Appendix 6

Visual Impact Assessment

Prepared by Green Bean Design

Mount Emerald Wind Farm

Proposed view toward Mount Emerald Wind Farm

LANDSCAPE & VISUAL IMPACT ASSESSMENT

Prepared for:

RATCH-Australia Corporation

Prepared by:

GREEN BEAN DESIGN
landscape architects

November 2013

Project:	Mount Emerald Wind Farm
Project Number:	13-173
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Green Bean Design – Capability Statement

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

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

Andrew has over 20 years continuous employment in landscape consultancy and has completed numerous landscape and visual impact assessments for a range of large scale and State significant infrastructure and renewable energy projects, including wind energy and solar power developments. GBD has been commissioned for over 20 wind energy projects across New South Wales, Victoria, South Australia and Queensland, including assessments for:

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

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Glossary

This LVIA has adopted the following definitions, including those outlined in the Landscape Institute and Institute of Environmental Management & Assessment, Guidelines for Landscape and Visual Impact Assessment, Second Edition (2002) and Third Edition (2013).

Table 1 Glossary

Term	Meaning
Cumulative effects	*The summation of effects that result from changes caused by a development in conjunction with other past, present or reasonably foreseeable actions.*
Cultural significance	*The aesthetic, historic, scientific, social or spiritual value for past, present or future generations.*
Indirect Impacts	*Impacts on the environment, which are not a direct result of the development but are often produced away from it or as a result of a complex pathway.*
Landscape	*An area, as perceived by people, the character of which is the result of the action and interaction of natural and/or human factors.*
Landcover	*Combinations of land use and vegetation that cover the land surface.*
Landform	*Combinations of slope and elevation that produce the shape and form of the land.*
Landscape character area	*These are single unique areas which are the discrete geographical areas of a particular landscape type.*
Landscape feature	*A prominent eye catching feature, for example a rock outcrop or built feature.*
Landscape and visual sensitivity	*A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type f change or development proposed and the value related to that receptor.*
Landscape and visual significance	*A measure of the importance or gravity of the environmental effect, defined by significance criteria specific to the environmental topic.*
Magnitude	*A combination of the scale, extent and duration of an effect.*

Table 1 Glossary

Term	Meaning
Mitigation	*Measures, including any processes, activity or design to avoid, reduce, remedy or compensate for adverse landscape and visual effects of a development project.*
Photomontage	*Computer simulation or other technique to illustrate the appearance of a development.*
Viewshed	*An area of land surrounding and beyond the project area which may be potentially affected by the Project.*
Visibility	*A relative determination at which a wind turbine or group of wind turbines can be clearly discerned and described.*
Visual amenity	*The value of a particular area or view in terms of what is seen.*
Visual Impact Assessment	*A process of applied professional and methodical techniques to assess and determine the extent and nature of change to the composition of existing views that may result from a development*
Visual receptor	*Individuals and/or defined groups of people who have the potential to be affected by a proposal.*
Zone Visual Influence (ZVI)	*A theoretical area of landscape from which the Project structures may be visible.*

Executive summary

Green Bean Design (GBD) was commissioned by RACL (the Proponent) to undertake a Landscape and Visual Impact Assessment (LVIA) for the Mount Emerald wind farm and associated development infrastructure (the project).

The project would have up to 70 wind turbines, and for the purpose of this LVIA, the proposed wind turbines have been assessed with a maximum blade tip height of 130.5 m from ground level to tip of blade and a maximum rotor diameter of up to 110 m. Associated electrical works include a proposed substation connection within the wind farm site boundary to the existing Chalumbin to Woree 275 kV transmission line.

This LVIA involved desktop studies and site inspections to collect and analyse information to describe and define the characteristics of the landscape in which the project would be located. This LVIA has determined that the landscape surrounding the project has an overall medium sensitivity to accommodate change, and represents a landscape that is reasonably typical of landscape character areas that are commonly found in the surrounding areas of the Atherton Tablelands.

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

The Zone of Visual Influence (ZVI) diagrams demonstrate the influence of topography on visibility and identify areas from which the wind farm turbines would be visible.

This LVIA assessed the potential visual significance of the Mount Emerald wind farm for 11 uninvolved residential dwellings within 2 km of the proposed wind turbines as well as uninvolved residential dwellings and facilities between 2 km and 5 km from the proposed wind turbines.

Executive summary

This LVIA also considered impacts for motorists travelling along local roads and highways within and surrounding the project area. A number of criteria were considered and assessed to determine levels of visual significance.

This LVIA determined that five uninvolved residential dwellings within the Mount Emerald wind farm 2 km viewshed would have a medium to high visual significance. Two residential dwellings within the Mount Emerald wind farm 2 km viewshed have been determined to have a medium visual significance. The remaining four uninvolved residential dwellings within the Mount Emerald wind farm 2 km viewshed would have a nil or low/low to medium visual significance.

A cumulative visual assessment identified one existing wind farm development (the operational Windy Hill wind farm development), approximately 50 km to the south south-east of the Mount Emerald wind project site. This LVIA determined that there is unlikely to be any 'direct' or 'indirect' visibility between the Mount Emerald wind farm and other existing wind farm developments within the Atherton Tablelands.

Night time obstacle lighting, if implemented, would have the potential to create a visual impact for residential view locations surrounding the Mount Emerald wind farm. This LVIA notes that in accordance with current CASA guidelines the Mount Emerald wind farm is unlikely to require obstacle lighting.

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

Introduction

Section 1

1.1 Introduction

This LVIA addresses one of the key requirements of the Mount Emerald wind farm Environmental Impact Assessment (EIS). This LVIA methodology adopted by GBD has been applied to a number of similar LVIA for wind farm developments and large scale infrastructure projects prepared by GBD, which have been peer reviewed, assessed and approved by State Government and Local Authorities.

This LVIA addresses and responds to the Final EIS Guidelines (EPBC 22011/6288) dated April 2012 and considers potential social and cultural impacts which relate to issues of landscape and visual amenity in the area surrounding the project area.

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

1.2 Guidelines

This LVIA has been prepared with regard to a number of existing planning and industry guidelines that relate to the assessment and determination of potential landscape and visual impacts with specific regard to wind farm developments. These guidelines include the:

- Draft National Wind Farm Development Guidelines;
- Wind Farms and Landscape Values National Assessment Framework; and
- Auswind Best Practice Guidelines.

1.2.1 Draft National Wind Farm Development Guidelines (July 2010)

The Draft National Wind Farm Development Guidelines, originally issued October 2009, were revised following a first round of public consultation and comment. The revised Guidelines were re-issued in July 2010 for a second round of comments. The Guidelines were developed to offer best practice advice, but not as a mandatory requirement for wind farm developments within Australia. In 2011 the Environment Protection and Heritage Standing Committee decided to cease further development of

the Guidelines. Whilst further development of the Guidelines has ceased, other State jurisdictions have, or are in the process of developing their own wind farm guidelines.

The advice and structure of the Guidelines are in general accordance with wind farm planning guidelines developed in Victoria and New South Wales, as well as industry best practice and have been considered in the preparation of this LVIA.

1.2.2 National Assessment Framework (June 2007)

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

Table 2 NAF Recommendations

NAF Tasks (through Steps 1 to 4)	LVIA Reference/Response
Step 1 Assess the Landscape Values **1A Preliminary Landscape Assessment** • 1A.1 Desktop Review • 1A.2 Seek information from Local Authority • 1A.3 Identify potential community and stakeholder interests • 1A.4 Site survey • 1A.5 Preliminary assessment of landscape values **1B Full Landscape Assessment** • 1B.1 Define the study area for assessment, including the zone of visual influence • 1B.2 Landscape Character Analysis • 1B.3 Natural and cultural values analysis • 1B.4 Involve communities and stakeholders in identifying landscape values • 1B.5 Document values and analyse significance	This LVIA has been prepared through a comparable methodology to that outlined in the NAF and has included a desktop review (pre site inspection) to determine potential view locations as well as establishing the extent and types of landscape characteristics within the 10km viewshed. Community and stakeholder interests have been identified by an ongoing process of direct consultation between the Proponent and relevant stakeholders. The results of the consultative process are included in this LVIA as well as other relevant sections of the EIS. Site survey and preliminary assessment work has been undertaken and incorporated into this LVIA. This LVIA addresses the requirements of Step 1B and presents an analysis of key considerations included in the NAF.
Step 2 Describe and Model the Wind	This LVIA has described and modelled the Mount

NAF Tasks (through Steps 1 to 4)	LVIA Reference/Response
Farm in the Landscape • 2.1 Describe the development • 2.2 Model the development • 2.3 Prepare a visual assessment report	Emerald wind farm development and selected view points from a range of view locations including uninvolved residential dwellings and road corridors within the a 5 km viewshed.
Step 3 Assess the Impacts of the Wind Farm on Landscape Values • 3.1 Seek community input to potential impacts • 3.2 Identify and describe impacts • 3.3 Identify potential cumulative impacts • 3.4 Identify other relevant factors • 3.5 Evaluate impacts	Community and stakeholder interests have been identified by an ongoing process of direct consultation between the Proponent and relevant stakeholders. The results of the consultative process are outlined and included in this LVIA as well as other relevant sections of the **EIS**. This LVIA has identified and described potential landscape and visual impacts associated with the Mount Emerald wind farm development as well as potential cumulative impacts resulting from other wind farm projects within the Atherton Tablelands.
Step 4 Respond to Impacts • 4.1 Changes to location or siting of the wind farm or ancillary infrastructure • 4.2 Layout and design considerations • 4.3 Minor changes and mitigation measures • 4.4 Recommend changes to the development	The development of the Mount Emerald wind farm turbine layout has been reviewed and adjusted throughout the preparation of this LVIA. Changes to the layout have occurred as a result of stakeholder consultation and specific concerns directed toward the visual impact of the wind farm from surrounding view locations. Significant changes have occurred throughout the development of the preferred design layouts including the removal and repositioning of turbines within site boundary.

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

1.2.3 Auswind Best Practice Guidelines (December 2006)

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

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

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

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

1.3 Methodology

This LVIA methodology included the following activities:

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

- preparation of photomontages and illustrative figures.

1.4 Desktop study

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

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

1.5 Preparation of ZVI diagrams

Three ZVI Diagrams have been prepared to illustrate the potential visibility of the wind turbines within the project viewshed. ZVI Diagrams included visibility from tip of blade, hub height and whole turbine. The ZVI are illustrated in **Figures 11, 12**, and **13** and detailed in **Section 7** of this LVIA.

1.6 Fieldwork and photography

The fieldwork involved:

- a 3 day site inspection to determine and confirm the potential extent of visibility of the project and ancillary structures;
- determination and confirmation of the various view location categories and locations from which the project structures could potentially be visible; and
- preparation of a record for each view location inspected and assessed.

1.7 Assessment of landscape sensitivity

The capability of the landscape to accommodate the wind farm would result primarily from the nature and degree of perceptual factors that can influence interpretation and appreciation of the

landscape, including landform, scale, topographic features, landcover and human influence or modifications.

1.8 Significance of visual impact

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

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

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

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

Although this rationale can be applied at a broad scale, this LVIA also considers, and has determined, the potential visual impact for individual view locations that would have a higher degree of sensitivity to the wind farm development, including the potential impact on individual residential dwellings situated in the surrounding landscape. The determination of a visual impact is also subject to a number of other factors which are considered in more detail in this LVIA.

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

1.9 Photomontages

The uninvolved residential and public photomontage locations were photographed by GBD. The modelling and photomontage preparation was undertaken by GL Garrad Hassan Pty Ltd.

Photomontages have been prepared from 13 view locations to illustrate the potential visibility of the Mount Emerald wind farm following construction. The public photomontage locations were selected to provide representative views from the vicinity of residential dwellings as well as publically accessible areas and road corridors. The photomontage locations are illustrated in **Figure 16** and the photomontages in **Figures 17** to **44**. The heights of the proposed turbines within the photomontages prepared by the Proponent were subject to peer review and verification by GBD. The photomontage methodology verification is illustrated in **Figure 45**.

1.10 Shadow flicker & blade glint

The Proponent commissioned a shadow flicker assessment, diagram and report for the Mount Emerald wind farm. None of the surrounding uninvolved residential dwellings are expected to experience in excess of 30 hours of shadow flicker per year, with the majority experiencing no shadow flicker at all. The detailed shadow flicker assessment is included in the EIS.

Glint is a phenomenon that results from the direct reflection of sunlight (also known as specular reflection) from a reflective surface that would be visible when the sun reflects off the surface of the wind turbine at the same angle that a person is viewing the wind turbine surface. Glint may be noticeable for some distance, but usually results in a low impact. The surfaces of the wind turbines, including the towers and blades, are largely convex, which will tend to result in the divergence of light reflected from the surfaces, rather than convergence toward a particular point. This will reduce the potential for blade glint.

Blade glint can also be further mitigated through the use of matt coatings which, if applied correctly, will generally mitigate potential visual impacts caused by glint.

Location

Section 2

2.1 Location

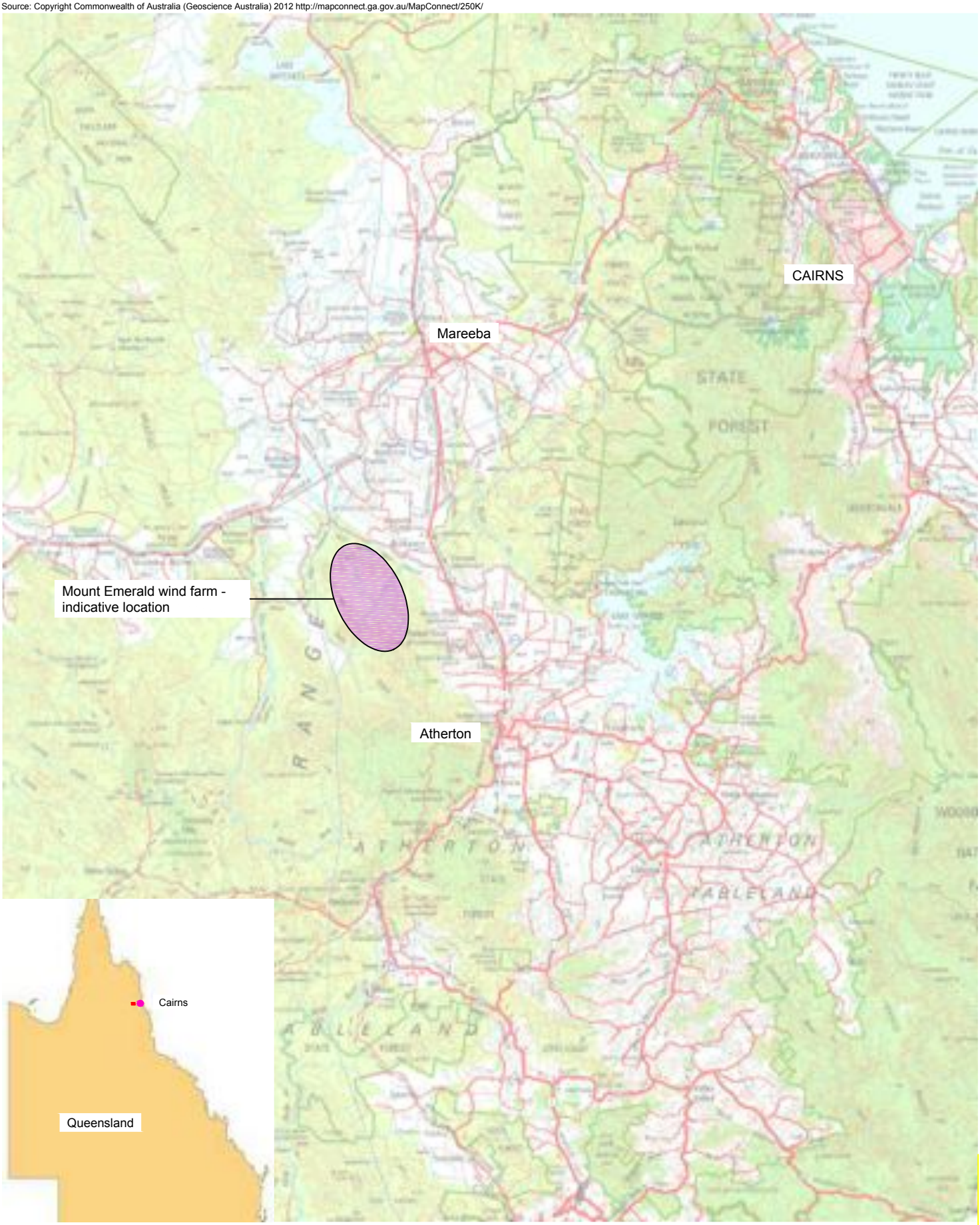
The project site (at its closest point) approximately 3.5km south west of Walkamin, off Springmount Road at Arriga on the Atherton Tablelands. Topographically, the site is situated at the northern most end of the Herberton Range (part of the Great Dividing Range) with the north-western section of the site being dominated by Walsh Bluff. It is characterised by rugged terrain with elevations of between 540m up to 1089m above sea level. The project site extends across a plateau and series of ridgelines running in an approximate north west to south east alignment from the topographic features of the Walsh Bluff in the north of the project area, to Mount Emerald in the south.

Geographically, the town centre of Mareeba is situated approximately 18km to the north of the site, with Atherton approximately 11.5km south east of the site. The general location of the Mount Emerald wind farm is illustrated in **Figure 1**.

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

- Mareeba (population around 7, 300 – urban centre and localities);
- Walkamin (population around 255 – urban centre and localities) ;
- Tolga (population around 878 – urban centre and localities) ; and
- Atherton (population around 6,700 – urban centre and localities).

Population figures from the 2011 Census (Australian Bureau Statistics 2011).



Not to scale

Figure 1 Location Plan

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Project description

Section 3

3.1 Project description

The key visual components of the Mount Emerald wind farm would comprise:

- up to 70 wind turbines;
- up to 70 individual 33kV external kiosk transformers and switchgear with associated control systems to be located in the vicinity of the wind turbine towers (in some turbine models transformer equipment will be integrated within the tower or nacelle);
- underground and overhead electrical and communication cable network linking turbines to each other within the project boundary;
- a collection/connection substation located within the wind farm project site;
- up to 4 permanent wind monitoring masts. The permanent monitoring masts may be either static guyed or un-guyed structures and will be to a minimum height of the wind turbine hubs;
- on site access tracks for construction, operation and ongoing maintenance; and
- Mount Emerald wind farm signage and maintenance facilities.

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

- construction compounds;
- laydown and storage areas;
- crane hardstand areas; and
- mobile concrete batching plant and rock crushing facilities.

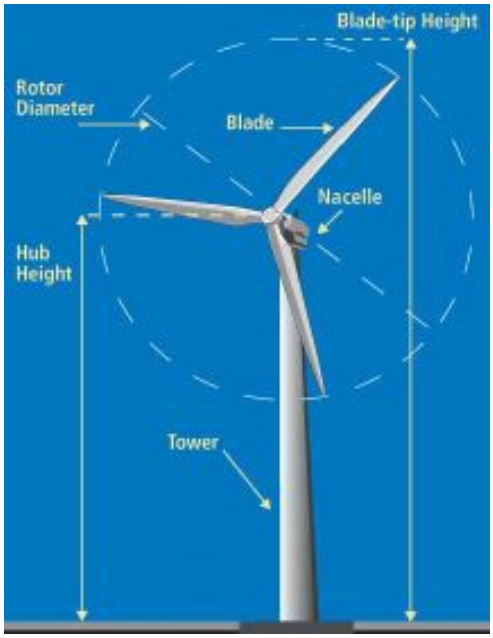
3.2 Wind turbines

The specific elements of the wind turbines comprise:

- concrete foundations;
- tubular tapering steel or concrete towers;
- nacelles at the top of the tower housing the gearbox and electrical generator;

- rotors comprising a hub (attached to the nacelle) with three blades; and
- three fibreglass / carbon fibre blades attached to each hub.

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



Configuration and components of a typical wind turbine

Table 3 outlines the main design parameters for the proposed Mount Emerald wind turbine layout:

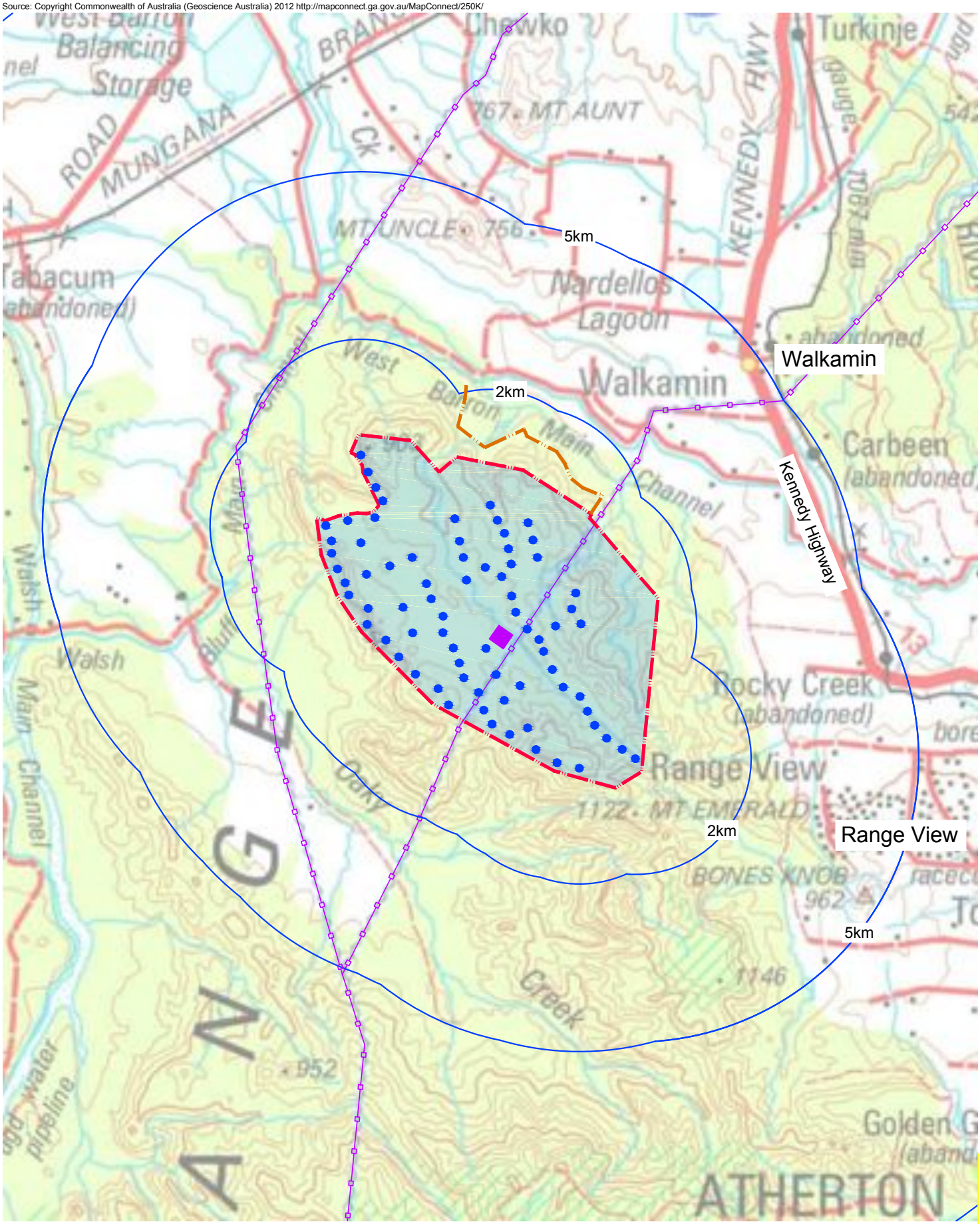
Table 3 Mount Emerald wind turbine details:

Element	Description
Tower height	80 m
Rotor Diameter	101 m
Overall height from ground level to tip of blade	130.5 m
Proposed number of Mount Emerald wind turbines	**70 turbines**

As new turbines come onto the market, it is possible that the final turbine selected may exceed, in minor respects, the assessed maximum turbine envelope. Minor increases in envelope size are unlikely to alter the determination of visual significance for residential view locations included in this LVIA. The indicative Mount Emerald wind farm design layout is illustrated in **Figure 2.**

3.3 Wind monitoring masts

Up to 4 permanent wind monitoring masts would be installed on-site, extending to a minimum height of the wind turbine hubs (around 80 m in height). The wind monitoring masts would be of a guyed or



Legend

- Proposed Mount Emerald wind turbine (indicative layout)
- Distance from proposed Mount Emerald wind turbine
- Existing transmission line
- Proposed substation (indicative location)
- Indicative site boundary
- Proposed access track

0km 1km 2km

Figure 2 Site layout

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un-guyed, narrow lattice or tubular steel design. The wind monitoring masts would be unlikely to create a significant visual impact, and are similar in scale, or smaller than a number of surrounding communication masts visible in the landscape surrounding the wind farm project area.

3.4 On-site access tracks

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

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

The proposed main access road to the wind farm (starting from the junction of Springmount and Kippen Drive) will utilise the route of an existing gravel track leading up to the wind farm site plateau. This track is partially visible from public roads and a small number of residential dwellings to the north east of the project area along Channel Drive. Works to widen the existing track will also include cut and fill operations to grade the existing track to enable access for construction and maintenance vehicles. Whilst this is likely to result in an increased level of visibility for the access road, there are a number of feasible and direct mitigation strategies which may be employed to reduce the potential level of visual significance. Strategic tree and shrub planting would provide effective screening or partial filtering of views toward the proposed access road.

3.5 Electrical works

The majority of cabling works, including the installation of control cables linking the turbines to the control building would be installed underground. For various technical, commercial and landform

reasons some cabling may be required to be installed on medium voltage overhead powerline supported by single low profile tubular poles.

Grid connection would be achieved via a connection to the existing TransGrid 330 kV powerline which is located approximately 35 km south of the wind farm site near Ulan. The wind farm turbines would be connected to on-site collection substations, control room and facilities for the grid connection.

Local environmental factors

Section 4

4.1 Climatic and atmospheric conditions

Local climatic and atmospheric conditions have the potential to influence the visibility of the project from surrounding view locations, and more significantly, from distant view locations. Meteorological data collected at Mareeba Airport between 1991 and 2002 indicates that there are:

- 86 clear days (annual mean average);
- 95 cloudy days (annual mean average); and
- 68 days of rain (annual mean average).

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

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

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

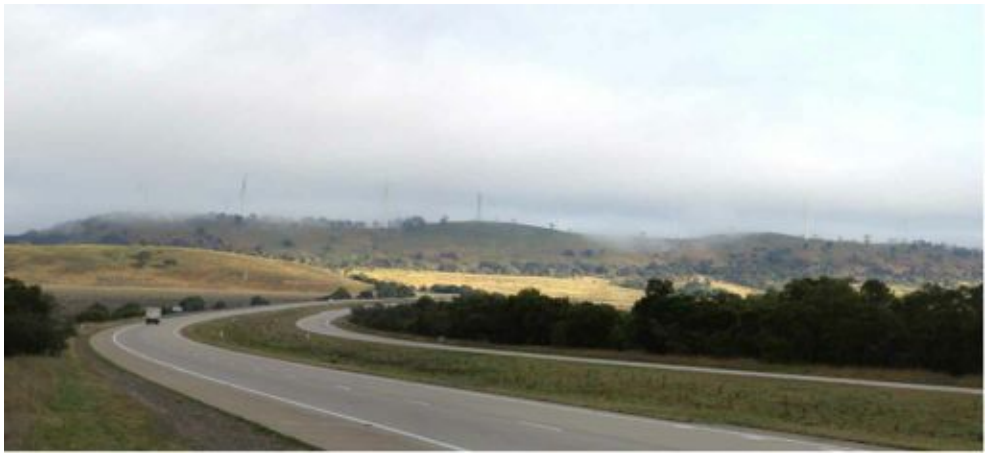
The extent to which weather conditions can influence visibility toward turbine structures is illustrated in **Figure 3**.

PHOTOGRAPH A - Day time view from Hume highway toward Cullerin wind farm at around 3.5km (13th June 2010)

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

PHOTOGRAPH B - Day time view from Hume highway toward Cullerin wind farm at around 3.5km (10th June 2010)

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



PHOTOGRAPH C - Day time view from Hume highway toward Cullerin wind farm at around 3.5km (7th July 2010)

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

Figure 3
Visibility and weather

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4.2 Topography and vegetation

A detailed survey of existing vegetation has been carried out as part of the biodiversity assessment for the project EIS.

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

Timbered areas have some potential to provide partial or full screening toward the project area from surrounding public and residential view locations. The screening potential tends to increase when combined with the local topography of hills and undulating landform.

The landscape within and surrounding the project site is illustrated in the panorama photographs presented in **Figures 5** to **9**.

Panorama photographs

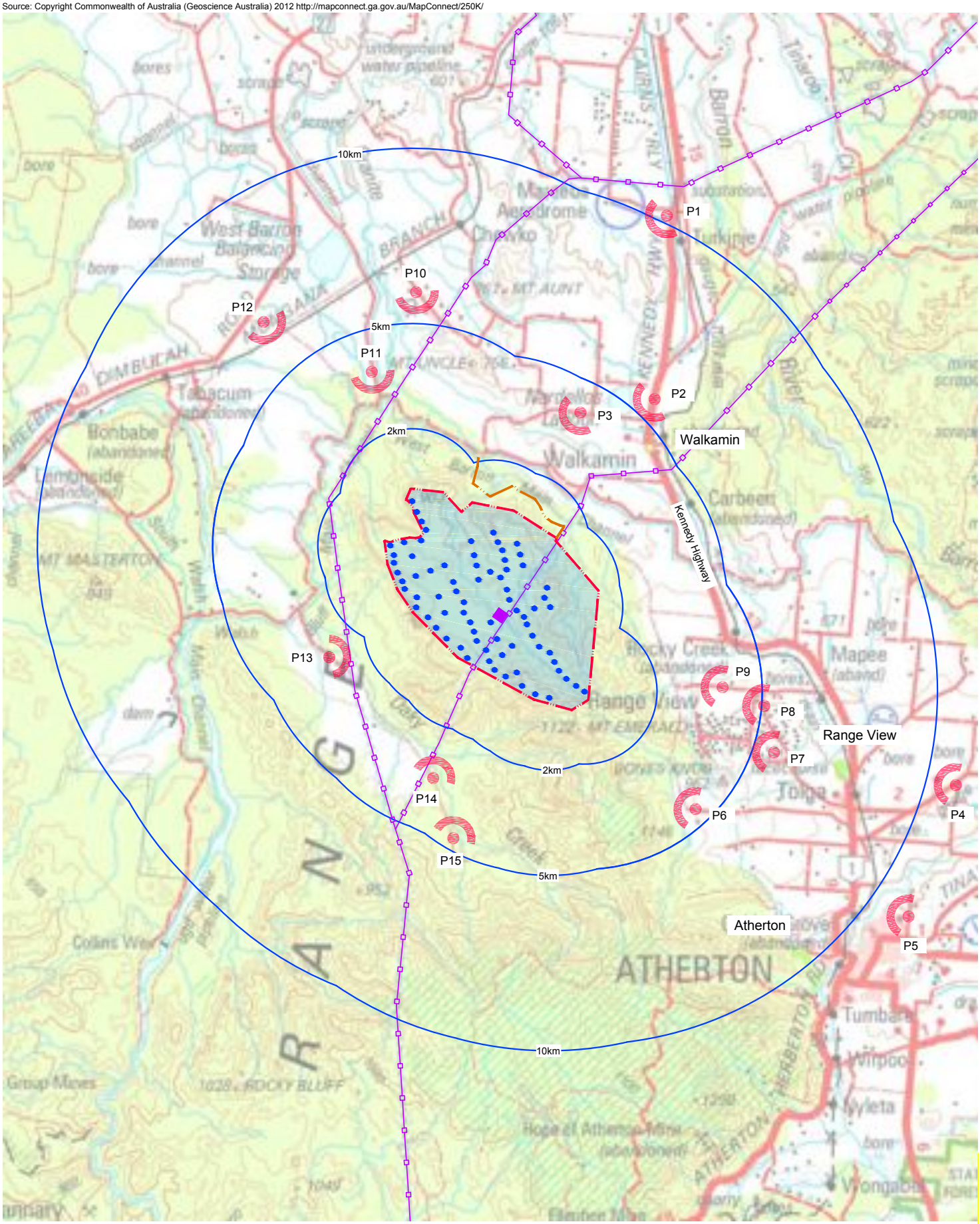
Section 5

5.1 Panorama Photographs

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

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

The panorama photograph locations are illustrated in **Figure 4**, and the panorama photographs illustrated in **Figures 5** to **9**. The panorama photographs are not to be confused with the photomontages. The panorama photographs do not include a representation or model of the wind turbine structures. The photomontages are discussed in **Section 10** of this LVIA, and are illustrated in **Figures 17** to **44**.



Legend

- Proposed Mount Emerald wind turbine (indicative layout)
- Proposed substation (indicative location)
- Photo location
- Distance from proposed Mount Emerald wind turbine
- Indicative site boundary
- Existing transmission line
- Proposed access track

0km 2km

Figure 4
Photo locations

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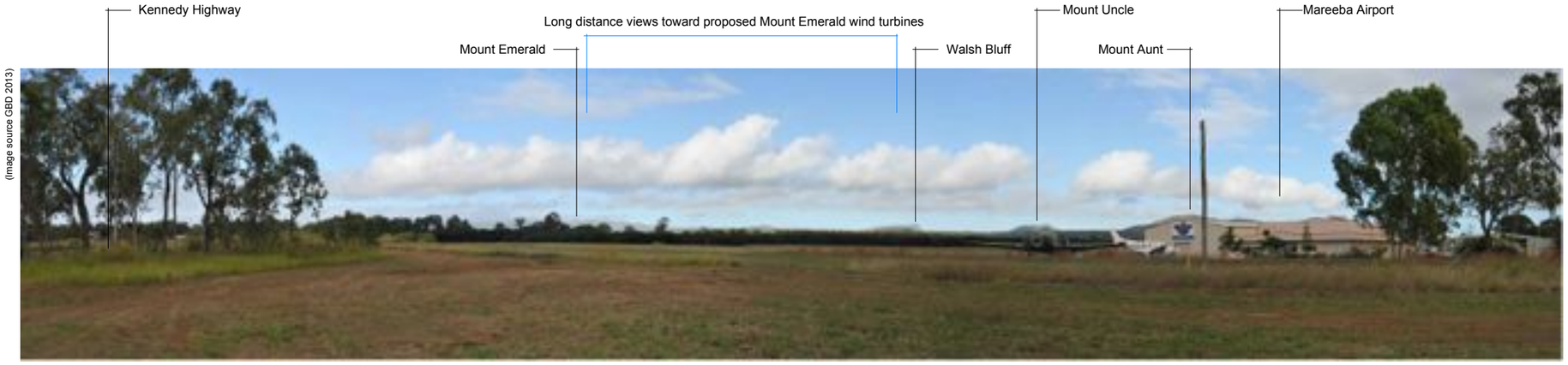

Photo Location P1- View south to south west from Kennedy Highway across Mareeba Airport

Photo Location P2 - View south to south west from the Kennedy Highway (southbound)

Photo Location P3 - View south to west from Hansen Road

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm prime lens. This combination of camera and lens results in a photograph equivalent to a 35mm single lens reflex camera with a 75 mm lens.

Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

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

Figure 5
Photo Sheet 1

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(Image source GBD 2013)

Photo Location P4- View west to north west from Kairi Road

(Image source GBD 2013)

Photo Location P5 - View west to north west from Twelfth Avenue, Atherton

(Image source GBD 2013)

Photo Location P6 - View north west from Griffin Road

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm prime lens. This combination of camera and lens results in a photograph equivalent to a 35mm single lens reflex camera with a 75 mm lens.

Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

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

Figure 6
Photo Sheet 2

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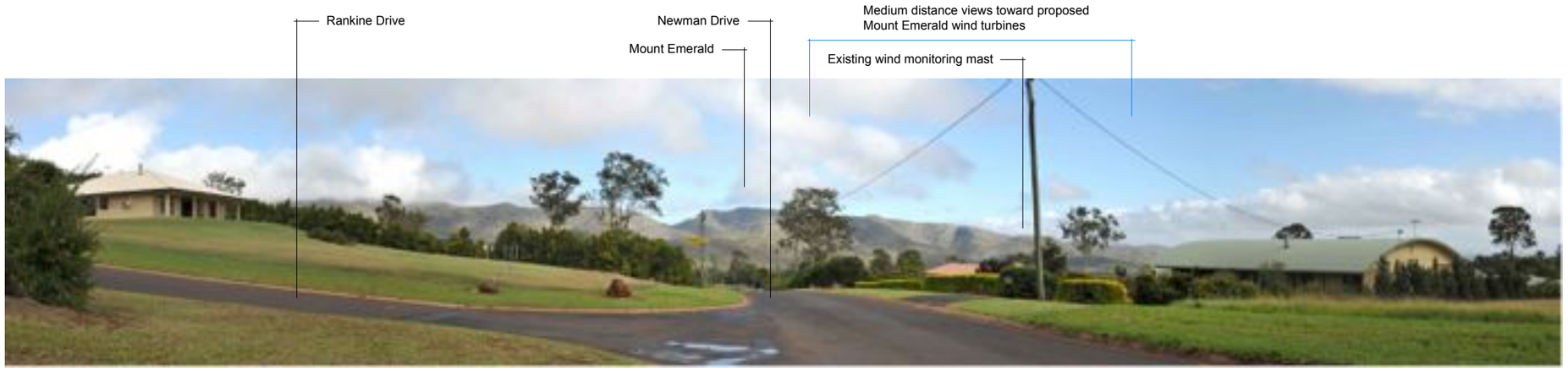

Photo Location P7- View north west from corner of Newman Road and Rankin Drive, Range View

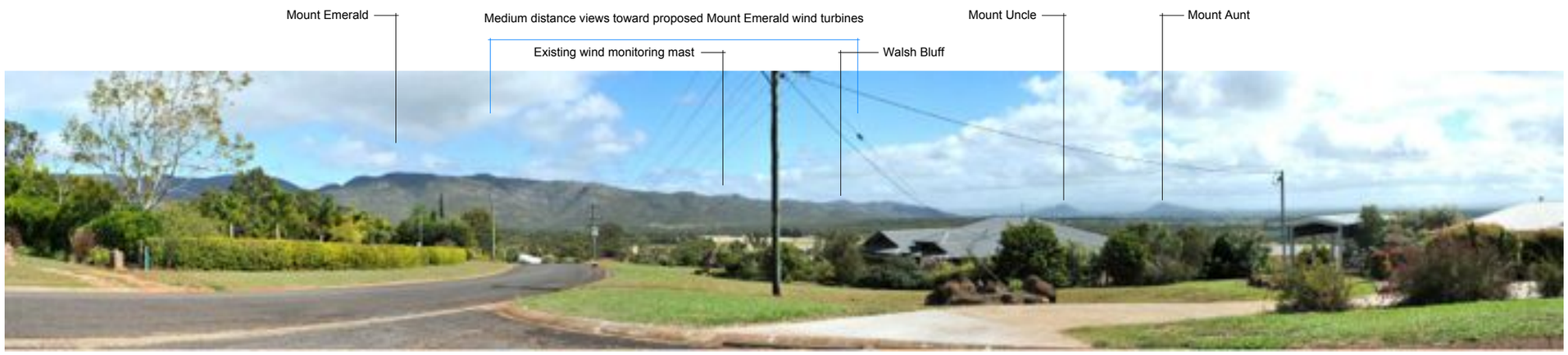

Photo Location P8 - View west to north west from Moffat Drive, Range View

Photo Location P9 - View south to west from Marnane Road

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm prime lens. This combination of camera and lens results in a photograph equivalent to a 35mm single lens reflex camera with a 75 mm lens.

Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

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

Figure 7
Photo Sheet 3

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Photo Location P10- View south from Narcotic Creek Road

Photo Location P11 - View south from Chettle Road

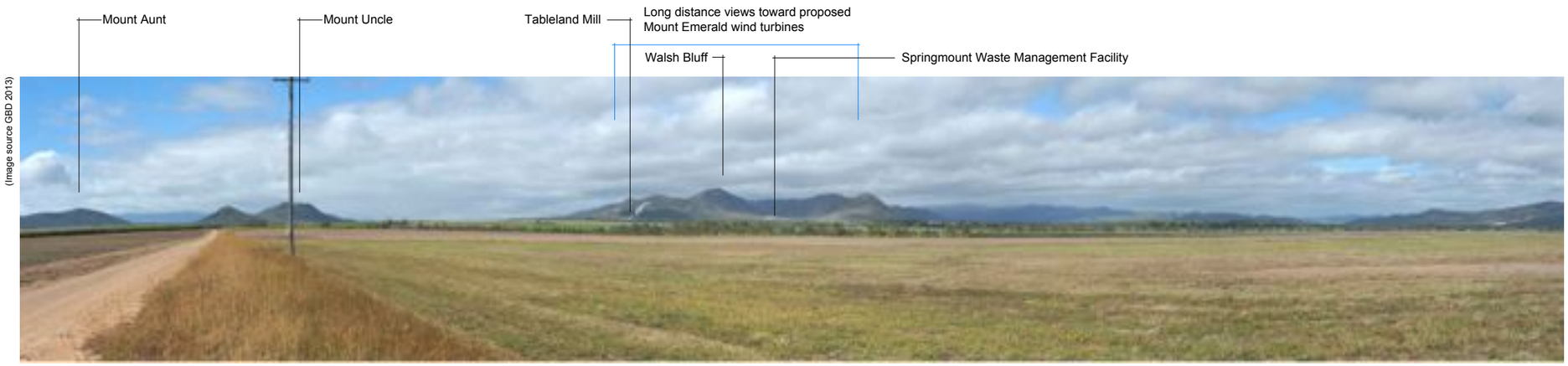

Photo Location P12 - View south to south east from farm access track (east of Burke Developmental Road)

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm prime lens. This combination of camera and lens results in a photograph equivalent to a 35mm single lens reflex camera with a 75 mm lens.

Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

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

Figure 8
Photo Sheet 4

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MOUNT EMERALD WIND FARM

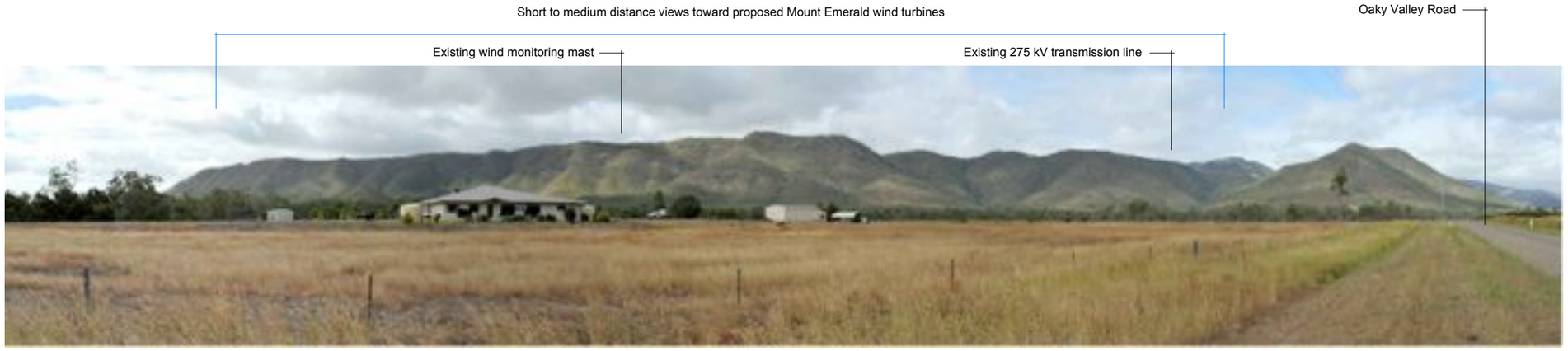

Photo Location P13- View north east to south east from Oaky Valley Road

Photo Location P14 - View north west to east from Oaky Valley Road

Photo Location P15 - View north west to east from Oaky Valley Road

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm prime lens. This combination of camera and lens results in a photograph equivalent to a 35mm single lens reflex camera with a 75 mm lens.

Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

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

Figure 9
Photo Sheet 5

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