside the viewshed*
8.5-17km	*Visually insignificant - A very small element which are difficult to discern and will be indistinct in different lighting and weather conditions.*
3-8.5km	*Potentially noticeable-but will not dominate the landscape - The degree of visual intrusion will depend on the landscape sensitivity and the sensitivity of the viewer; however the proposed wind turbines will not dominate the landscape.*
1.5 – 3km	*Highly visible and will usually dominate the landscape - The degree of visual intrusion will depend on the wind turbines' placement within the landscape and factors such as foreground screening.*
<1.5km	*Will be visually dominant in the landscape from most viewing locations -The degree of visual intrusion will only be reduced by screening by nearby vegetation or buildings.*

3.2 Landscape Units and Sensitivity

The LVIA outlined five landscape units within the viewshed. Table 3-2 reproduces the table outlining the sensitivity of the landscape units within the viewshed of the Yass Valley Wind Farm from the LVIA within the EA Application.

Table 3-2 *Landscape Units and Sensitivity*

Landscape Unit	Sensitivity
Unit 1 Gently Undulating and Flat Cleared Farmland	**Low** This unit is highly modified, contains visible infrastructure, is not topographically dramatic and does not contain large areas of water.
Unit 2 Steeply Undulating Cleared Farmland	**Medium** This landscape is largely cleared of vegetation however the steeply folded hills create an appealing landscape.
Unit 3 Forested Hills	**Medium to High** This landscape is attractive
Unit 4 Rural Townships	**Medium** The concentration of houses increases the visual sensitivity of this landscape unit.
Unit 5 Recreation Resorts	**High** Used for recreation and to enjoy views of the landscape.

The proposed transmission line, switchyard and substations are all located within the viewshed of the wind farm. Therefore, the landscape units and sensitivity discussed in the LVIA apply to the visual impact considerations for these facilities.

3.3 Implications

Overall, there is a minor change to the extent of the viewshed of the proposed wind farm under the Current Proposal in comparison to the EA Application.

The landscape units and sensitivity within the revised viewshed will remain consistent with those described within the LVIA.

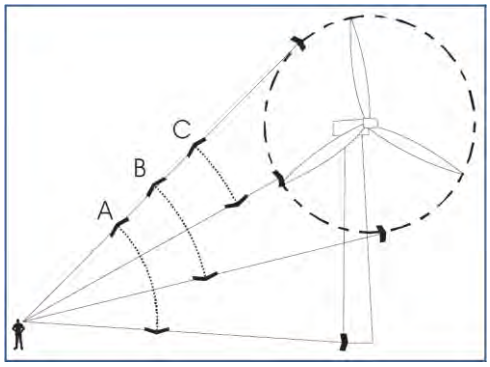
4 SEEN AREA ANALYSIS

A Seen Area Analysis (SAA) was part of the initial EA Application. This assessment has been redone to show from which of the surrounding areas a viewer can potentially see either entire wind turbines of part of wind turbines. It is stressed that these seen area analysis diagrams are based solely on topography and do not take into account the screening by vegetation or by buildings. An A3 enlarged version of the SAA undertaken for the Current Proposal is enclosed in Annex A.

4.1 Extent of visibility

It is often advantageous to examine the numbers of wind turbines that can be seen in their entirety or in differing degrees of visibility. Figure 4-1 illustrates the various extents that the mapping analysis software generates to record if one or more wind turbines and part of thereof are visible.

Figure 4-1 Differing degrees of visibility



The SAA considers four parameters for the visibility of wind turbines. These are:

- Zone A – visibility of one or more wind turbines is visible in its entirety;
- Zone B – visibility of whole or part of the swept path of one or more wind turbines is visible in its entirety;
- Zone C – visibility of whole or part of the hubs and above or half of the swept path of one or more wind turbines is visible in its entirety; and
- Zone D – visibility of the tips or any part of one or more wind turbines is visible in its entirety;

Further, for each scenario there are areas where no part or whole of the wind turbines area visible:

- Not visible – areas from which no turbines or parts thereof are visible ;

Of these scenarios discussed above, it is probably the maps for Zone B and Zone C that are the most useful. The mapping of turbines in their entirety or the areas from which a blade tip is visible is not indicative of overall visibility, where Zone A is too restrictive and Zone D being unduly open. Relevant scenarios are discussed below.

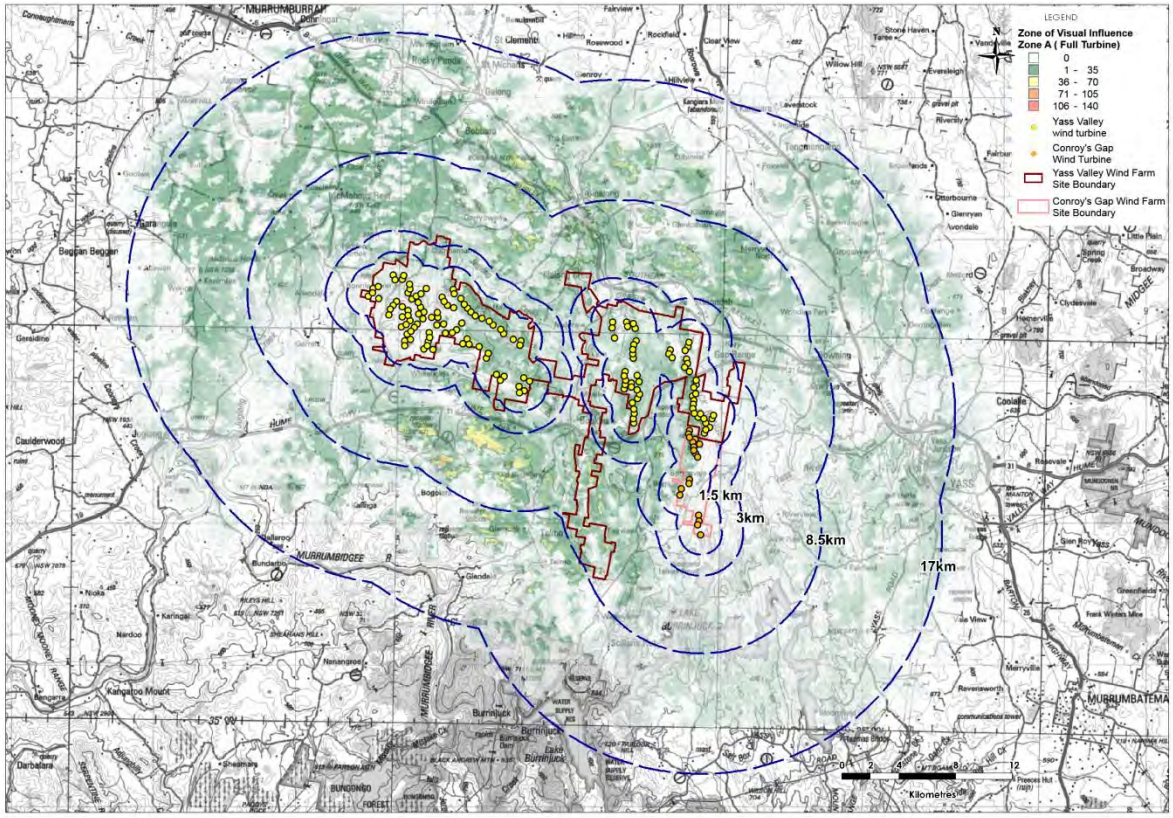
Since the initial submission to the DP&I the Seen Area Analysis of the proposed wind farm has been updated to include the following:

- A revised wind farm layout for Yass Wind Farm; and
- Cumulative analysis based on the wind turbines approved at Conroys Gap Wind Farm.

4.2 Visibility of entire wind turbines

Figure 4-2 shows those areas that a viewer can potentially see entire wind turbines. The combined viewshed of the proposed Yass Valley Wind Farm and the approved Conroys Gap Wind Farm are shown. An A3 enlarged version of the map is enclosed in Annex A.

Figure 4-2 Zone A –Number of wind turbines visible in their entirety (Source: YVWF)



There are no areas from which all the wind turbines will be visible in their entirety. 83 wind turbines are visible in their entirety from few locations to the south-west that are also beyond 3 km of the nearest wind turbine.

In areas surrounding the wind farm viewers can typically see up to 50 wind turbines in their entirety (yellow areas). In the green areas a viewer could potentially see up to 25 wind turbines in their entirety. These areas are less extensive that shown in the EA Application.

In part the extent of visibility reflects the relatively undulating character of the surrounding landscape. Again it is stressed that this analysis does not take into account vegetation and building structures.

4.3 Visibility of part or whole of the swept path of the rotor

Figure 4-3 shows those areas that a viewer can potentially see the entire swept path of the rotor on the proposed wind turbines. An A3 enlarged version of the map is enclosed in Annex A.

Figure 4-3 Zone B – Number of wind turbines with entire swept path visible (Source: YVWF)

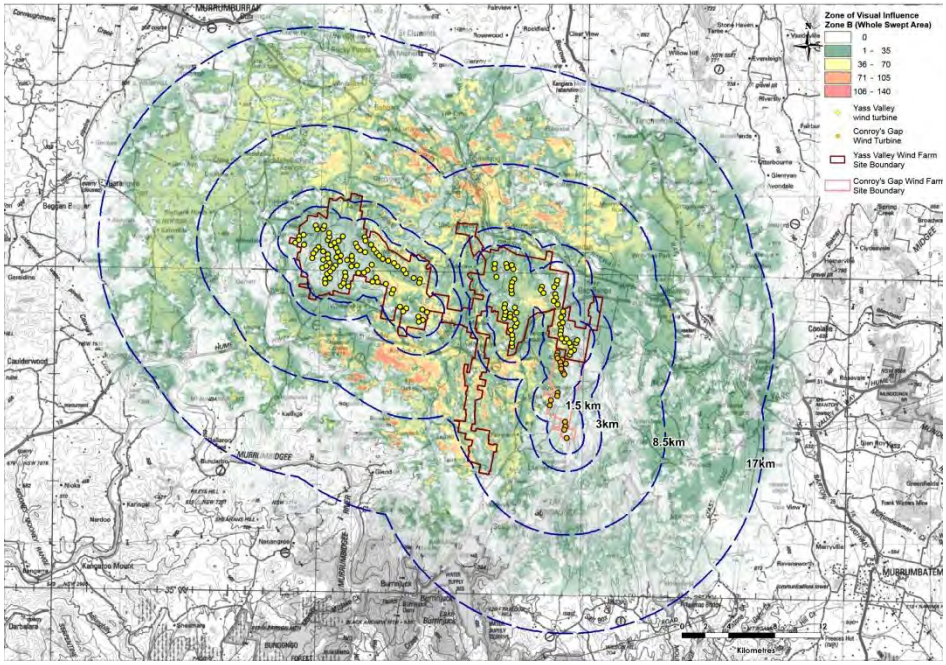
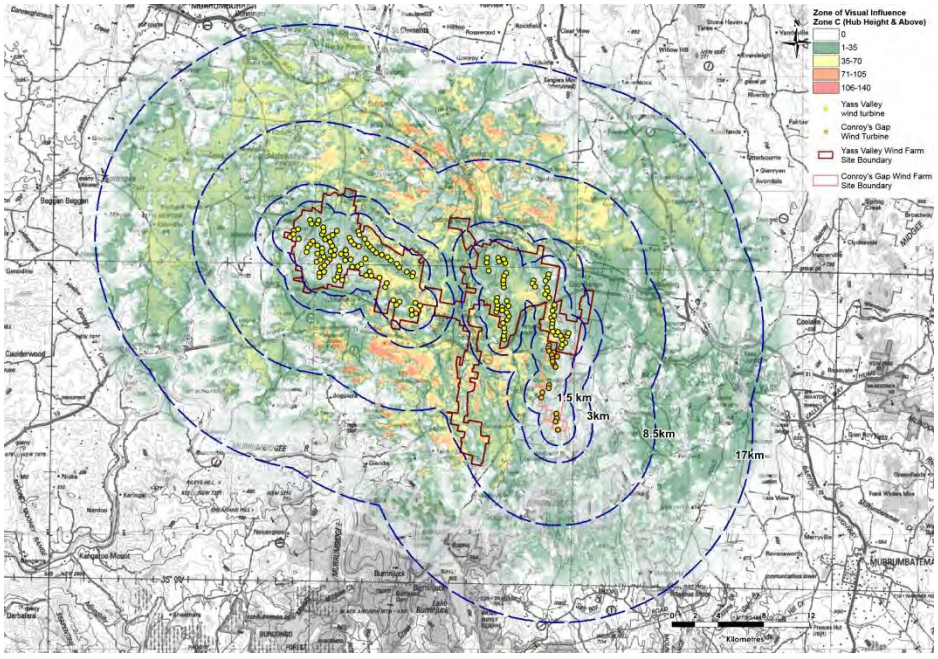


Figure 4-4 shows those areas that a viewer can potentially see the half of the swept path of the rotor (from the nacelle upwards) on the proposed wind turbines.

Figure 4-4 Zone C– Number of wind turbines with hub and above visible (Source: YVWF)



The areas affected are less than those shown in the initial EA Application and the overall pattern is also similar with those areas potentially able to see more wind turbines located to the north and east of the wind farm.

4.4 The relevance of this analysis

The nature of the surrounding landscape means that there are no locations within the 17 km viewshed from where viewers can potentially see all of the wind turbines in their entirety and there are very few locations within the viewshed that will view all of the proposed wind turbines from the nacelle and above. This remains unchanged since the EA Application. Only in areas especially to the north and east, the wind turbine will be a visible component of the landscape.

This Seen Area Analysis led to the selection of the initial viewpoints within the EA Application. In the Current Proposal there are areas, mainly to the south and adjacent to the now withdrawn Carrolls Ridge precinct, where a viewer will not have any potential views of the proposed wind turbines. Overall, however, the areas from which wind turbines were visible in the EA Application are similar to those in the Current Proposal.

For this reason and for the sake of clarity the viewpoints that were selected in the initial EA Application have also been discussed in this re-assessment of the Current Proposal.

5 ASSESSMENT OF VISUAL IMPACT

In the EA Application, a qualitative assessment of visual impact was undertaken from the following locations:

- Publicly accessible viewpoints;
- Sequential viewpoints; and
- Residential viewpoints.

Revised photomontages have been prepared to illustrate the Current Proposal from several viewpoints based on photographs shown in the LVIA as well as photographs taken during subsequent site visits. The photomontage preparation methodology is consistent with that described within the LVIA and is reproduced below:

- *The methodology used in the creation of the photomontages includes a computer model of the existing topography and the wind turbines and this model is then overlaid on the photographs of the existing view. Wind turbines from this model are then be rendered for the "after" view.*
- *Generally the field of view for photomontages is approximately 60^{O} horizontal and 15^{O} vertical. The rationale behind this field of view is set out in Annexure B (EA Application).*
- *It is stressed that the small images used within the report are only for referencing comments made within the text. While technically correct, they do not accurately portray a perceptually accurate image to assess the visual impact. For this reason larger (A3) images are appended to this report (Annexure C - EA Application) however while these are better, a proper assessment of the visual impact can be made when the images are produced at A0 sizes and held at arm's length.*

Enlarged A3 version of the revised photomontages comparing the EA Application and the Current Proposal are enclosed in Annex B. The same figures when scaled up to A0 sheets provide a more accurate representation of the scale of the development especially when a person holds them at arm's length.

The GPS coordinates listed throughout this report, for the viewpoints, are referenced to Zone 55 GDA94 datum.

The following section will discuss the change in the assessment of visual impact for the Current Proposal, if any.

A map of all viewpoints assessed (Public, Sequential, Residential and Cumulative) are shown in Annex D.

5.1 Publicly accessible viewpoints

Figure 5-1 shows the location of the publicly accessible viewpoints discussed within the LVIA with the Current Proposal.

Figure 5-1 Publicly accessible viewpoints (Current Proposal for wind farm)

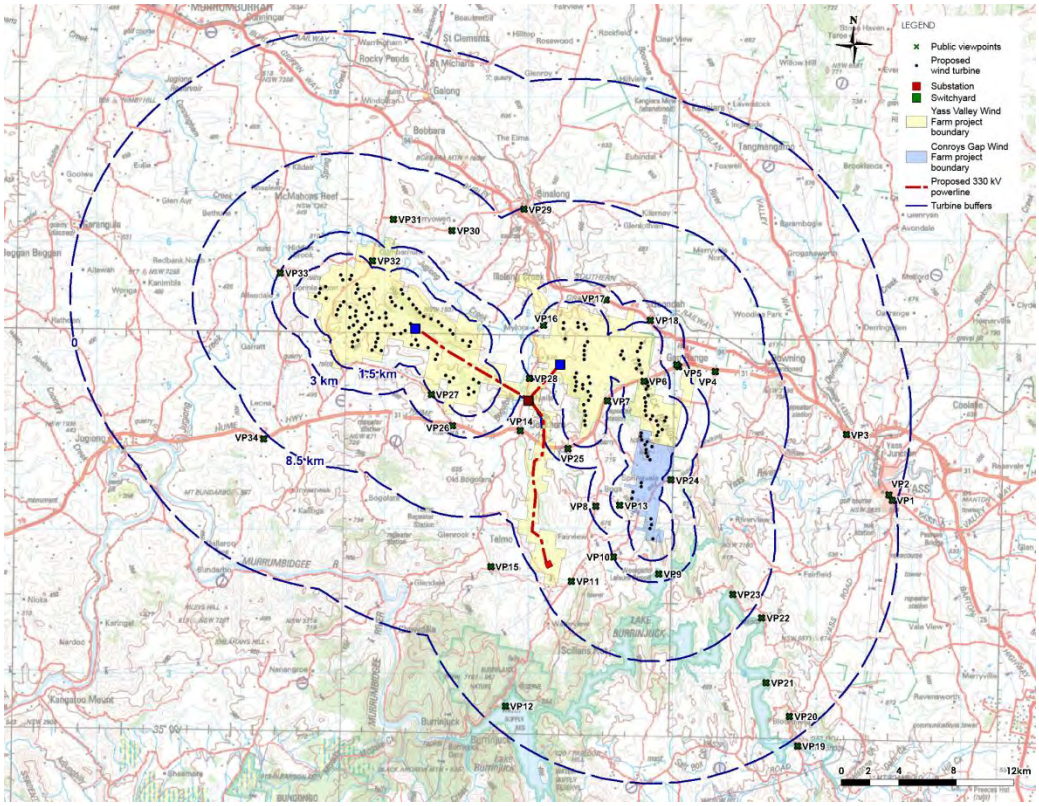


Table 5-1 compares the visual impact change between the EA Application and the Current Proposal from publicly accessible viewpoints. Those viewpoints which have had an alteration in the assessed level of visual impact are highlighted in red.

Table 5-1 Comparison summary assessment of publicly accessible viewpoints

VP	Dominant landscape units and sensitivity	Viewer numbers	Distance to nearest turbine (approx.) EA Application	Overall visual impact EA Application	Distance to nearest turbine (approx.) Current Prop	Overall visual impact Current Prop
1	*4 - Medium*	*High*	*16.7 km - W*	*Negligible*	*16.7 - NW (144)*	*Negligible*
2	*4 - Medium*	*High*	*16.4 km - W*	*Nil*	*16.4 - NW (144)*	*Nil*
3	*1 - Low*	*High*	*12.6 km - W*	*Minor*	*12.6 - W (143)*	*Minor*
4	*1 - Low*	*Low on Graces Flat Road* *High on the Hume Highway*	*4.7 km - W*	*Minor*	*4.7 - SW (143)*	*Minor*
5	*2 & 1 - Medium*	*High*	*2.4 km - NW*	*Medium*	*2.4 - SW (136)*	*Medium*
6	*2 - Medium*	*High*	*300 m - SE*	*Medium*	*0.3 - SE (136)*	*Medium*

VP	Dominant landscape units and sensitivity	Viewer numbers	Distance to nearest turbine (approx.) EA Application	Overall visual impact EA Application	Distance to nearest turbine (approx.) Current Prop	Overall visual impact Current Prop
7	2 - Medium	High	1.2 km - W	Medium	1.2 - NW (93)	Medium
8	2 - Medium	Medium	4.5 km - S	Medium	5.6 - N (95)	Medium
9	5 & 2 - High - Medium	Medium	4.5 km - SW	Medium	9.6 - N (145)	Minor
10	2 & 3 - Medium	Medium	1.7 km - SW	Medium	8.9 - NE (145)	Minor
11	3 - High	Medium	814 m - SE	Medium	10.8 - N (95)	Minor
12	3 - High	High	4.5 km - NE	Nil	20.2 - NE (95)	Nil
13	3 - High	Low	4.9 km - SW	Minor	5.4 - NE (145)	Minor
14	2 - Medium	High	4.3 km - NW	Medium	4.1 - NW (76)	Medium
15	2 - Medium	Low	6.2 km - E	Minor	11.7 - NE (95)	Minor
16	2 - Low	Low	1.3 km - E	Minor	1.4 - E (122)	Minor
17	2 - Medium	High	2.3 km - SW	Medium	2.3 - SW (112)	Medium
18	2 - Medium	High	1.8 km - SW	Medium	1.8 - SW (100)	Medium
19	2 - Medium	Low	16.5 km - NW	Minor	23.6 - NW (145)	Negligible
20	2 - Medium	Low	15.3 km - NW	Minor	21.5 - NW (145)	Negligible
21	2 - Medium	Low	13.3 km - NW	Nil	18.7 - NW (145)	Nil
22	2 - Medium	High	11.9 km - NW	Nil	14.6 - NW (145)	Nil
23	5 - High	Low	9.7 km - W	Nil	12.2 - NW (145)	Nil
24	2 - Medium	Low	3.2 km - NW	Minor	3.2 - N (145)	Minor
25	2 - Medium	High	2.3 km - NE	Minor	1.9 - NE (95)	Minor
26	2 - Medium	High	2.4 km - NE	Minor	2.4 - NE (77)	Minor
27	1 - Low	Low	1.5 km - NE	Minor	1.5 - NE (79)	Minor
28	2 - Medium	Low	1.5 km - NE	Minor	3.1 - E (88)	Minor
29	1 - Low	Medium	8.0 km - SW	Minor	8.4 - SE (111)	Minor
30	4 & 2 - Medium	Low	5.5 km - SW	Minor	5.5 - SW (1)	Minor
31	2 - Medium	Low	5.1 km - S	Minor	4.9 - SW (129)	Minor
32	2 - Medium	Low	2.4 km - S	Minor	1.8 - SW (129)	Minor
33	2 - Medium	Low	3.5 km - SE	Minor	3 - SE (69)	Minor
34	2 - Medium	High	7.7 km - NE	Minor	8.8 - NE (41)	Minor

There are no locations where under the Current Proposal the wind turbines are located substantially closer to a viewpoint discussed within the LVIA.

For most viewpoints, the alterations in the current layout have resulted in minor changes in distance to the nearest wind turbine and therefore, the visual impact remains unchanged. For example if the nearest wind turbine in the EA Application assessment was 4.9 km and it is now 5.4 km and the visual impact would be assessed equally.

However where distance to the nearest wind turbine increases dramatically, say from 1.7 km to a distance of 8.9 km, the visual impact is less, solely based on this increased distance to the nearest wind turbine. For some viewpoints located to the south of the proposed wind farm, due to the removal of wind turbines associated with the Carrolls Ridge precinct under the Current Proposal the level of visual impact is reduced.

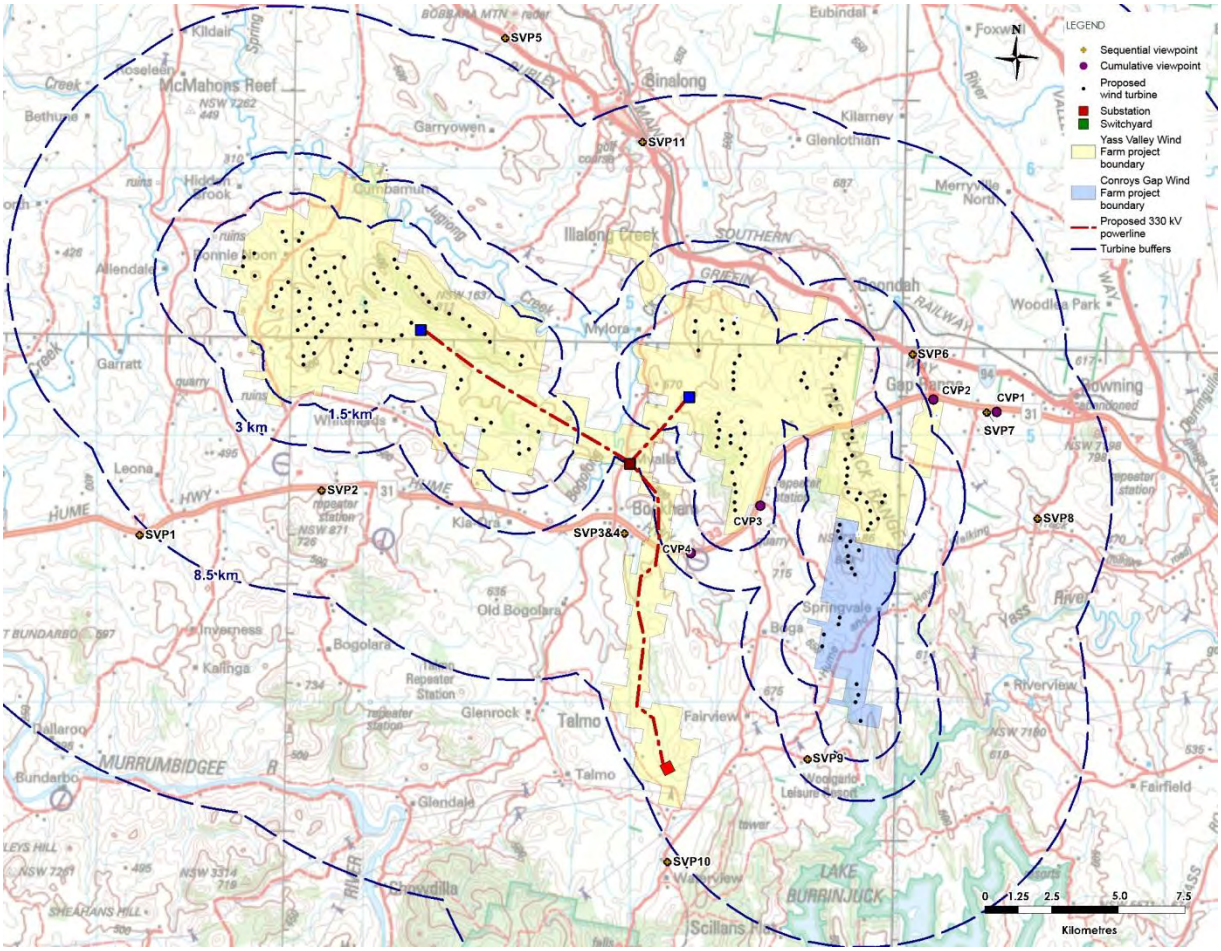
Of the 34 viewpoints that were assessed, six viewpoints have been re-assessed to have a lower level of visual impact. This is because of the increased distance to the nearest wind turbine from these viewpoints.

5.2 Sequential viewpoints

Sequential viewpoints (SVP's) were selected from locations along the Hume Highway, along Burley Griffin Way and from the local road network to the south of the Hume Highway serving Lake Burrinjuck.

Figure 5-2 shows the location of the sequential viewpoints discussed within the LVIA with the Current Proposal.

Figure 5-2 Sequential viewpoints (Current Proposal for wind farm)



The original viewpoints that were assessed as part of the EA Application were:

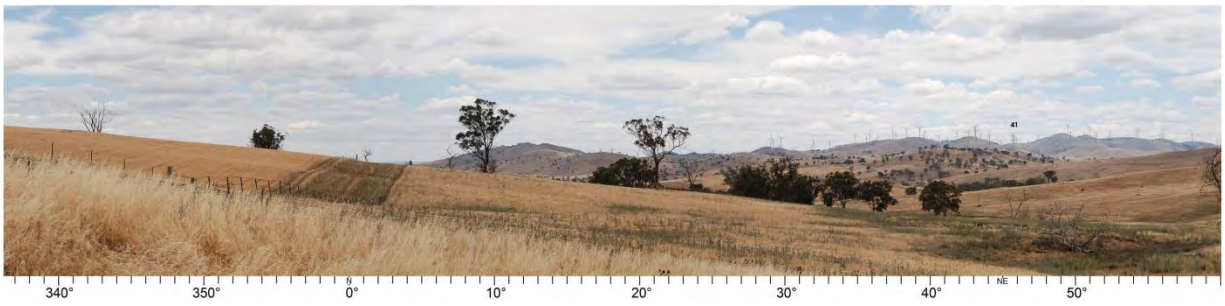
- SVP1, SVP2, SVP3 look at the sequential views for a traveller heading east on the Hume Highway towards Yass. SVP7 was taken from the Hume Highway looking west.
- SVP5, SVP6 and SVP11 examined the views from Burley Griffin Way for a traveller heading south towards Yass.
- SVP8, SVP9 and SVP10 examined the views from locations near the Hume & Hovell Walking Track which parallels Black Range Road.
- Two photomontages (SVP1 and SVP2) have been re-done to examine the likely change in visual impact with the reduction in turbine numbers and particularly the removal of the wind turbines within the Carrolls Ridge Precinct.

5.2.1 SVP1 – Hume Highway

For travellers heading east towards Yass on Hume Highway, the wind farm will first appear to the north. As one approaches Yass, the proposed wind turbines will be visible on both sides of the Highway. Figure 5-3 and Figure 5-4 show the view from a location approximately 44 km from Yass. An A3 enlarged version of the photomontages comparing the EA Application and the Current Proposal is enclosed in Annex B.

Figure 5-3 EA Application - SVP1 Photomontage

Figure 5-4 Current Proposal - SVP1 Photomontage (Source YVWF)



In the EA Application the closest wind turbines were approximately 7.6 km to the north and are visible on the left of Figure 5-3.

Figure 5-4 shows that in the Current Proposal these wind turbines have been removed and the nearest wind turbines are now 8.7 km to the north-east. These wind turbines are still visible on the ridge to the right hand side of Figure 5-4. In assessing the sequential impact there would only be a minor reduction in visual impact.

Other turbines would also be visible to the right of these wind turbines and these are further away and remain in the current proposal. The turbines will remain in view as a traveller moves closer to Yass.

The nearest approved turbine (R12) at CGWF will be located approximately 25.9 km east of this location. At this distance the wind turbines of CGWF will have negligible visual impact on the views. Therefore, the overall cumulative visual impact is assessed as **negligible**.

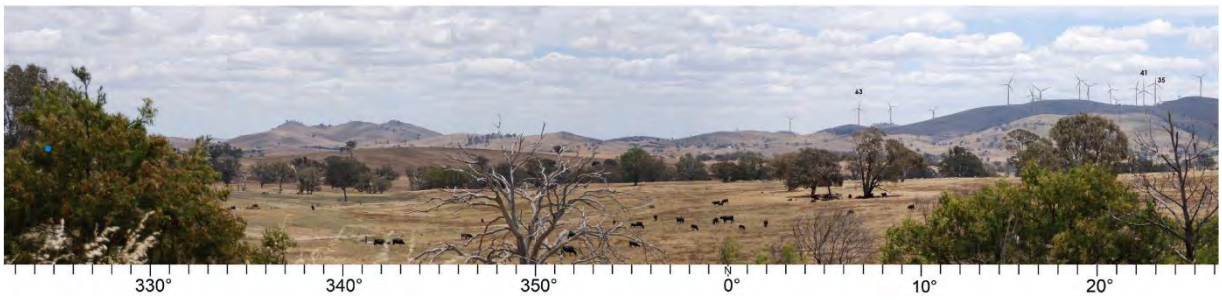
5.2.2 SVP2 – Hume Highway

SVP2 is taken from a location on the Hume Highway approximately 37 km from Yass. From this location, for a viewer looking north through breaks in the roadside vegetation, the nearest wind turbines parallel the Highway and take up more than a 120^{O} field of view.

The nearest group of wind turbines discussed within the EA Application are visible on the left of Figure 5-5 are approximately 7 km from the Highway. An A3 enlarged version of the photomontages comparing the EA Application and the Current Proposal is enclosed in Annex B.

Figure 5-5 EA Application - SVP2 - Photomontage

Figure 5-6 Current Proposal - SVP2 - Photomontage (Source YVWF)



The wind turbines in Figure 5-6 continue parallel to the Highway approximately 6 – 7 km from the roadway. In the Current Proposal the nearest wind turbine is located approximately 5.5 km north. The turbines in the east have been removed as shown in Figure 5-6. However, there would only be a minor reduction in visible impact with the removal of the wind turbines to the left.

There would only be minor changes to the arrangements of wind turbines that were visible to the right of this panorama. The visual impact would remain unchanged.

The nearest approved turbine (R2) at CGWF will be located approximately 22.2 km east of this location. At this distance the wind turbines of CGWF will have negligible visual impact on the views. Therefore, the overall cumulative visual impact is assessed as **negligible**.

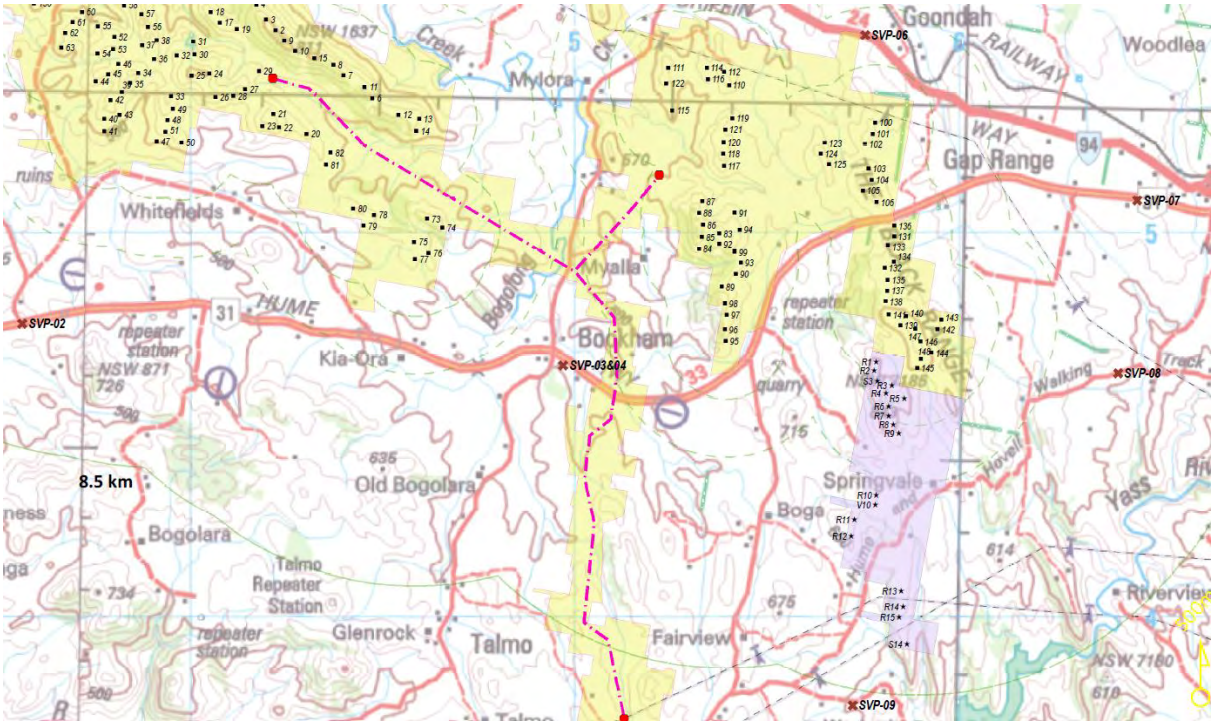
5.2.3 Summary of visual impact from sequential viewpoints

These two viewpoints illustrate that there would be a minor and inconsequential change to the sequential views for a traveller moving through the region and a similar minor change is expected for travellers on Burley Griffin Way and walkers on the Hume & Hovell Walking Track as assessed in the EA Application.

From a cumulative visual impact standpoint, there will be several locations on the Hume Highway where the wind turbines of both Conroys Gap Wind Farm and the Yass Valley Wind Farm will be visible.

Figure 5-7 shows the map of approved wind turbines at Conroys Gap Wind Farm and proposed wind turbines at Yass Valley Wind Farm as well as several sequential viewpoints.

Figure 5-7 ***Map of approved wind turbines at Conroys Gap Wind Farm and proposed wind turbines at Yass Valley Wind Farm***



As seen in Figure 5-7, at their nearest the wind turbines of the two wind farms are located approximately 0.8 km apart. Therefore, for an observer, the two wind farm will appear as a single continuous development and undistinguishable from each other.

Table 5-2 lists the sequential viewpoints and the distance and direction to nearest proposed wind turbines at Yass Valley and the nearest approved wind turbines at Conroys Gap. Viewpoints where the nearest approved wind turbine of CGWF is less than 3 km away is highlighted in light blue.

Table 5-2 ***Cumulative visual impact from sequential viewpoints***

Viewpoint	Distance to proposed wind turbines (YVWF)	Distance to approved wind turbines (CGWF)	Assessment of cumulative visual impact of approved CGWF and proposed YVWF
SVP-01	8.7 km - NE (41)	25.9 km - E (R12)	Negligible (Refer Section 5.2.1)
SVP-02	5.5 km - NE (41)	22.2 km - E (R2)	Negligible (Refer Section 0)
SVP-03&04	4.3 km - E (95)	8.1 km - E (R2)	Low (Given the distance YVWF and CGWF will appear contiguous and indistinguishable)
SVP-05	9.4 km - NW (1)	20 km - SE (R1)	Negligible (Given the distance CGWF will have negligible impact)
SVP-06	2.3 km - S (100)	8.5 km - S (R1)	Low (Given the distance YVWF and CGWF will appear contiguous and indistinguishable)
SVP-07	6 km - SW (143)	8 km - SW (R5)	Low (Given the distance YVWF and CGWF will appear contiguous and indistinguishable)
SVP-08	4.8 km - NW (143)	5.6 km - W (R5)	Low (Given the distance YVWF and CGWF will appear contiguous and indistinguishable)
SVP-09	8.9 km - NE (145)	2.1 km - NE (S14)	Medium (The nearest approved wind turbines at CGWF can dominate the view)
SVP-10	13.2 km - NE (95)	8.9 km - NE (S14)	Negligible (Given the distance CGWF will have negligible impact)
SVP-11	6.2 km - SE (111)	15.3 km - SE (R1)	Negligible (Given the distance YVWF will have negligible impact)

From certain locations such as SVP-06 and SVP-09, given its proximity, the wind turbines can dominate the view.

In case of SVP-06, the nearest approved wind turbine at CGWF will be approximately 8.5 km south, while the nearest proposed wind turbine at YVWF will be approximately 2.3 km south. The view to the approved wind turbines of CGWF will be through the proposed wind turbines at YVWF. Therefore, the two wind farms will not be distinguishable and the overall cumulative visual impact will be low.

Similarly in case of SVP-09, the nearest approved wind turbine at CGWF will be approximately 2.1 km north east, while the nearest proposed wind turbine at YVWF will be approximately 8.9 km north east. The approved wind turbines of CGWF will dominate the view over the distant proposed wind turbines at YVWF. Therefore, the overall cumulative visual impact will be medium.

Overall, for an observer, from most sequential viewpoint locations discussed, the two wind farm will appear as a single continuous development from most locations the cumulative visual impact of the addition of proposed wind turbines of YVWF will not be appreciable.

5.3 Residential viewpoints

In its preliminary review of the Submissions Report, the DP&I requested an assessment from all residences within the 8.5km zone "*(being the zone identified in the EA where the greatest visual impact of the wind farm will occur within, inclusive of R04)*".

For residences located between 3 km and 8.5 km of the proposed wind turbines such as R04 (as described in the LVIA as well as in Chapter 3 of this report), the proposed wind turbines will be

"Potentially noticeable-but will not dominate the landscape - The degree of visual intrusion will depend on the landscape sensitivity and the sensitivity of the viewer; however the proposed wind turbines will not dominate the landscape."

Given the distance, and other locational factors such as intervening topography, vegetation and the orientation of the living areas, for the residences located between 1.5 km and 8.5 km of the proposed wind turbines, the level of visual impact will be much smaller than those residences that are located closer to the wind farm. Only for residences located within 1.5 km, the proposed wind turbines will be

"… visually dominant in the landscape from most viewing locations -The degree of visual intrusion will only be reduced by screening by nearby vegetation or buildings."

During the preparation of LVIA, as a conservative approach, several residences within and outside of the 1.5 km zone were visited to discuss the range of impacts on selected residential properties.

In its preliminary review the DP&I has now requested assessment from

"…all non-associated receivers with a dwelling within 2km of a turbine in addition to the residential viewpoints identified in Table 9.2 of the EA"

In response to DP&I's further information request, a subsequent site visit was undertaken in March 2013 to residences within and beyond 2 km of the proposed wind turbines.

Table 5-3 list the number of dwellings within 1.5 km, 2 km and 3 km of the wind turbines.

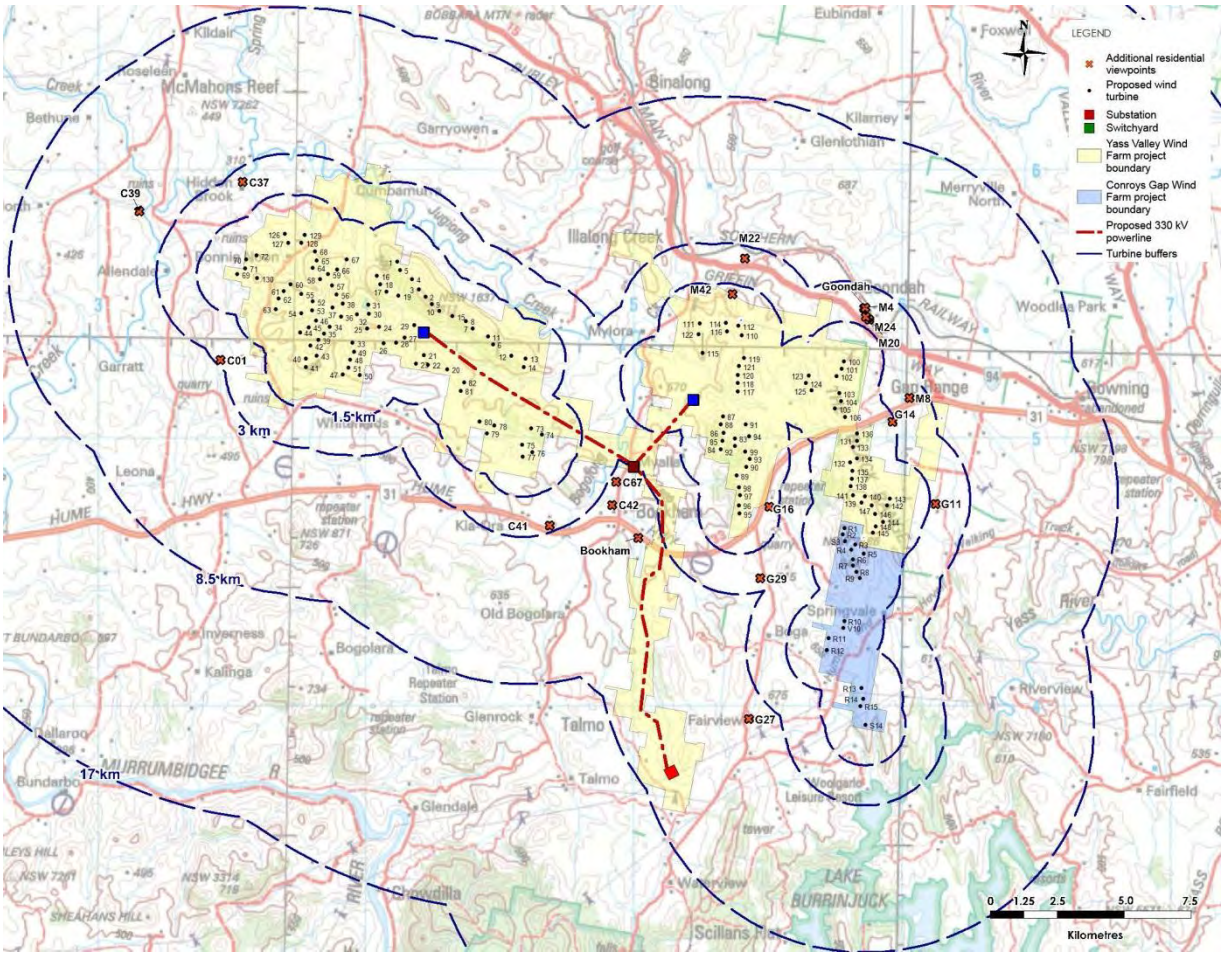
Table 5-3 Number of dwellings within three kilometres of the wind turbines

	Number of dwellings within the distance ranges		
No	**0 km-1.5 km**	**1.5 km-2 km**	**2 km-3 km**
Associated	8	9	6
Non-Associated	3 (G14, G16, M42)	3 (G11, M20, M24)	24
Total	**11**	**12**	**30**

In all, there are 53 dwellings within 3 km of the proposed wind turbines. Of these 30 are non-associated. There are 23 dwellings within 2 km of the proposed wind turbines. Of these, only six are non-associated with the development.

Figure 5-8 shows the residential viewpoints assessed within and beyond 2 km of wind farm as part of this report.

Figure 5-8 Additional residential viewpoints



Where access and permission was available from respective landowners, a further assessment of the visual impact was undertaken for residences located:

- within 2 km of the proposed wind turbines;
- beyond 2 km of the proposed wind turbines.

In some instances, where permission was available, photographs were retaken from the same residential locations visited during the preparation of the LVIA and are discussed below.

5.4 Residences located within 2 km of proposed wind turbines

Six non-associated residences are located within 2 km of the proposed wind turbines. These are G14, G11, G16, M20, M42 and M24. Of these M42 is a new dwelling that was built following the submission of EA Application and has not been visited by ERM. G14 (R1 in EA Application) was visited during the EA Application preparation and revised photomontages have been prepared.

5.4.1 Dwelling G14 "Tullyvale Hall" - Viewpoint R1 (EA Application)

Dwelling G14 "Tullyvale Hall" is located to the east of the proposed wind farm. It is accessed from Hume Highway. The assessment included within the LVIA has been updated with reference to the Current Proposal.

VP R1 (G14 - 659544E, 6150737S, 605m AHD)

The dwelling sits on a low hill located west of the township of Yass. The nearest wind turbine (136) is approximately 1.4 km to the south-west. Figure 5-9 is of a view from the driveway towards the dwelling and the extensive planting around the existing dwelling.

Figure 5-9 View down driveway towards Dwelling G14

The dwelling is orientated to the west with views to the garden as shown in Figure 5-10.

Figure 5-10 "Tullyvale Hall", view of front of Dwelling G14

Existing vegetation limits views from the dwelling to the garden and its immediate surrounds and to the proposed wind farm. Therefore, the overall visual impact from living areas of the residence is assessed as **low**.

There are views to the surrounding landscape and the proposed wind farm from some locations along the driveway. Figure 5-11 is taken from the driveway some distance before the dwelling.

Figure 5-11 View south-west from the driveway to Dwelling G14

Figure 5-12 and Figure 5-13 shows the photomontage on photographs recently taken by YVWF from the driveway near the dwelling.

Figure 5-12 Photomontage - View north-west from the driveway to Dwelling G14 (GPS 659586E, 6150697S)

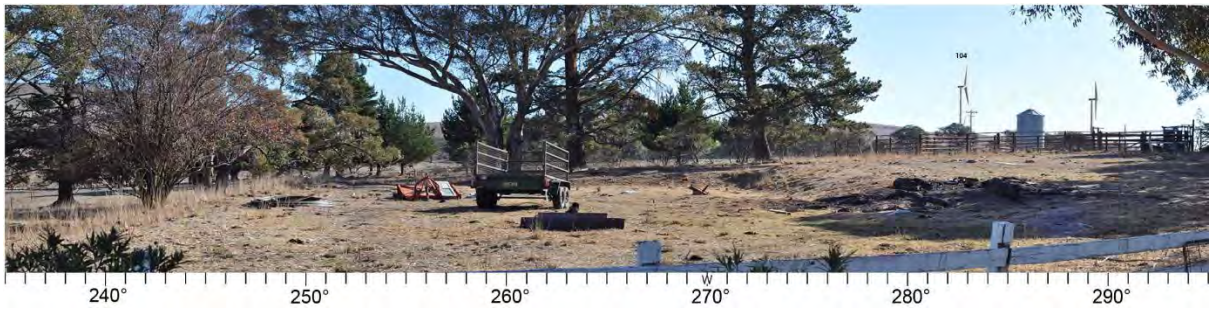


Figure 5-13 Photomontage - View south-west from the driveway to Dwelling G14 (GPS 659586E, 6150697S)

Based on the recent photomontage prepared by YVWF and as shown in Figure 5-12 and Figure 5-13, the proposed wind turbines will be visible through gaps in perimeter vegetation from some locations within the garden. The nearest visible wind turbines will be located at 1.7 km north-west (106) and 2.9 km south-west (143) of this location. Therefore the overall visual impact on views from the garden is assessed as **high** to **medium**.

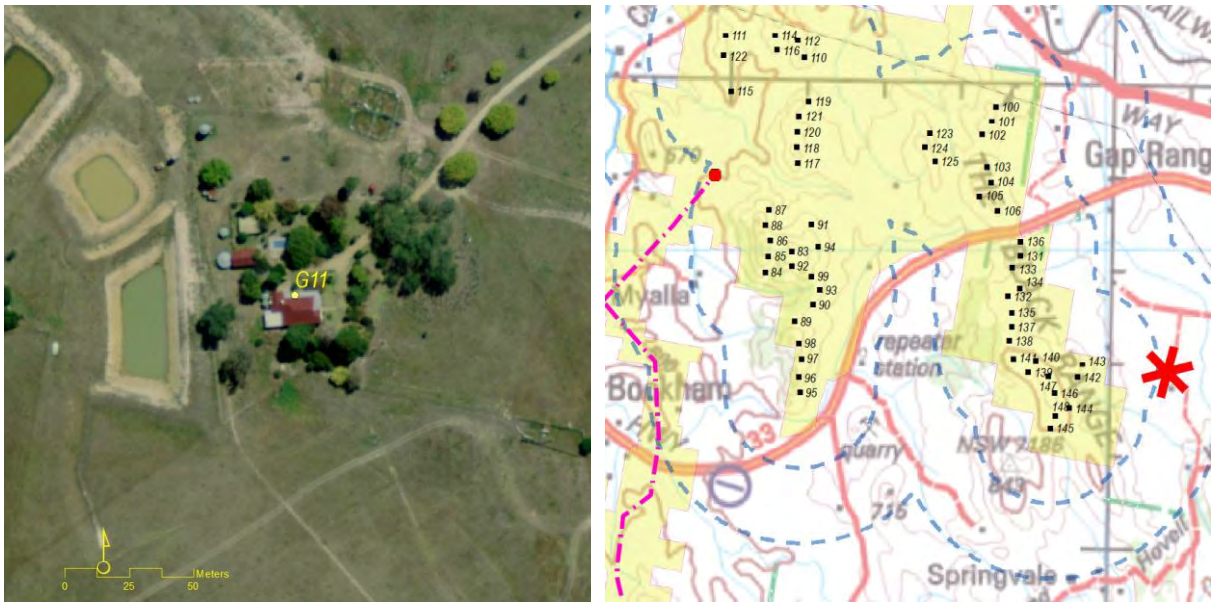
Mitigation is possible by foreground planting along the fence if desired. Such planting upon establishment will reduce the overall visual impact to a low level.

The nearest approved turbine (R1) at CGWF will be located approximately 4.4 km south west of this location and be only visible through the proposed turbines at YVWF. At this distance the

two wind farms will appear to be contiguous. Therefore, the overall cumulative visual impact is assessed as **low**.

5.4.2 Dwelling G11 - "Tannochbrae"

Dwelling G11 - "Tannochbrae" is located to the east of the proposed wind farm. It is accessed from Graces Flat Road which is also an unsealed road. The nearest wind turbine (143) is approximately 1.7 km to the west.



ERM personnel visited and photographed the property in March 2013. However, the resident has since declined permission to use the photographs for the assessment of visual impact on views from the property.

It is however acknowledged based on the site visit and from the aerial photography that the residence is located within an established garden with mature trees. Further the living area of the house is oriented to the north and east towards the garden and away from the proposed wind farm. Therefore, the overall visual impact from living areas of this residence is assessed as **low**.

The nearest approved turbine (R1) at CGWF will be located approximately 3.3 km south of this location behind the proposed turbines at YVWF. At this distance the two wind farms will appear to be contiguous. Therefore, the overall cumulative visual impact is assessed as **low**.

5.4.3 Dwelling G16 – "Stony Creek"

Dwelling G16 – "Stony Creek" is located to the south of the proposed wind farm. It is accessed from Paynes Road which is a sealed road. The nearest wind turbine (96) is approximately 1.1 km to the west.

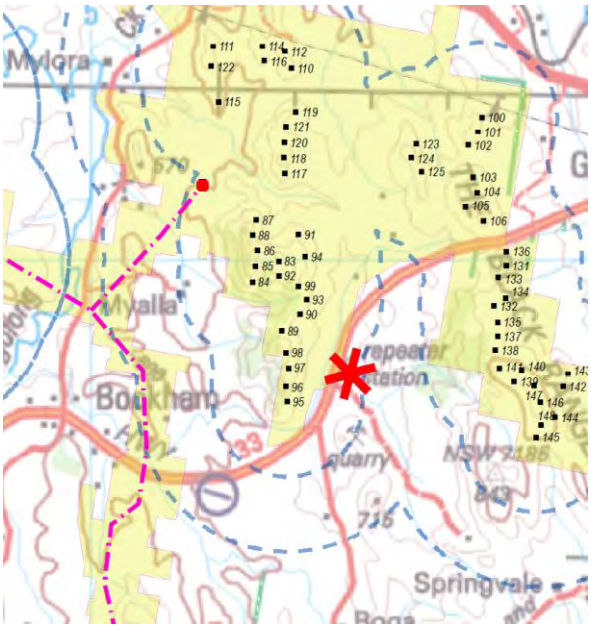


Figure 5-14 shows the view north and east from the garden towards the dwelling. The dwelling and the living areas are oriented west.

Figure 5-14 View east from garden towards Dwelling G16 (655001E, 6147509S, 522m AHD)

The dwelling is set within a garden contains some kids play equipment and has some established vegetation of both native and exotic species.

The dwelling is set back by approximately 100m from Hume Highway. This eastern setback consists of several mature trees that screen views from the dwelling to its surrounding and will screen views of the wind turbines from the living areas.

At this distance the wind turbines will be "*visually dominant in the landscape*". However, the existing foreground vegetation will limit views towards the wind farm. Therefore, the overall visual impact is assessed as **nil** from living areas.

Figure 5-15 shows the view west to east from the driveway.

Figure 5-15 View west to east from driveway to Dwelling G16 (655032E, 6147498S, 523m AHD)

Figure 5-16 shows the photomontage of the Current Proposal from the same location.

Figure 5-16 Photomontage – 60° view north-west - (Source YVWF)

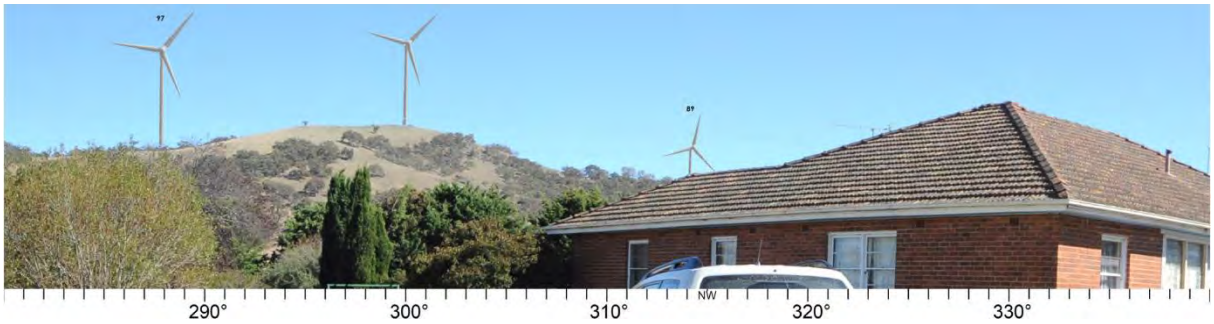
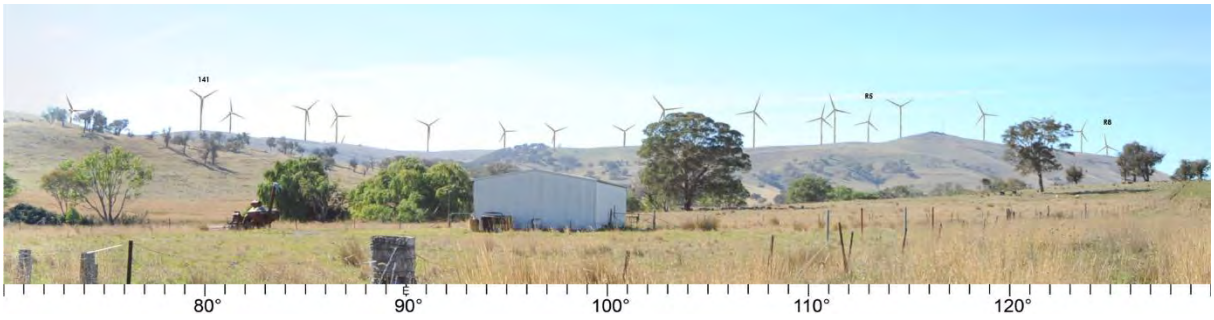


Figure 5-17 shows the photomontage from the same location looking towards the Current Proposal as well as approved wind turbines of CGWF.

Figure 5-17 Photomontage – 60° view north-east - (Source YVWF)



There will be views east to the proposed wind turbines from the driveway located to the west and east of the dwelling. From this location the nearest wind turbines will be approximately 1.1 km to the west of the driveway and 3 km east. At this distance the overall visual impact is assessed to be **medium** to **high**.

Further mitigation is possible through planting to the western edge of the garden as an extension to the existing trees. Together this planting in time will effectively filter views of the proposed wind farm. With additional planting the overall visual impact will be **medium** to **low**.

The nearest approved turbine (R1) at CGWF will be located approximately 2.9 km east of this location. Some of the approved wind turbines of CGWF will overlap and appear in front of YVWF. While together the wind turbines will appear in a wider view, overall the two wind farms will appear to be contiguous and indistinguishable. Therefore, the overall cumulative visual impact is assessed as **low**.

5.4.4 Dwelling M20 – "Dunderalligo"

Dwelling M20 – "Dunderalligo is located to the north-east of the proposed wind farm. It is accessed from Goondah Road which is an unsealed road. The nearest wind turbine (100) is approximately 1.9 km to the south-west.

Figure 5-18 shows the view east from the driveway towards the dwelling.

Figure 5-18 View east from driveway towards Dwelling M20 (658739E, 6154532S, 551m AHD)

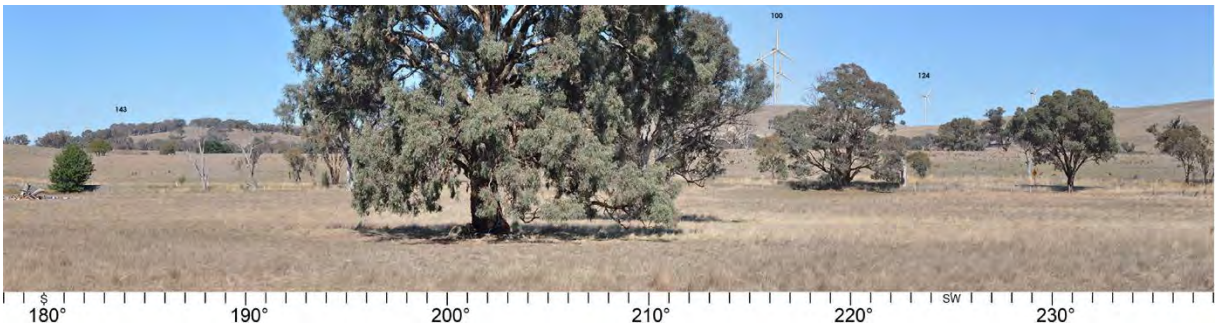
The dwelling is located on a rise and is set within a small garden with some established vegetation of both native and exotic species. The dwelling has a verandah to its north (entrance) and to the south which is oriented towards the hills in the south.

Figure 5-19 shows the view south and west towards the proposed wind farm from the driveway.

Figure 5-19 View south to west from Dwelling M20 driveway towards the wind farm (658739E, 6154532S, 551m AHD)

Figure 5-20 shows the photomontage from the farm near the driveway on photographs taken by YVWF.

Figure 5-20 Photomontage – 60° view south-west (Source YVWF – 658728E, 6154519S, 551m AHD) UPDATED



The nearest wind turbine is located 1.9 km to the south-west. At this distance the wind turbines will be "*highly visible and will usually dominate the landscape*". Given the lack of foreground vegetation the proposed wind turbines will be visible. Therefore, the overall visual impact is assessed as **high**.

If desired, mitigation is possible through planting to the southern edge of the garden. Such planting will also protect the dwelling from cold southerly winds while filtering views to the wind farm. With landscape planting the overall visual impact will be **medium** to **low**.

The nearest approved turbine (R1) at CGWF will be located approximately 7.9 km south of this location. At this distance, given the topography the approved wind turbines of CGWF will not be visible as a whole. Further, the two wind farms will appear to be indistinguishable. Therefore, the overall cumulative visual impact is assessed as **negligible**.

5.4.5 Dwelling M24 – "Turkana"

Dwelling M24 – "Turkana" is located to the north-east of the proposed wind farm. It is accessed from Goondah Road which is an unsealed road. The nearest wind turbine (100) is approximately 1.9 km to the south-west.

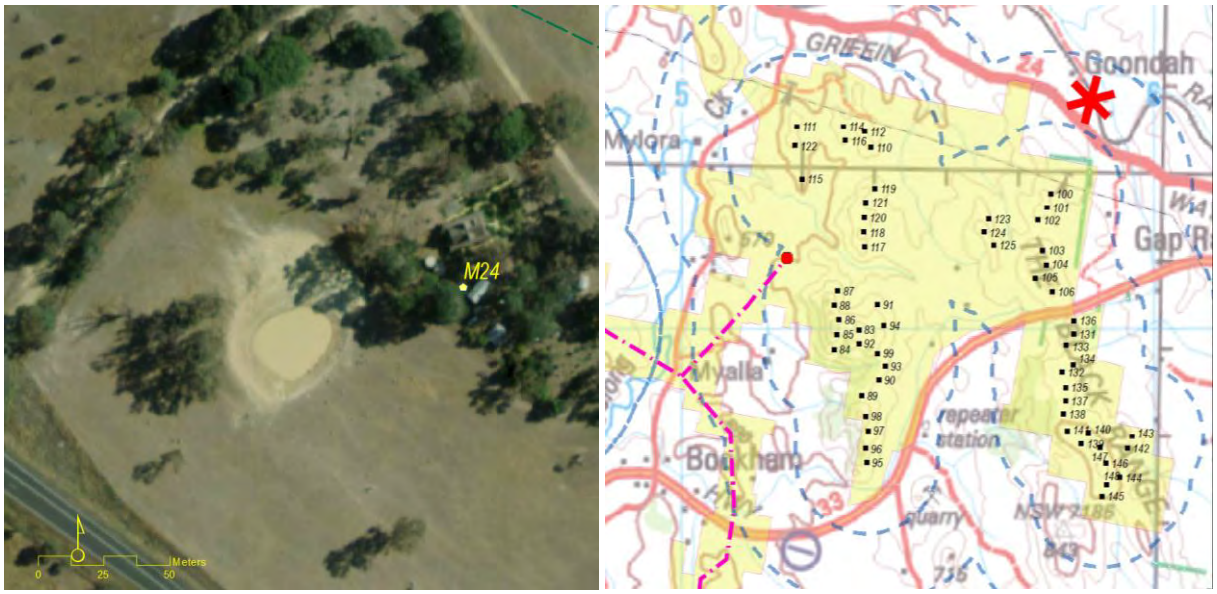


Figure 5-21 shows the view south to north from the driveway towards the dwelling.

Figure 5-21 View south to north from driveway towards Dwelling M24 (658643E, 6154608S, 550m AHD)

The main dwelling which is a double storey building is located at a lower elevation to the driveway. The garage is just visible to the left. A studio building is also located further to the left of the garage. The main dwelling set within a landscaped garden consisting of established vegetation comprising of both native and exotic species. The dwelling and living areas are oriented north and east away from the wind farm.

Figure 5-22 shows the view west to the rear yard, with the verandah overlooking the rear garden.

Figure 5-22 View west to rear yard of Dwelling M24 (658618E, 6154610S, 549m AHD)

The property edge is planted heavily with native shrubs and trees. This planting will filter views of the proposed wind farm from both the ground level and from first floor. Figure 5-23 shows the view east to west towards the proposed wind farm from a break in vegetation near the rear fence.

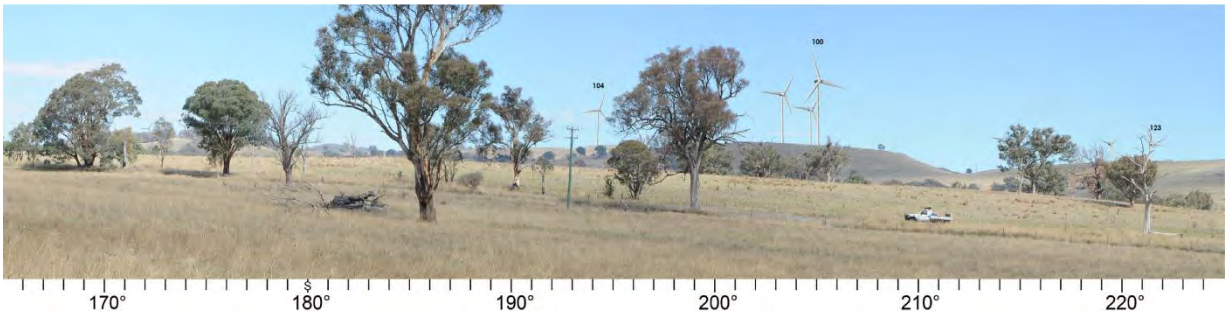
Figure 5-23 View east from driveway towards the wind farm (658613E, 6154589S, 549m AHD)

In Figure 5-24 the dwelling is visible to the right while the studio to the left.

Figure 5-24 View west from driveway towards the wind farm (658613E, 6154589S, 549m AHD)

Figure 5-25 shows the photomontage on photographs taken by YVWF near the fence.

Figure 5-25 Photomontage - 60° view south-west (Source YVWF – 658632E, 6154584S)



The nearest wind turbine is located 1.9 km to the south-west. At this distance the wind turbines will be "*highly visible and will usually dominate the landscape*. However, the orientation of the dwelling and living areas are to the north and east and away from the wind farm. Further, given the intervening vegetation within the garden and fence lines will filter views of the proposed wind farm; the overall visual impact from living areas of the main dwelling is assessed as **low**.

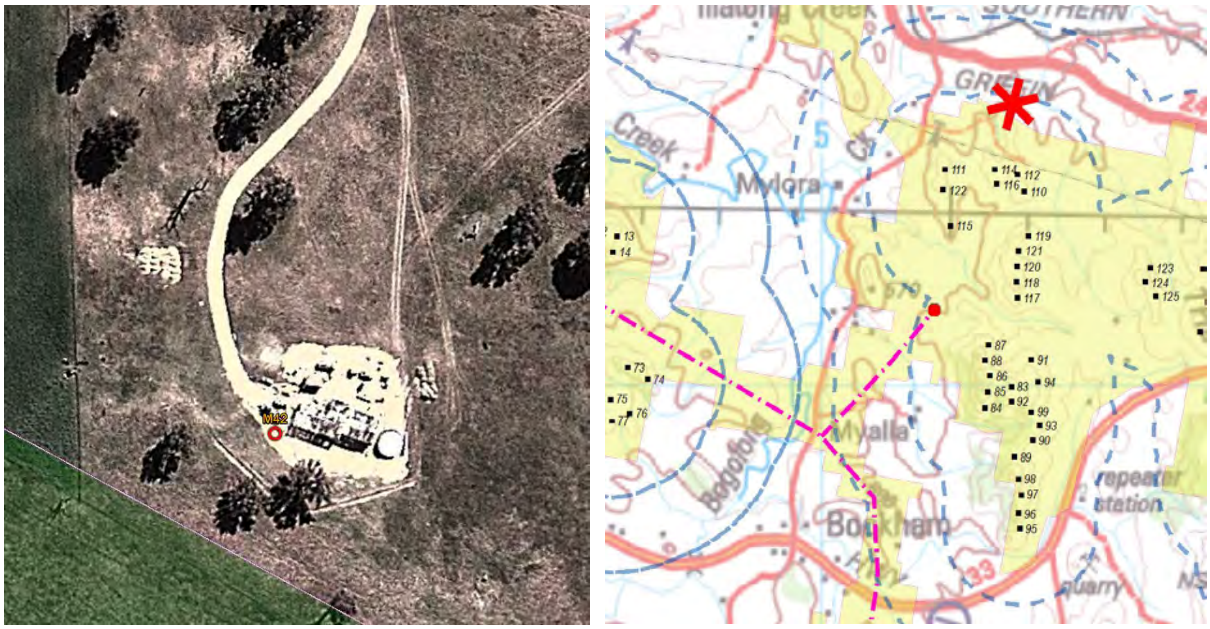
Views to the wind farm will be available only from a gap in the boundary vegetation. The overall visual impact of the wind turbines from this location is assessed as **medium**.

If desired, mitigation is possible through planting to the southern edge of the garden. Such planting will also protect the dwelling from cold southerly winds while filtering views to the wind farm. With landscape planting the overall visual impact will be **low**.

The nearest approved turbine (R1) at CGWF will be located approximately 8.0 km south of this location. At this distance, given the topography the approved wind turbines of CGWF will not be visible as a whole. Further, the two wind farms will appear to be indistinguishable. Therefore, the overall cumulative visual impact is assessed as **negligible**.

5.4.6 Dwelling M42

Dwelling M42 is located to the north of the proposed wind farm. Dwelling M42 is accessed from Burley Griffin Way which is a sealed road. The nearest wind turbine (114) is approximately 1.1 km to the south.



Source: Google Earth

The dwelling has been constructed recently and after the submission of LVIA and was not visited by a representative of ERM. This assessment of the visual impact on Dwelling M42 is solely based on information provided to ERM by YVWF.

Figure 5-26 shows the view south from the driveway towards the dwelling. The dwelling is set back by approximately 800m from Burley Griffin Way.

Figure 5-26 View south from Dwelling M42 driveway towards the wind farm (653747E, 6155760N)

The single storey dwelling is located on a slope and cuts into the hill. The front verandah and living areas are oriented north as seen in Figure 5-27.

Figure 5-27 View south from driveway towards Dwelling M42 (653747E, 6155760N)

Figure 5-28 shows the cutting to the rear yard. The closest proposed wind turbines that are directly south of the dwelling will be screened by the cutting and the intervening topography.

Figure 5-28 View west to rear yard of Dwelling M42 (Source YVWF)

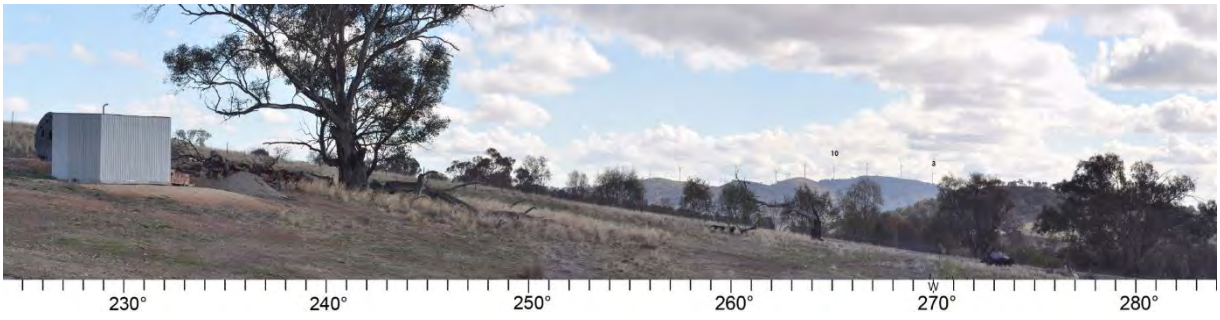
Figure 5-29 shows the view north-west from the driveway near the garage of the dwelling.

Figure 5-29 Photomontage (Source YVWF – GPS 653661E, 6155465S)

Figure 5-30 and Figure 5-31 show the photomontage from the same location.

Figure 5-30 Photomontage – 60° view south-west (Source YVWF)

Figure 5-31 Photomontage - 60° view west (Source YVWF)



The intervening topography will screen views of most of the wind turbines. The nearest wind turbines (tips of 114 at 1.1 km and swept path of 111 at 1.7 km) as shown in Figure 5-30 will be

partially visible from the driveway. At this distance the wind turbines will be "*highly visible and will usually dominate the landscape*.

Further the living areas of the dwelling are oriented towards north and away from the wind farm. Therefore, the overall visual impact on the living areas is assessed as **low** to **negligible**.

From the driveway there will be views to the wind turbines to the west that are located approximately 1.1 km from this location. Therefore, the overall visual impact of the wind turbines from this location is assessed **medium**.

If desired, mitigation is possible through planting to along the perimeter of the garden to the south-east and west to filter views to the wind farm. With landscape planting the overall visual impact will be **low** to **negligible**.

The nearest approved turbine (R1) at CGWF will be located approximately 7.9 km south of this location. At this distance, given the topography the approved wind turbines of CGWF will not be visible as a whole. Further, the two wind farms will appear to be contiguous and indistinguishable. Therefore, the overall cumulative visual impact is assessed as **negligible**.

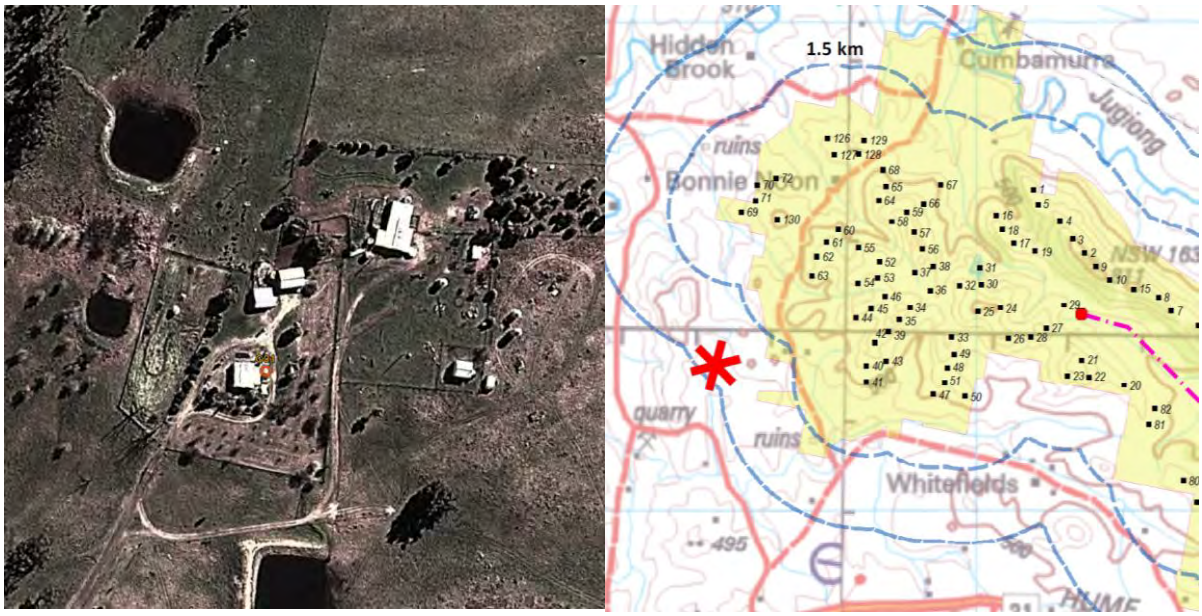
5.5 Residences located beyond 2km of proposed wind turbines

Several non-associated residences are located beyond 2 km of the proposed wind turbines. Selected residences were visited in March 2013. These include C01, C37, C39 (R05), C67, G29, and M22 (R03).

Of these, dwellings C39 (R05) and M22 (R03) have been revisited following the submission of the EA Application. Together these show the level of impact for residences located beyond 2 km from the proposed wind farm.

5.5.1 Dwelling C01 – "Hillview"

Dwelling C01 – "Hillview" is located to the east of the proposed wind farm. It is accessed from Berremangra Road which is a sealed road. The nearest wind turbine (63) is approximately 2.7 km to the north-east.



Source : Google Earth

Figure 5-32 shows the view east towards the dwelling and sheds from the driveway.

Figure 5-32 View east of Dwelling C01 and sheds from driveway (634518E, 6153016S, 434m AHD)

The dwelling is set within a garden that consists of established native and exotic vegetation.

Figure 5-33 shows the view south from the garden towards the entrance of the dwelling. The living areas of the dwelling are oriented north overlooking sheds and the garden towards the wind farm.

Figure 5-33 View south from driveway to the entrance of Dwelling C01 (634554E, 6153001S, 436m AHD)

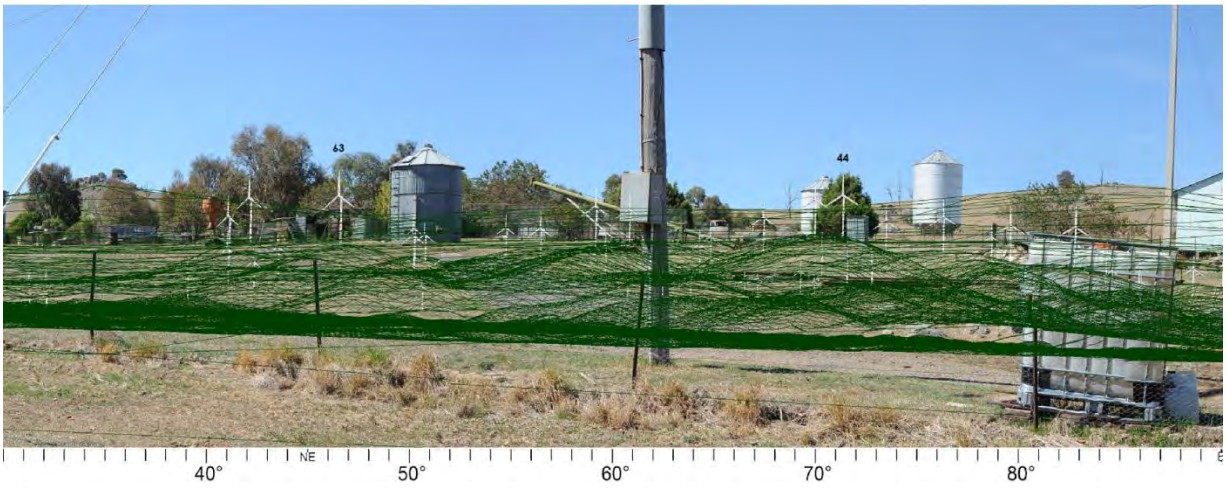
Existing vegetation within the garden limits views from the dwelling to its surrounds and the proposed wind turbines.

Figure 5-34 shows the view north-east from the driveway towards the proposed wind farm. The view is across the paddock towards the wind farm, and filtered by existing trees.

Figure 5-34 View north-east from the rear of Dwelling C01 (634550E, 6153007S, 436m AHD)

Existing power lines, and farm sheds and infrastructure are visible in the foreground. Figure 5-35 shows the photomontage of the proposed wind farm with a wireframe overlay of the terrain near the fence and sheds adjacent.

Figure 5-35 Photomontage – (Source YVWF – GPS 634567E, 6153015S)



Most wind turbines will be screened by topography or intervening vegetation. There may be some views to the blades of the wind turbines from this location.

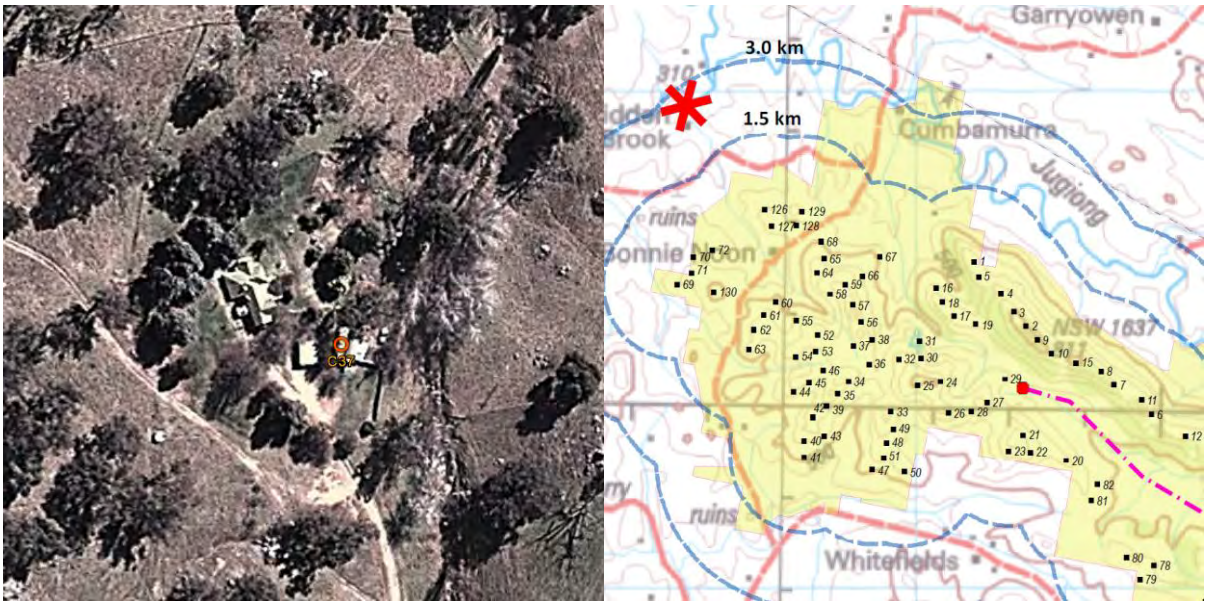
The nearest wind turbine is located 2.7 km to the north-east. At this distance the wind turbines "*highly visible and will usually dominate the landscape*". However, there are no views from the living areas towards the wind farm. The overall visual impact is assessed as **nil** from living areas.

There will be views to the proposed wind farm from the driveway of the property. However, given the topography and intervening vegetation, the wind turbines will be partially or wholly screened. Therefore, the overall visual impact is assessed as **low**.

The nearest approved turbine (R1) at CGWF will be located approximately 24.1 km south east of this location. Given the topography the approved wind turbines of CGWF will not be visible. Therefore, the overall cumulative visual impact is assessed as **nil**.

5.5.2 Dwelling C37 – "Hidden Brook"

Dwelling C37 – "Hidden Brook" is located to the north-west of the proposed wind farm. Dwelling C37 is accessed from Cumbamurra Road which is an unsealed road. The nearest wind turbine (126) is approximately 2.5 km to the south-east.



Google aerial

Figure 5-36 shows the view north towards the dwelling and from the driveway.

Figure 5-36 View north from driveway to Dwelling C37 (635351E, 6159618S, 325m AHD)

The dwelling is located on a side of the valley. It is surrounded by scattered trees in addition to the trees within garden areas of the dwelling. The dwelling is set within a garden that consists of established native and exotic vegetation. Figure 5-37 shows the view south from the entrance towards the proposed wind farm. The living areas of the dwelling are oriented east and north overlooking the valley and the garden away from the wind farm.

Figure 5-37 View south from driveway to the entrance of Dwelling C37 (635338E, 6159644S, 327m AHD)

Existing vegetation within the garden will limit views from the dwelling to the proposed wind turbines.

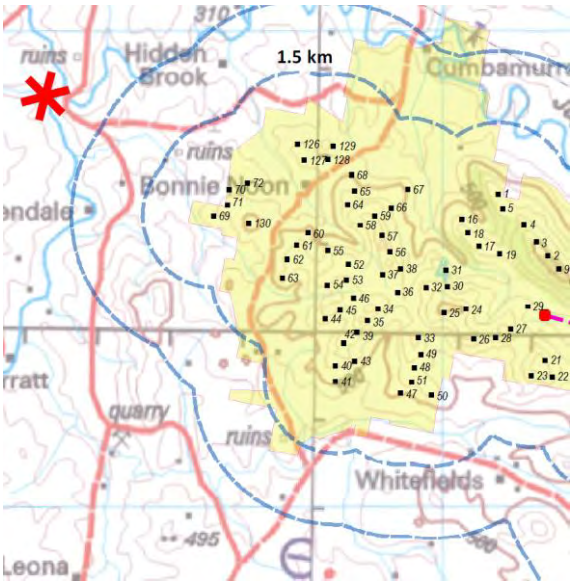
The nearest wind turbine is located 2.5 km to the south-east. At this distance the wind turbines "*highly visible and will usually dominate the landscape*". However, given the location of the dwelling in the valley and intervening vegetation there will be no views of the wind farm. Therefore, the overall visual impact is assessed as **nil**.

The nearest approved turbine (R1) at CGWF will be located approximately 25.9 km south east of this location. Given the topography the approved wind turbines of CGWF will not be visible. Therefore, the overall cumulative visual impact is assessed as **nil**.

5.5.3 Dwelling C39 – "Naranghi" (Viewpoint R5 and Dwelling #C54 in EA Application)

Dwelling C39 - "Naranghi" was visited during the preparation of LVIA. It has since been revisited to demonstrate the change in visual impact since the removal of several wind turbines in the west of the original EA Application.

Dwelling C39 is located to the north-west of the proposed wind farm. Dwelling C37 is accessed from Garratt Road which is an unsealed road. The nearest wind turbine (69) is approximately 4.3 km to the south-east.



The dwelling sits on the side of a hill near the Jugiong Creek. Figure 5-38 shows the location of the existing dwelling with Jugiong Creek visible to the right of this photograph.

Figure 5-38 View north towards Dwelling C39 (631525E, 6158499S, 297m AHD)

The existing dwelling is orientated to the east and north across the creek as shown in Figure 5-39.

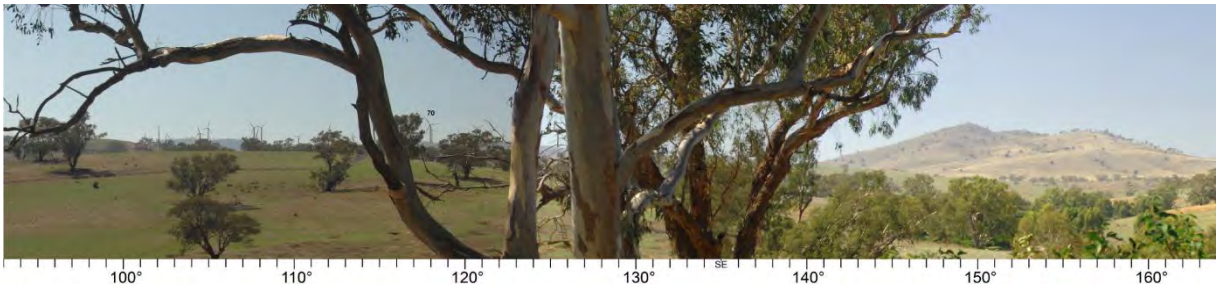
Figure 5-39 View north towards Dwelling C39 (631525E, 6158499S, 297m AHD)

From the rear yard there are views to the wind turbines to the south-east. Figure 5-40 shows the photomontage of the EA Application from this location.

Figure 5-40 EA Application – R5 - Photomontage (631542E, 6158496S, 313m AHD)

Since the EA Application, the wind turbine layout has been amended. Figure 5-41 shows the photomontage of the Current Proposal from the same location.

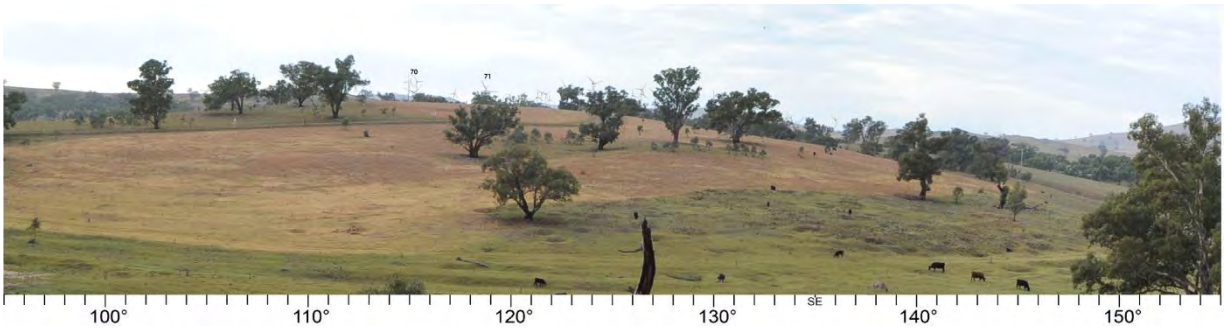
Figure 5-41 Current Proposal – RVP5 - Photomontage (Source YVWF)



Since the EA Application, the dwelling was revisited and a photomontage prepared to show the change in visual impact from the same property as shown in Figure 5-42. The photomontage shows the proposed wind turbines. Because of the views from the dwelling and the front verandah, the overall visual impact from this residence was assessed as **medium** within the EA Application. An A3 enlarged version of the photomontages comparing the EA Application and the Current Proposal is enclosed in Annex B.

Although the photomontage shows the turbines removed from the ridge on the right a similar group or wind turbines will be located to the left and behind the tree in Figure 5-42. As these wind turbines would be more visible if the vantage point was moved a little to the left, a similar level of visual impact is assessed for both the EA Application and the Current Proposal.

Figure 5-42 *60^{O} Photomontage of Current Proposal from the Dwelling C39 garden (631559E, 6158512S, 297m AHD) – (Source YVWF)*



The nearest wind turbine is now located 4.3 km south-east. At this distance the proposed wind turbines will be "*potentially noticeable-but will not dominate the landscape*". Overall the visual impact is assessed as **medium**.

The nearest approved turbine (R1) at CGWF will be located approximately 28.8 km south east of this location. Given the intervening topography the approved wind turbines of CGWF will not be visible. Therefore, the overall cumulative visual impact is assessed as **nil**.

5.5.4 Dwelling C67 – "Keliven"

Dwelling C67 – "Keliven" is located to the south of the proposed wind farm. It is accessed from Illalong Road which is a sealed road. The nearest wind turbine (74) is approximately 3.2 km to the north-west.

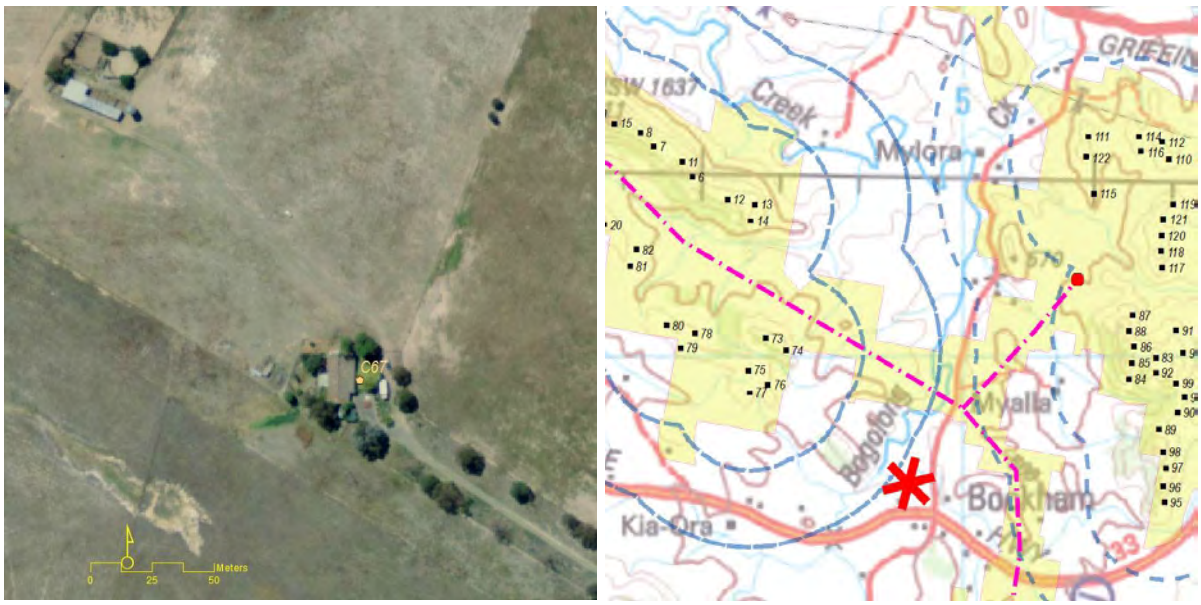


Figure 5-43 shows the view east towards the dwelling from the garden.

Figure 5-43 View west of Dwelling C67 from the garden (649306E, 6148460S, 447m AHD)

The dwelling is set within a garden that consists of some established vegetation. The living areas of the dwelling are oriented west towards the garden and the wind farm. The front porch is lined by grape vines.

Figure 5-44 shows the view south to the rear garden.

Figure 5-44 View north-west to north-east from Dwelling C67 garden (649306E, 6148460S, 447m AHD)

The garden in the rear is well established and has several mature trees and boundary vegetation. Together these will filter views of the wind farm from the rear of the dwelling.

Figure 5-45 shows the view north-west to north-east from the front garden towards the proposed wind farm. The proposed wind turbines will be visible from this location.

Figure 5-45 View north-west to north-east from Dwelling C67 garden (649306E, 6148460S, 447m AHD)

Figure 5-46 and Figure 5-47 show the photomontage of the proposed wind farm from the farm near the front garden.

Figure 5-46 Photomontage on view north-west near garden – (Source YVWF - 649308E, 6148466S, 447m AHD)

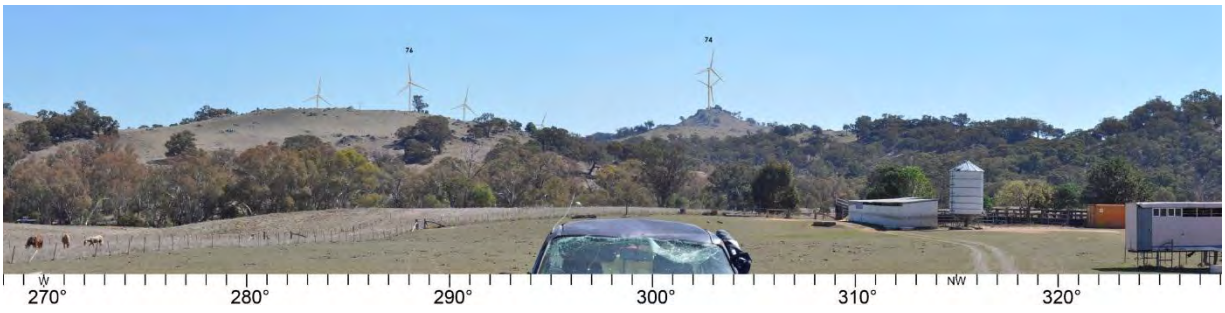
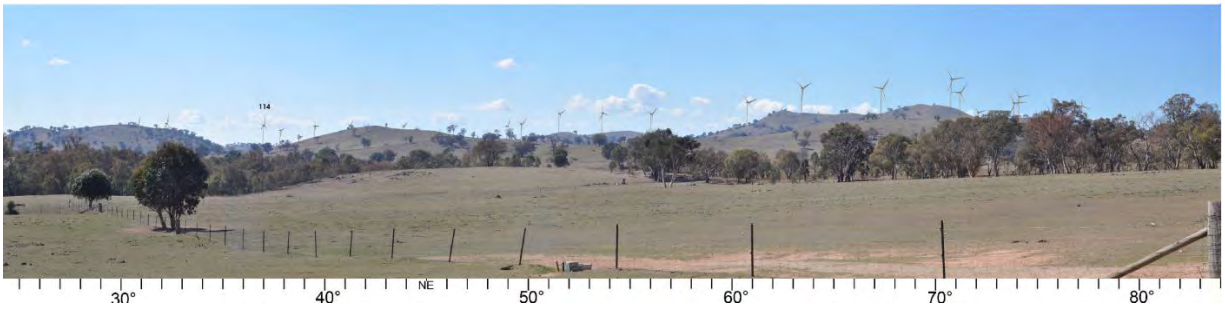


Figure 5-47 Photomontage on view north-east near garden – (Source YVWF - 649308E, 6148466S, 447m AHD)



The proposed wind turbines will be visible from this location. The nearest wind turbine is located 3.3 km to the north-east. At this distance the wind turbines "*Potentially noticeable-but will not dominate the landscape -*". The wind turbines will be partially or wholly screened from locations within the dwelling by intervening vegetation and topography. However, from the garden there are some locations where the wind turbines of Coppabella and Marilba will be visible. In recognising the wider view that may be potentially visible from areas adjacent of the dwelling, the overall visual impact is assessed as **medium** (from the dwelling) to **high** (garden).

If desired, mitigation is possible through planting along the perimeter of the garden. The planting can comprise of a mix of native and deciduous trees. Such vegetation upon establishment will assist in filtering views to the wind turbines from the garden and therefore bring the overall visual impact to a medium to low level.

The nearest approved turbine (R1) at CGWF will be located approximately 8.7 km south east of this location. Given the intervening topography and vegetation the approved wind turbines of CGWF will not be visible. Therefore, the overall cumulative visual impact is assessed as **nil**.

5.5.5 Dwelling G29 - "Bogo"

Dwelling G29 – "Bogo" is located to the south of the proposed wind farm. It is accessed from Burrinjuck Road which is a sealed road. The nearest wind turbine (95) is approximately 2.5 km to the north.

Figure 5-48 shows the view south-west to north-east towards the sheds and Dwelling G29.

Figure 5-48 View north-east towards farm sheds and Dwelling G29 (654726E, 6144682S, 557m AHD)

The dwelling is located further north of the sheds. Figure 5-49 shows the view north-east to the dwelling, near its entrance. The dwelling sits within an established garden with small trees. The hills are visible in the background.

Figure 5-49 View south-west to north-east towards Dwelling G29 (654656E, 6144827S, 554m AHD)

Figure 5-50 shows the view south towards the dwelling. The dwelling and its living areas are oriented to the north towards the wind farm.

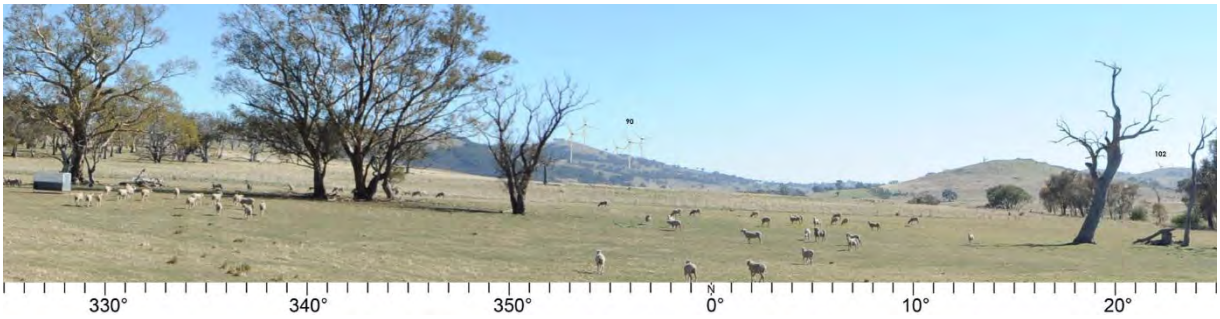
Figure 5-50 View south towards Dwelling G29 from garden (654689E, 6144862S, 554m AHD)

Figure 5-51 shows the view north-west to north-east towards the wind farm from the garden.

Figure 5-51 View north-west to north-east farm the garden towards the wind farm (654689E, 6144862S, 554m AHD)

The proposed wind turbines will be visible from this location as seen in Figure 5-52.

Figure 5-52 Photomontage – (Source YVWF)



The nearest wind turbine is located 2.5 km to the north-east and will be partially visible behind the trees to the left in Figure 5-52. At this distance the wind turbines "*highly visible and will usually dominate the landscape*".

The approved wind turbines of Conroys Gap Wind Farm will also be visible from this location. As a whole these will appear to be part of a single wind farm. Therefore, the overall visual impact for G29 is assessed as **medium**. The nearest approved turbine (S3) at CGWF will be located approximately 3.4 km east of this location. Cumulatively, the two wind farm will appear contiguous and indistinguishable. However, the resident will have a wider view to wind turbines. Therefore, the overall cumulative visual impact is assessed as **medium**.

Some mitigation is possible through selective planting in the north and east along the boundary fence that will filter views of the wind turbines. The overall visual impact will reduce and will be **medium** to **low** with planting.

5.5.6 Dwelling M22 – "Poverty Hill" (Viewpoint R3 and Dwelling #M22 in EA Application)

Dwelling M22 – "Poverty Hill" is located to the north of the proposed wind farm. It is accessed from Burly Griffin Way which is a sealed road. With the changes to the wind turbine layout within the Current Proposal, the nearest wind turbine (114) is approximately 2.5 km to the south.

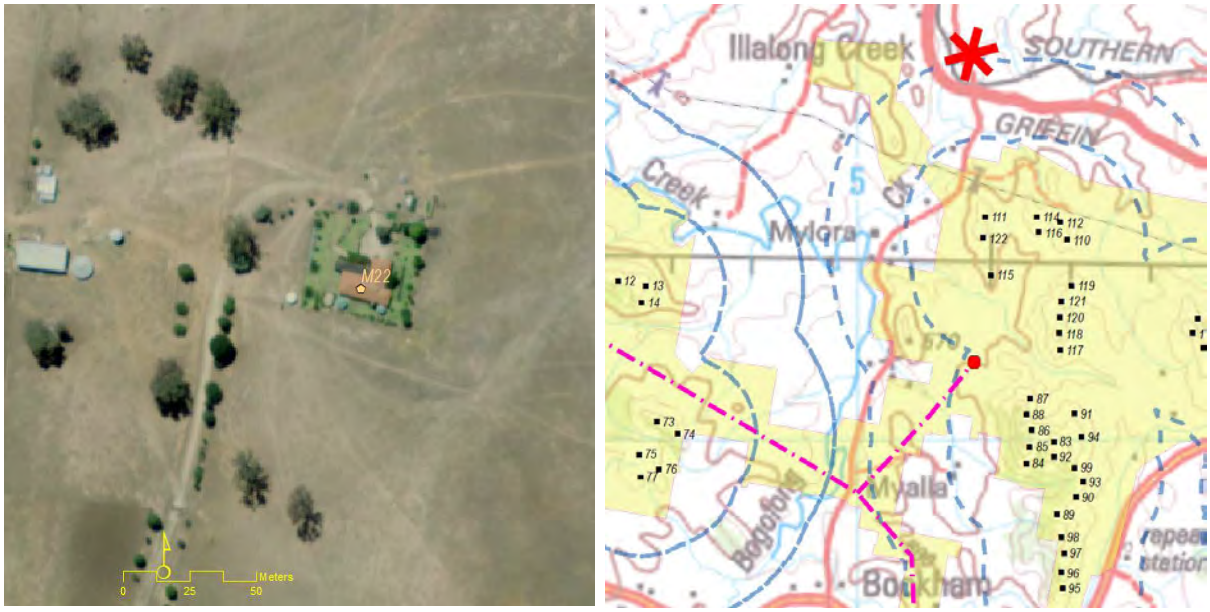


Figure 5-53 shows the view south-west to north-east towards the sheds and Dwelling G29.

Figure 5-53 View south towards Dwelling M22 and the wind farm from entrance (654110E, 6156808S, 492m AHD)

The dwelling is oriented north and overlooks the railway line. Figure 5-54 shows the view north-west to the rear of the dwelling. The dwelling sits within a garden with small shrubs.

Figure 5-54 View south-west to north-east towards Dwelling M22 (654117E, 61567787S, 492m AHD)

Figure 5-55 shows the view south towards the proposed wind farm.

Figure 5-55 View south towards Dwelling M22 from garden (654120E, 6156776S, 492m AHD)

The nearest wind turbine is located 2.5 km to the south and will be visible only from the rear garden. At this distance the wind turbines "*highly visible and will usually dominate the landscape*". However, given the dwelling and living areas are oriented north away from the wind farm the overall visual impact for Dwelling M22 is assessed as **low**. The level of impact remains consistent with that described within the LVIA for EA Application.

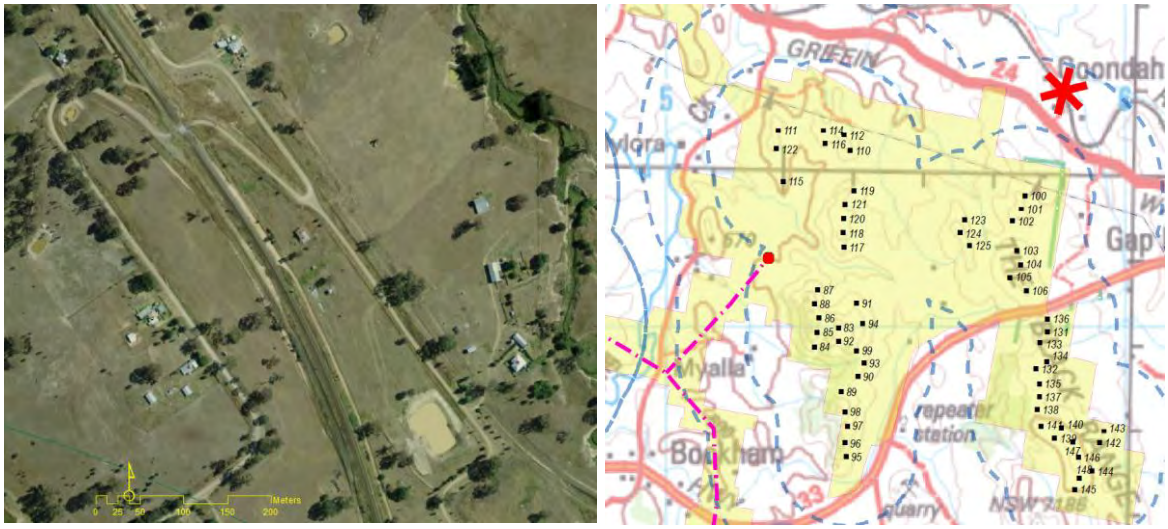
The nearest approved turbine (R1) at CGWF will be located approximately 10.7 km south east of this location. Cumulatively, however, the two wind farm will appear contiguous and indistinguishable. Therefore, the overall cumulative visual impact is assessed as **negligible**.

5.6 Residences in rural communities

Two rural communities, Goondah in the north and Bookham in the south are near the proposed wind farm. Typically these communities have several dwellings within a regular street network. The following section assesses the visual impact on these clusters of residences.

5.6.1 Goondah

Goondah is located approximately 2.3 km north of the proposed wind farm.



Some of the residences were visited during the preparation of LVIA. These include Dwellings M3, M4 both of which were assessed to have low visual impact. Figure 5-56 shows the view north-west from Goondah Road.

Figure 5-56 View north-west from Goondah Road (658583E, 6154938S, 548m AHD)

Most residences within Goondah are located further north of Figure 5-56. Goondah Road drops to a valley further north and east where other residences are located. These residents will have not view to the proposed wind turbines due to the intervening topography and therefore will have **low** to **negligible** visual impact.

The nearest approved turbine (R1) at CGWF will be located approximately 8.3 km south of this location. Cumulatively, the two wind farm will appear contiguous and indistinguishable. Therefore, the overall cumulative visual impact is assessed as **negligible**.

5.6.2 Bookham

Bookham is located approximately 3.9 km south-west of the proposed wind farm.

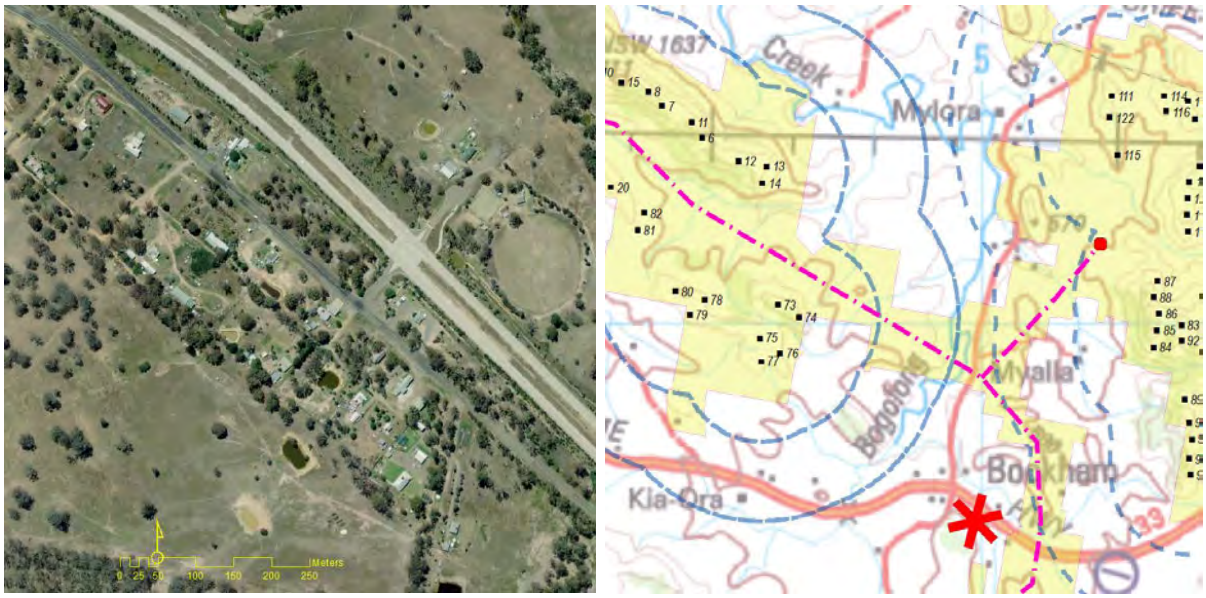


Figure 5-56 shows the view north from Illalong Road.

Figure 5-57 View north from Illalong Road (650122E, 6146345S, 469m AHD)

Residences within Bookham are with large rural allotments arranged in a grid. Most dwellings are set within landscaped gardens that comprise of mature trees. The foreground topography and vegetation will screen/ filter views towards the proposed wind farm. Therefore, for most residences within Bookham, given the intervening topography, vegetation and the distance, the overall visual impact of the proposed wind farm is assessed **low** to **negligible**.

The nearest approved turbine (R1) at CGWF will be located approximately 7.6 km east of this location. Cumulatively, the two wind farm will appear contiguous and indistinguishable. Therefore, the overall cumulative visual impact is assessed as **negligible**.

5.7 Change in visual impact on residential viewpoints addressed within the EA Application

Figure 5-58 shows the location of the residential viewpoints and the Current Proposal.

Figure 5-58 Residential viewpoints (with Current Proposal for wind farm)

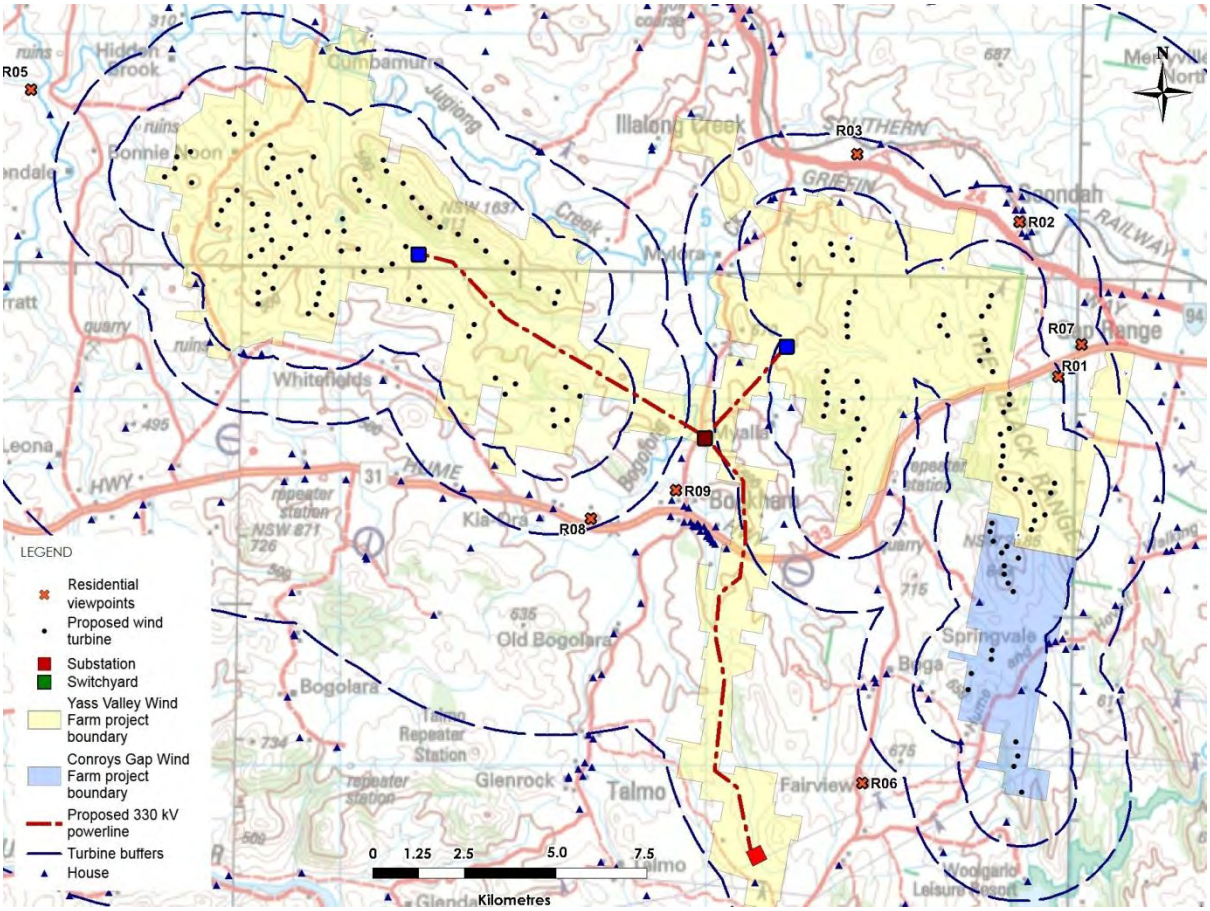


Table 5-4 compares the visual impact change between the EA Application and the Current Proposal from the residential viewpoints.

Table 5-4 Comparison summary assessment of residential viewpoints

House ID (EA VP#)	Distance and direction to (nearest wind turbine) EA Application	Overall visual impact EA Application	Distance and direction to (nearest wind turbine) Current Proposal	Overall visual impact Current Proposal
G14 (R1)	*1.3 km - S (MRL 53)*	*Low – without screening Existing screening*	*1.4 km - SW (136)*	*Low – without screening Existing screening*
M04 (R2)	*2.1 km - S (MRL 43)*	*Low – without landscape mitigation Screening may not be appropriate*	*2.1 km - SW (100)*	*Low – without landscape mitigation Screening may not be appropriate*
M22 (R3)	*2.2 km - S (MRL 05)*	*Low – without landscape mitigation*	*2.5 km - S (114)*	*Low – without landscape mitigation*

House ID (EA VP#)	Distance and direction to (nearest wind turbine) EA Application	Overall visual impact EA Application	Distance and direction to (nearest wind turbine) Current Proposal	Overall visual impact Current Proposal
		Screening may not be appropriate		*Screening may not be appropriate*
C83 (R4)	*10 km - S (COP01)*	*Negligible – without landscape mitigation Extensive existing screening*	*9.9 km - SW (129)*	*Negligible – without landscape mitigation Extensive existing screening*
C39 (R5)	*4.5 km - SE (COP74)*	*Medium - without landscape mitigation*	*4.3 km - SE (69)*	*Medium - without landscape mitigation*
G27 (R6)	*2.4 km to the South (CAR 01) 8.1 km to the North (MRL 39)*	*Low – without screening Existing screening*	*No turbines to the south. 7.7 km - N (95)*	*Not applicable Existing screening*
M8 (R7)	*2.3 km - S (MRL 53)*	*Negligible – Existing vegetation around gallery Medium – Bamboo garden without mitigation Low – Proposed eco village site*	*2.3 km – SW (136)*	*Negligible – Existing vegetation around gallery Medium – Bamboo garden without mitigation Low – Proposed eco village site*
C41 (R8)	*2.7 km - N (COP 68)*	*Low - without landscape mitigation*	*2.7 km – NW (77)*	*Low - without landscape mitigation*
C42 (R9)	*3.8 km - NW (COP 71)*	*Medium - without landscape mitigation*	*3.5 km – NW (76)*	*Medium - without landscape mitigation*
G11	*NA*	*Not assessed in EA*	*1.7 km-W (143)*	*Low – Existing vegetation and orientation of residence*
G16	*NA*	*Not assessed in EA*	*1.1 km-W (96)*	*Nil - from living areas Medium to Low - from driveway with landscape mitigation*
M20	*NA*	*Not assessed in EA*	*1.8 km-SW (100)*	*High - from living areas Medium to Low - with landscape mitigation*
M24	*NA*	*Not assessed in EA*	*1.9 km-SW (100)*	*Low - from living areas Low - with landscape mitigation*
M42	*NA*	*Not assessed in EA*	*1.1 km-S (114)*	*Nil - from living areas Low - from driveway with landscape mitigation*
C01	*NA*	*Not assessed in EA*	*2.7 km-NE (63)*	*Nil - from living areas Low - from driveway*
C37	*NA*	*Not assessed in EA*	*2.5 km-SE (126)*	*Nil*
C67	*NA*	*Not assessed in EA*	*3.3 km-NW (74)*	*Medium - from living areas High - from garden without landscape mitigation*
G29	*NA*	*Not assessed in EA*	*2.5 km-N (95)*	*Medium - from living areas Medium to Low - with landscape mitigation*
Goondah	*NA*	*Not assessed in EA*	*2.3 km-S (100)*	*Low to Negligible*
Bookham	*NA*	*Not assessed in EA*	*3.8 km-NE (95)*	*Low to Negligible*

The assessment of visual impact from residential properties remains unchanged from that assessed within the LVIA except for the reduction in impact from one residential property as discussed in residential viewpoint R6. In this instance, the nearest wind turbines were approximately 2.4 km to the south in the EA Application and these turbines, which were part of the Carrolls Ridge Precinct, have been removed. The nearest wind turbines are now some 7.7 km to the north.

5.8 Summary of residential visual impact

Of the six non-associated dwellings within 2 km of the nearest wind turbine, three of the dwellings have low (G14, M24 & G11) visual impact, two of these have high (M20 & G16) and one medium (M42) level of visual impact. For all dwellings that have high level of visual impact it is possible and desirable to minimise the impact through screen planting near the dwelling.

6 TRANSMISSION LINE ASSESSMENT

The DP&I have requested that an assessment of visual impacts be undertaken for the current transmission line route.

Given the proposed transmission line is located within the viewshed of the wind farm; the landscape units described with the LVIA remain relevant for the assessment of visual impacts of the proposed transmission line. In order to avoid duplication, please refer to the description of landscape units within the original EA application material.

The methodology for the landscape & visual impact assessment of the transmission line aligns with the methodology within the EA application for the wind farm application. The key methods in assessing the visual impact of the proposed transmission line are outlined below:

The viewshed and the of the transmission line

Define the viewshed of the transmission line and establish the Zones of Visual Influence based upon the parameters of human vision.

Quantitative analysis

Describe the implications of a Seen Area Analysis. The SAA is based on topography. It determines areas within the viewshed from where the transmission line may/not is visible.

Visual assessment from publically accessible locations

Viewpoints that are representative of views from publically accessible locations (usually along the road network) have been selected to assess the visual impact of the proposed transmission line and associated infrastructure.

Describe the visual impact assessment as a rating of the level of visual impact that results from modification to the landscape from proposed development.

6.2 The viewshed of the transmission line

The viewshed of the proposed transmission line is based on the overall height of the proposed transmission line poles and the parameters of human vision. Given that the overall height of the pole, which is up to a height of 45 m, the viewshed will extend to a distance of 5 km wherein a pole will take up 5% of the vertical field of view. Refer to Annex C for more detailed explanation.

Figure 6-1 *Vertical field of view*

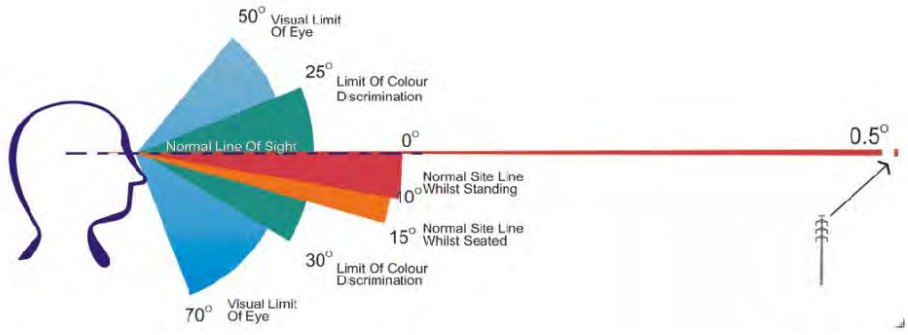


Table 6-1 lists the ZVI based on a 45 m high pole.

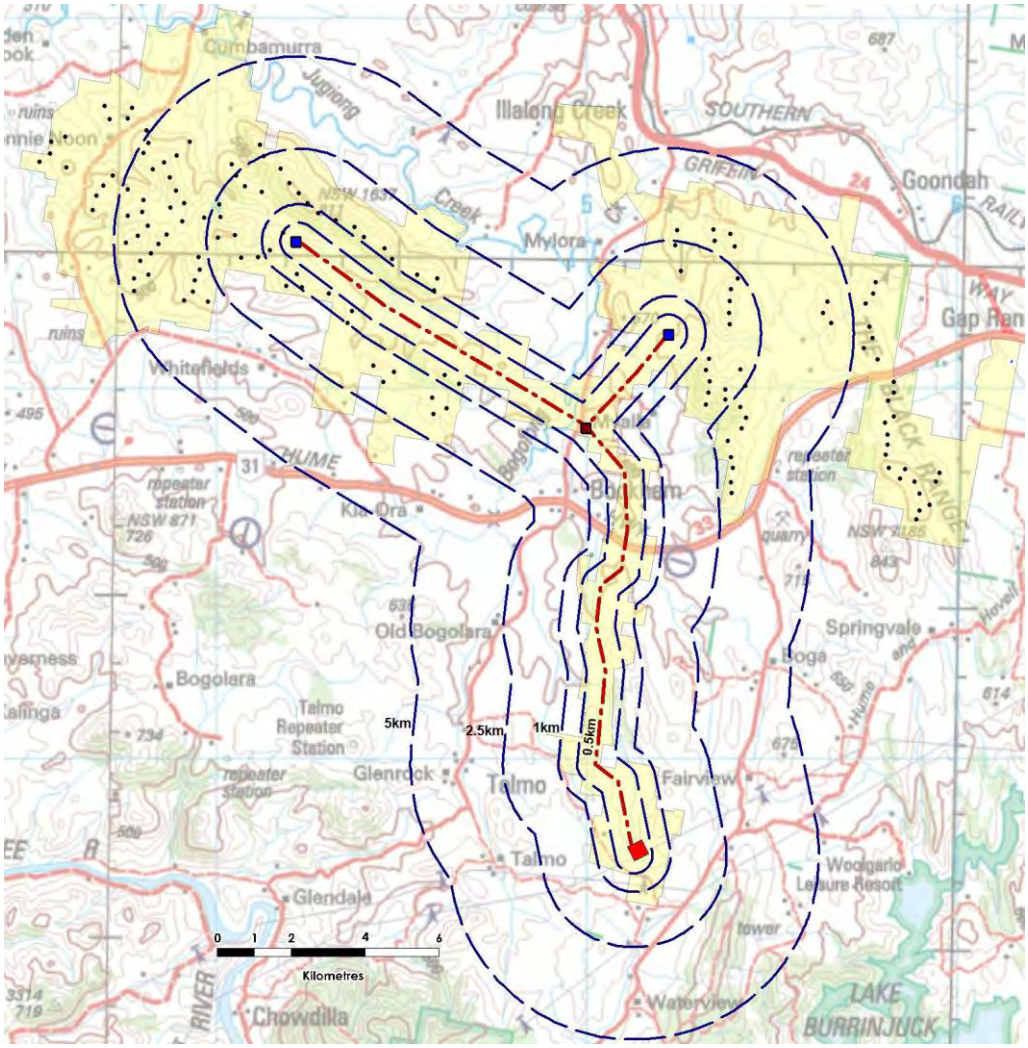
Table 6-1 Zones of Visual Influence

Distance of an observer to nearest pole	Zones of visual influence (based on a 45m high pole)
>5km	*Outside the viewshed*
2.5 km – 5 km	*Visually insignificant* *A very small element which are difficult to discern and will be indistinct in different lighting and weather conditions.*
1 km - 2.5 km	*Potentially noticeable, but will not dominate the landscape.* *The degree of visual intrusion will depend on the landscape sensitivity and the sensitivity of the viewer; however the proposed transmission line will not dominate the landscape.*
0.5 km – 1 km	*Highly visible and will usually dominate the landscape* *The degree of visual intrusion will depend on the placement of the proposed transmission line within the landscape and factors such as foreground screening.*
<0.5 km	*Will be visually dominant in the landscape from most viewing locations.* *The degree of visual intrusion will only be reduced by screening by nearby vegetation or buildings.*

6.3 The Zones of Visual Influence of the transmission line

Within the viewshed there are differing Zones of Visual Influence (ZVI). The ZVI for the proposed transmission line is shown in Figure 6-2.

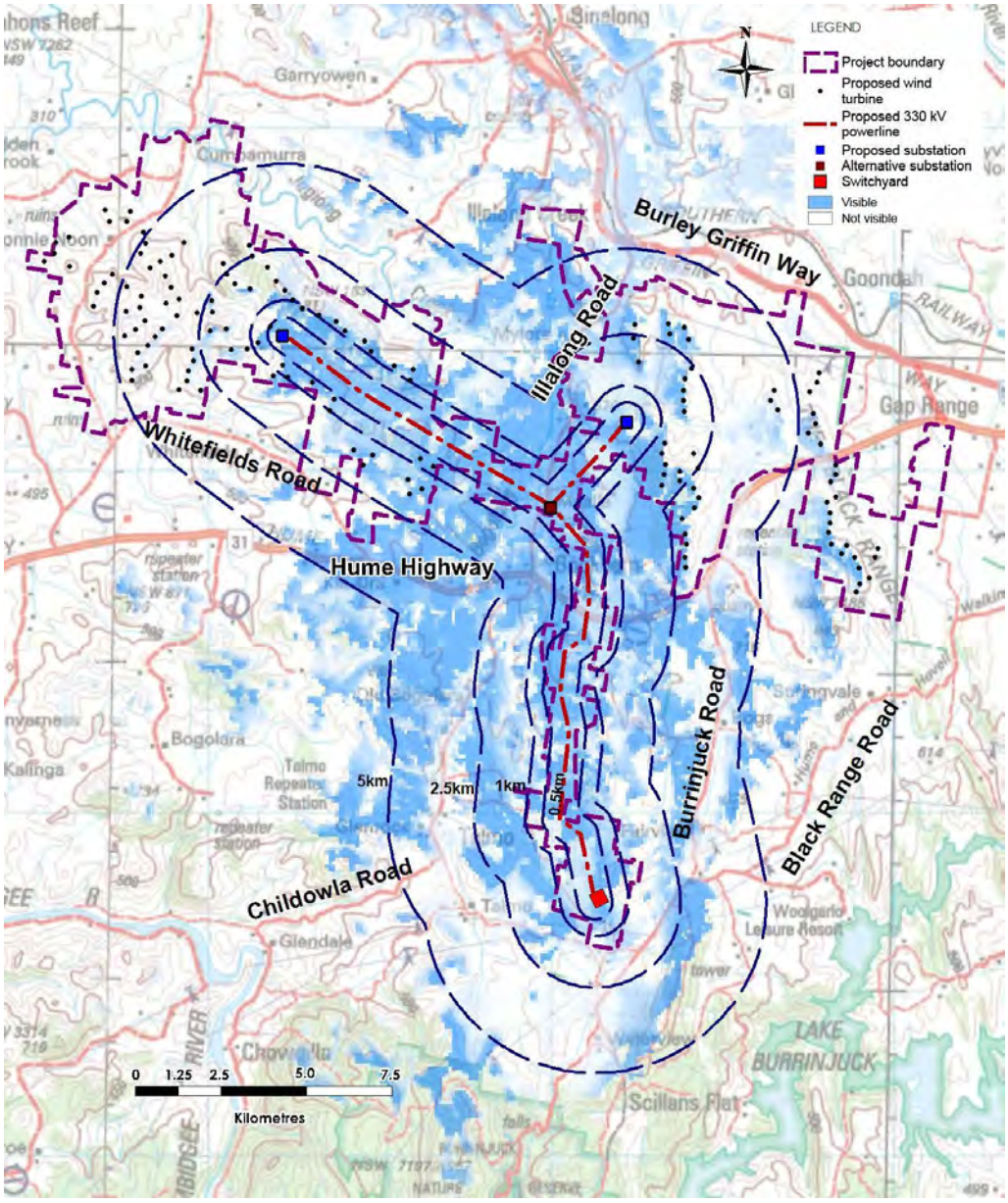
Figure 6-2 Zones of Visual Influence for the proposed transmission line



6.4 Seen Area Analysis of the transmission line

A Seen Area Analysis (SAA) has been undertaken to show from which of the surrounding areas a viewer can potentially see any part of poles as shown in Figure 6-3. It is stressed that this seen area analysis is based solely on topography and does not take into account the screening by vegetation or by buildings. An A3 enlarged version of the SAA undertaken for the transmission line is enclosed in Annex A.

Figure 6-3 *Seen Area Analysis of the transmission line (Source YVWF)*



The SAA shows that given the undulating nature of the surrounding landscape, the visibility of the transmission line is limited to the 2.5 km zone. There are very few locations beyond this distance that have visibility to any part of the proposed poles. Most sealed roads are located either outside the viewshed or at the outer zones of the viewshed.

6.4.1 Hume Highway

The proposed transmission line crosses the Hume Highway. The SAA shows that the transmission line may be visible for some distance to the east and west of Hume Highway near the crossing over of the Highway and along Illalong Road.

6.4.2 Black Range Road and Childowla Road

Black Range Road runs to the west of the proposed transmission line while Childowla Road to its east. The SAA also shows that there are very few locations on Black-Range Road (to the east) and Childowla Road (to the west) from where the proposed transmission line will be visible due to the intervening topography.

6.4.3 Limitations of a SAA

The above assessment does not take into consideration the screening offered by existing vegetation or buildings and is solely based on a topographical analysis. This is addressed through a qualitative assessment from a range of viewpoints in the next section of this report.

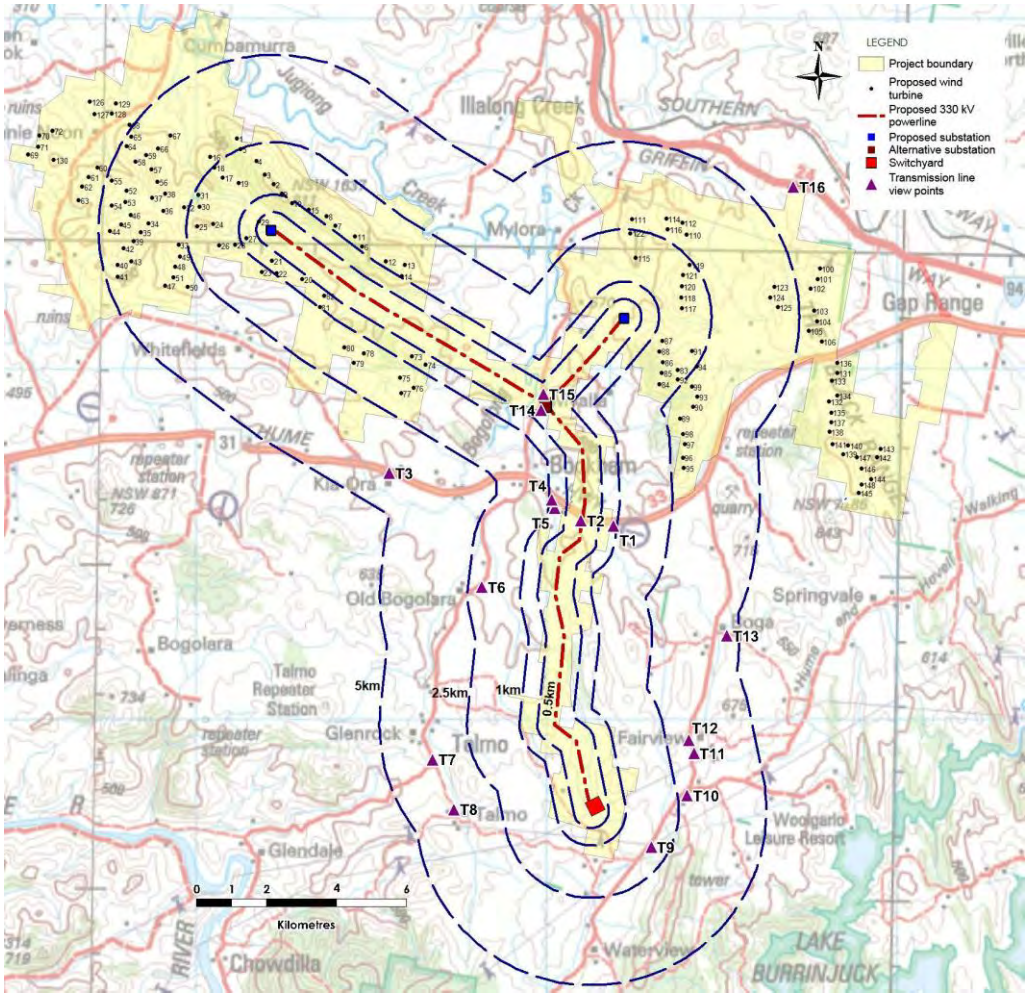
6.5 Assessment of visual impact from publicly accessible locations

The visual impact of the proposed transmission line is assessed based on

- views from publicly accessible locations and
- each of the non-involved residential viewpoints located within 1km of the transmission line.

These viewpoints have been selected as representative of a wide range of views from the surrounding landscape towards the proposed transmission line. Figure 6-4 shows the location of the selected viewpoints within the viewshed.

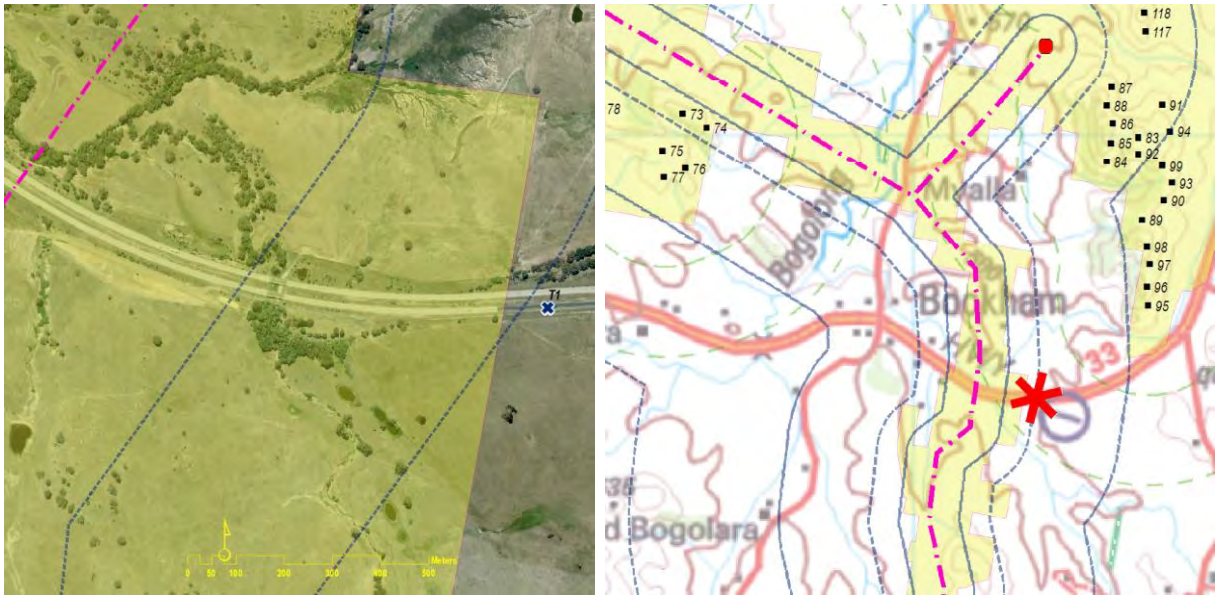
Figure 6-4 Publicly accessible viewpoints (proposed transmission line)



The assessment of the proposed transmission line has been undertaken from publicly accessible locations.

6.5.1 Viewpoint T1- Hume Highway

Viewpoint T1 is located on a rise in Hume Highway. The proposed transmission line, at its nearest, is approximately 1 km north-west of Viewpoint T1.



VP T1 (651885E, 6145610S, 489m AHD)

Figure 6-5 shows the view west to north-west from Hume Highway towards the proposed transmission line.

Figure 6-5 Viewpoint T1 – View west to north-west from Hume Highway towards the proposed transmission line

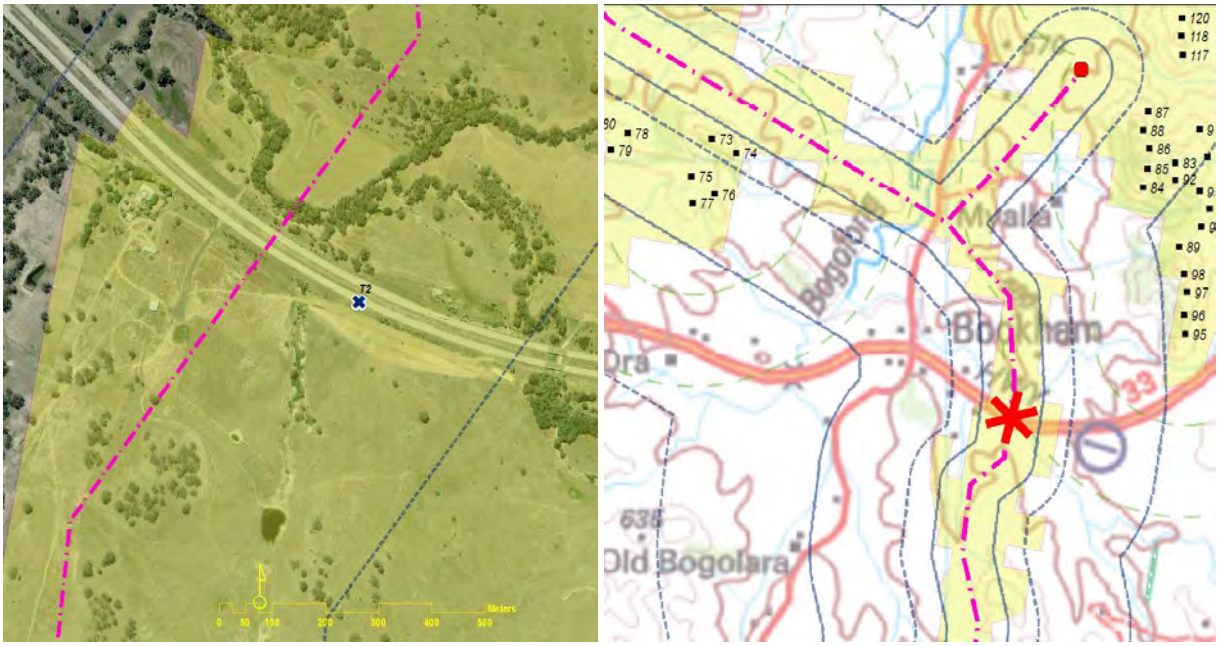
The view is characterised by gently undulating farmland and partly vegetated hills in the background. Roadside vegetation is well established to the north of the highway with some vegetation to the south. Existing power lines run parallel to the Highway in the south.

The proposed transmission line is located approximately 1 km to the west and near its crossing over the Hume Highway. The existing roadside vegetation will filter views of the proposed transmission line to the north-west.

Given the low landscape sensitivity, the distance and the presence of similar infrastructure, the overall visual impact is assessed as **low**.

6.5.2 Viewpoint T2 – Hume Highway

Viewpoint T2 is located near a valley on Hume Highway. The proposed transmission line, at its nearest, is approximately 0.2 km north-west of Viewpoint T2.



VP T2 (650954E, 6145760S, 470m AHD)

Figure 6-6 shows the view south-west to west from Hume Highway towards the proposed transmission line.

Figure 6-6 Viewpoint T2 - View south-west to west from Hume Highway towards the proposed transmission line

The highway is in a cutting and the embankment face is visible to the left in Figure 6-6. There is established roadside vegetation to the north of the highway.

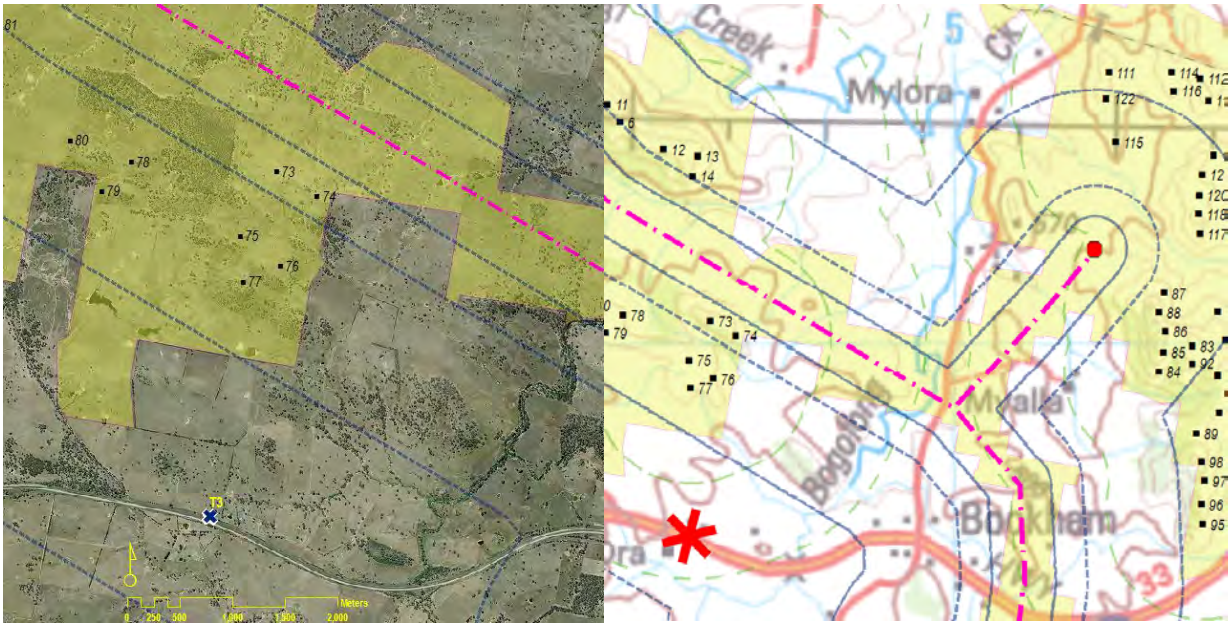
The proposed transmission line will cross the highway and will be visible from this location. Given the existing roadside vegetation, the proposed transmission line will only be partially visible in the north-west.

However, these transmission line poles will be a dominant element in the view. The transmission line poles are proposed on a farm landscape therefore the overall visual impact of the proposed transmission line is assessed as **low** to **medium**.

It is recommended that the given the existing topography, the transmission line poles are set equally apart on either side of the highway to minimise its impact.

6.5.3 Viewpoint T3 – Hume Highway

Viewpoint T3 is located on Hume Highway near the driveway entrance to a dwelling. The proposed transmission line, at its nearest, is approximately 3.2 km north-east of Viewpoint T3.



VP T3 (645483E, 6147100S, 506m AHD)

Figure 6-7 shows the view north-east from Hume Highway towards the proposed transmission line.

Figure 6-7 Viewpoint T3 – view north-east from Hume Highway towards the proposed transmission line

The hills are visible in the background. There are patches of vegetation near the creek and some scattered trees within the farmland. An existing power line, to the north side of the highway is visible to the left in Figure 6-7 and has been enlarged in Figure 6-8.

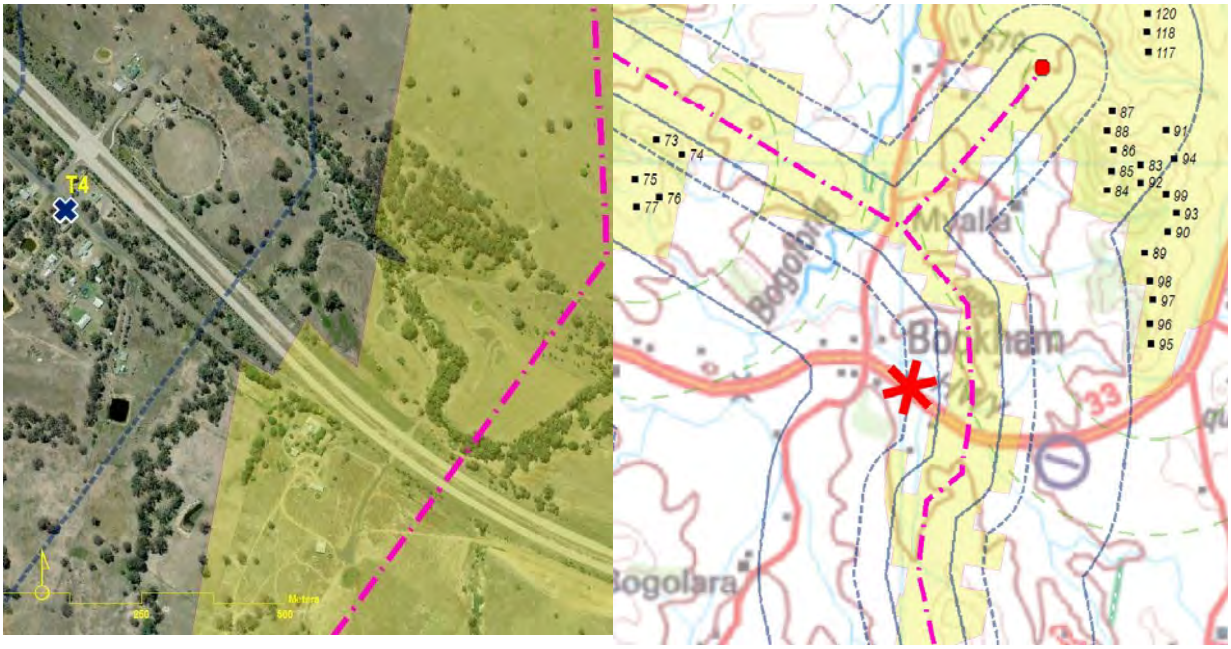
Figure 6-8 Enlarged photo showing existing power line

The proposed transmission line is located approximately 3.2 km north-east of this location and will be partially visible behind existing vegetation. The transmission line poles will be a small

element in the view. Therefore, given the distance, intervening vegetation, low landscape sensitivity and the presence of similar infrastructure the overall visual impact of the proposed transmission line is assessed as **low**.

6.5.4 Viewpoint T4 - Bookham

Viewpoint T4 is located on Illalong Road at Bookham. The proposed transmission line, at its nearest, is approximately 0.8 km south-east of Viewpoint T4.



VP T4 (605122E, 6146345S, 469m AHD)

Figure 6-9 shows the view south-east towards the proposed transmission line from Illalong Road.

Figure 6-9 Viewpoint T4 – view south-east from Illalong Road towards the proposed transmission line

The church is on the right and the public rest area to the left. Existing infrastructure such as power poles are visible in the foreground. The roadsides are densely vegetated with native trees.

The proposed transmission line is located approximately 0.8 km south-east of this location. The foreground vegetation will screen views to the proposed transmission line. Given the intervening vegetation, the overall visual impact of the proposed transmission line is assessed as **negligible**.

6.5.5 Viewpoint T5 – Garry Street

Viewpoint T5 is located on a rise along Garry Street, at the outskirts of Bookham and south of the Hume Highway. The proposed transmission line, at its nearest, is approximately 0.6 km south-east of Viewpoint T5.

VP T5 (650206E, 6146115S, 471m AHD)

Figure 6-10 shows the view north to south-east towards the proposed transmission line from Garry Street.

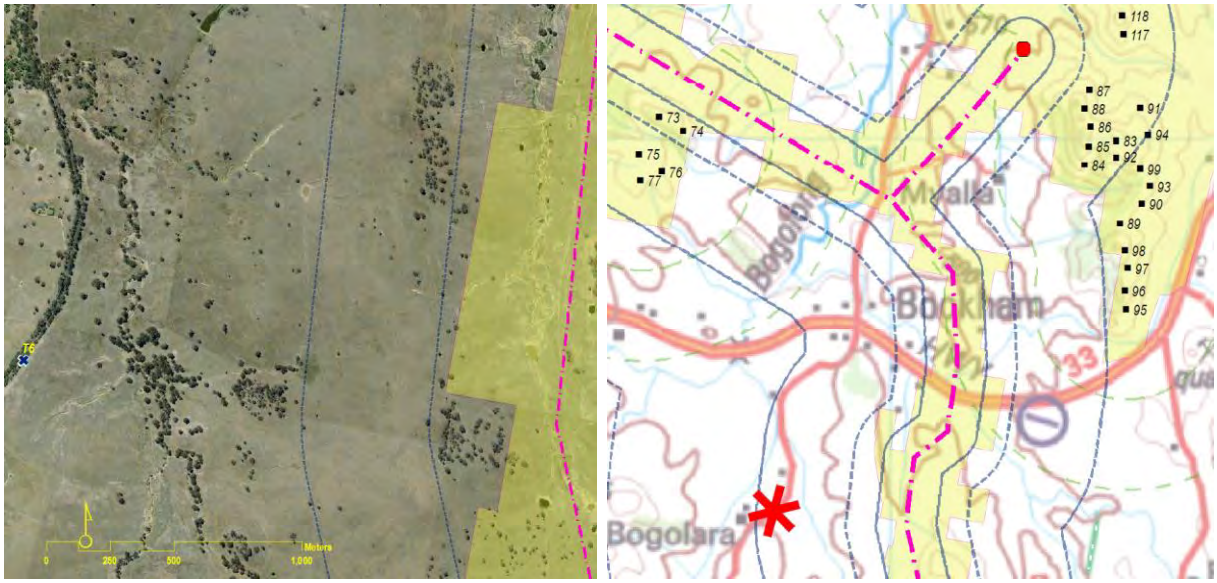
Figure 6-10 Viewpoint T5 – view north to south-east towards the proposed transmission line from Garry Street

The view is taken near a dwelling. Existing power line is visible in the foreground of Figure 6-10. Most dwellings are within large allotments and set back from the road. The setbacks support established vegetation of both native and exotic species.

The proposed transmission line is located approximately 0.6 km south-east of this location and will be partially visible through gaps in vegetation. However, given the presence of similar infrastructure and the intervening vegetation, the overall visual impact of the proposed transmission line is assessed as **low**.

6.5.6 Viewpoint T6 – Childowla Road

Viewpoint T6 is located on a rise along Childowla Road, near a gap in roadside vegetation. The proposed transmission line, at its nearest, is approximately 2.1 km east of Viewpoint T6.



VP T6 (648125E, 6143860S, 490m AHD)

Childowla Road has established roadside vegetation of native tree for most of its length as shown in Figure 6-11.

Figure 6-11 Roadside vegetation on Childowla Road

Figure 6-12 shows the view north-east to south-east towards the proposed transmission line from Childowla Road.

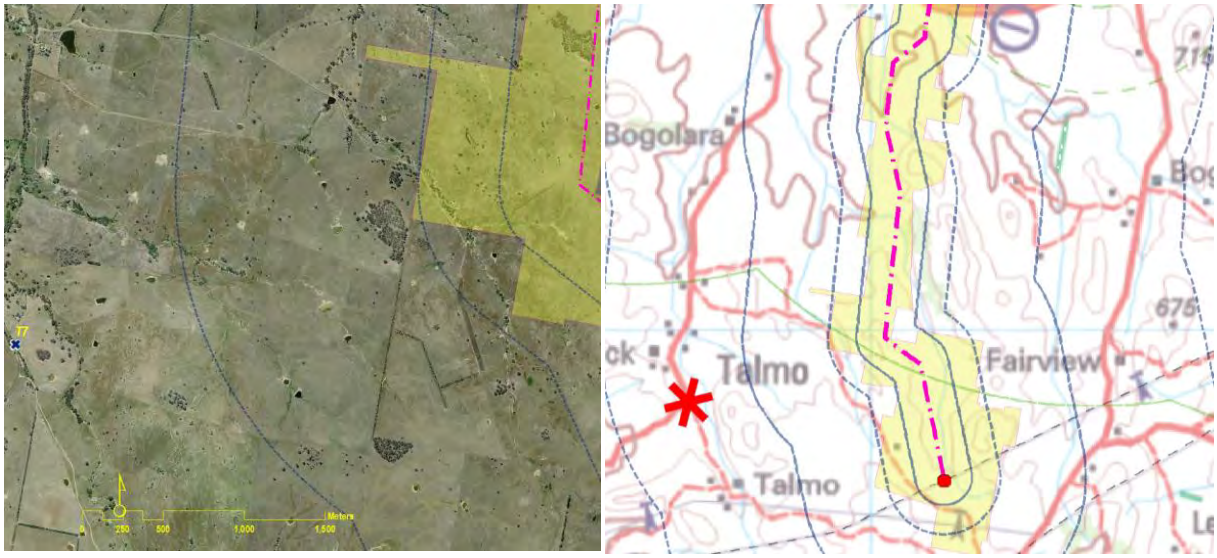
Figure 6-12 Viewpoint T6 – view north-east to south-east from Childowla Road towards the proposed transmission line

The view is taken near a gap in roadside vegetation. An existing power line that runs parallel to Childowla Road is visible in the middle of Figure 6-12.

The proposed transmission line is located approximately 2.1 km east of this location and will be partially visible from the gap in vegetation. However, the proposed transmission line poles will be a much smaller element in the view in comparison to the existing power poles visible in the foreground. Further, given the existing roadside vegetation, the views to the proposed transmission line will be fleeting for a road user. Therefore, the overall visual impact of the proposed transmission line is assessed as **low** to **negligible**.

6.5.7 Viewpoint T7 – Childowla Road

Viewpoint T7 is located on Childowla Road, near a gap in roadside vegetation. The proposed transmission line, at its nearest, is approximately 3.7 km north-east of Viewpoint T7.



VP T7 (647329E, 6137515S, 551m AHD)

Figure 6-13 shows the view north-west to south-east towards the proposed transmission line from Childowla Road.

Figure 6-13 Viewpoint T7 - view north-west to south-east from Childowla Road

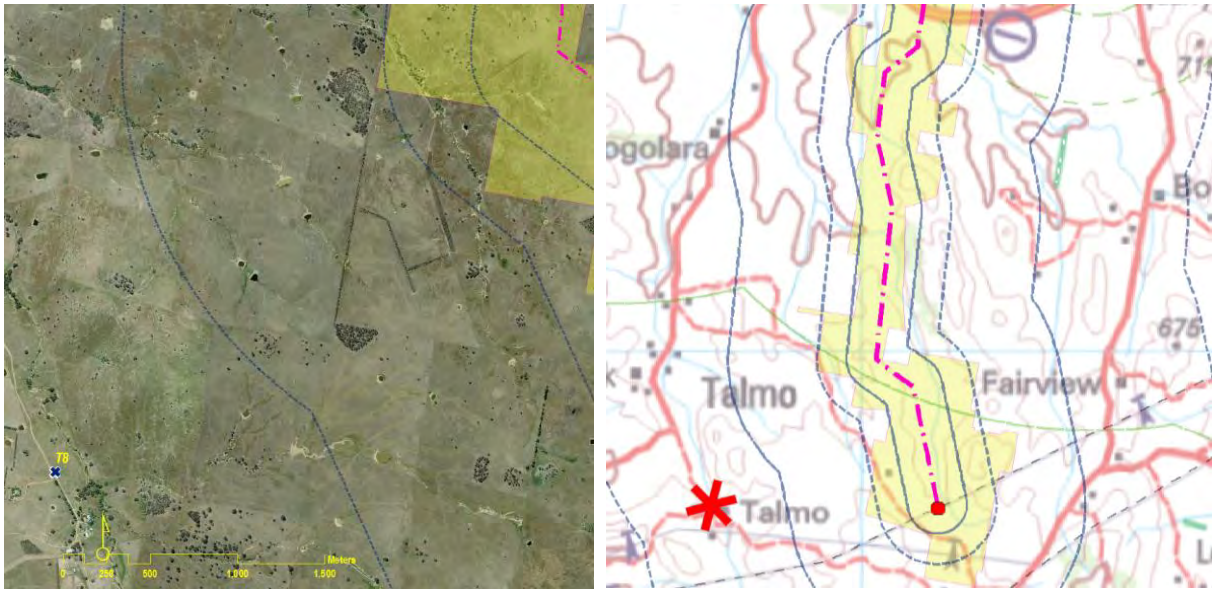
The view is taken near a gap in roadside vegetation. An existing power line that runs parallel to Childowla Road is visible in the middle of Figure 6-13.

The proposed transmission line is located approximately 3.7 km north-east of this location and will be a small element in the landscape if visible. Given the distance, intervening topography and presence of similar infrastructure the overall visual impact of the proposed transmission line is assessed as **negligible**.

6.5.8 Viewpoint T8 – Talmo Road

Viewpoint T8 is located on Talmo Road. Talmo Road is an unsealed road that provides access to several dwellings at Talmo.

The proposed transmission line, at its nearest, is approximately 4 km north-east of Viewpoint T8. Viewpoint T8 is 4.2km west of the proposed off-site substation.



VP T8 (646721E, 6138940S, 540m AHD)

Figure 6-14 shows the view east to south-east from Talmo Road towards proposed transmission line and off-site substation.

Figure 6-14 Viewpoint T8 - view east to south-east from Talmo Road

The view is to cleared farmland and hills. Existing power pole is visible in Figure 6-13. There is some roadside vegetation along Talmo Road. The intervening hills will screen any views of the proposed transmission line and the substation from this location.

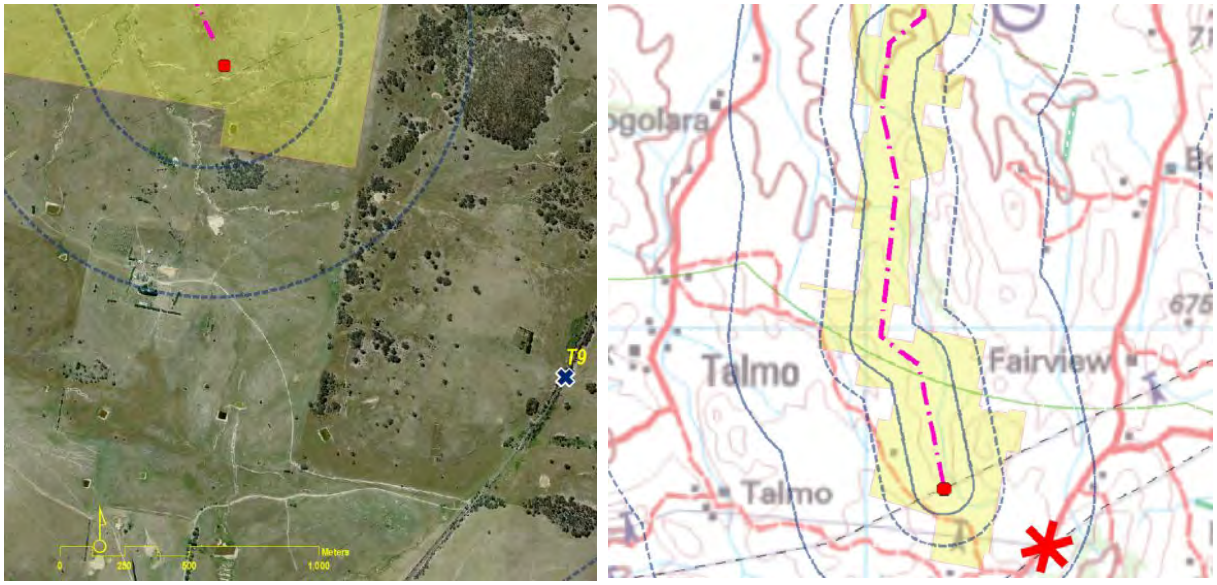
The proposed transmission line and the off-site substation are located over 4km. Given the intervening topography the facilities will not be visible as shown in the Seen Area Analysis (refer Figure 6-3).

Therefore, given the intervening topography the overall visual impact of the proposed transmission line and off-site substation are assessed as **nil**.

6.5.9 Viewpoint T9 – Burrinjuck Road

Viewpoint T9 is located on Burrinjuck Road. The proposed transmission line and off-site substation, at its nearest, are approximately 1.9 km north-west of Viewpoint T9. Viewpoint T9

will be one of the nearest publicly accessible locations (in the south) to the off-site substation and transmission line.



VP T9 (652962E, 6136440S, 654m AHD)

Burrinjuck Road has established roadside vegetation. Figure 6-15 shows the view south-west to north-west from Burrinjuck Road towards the proposed transmission line and off-site substation. The view is from a gap in roadside vegetation.

Figure 6-15 Viewpoint T9 – view south-west to north-west from Burrinjuck Road

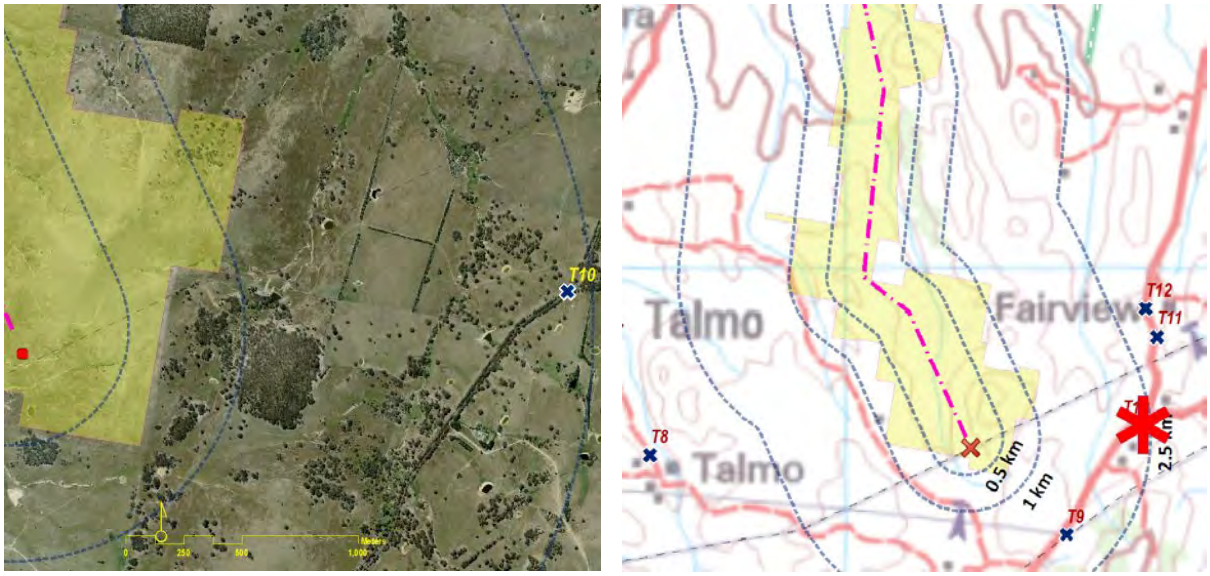
Figure 6-16 shows the view to the existing 330kV line and the 132kV branch line. The 132kV line is visible over the hill to the right in Figure 6-15.

Figure 6-16 Viewpoint T9 – view south-west to north-west from Burrinjuck Road

Due to the intervening topography the proposed transmission line and substation will not be visible from this location. The overall visual impact, therefore, is assessed as **nil**.

6.5.10 Viewpoint T10 - Burrinjuck Road

Viewpoint T10 is located on Burrinjuck Road. The proposed transmission line and off-site substation, at its nearest, are approximately 2.4 km west of Viewpoint T10.



VP T10 (653987E, 6137910S, 622m AHD)

Viewpoint T10 is located at a gap in roadside vegetation. Figure 6-17 shows the view south-west to north-east from Burrinjuck Road towards the proposed transmission line and off-site substation.

Figure 6-17 Viewpoint T10 - view south-west to north-east from Burrinjuck Road

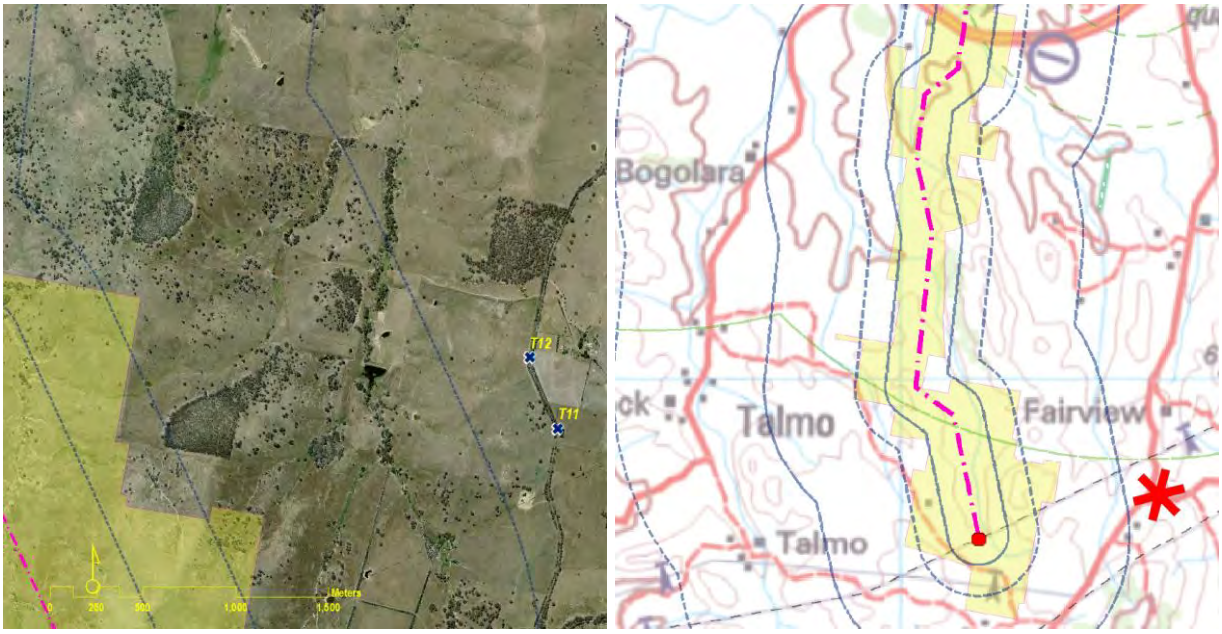
Patches of vegetation in the farmland as well as roadside vegetation is visible.

At their nearest both the proposed transmission line and the off-site substation are located over 2.4 km from this location. At this distance both facilities may be discernible but will be a minor element in the landscape.

Further, the proposed off-site substation will be screened by intervening topography. The proposed transmission line will be partially screened by the intervening topography and vegetation. Therefore, the overall visual impact is assessed as **nil** for the off-site substation and **negligible** for the proposed transmission line.

6.5.11 Viewpoint T11 - Burrinjuck Road

Viewpoint T11 is located on Burrinjuck Road. The proposed transmission line and off-site substation, at its nearest, are approximately 2.9 km south-west of Viewpoint T11.



VP T11 (654185E, 6138918S, 609m AHD)

Figure 6-18 shows the view south to west from a gap in roadside vegetation along Burrinjuck Road.

Figure 6-18 Viewpoint T11 - view south to west from a gap in roadside vegetation along Burrinjuck Road

The view is characterised by farmland and hills in the background. Patches of vegetation are also visible in the farmland area. Figure 6-20 shows the view south-west to the existing 330kV transmission line and lattice towers from the same location.

Figure 6-19 Viewpoint T11 - view south-east to existing 330kV transmission line

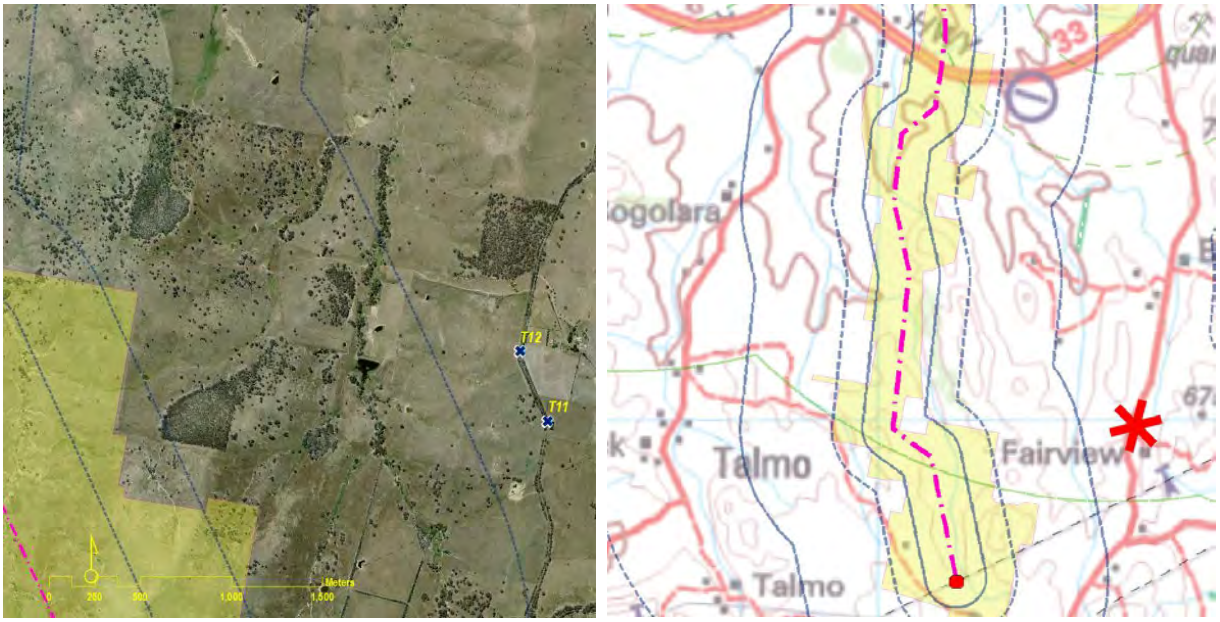
At their nearest both the proposed transmission line and the off-site substation are 2.9 km south-west of this location. At this distance both facilities will be a minor element in the

landscape. The hills in the middle distance will screen views of both the proposed off-site substation and the proposed transmission line.

Therefore, the overall visual impact of the off-site substation and the proposed transmission line is assessed as **nil**.

6.5.12 Viewpoint T12 - Burrinjuck Road

Viewpoint T12 is located on Burrinjuck Road. The proposed transmission line and off-site substation, at its nearest, are approximately 2.9 km west and south-west of Viewpoint T12.



VP T12 (654031E, 6139502S, 608m AHD)

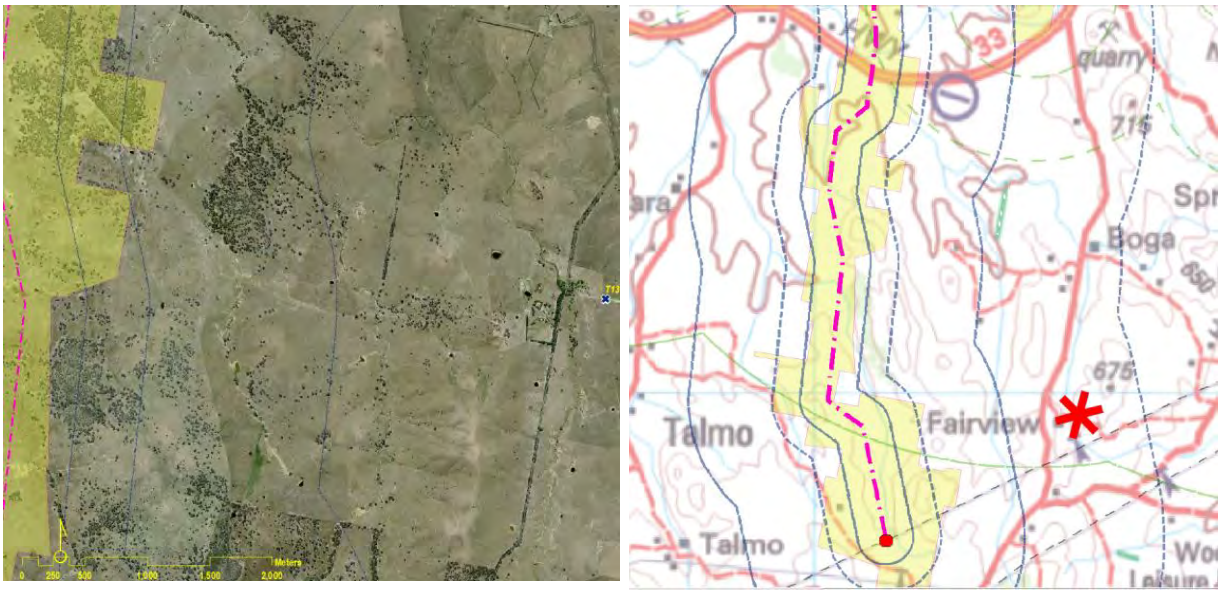
Figure 6-20 shows the view north-west on a rise on Burrinjuck Road towards the proposed transmission line.

Figure 6-20 Viewpoint T12 – shows the view north-west towards proposed transmission line from Burrinjuck Road

The view which is from a gap in roadside vegetation is to undulating farmland. The nearest visible sections of the proposed transmission line will be over 5 km north-west of this location. At this distance the proposed transmission line will be a very small element in the landscape. The overall visual impact of the proposed transmission line is assessed as **negligible**.

6.5.13 Viewpoint T13 – Sutton Grange Road

Viewpoint T13 is located on Sutton Grange Road which is an unsealed road. The proposed transmission line at its nearest is approximately 4.7 km west of Viewpoint T13. The off-site substation is approximately 5.9 km south-west of Viewpoint T13.



VP T13 (655123E, 6142475S, 538m AHD)

Figure 6-21 shows the view north-west towards the proposed transmission line from Sutton Grange Road.

Figure 6-21 ViewpointT13 - view north-west towards the proposed transmission line from Sutton Grange Road

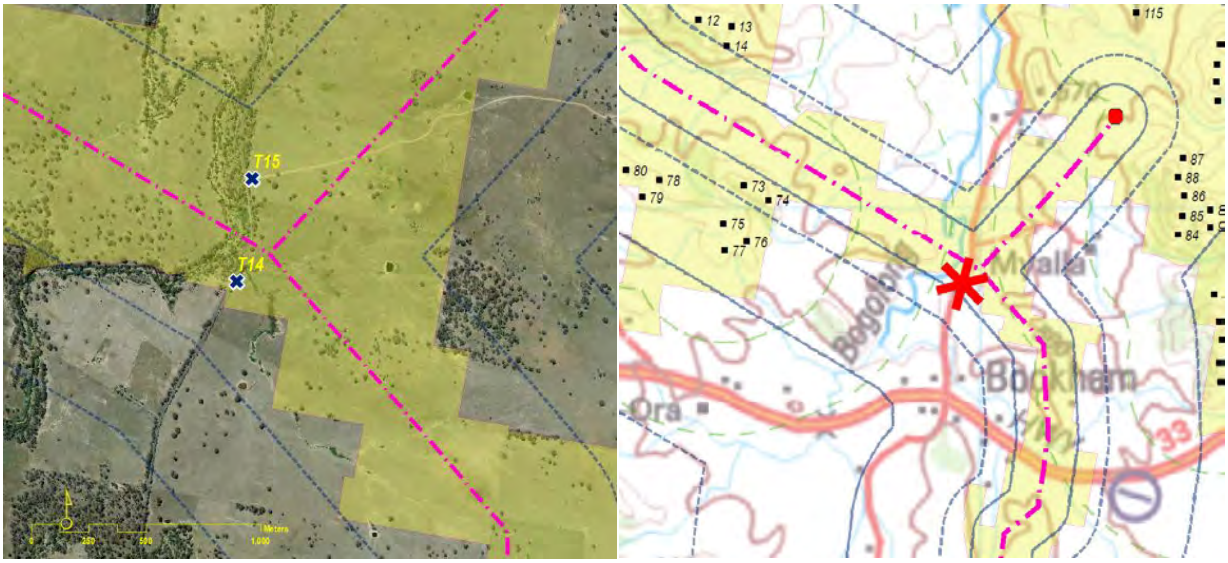
The dominant element in the view is the vegetation along the road and over the intervening hills. This intervening vegetation together with the topography will screen views of the proposed transmission line.

There may be some fleeting views to the transmission line to the north-west in the far distance from gaps in vegetation. However, the visible section of the proposed transmission line will be over 5 km from this location and will be a very small element in the landscape.

The overall visual impact of the proposed transmission line is assessed as **negligible**.

6.5.14 Viewpoint T14 – Illalong Road

Viewpoint T14 is located on Illalong Road. The proposed transmission line, at its nearest, is approximately 0.2 km north-east of Viewpoint T14.



VP T14 (649811E, 6148915S, 446m AHD)

Figure 6-22 shows the view to roadside vegetation on Illalong Road.

Figure 6-22 Existing vegetation along Illalong Road

There is established roadside vegetation along Illalong Road. The undulating topography and the vegetation screen views to the surrounding landscape where the transmission line is proposed.

Figure 6-23 shows the view north-east towards the proposed transmission line from an embankment on Illalong Road reserve.

Figure 6-23 Viewpoint T14 - view north-east towards the proposed transmission line from Illalong Road

Existing vegetation along a creek is visible to the left in Figure 6-23. The proposed transmission line branches east and west near this location.

This intervening vegetation together with the topography will screen views of the western branch of the transmission line. To the east there will be views the proposed transmission line across the paddocks.

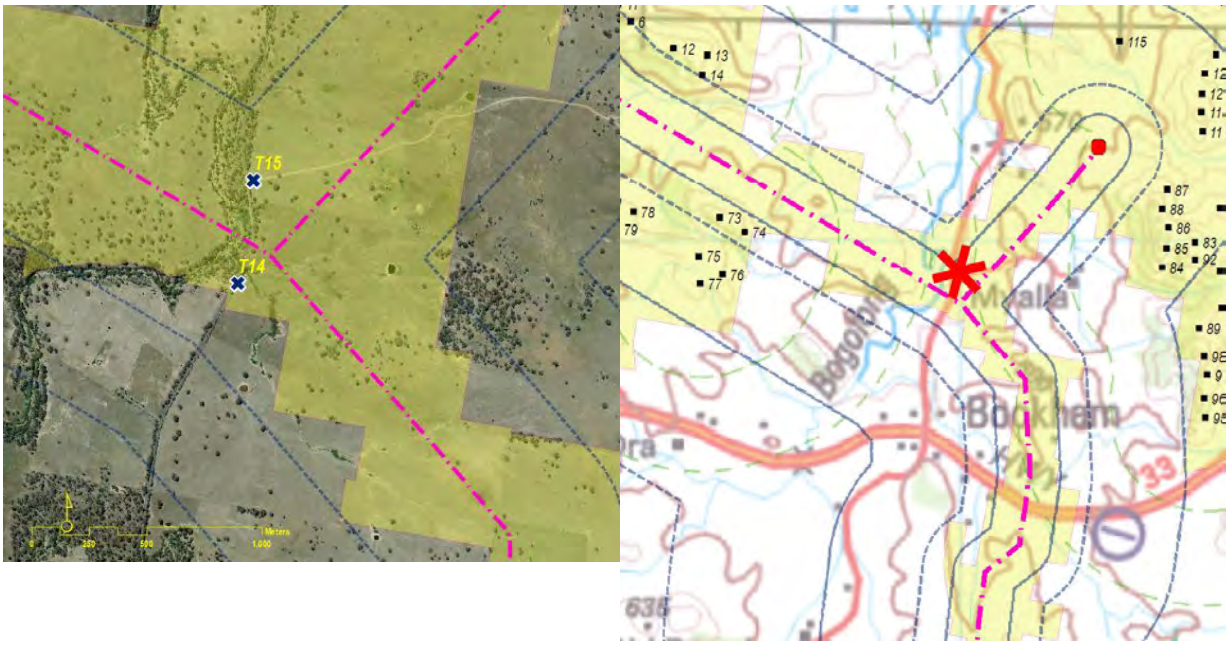
It is possible that instead of two on-site substations, a single substation could be located near the junction of the two branching transmission lines (Option 2). In such a case, the proposed substation will be visible on the hill beyond.

Should the on-site substation (Option 2) be located at the junction of the branch lines, the overall visual impact is assessed as low given only a fleeting view is available. It is also possible to provide perimeter planting to the substation facility that will effectively filter views of the facility from the surrounding locations. This is discussed in Section 6.8.

However, from the road the views of the transmission line and substation are limited by the topography and roadside vegetation. Therefore, the overall visual impact is assessed as **low**.

6.5.15 Viewpoint T15 – Illalong Road

Viewpoint T15 is located on Illalong Road. The proposed transmission line, at its nearest, is approximately 0.3 km south-east of Viewpoint T15.



VP T15 (649880E, 6149362S, 442m AHD)

Figure 6-24 shows the view from the driveway of the property towards Illalong Road.

Figure 6-24 Viewpoint T15 - view east from Illalong Road near the driveway

There is substantial existing vegetation along Illalong Road.

As discussed previously, an on-site substation (Option 2) may be located in this property. The western branch of the transmission line will be screened by existing roadside vegetation as can be seen to the left in Figure 6-25.

Figure 6-25 shows the view east towards the proposed transmission line from Illalong Road near the driveway to the property.

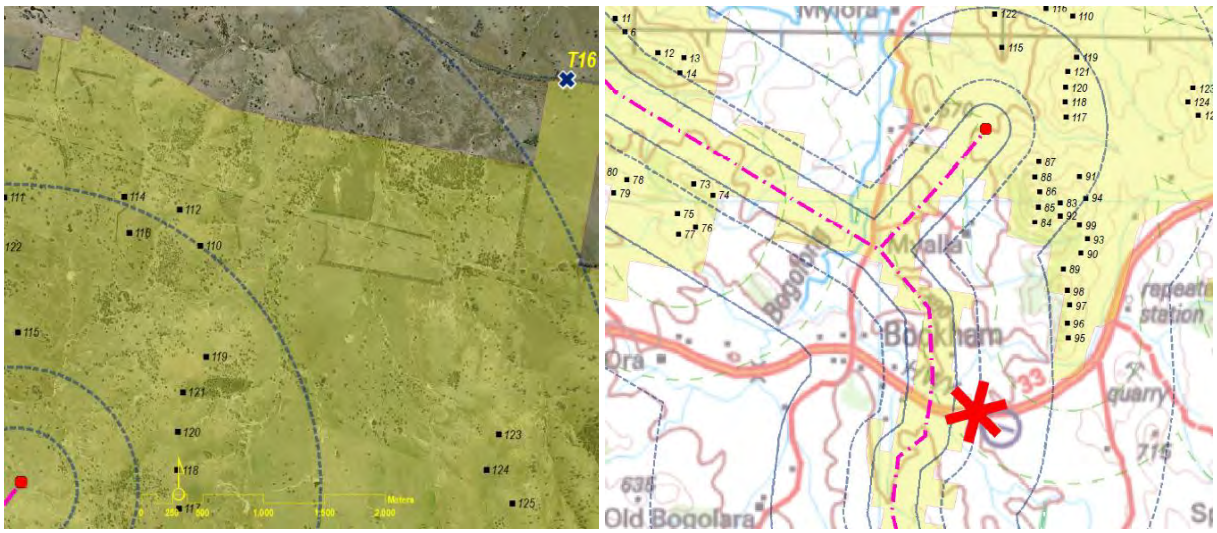
Figure 6-25 Viewpoint T15 - view east from Illalong Road near the driveway

The farmland has some scattered native trees with denser vegetation to the north. The proposed transmission line will be visible from this gap in vegetation. However, this view is fleeting given the roadside vegetation and topography. The overall visual impact of the proposed transmission line is assessed as **low** to **negligible**.

Similarly, there will be fleeting views to the on-site substation (Option 2) should it be located at the junction of the branch lines. The overall visual impact is assessed as **low** to **negligible**.

6.5.16 Viewpoint T16 – Burley Griffin Way

Viewpoint T16 is located on Burley Griffin Way. The proposed transmission line, at its nearest, is approximately 5.6 km south-west of Viewpoint T16.



VP T16 (657017E, 6155281S, 549m AHD)

Burley Griffin Way is the nearest main road to the wind farm. At its nearest it is located over 4.5 km north of the proposed transmission line. At this distance the proposed transmission line and the substations will be a minor element in the landscape.

Figure 6-26 shows the view south-west from a gap in roadside vegetation on Burley Griffin Way towards the proposed transmission line

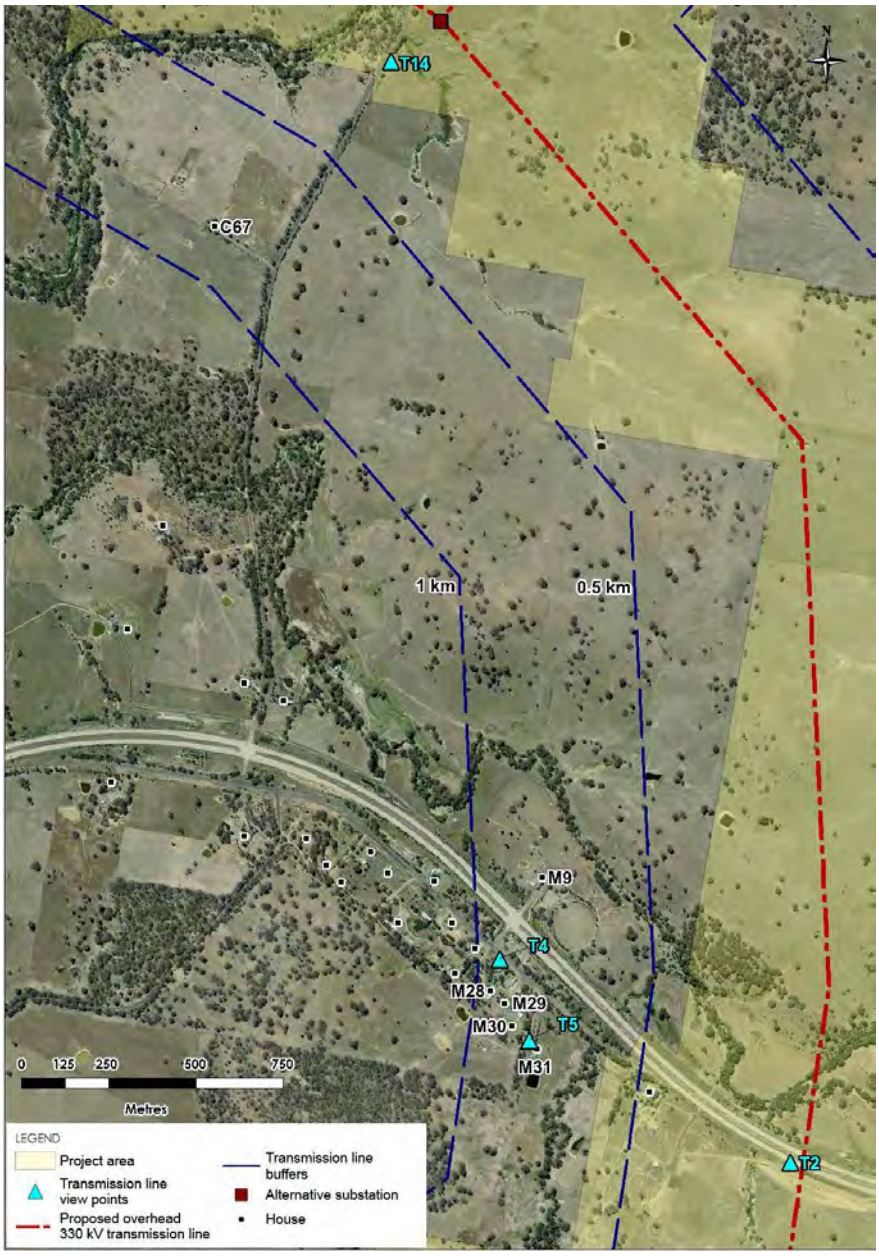
Figure 6-26 Viewpoint T16 - view south-west from a gap in roadside vegetation on Burley Griffin Way

Given the intervening topography, the proposed transmission line and potential substations will not be visible from this location. The overall visual impact is therefore assessed as **nil**.

6.6 Assessment of visual impact from residential locations

There are six non-involved residences within 1 km of the proposed transmission line. Figure 6-27 shows the location of the six residences and the viewshed of the proposed transmission line.

Figure 6-27 Map showing residential locations within 1 km of the proposed transmission line corridor

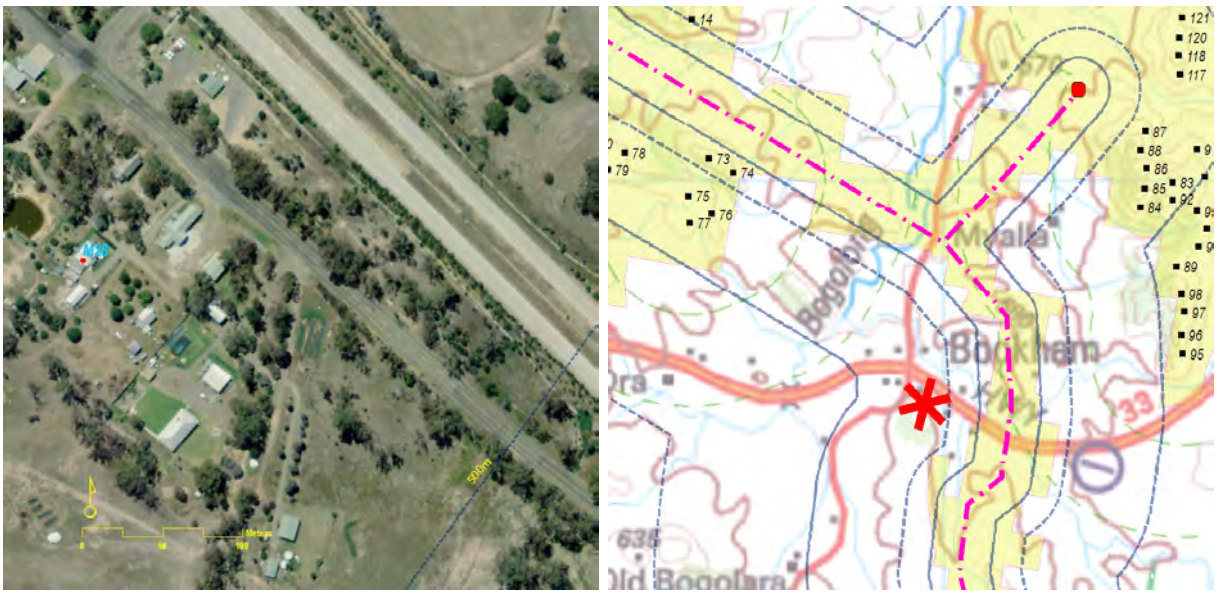


Of the six identified residences five residences, M31, M9, M30, M29 and M28 are located at the outskirts of Bookham and one residence, C67 is located on Illalong Road.

The following assessment of the visual impact on the six non-involved residences is solely based on information provided to ERM by YVWF. These assessments are based on photographs taken by YVWF on 31 March 2014 as well as photomontages of the proposed transmission line prepared by YVWF. An ERM representative has previously visited residences at C67 and M31 and visited the area for the assessment of visual impact from publicly accessible locations.

6.6.1 Dwelling M28

Dwelling M28 is located in Bookham approximately 790 m north west of the proposed transmission line. It is accessed from an unsealed road parallel to Drummond Street.



M28 (650106E, 6146276S, 472m AHD)

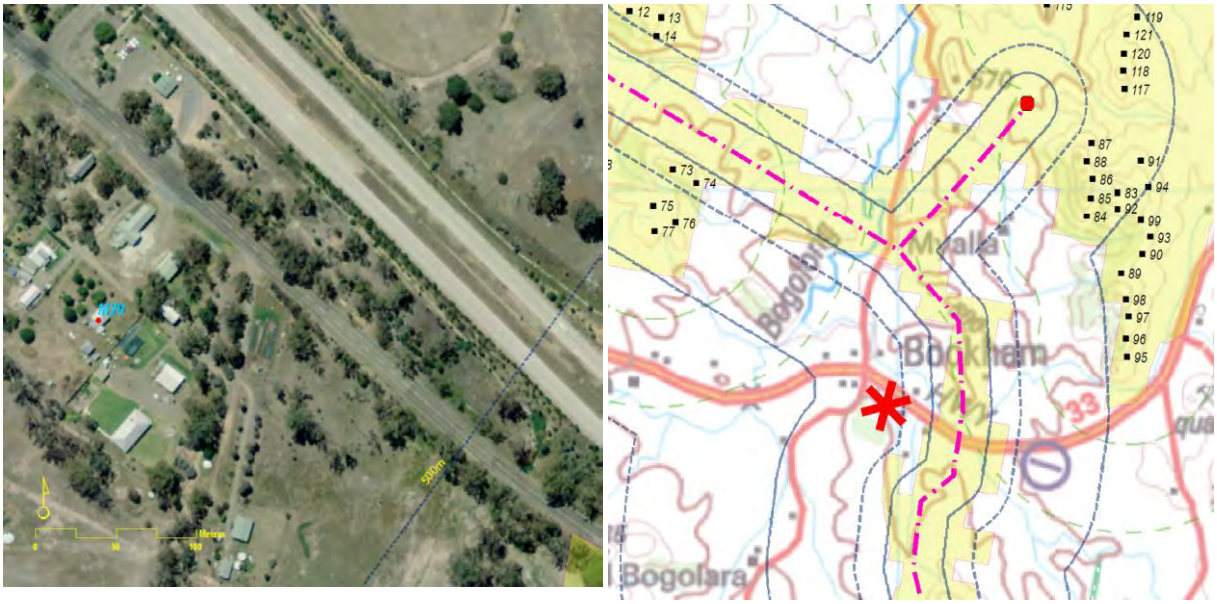
Figure 6-28 shows the view east from driveway towards the proposed transmission line.

Figure 6-28 View east from driveway of dwelling M28 towards the proposed transmission line (Source YVWF)

The existing power poles are visible in the foreground. Existing vegetation within adjoining properties and reserves will screen and filter views of the proposed transmission line. Overall the visual impact of the proposed transmission line is assessed as **negligible**.

6.6.2 Dwelling M29

Dwelling M29 is located in Bookham approximately 730 m north west of the proposed transmission line. It is accessed from an unsealed road parallel to Drummond Street.



M29 (650147E, 6146224S, 471m AHD)

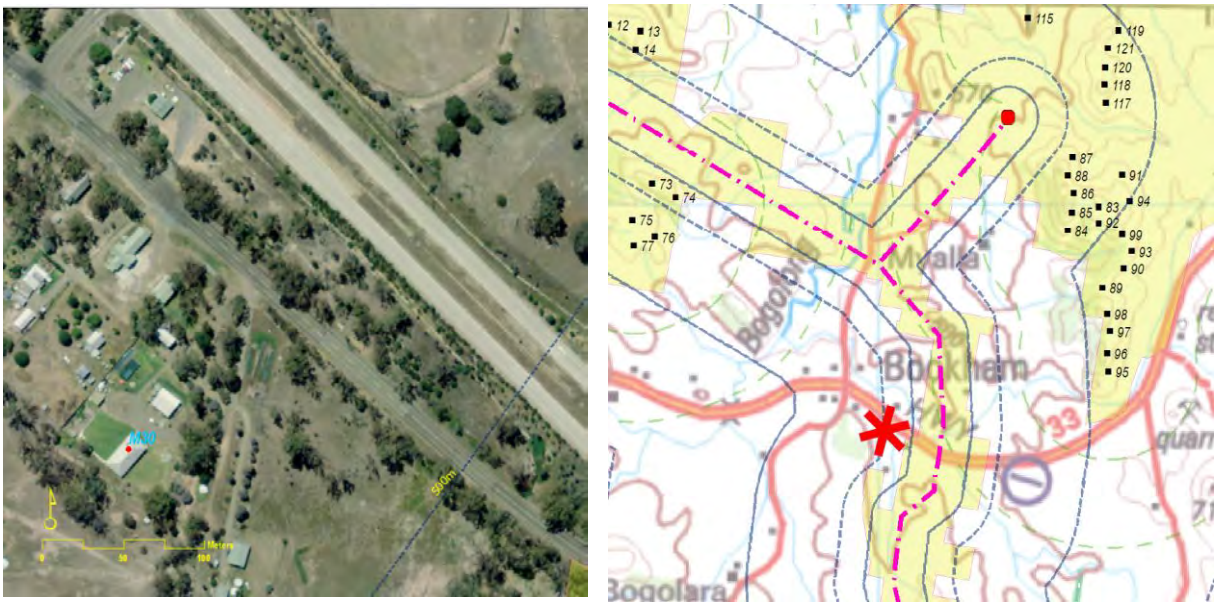
Figure 6-29 shows the view east towards the proposed transmission line from the rear garden.

Figure 6-29 View east from rear garden of dwelling M29 towards the proposed transmission line (Source YVWF)

The existing shed is visible to the left of Figure 6-29. The boundary fence has been planted with semi mature *Allocasuarina sp* trees that filter views. The views to the proposed transmission line will also be filtered by the intervening vegetation and built structures. Therefore, the overall visual impact for views from dwelling M29 is assessed as negligible.

6.6.3 Dwelling M30

Dwelling M30 is located in Bookham approximately 670 m north west of the proposed transmission line. It is accessed from an unsealed road parallel to Drummond Street.



M30 (650171E, 6146168S, 473m AHD)

Figure 6-30 shows the view east towards the proposed transmission line from the rear garden.

Figure 6-30 View east from driveway of dwelling M30 towards the proposed transmission line (Source YVWF)

The existing trees near the driveway and within the farm areas to the east will screen and filter views to the proposed transmission line. Therefore, the overall visual impact on views from dwelling M30 is assessed as **negligible**.

6.6.4 Dwelling M31

Dwelling M31 is located in Bookham approximately 570 m north west of the proposed transmission line. It is accessed from Garry Street which is an unsealed road.

M31 (650234E, 6146075S, 471m AHD)

Figure 6-31 shows the view east from garden of dwelling M31 towards the proposed transmission line.

Figure 6-31 View east from garden of dwelling M31 towards the proposed transmission line (Source YVWF)

The mature existing trees near the gully to the east will screen and filter views to the proposed transmission line. Therefore, the overall visual impact on views from dwelling M31 is assessed as **negligible**.

6.6.5 Dwelling M9

Dwelling M9 is located north of Bookham approximately 790 m west of the proposed transmission line. It is accessed from Hume Highway.

M9 (650260E, 6146571S, 465m AHD)

Figure 6-32 shows the photomontage north east from garden of dwelling M9 towards the proposed transmission line.

Figure 6-32 View north east from driveway of dwelling M9 towards the proposed transmission line (Source YVWF)

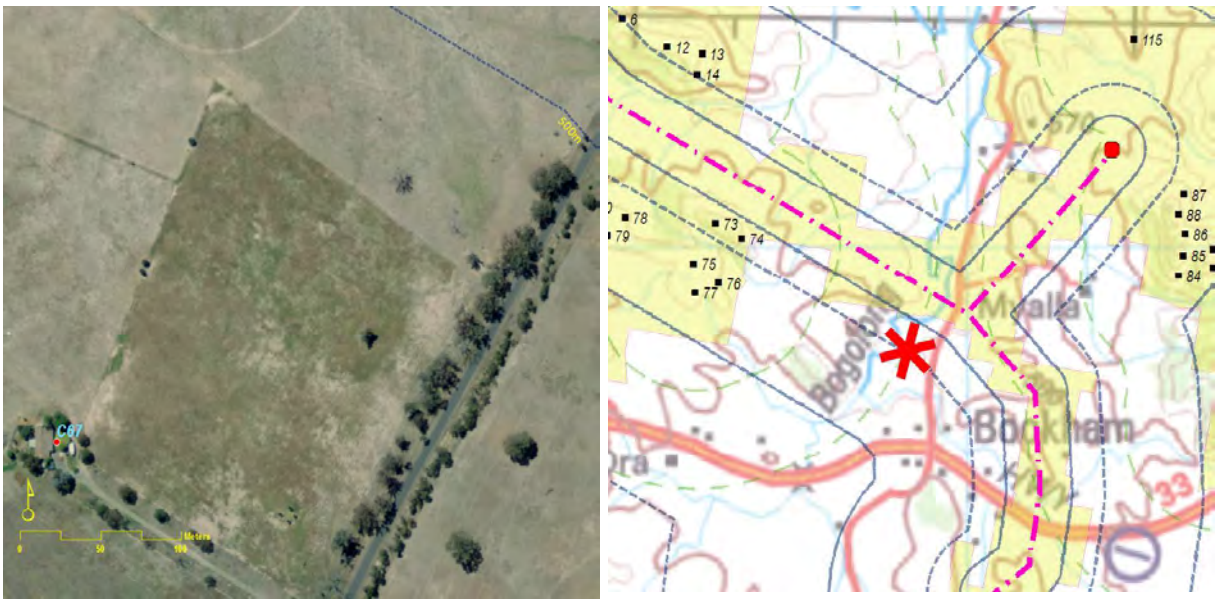
The proposed transmission line will be intermittently visible from this location as shown in Figure 6-32. The proposed wind turbines will also be visible in the distance. Overall, given the proximity to the transmission line, however the overall visual impact is assessed as **medium**.

Landscape mitigation

If desired, it is possible to undertake landscape mitigation through planting of a copse of native trees along the eastern fence of the dwelling. Upon maturing such plating will screen and filter views of the proposed transmission line and bring the overall visual impact to a low level.

6.6.6 Dwelling C67 – "Keliven"

Dwelling C67 – "Keliven" is located 820m to the south west of the proposed transmission line. It is accessed from Illalong Road which is a sealed road.



C67 (649308E, 6148466S, 447m AHD)

A description of the dwelling and surrounds is provided in in Section 5.5.4 of this report. Figure 6-33 shows the photomontage of the proposed transmission line as well as the proposed wind farm near the garden.

Figure 6-33 Photomontage on view north-east near garden – (Source YVWF - 649308E, 6148466S, 447m AHD)

The proposed transmission line will be partially visible from this location. At its nearest the proposed transmission line will be approximately 790m from this location. At this distance the transmission line poles will be "*highly visible and will usually dominate the landscape*". The transmission line and poles will be partially or wholly screened from locations within the dwelling by intervening vegetation and topography. Therefore, the overall visual impact of the proposed transmission line is assessed as **medium**.

It is noted however, given the visibility of the proposed wind turbines in the wider panorama, as discussed in Section 5.5.4, the overall visual impact was assessed to be **high** and collectively for the wind turbines and the transmission line, the assessment of the overall visual impact will remain **high**.

If desired, mitigation is possible through planting along the perimeter of the garden. The planting can comprise of a mix of native and deciduous trees. Such vegetation upon

establishment will assist in filtering views to the wind turbines from the garden and therefore bring the overall visual impact to a medium to low level.

Figure 6-34 *Transmission line visual impact assessment location - C67*

6.7 Summary of visual impact

The proposed transmission line will be visible from very few locations on the surrounding road network. To the south of the Hume Highway, the proposed transmission will have low to negligible visual impact given it sits between hill ranges and is setback from both main roads which are, Childowla Road (in the west) and Burrinjuck Road (in the east and south). Further, there is established roadside vegetation on both roads that screen and filter views towards the proposed transmission line.

Even from the local roads the visibility to the transmission lines is limited by topography. Given the presence of existing power lines in the area the overall visual impact of the proposed transmission line will be negligible.

Similarly, the proposed off-site substation is also located in a valley away from most roads and will have negligible to low visual impact.

6.7.1 Summary of transmission line visual impact on publicly accessible locations

To the north of the Hume Highway, the proposed transmission line branches to the Coppabella and Marilba precincts. In this area, most main roads lie outside the viewshed of the transmission line providing very few opportunities to view the proposed transmission line. Further, the proposed transmission line sits within an undulating hilly landscape which, screens views to the facility from surrounding locations.

Burly Griffin Way is the nearest main toad to the proposed transmission line in the north. But as discussed in Viewpoint T16, there are very limited views towards the proposed transmission line through the gaps in roadside vegetation. At its nearest, the transmission line is located more than 4.5 km from Burley Griffin Way. At this distance even if it is visible, the transmission line will be a minor element in the view. Overall the visual impact of the transmission line will be negligible for road users to the north.

North of Bookham, Illalong Road runs nearest to the proposed transmission line. Illalong Road has established roadside vegetation for most of its length providing very few avenues to the proposed transmission line or the substation facility at the alternative location (Option 2). Given the low visibility from most locations on Illalong Road the overall impact of the proposed transmission line will be low to negligible.

Only from a small section on the Hume Freeway, particular near its crossing over the highway, will the proposed transmission line will be apparent in the view. However, given the presence of the similar power lines in the area and other farm infrastructure, the overall visual impact will be low. To minimise the impact of the poles where the transmission line crosses the Hume Highway it is recommended that the poles be placed equally apart from the Hume Highway such that at no place these poles are located within 200 m of the Hume Highway.

Overall, the proposed transmission line is well located within the existing landscape.

6.7.2 Summary of the visual impact by transmission line on residences

A summary of the visual impact on the six non-involved residences located within 1 km of the proposed transmission line is listed in Table 6-2.

Table 6-2 Transmission line impact assessment on residential viewpoints within 1 km

House ID	Location	Distance to transmission line (m)	Direction to transmission line	Overall Visual Impact
M28	Bookham	960	East	Negligible
M29	Bookham	910	East	Negligible
M30	Bookham	880	East	Negligible
M31	Bookham	800	East	Negligible
M9	Bookham	800	East	Medium
				Low – if landscape mitigation is undertaken
C67	Illalong Road	840	North	Medium
				Low – if landscape mitigation is undertaken

Only from dwelling M9 and C67, will there be medium level of visual impact. Landscape mitigation of visual impact is achievable through selective planting to the foreground of the residences if desired.

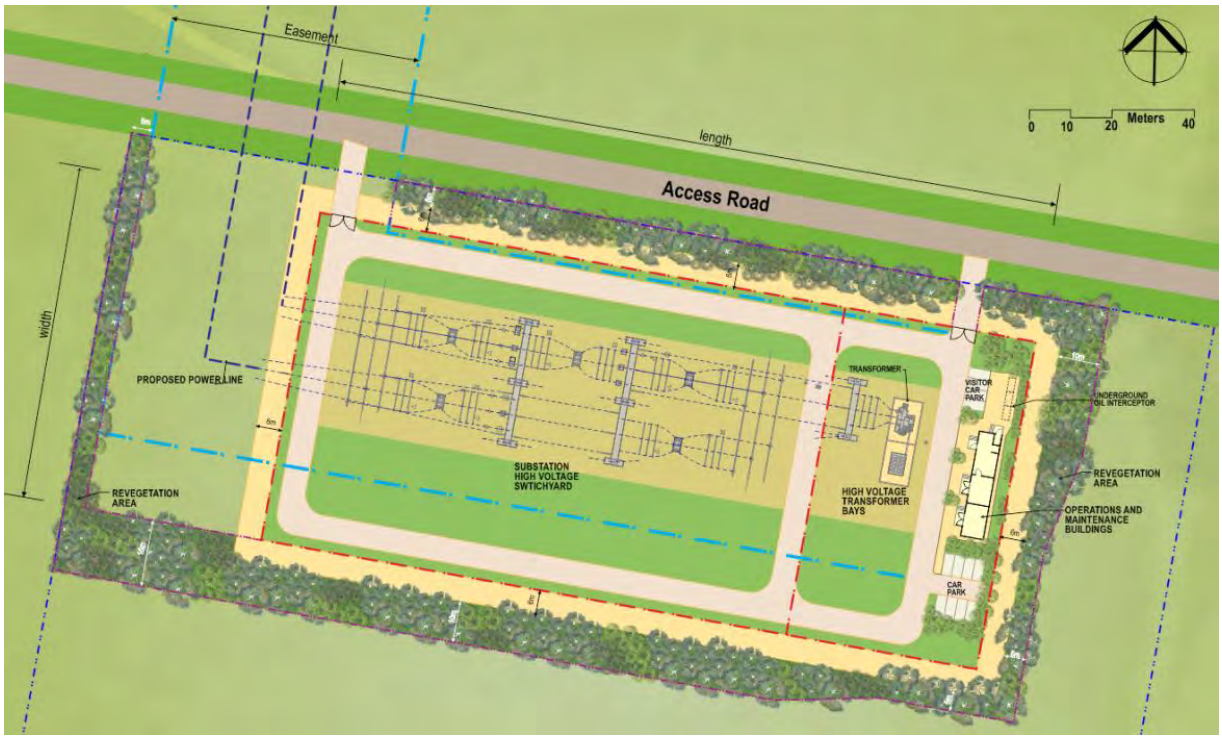
6.8 Mitigation measures

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

6.8.1 Perimeter planting to substations

Perimeter planting can be undertaken to substations. Such planting will effectively screen the facility from its immediate environment. Figure 6-35 illustrates an indicative landscape concept for the substation and switchyard.

Figure 6-35 Indicative plan showing perimeter planting for a substation

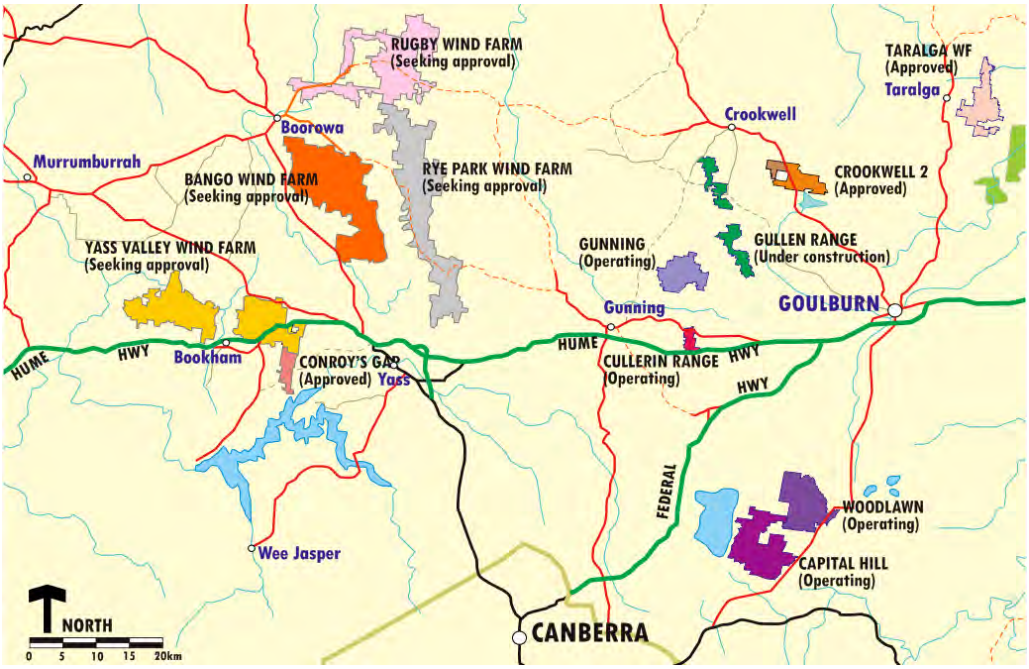


Indigenous vegetation can be planted within a revegetation area to the perimeter of the site. The revegetation area can vary in width such that upon establishment, this boundary planting will be similar in appearance to a remnant patch of vegetation or hedgerows commonly seen in the surrounding farming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

7 CUMULATIVE VISUAL IMPACT

The presence of multiple wind farms in an area can create a cumulative visual impact. Since the EA Application, several wind farms have been proposed in the region. Figure 7-1 shows the approved, proposed and existing wind farms in the vicinity of the Yass Valley Wind Farm.

Figure 7-1 Existing and proposed wind farms



Operating wind farms in the area include the Crookwell 1, Cullerin Range, Woodlawn, Capital Hill and Gunning wind farms. Conroys Gap Wind Farm is the nearest approved wind farm to the Yass Valley Wind Farm and comprises of 15 turbines. Apart from Conroys Gap Wind Farm (shown in Figure 7-1) other existing and approved wind farms lie more than 50 km further to the east. The Gullen Range Wind Farm is currently under construction and over 60km east of the Yass Valley Wind Farm proposal.

Several wind farms are also proposed in the area such as the Bango Wind Farm, Rye Park Wind Farm and the Rugby Wind Farm. Table 7-1 lists the existing and proposed wind farms in the vicinity of the Yass Valley Wind Farm and their location is shown in Figure 7-1.

Table 7-1 Existing and proposed wind farms in the area

Project and Location	Proponent	Project Capacity	No. of Turbines	Status
Bango Wind Farm	Wind Prospect	200 MW	100	Proposed
Capital WF, Bungendore	Renewable Power Ventures	126 MW	63	(Operational)
Conroys Gap WF	Origin Energy	30 MW	15	(DA approved)
Crookwell 1 WF, near Crookwell	Delta Electricity	4.8 MW Built 1997	8	(Operational)
Crookwell 2 WF, near Crookwell	TME	92 MW	46	(DA approved)

Project and Location	Proponent	Project Capacity	No. of Turbines	Status
Cullerin WF, near Goulburn	Origin Energy	30 MW	15	(Operational)
Gullen Range WF, near Gunning	Gullen Range Wind Farm P/L	Up to 278 MW	84	(Under construction)
Gunning WF, near Gunning	Delta Electricity	64 MW	32	(Operational)
Rugby Wind Farm	Windlab & Repower Australia	166 MW	52	Proposed
Rye Park Wind Farm	Epuron	200 MW?	100	Proposed
Taralga WF, near Taralga	RES Southern Cross	186 MW	62	(DA approved)
Woodlawn WF, near Tarago	Wind Energy JV	50 MW	25	(Operational)

7.1 Sequential or simultaneous visual impact

Cumulative visual impact can occur either by:

- sequential and simultaneous views to wind turbines from publicly accessible viewpoints or from private viewing locations, or
- changes to a communities or visitor's perception of a region due to the presence of multiple wind farms in an area.

Sequential and simultaneous visual impact is greatest from the main roads and highways. The following section examines the cumulative visual impact of the proposed Yass Valley Wind Farm and the nearest approved Conroys Gap Wind Farm (CGWF).

Cumulative visual impact is also a measure of the incremental change brought about by the presence in the landscape of the Conroys Gap Wind Farm. This cumulative change is in addition to the impact of the YVWF.

Simplistically, there are three possible scenarios, which are:

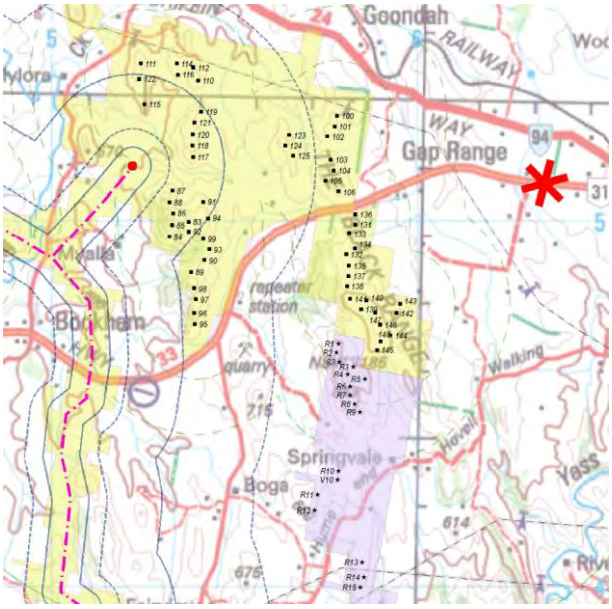
- The proposed Yass Valley Wind Farm is closer than Conroys Gap Wind Farm and CGWF is seen through or behind the YVWF. In this instance the cumulative visual impact would be negligible to low as the foreground wind turbines are those that create the visual impact. Incremental change will be unnoticeable.
- The proposed Yass Valley Wind Farm is further than Conroys Gap Wind Farm and YVWF is seen through or behind the CGWF. In this instance the cumulative visual impact could be higher as the wind turbines in the foreground are those that the visual impact. Incremental change will be noticeable and will depend upon distance to the nearest wind turbine as well as landscape and viewer sensitivity.
- At some locations a third scenario may occur where the CGWF is in one direction and the YVWF is in another. The net result may be that a viewpoint is surrounded by wind turbines, whereas previously the YVWF was only in one direction. In this scenario the cumulative visual impact could be higher and needs to be assessed based on distance, viewer and landscape sensitivity.

The following assessment will examine if these apply to the viewpoints around the Yass Valley Wind Farm

7.1.1 Cumulative Viewpoint 1 - Hume Highway

Viewpoint CVP1 is located on a rise in Hume Highway. The nearest proposed wind turbine (Yass Valley Wind Farm) is approximately 5.2 km south-west of Viewpoint CVP1 and the nearest approved wind turbine (Conroys Gap Wind Farm) is approximately 7.2 km south-west of Viewpoint CVP1.

Google Earth



CVP1 (663685E, 6150965S, 965m AHD)

Figure 7-2 shows the existing view south-west from Hume Highway. This viewpoint is located at a gap in roadside vegetation of the Hume Highway road reserve.

Figure 7-2 Viewpoint CVP1 – Existing view south-west from Hume Highway (Source YVWF - 663685E, 6150965S)

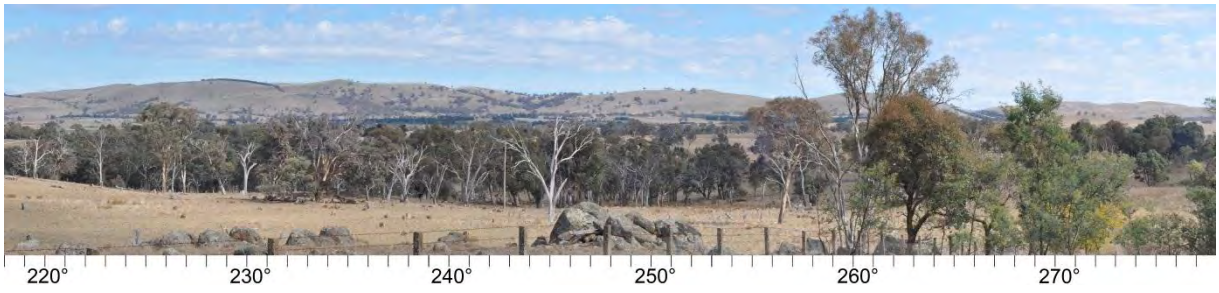
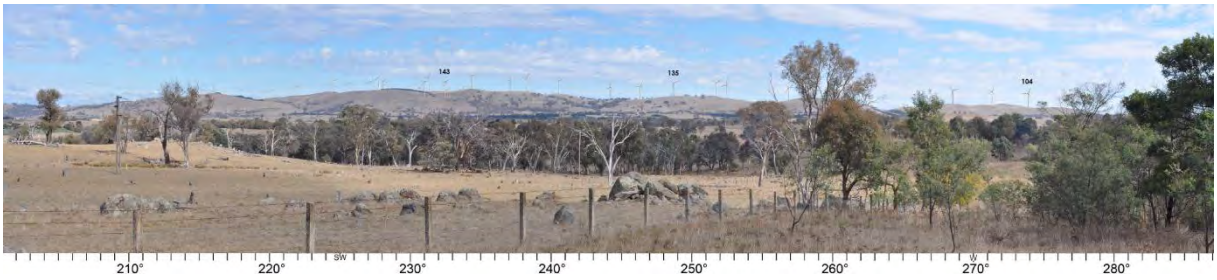


Figure 7-3 shows the photomontage of towards the proposed Yass Valley Wind Farm and the Conroys Gap Wind Farm from the same location

Figure 7-3 Photomontage Viewpoint CVP1 – View south-west from Hume Highway (Source YVWF)

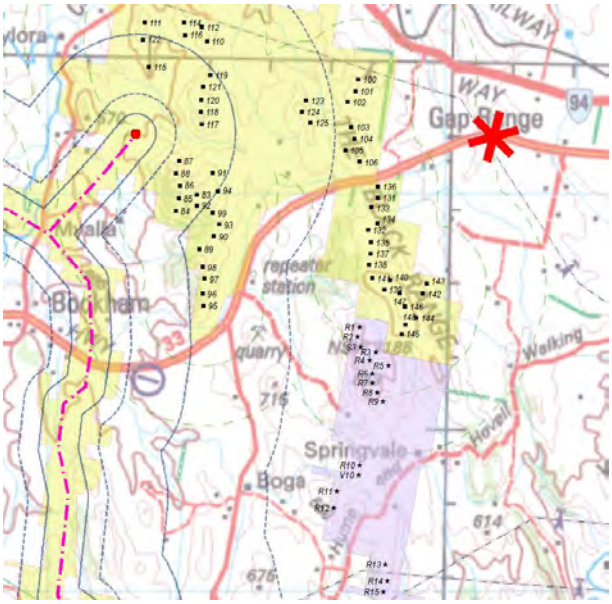


The wind turbines of the two wind farm developments will be simultaneously visible from this location. Given their proximity, the two wind farms will be seen as one continuous wind farm. From this location the nearest visible turbine will be of Yass Valley Wind Farm approximately 5.2 km to the south-west. At this distance the wind turbines will be noticeable but will not dominate the landscape. Overall, the cumulative visual impact is assessed as **low**.

7.1.2 Cumulative Viewpoint 2 - Hume Highway

Viewpoint CVP2 is located on a rise in Hume Highway near the intersection with Burley Griffin Way. The nearest proposed wind turbine (Yass Valley Wind Farm) is approximately 3.2 km south-west of Viewpoint CVP2 and the nearest approved wind turbine (Conroys Gap Wind Farm) is approximately 5.7 km south-west of Viewpoint CVP2.

Google Earth



CVP2 (661331E, 6151427S, 592m AHD)

Figure 7-5 shows the existing view south-west to west from Hume Highway. CVP2 is located near the intersection of Hume Highway and Burley Griffin Way near a truck parking lane.

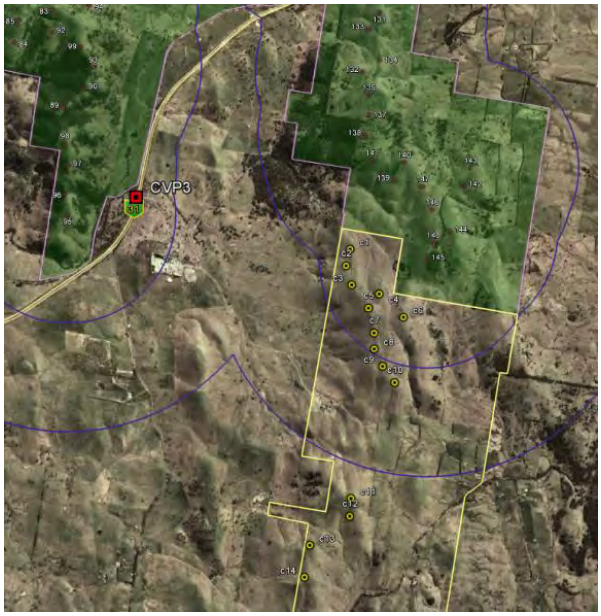
Figure 7-4 Viewpoint CVP2 – View south-west from Hume Highway

From this location the nearest visible turbine will be of Yass Valley Wind Farm approximately 3.2 km to the south-west and will be more prominent than the approved wind turbines at Conroys Gap Wind Farm. Given the topography of hills and the distance to the Conroys Gap Wind Farm will be visible behind the proposed Yass Valley Wind Farm. The two wind farms will be visible simultaneously. Overall the cumulative visual impact is assessed as **low**.

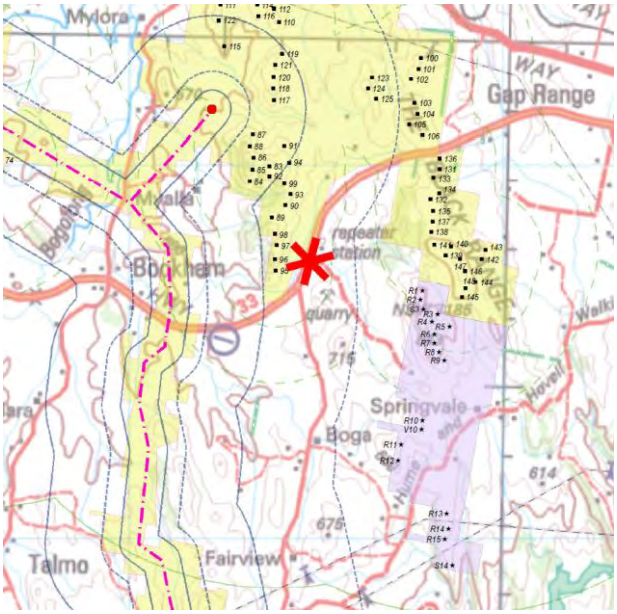
7.1.3 Cumulative Viewpoint 3 - Hume Highway

Viewpoint CVP3 is located on a rise in Hume Highway. The nearest proposed wind turbine (Yass Valley Wind Farm) is approximately 0.9 km west of Viewpoint CVP2 and the nearest

approved wind turbine (Conroys Gap Wind Farm) is approximately 3.0 km east of Viewpoint CVP3.



Google Earth



CVP3 (654853E, 6147448S, 521m AHD)

Figure 7-5 shows the existing view east-west from Hume Highway. This viewpoint is located near the intersection of Hume Highway and Paynes Road.

Figure 7-5 Viewpoint CVP3 – View south-west from Hume Highway

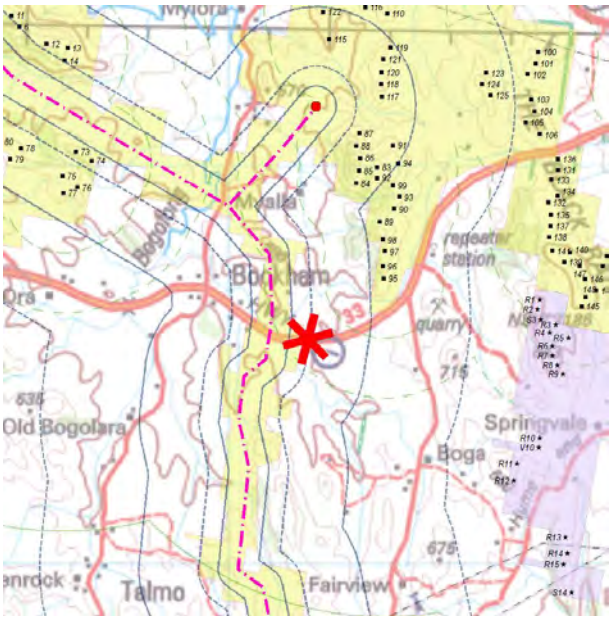
The wind turbines of the two wind farm developments will be simultaneously visible from this location. From this location the nearest visible turbine will be of Yass Valley Wind Farm approximately 0.9 km to the west. At this distance the wind turbines will be a dominant element in the landscape. The greatest level of visual impact will be from wind turbines nearest to CVP3, which the from the proposed wind turbines at Yass Valley Wind Turbine with an overall **medium** level of visual impact.

The wind turbines approved at Conroys Gap Wind Farm will be visible in front of the Yass Valley wind turbines (approximately 3.0 km) to the east. Given the proximity of the two wind farms, for an observer it will be very difficult to discern the two wind farm developments separately. Therefore, the cumulative visual impact is assessed as **low**.

7.1.4 Cumulative Viewpoint 4 - Hume Highway

Viewpoint CVP4 is located on a rise in Hume Highway. The nearest proposed wind turbine (Yass Valley Wind Farm) is approximately 2.3 km north-east of Viewpoint CVP4 and the nearest approved wind turbine (Conroys Gap Wind Farm) is approximately 5.6 km east of Viewpoint CVP4.

Google Earth



CVP4 (652242E, 6145683S, 497m AHD)

Figure 7-6 shows the existing view east-west from Hume Highway. This viewpoint is located near the intersection of Hume Highway and Paynes Road.

Figure 7-6 Viewpoint CVP4 – View south-west from Hume Highway

Figure 7-7 and Figure 7-8 show photomontage of the proposed Yass Valley Wind Farm and the Conroys Gap Wind Farm from the same location in 60O views.

Figure 7-7 60° Photomontage Viewpoint CVP4 – View north from Hume Highway

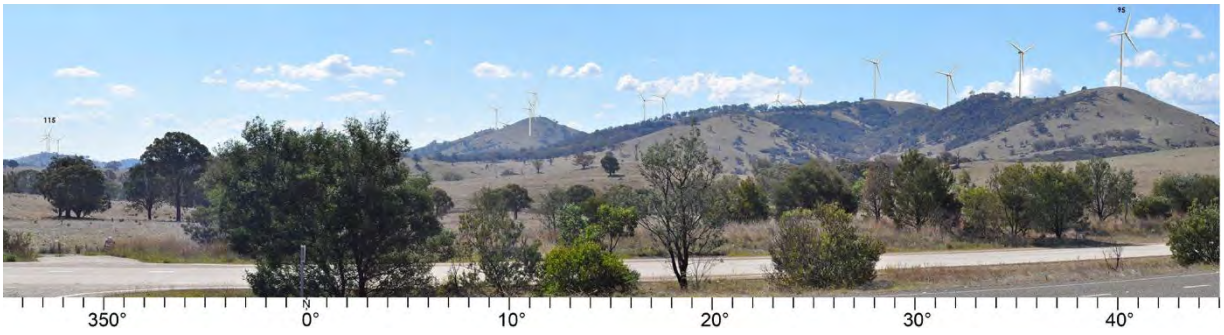
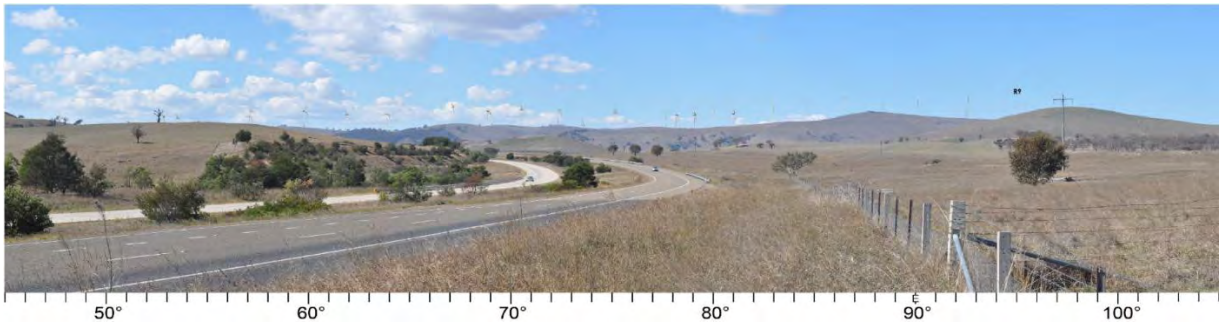


Figure 7-8 *60° Photomontage Viewpoint CVP4 – View north-east from Hume Highway*



The wind turbines of the two wind farm developments will be simultaneously visible from this location. From this location the nearest visible turbine will be of Yass Valley Wind Farm approximately 2.3 km to the north-east. At this distance the wind turbines will be highly visible in the landscape.

The wind turbines approved at Conroys Gap Wind Farm will be visible in front of the Yass Valley wind turbines (approximately 5.6 km) to the east. Given the proximity of the two wind farms and as seen in the photomontages, for an observer it will be very difficult to discern the two wind farm developments separately.

The addition of the Yass Valley Wind Farm will mean that the cumulative wind farm of Yass and Conroys Gap will the Hume Highway. Therefore, a viewer will be more aware of this wind farm landscape. However, the overall visual impact is the same as that solely derived from that of Yass Valley Wind Farm. In this instance, the cumulative visual impact is no different to the impact of the Yass Valley Wind Farm. Therefore, the overall cumulative visual impact is assessed as **low**.

7.2 Summary of cumulative visual impact from viewpoints

The visual impact of the wind turbines are dictated by their distance to the observer and other factors such as the landscape sensitivity, viewer numbers as well as landscape characteristics such as intervening vegetation and topography.

Table 7-2 lists the public and residential viewpoints discussed within the EA Application as well as subsequently within this report. The distance and direction to the nearest wind turbine at Yass Valley and Conroys Gap are listed. Instances where the approved wind turbines of Conroys Gap are closer than those of Yass Valley are highlighted (in light blue).

Table 7-2 *Cumulative visual impact from public viewpoints*

Viewpoint	Distance to proposed wind turbines (YVWF)	Distance to approved wind turbines (CGWF)	Assessment of cumulative visual impact of approved CGWF and proposed YVWF
	PUBLIC VIEWPOINTS		
VP01	16.7 km - NW (144)	16.8 km - W (R14)	Negligible (Screened by vegetation and built form of Yass township – Refer to EA Application LVIA)
VP02	16.4 km - NW (144)	16.6 km - W (R14)	Nil (no views too wind turbines – Refer to EA Application LVIA)
VP03	12.6 km - W (143)	13.5 km - W (R5)	Negligible (The distance to nearest wind turbines)
VP04	4.7 km - SW (143)	6.7 km - SW (R1)	Low (The distance to YVWF and the two farms would appear contiguous and indistinguishable)
VP05	2.4 km - SW (136)	5.3 km - SW (R1)	Low (The distance to YVWF and the two farms would appear contiguous and indistinguishable)
VP06	0.3 km - SE (136)	3.7 km - S (R1)	Low (The distance to YVWF and the two farms would appear contiguous and indistinguishable)
VP07	1.2 km - NW (93)	3.3 km - SE (R1)	Low (The distance to YVWF and the two farms would appear

Viewpoint	Distance to proposed wind turbines (YVWF)	Distance to approved wind turbines (CGWF)	Assessment of cumulative visual impact of approved CGWF and proposed YVWF
			contiguous and indistinguishable)
VP08	5.6 km - N (95)	2.5 km - E (R12)	Medium (The CGWF will appear in the foreground)
VP09	9.6 km - N (145)	2.4 km - S (S14)	Medium (The CGWF will appear in the foreground)
VP10	8.9 km - NE (145)	3 km - NE (S14)	Medium (The CGWF will appear in the foreground)
VP11	10.8 km - N (95)	6.3 km - NE (S14)	Low (The distance to nearest wind turbines)
VP12	20.2 km - NE (95)	15.4 km - NE (S14)	Nil (No views to wind turbines due to intervening topography and vegetation. Refer LVIA)
VP13	5.4 km - NE (145)	0.9 km - NE (R12)	Low (Low viewer numbers)
VP14	4.1 km - NW (76)	8.4 km - E (R2)	Low (The distance to YVWF and the two farms would appear contiguous and indistinguishable)
VP15	11.7 km - NE (95)	10.9 km - NE (R12)	Negligible (The distance to nearest wind turbines)
VP16	1.4 km - E (122)	10.1 km - SE (R1)	Low (The distance to YVWF and the two farms would appear contiguous and indistinguishable)
VP17	2.3 km - SW (112)	9.6 km - SE (R1)	Low (The distance to YVWF and the two farms would appear contiguous and indistinguishable)
VP18	1.8 km - SW (100)	7.9 km - S (R1)	Low (The distance to YVWF and the two farms would appear contiguous and indistinguishable)
VP19	23.6 km - NW (145)	17.5 km - NW (S14)	Negligible (The distance to nearest wind turbines)
VP20	21.5 km - NW (145)	15.5 km - NW (S14)	Negligible (The distance to nearest wind turbines)
VP21	18.7 km - NW (145)	12.7 km - NW (S14)	Nil (No wind turbines visible – refer LVIA)
VP22	14.6 km - NW (145)	9.3 km - NW (S14)	Nil (No wind turbines visible – refer LVIA)
VP23	12.2 km - NW (145)	6.7 km - NW (S14)	Nil (No wind turbines visible – refer LVIA)
VP24	3.2 km - N (145)	2 km - NW (R9)	Low (Low viewer numbers)
VP25	1.9 km - NE (95)	5.1 km - E (R2)	Low (The distance to YVWF and the two farms would appear contiguous and indistinguishable)
VP26	2.4 km - NE (77)	13.1 km - E (R2)	Low (The distance to YVWF and the two farms would appear contiguous and indistinguishable)
VP27	1.5 km - NE (79)	14.8 km - E (R2)	Low (The distance to YVWF and the two farms would appear contiguous and indistinguishable)
VP28	3.1 km - E (88)	8.7 km - SE (R1)	Low (The distance to YVWF and the two farms would appear contiguous and indistinguishable)
VP29	8.4 km - SE (111)	17.6 km - SE (R1)	Negligible (The distance to nearest CGWF wind turbines)
VP30	5.5 km - SW (1)	19.3 km - SE (R1)	Negligible (The distance to nearest CGWF wind turbines)
VP31	4.9 km - SW (129)	22.8 km - SE (R1)	Negligible (The distance to nearest CGWF wind turbines)
VP32	1.8 km - SW (129)	22.2 km - SE (R1)	Negligible (The distance to nearest CGWF wind turbines)
VP33	3 km - SE (69)	27.4 km - SE (R1)	Negligible (The distance to nearest CGWF wind turbines)
VP34	8.8 km - NE (41)	25.9 km - E (R12)	Negligible (The distance to nearest CGWF wind turbines)
	SEQUENTIAL VIEWPOINTS		
SVP-01	8.7 km - NE (41)	25.9 km - E (R12)	Negligible (Refer Section 5.2.1)
SVP-02	5.5 km - NE (41)	22.2 km - E (R2)	Negligible (Refer Section 5.2.2)
SVP-03&04	4.3 km - E (95)	8.1 km - E (R2)	Low (Refer Table 7-2)
SVP-05	9.4 km - NW (1)	20 km - SE (R1)	Negligible (Refer Table 7-2)
SVP-06	2.3 km - S (100)	8.5 km - S (R1)	Low (Refer Table 7-2)
SVP-07	6 km - SW (143)	8 km - SW (R5)	Low (Refer Table 7-2)
SVP-08	4.8 km - NW (143)	5.6 km - W (R5)	Low (Refer Table 7-2)
SVP-09	8.9 km - NE (145)	2.1 km - NE (S14)	Medium (Refer Table 7-2)
SVP-10	13.2 km - NE (95)	8.9 km - NE (S14)	Negligible (Refer Table 7-2)
SVP-11	6.2 km - SE (111)	15.3 km - SE (R1)	Negligible (Refer Table 7-2)

Viewpoint	Distance to proposed wind turbines (YVWF)	Distance to approved wind turbines (CGWF)	Assessment of cumulative visual impact of approved CGWF and proposed YVWF
	CUMULATIVE VIEWPOINTS		
CVP1	5.2 km - SW (143)	7.3 km - SE (R5)	Low (Refer to Section 7.1.1)
CVP2	3.2 km - SW (136)	5.9 km - SW (R1)	Low (Refer to Section 7.1.2)
CVP3	0.9 km - W (96)	3.0 km - E (R1)	Low (Refer to Section 7.1.3)
CVP4	2.0 km - NE (95)	5.2 km - E (R2)	Low (Refer to Section 7.1.4)
	RESIDENTIAL VIEWPOINTS		
G14 (R1)	1.4 km - SW (136)	4.4 km - SW (R1)	Low (Refer to Section 5.4.1)
M04 (R2)	2.1 km - SW (100)	8.3 km - S (R1)	Low (Refer to LVIA)
M22 (R3)	2.6 km - SW (114)	10.7 km - SE (R1)	Negligible (Refer to Section 5.5.6)
C83 (R4)	10 km - SW (129)	25.6 km - SE (R1)	Negligible (Refer to LVIA)
C39 (R5)	4.3 km - SE (69)	28.8 km - SE (R1)	Nil (CGWF will not be visible)
G27 (R6)	7.7 km - N (95)	3.8 km - NE (R12)	Low (Wind farms contiguous and indistinguishable and screened by vegetation)
M8 (R7)	2.3 km - SW (136)	5.5 km – S (R1)	Low (Wind farms contiguous and indistinguishable and screened by vegetation)
C41 (R8)	2.7 km - NW (77)	10.9 km - E (R2)	Negligible (screened by intervening topography to east)
C42 (R9)	3.6 km - NW (76)	8.7 km - E (R2)	Negligible (CGWF screened by topography)
G11	1.7 km - W (143)	3.3 km - SW (R5)	Low (Refer to Section 5.4.2)
G16	1.1 km - W (96)	2.9 km - E (R1)	Low (Refer to Section 5.4.3)
M20	1.9 km - SW (100)	7.9 km - S (R1)	Negligible (Refer to Section 5.4.4)
M24	1.9 km - SW (100)	8.0 km - S (R1)	Negligible (Refer to Section 5.4.5)
M42	1.1 km - S (114)	9.7 km - SE (R1)	Negligible (Refer to Section 5.4.6)
C01	2.7 km - NE (63)	24.1 km - SE (R1)	Nil (Refer to Section 5.5.1)
C37	2.5 km - SE (126)	25.9 km - SE (R1)	Nil (Refer to Section 5.5.2)
C67	3.3 km - NE (74)	8.7 km - E (R1)	Nil (Refer to Section 5.5.4)
G29	2.5 km - NE (95)	3.4 km - E (S3)	Medium (Refer to Section 5.5.5)
Goondah	2.2 km - SW (100)	8.3 km - S (R1)	Negligible (Refer to Section 5.6.1)
Bookham	3.9 km - E (95)	7.6 km - E (R2)	Negligible (Refer to Section 5.6.2)

Refer to Annex D for A3 size maps of all the public, sequential, cumulative and residential viewpoints discussed within this report.

7.2.1 Simultaneous views

Cumulative visual impact is partly a measure of the incremental change brought about by the presence in the landscape of the Conroys Gap Wind Farm. Simultaneous views may have a cumulative visual impact.

As summarised in Table 7-2 from most public locations the YVWF is in the foreground. The incremental change and the consequent cumulative visual impact caused by the addition of CGWF in the background is a low or negligible for most locations.

However, in some instances (e.g. VP08, VP09, VP10), the Conroys Gap Wind Farm will appear in the foreground. In such instances, the cumulative visual impact will increase and the assessment of the impact will depend on landscape and viewer sensitivity.

There are no instances where the third possible scenario occurs, where a viewpoint which would be partly affected by the YVWF would be then completely surrounded if CGWF was constructed.

7.3 Change in perception

The main cumulative visual impact is that which changes a visitor's or residents perception of an area through which they are travelling.

This is bought about by sequential and/or simultaneous views of multiple wind farms. The greatest chance of changing a viewer's perception of an area is when these views are available from the highways and roads that people use.

7.3.1 Views from towns and regional centres

There are no locations within the township of Yass where one can perceive the Yass Valley Wind Farm. Therefore as there are no views to multiple wind farms from Yass there would be no direct cumulative visual impact on the township of Yass.

The Yass Valley Wind Farm would be visible from the townships of Bookham and Bowning and there are limited views from Binalong. However there would be no township location where the proposed Conroys Gap wind farms would add to the impact of the Yass Valley Wind Farm. Therefore there would be no cumulative visual impact on the townships in the viewshed of the Yass Valley Wind Farm.

7.3.2 View from main highways

Travellers along the Hume Highway will pass by the Gullen and Cullerin Range Wind Farm more than 50 km to the east of the Yass Valley Wind Farm site once they are constructed.

However as has been demonstrated previously, views from the Hume Highway to the Yass Valley Wind Farm are limited to the road between Bowning and some distance west of Bookham. The only wind farm with the potential to increase a viewer's exposure to wind farms in this area is the Conroys Gap Wind Farm on the same range of hills. This would appear as part of the Yass Valley Wind Farm for viewers travelling along the Hume Highway and local roads. Therefore it would only be expected to marginally add to the visual impact of the Yass Valley Wind Farm.

For these reasons, whilst it may be possible for more than one wind farm to be viewed while travelling through the Yass Valley, the cumulative visual impact would be minimal.

7.3.3 Views from minor / local roads

There may be a cumulative visual impact for users of roads running near the Yass Valley Wind Farm and continuing past other wind farms. However these are typically small gravel roads, serving local farms and the cumulative visual impact would be negligible.

7.3.4 Views from residential dwellings

The presence of multiple wind farms in an area can create a cumulative visual impact. Since the EA for the Yass Valley Wind Farm was lodged in 2009, several other wind farms have been proposed in the region. Operating wind farms including the Gunning, Cullerin Range and Capital Wind Farms lie between 50 km and 60 km to the east of the Yass Valley Wind Farm site.

The approved Conroys Gap wind farm which is located immediately adjacent to the Yass Valley Wind Farm is the only other wind farm that will provide a cumulative visual impact with the Yass Valley Wind Farm. Cumulative visual impact can occur either by sequential and simultaneous views to wind turbines from publically accessible viewpoints or from private viewing locations, or from changes to communities or visitor's perceptions of a region due to the presence of multiple wind farms in an area.

The two wind farms will be visible simultaneously from a number of viewpoints, particularly along the Hume Highway. Additional photomontages have been prepared from these viewpoints to demonstrate the cumulative visual impact which has been assessed as low. The two wind farms will remain indistinct from each other and therefore will not cumulatively change the wind farm landscape character.

There may be simultaneous and sequential views of the proposed Yass Valley Wind Farm and the approved Conroys Gap Wind Farm from residences around these wind farms.

The most affected residential properties will be those that are located immediately to the east and west of the Conroys Gap Wind Farm where residents may be able to see Conroys Gap wind turbines while viewing in one direction and then the Yass Valley wind turbines when viewing in another. This potential panorama would be greater for residents to the west of Conroys Gap Wind Farm. Residents, especially to the west of Conroys Gap Wind Farm, may have a larger panorama of wind turbines than would be the case if only one wind farm was visible. Therefore there could be a cumulative visual impact. The previous assessment has shown that houses are well screened by existing vegetation. Therefore the probability of residential properties being able to see this enlarged panorama of wind turbines is low. The combination of few affected residential properties and this existing vegetation would lead to the conclusion that the likely cumulative visual impact caused by this increased panorama from residential properties immediately to the east and west of Conroys Gap Wind Farm is low.

Residents to the north of Conroys Gap Wind Farm and the Yass Valley Wind Farm may be able to view turbines from both wind farms silhouetted against each other. However if this occurs, it would be difficult to differentiate the Yass Valley wind turbines in the foreground from the Conroys Gap wind turbines in the background as they would appear as the one wind farm with the visual impact created by the nearer wind turbines within the Yass Valley Wind Farm. There would be minimal cumulative visual impact created by being able to see Conroys Gap wind turbines in the distance.

Similarly residents to the south of Conroys Gap Wind Farm and the Yass Valley Wind Farm may be able to view turbines from both wind farms silhouetted against each other. However if this occurs, it would be difficult to differentiate the Conroys Gap wind turbines in the foreground from the Yass Valley wind turbines in the background, as they would appear as the one wind farm, with the visual impact created by the nearer wind turbines within the Conroys Gap Wind Farm. There would be minimal cumulative visual impact created by being able to see the Yass Valley wind turbines in the distance.

Therefore the additional visual impact will be relatively low in comparison to the level of impact that these properties will incur from the presence of the nearest wind turbines.

Residential properties without existing screening vegetation that are within 5km of Conroys Gap Wind Farm and also have a cumulative view of Yass Wind farm would be offered landscaping to mitigate the additional cumulative visual impact.

7.4 Overall cumulative visual impact

This assessment of the cumulative visual impact of the Yass Valley Wind Farm has concluded that there would be minimal cumulative visual impact and that the changes to peoples' perception of the surrounding area would not be significantly changed by the presence of multiple wind farms in the locality.

However there would be no change to the assessment if these were not constructed as any impact that does occur, is present because of the adjacent location of the Marilba Hills Precinct and the Conroys Gap Wind Farm. The presence of the Coppabella Precinct adds little to the (minimal) cumulative visual impact of the wind turbines at these two locations.

8 RESPONSE TO SUBMISSIONS

A response to the relevant landscape and visual amenity submissions is discussed in *Table 8-1*.

Table 8-1 Response to submissions on landscape and visual amenity impacts

Item	*Submissions raised*	Response
1	***Loss of visual amenity and rural character***	
	adverse impacts on tourism and traveller amenity and on potential for rural residential development	Many studies have shown that the majority of people do not object to wind turbines in any but the most pristine landscapes. Therefore the presence of the Yass Valley Wind Farm is not expected to impact on tourism and traveller amenity. A similar finding is also relevant for rural residential.
2	***Size and scale of wind farm***	
	the unprecedented size and scope of the project in NSW and the consequent impact on the hosting district, including 90 non-involved residences within 5 km of the proposed wind farm precincts, several villages, two towns and the visual gateway to the Yass Shire along the Hume Highway from the Riverina	See above.
	… people find it difficult to comprehend the imposing size and scale of a modern industrial wind turbine in the landscape.	Most people have now seen wind turbines in the landscape and the approval rating has increased in those areas where wind farms have been commissioned.
3	***Cumulative visual impact***	
	flawed analysis of the pervasive cumulative visual impact, especially relating to poor presentation of visual impacts of giant wind turbines at close viewing distances along public roadways	The analysis tries to explore the effect of the wind turbines on both sequential viewpoints along the major highways through the region. It is recognised within the EA Application that "*the small images used within the report are only for referencing comments made within the text. While technically correct, they do not accurately portray a perceptually accurate image to assess the visual impact. For this reason larger (A3) images are appended to this report (EA Application - Annexure D) however while these are better, a proper assessment of the visual impact can be made when the images are produced at A0 sizes and held at arm's length*." (EA Application, LVIA page 3)
	It is inevitable that there will be a large cumulative visual impact on the immediate vicinity (in particular, at distances under 5 km) due to the high number of wind stations proposed. The turbines are inherently conspicuous structures that have been intentionally located in prominent positions. The visual effect of the wind turbines will be pervasive in the district to the south of Binalong, along the Hume Highway, along NSW state road Burley Griffin Way to Harden, minor sealed roads (Illalong) and numerous unsealed routes.	There is a visual impact but for the reasons stated above the visibility of wind turbines not necessarily mean that there is a high cumulative visual impact. As noted in Section 7 of this report, given the proximity of the approved Conroys Gap Wind Farm and the proposed Yass Valley Wind Farm, from most locations the wind turbines of the two developments will be indistinct

Item	*Submissions raised*	Response
		from one another. Overall they will appear as a singular wind farm. As stated previously *"When the approved Conroys Gap Wind Farm is built, the area around Yass Valley Wind Farm will change. It will be characterised by a farm landscape with wind turbines. The two wind farms will remain indistinct from each other and therefore will not cumulatively change the wind farm landscape character."*
4	***Night lighting***	
	insufficient information given in relation to obstacle lighting, preventing assessment of the adverse impact of night obstacle lighting on traffic, and in causing degradation of the night sky	Not required as night lighting is not proposed.
	CASA have advised the project that about 50 aircraft obstacle lights may be needed to fulfil its safety requirements. This is roughly one strobing high-powered obstacle light for approximately every third wind station.	Not required as night lighting is not proposed.
5	***Viewpoint selection***	
	Instead, the proponent generates a selective shortlist of locations and uses photomontages with an unusual choice of aspect ratios, camera lens angles, and printing formats to support its arguments that the visual impact is "low to medium" at every viewing location in the affected district.	The use of 34 viewpoints plus additional viewpoints is not a selective shortlist. Most locations that were chosen were chosen for their potential to see the wind farm. Panoramas are of necessity of different viewing angles as sometimes the panorama has to show 90^{O} and at other times over 180^{O} field of view. It is recognised that this automatically changes the "apparent" size of wind turbines and for this reason a 60^{O} field of view is always constructed for the area which has the closest wind turbines. Refer to Section 5 for photomontage preparation methodology.
	Locations chosen are highly selective and sometimes hard to understand. The visual impact over more than 20 kilometres of Burley Griffin Way is represented by only a few photomontage locations.	It is impossible to take photographs from all locations. However, the viewpoints selected were from locations that would represent the worst case locations, where wind turbines were visible.
6	***Photomontages***	
	… the photomontages understate the probable visual impact of the wind turbine arrays	Refer quote above and the LVIA for the EA Application.
	If there are no conditions under which visual impact would be unacceptable, a genuine judgment cannot be made	In past applications viewpoint locations have had high levels of visual impact. The assessment of unacceptable has to balance other criterion besides visual (e.g. Policy and potential for mitigation).
7	***Residential viewpoints***	
	We find it unacceptable that your assessment concludes there were no areas where the wind farm would create unacceptable visual impacts. I am unable to find an area in the report where you define unacceptable, in our view the visual impacts from Viewpoint RVPS (Dwelling #C34)	Unacceptable is not a level of impact. Visual impact is assessed as high, medium or low. Acceptability or unacceptability is a balanced assessment of a number of criteria.

Item	*Submissions raised*	Response
	will be unacceptable if the towers are to be lit in the same fashion as the Gunning towers. *…Gunning has 15 turbines and the Impact of 15 red flashing lights at night time is substantial. We point out that this DA application proposes up to 200 turbines and that number of red flashing lights spread across such a large area will have an enormous impact. Anyone living within a line of sight of these turbines will be forced to have special window treatments to block out these lights if installed, no mention of support or compensation for this action.*	Night lighting is not required in the Current Application.

9 CONCLUSION

In summary, the landscape and visual impact assessment within the EA Application is supported by this response to the submissions.

The initial EA Assessment concluded that *"that the proposed Yass Valley Wind Farm will have a generally low visual impact on its surrounds, and the site is a suitable landscape for the construction of a wind farm.*

This conclusion was based on:

- *Perception studies which continually show that the majority of viewers do not object to the construction of wind turbines on any but the most sensitive and localised landscapes. This is supported by the social research undertaken not only for the Yass Valley Wind Farm but also for other wind farms.*
- *Targeted social research on perception was also undertaken by the proponent and has clearly demonstrated that there is a very high level of support for wind farms amongst local residents in the area with 89% supporting wind farms on the Southern Tablelands and 71% supporting wind farms within 1km of their residence.*
- *The proposed Yass Valley Wind Farm site is located in a man-modified landscape. The landscape units in the viewshed are well represented across this area. Agricultural activity, associated structures and other signs of human intervention have also created a landscape that can absorb other changes.*
- *There is low visual impact on townships. There are limited locations from which long distance views are available from the townships of Yass to the east and the villages of Bowning and Binalong to the east and north-east. The visual impact from these towns would be negligible. There is also minimal to no visibility of the wind turbines from other smaller settlements in the area.*
- *The main visibility is from major roads. The Hume Highway, to the south and the Burley Griffith Way to the north are two major roads within the region. Although there will be views from these two highways the overall impact is expected to be medium due to the predominately medium landscape sensitivity.*
- *There will be a visual impact on viewers using the minor roads within the locality especially where these run along the wind farm precincts. These un-made roads run along and through the different precincts within the Yass Valley Wind Farm. Visibility from these minor roads, which have far fewer users than the highways and main roads, is sometimes, but not always, restricted by roadside vegetation, however there is no doubt that there will be extensive views from this road network. It is considered that the visual impact will be minor from these locations predominately because the viewer numbers are low.*
- *The zone of greatest potential visual impact for residential properties lies within three kilometres of the nearest wind turbine. There are 26 non-participatory residences within 3 km of the two precincts within the current Project Application for Development Approval. This increases by a further 7 houses to a total of 33 non-participatory residences, when the wind turbines within the Carrols Ridge Precinct are also included. However many of these existing residences have screening in the form of wind breaks. Landscape mitigation can be effective in lessening the visual impact on residential properties without existing screening.*
- *The cumulative visual impact of the proposed Yass Valley Wind Farm with other wind farms in the area is expected to be no greater than the visual impact of the Yass Valley Wind Farm by itself. Users of the Hume Highway and Burley Griffin Way will, in the future, pass other sites, and there is the probability that the acceptance levels will reduce. There is no doubt that this will be the case for users of the Hume Highway to the south, where there is the potential for sequential views to be afforded by the Yass Valley Wind Farm and the Conroys Gap Wind farm. Further away travellers will pass the Cullerin Range Wind Farm.*

- *The level of cumulative visual impact for users of Burley Griffin Way would be less as there are few opportunities for sequential wind farm views. It is therefore assessed as being a low adverse visual impact.*
- *There are few local roads where multiple wind farms become visible, either sequentially or simultaneously and as it is these viewing experiences that can change peoples' perception of an area. Therefore the visual impact is no greater than that assessed from individual viewpoints and that the cumulative visual impact is considered to be low.*

This Current Proposal also does not include any night time lighting.

The proposed transmission line and substations will have low to negligible visual impact for most locations within the viewshed.

Therefore the conclusions within the EA Application are still relevant to the overall visual impact of the Current Proposal.

Annex A - SEEN AREA ANALYSIS

This page is intentionally blank

LEGEND

Zone of Visual Influence
Zone A (Full Turbine)

- 0
- 1 - 35
- 36 - 70
- 71 - 105
- 106 - 140

Yass Valley wind turbine

Conroy's Gap Wind Turbine

Yass Valley Wind Farm Site Boundary

Conroy's Gap Wind Farm Site Boundary

1.5 km

3km

8.5km

17km

0 2 4 8 12

Kilometres

Zone of Visual Influence
Zone B (Whole Swept Area)

	0
	1 - 35
	36 - 70
	71 - 105
	106 - 140

Yass Valley wind turbine

Conroy's Gap Wind Turbine

Yass Valley Wind Farm Site Boundary

Conroy's Gap Wind Farm Site Boundary

1.5 km

3km

8.5km

17km

0 2 4 8 12

Kilometres

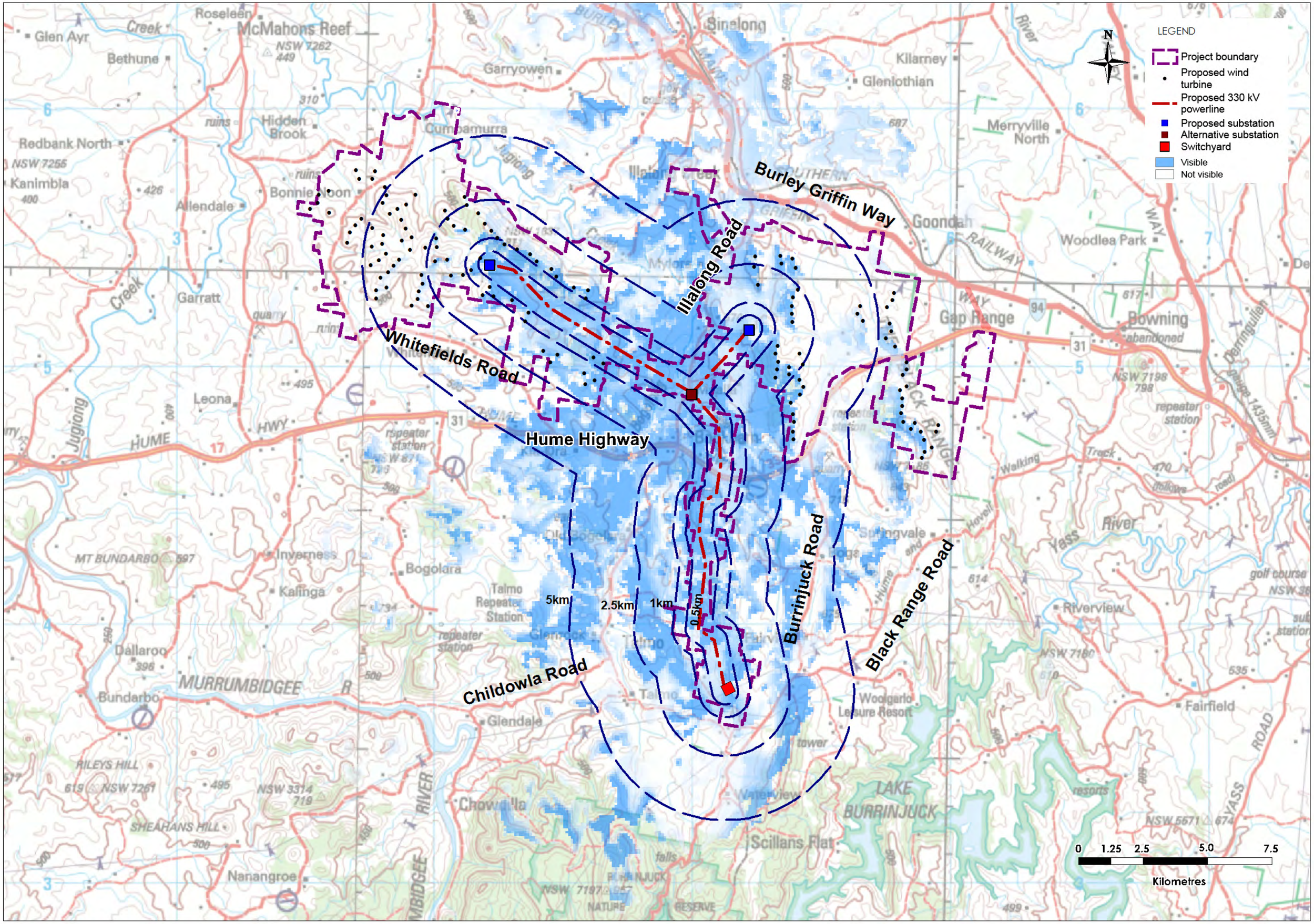
Zone of Visual Influence
Zone C (Hub Height & Above)

- 0
- 1-35
- 35-70
- 71-105
- 106-140

- Yass Valley wind turbine
- Conroy's Gap Wind Turbine
- Yass Valley Wind Farm Site Boundary
- Conroy's Gap Wind Farm Site Boundary

1.5 km
3km
8.5km
17km

0 2 4 8 12
Kilometres


LEGEND
Project boundary
Proposed wind turbine
Proposed 330 kV powerline
Proposed substation
Alternative substation
Switchyard
Visible
Not visible
N
Burley Griffin Way
Illalong Road
Whitefields Road
Hume Highway
Burrinjuck Road
Black Range Road
Childowla Road
5km
2.5km
1km
0.5km
Sinelong
Garryowen
Killarney
Gleniothian
Merryville North
Goonda
Woodlea Park
Gap Range
Bowning
Cumbamurra
Illalong Creek
Redbank North
Kanimbla
Allendale
Bonnie Noon
Hidden Brook
McMahons Reef
Roseleen
Glen Ayr
Bethune
Garratt
Leona
Inverness
Bogolara
Kalinga
Talmo Repeater Station
Glendale
Dallaroo
Bundarbo
MURRUMBIDGEE R
Chowilla
Nanangroe
Springvale
Woolgarlo Leisure Resort
Riverview
Fairfield
Scillans Flat
LAKE BURRINJUCK
Yass River
0 1.25 2.5 5.0 7.5
Kilometres

Annex B - PHOTOMONTAGES

This page is intentionally blank

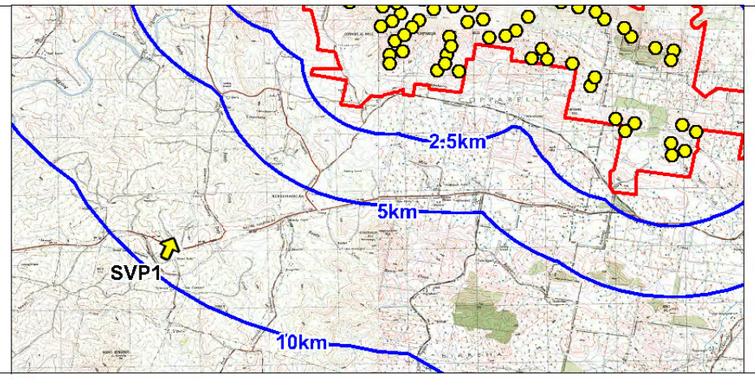
Yass Valley Wind Farm - Photomotage locations

No.	Ref ID	Location / Title	EA 2009	Preferred Project Report Nov 2012	Preferred Project & Submissions Report Jul 2013	Preferred Project & Submissions Report Apr 2014
1	SVP1	Coppabella Hills - Hume Highway	x	x	x	x
2	SVP2	Coppabella Hills - Hume Highway	x	x	x	x
3	SVP3	Marilba Precinct - Bookham	x			x
4	SVP5	Coppabella and Marilba - Burley Griffin Way	x			x
5	SVP6	Coppabella and Marilba - Burley Griffin Way	x			x
6	SVP7	Marilba Precinct - Hume Highway	x			x
7	SVP8	Marilba Hills - Common Road	x			x
8	SVP11	Coppabella and Marilba - Burley Griffin Way	x			x
9	VP6	Conroy's Gap - Truck Parking Area	x			x
10	RVP7C	The Crisp Gallaries - Future Eco Village	x			x
11	RVP7B	The Crisp Gallaries - Future Bamboo Garden	x			x
12	RVP5	Naranghi	x	x		x
13	C39	Naranghi (same location as RVP5)			x	x
14	CVP1	Hume Highway west of Conroy's Gap			x	x
15	CVP4	Hume Highway east of Conroy's Gap			x	x
16	M20	Residence			x	x
17	M24	Residence			x	x
18	C67	Residence			x	x
19	G14	Residence			x	x
20	G16	Residence			x	x
21	G29	Residence			x	x
22	M42	Residence			x	x
23	C01	Residence			x	x
24	C59	Robinsons Road, Bogolara				x
25	VP10	Garry's road, Binalong				x
26	C53	Residence				x
27	C74	Residence				x

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage SVP1-1

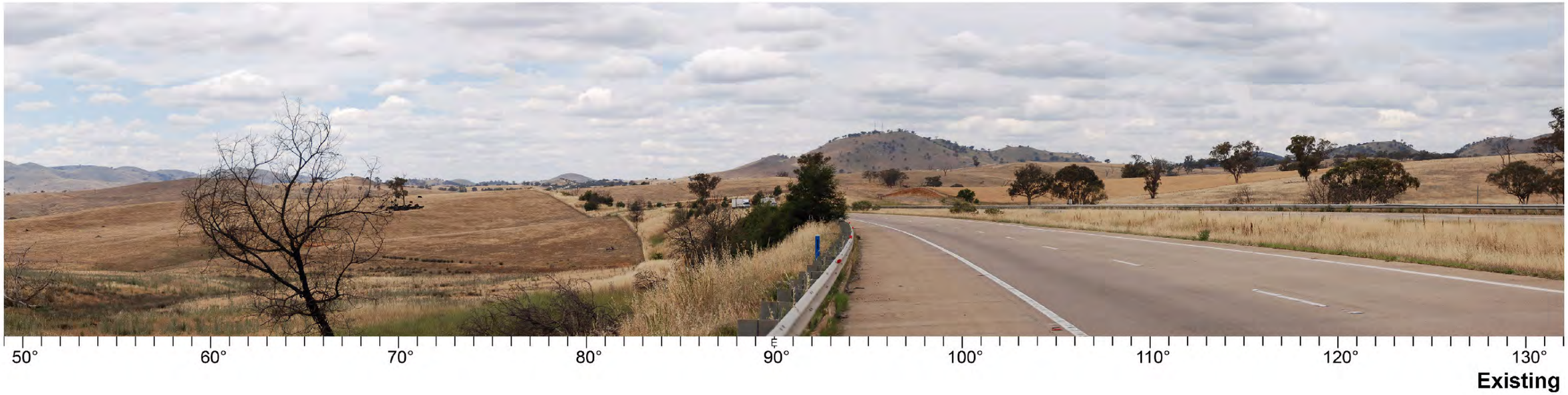
Closest visible turbine: 41 (8.8km)

Field of View: 84°

Start Bearing: 336°, End Bearing: 60°

Co-ordinates: 631,596m E, 6,146,352m N

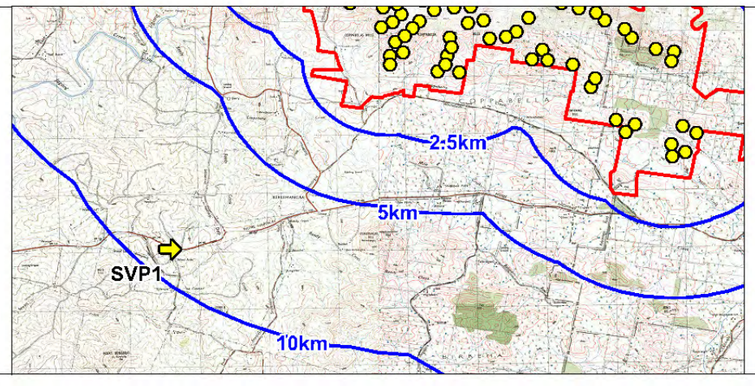
MGA Zone 55 GDA94



Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage SVP1-2

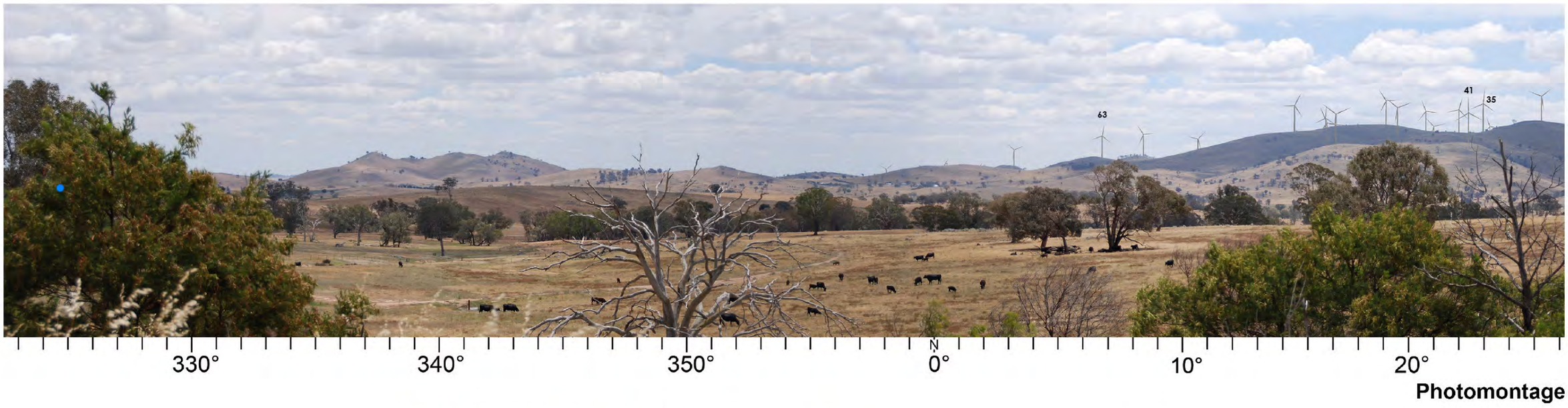
Field of View: 83°

Start Bearing: 49°, End Bearing:132°

Co-ordinates: 631,596m E, 6,146,352m N

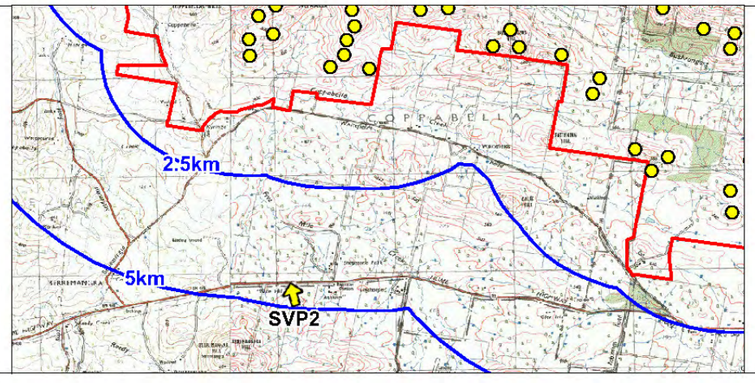
MGA Zone 55 GDA94

Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

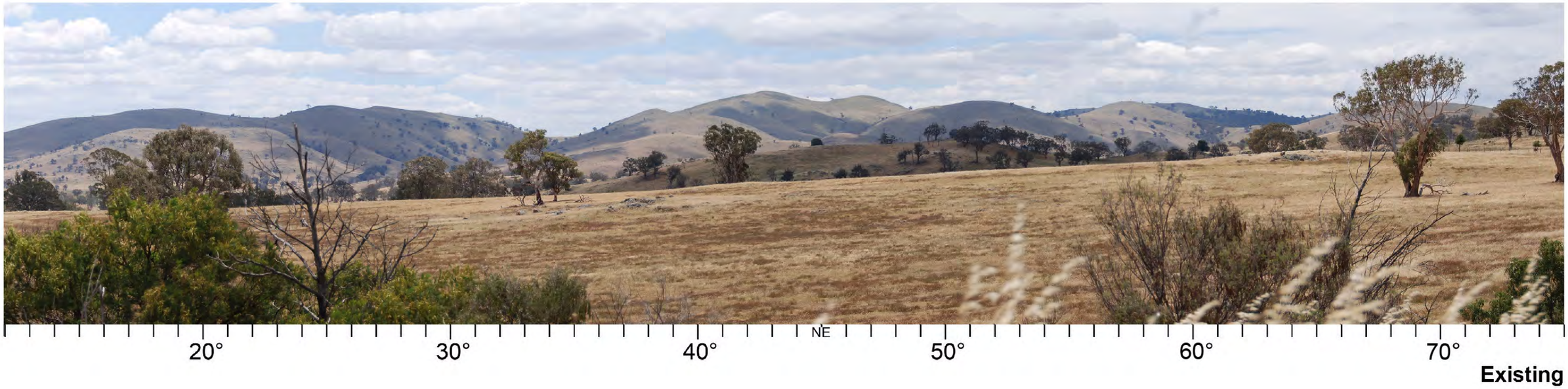
Photomontage SVP2-1

Field of View: 63°

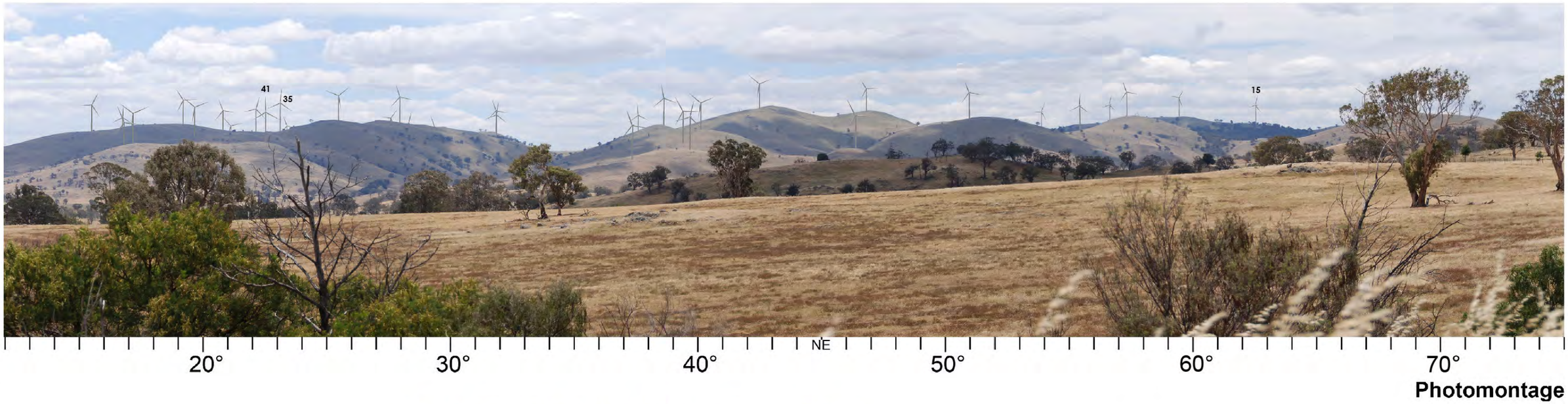
Start Bearing: 223°, End Bearing: 26°

Co-ordinates: 635,559m E, 6,147,668m N

MGA Zone 55 GDA94

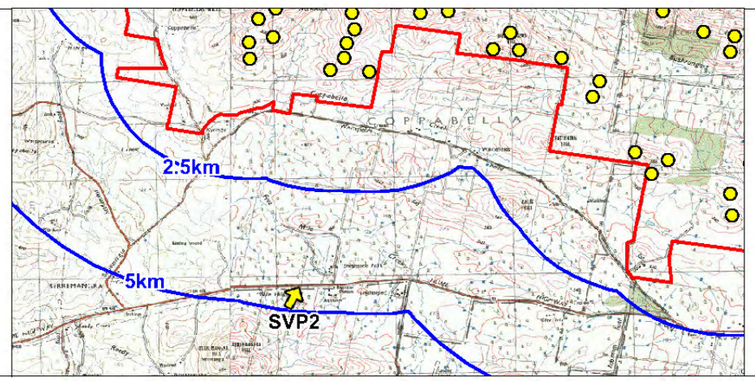


Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage SVP2-2

Closest visible turbine: 41 (5.5km)

Field of View: 63°

Start Bearing: 11°, End Bearing: 74°

Co-ordinates: 635,559m E, 6,147,668m N

MGA Zone 55 GDA94

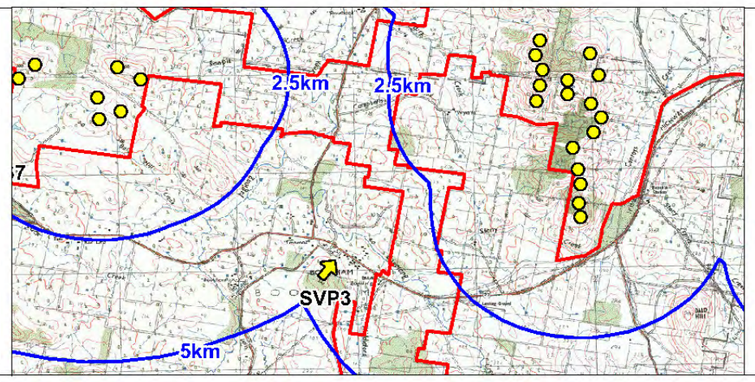
Existing

SVP3a SVP3b

338° 38° 98°

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage SVP3

Closest visible turbine: 95 (3.9km)

Field of View: 200°

Start Bearing: 298°, End Bearing: 138°

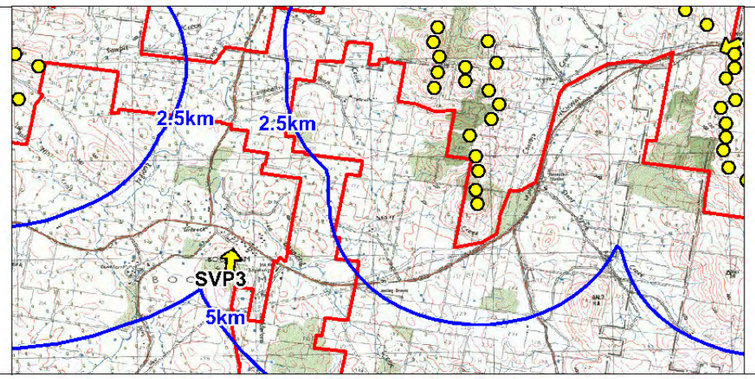
Co-ordinates: 650,114m E, 6,146,355m N

MGA Zone 55 GDA94

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage SVP3a

Field of View: 60°

Start Bearing: 338°, End Bearing: 38°

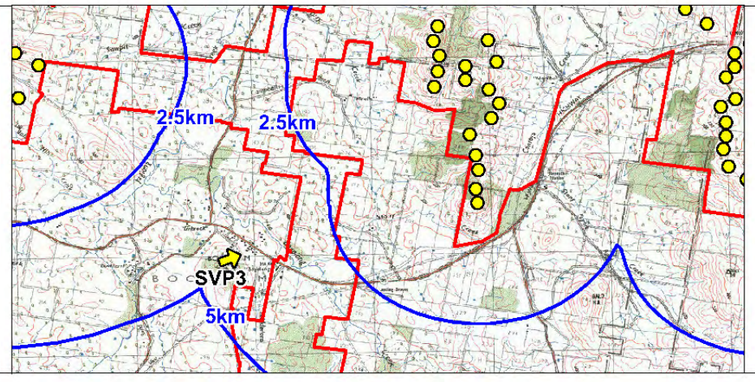
Co-ordinates: 650,114m E, 6,146,355m N

MGA Zone 55 GDA94

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage SVP3b

Closest visible turbine: 95 (3.9km)

Field of View: 60°

Start Bearing: 38°, End Bearing: 98°

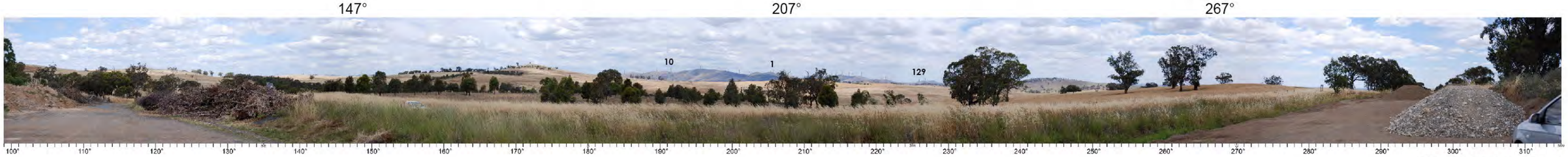
Co-ordinates: 650,114m E, 6,146,355m N

MGA Zone 55 GDA94

Existing

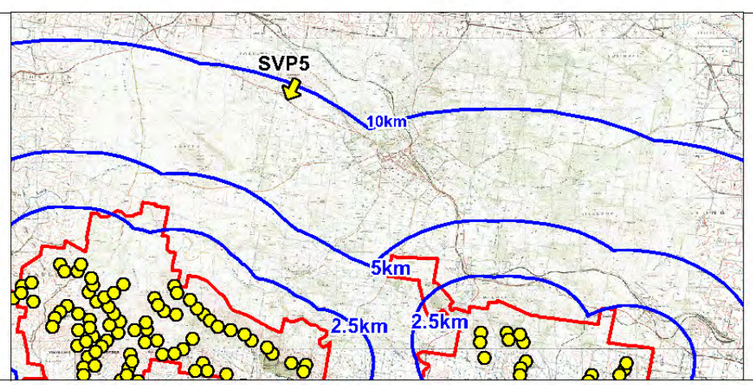
SVP5a | SVP5b

147° | 207° | 267°



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage SVP5

Closest visible turbine: 1 (9.4km)

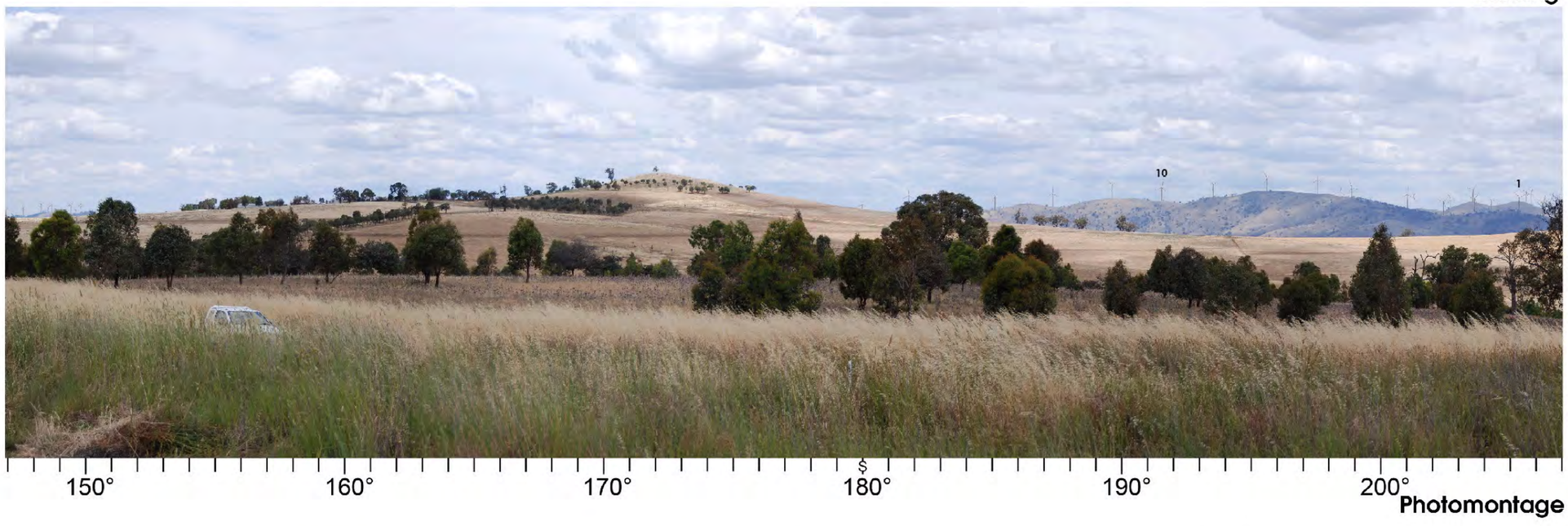
Field of View: 216°

Start Bearing: 99°, End Bearing 315°

Co-ordinates: 645,315m E, 6,165,158m N

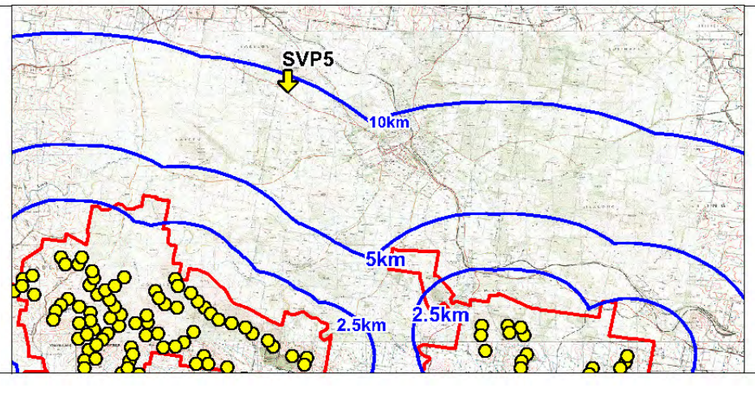
MGA Zone 55 GDA94

Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage SVP5a

Closest visible turbine: 1 (9.4km)

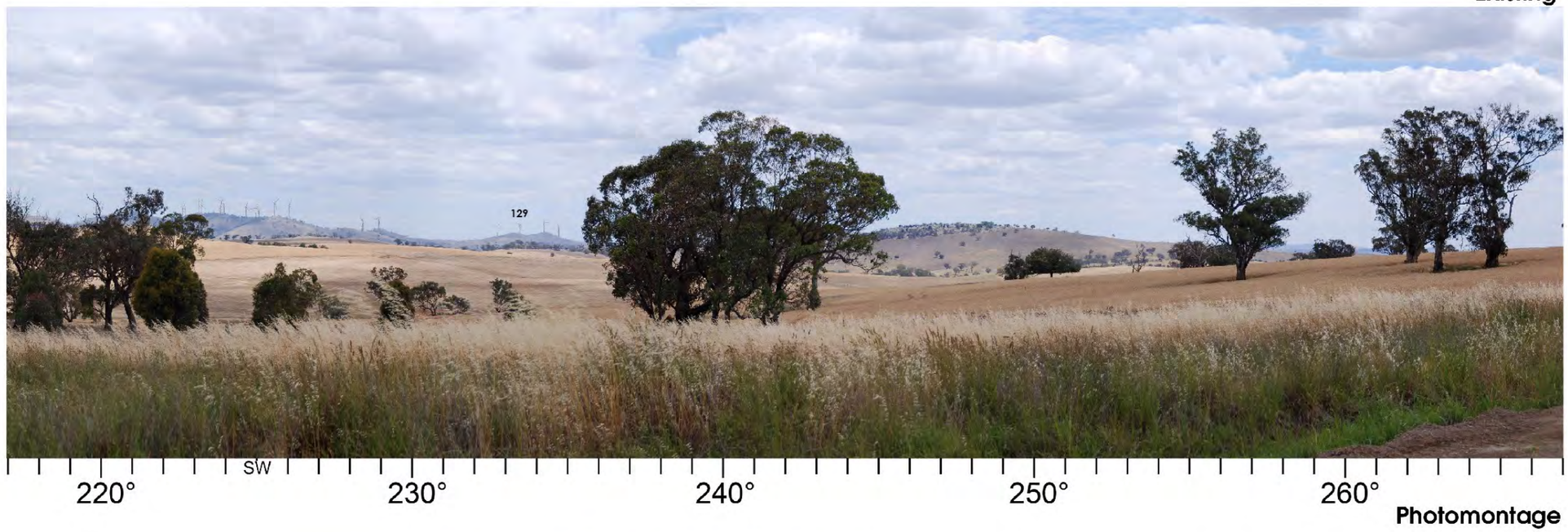
Field of View: 60°

Start Bearing: 147°, End Bearing 207°

Co-ordinates: 645,315m E, 6,165,158m N

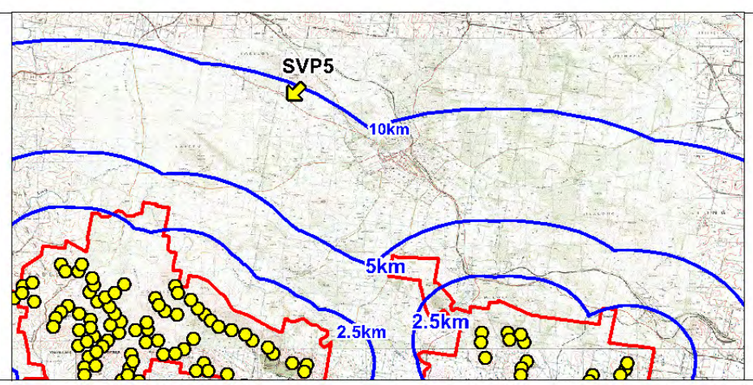
MGA Zone 55 GDA94

Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

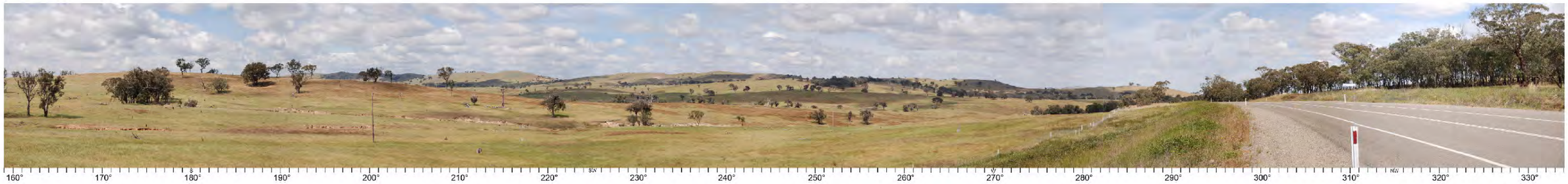
Photomontage SVP5b

Field of View: 60°

Start Bearing: 207°, End Bearing 267°

Co-ordinates: 645,315m E, 6,165,158m N

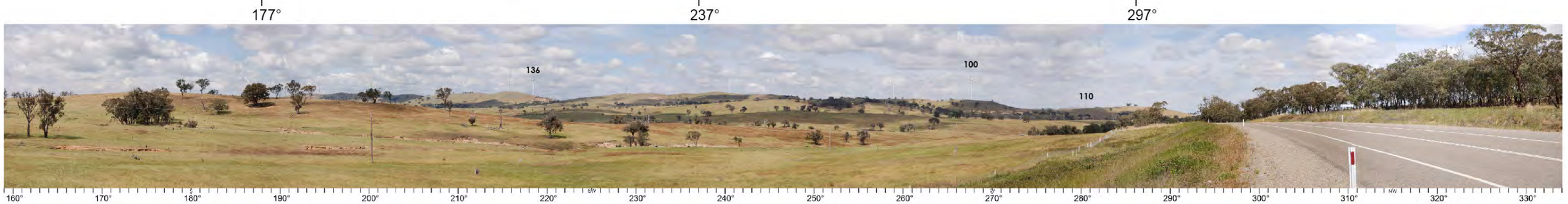
MGA Zone 55 GDA94



Existing

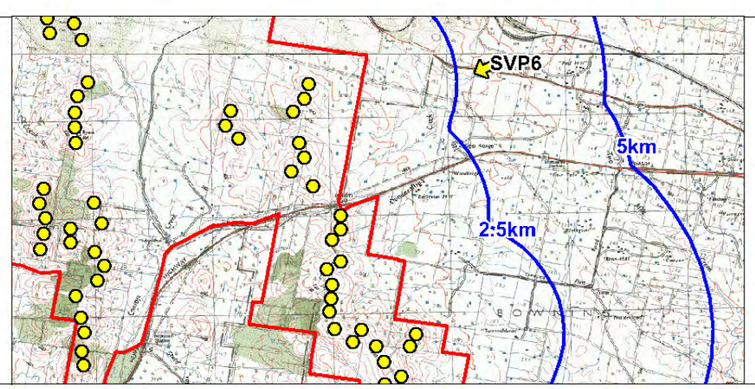
SVP6a | SVP6b

177° | 237° | 297°



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage SVP6

Closest visible turbine: 100 (2.7km)

Field of View: 175°

Start Bearing: 159°, End Bearing: 334°

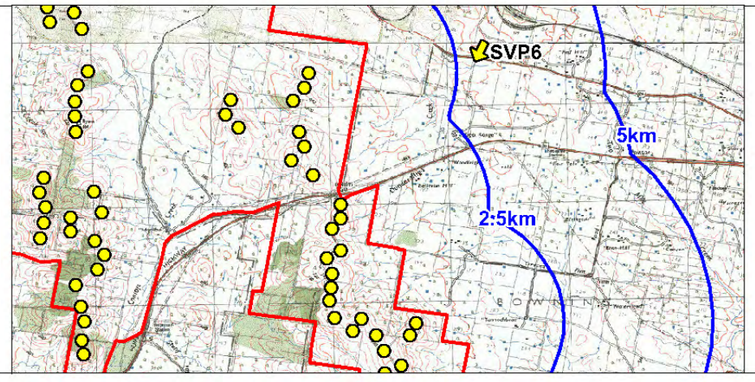
Co-ordinates: 660,529m E, 6,153,118m N

MGA Zone 55 GDA94

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

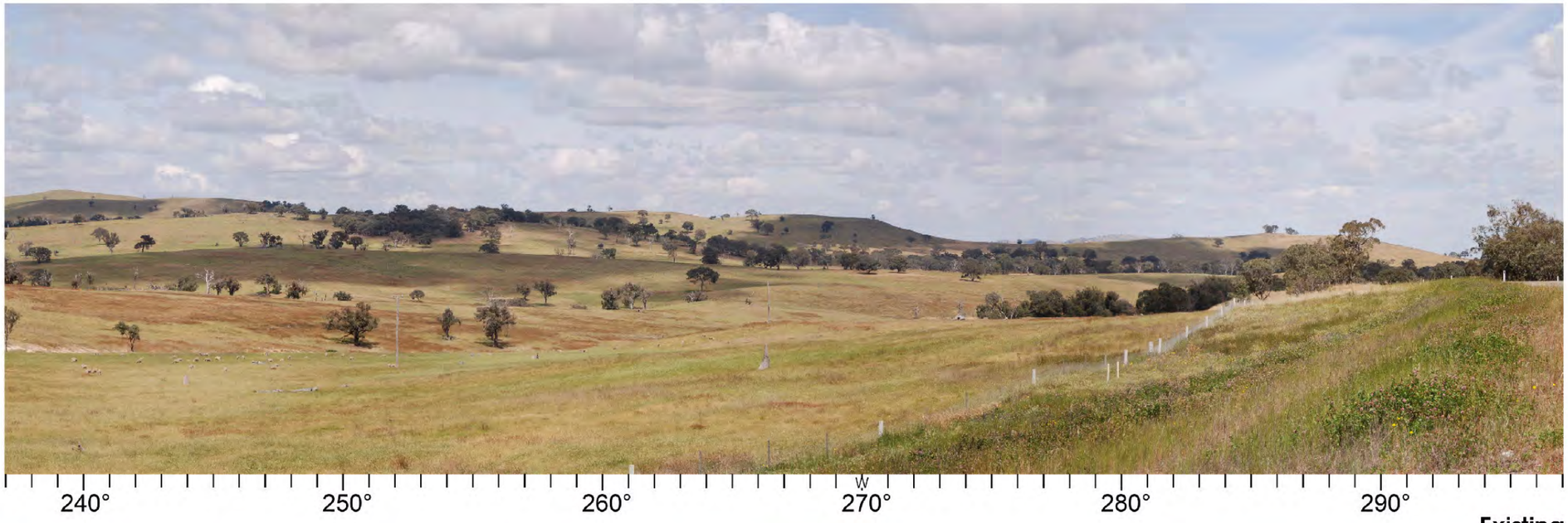
Photomontage SVP6a

Field of View: 60°

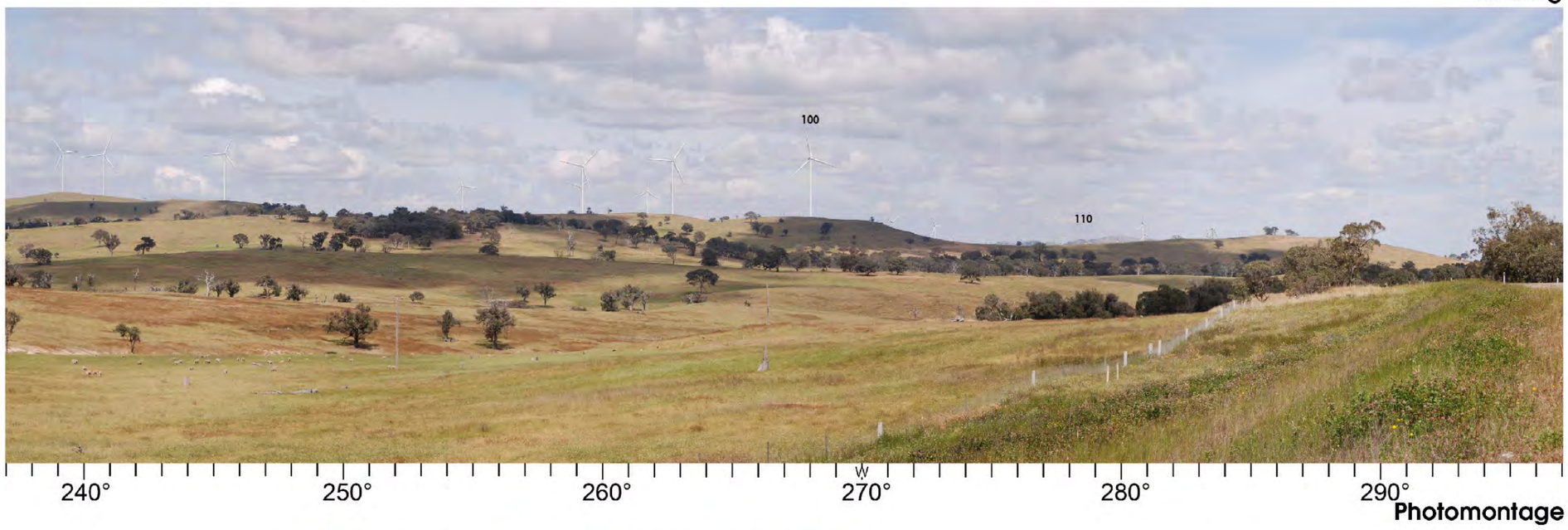
Start Bearing: 177°, End Bearing: 237°

Co-ordinates: 660,529m E, 6,153,118m N

MGA Zone 55 GDA94

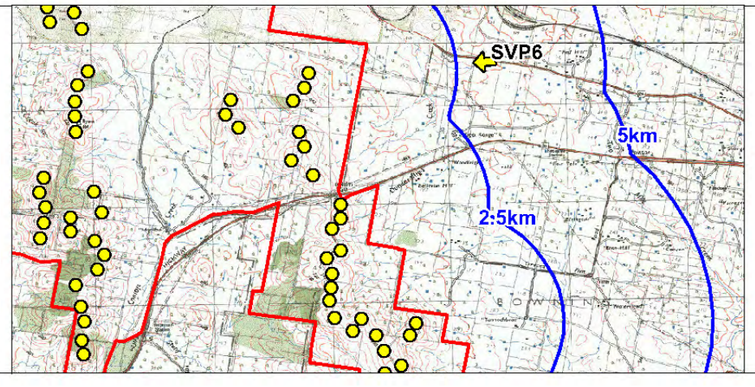


Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage SVP6b

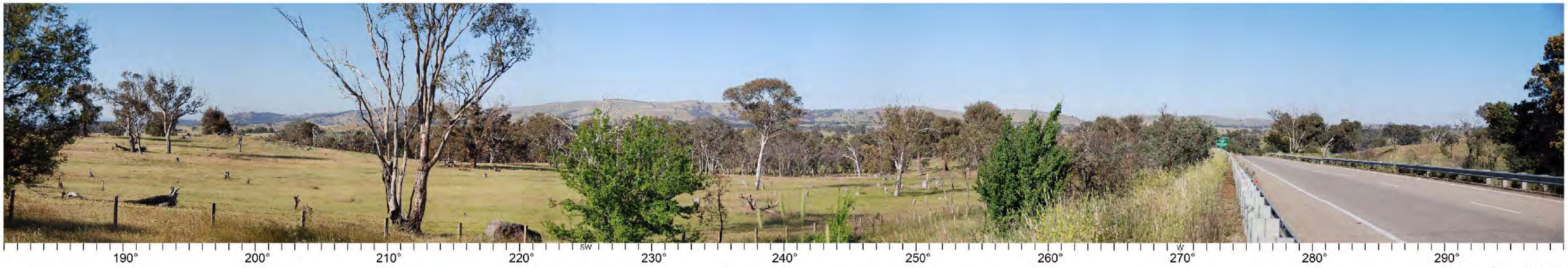
Closest visible turbine: 100 (2.7km)

Field of View: 60°

Start Bearing: 237°, End Bearing: 297°

Co-ordinates: 660,529m E, 6,153,118m N

MGA Zone 55 GDA94



Existing

SVP7b

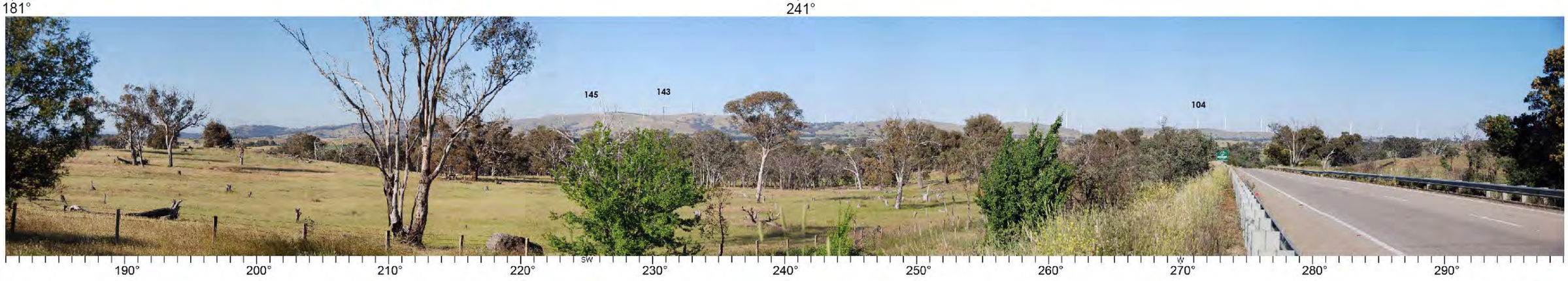
239°

299°

SVP7a

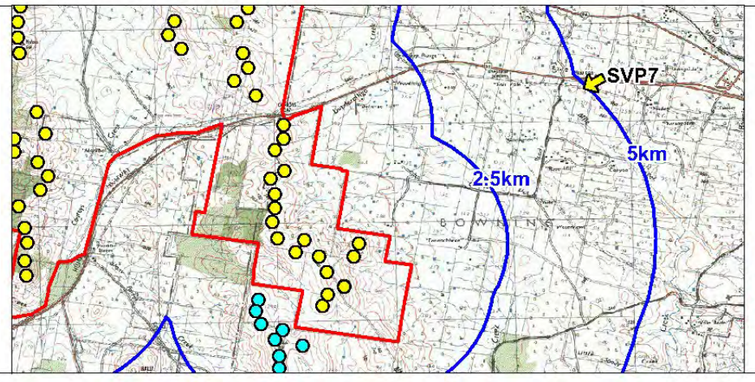
181°

241°



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomotage SVP7 - Marilba Hills Precinct, Hume Highway

Closest visible turbine: 143 (5.2km)

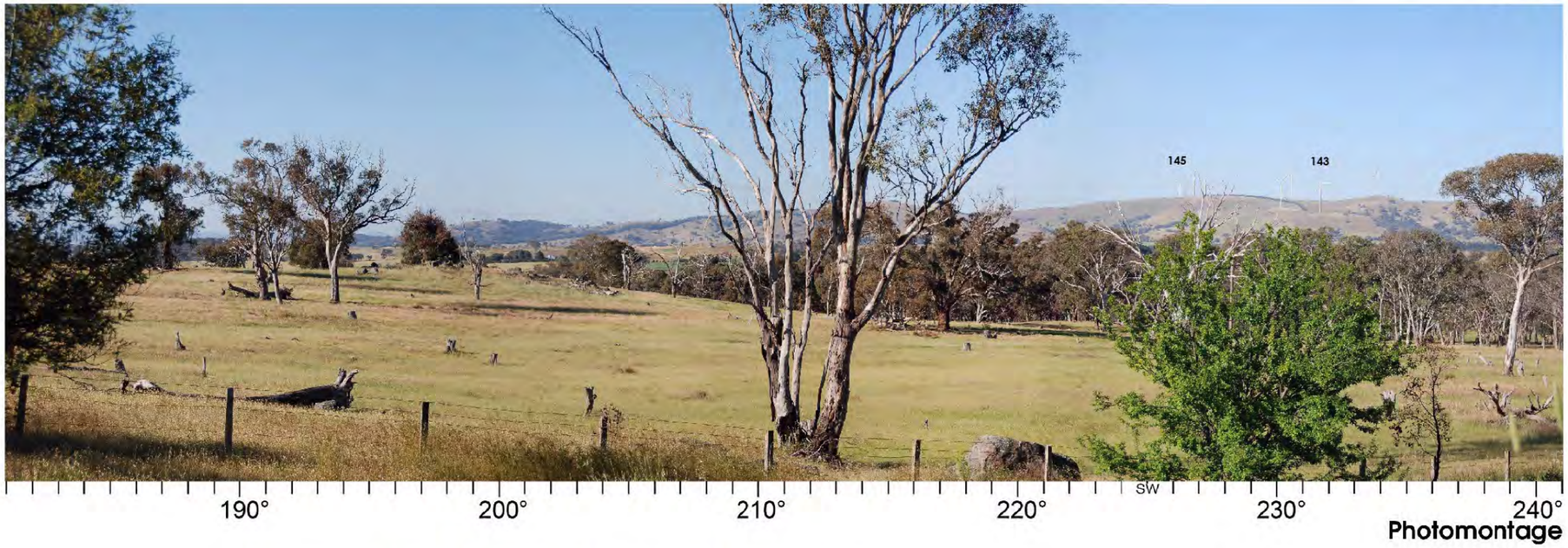
Field of view: 119°

Start Bearing: 181°, End Bearing: 299°

Co-ordinates: 663,621m E, 6,150,982m N

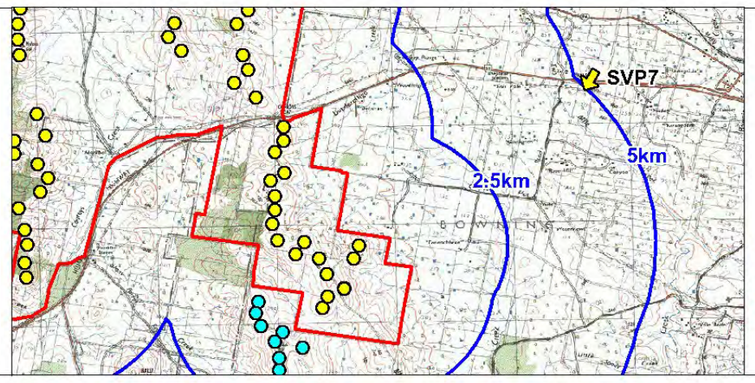
MGA Zone 55 GDA95

Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomotage SVP7a - Marilba Hills Precinct, Hume Highway

Closest visible turbine: 143 (5.2km)

Field of view: 60°

Start Bearing: 181°, End Bearing: 241°

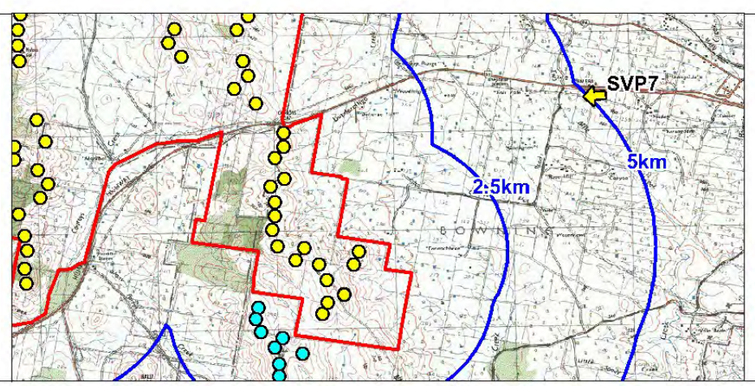
Co-ordinates: 663,621m E, 6,150,982m N

MGA Zone 55 GDA95

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

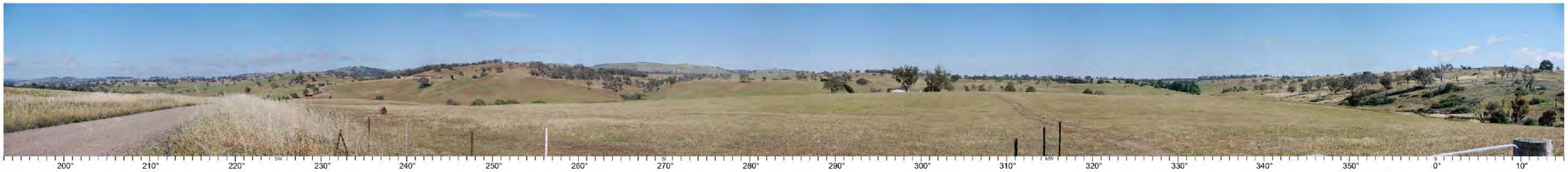
Photomotage SVP7b - Marilba Hills Precinct, Hume Highway

Field of view: 60°

Start Bearing: 239°, End Bearing: 299°

Co-ordinates: 663,621m E, 6,150,982m N

MGA Zone 55 GDA95



Existing

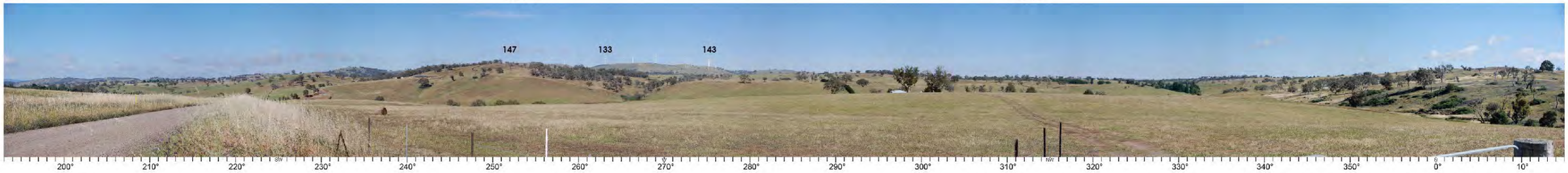
SVP8a

SVP8b

193°

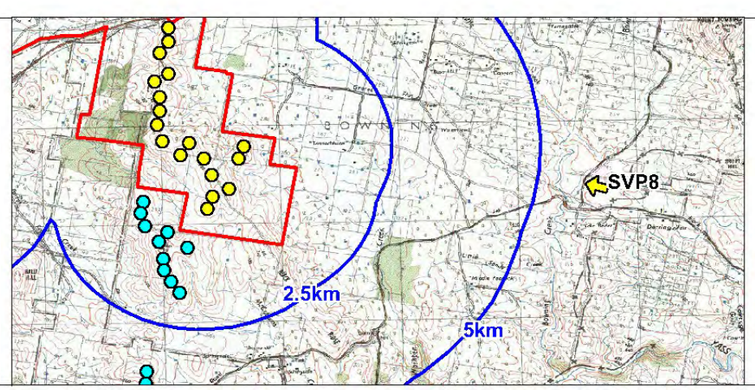
253°

313°



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage SVP8

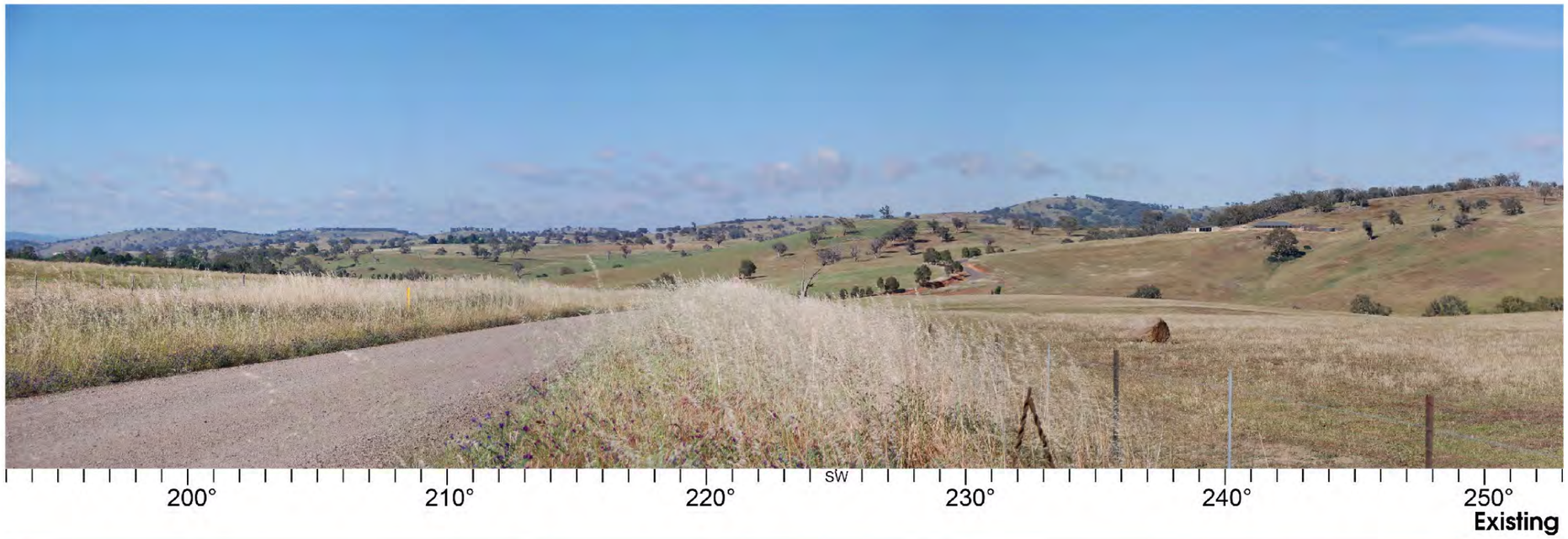
Closest visible turbine: 143 (5.2km)

Field of View: 182°

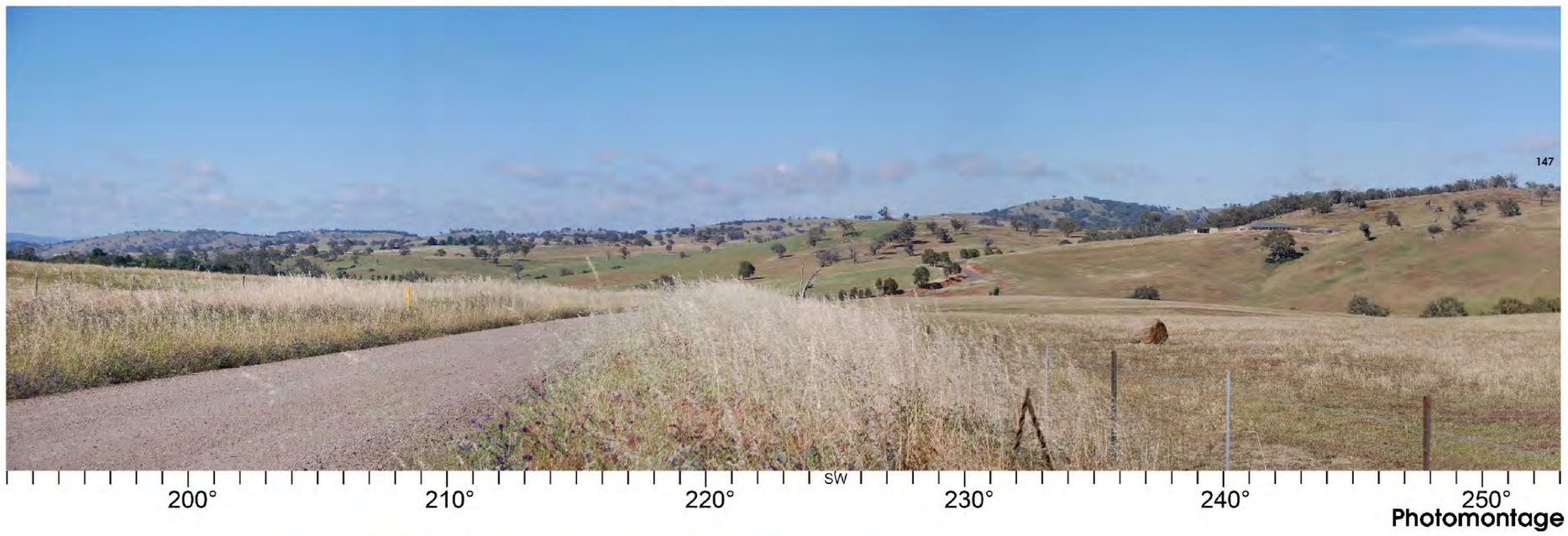
Start Bearing: 193°, End Bearing: 15°

Co-ordinates: 663,621m E, 6,150,982m N

MGA Zone 55 GDA94

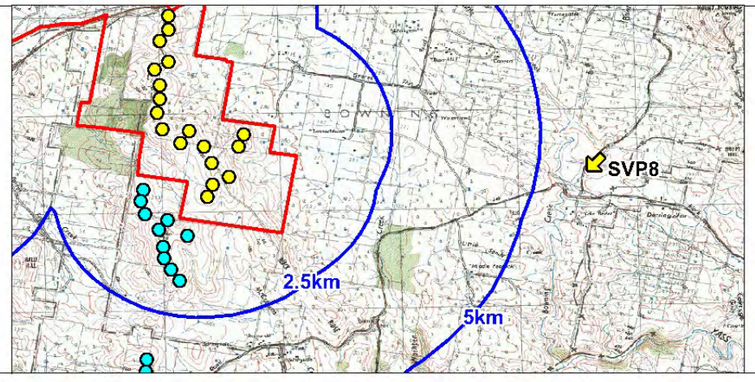


Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

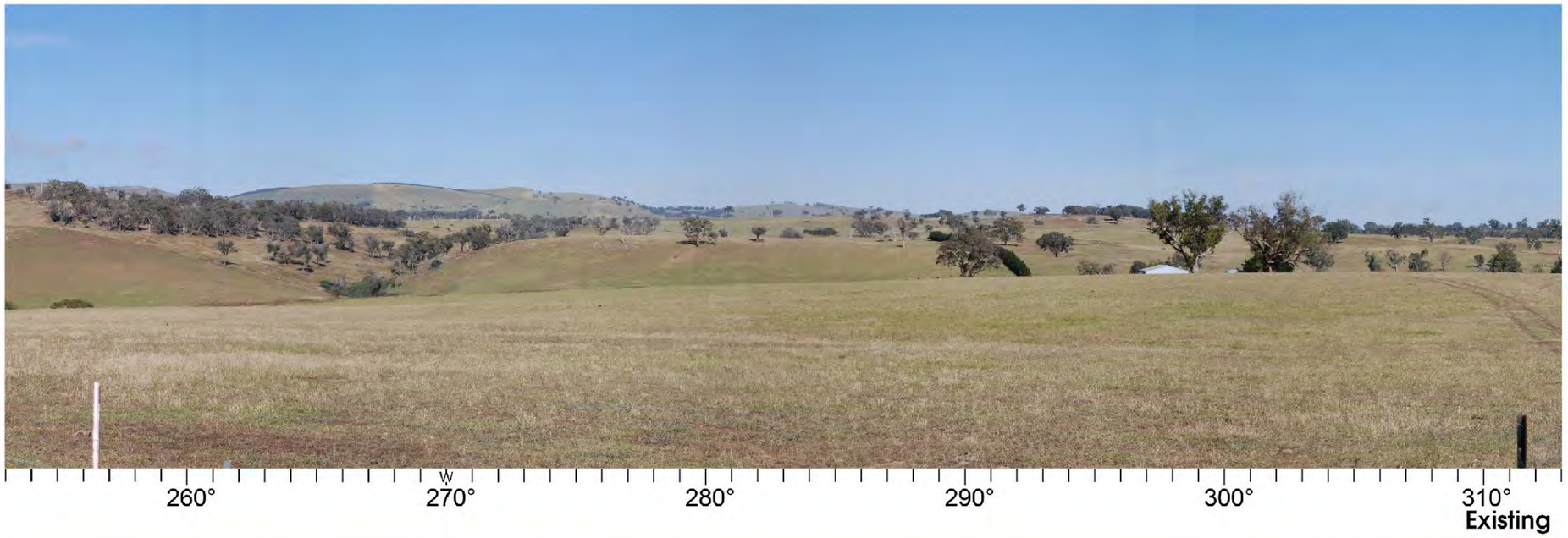
Photomontage SVP8a

Field of View: 60°

Start Bearing: 193°, End Bearing: 253°

Co-ordinates: 663,621m E, 6,150,982m N

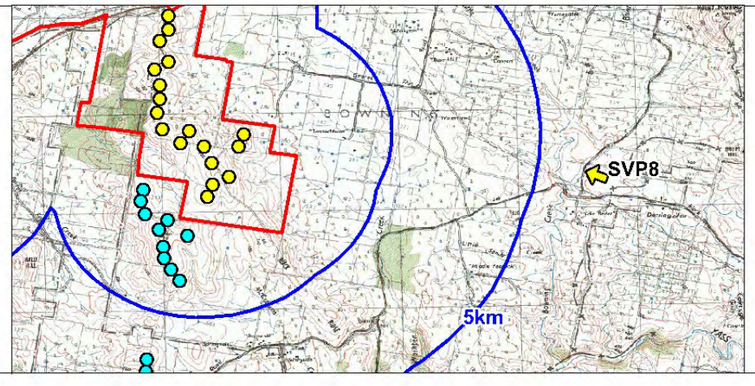
MGA Zone 55 GDA94



Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage SVP8b

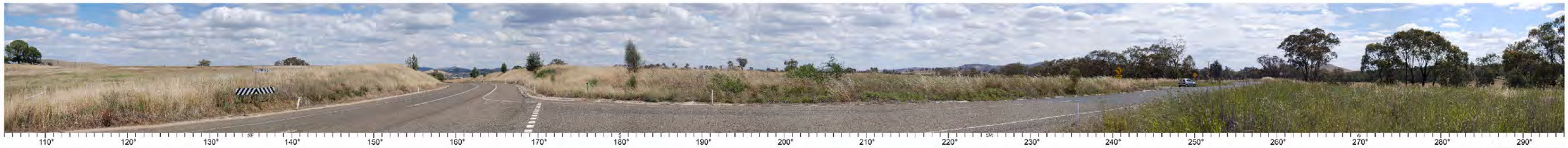
Closest visible turbine: 143 (5.2km)

Field of View: 60°

Start Bearing: 253°, End Bearing: 313°

Co-ordinates: 663,621m E, 6,150,982m N

MGA Zone 55 GDA94



Existing

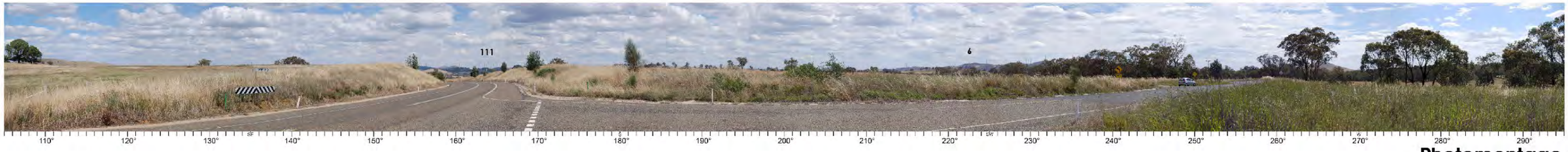
SVP11a

SVP11b

139°

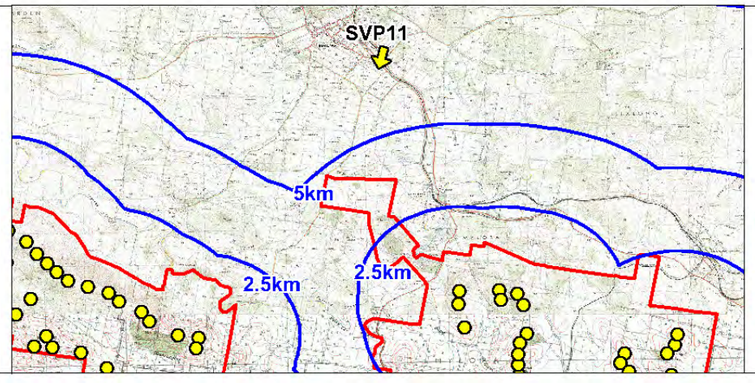
199°

259°



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage SVP11

Closest visible turbine: 111 (6.5km)

Field of View: 190°

Start Bearing: 105°, End Bearing 295°

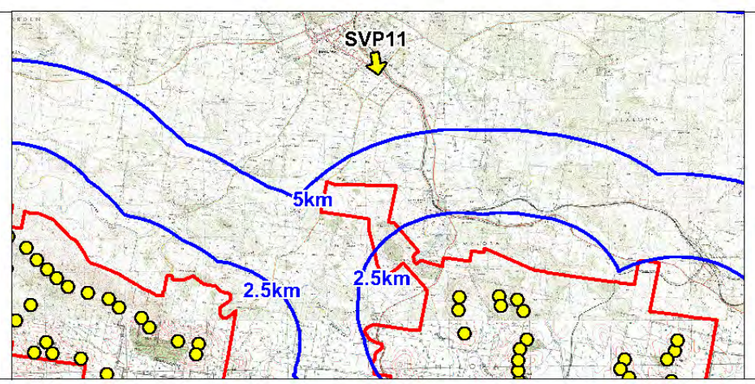
Co-ordinates: 650,877m E, 6,160,300m N

MGA Zone 55 GDA94

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage SVP11a

Closest visible turbine: 111 (6.5km)

Field of View: 60°

Start Bearing: 139°, End Bearing 199°

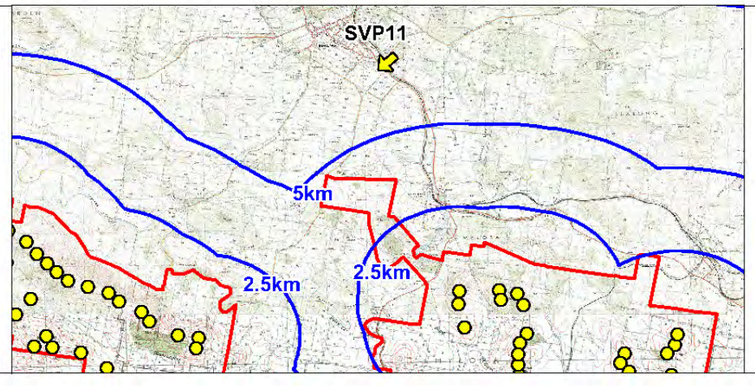
Co-ordinates: 650,877m E, 6,160,300m N

MGA Zone 55 GDA94

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

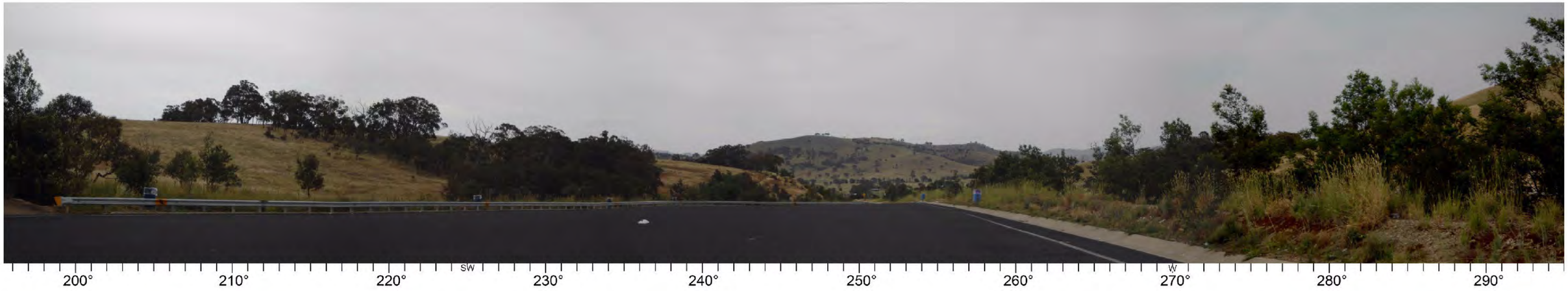
Photomontage SVP11b

Field of View: 60°

Start Bearing: 199°, End Bearing 259°

Co-ordinates: 650,877m E, 6,160,300m N

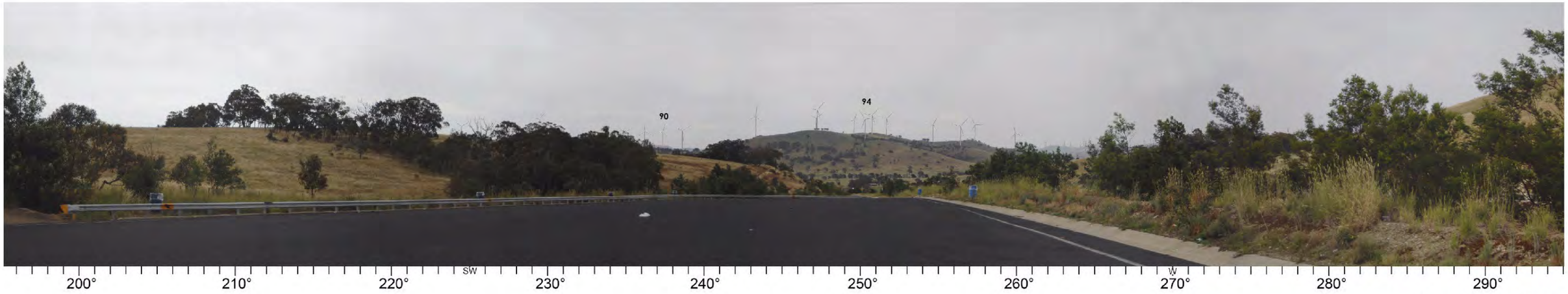
MGA Zone 55 GDA94



Existing

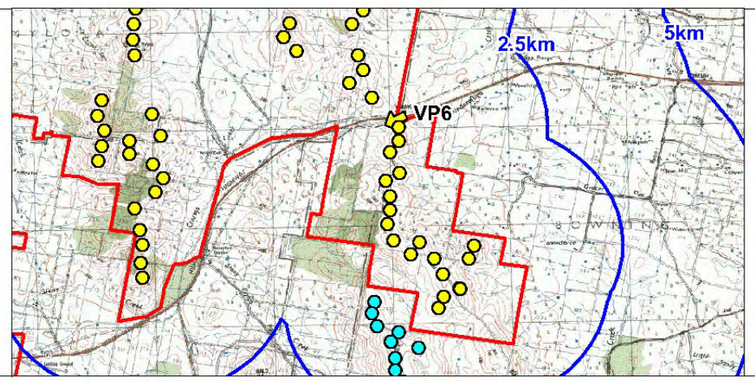
VP6a

210° 270°



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomotage VP6 - Conroy's Gap Truck Parking Area

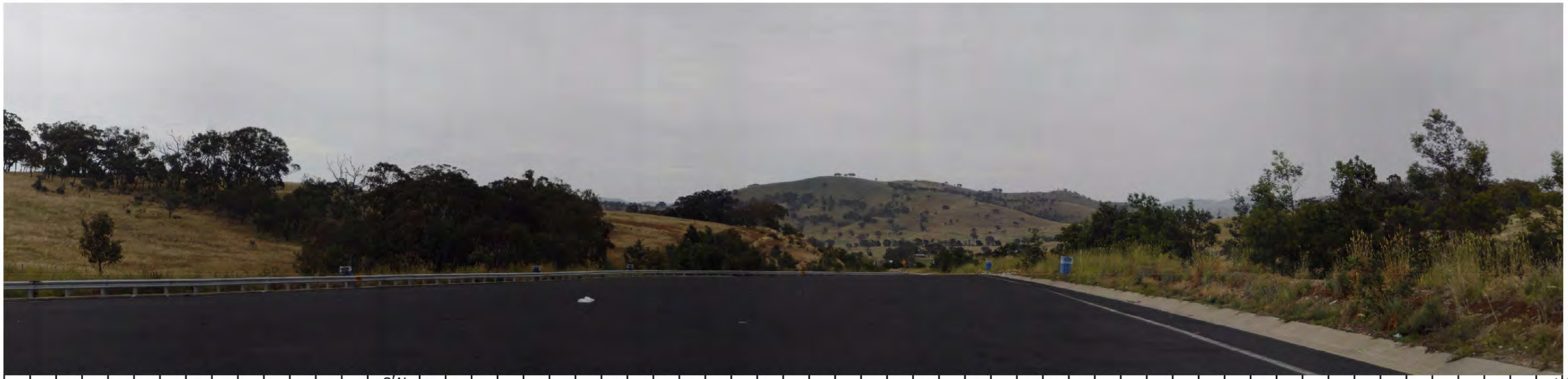
Closest visible turbine: 94 (3.7km)

Field of view: 100°

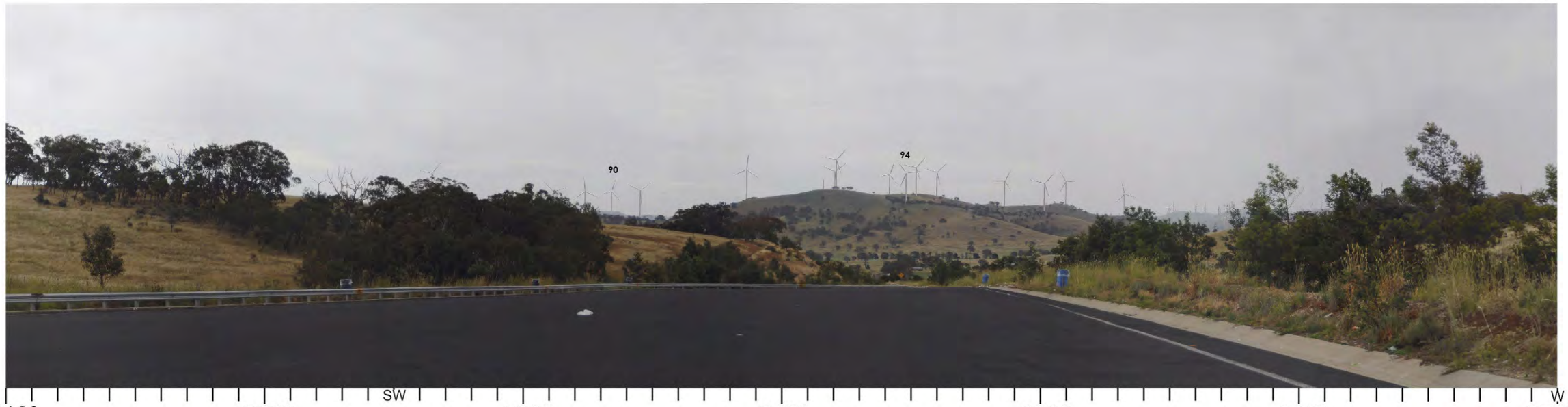
Start Bearing: 195°, End Bearing: 295°

Co-ordinates: 657,989m E, 6,150,328m N

MGA Zone 55 GDA95

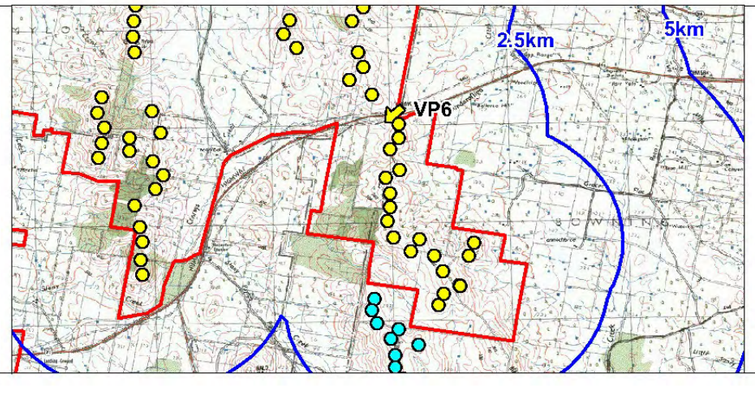


Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomotage VP6a - Conroy's Gap Truck Parking Area

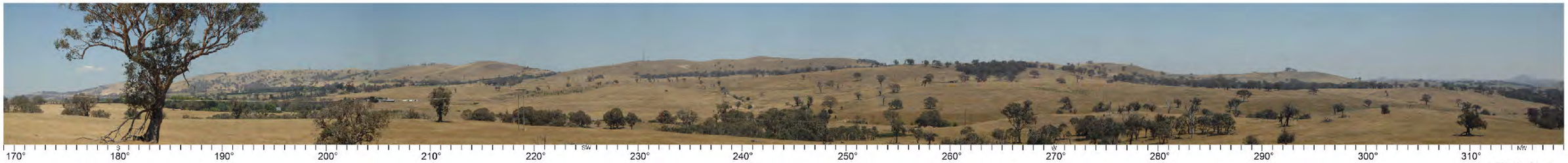
Closest visible turbine: 94 (3.7km)

Field of view: 60°

Start Bearing: 210°, End Bearing: 270°

Co-ordinates: 657,989m E, 6,150,328m N

MGA Zone 55 GDA95



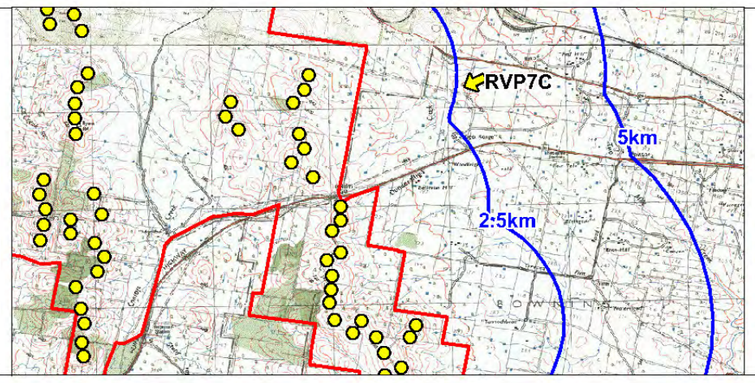
Existing

RVP7C(a) RVP7C(b)

184° 244° 304°

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage RVP7C

Closest visible turbine: 100 (2.5km)

Field of View: 150°

Start Bearing: 169°, End Bearing: 319°

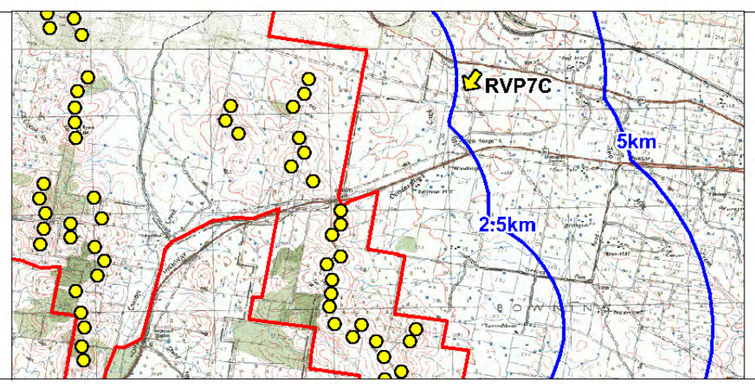
Co-ordinates: 660,367m E, 6,152,689m N

MGA Zone 55 GDA94

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

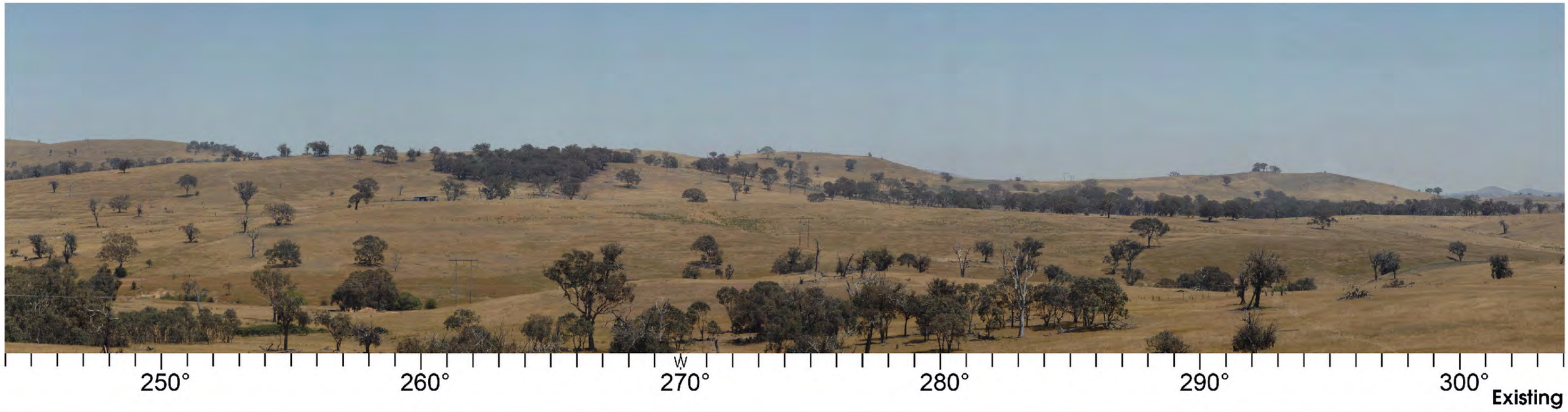
Photomontage RVP7C(a)

Field of View: 60°

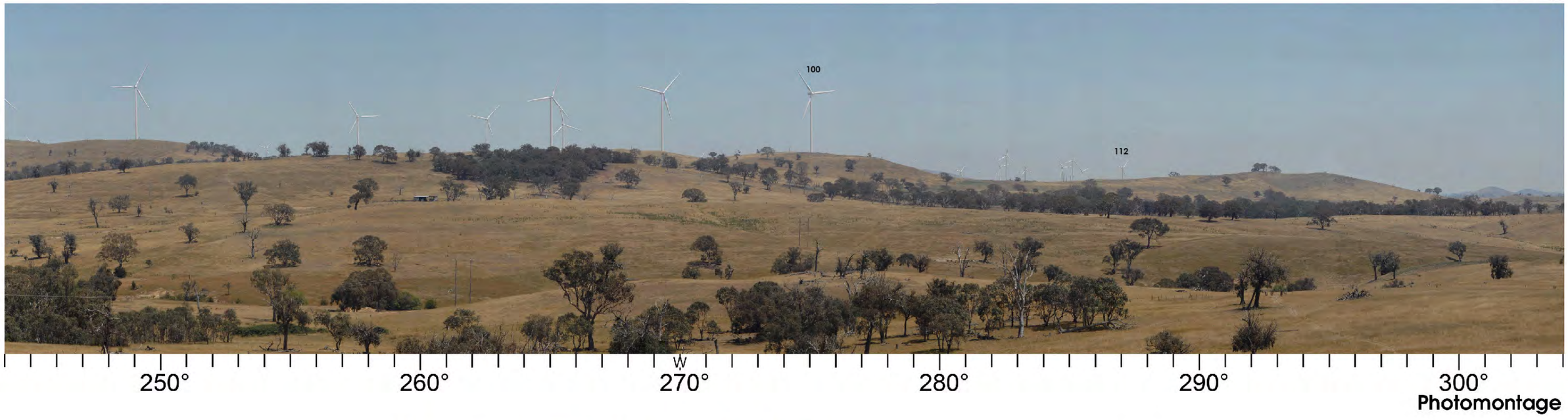
Start Bearing: 184°, End Bearing: 244°

Co-ordinates: 660,367m E, 6,152,689m N

MGA Zone 55 GDA94

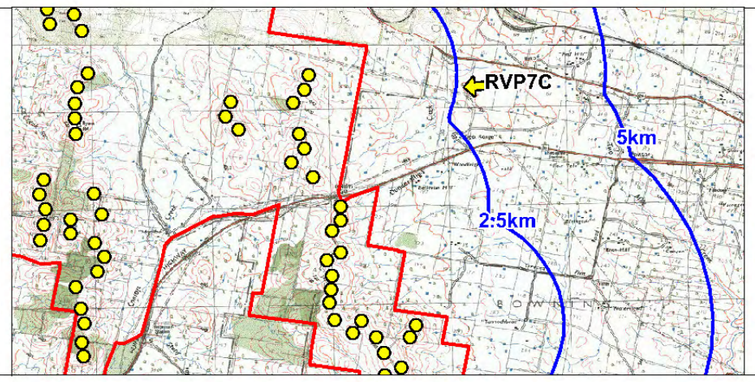


Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage RVP7C(b)

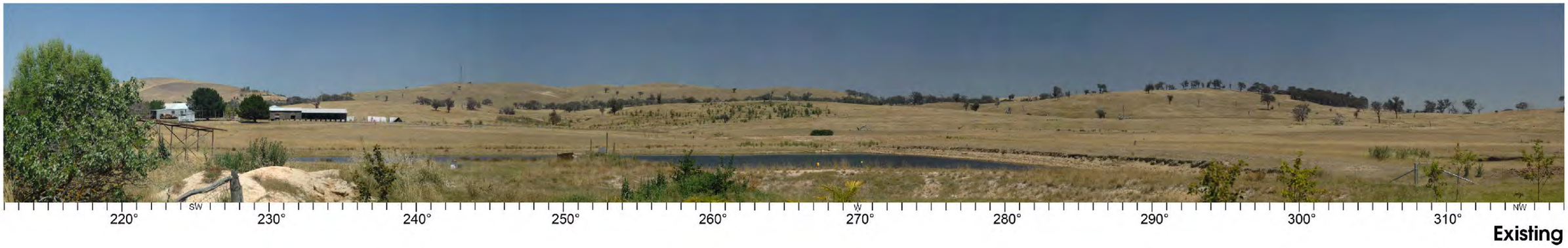
Closest visible turbine: 100 (2.5km)

Field of View: 60°

Start Bearing: 244°, End Bearing: 304°

Co-ordinates: 660,367m E, 6,152,689m N

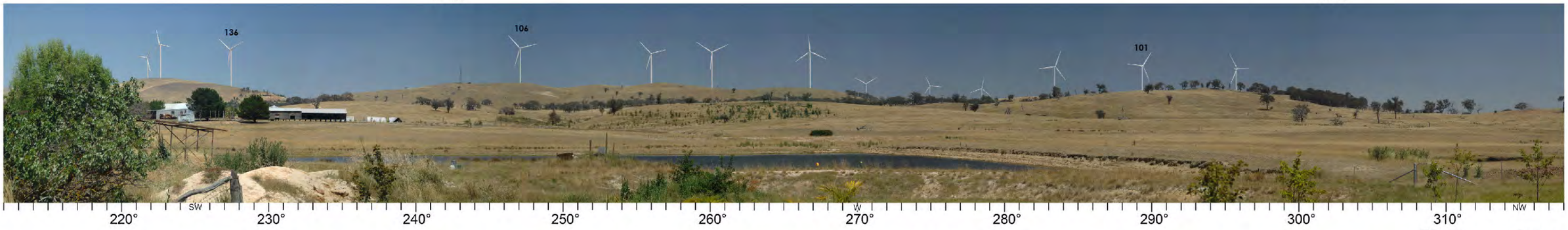
MGA Zone 55 GDA94



Existing

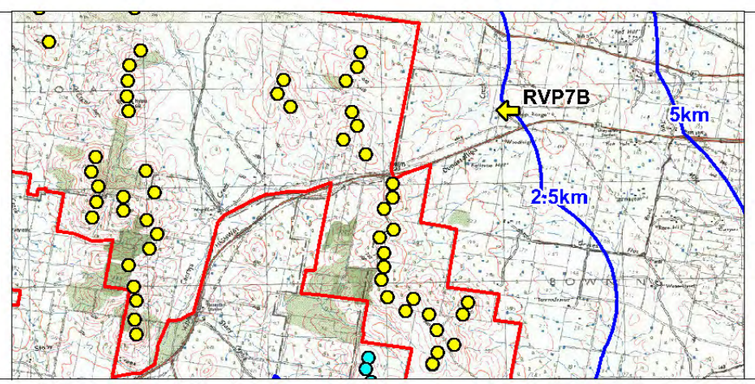
RVP7B(a)

242° 302°



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage RVP7B

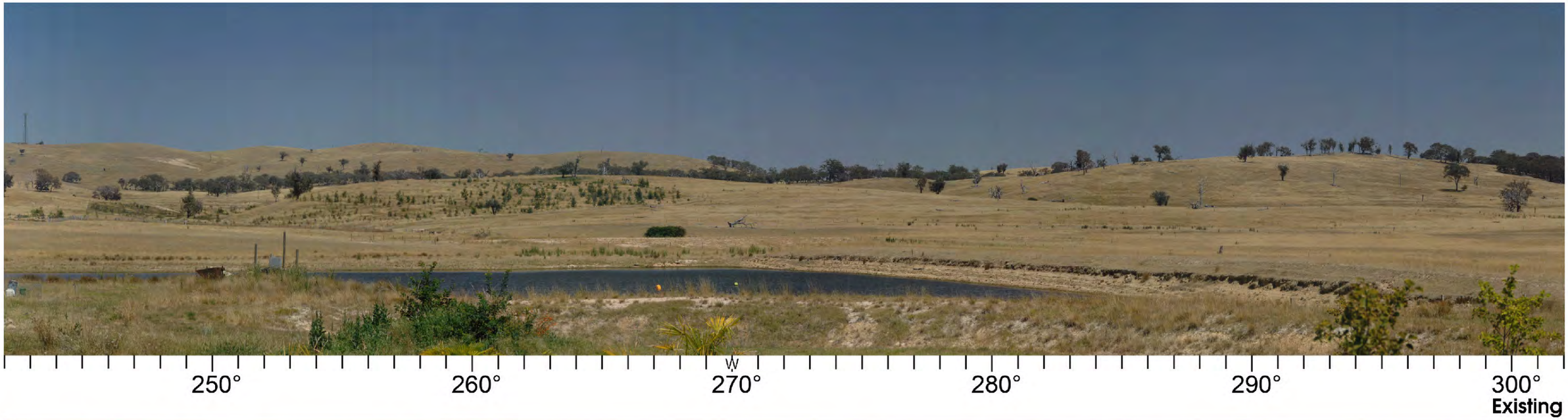
Closest visible turbine: 106 (2.4km)

Field of View: 106°

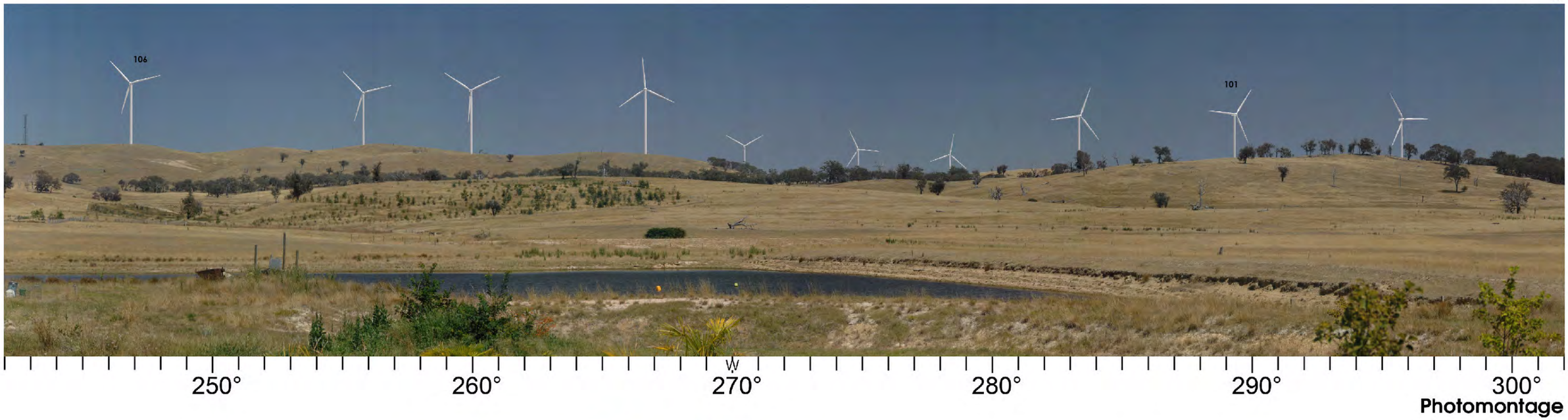
Start Bearing: 212°, End Bearing: 318°

Co-ordinates: 660,018m E, 6,151,762m N

MGA Zone 55 GDA94

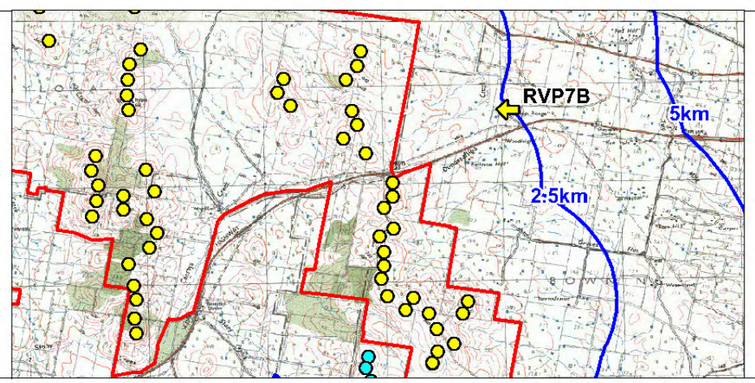


Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage RVP7B(a)

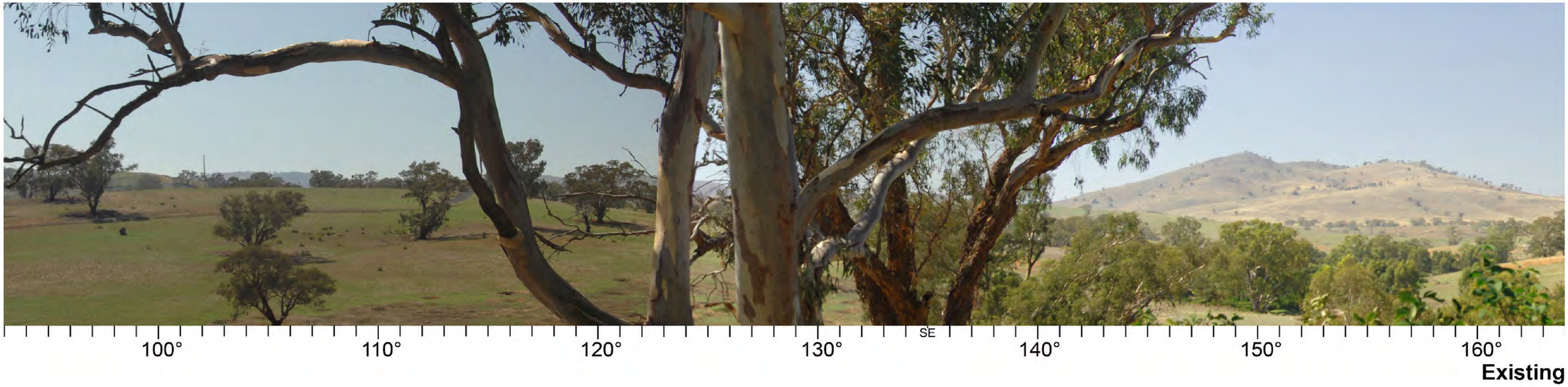
Closest visible turbine: 106 (2.4km)

Field of View: 60°

Start Bearing: 242°, End Bearing: 302°

Co-ordinates: 660,018m E, 6,151,762m N

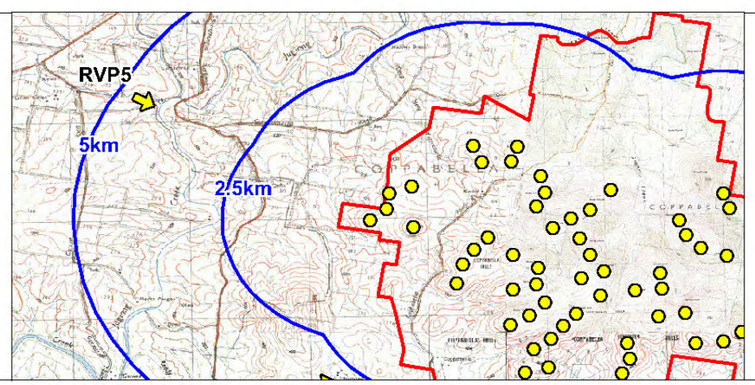
MGA Zone 55 GDA94



Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage RVP5 - 'Naranghi'

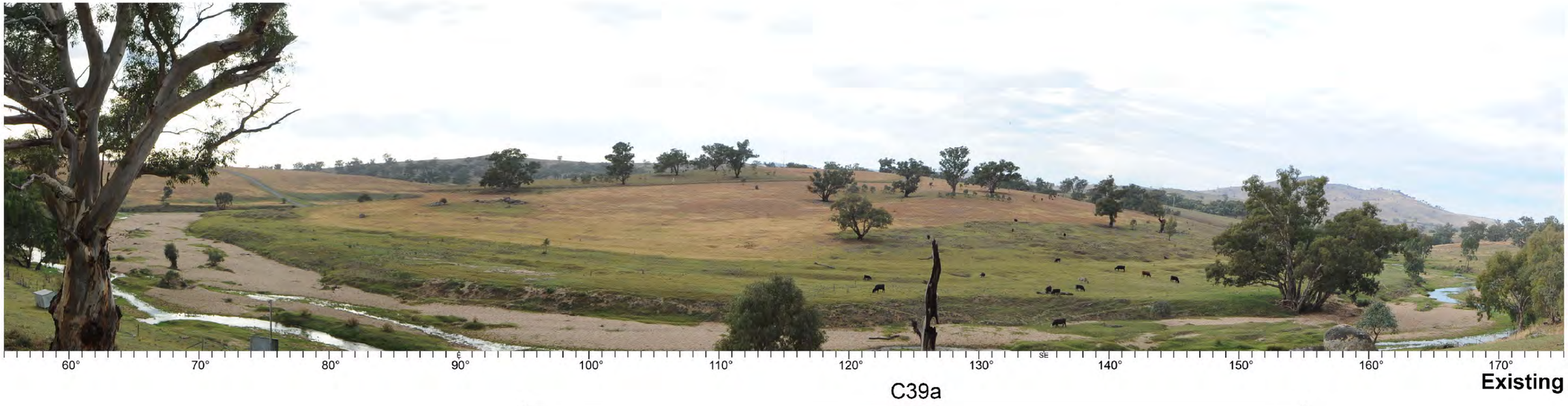
Closest visible turbine: 70 (4.4km)

Field of View: 71°

Start Bearing: 93°, End Bearing:164°

Co-oridnates: 631,542m E, 6,158,496m N

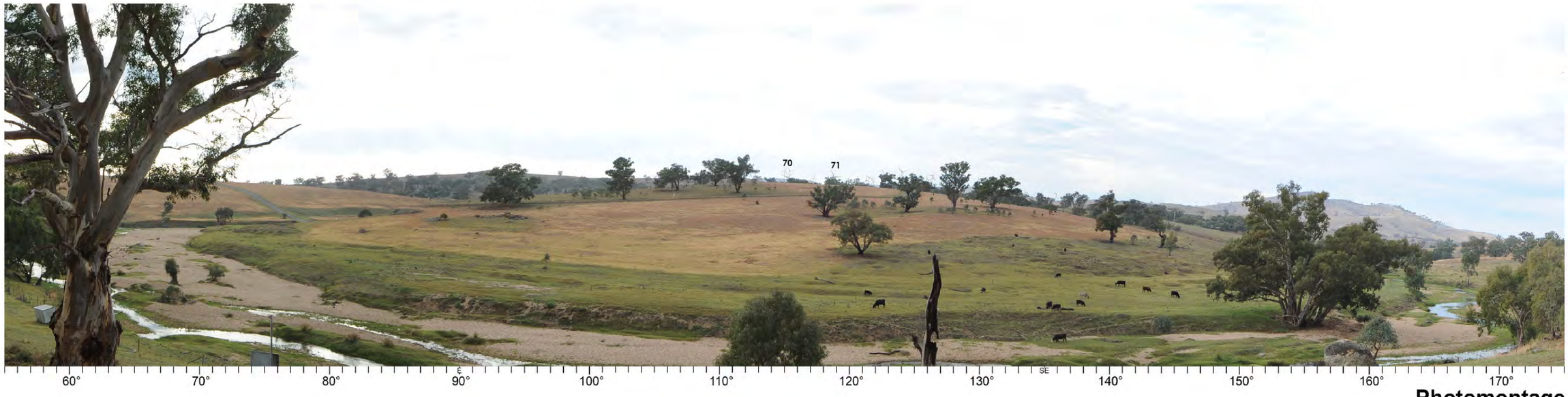
MGA Zone 55 GDA94



Existing

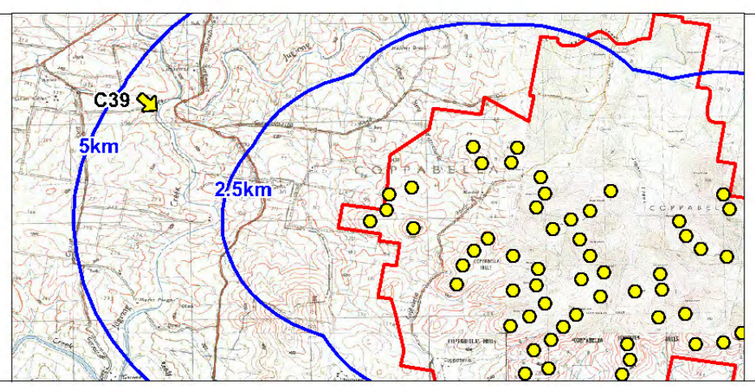
C39a

95° 155°



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage C39

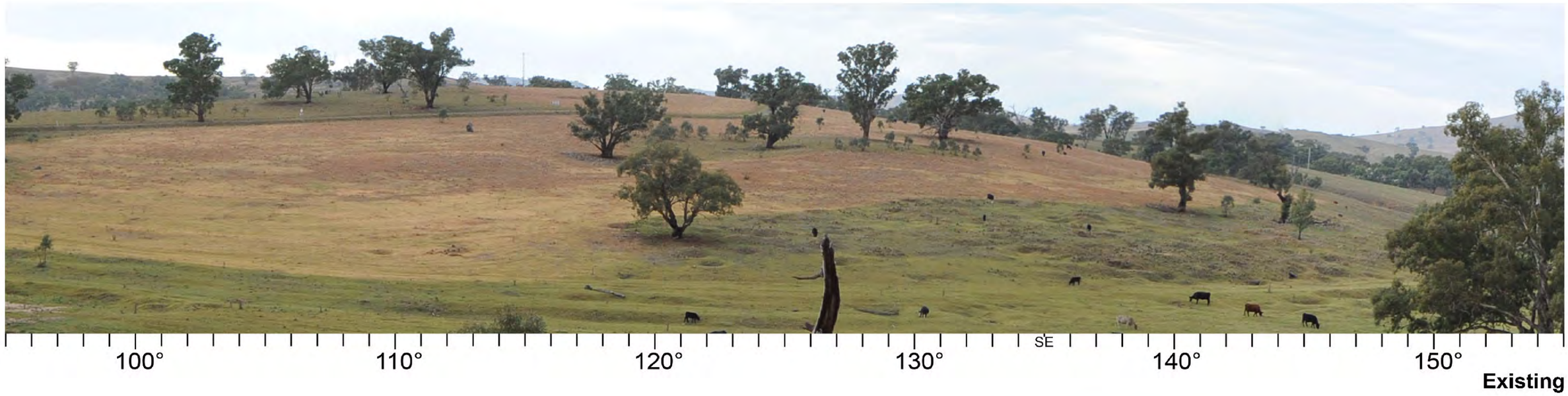
Closest visible turbine: 70 (4.4km)

Field of View: 120°

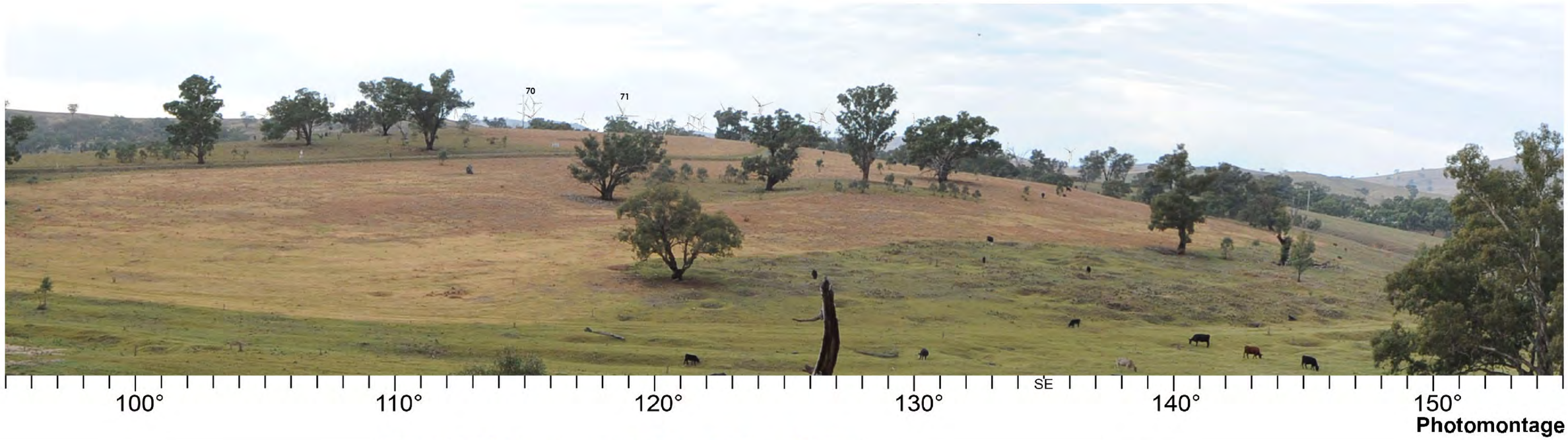
Start Bearing: 55°, End Bearing: 175°

Co-ordinates: 631,559m E, 6,158,512m N

MGA Zone 55 GDA94

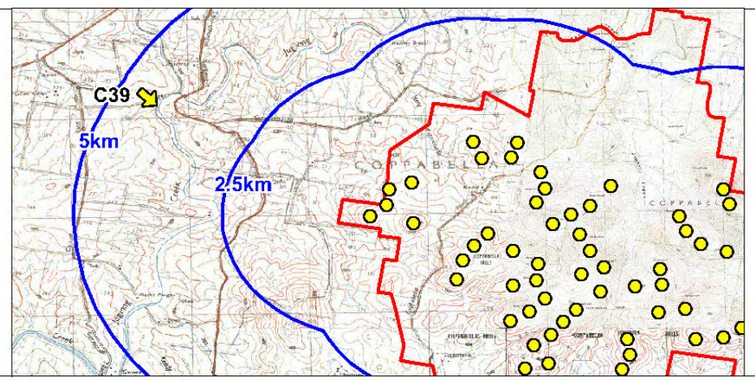


Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage C39a

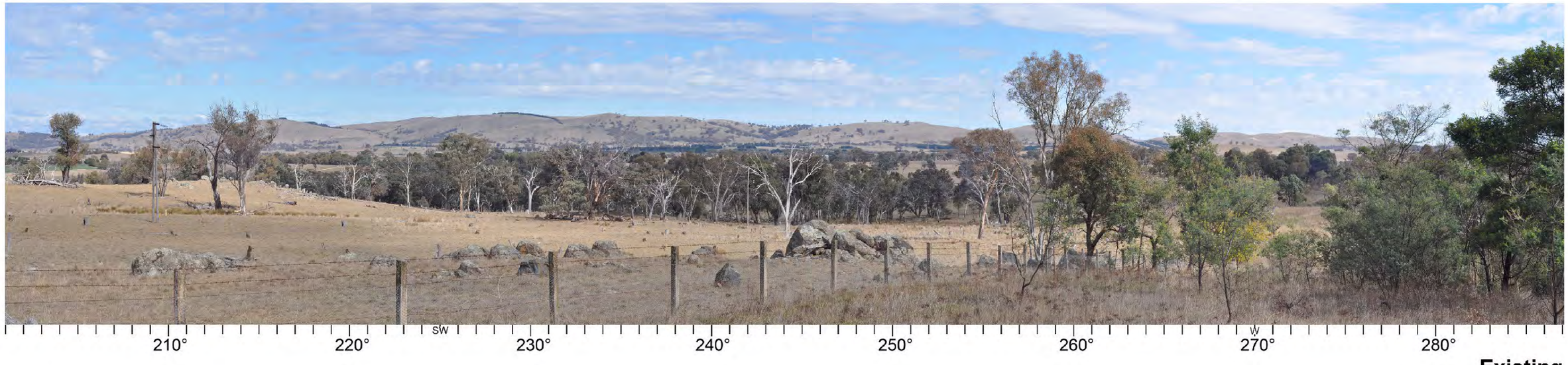
Closest visible turbine: 70 (4.4km)

Field of View: 60°

Start Bearing: 95°, End Bearing: 155°

Co-ordinates: 631,559m E, 6,158,512m N

MGA Zone 55 GDA94



Existing

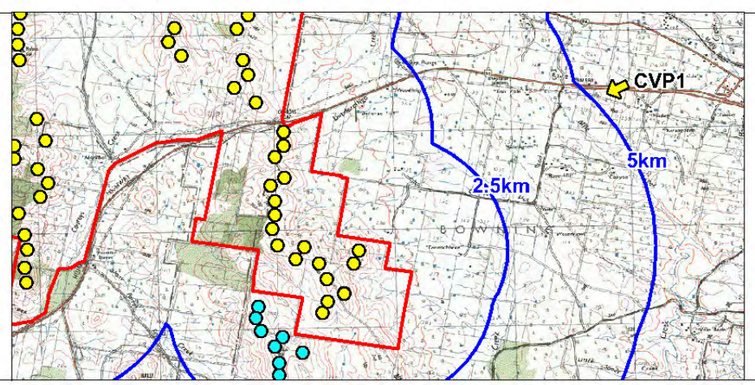
CVP1a

216° — 276°

Conroy's Gap Wind Farm: 201° - 225° | Both Conroy's Gap and Yass Wind Farm: 225° - 234° | Yass Wind Farm: 234° - 287°

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage CVP1 - Hume Highway East

Closest visible turbine: 143 (5.3km)

Field of View: 86°

Start Bearing: 201°, End Bearing:287°

Co-ordinates: 663,685m E, 6,150,965m N

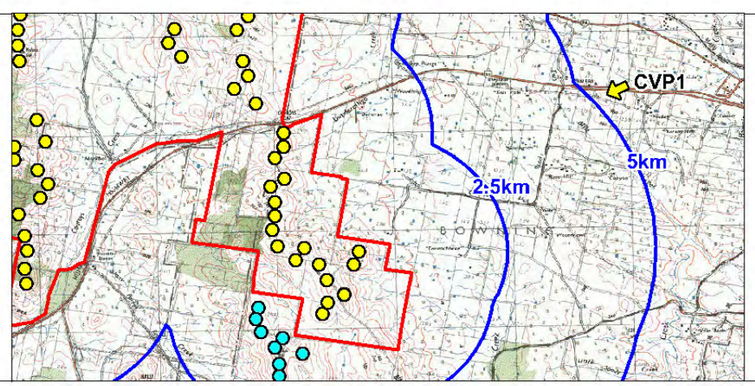
MGA Zone 55 GDA94

Existing

Conroy's Gap Wind Farm: 216° - 225° | Both Conroy's Gap and Yass Wind Farm: 225° - 234° | Yass Wind Farm: 234° - 276°

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomotage CVP1a - Hume Highway East

Closest visible turbine: 143 (5.3km)

Field of view: 60°

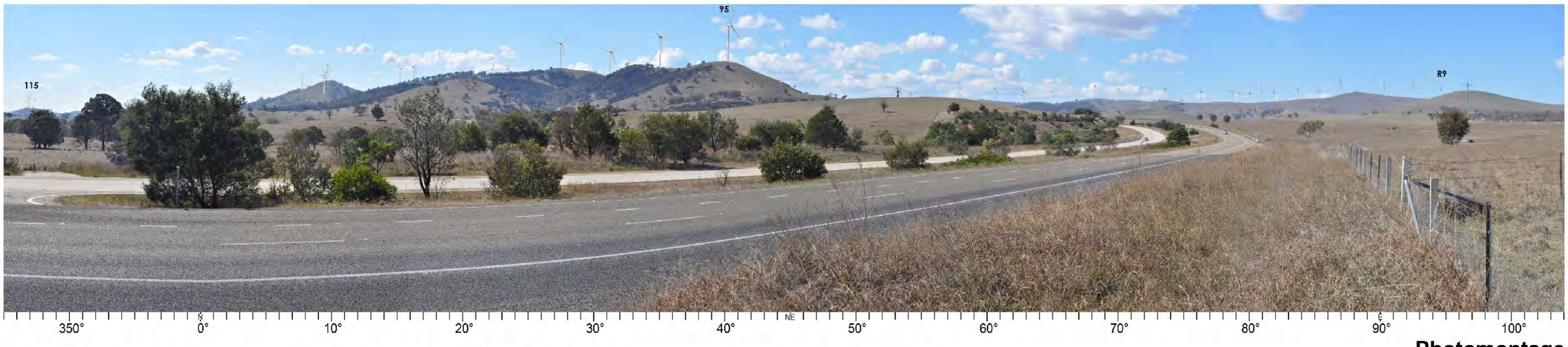
Start Bearing: 216°, End Bearing: 276°

Co-ordinates: 663,685m E, 6,150,965m N

MGA Zone 55 GDA95

Existing

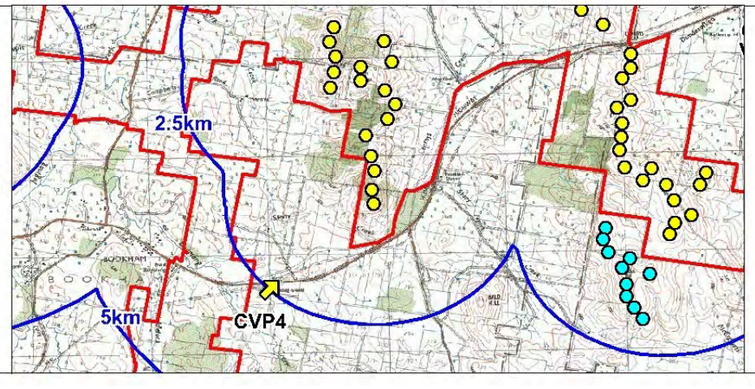
345° 45° 105°



Photomontage

Yass Wind Farm: 345° - 75° Both Conroy's Gap and Yass Wind Farm: 75° - 82° Conroy's Gap Wind Farm: 82° - 105°

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage CVP4 - Hume Highway West

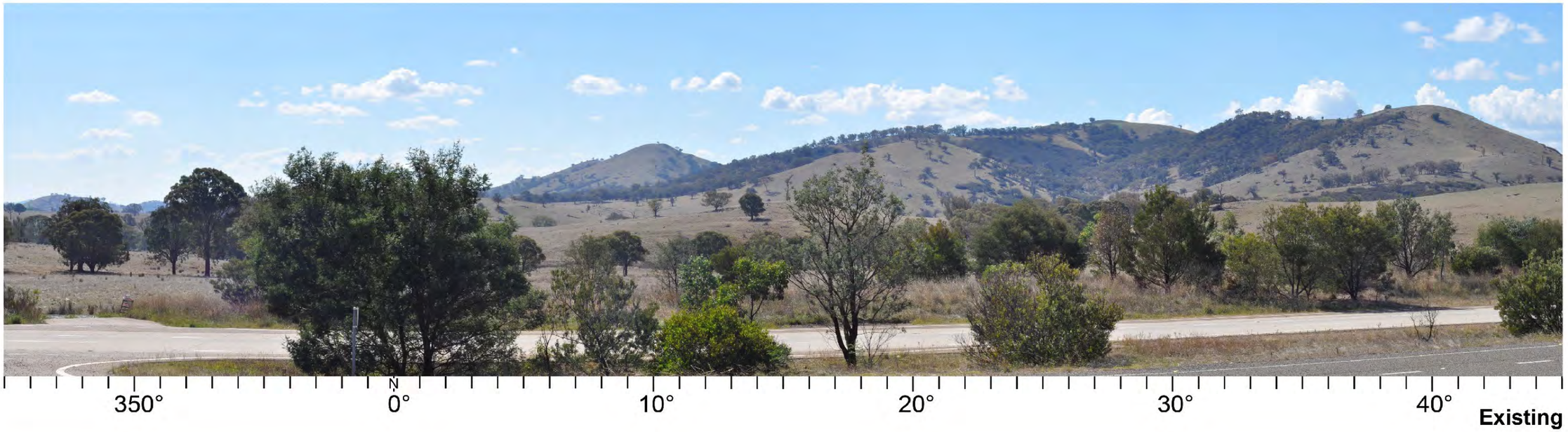
Closest visible turbine: 95 (2km)

Field of View: 120°

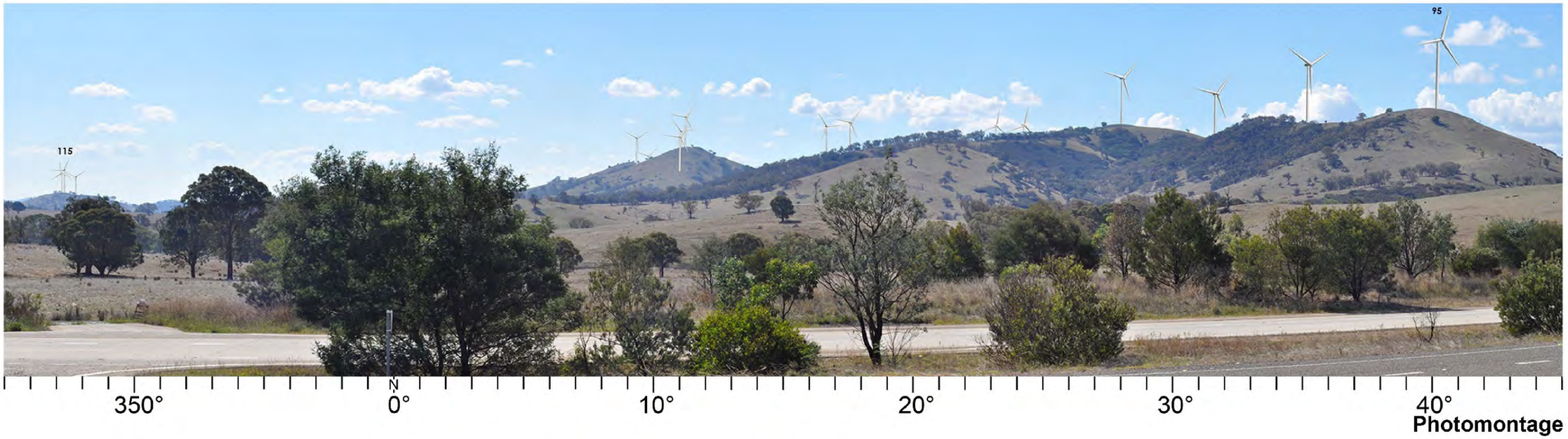
Start Bearing: 345°, End Bearing: 105°

Co-ordinates: 652,570m E, 6,145,642m N

MGA Zone 55 GDA94

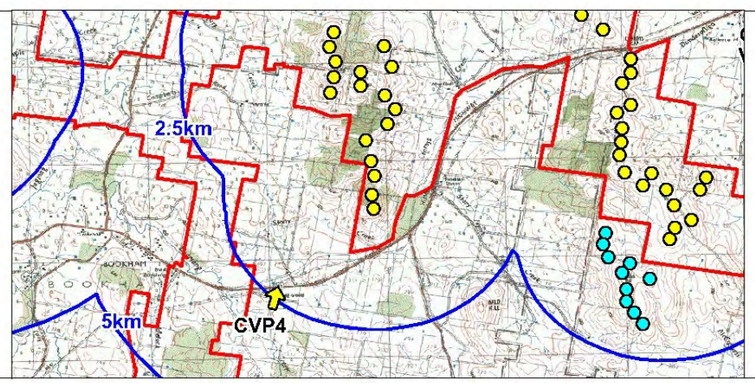


Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage CVP4a - Hume Highway West

Closest visible turbine: 95 (2km)

Field of View: 60°

Start Bearing: 345°, End Bearing: 45°

Co-ordinates: 652,570m E, 6,145,642m N

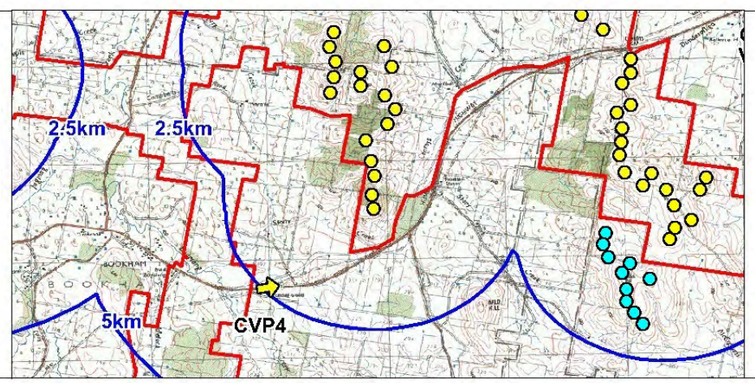
MGA Zone 55 GDA94

Existing

Yass Wind Farm: 45° - 75° Both Conroy's Gap and Yass Wind Farm: 75° - 82° Conroy's Gap Wind Farm: 82° - 105°

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

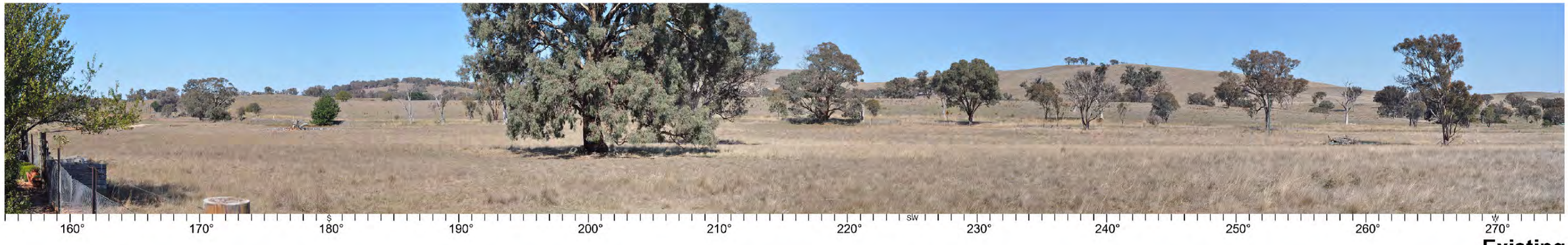
Photomontage CVP4b - Hume Highway West

Field of View: 60°

Start Bearing: 45°, End Bearing: 105°

Co-ordinates: 652,570m E, 6,145,642m N

MGA Zone 55 GDA94

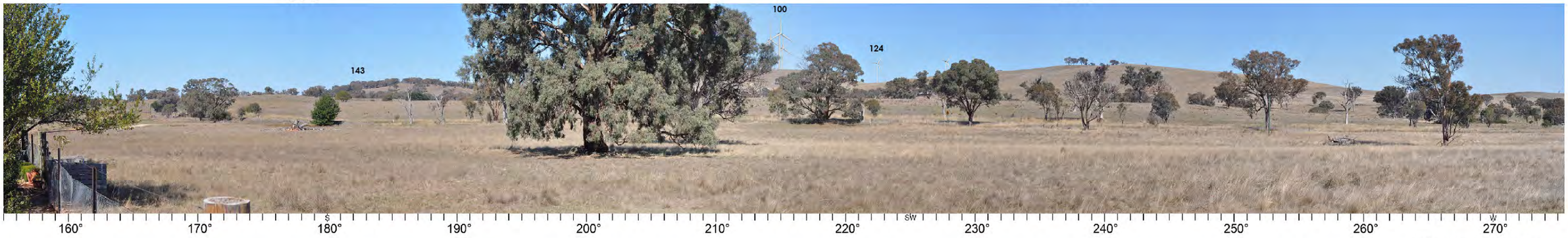


Existing

M20a

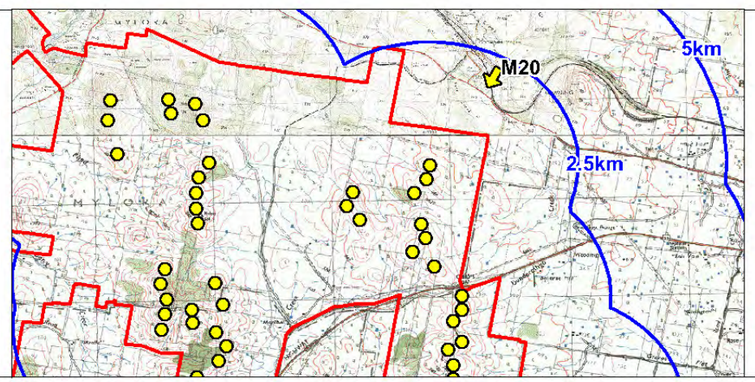
178°

238°



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage M20

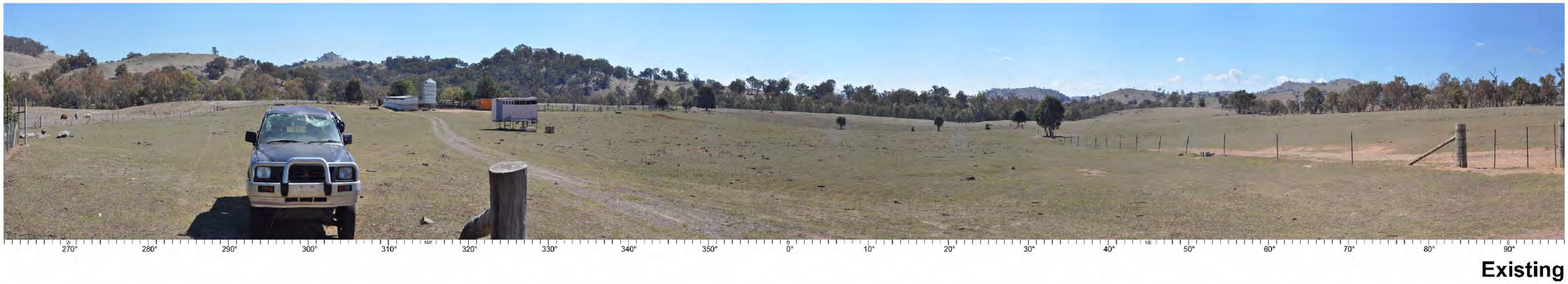
Closest visible turbine: 100 (1.9km)

Field of View: 120°

Start Bearing: 155°, End Bearing:275°

Co-oridnates: 658,728m E, 6,154,519m N

MGA Zone 55 GDA94



Existing

C67a

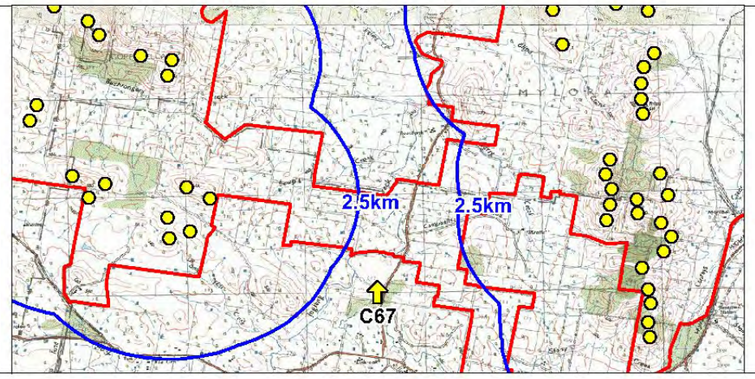
268° — 328°

C67b

24° — 84°

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage C67

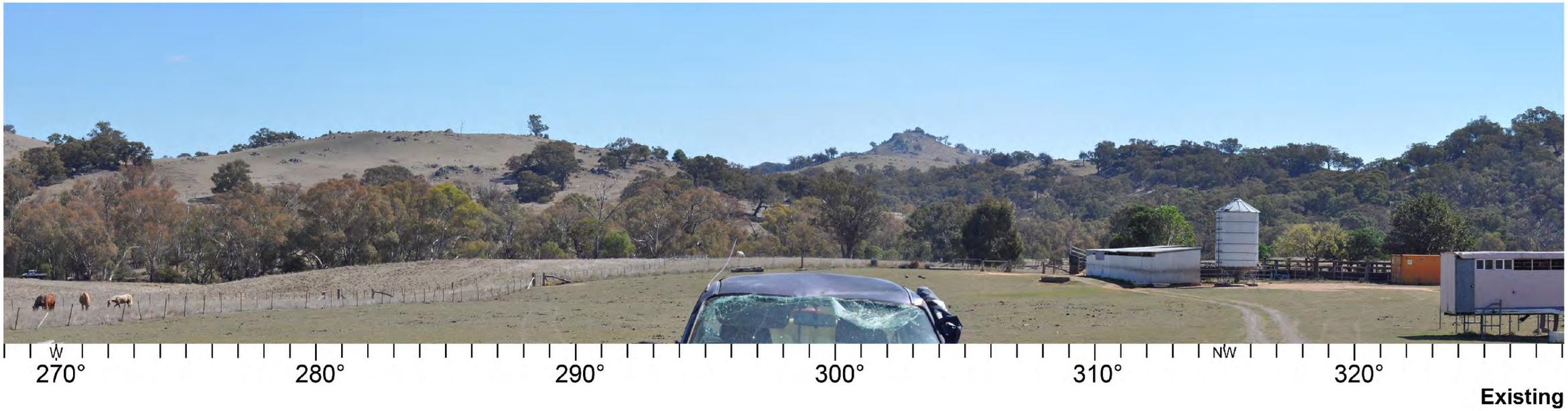
Closest visible turbine: 74 (3.3km)

Field of View: 255°

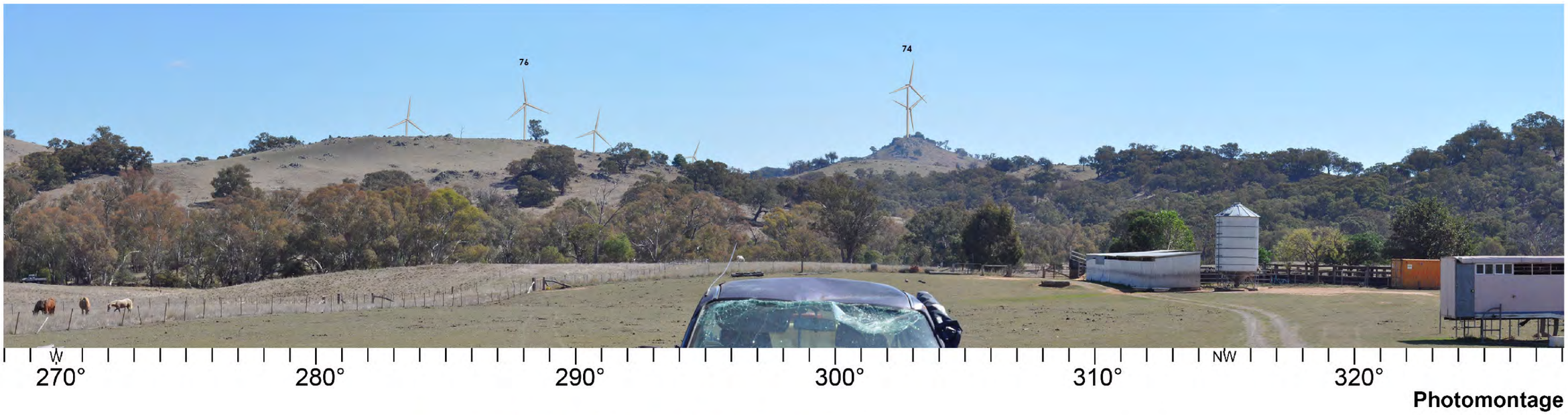
Start Bearing: 262°, End Bearing: 97°

Co-ordinates: 649,308m E, 6,148,466m N

MGA Zone 55 GDA94

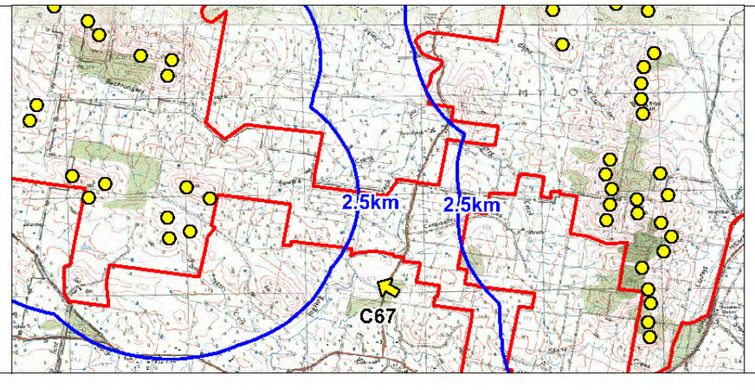


Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage C67a

Closest visible turbine: 74 (3.3km)

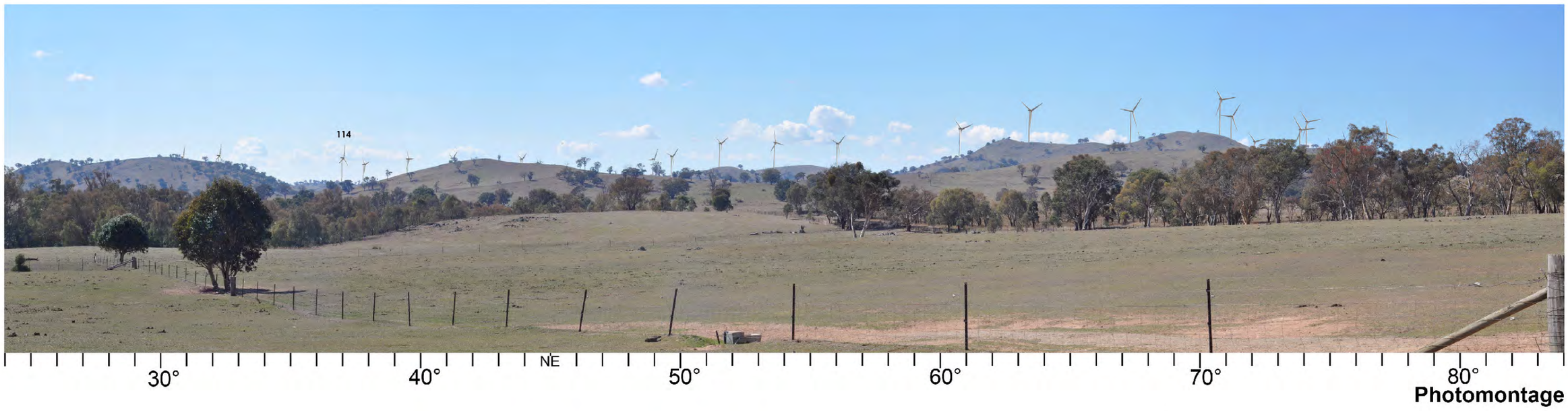
Field of View:60°

Start Bearing: 268°, End Bearing: 328°

Co-ordinates: 649,308m E, 6,148,466m N

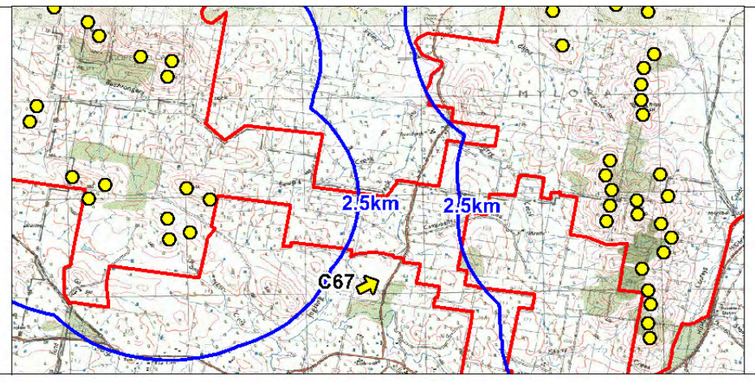
MGA Zone 55 GDA94

Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

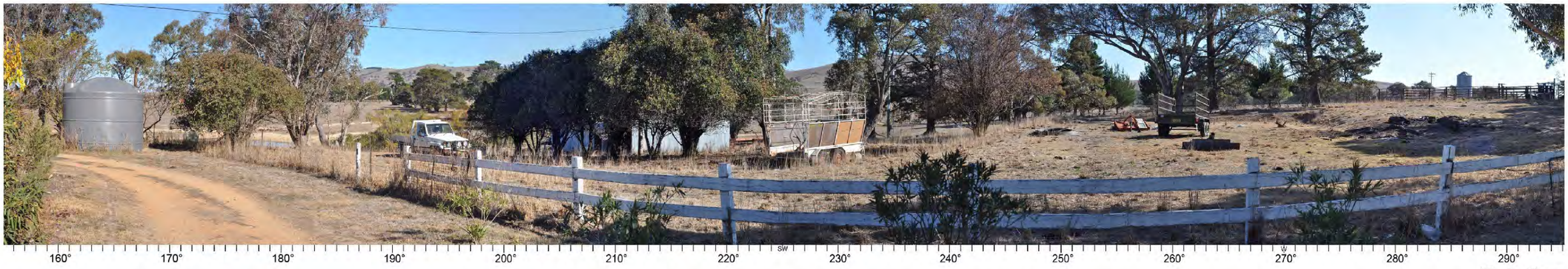
Photomontage C67b

Field of View: 60°

Start Bearing: 24°, End Bearing: 84°

Co-ordinates: 649,308m E, 6,148,466m N

MGA Zone 55 GDA94



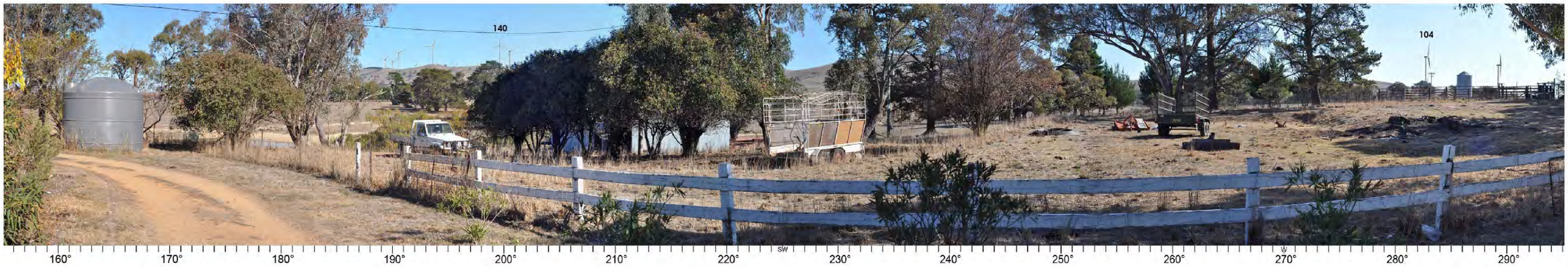
Existing

G14a

155° — 215°

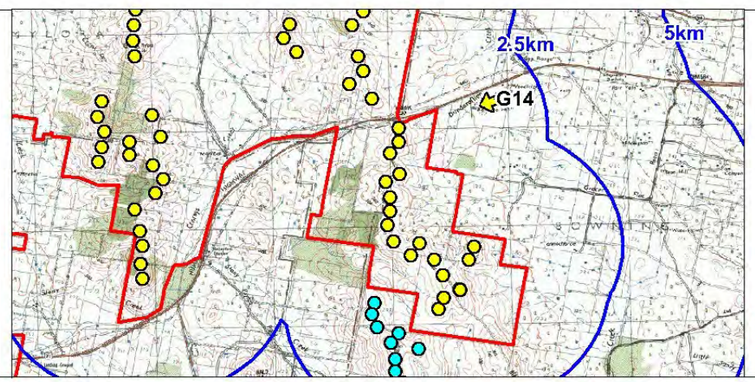
G14b

235° — 295°



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage G14

Closest turbine visible on photomontage:104 (2km)

Field of View: 140°

Start Bearing: 155°, End Bearing: 295°

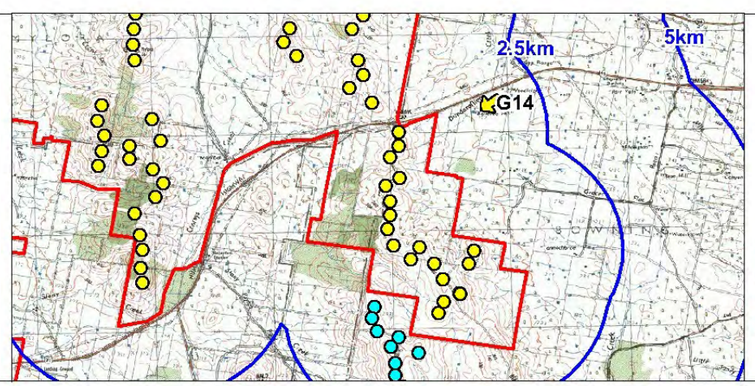
Co-ordinates: 659,586m E, 6,150,7697m N

MGA Zone 55 GDA94

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage G14a

Field of View: 60°

Start Bearing: 155°, End Bearing: 215°

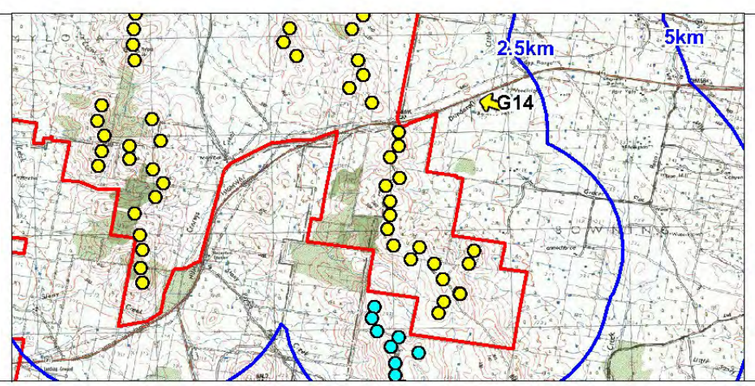
Co-ordinates: 659,586m E, 6,150,697m N

MGA Zone 55 GDA94

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage G14b

Closest turbine visible on photomontage:104 (2km)

Field of View: 60°

Start Bearing: 235°, End Bearing: 295°

Co-ordinates: 659,586m E, 6,150,697m N

MGA Zone 55 GDA94

Existing

G16a

280° 340°

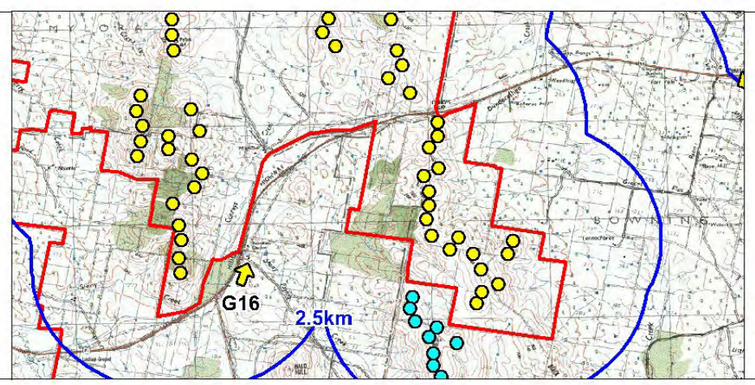
G16b

70° 130

Yass Wind Farm: 280° - 100° Conroy's Gap Wind Farm: 100° - 130°

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage G16

Closest turbine visible on photomontage: 97 (1.2km)

Field of View: 210°

Start Bearing: 280°, End Bearing: 130°

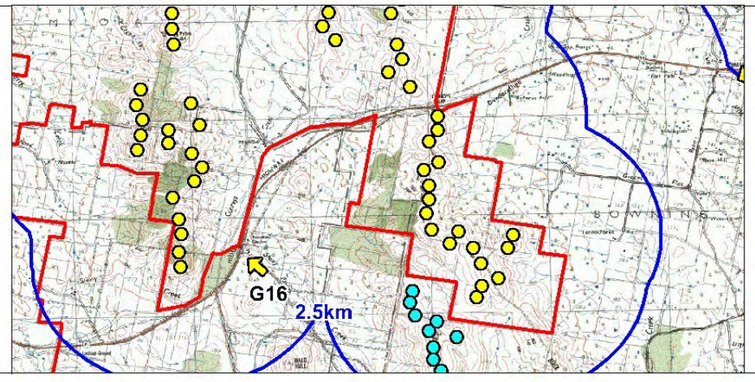
Co-ordinates: 655,008m E, 6,147,415m N

MGA Zone 55 GDA94

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage G16a

Closest turbine visible on photomontage: 97 (1.2km)

Field of View: 60°

Start Bearing: 280°, End Bearing: 340°

Co-ordinates: 655,008m E, 6,147,415m N

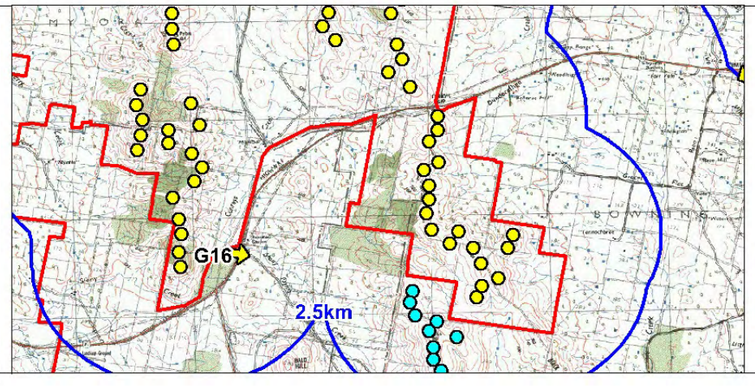
MGA Zone 55 GDA94

Existing

Yass Wind Farm: 70° - 100° Conroy's Gap Wind Farm: 100° - 130°

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

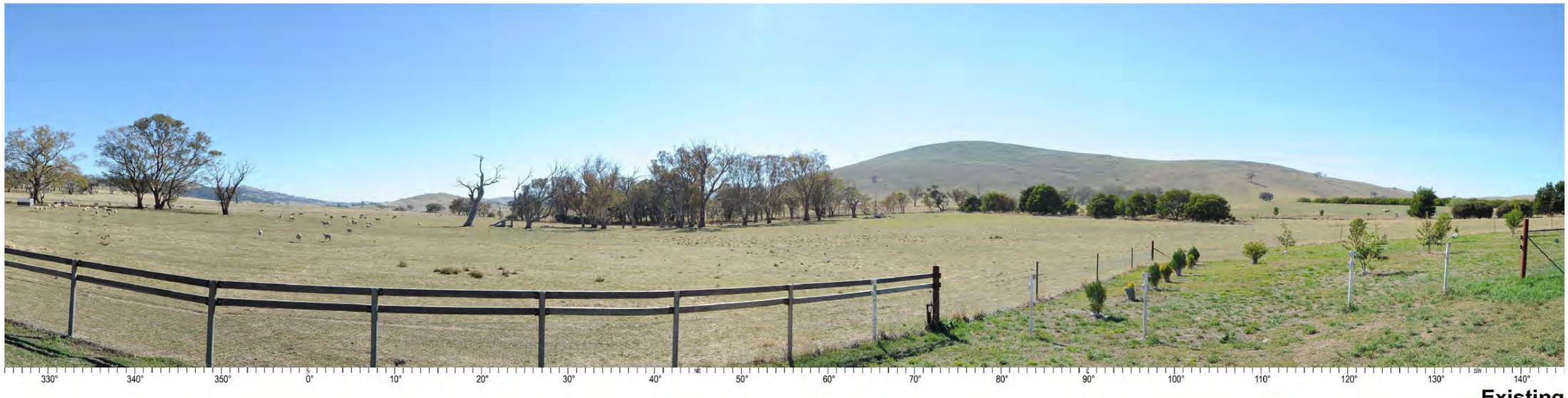
Photomontage G16b

Field of View: 60°

Start Bearing: 70°, End Bearing: 130°

Co-ordinates: 655,008m E, 6,147,415m N

MGA Zone 55 GDA94



Existing

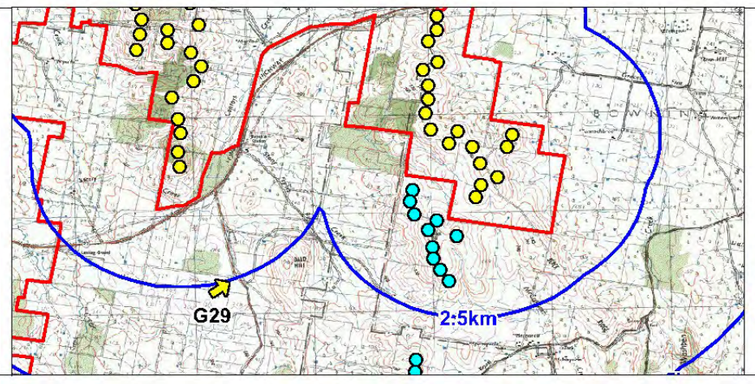
G29a

325° 25°

Photomontage

Yass Wind Farm: 325° - 60° Conroy's Gap Wind Farm: 120° - 145°

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage G29

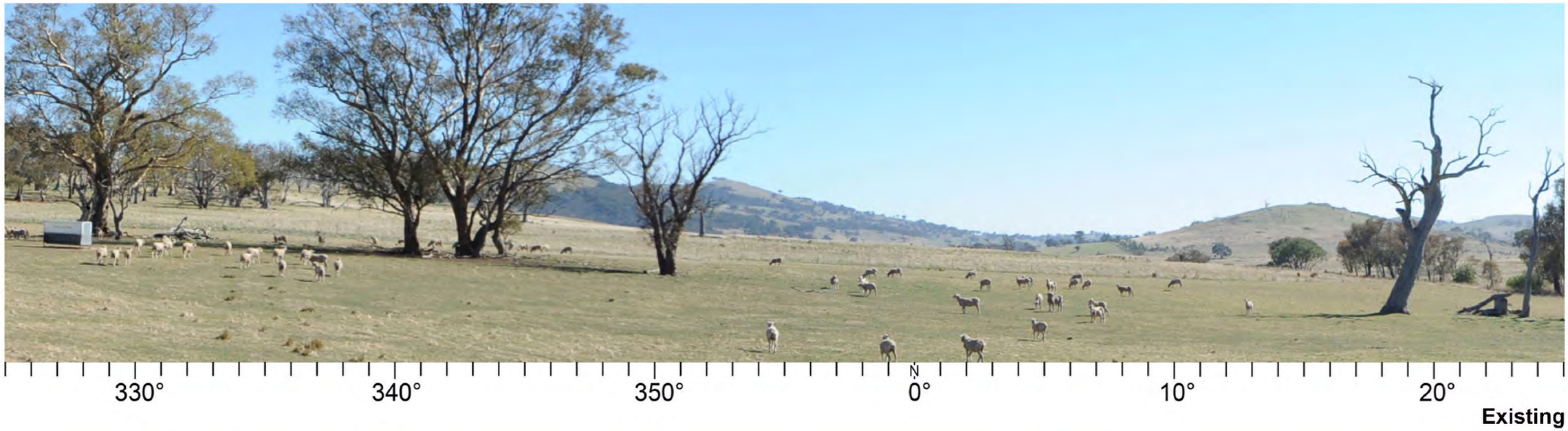
Closest visible turbine: 90 (4.2km)

Field of View: 180°

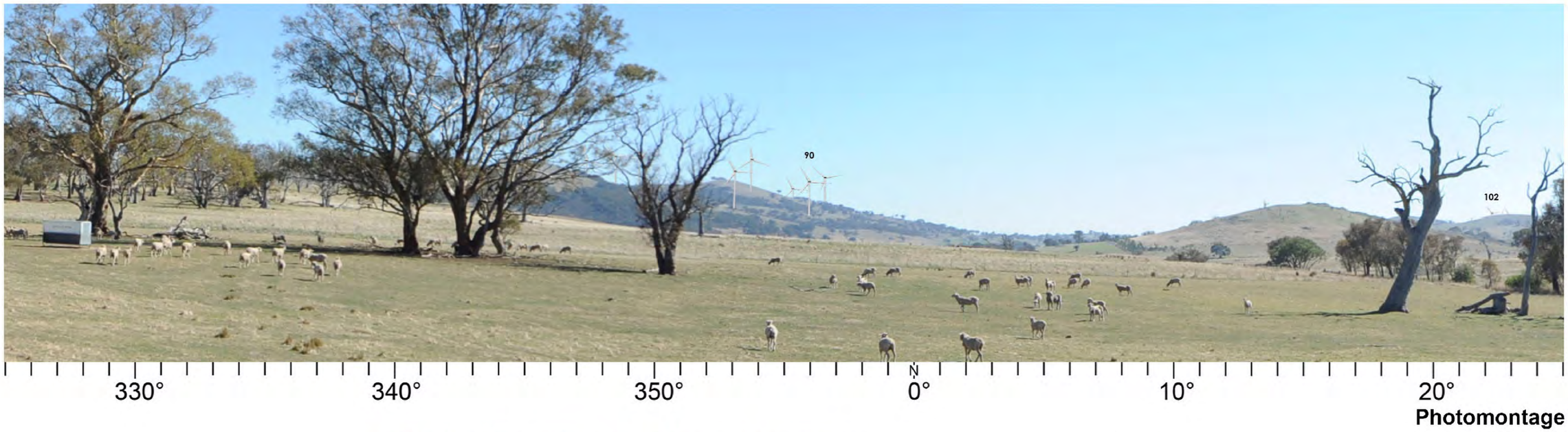
Start Bearing: 325°, End Bearing: 145°

Co-ordinates: 654,670m E, 6,144,842m N

MGA Zone 55 GDA94

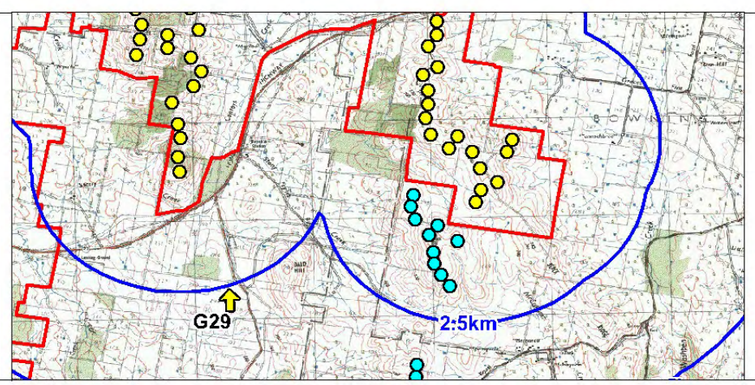


Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Conroy's Gap Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage G29a

Closest visible turbine: 90 (4.2km)

Field of View: 60°

Start Bearing: 325°, End Bearing: 25°

Co-ordinates: 654,670m E, 6,144,842m N

MGA Zone 55 GDA94

Existing

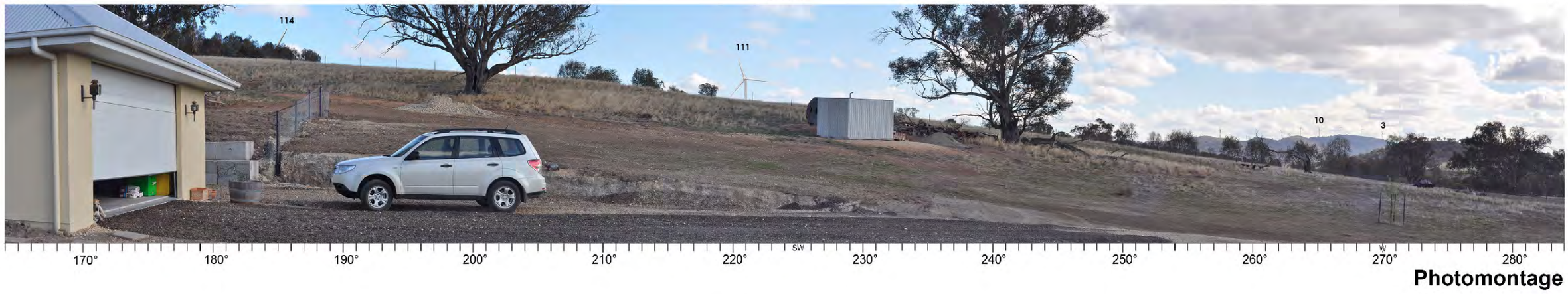
M42a

M42b

164°

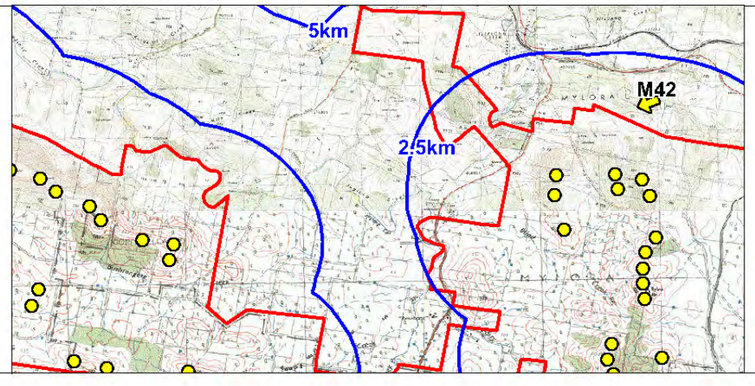
224°

284°



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage M42

Closest visible turbine: 111 (1.9km)

Field of View:120°

Start Bearing: 164°, End Bearing: 284°

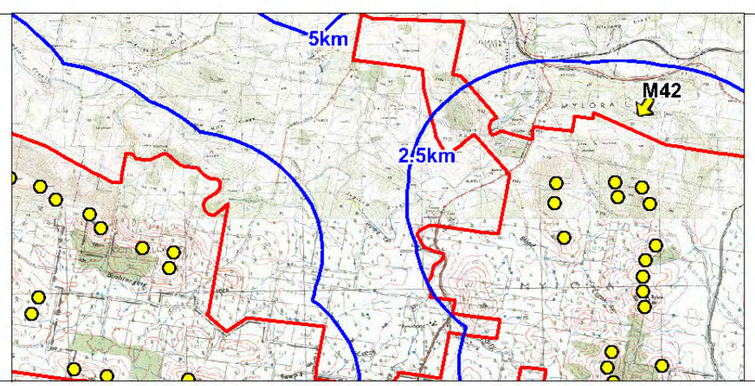
Co-ordinates: 653,661m E, 6,155,465m N

MGA Zone 55 GDA94

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage M42a

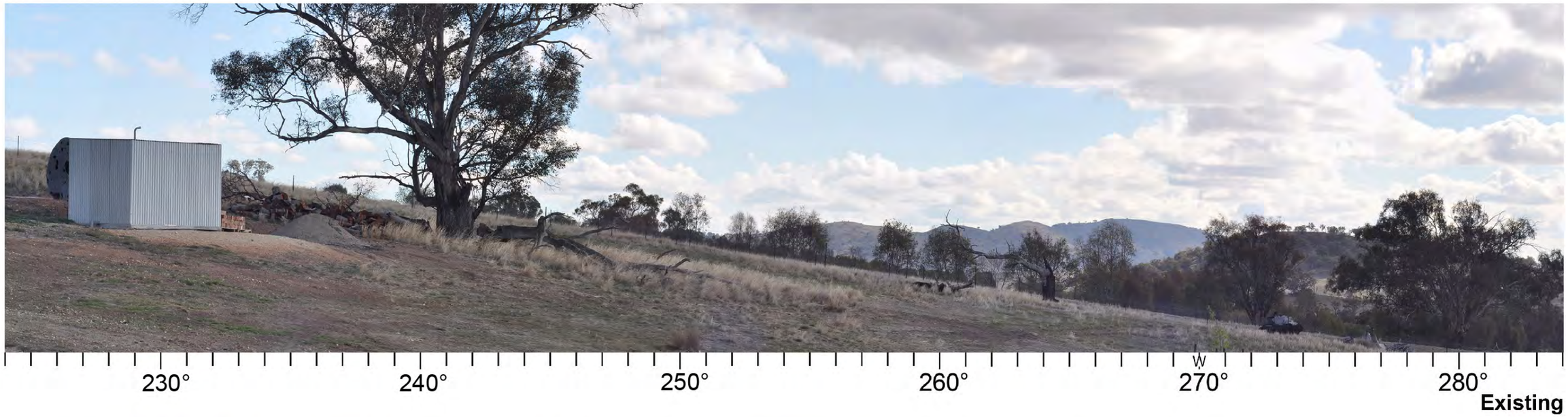
Closest visible turbine: 111 (1.9km)

Field of View: 60°

Start Bearing: 164°, End Bearing 224°

Co-ordinates: 653,661m E, 6,155,465m N

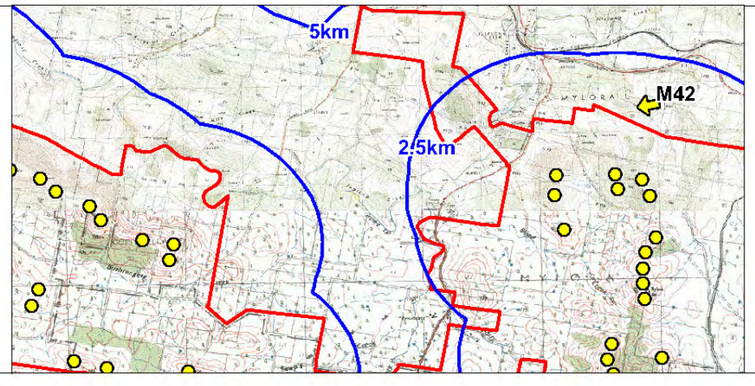
MGA Zone 55 GDA94



Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage M42b

Field of View: 60°

Start Bearing: 224°, End Bearing 284°

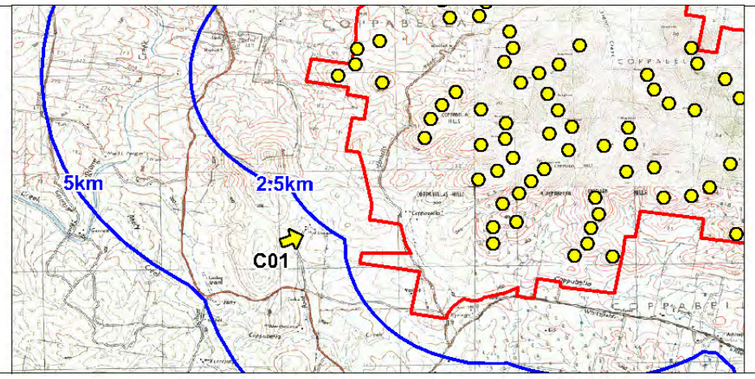
Co-ordinates: 653,661m E, 6,155,465m N

MGA Zone 55 GDA94

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage C01 Windframe

Closest visible turbine: 63 (2.7km)

Field of View: 95°

Start Bearing: 20°, End Bearing: 115°

Co-ordinates: 634,567m E, 6,153,015m N

MGA Zone 55 GDA94

Existing

C59a

313°

13°

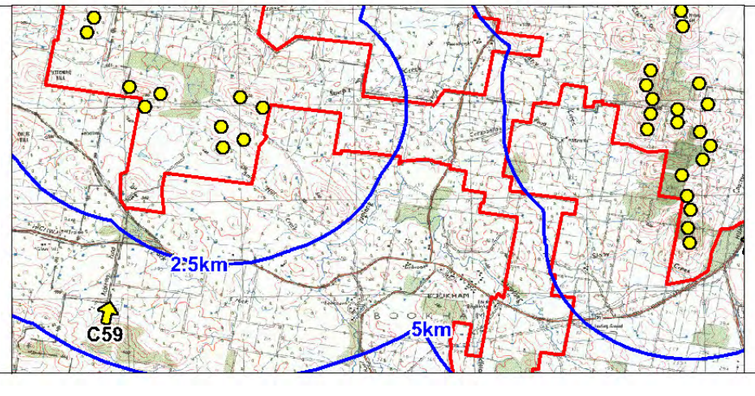
C59b

23°

83°

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage C59 - Robinsons Road

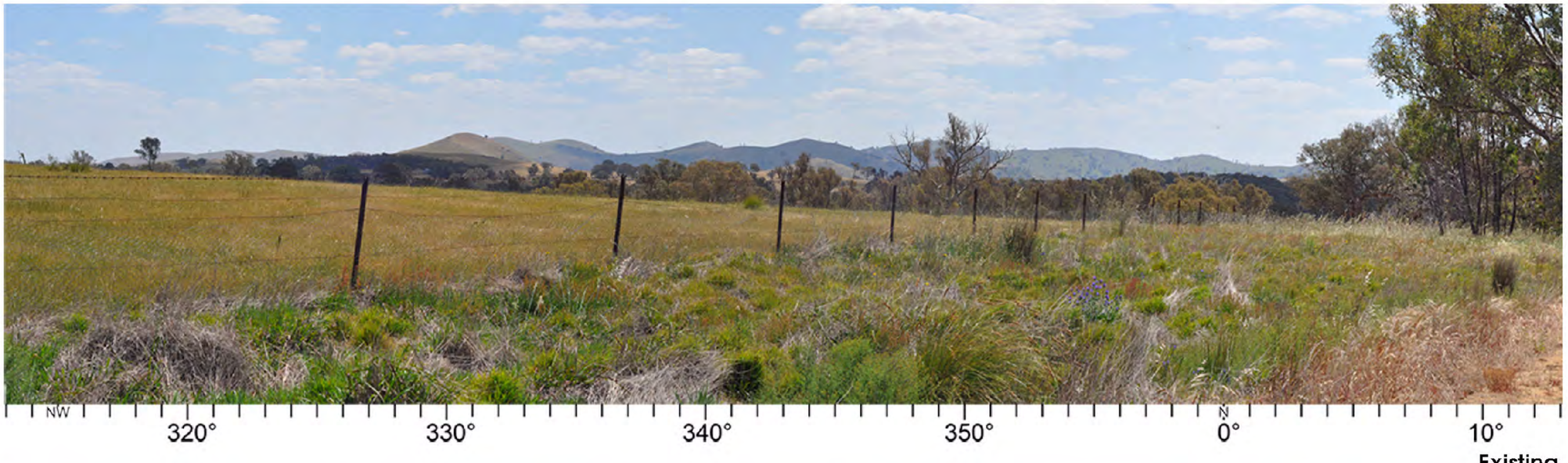
Closest visible turbine: 77(3.8km)

Field of View: 134°

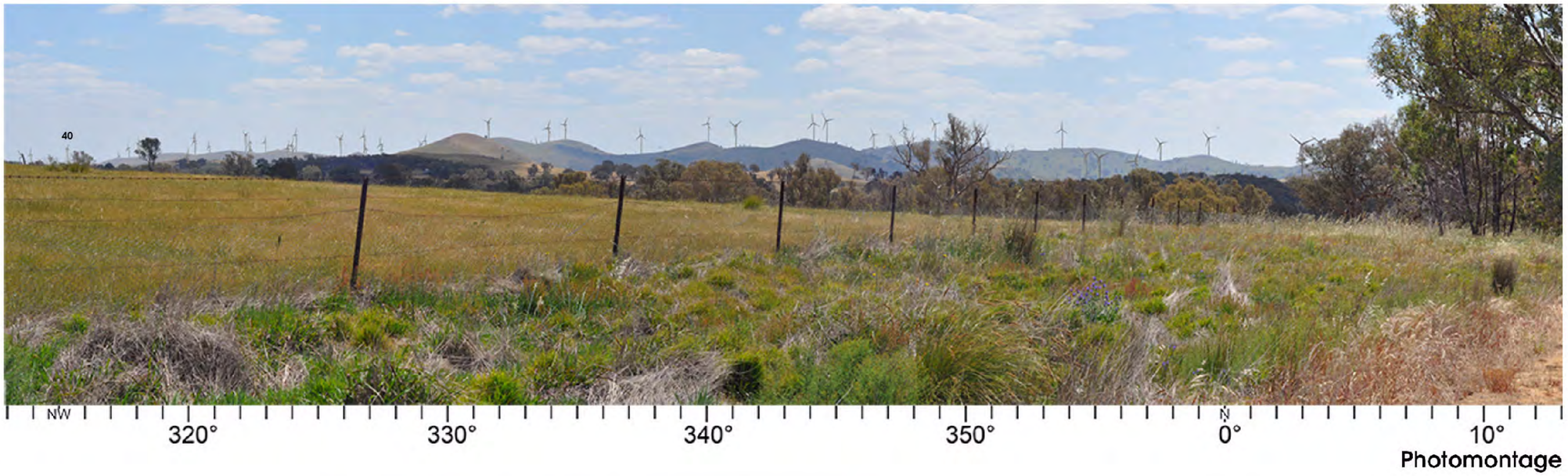
Start Bearing: 313°, End Bearing: 87°

Co-ordinates: 643,793m E, 6,146,157m N

MGA Zone 55 GDA94

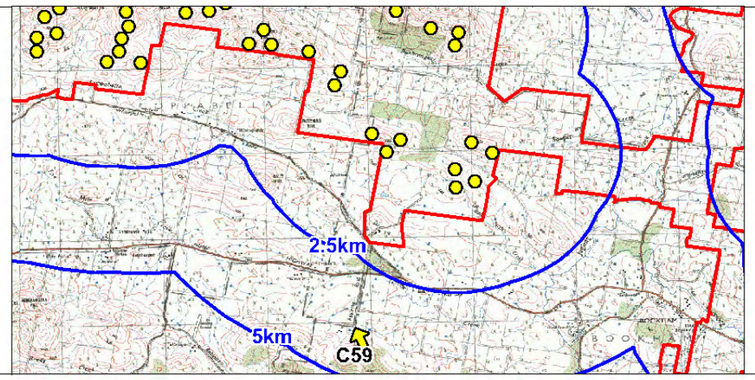


Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage C59a - Robinsons Road

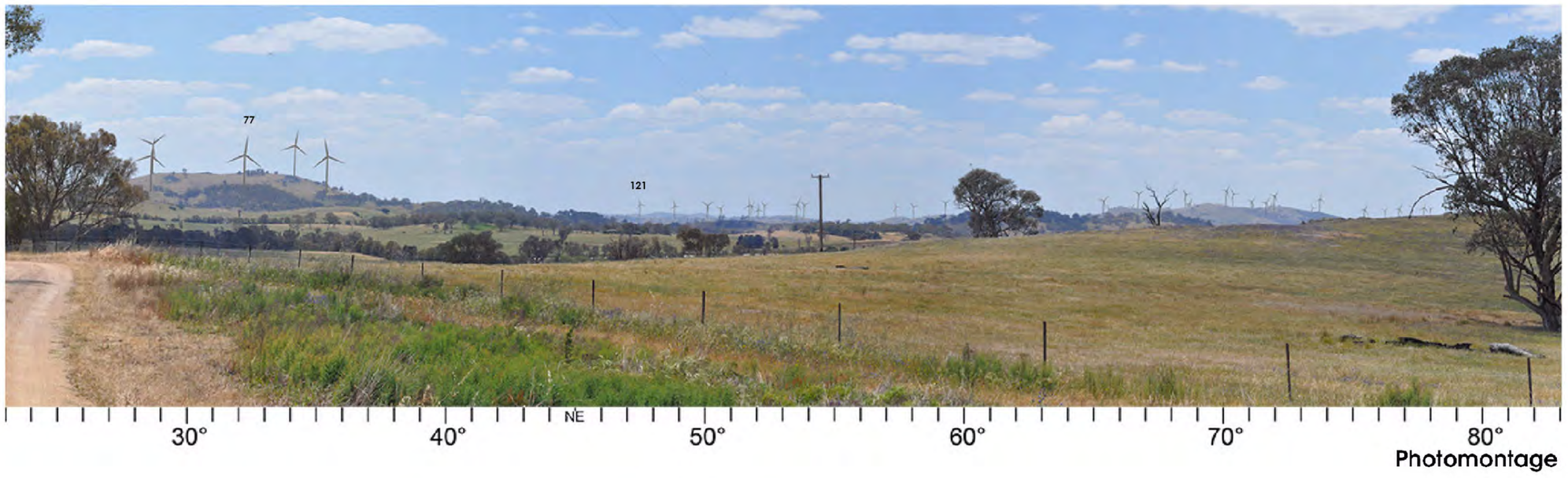
Field of View: 60°

Start Bearing: 313°, End Bearing: 13°

Co-ordinates: 643,793m E, 6,146,157m N

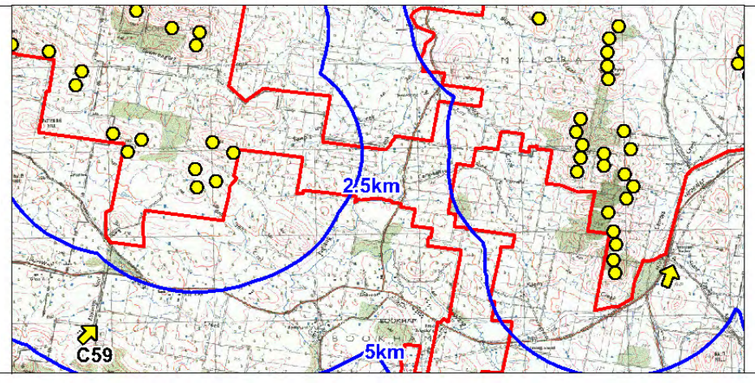
MGA Zone 55 GDA94

Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage C59b - Robinsons Road

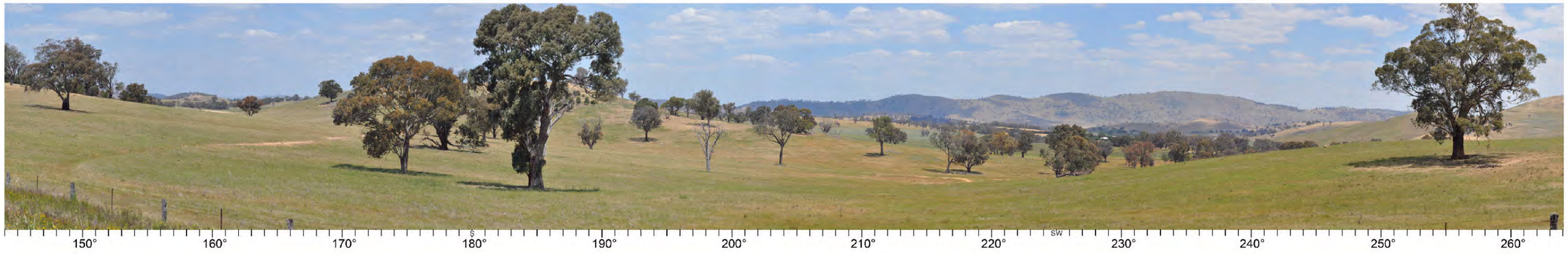
Closest visible turbine: 77(3.8km)

Field of View: 60°

Start Bearing: 23°, End Bearing: 83°

Co-ordinates: 643,793m E, 6,146,157m N

MGA Zone 55 GDA94



Existing

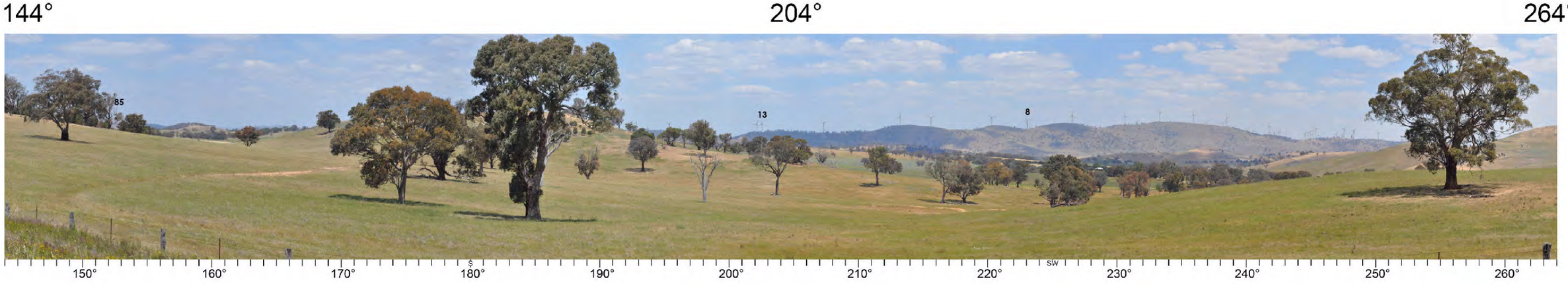
VP10a

VP10b

144°

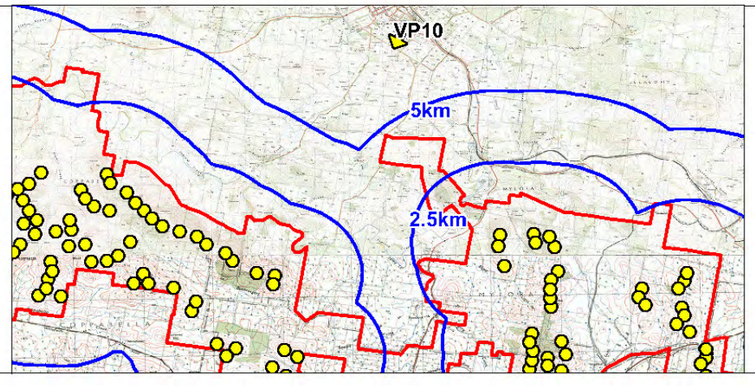
204°

264°



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage VP10 - Garrys Road, Binalong

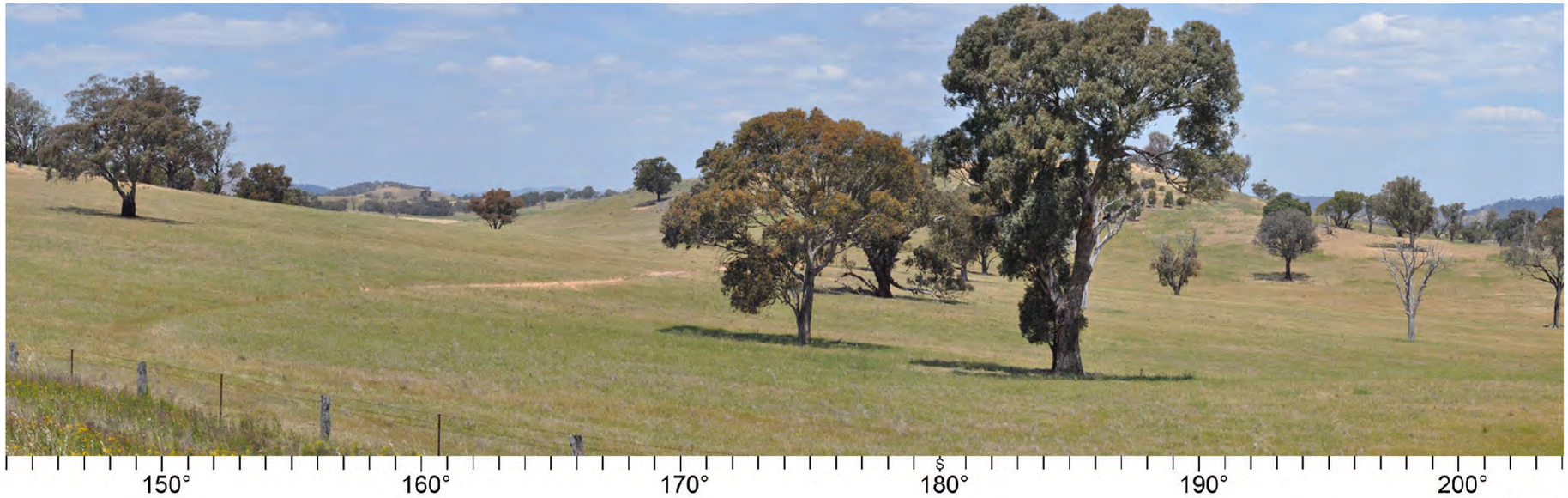
Closest visible turbine: 8 (8.7km)

Field of View: 120°

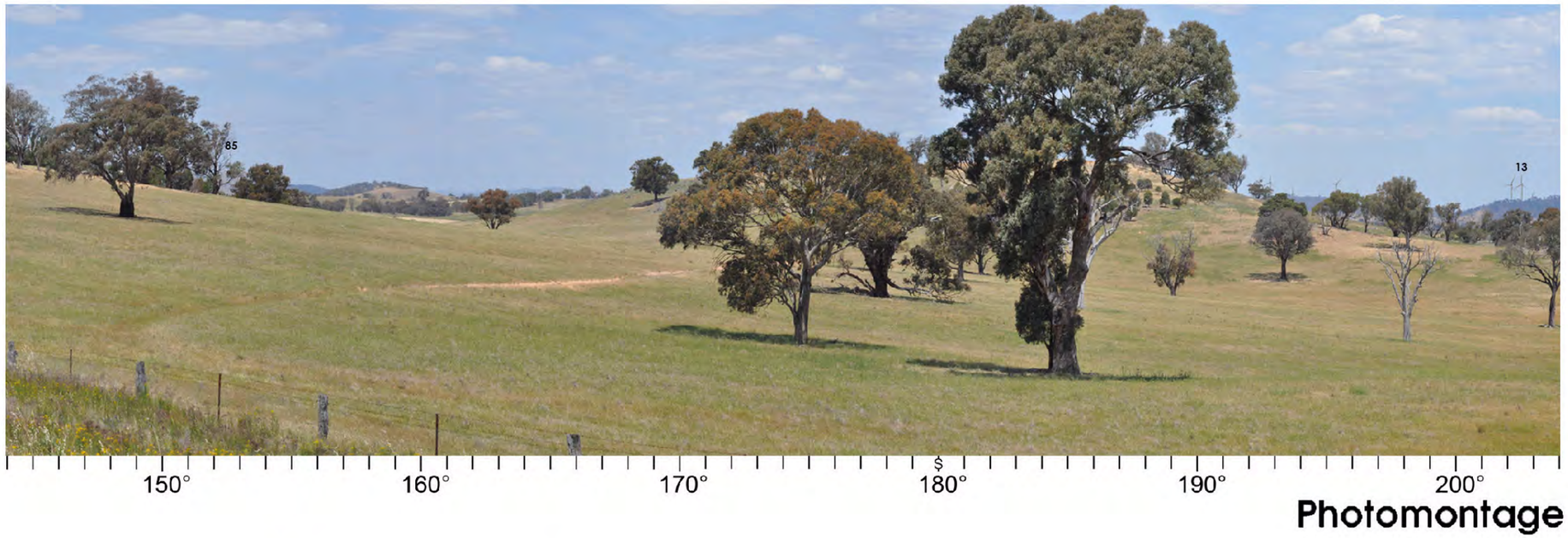
Start Bearing: 144°, End Bearing: 264°

Co-ordinates: 649,359m E, 6,160,940m N

MGA Zone 55 GDA94

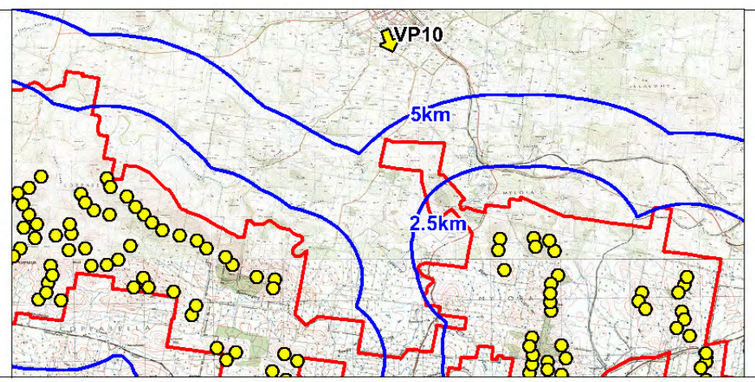


Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage VP10a - Garrys Road, Binalong

Field of View: 60°

Start Bearing: 144°, End Bearing: 204°

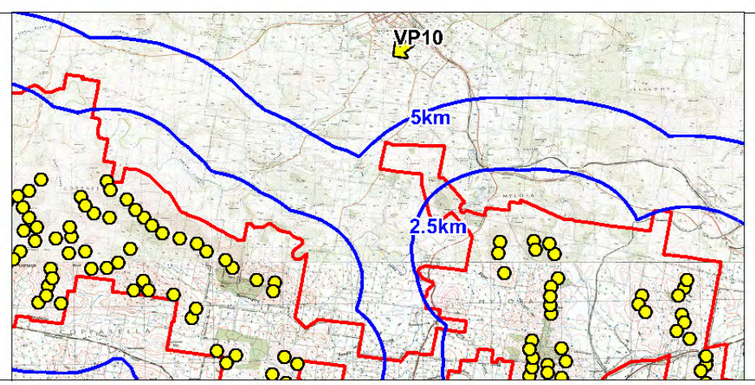
Co-ordinates: 649,359m E, 6,160,940m N

MGA Zone 55 GDA94

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage VP10b - Garrys Road, Binalong

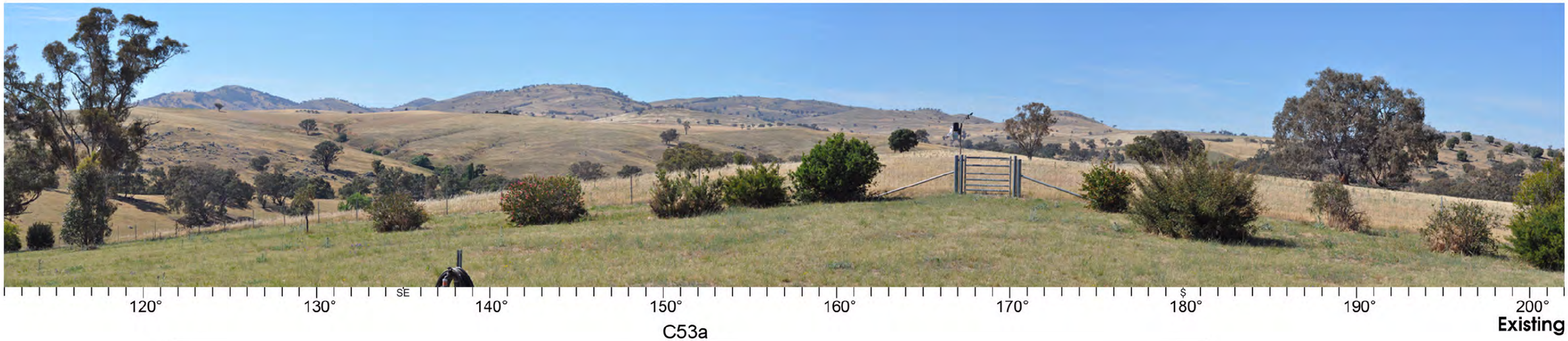
Closest visible turbine: 8 (8.7km)

Field of View: 60°

Start Bearing: 204°, End Bearing: 264°

Co-ordinates: 649,359m E, 6,160,940m N

MGA Zone 55 GDA94

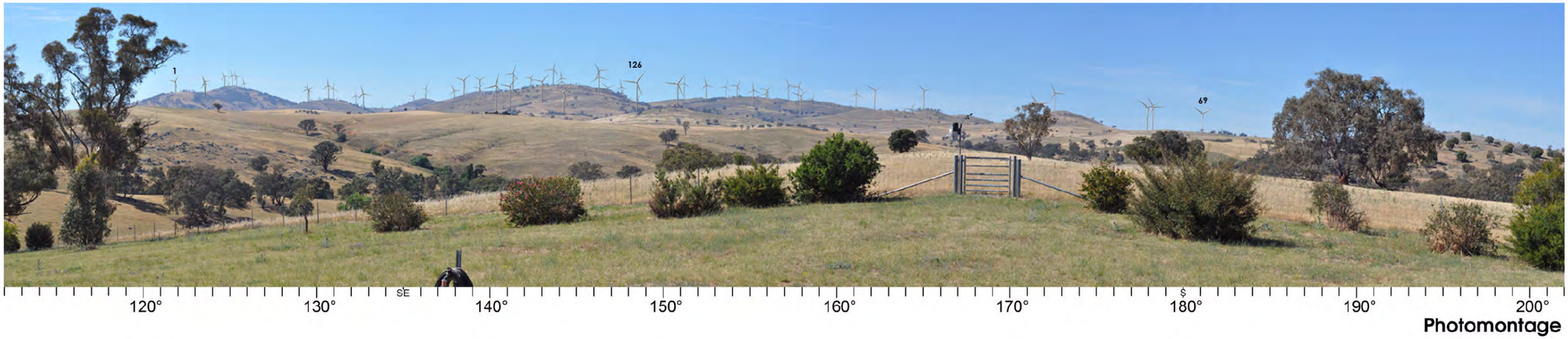


Existing

C53a

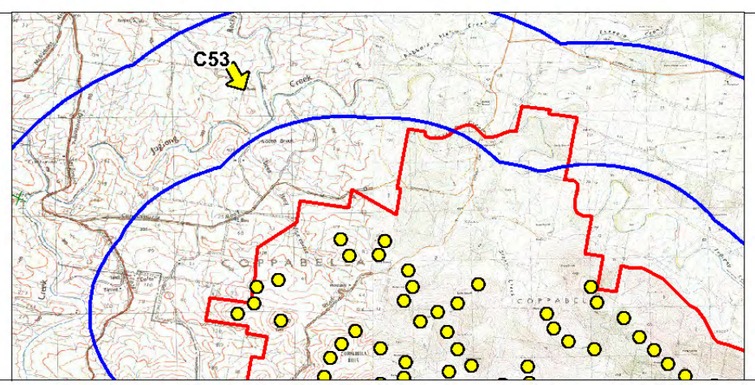
121.5°

181.5°



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage C53

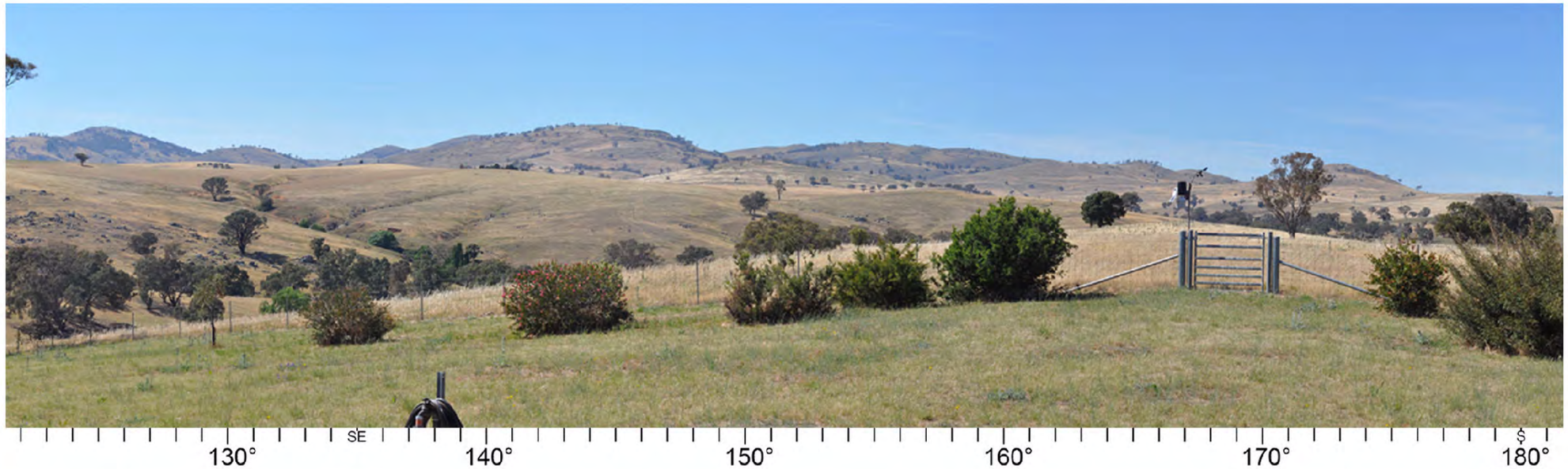
Closest visible turbine: 126 (3.5km)

Field of View: 90°

Start Bearing: 112°, End Bearing: 202°

Co-ordinates: 635,359m E, 6,160,661m N

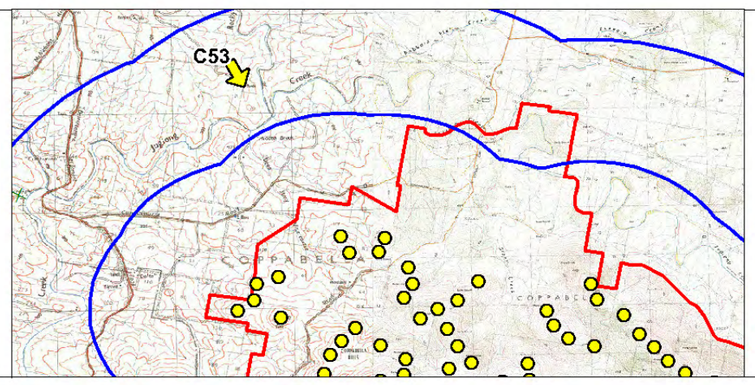
MGA Zone 55 GDA94



Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage C53a

Closest visible turbine: 126 (3.5km)

Field of View: 60°

Start Bearing: 121.5°, End Bearing: 181.5°

Co-ordinates: 635,359m E, 6,160,661m N

MGA Zone 55 GDA94

Existing

C74b

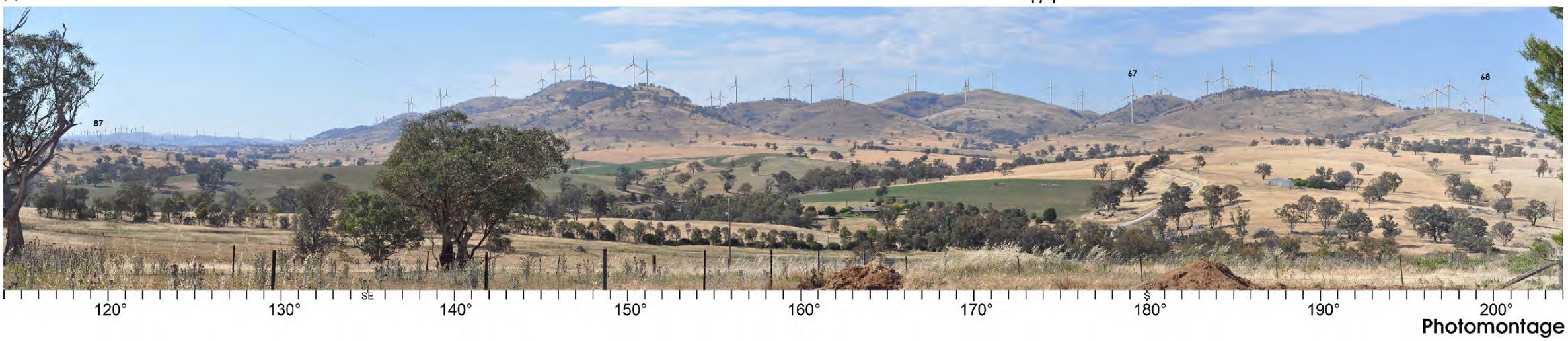
144°

204°

C74a

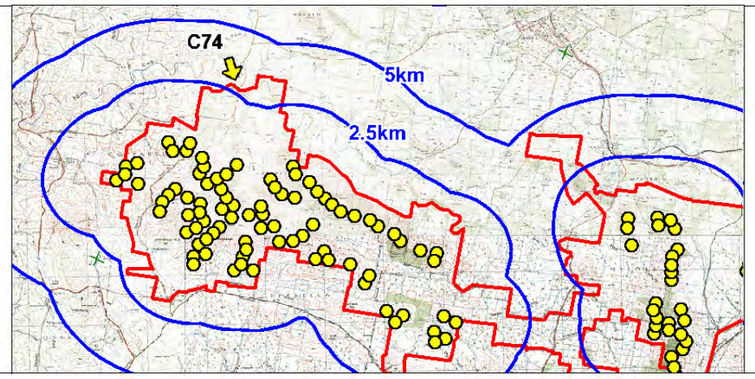
114°

174°



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage C74

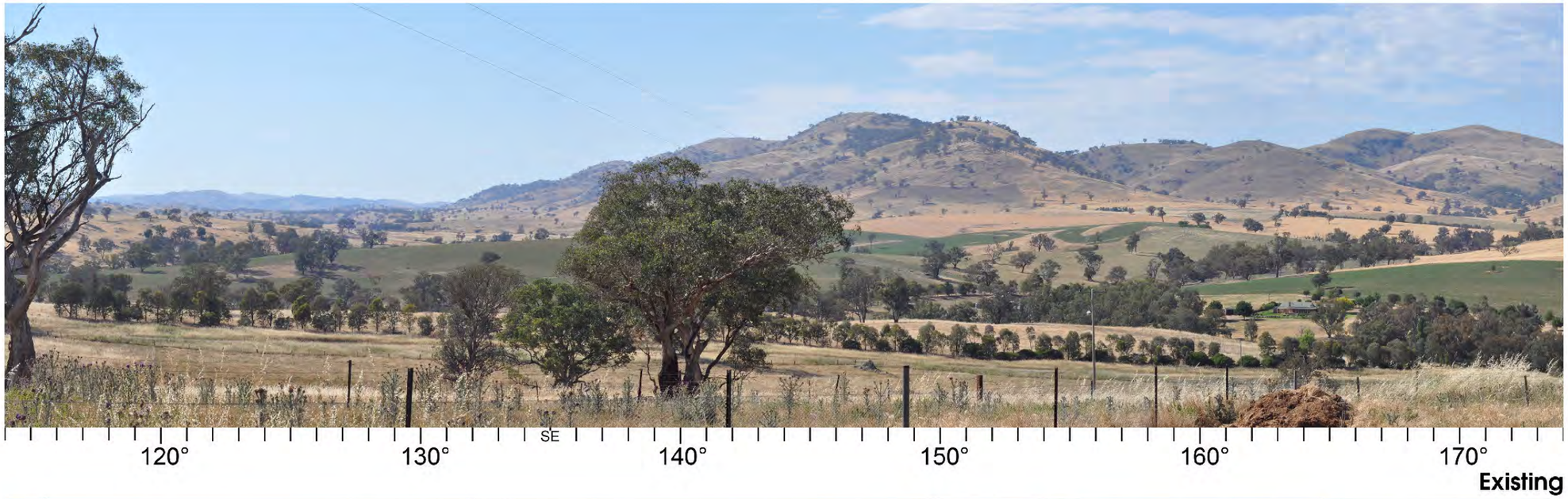
Closest visible turbine: 68 (3.6km)

Field of View: 90°

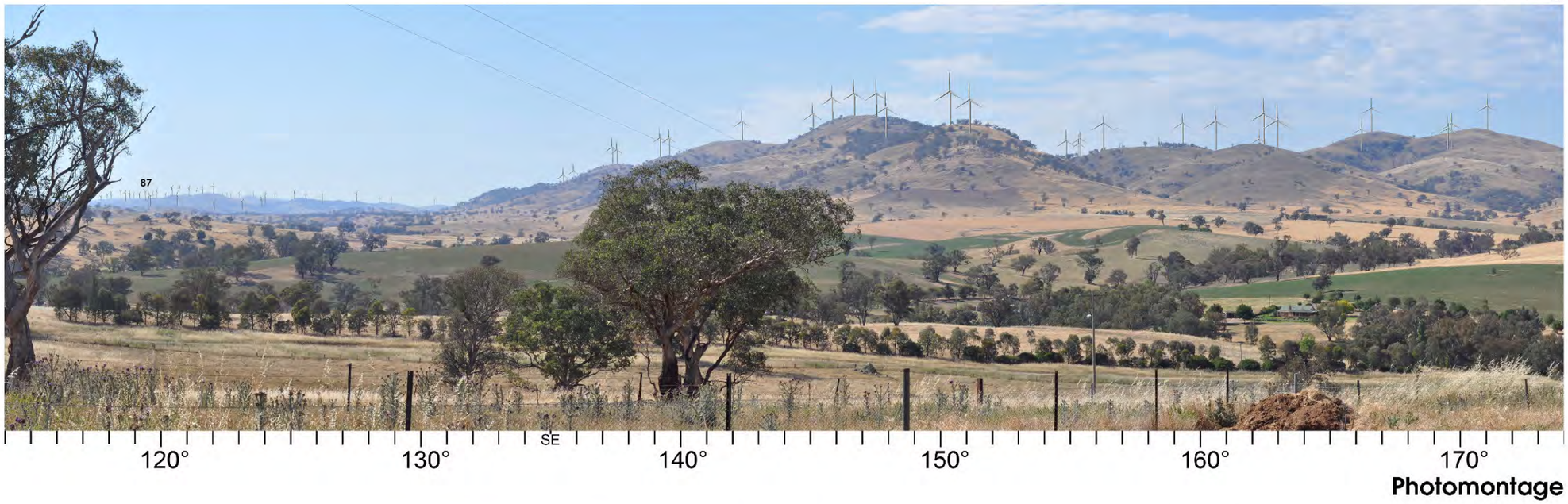
Start Bearing: 114°, End Bearing: 204°

Co-ordinates: 639,308m E, 6,160,344m N

MGA Zone 55 GDA94

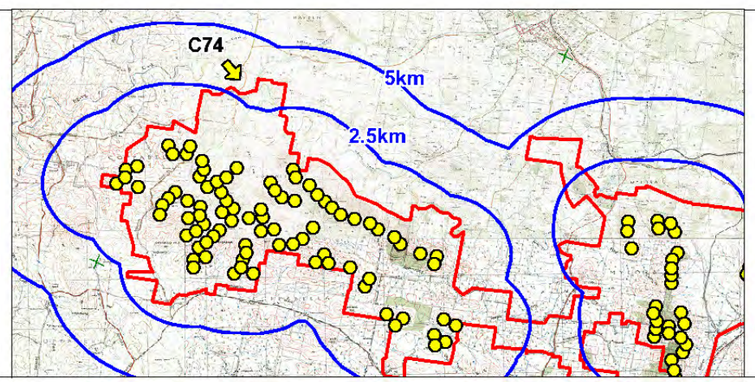


Existing



Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage C74a

Field of View: 60°

Start Bearing: 114°, End Bearing: 174°

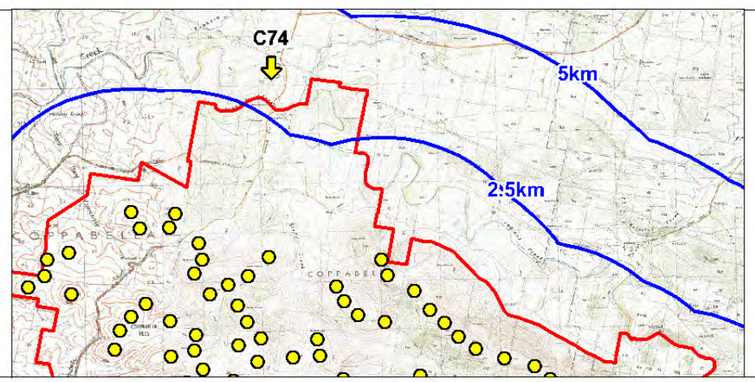
Co-ordinates: 639,308m E, 6,160,344m N

MGA Zone 55 GDA94

Existing

Photomontage

EPURON



Legend

- Photomontage Viewpoint
- Proposed Turbine
- Turbine buffer
- Site perimeter

Details

Photomontage C74b

Closest visible turbine: 68 (3.6km)

Field of View: 60°

Start Bearing: 144°, End Bearing: 204°

Co-ordinates: 639,308m E, 6,160,344m N

MGA Zone 55 GDA94

Annex C - PARAMETERS OF HUMAN VISION

This page is intentionally blank

C.1 PARAMETERS OF HUMAN VISION

The viewshed for the Yass Valley Wind Farm can be determined by determining the extent to which an object is part of an observer's static field of view. The viewshed in a man-modified landscape has in past projects been delineated to that area in which an object takes up at least 5% of the field of view.

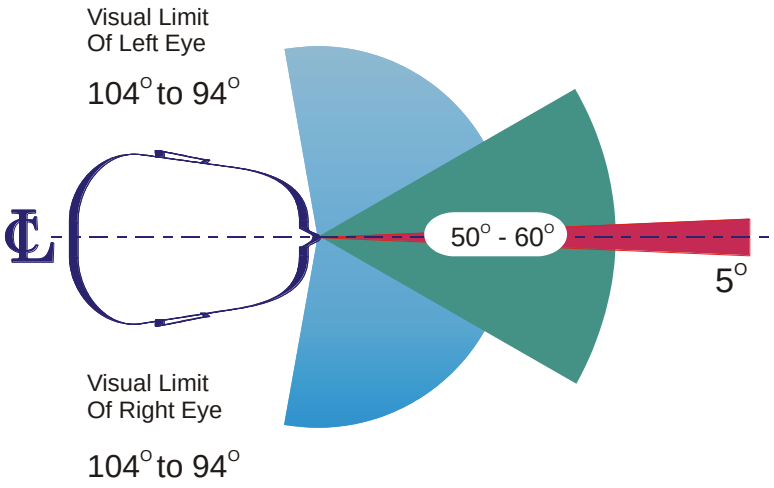
The measurement of the field of view is based upon the parameters of human vision outlined below. These provide a basis for assessing and interpreting the impact of a development by comparing the extent to which the development will intrude into the central field of vision (both horizontally and vertically).

C.1.1 Horizontal field of view

The central field of vision for most people covers an angle of between 50° to 60°. Within this angle, both eyes observe an object simultaneously. This creates a central field of greater magnitude than that possible by each eye separately.

This central field of vision is termed the 'binocular field' and within this field images are sharp, depth perception occurs and colour discrimination is possible. These physical parameters are illustrated in Figure 9-1.

Figure 9-1 Horizontal field of view



The visual impact of a development will vary according to the proportion in which a development impacts on the central field of vision.

Viewshed based on the horizontal field of view

The viewshed of a single wind turbine is calculated on the extent to which a single wind turbine (in this example the widest section is the swept path of the rotor) would intrude into the 60° central field of vision.

Similarly the viewshed of a single transmission line pole is calculated on the extent to which a single pole (in this example the widest section are the cross arms) would intrude into the 60° central field of vision.

Table 9-1 lists the extent to which a swept path of a single rotor and the cross arms of the transmission line pole would interrupt the horizontal field of view.

Table 9-1 ***Visual impact based on the degree a swept path of a single rotor as well as a single cross arm of a transmission line poke would take up in the horizontal field of view***

Horizontal Field of View	Visual Impact	Distance from an observer to a rotor with 100 m diameter (Transmission line pole based on 4 m wide cross arms)
<2.5^{O} of view (5% of 50^{O} = 2.5O)	**Insignificant** The swept path of the rotor would take up less than 5% of the central field of view. The rotor, unless particularly conspicuous against the background, will not intrude significantly into the view. The extent of the vertical angle will also affect the visual impact.	> 2290 m (>91 m)
2.5^{O} – 30^{O} of view (60% of 50^{O} = 30^{O})	**Potentially Noticeable** The swept path of the rotor may be noticeable and its degree of visual intrusion will depend greatly on its ability to blend in with its surroundings and particularly the sky.	173 m-2290 m (91 m-7 m)
>30^{O} of view	**Potentially Visually Dominant** At this distance the swept path of a single rotor will fill more than 50 percent of the central field of vision and will always be noticed and sympathetic treatments, such as paint colours to blend against a sky, will only be able to partially mitigate visual effects.	< 173 m (<7 m)

These calculations suggest that the impact of a 100m wide rotor would reduce to insignificance at approximately 2,290 m, as the swept path of the rotor would, at this distance, form less than 5% or 2.5^{O} of the horizontal field of view. At distances less than 173 m, a 92 m wide rotor, would be visually dominant.

Similarly, a 4 m wide cross arm on a transmission line pole would reduce to insignificance at approximately 91 m. Only at distances less than 7 m would the cross arms of the pole become visually dominant.

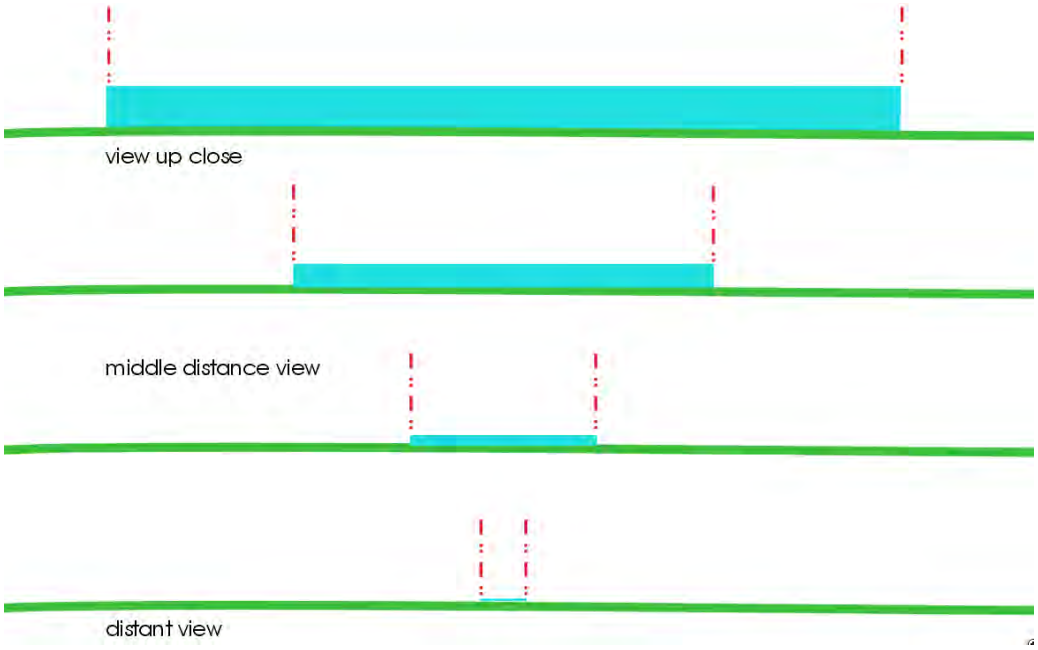
These calculations do not take into account the height of the wind turbines, nor do they allow for the placement of multiple wind turbines within the landscape.

The distance ranges derived by the analysis of a single rotor in the horizontal field of view are far less than experience would suggest to be reasonable. The previous calculation is based on the visual impact of a single rotor in the horizontal field of view. A single wind turbine or a transmission lime pole has the same height as many such elements sited across several kilometres. Therefore, their intrusion into the vertical field of view may better determine the viewshed for a wind farm.

The point from which the wind turbine or a pole becomes an indistinct line on the landscape, better determines the viewshed. That is the point at which the vertical size of a range of wind turbines or transmission line poles diminishes to an imperceptible component within the vertical field of view.

Figure 9-2 shows how the viewshed of a long horizontal object is determined by its height and not by its width.

Figure 9-2 *The diminution in visibility with distance from a long horizontal object*



As an observer moves further away from a horizontal object the width may still be apparent, however the vertical dimension reduces to insignificance

This effect can also be demonstrated by the example of a farm fence that may be several kilometres in width, yet as one moves further away, it becomes less apparent, until at some distance it is not possible to separate this element from the horizontal plane of the landscape. Similarly, the viewshed of a long horizontal object such as a wind farm can also be determined by its height.

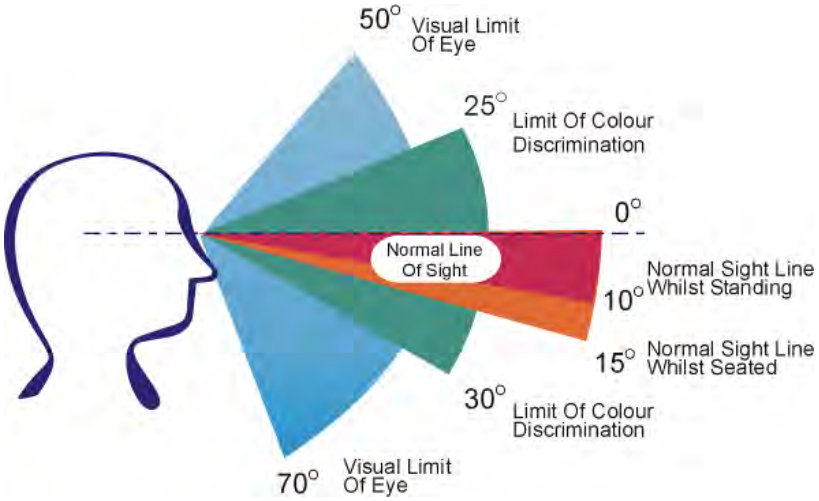
As wind farms are comprised of many tall slim towers with rotating blades, wind farms are different to a solid structural mass such as buildings. At greater distances, the rotating blade becomes the most visible element and at closer distances, it is the overall height of the wind turbine that becomes most apparent.

For these reasons the extent of the viewshed is to be based on an analysis of the extent to which wind turbines or poles extend into the vertical field of view.

C.1.2 Vertical field of view

A similar analysis can be undertaken based upon the vertical line of sight for human vision. These physical parameters are illustrated in Figure 9-3.

Figure 9-3 Vertical field of view



As can be seen in Figure 9-3 typical line of sight is considered to be horizontal or 0O. A person's natural or normal line of sight is normally a 10O cone of view below the horizontal and, if sitting, approximately 15O.

Objects, which take up 5% of this cone of view (5% of 10O = 0.5O) will only take up a small proportion of the vertical field of view, and are only visible when one focuses on them directly. However, they are not dominant, nor do they create a significant change to the existing environment when such short objects are placed within a disturbed or man-modified landscape.

Viewshed based on the vertical field of view

Objects that take up 5% of this cone of view (5% of 10O = 0.5O) are considered visually insignificant. That is not to imply that the objects become invisible at this distance, rather they become such a minor element in an already man modified landscape that their visual impact can be considered to be insignificant.

Once objects take up at least 10% of the vertical field of view, they can be more readily discernible (10% of 10O = 1O) and this visibility increases as the wind turbines increasingly take up a greater proportion of the vertical field of view.

When the wind turbines or transmission line poles take up 25% of the vertical field of view, they become visually evident and when they take up 50% of the vertical field of view, they will dominate the view.

Table 9-2 shows the distance at which a wind turbine approximately 150 m high and a transmission line pole approximately 45 high diminishes with distance within the vertical field of view.

Table 9-2 *Visual impact based on the vertical field of view to a wind turbine or a transmission line pole*

Vertical Line of Sight	Visual Impact	Distance from an observer to a 150 m high wind turbine (Transmission line pole 45 m high)
< 0.5° of vertical angle (5% of 10° = 0.5°)	**Insignificant** A thin line in the landscape.	17,188 m (5156 m)
0. 5°-2. 5° of vertical angle	**Potentially noticeable** The degree of visual intrusion will depend on the development's ability to blend in with the surroundings.	3,435 m – 17,188 m (1030 m-5156 m)
2.5° – 5° of vertical angle	**Visually evident** Usually visible, however the degree of visual intrusion will depend of the width of the object and its placement within the landscape.	<3,435 m (<1030 m)

As shown in Table 9-2 the visual intrusion of the wind turbine or the transmission line pole in the vertical field of view demonstrates the influence of distance on the visual impact of a development.

C.1.3 Proposed viewshed & zones of visual influence

The preceding analysis shows that a 150 m high wind turbine recedes into an insignificant element in the landscape at approximately 17 km. Similarly, a 45 m high transmission line pole recedes into an insignificant element in the landscape at approximately 5 km. Table 9-3 sets out the zones of visual influence based on the intrusion of a development in the vertical field of view.

Table 9-3 *Zone of visual influence for wind turbines and a transmission line poles*

Distance from an observer to the nearest wind turbine and *(Transmission line pole 45 m high)*	Zones of visual influence
>0.5° of vertical angle >17 km *(>5km)*	**Outside the viewshed**
0.5° – 1° of vertical angle 8.5 km -17 km *(2.5 km – 5 km)*	**Visually insignificant** A very small element which are difficult to discern and will be indistinct in different lighting and weather conditions.
1° – 2.5° of vertical angle 3 km -8.5km *(1 km - 2.5 km)*	**Potentially noticeable, but will not dominate the landscape** The degree of visual intrusion will depend on the landscape sensitivity and the sensitivity of the viewer; however the proposed wind turbines or transmission line poles will not dominate the landscape.
2.5° – 5° of vertical angle 1.5 km – 3km *(0.5 km – 1 km)*	**Highly visible and will usually dominate the landscape** The degree of visual intrusion will depend on the wind turbines' or the transmission line poles' placement within the landscape and factors such as foreground screening.
<5° of vertical angle <1.5 km *(<0.5 km)*	**Visually dominant in the landscape** The degree of visual intrusion will only be reduced by screening by nearby vegetation or buildings

As this calculation is intended as only a guide to setting the viewshed, all figures have been rounded to the nearest appropriate kilometre).

Insignificant visual impact & beyond the limit of the viewshed occurs at approximately 17 km, at which point a 150 m high wind turbine is no longer a significant visible element in a man modified landscape except for the most sensitive of locations. The swept path of the rotor also becomes the only visible element in some lighting conditions as the supporting tower becomes imperceptible and possibly this could reduce the viewshed to 11.5 km in these lighting conditions.

The 17 km viewshed is based on a conservative assumption that the wind turbines are a solid mass 150 m high, similar to a building. In reality the wind turbines are widely spaced and the wind farm is a far more visually transparent object than a solid building mass some 150 m high and many kilometres in width. However, it is also to be noted that the turning of the rotor also attracts the eye, extending the viewshed.

Likewise, approximately at 5 km a 45 m high transmission line pole becomes an insignificant element in the landscape.

It is stressed that these calculations attempt to locate the distance at which a wind farm becomes imperceptible within a man-modified landscape. This is not to say that wind turbines at 18 km, or even at 27 km, become invisible. Wind turbines of this height will be discernible in good lighting conditions to an observer who knows where the wind turbines are located and therefore focuses in that direction. However the visual impact within a man modified landscape is not considered significant beyond this distance, aside from exceptional circumstances.

Visually insignificant visual impact of a wind turbine occurs between 8.5 km – 17 km and occurs at distances at 2.5 km – 5 km for a transmission line pole. At these distances the wind turbines are a very small element in the landscape and are often hard to discern. In any but exceptionally clear lighting conditions they are imperceptible.

Potentially noticeable visual impact occurs between 3 km to 8.5 km where the entire wind turbine is visible and lighting does not alter the visibility of the tower versus that of the rotor and occurs at distances at 1 km – 2.5 km from a transmission line pole.

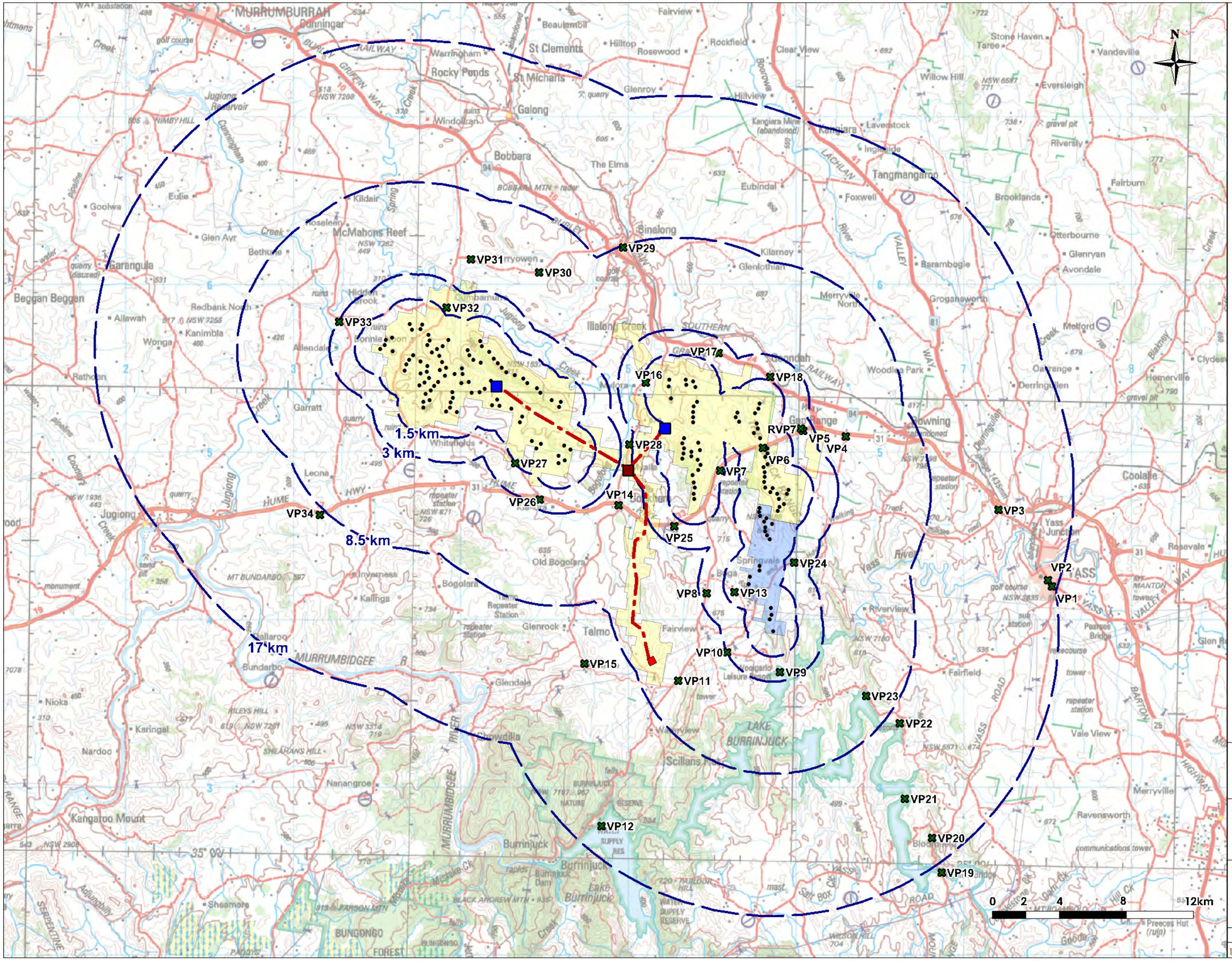
Foreground vegetation and intervening landform can reduce the degree to which the wind turbines are noticeable.

Visually evident occurs at distances between 1.5 km and 3 km where the wind turbines have increased in visibility and are evident and potentially dominant in the landscape and occurs at distances at 0.5 km – 1 km from a transmission line pole. Landscape is less effective at screening wind turbines unless it is close to the viewer.

Visually dominant occurs at distances closer than 1.5 km and occurs at distances less than 0.5 km from a transmission line pole. Wind turbines visible at this distance dominate will always the landscape.

Annex D - MAPS SHOWING VIEWPOINT LOCATIONS

This page is intentionally blank



LEGEND

- Public viewpoints
- Proposed wind turbine
- Proposed substation
- Alternative substation
- Switchyard
- Yass Valley Wind Farm project boundary
- Conroys Gap Wind Farm project boundary
- Proposed 330 kV powerline
- Turbine buffers

EPURON

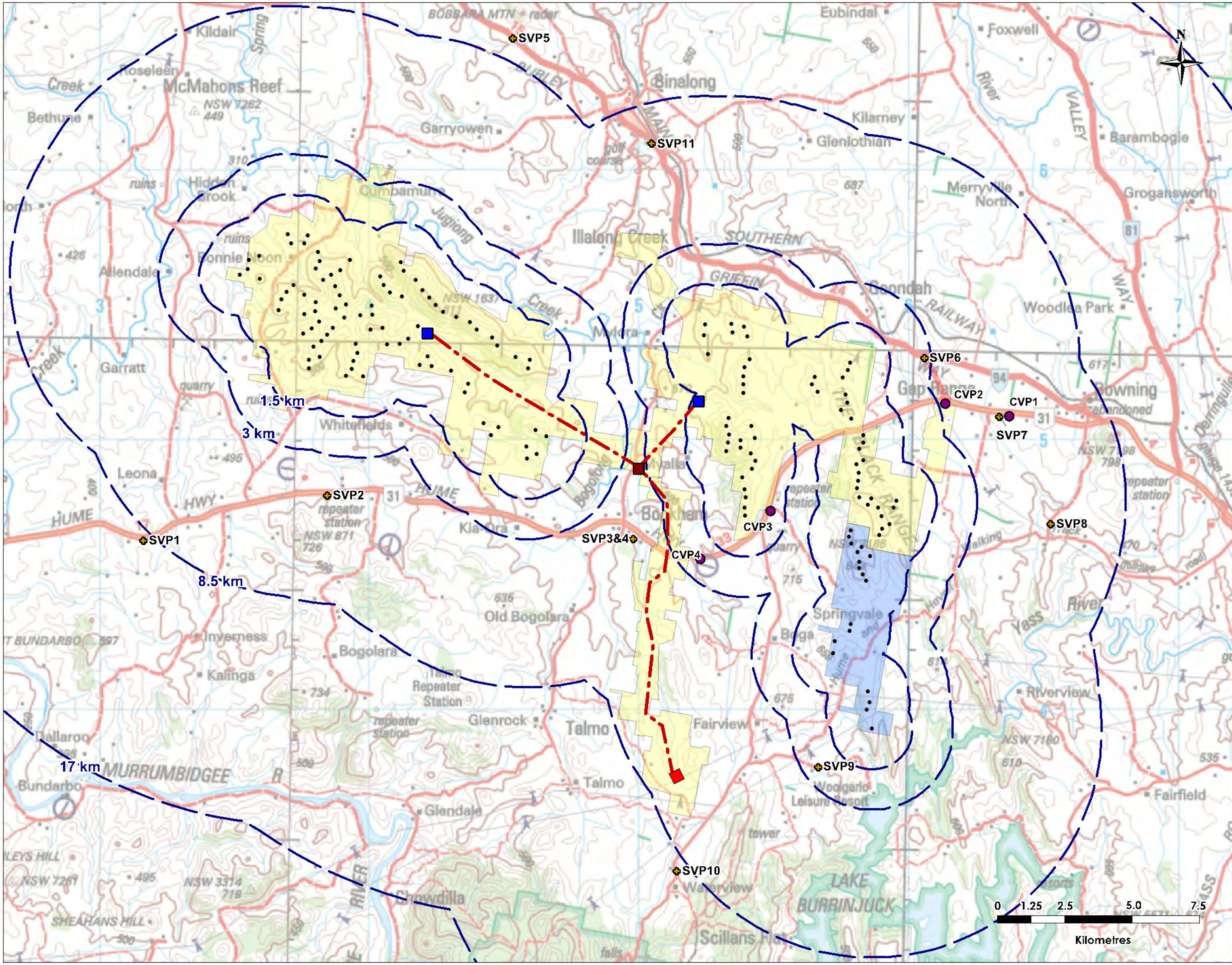
PROJECT

Yass Valley Wind Farm

TITLE

Publicly Accessible Viewpoints

SCALE	DATE	DRAWN
1:200,000 at A3	15/04/14	MK



LEGEND

- Sequential viewpoint
- Cumulative viewpoint
- Proposed wind turbine
- Proposed substation
- Alternative substation
- Proposed switchyard
- Yass Valley Wind Farm project boundary
- Conroys Gap Wind Farm project boundary
- Proposed 330 kV powerline
- Turbine buffers

EPURON

PROJECT

Yass Valley Wind Farm

TITLE

Sequential & Cumulative Viewpoints

SCALE	DATE	DRAWN
1:125,000 at A3	15/04/14	MK

LEGEND

- Additional residential viewpoints
- Proposed wind turbine
- Proposed substation
- Alternative substation
- Proposed switchyard
- Yass Valley Wind Farm project boundary
- Conroys Gap Wind Farm project boundary
- Proposed 330 kV powerline
- Turbine buffers

1.5 km
3 km
8.5 km
17 km

0 1.25 2.5 5.0 7.5
Kilometres

EPURON

PROJECT
Yass Valley Wind Farm

TITLE
Additional Residential Viewpoints

SCALE	DATE	DRAWN
1:125,000 at A3	15/04/14	MK

This page is intentionally blank

ERM has offices world wide

Australia
Argentina
Belgium
Brazil
China
France
Germany
Hong Kong
Hungary
India
Indonesia
Ireland
Italy
Japan
Korea
Malaysia
Mexico
Netherlands
New Zealand
Peru
Poland
Portugal
Puerto Rico
Singapore
Spain
Sri Lanka
Sweden
Taiwan
Thailand
UK
USA
Venezuela
Vietnam

Environmental Resources Management Australia

Level 3, Tower 3,
World Trade Centre
18-38 Siddeley Street
Docklands VIC 3005

PO Box 266
South Melbourne Victoria 3205
T: +61 3 9696 8011
F: +61 3 9696 8822