# LANDSCAPE & VISUAL IMPACT ASSESSMENT

## PROPOSED BODANGORA WIND FARM












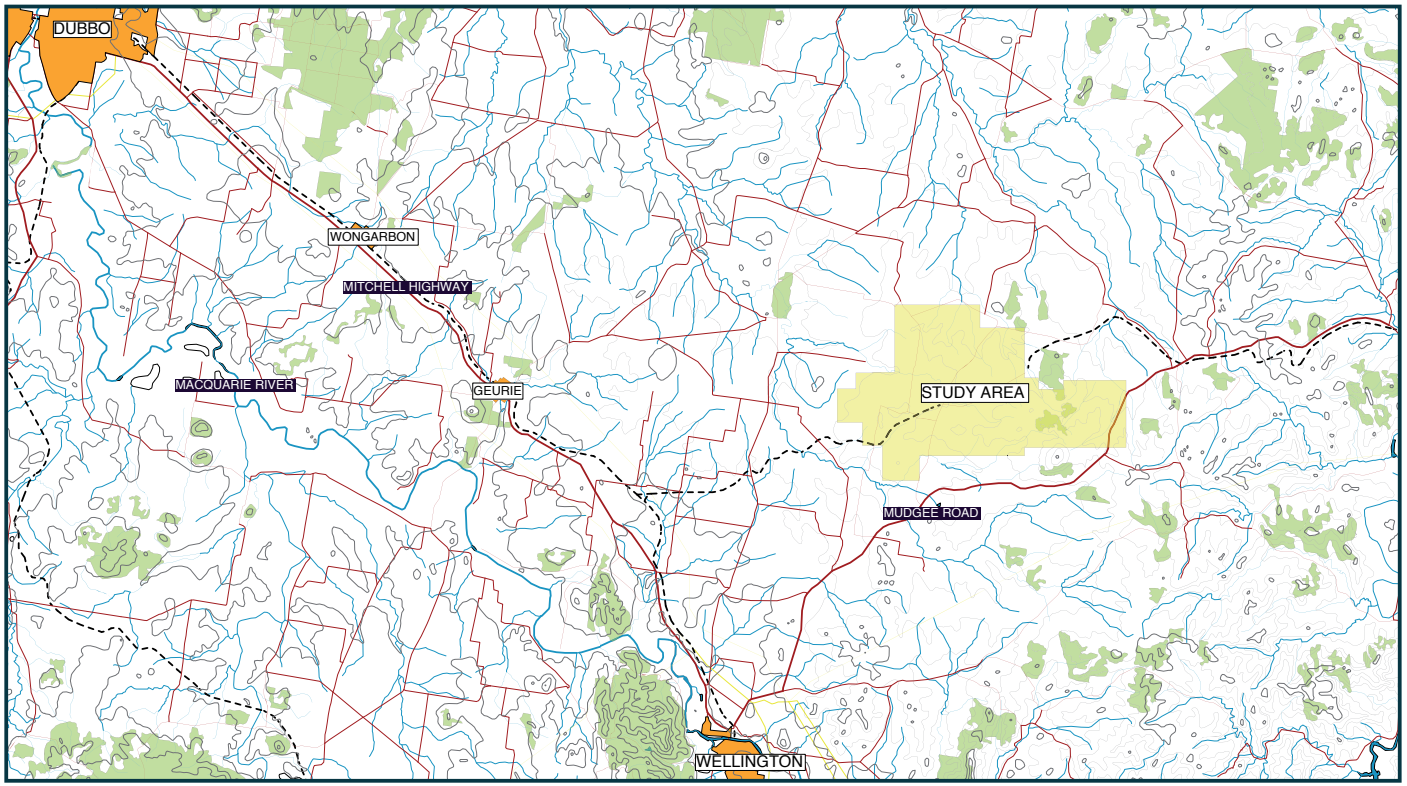

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Moir Landscape Architecture
5 Woodstock Street PO Box 505 Mayfield, NSW 2304
Phone (02)4967 1000 Fax (02)4967 1500
admin@moirlandscapearchitecture.com.au
www.moirlandscapearchitecture.com.au

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# 1.0 INTRODUCTION

## 1.1 BACKGROUND

Moir Landscape Architecture have been commissioned by Infigen Energy to prepare a Landscape and Visual Impact Assessment (LVIA) for the proposed Bodangora Wind Farm, located north east of Wellington in NSW (See Figure 1). This LVIA will support the Environmental Impact Statement (EIS) document prepared for the proposal and lodged with the Department of Planning and Infrastructure (DOP) for assessment under Part 3A of the Environmental Planning and Assessment Act, 1979.

The purpose of this report is to provide an assessment of visibility and potential visual impacts and information to assist the community and the DOP to understand and assess the likely impacts.

As cadastral information has little influence in defining visual catchments this assessment aims to identify the landscape character, and dominant features of the relevant visual catchments that the Study Site lies within. The purpose of this report is to provide an assessment of visibility and visual impacts and information to assist the community and the DOP to understand and assess the likely impacts.

Survey work for the study was undertaken between 8th -11th August 2011 using key viewpoints and locations with potential views towards the Study Site. The report details the results of the field work, documents the assessment of the landscape character and visual setting, and makes recommendations to assist in the mitigation of any potential impacts resulting from the proposed development.

## 1.2 PROJECT OVERVIEW

The proposed Bodangora Wind Farm is situated approximately 15 km north east of Wellington and 40 km south east of Dubbo, New South Wales (NSW).

This LVIA has been developed based on the proposed layout which consists of the construction and operation of up to 36 wind turbines, each with a nominal capacity of between 2 MW and 5MW with the total wind farm capacity being between 60 MW and 110 MW. The assessment is based on wind turbines with a height of up to 150 metres and aims to present the worst case scenario.

In addition to the wind turbines, the associated ancillary works will be assessed. These include the construction of a facilities building, a 132 kV power line connecting to existing transmission lines, a switching substation temporary patching plants and access tracks.

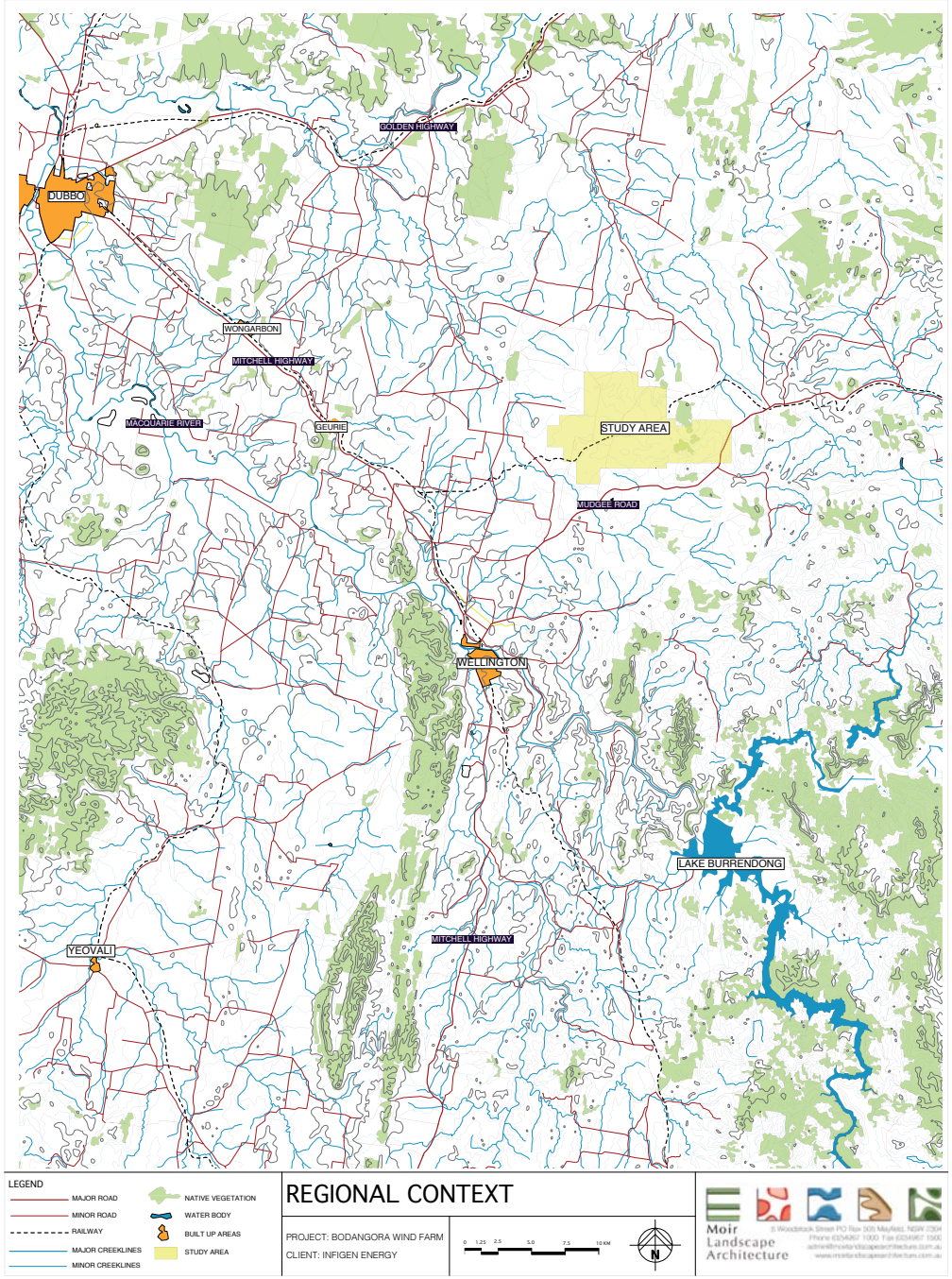


FIGURE 1: Regional Context

# 2.0 STATUTORY FRAMEWORK

## 2.1 PART 3A PROJECT PROCESS

The proposed development is a large scale, major infrastructure project of both regional and State environmental significance. Applications of this scale are determined by the Minister for Planning under Part 3A of the Environmental Planning and Assessment Act 1979.

The preparation of an Environmental Assessment (EA) forms the first step of the Part 3A Project Assessment. The Director-General requirements for the preparation of the EA are outlined in Section 2.2.

## 2.2 DIRECTOR GENERAL REQUIREMENTS

As part of the proposal the Director General has set a number of requirements which need to be addressed as part of the preparation of the EA. The requirements required for assessment of visual impact include:

- provide a comprehensive assessment of the landscape character and values and any scenic or significant vistas of the area potentially affected by the project, including an assessment of the significance of landscape values and character in a local and regional context. This should describe community and stakeholder values of the local and regional visual amenity and quality, and perceptions of the project based on surveys and consultation;
- assess the impact of shadow "flicker", blade "glint" and night lighting from the wind farm;
- identify the zone of visual influence of the wind farm including consideration to night lighting (no less than 10 kilometres) and assess the visual impact of all project components on this landscape;
- include an assessment of any cumulative visual impacts from transmission line infrastructure;
- include photomontages of the project taken from potentially affected residences (including approved but not yet developed dwellings or subdivisions with residential rights), settlements and significant public view points, and provide a clear description of proposed visual amenity mitigation and management measures for both the wind farm and the transmission line. The photomontages must include representative views of turbine night lighting if proposed; and
- provide an assessment of the feasibility, effectiveness and reliability of proposed mitigation measures and any residual impacts after these measures have been implemented.

## 2.3 POLICY CONSIDERATIONS

There is not yet guidelines for the development of wind farms in NSW. The following provides an overview of the, guidelines, relevant frameworks and considerations of authorities utilised to form the methodology for this visual impact assessment.

In addition to these guidelines and frameworks, Wind Farm related literature and previous Visual Impact Assessments of relevance have been utilised throughout the Visual Impact Assessment process.

### Best Practice Guidelines for Wind Energy Development

The Best Practice Guidelines for Wind Energy Development were developed in November 1994 by the British National Wind Energy Association to assist the development of appropriate wind energy projects in the UK

### Wind Farms and Landscape Values National Assessment Framework

The Australian Council of National Trusts (ACNT) and the Australian Wind Energy Association have prepared a report entitled: 'Wind Farms and Landscape Values'. The purpose of the report is to develop a mutually agreed methodology for assessing landscape values for wind farm proposals. The National Assessment Framework, Stage 2 of the document, provides a rigorous and transparent method for assessing, evaluating and managing the impact of wind farms on landscape values. The step by step approach entails describing and modelling wind farms proposals in the landscape, assessing the positive and negative impacts on landscape values and finally managing those impacts.

The National Assessment Framework has four steps as follows:
Step 1: Assess the Landscape Value,
Preliminary Landscape Assessment.
Full Landscape Assessment.
Step 2: Describe and model the wind farm in the landscape.
Step 3: Assess the impacts of the wind farm on landscape values.
Step 4: Respond to impacts.

### National Wind Farm Development Guidelines

The Environment Protection and Heritage Council have developed a draft guideline (July 2010) to provide consistent framework and methods for assessing issues unique to wind farm developments. References to these guidelines have been made throughout the report.

### Wellington Shire Council

The proposed development is located within the Wellington Shire Council. No relevant policies of landscape or scenic quality guidelines apply to the area within these councils.

### Road and Traffic Authority

The assessment of shadow flicker, blade glint and reflectivity is to include an assessment of the impact on road users.

### Civil Aviation Safety Authority

The LVIA includes an assessment of night lighting in accordance with the Civil Aviation Safety Authority (CASA).

# 3.0 STUDY METHOD

## 3.1 LANDSCAPE AND VISUAL IMPACT ASSESSMENT

The purpose of a Landscape and Visual Impact Assessment is to identify and determine the value, significance and sensitivity of a landscape. The method applied to this study involved systematically evaluating the visual environment pertaining to the site and using value judgements based on community responses to scenery. The assessment was undertaken in stages as noted below:

SITE & REGIONAL CONTEXT
- Overview of the regional and site context including both natural and cultural features.

LANDSCAPE CHARACTER
- Description of the regional landscape character and significant features.
- Classification of the local landscape into different character types and a description (Referred to as Landscape Character Units). A determination of the landscapes ability to absorb different types of development based on the physical and environmental character of the landscape.

THE PROPOSAL
- Overview of the proposed wind farm development and associated infrastructure.

VISUAL IMPACTS
- Computer modelling to determine the Zone of Visual Influence (ZVI) based on topography alone to represent worst case scenario.
- The undertaking of a viewpoint analysis to identify sites likely to be affected by development of the site and a photographic survey using a digital camera and a handheld GPS unit to record position and altitude.
- Visual modelling of the wind farm from key viewpoints in the form of photomontages to depict the potential visual change. (AUS WEA 2007 or 2005)

VISUAL EFFECTS
- Overview of potential Visual effects including Shadow Flicker, Blade Glint and Reflectivity and Night Lighting.

CUMULATIVE VISUAL IMPACTS
- Assess the cumulative visual impacts based on existing and proposed development in the area.

VISUAL IMPACT SUMMARY
- Assessment of the overall visual impact, summary of visual impact on residents and public receptors.

COMMUNITY PERCEPTIONS
- Overview of the community perception, consultation process and outcomes.

MITIGATION METHODS
- Preparation of recommendations for impact mitigation and suggestions for suitable development to maintain the areas visual quality.

## 3.2 DEFINITIONS

Definitions for terms used throughout the VIA have been included in this section of the report.

### 3.2.1 Landscape Values

Landscape values are the cultural attributes (social, indigenous, artistic and environmental) as well as the aesthetics of a place, as shown in figure 2.


FIGURE 2: Landscape Values

### 3.2.2 Visual Quality

Visual quality of an area is essentially an assessment of how viewers may respond to designated scenery. Scenes of high visual quality are those which are valued by a community for the enjoyment and improved amenity they can create. Conversely, scenes of low visual quality are of little value to the community with a preference that they be changed and improved, often through the introduction of landscape treatments.

As visual quality relates to aesthetics its assessment is largely subjective. There is evidence to suggest that certain landscapes are constantly preferred over others with preferences related to the presence or absence of certain elements. The rating of visual quality for this study has been based on scenic quality ratings and on the following generally accepted assumptions arising from scientific research (DOP, 1988):

- Visual quality increases as relative relief and topographic ruggedness increases;
- visual quality increases as vegetation pattern variations increase;
- visual quality increases due to the presence of natural and/or agricultural landscapes;
- visual quality increases owing to the presence of water forms (without becoming too common) and related to water quality and associated activity; and
- visual quality increases with increases in land use compatibility.

In addition to the above, cultural items may also endow a distinct character to an area and therefore contribute to its visual quality due to nostalgic associations and the desire to preserve items of heritage significance.

### 3.2.3 Visual Sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different areas. The assessment is based on the number of people affected, land use, and the distance of the viewer from the proposal. (EDAW, 2000).

For example, a significant change that is not frequently seen may result in a low visual sensitivity although its impact on a landscape may be high. Generally the following principles apply:

- Visual sensitivity decreases as the viewer distance increases.
- Visual sensitivity decreases as the viewing time decreases.
- Visual sensitivity can also be related to viewer activity (e.g. a person viewing an affected site whilst engaged in recreational activities will be more strongly affected by change than someone passing a scene in a car travelling to a desired destination).

Sensitivity ratings are defined as high, moderate or low and are shown in the table below (URBIS, 2009).

| VISUAL SENSITIVITY | | | | | |
|---|---|---|---|---|---|
| VISUAL USE AREA | FOREGROUND | | MIDDLEGROUND | | BACKGROUND |
| | Local setting | | Sub-Regional setting | | Regional setting |
| | 0-1 | 1-2km | 2-4.5 | 4.5-7 | > 7kms |
| Townships | High | High | High | Mod | Low |
| Rural residences | High | High | High | Mod | Low |
| Main Highway | Mod | Mod | Low | Low | Low |
| Local Roads | Mod | Mod | Low | Low | Low |
| Railway Line (Freight) | Low | Low | Low | Low | Low |
| Agricultural Land | Low | Low | Low | Low | Low |

TABLE 1: Visual Sensitivity Table

### 3.2.4 Visual Effect

Visual effect is the interaction between a proposal and the existing visual environment. It is often expressed as the level of visual contrast of the proposal against its setting or background in which it is viewed.

Low visual effect: occurs when a proposal blends in with its existing viewed landscape due to a high level of integration of one or several of the following: form, shape, pattern, line, texture or colour. It can also result from the use of effective screening often using a combination of landform and landscaping.

Moderate visual effect: occurs where a proposal is visible and contrasts with its viewed landscape however, there has been some degree of integration (e.g. good siting principles employed, retention of significant existing vegetation, provision of screen landscaping, appropriate colour selection and/or suitably scaled development).

High visual effect: results when a proposal has a high visual contrast to the surrounding landscape with little or no natural screening or integration created by vegetation or topography.

### 3.2.5 Visual Impact

Visual impact refers to the change in appearance of the landscape as a result of development. (EPHC, 2010). Visual impact is the combined effect of visual sensitivity and visual effect. Various combinations of visual sensitivity and visual effect will result in high, moderate and low overall visual impacts as suggested in the below table (URBIS, 2009).

| VISUAL IMPACT | | | | |
|---|---|---|---|---|
| | | VISUAL EFFECT ZONES | | |
| | | HIGH | MODERATE | LOW |
| VISUAL SENSITIVITY LEVELS | HIGH | High Impact | High Impact | Moderate Impact |
| | MODERATE | High Impact | Moderate Impact | Low Impact |
| | LOW | Moderate Impact | Low Impact | Low Impact |

TABLE 2: Visual Impact Table

### 3.2.6 Zone of Visual Influence (ZVI)

The Zone of Visual Influence (ZVI) represents the area over which a development can theoretically be seen, and is based on a Digital Terrain Model (DTM). The ZVI usually presents a bare ground scenario - ie a landscape without screening, structures or vegetation, and is usually presented on a base map. It is also referred to as a zone of theoretical visibility. (Horner and Maclennan et al, 2006).

### 3.2.7 Visual Absorption Capability

Visual Absorption Capability (VAC) is used to assess the landscapes susceptibility to visual change caused by human activities. A landscape with a high VAC would be able to accept alterations caused by human alteration with little or no loss to the landscape character or visual condition.

### 3.2.8 Photomontage

A photomontage is a visualisation based on the superimposition of an image (ie turbine, building, road, landscape addition etc) onto a photograph for the purpose of creating a realistic representation of proposed or potential changes to a view. (Horner and Maclennan et al, 2006).

Photomontages have been utilised in this Visual Impact Assessment to assist in the impact assessment of the proposal. Refer to section 9.0.

## 3.3 VISIBILITY ASSESSMENT CRITERIA

In order to facilitate objective assessment of visibility, a set of key assessment criteria was developed. The key criteria against which the visibility of the proposed development was assessed from each viewpoint are:

- the distance from the wind farm
- the potential visual prominence (in relation to the view field angle)
- the number of visible turbines
- the context in which the turbines are viewed

These methods of assessment have been summarised from each viewpoint, forming part of the Visual Impact section of this report (refer to section 7.0).

### 3.3.1 Distance from the wind farm

The distance of each viewpoint to the closest turbine was a significant determining factor in ranking the visual prominence of the development. The visual impact decreases or increases in direct relation to the distance.

Local setting: Up to 2km from the development

Sub regional setting: between 2km and 10km from the development

Regional setting: beyond 10km of the development

These distances have been established based on previous studies undertaken in association with Wind Farm development and by the requirements outlined by the Director General. The distance to the nearest proposed wind turbine has been measured for each viewpoint. Table 5 outlines the potential visual prominence of the development in relation to the distance from the object.

| DISTANCE FROM WIND TURBINE | POTENTIAL VISUAL PROMINENCE |
|---|---|
| > 12 km | VISUALLY INSIGNIFICANT<br>A very small element in the viewshed, which is difficult to discern and will be invisible in some lighting or weather circumstances. Rotor blade movement can often be seen on a clear day. |
| 6-12 km | POTENTIALLY NOTICABLE BUT WILL NOT DOMINATE THE LANDSCAPE<br>The development will be noticable. The degree that it intrudes on the view will increase as distance decreases. |
| 2.5-6 km | POTENTIALLY NOTICABLE AND CAN DOMINATE THE LANDSCAPE<br>The development may be highly noticable. |
| 1-2.5 km | HIGHLY VISIBLE AND WILL USUALLY DOMINATE THE LANDSCAPE<br>The development may be highly noticable. |
| <1 km | WILL ALWAYS BE VISUALLY DOMINANT IN THE LANDSCAPE<br>The development is highly noticable. |

TABLE 3: Visual prominence in relation to distance and viewshed (URBIS, 2009)

### 3.3.2 View field angle

The view field angle is the angle subtended by the wind farm at the observers location (see Figures 2 & 3). This angle varies for differing viewpoints based on the distance from the wind turbines, the number of turbines, the layout and its orientation relative to the viewer and intervening topography. A person normally sees approximately 100° at any point and can easily see a much broader field by scanning from side to side. (Connel Wagner)

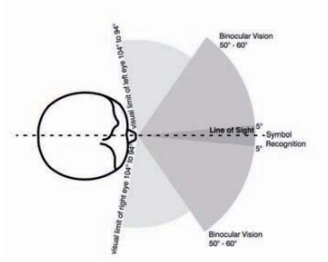


FIGURE 3: Horizontal Line of Sight

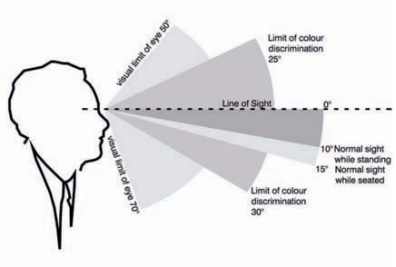


FIGURE 4: Vertical Line of Sight

The field of angle can be measured by both the horizontal and vertical line of sight (refer to figures 3 and 4). However due to the unique spatial arrangement of the proposed wind farm development, this VIA will focus on the vertical angle of view.

In this case the vertical line of sight is used to assess the visual prominence of the proposed development from each viewpoint. The field of view is based merely on the theoretical angle between the viewer and the wind turbine and does not take into account topography, vegetation or buildings which may lessen the visual prominence and is therefore based on worst case scenario. Table 4 outlines the potential visual prominence of the development based on the vertical field of view.

| DEGREES OF FIELD OF VIEW OCCUPIED | POTENTIAL VISUAL PROMINENCE - VISUAL FIELD OF VIEW |
|---|---|
| Less than 0.5° | INSIGNIFICANT<br>A small thin line in the landscape. |
| 0.5°-2.5° | POTENTIALLY NOTICABLE<br>The development may be noticable. The degree that it intrudes on the view will be dependent on how well it integrates with the landscape setting. |
| Greater than 2.5° | POTENTIALLY DOMINANT<br>The development will be highly noticable, although the degree of visual intrusion will depend on the landscape setting and the width/spread of the object. |

TABLE 4: Vertical line of sight- Visual impact/ visual prominence (URBIS, 2009)

### 3.3.3 Number of visible turbines

The number of visible turbines was determined from each viewpoint, based on topographic mapping and review of the wind farm layout in relation to the viewpoint. The number of turbines visible to the viewer is likely to contribute to the overall visibility ranking.

The wind farm layout has a total of 36 proposed wind turbines.

| NUMBER OF TURBINES VISIBLE | PERCENTAGE OF DEVELOPMENT |
|---|---|
| 31-36 | 100% |
| 23-30 | 80% |
| 15-22 | 60% |
| 8-14 | 40% |
| 1-7 | 20% |

TABLE 5: Percentage of visible turbines

### 3.3.4 Viewing context

A number of factors existing on a local level can influence the visibility of the proposed wind farm development as viewed. The influences include but are not limited to the backdrop of the wind farm, local influences and visual desensitisation. These include but are not limited to:

- Visual backdrop of the proposal
- Local influences
- Visual desensitisation

#### VISUAL BACKDROP

The backdrop upon which the wind turbines are viewed can be a relevant factor in the assessment of the visual impact. For example most views of the wind turbines will have a backdrop against the sky. In clear weather, the wind turbines will appear prominent contrasting against the blue sky, where as on overcast days the wind turbines may be less noticeable with an overcast or cloudy background reducing the level of visual contrast. For each photomontage developed for the proposed wind turbines, a comparative photomontage has been developed with a blue sky back drop to assist in demonstrating the worst case scenario of the proposed wind turbines.

Turbines against a cloudy backdrop.

Turbines against a blue sky backdrop.

#### LOCAL INFLUENCES

A variety of influences on a local level can directly impact the visibility of the proposed development. For example, wind break planting around homesteads and retained vegetation along roadsides are a characteristic of the existing landscape which effectively contain views from within surrounding properties. In effect this screens views to the distance and influences the visual impact from each viewpoint.

Roadside screen planting.

Homestead screen planting.

#### VISUAL DESENSITISATION

Another visual influence is the desensitisation of viewers to visual modification due to existing land use in the area. For example the presence of agricultural equipment surrounding homesteads and the presence of storage areas, farm equipment and sheds through the landscape can have a greater visual influence from viewpoints than the proposed development in the distance. Examples of this within the local context of the Site include farming equipment, the Wellington Substation and transmission lines.

Wellington Substation.

Existing Infrastructure.

## 4.1 REGIONAL CONTEXT

The Study Area is located in the Orana Region in central New South Wales approximately 15km north east of Wellington and 40km south east of Dubbo and 45km north west of Mudgee. The region is predominately rich agricultural land utilised for wheat, beef cattle and sheep farming.

### 4.1.1 Wellington

Wellington is an inland country town located at the junction of the Macquarie and Bell River in inland New South Wales. The town is  located approximately 370km by road north west of Sydney, at the foothills of Mount Arthur.

Wellington was first settled in 1823 by a party of convicts and soldiers at the junction of the Macquarie and Bells Rivers. The convicts were removed 8 years later and the town was turned over to the Missionary Society Misson before becoming gazetted a town in 1846. Today Wellington is the administrative town of the Wellington Shire Council and has a population of approximately 4,600 people.

Wellington Train Station & Cameron Park

### 4.1.2 Dubbo & Mudgee

The closest major towns to the study area are Dubbo and Mudgee both located approximately 40km from the site. Both Mudgee and Dubbo are large regional town centres servicing the Orana region of NSW. Tourist roads including Mudgee Road run through the Study Area connecting to these major towns.


Dubbo and Mudgee Main Streets

### 4.1.3 Bodangora

Bodangora is a small, historical village located approximately 2.5km south west of the proposed wind farm site. Bodangora was formerly known as Mitchell's Creek and has a rich history in Gold Mining and Farming. Located just over 11km north east of Wellington, Bodangora is today a small settlement of rural residential properties within close proximity to the Wellington Airport.

St Pauls Church & Bodangora village (Source: The Bodangora Website)

### 4.1.4 Goolma

Goolma is a small country town located approximately 14km east of the proposed wind farm. Established in the mid 1800s, Goolma has changed only marginally with only a public school, church, and a small number of stores. The surrounding land use generally comprises wool and cattle farms with a few grain crops.

Goolma Hotel  (Source: G'day Pubs) & Railway Bridge (Source: About NSW)

### 4.1.5 Geurie

Geurie is a small village located midway between Wellington and Dubbo on the Mitchell Highway. Geurie has a small railway station and is serviced twice daily by the Country link service between Sydney and Dubbo. In 2006 Geurie had a population of 466.

## 4.1.5 Major Roads

The Mitchell Highway is a major highway utilised as a travel corridor between Wellington and Dubbo. The Mitchell Highway is located approximately 15km to the west of the Study Area. A number of local roads run from the highway servicing homesteads.

Mudgee Road runs in a north easterly direction from Wellington, passing Bodangora to Gulgong. Mudgee Road is a major travel corridor in the area utilised by local residents, tourists and heavy vehicles associated with the surrounding industry.

Mitchell Highway

Mudgee Road

## 4.1.6 Land use

The land of the region is generally used for grazing purposes and cropping. Crops inlcude wheat, oasts, legume, canola, peas and large areas of lucerne. The main animal enterprises include: cattle, prime lambs and wool. A number of isolated homesteads are located throughout the region generally servicing the agricultural industry.

Improved Pasture

Sheep Grazing

## 4.1.7 Cultural Significance

### PRE EUROPEAN SETTLEMENT

The Bodangora district was traditionally Wiradjuri country, the largest Aboriginal language group in NSW. The Wiradjuri country stretches from the eastern boundary of the Great Dividing Range to as far west as Nyngan. The Wiradjuri people were known as the people of three rivers the Macquarie River, Lachlan River and Murrambidgee River.

### GOLD MINING

The Wellington district has a rich history in Gold Mining. As early as 1839 gold is believed to have been collected from the Namina estate near Mitchells Creek. In 1851 a discovery of Gold at Summer Hill Creek was made public starting the Gold Rush in the Wellington district. In 1869 Mitchells Creek Mining Co was founded. Stuart Town (formerly known as Ironbarks) was established in 1870s housing many european and chinese miners.

Stuart Town

### FARMING

The area surrounding what is now known as the village of Bodangora was originally part of the 'Naima' estate, utilised mainly for sheep grazing. In 1873 a flour mill opened up in Dubbo and land within the Bodangora district was recognised by early pioneers as suitable for wheat grazing.

Mining and farming (Source: The Bodangora Website)

## 4.2 SITE CONTEXT

The Study Area is located approximately 15km north east of Wellington and within 2km north east of the village Bodangora (Refer to Figure 5).

### 4.2.1 Landform

The landform of the study area is typically sloping to undulating topography with local rises. Mount Bodangora is the main feature of the landscape at an elevation of approximately 743 it is visible from most points within the study area. Spicers Pinnacle is located north of Mudgee Road off Spicers Creek Road and is a local high point with an elevation of 521m.

### 4.2.2 Water Bodies

A number of minor creek lines run throughout the study area forming part of the Macquarie River Catchment, draining into Lake Burrendong. Mitchell Creek, Spicers Creek and Mullion Creek are tributaries of the Talbragar River and run through the study area with a moderate coverage of riparian vegetation. A number of smaller intermittent watercourses run throughout the study area in the form of small streams and minor drainage lines. These watercourses generally lack riparian vegetation and do not feature prominently in the landscape.

### 4.2.3 Vegetation

The landscape typical of the region is predominately cleared, open grazing land with scattered groupings of remnant native trees. Native vegetation occurs throughout the study area along ridge lines and areas determined too steep for agricultural use. Retained vegetation is also common along creek line, roadsides and along the perimeters of paddocks and property boundaries.

### 4.2.4 Roads

The Study Area is located to the north of Mudgee Road, a major travel corridor between Mudgee and Wellington. Mudgee road is utilised by heavy transport vehicles, residents and tourists. A number of minor roads run through the Study Area, providing access to isolated homesteads. These roads are generally unsealed, and used intermittently.

### 4.2.5 Land use

Land within the study area is generally utilised for grazing purposes. A number of isolated homesteads are located throughout the study area generally servicing the agricultural industry.

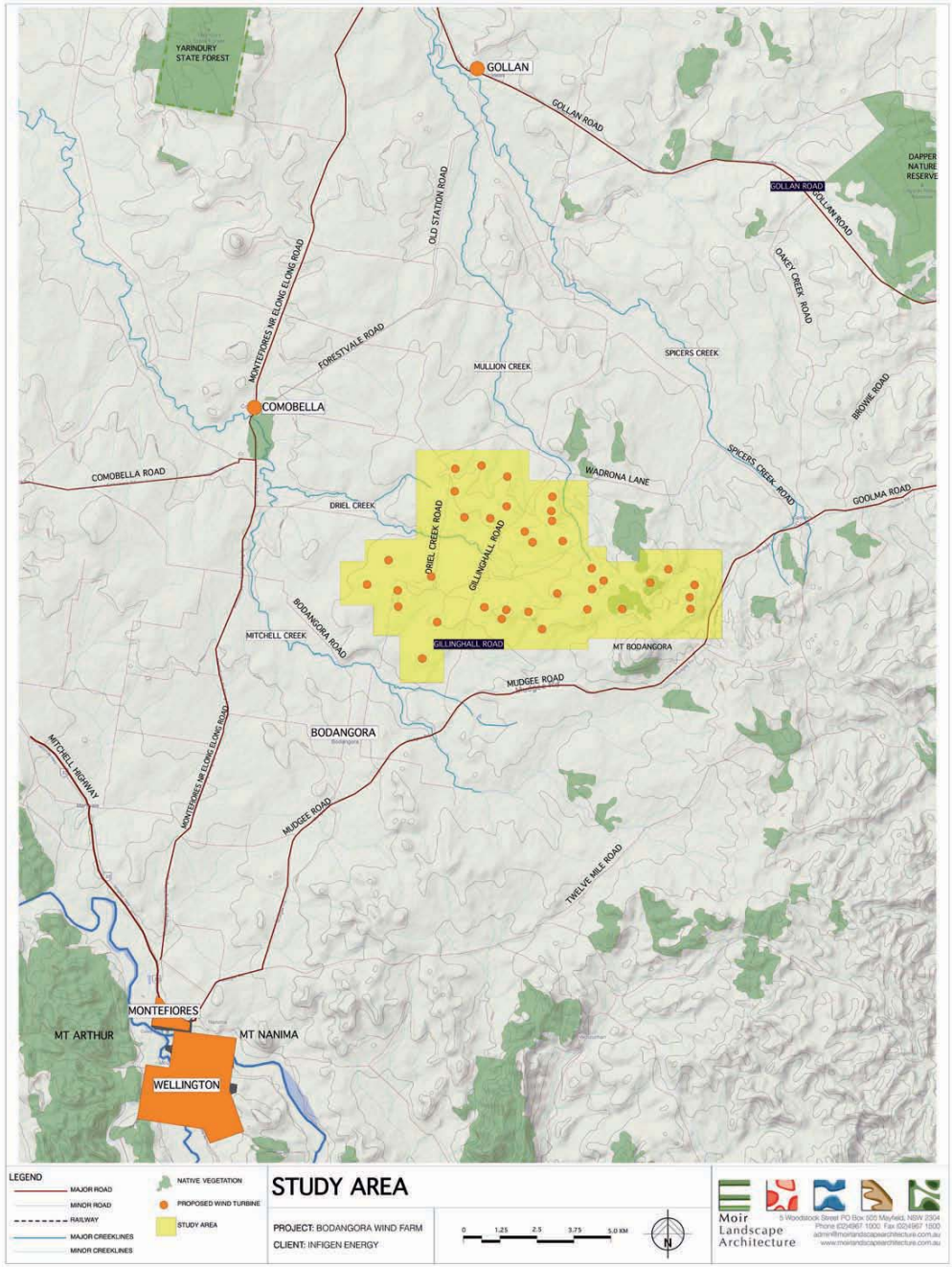


FIGURE 5: Study Area

## 5.1 REGIONAL LANDSCAPE CHARACTER

### 5.1.1 South Western Slopes Bioregion

The Study Area is located within the north eastern pocket of the South Western Slopes Bioregion which is bounded to the north by the Bringalow Belt South bioregion and the South by the South Eastern Highlands bioregion. (OEH 2011)

The South Western Slopes Bioregion covers approximately 10% of New South Wales. The geology, soils and vegetation are complex and diverse but are typified by granites and meta-setiments. The Study Area is located within the Upper Slopes of the NSW South Western Slopes bioregion. (Refer to Figure 6)

### 5.1.2 Landform

The South Western Slopes Bioregion is a large area of foothills and ranges comprising the western fall of the Great Dividing Range. The landscape is typically gently undulating to undulating. An elevated ridge line associated with the Mount Arthur Reserve is located to the west of Wellington. Burrendong State recreation area surrounds Lake Burrendong with elevated ridges.

### 5.1.3 Water bodies

Lake Burrendong is the most prominent water body of the region, created by the Burrendong Dam on the Macquarie River. Macquarie River is one of the main inland rivers of NSW and runs south east past Dubbo and through Wellington valley before reaching Lake Burrendong. A number of smaller tributaries of the Macquarie River run through the landscape.

### 5.1.4 Vegetation

Vegetation in the NSW south western slopes bioregion consists of open forests and woodlands. Vegetation within the NSW South Wester Slopes Bioregion upper slopes is generally black cypress pine, kurrajong, red ironbark white gum, yellow box and Blakely's red gum on the lower slopes. Rough- barker apple on flats with river oak on upper tributaries and river red gum on lower and larger streams. (OEH 2011)

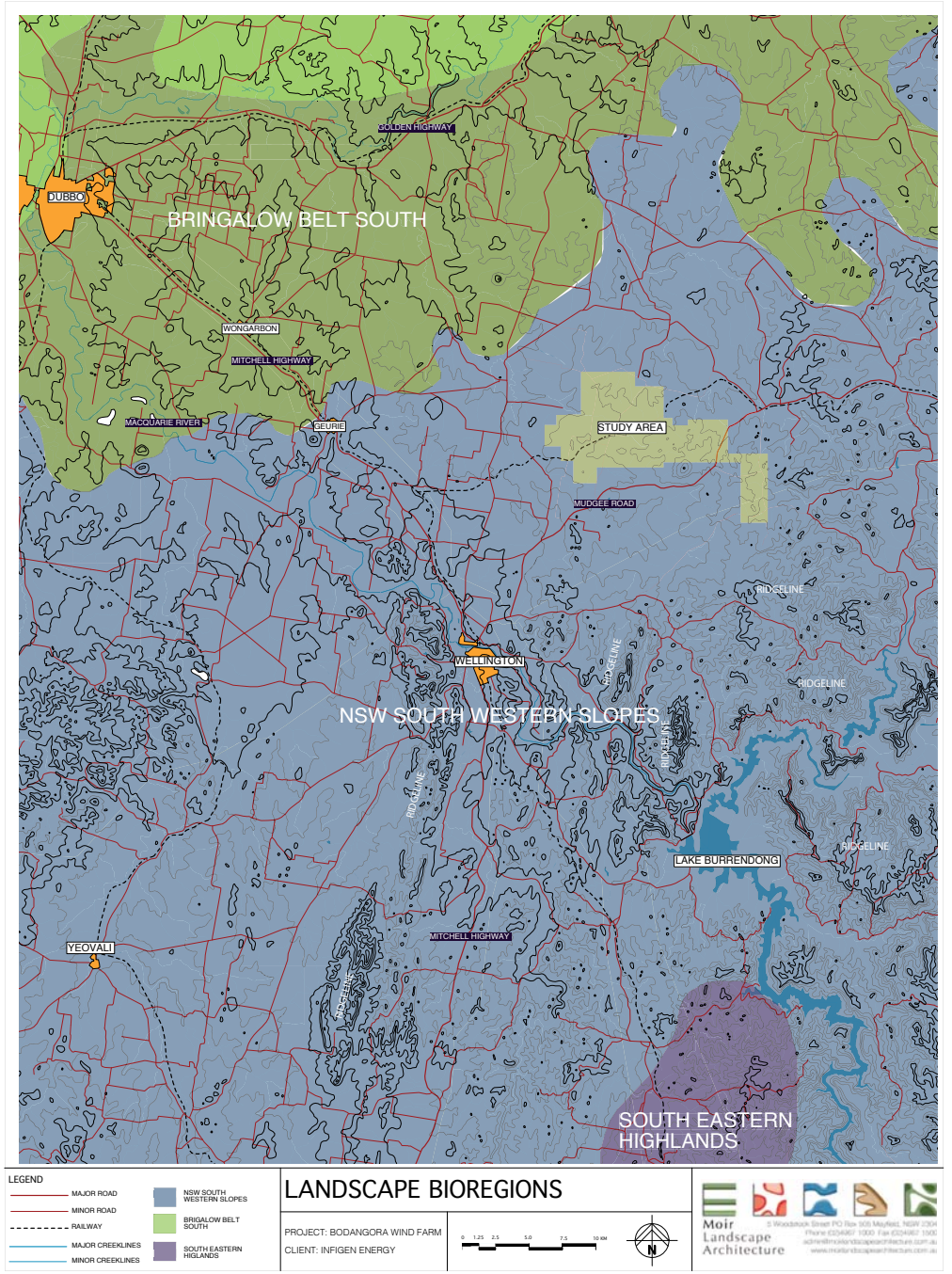


FIGURE 6: Regional Landscape Character

## 5.2 LANDSCAPE CHARACTER UNITS

Generally one of the first steps in carrying out a landscape and visual assessment is to identify and map the landscape character of the surrounding area.

The landscape character of a site refers to the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects a particular combination of geology, landform, soils, vegetation, land use and human settlement and creates a particular sense of place for different areas within the landscape. (Horner and Maclennan et al, 2006).

The study area has a similar landscape character, however subtle variations in the landscape have been recognised and the landscape has been classified into distinct and relatively homogenous units of landscape character for the purpose of this report.

These Landscape Character Units (LCU) form the elements of the local visual context hence their quality also reflects to a degree its visual amenity. For each LCU an overall rating of the visual sensitivity has been assessed to assist in the overall visual impact assessment.

The LCUs for the purpose of this report have been defined as:

- LCU 1 - Wellington
- LCU 2 - Bodangora
- LCU 3 - Mount Bodangora
- LCU 4 - Comobella
- LCU 5 - Spicers Creek

These landscape character units (LCU) are identified in Figure 7 summarised in the following pages.

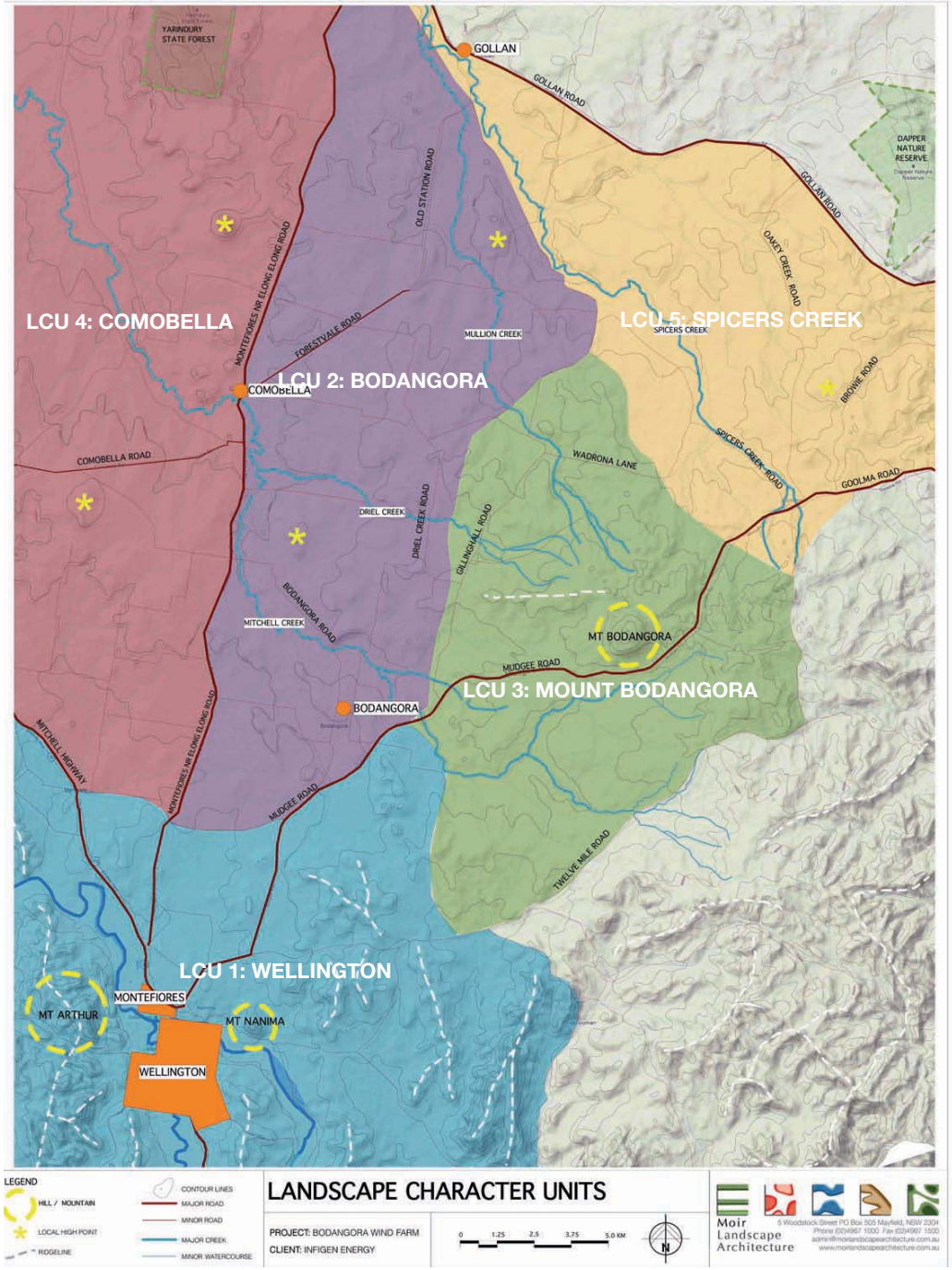


FIGURE 7: Landscape Character Units

## 5.2.1 LCU 1: WELLINGTON

The Wellington LCU encompasses a large area to the south west of the proposed site, bounded to the north by Mudgee Road and the Mitchell Highway and to the east by vegetation associated with the Mount Bodangora LCU and the Uungula LCU. The LCU incorporates the township of Wellington, the steep vegetated ranges associated with Mount Arthur to the west of Wellington and the undulating, sparsely vegetated rural landscape to the east of Wellington.

The landscape quality of the Wellington LCU has been rated as high due to the higher population and the unique landscape character.

| CHARACTER | LANDSCAPE QUALITY RATING<br>LOW MEDIUM HIGH |
|---|---|
| LANDFORM & SCALE | |
| LANDCOVER | |
| SETTLEMENT & HUMAN INFLUENCE | |
| MOVEMENT | |
| RARITY | |
| INTERVISIBILITY WITH ADJACENT LANDSCAPES | |

TABLE 6: LCU 1 Wellington Landscape Quality Rating

Mitchell Highway- Wellington

Macquarie River

Mount Arthur Range

### VIEWS:

Views from the Wellington LCU are generally contained by the undulating topography to the east and the steep ridge line of Mount Arthur Reserve to the west. It is unlikely the proposed wind farm would be visible from the LCU due to the topography.

### TOPOGRAPHY:

The topography of the Wellington LCU varies. The Wellington township is sited within a valley floor and characterised by flat land on the bank of the Macquarie River. The town is bounded to the west by the Mount Arthur at an elevation of 563m.

### ROADS / INFRASTRUCTURE:

The Mitchell Highway runs through Wellington and connects with Mudgee Road to the north of the town. A number of local roads run through the township, becoming sparse towards the outskirts of the town. Rural properties located to the east of Wellington are serviced by a small number of unsealed minor roads accessed off Mudgee Road. High voltage power lines run through the LCU to the Transgrid substation located 3km north east of Wellington.

### VEGETATION:

The LCU is generally cleared grazing land with a sparse coverage of vegetation with an increase in density on sloping land unfit for agricultural use. To the west of Wellington the Mount Arthur Reserve is densely vegetated. Riparian vegetation occurs through the LCU associated with the Macquarie and Bell rivers.

### LAND USE:

Land use within the LCU varies from urban development in the township of Wellington to rural residential on the outskirts of the town to isolated homesteads further east of Wellington. Land use to the east of Wellington is generally dryland cropping and grazing on native and improved pasture. Wellington Correctional Centre is located off Mudgee Road north east of Wellington.

### WATERCOURSES:

The Macquarie River is the most prominent water body of the local area, running through the Wellington Valley and draining into Lake Burrendgong to the south east. The Bell River is a tributary of the Wellington River running south from Wellington. A number of small intermittent water courses and drainage lines run through the landscape to the east of Wellington.

## 5.2.2 LCU 2: BODANGORA

The Bodangora LCU extends from the north of Wellington and is bounded to the north east by Mitchell Creek and the north by Comobella Road. The LCU incorporates Bodangora Village, Wellington Airport and a large area of generally cleared and gently undulating land to the north utilised for agricultural activities. A number of the proposed wind turbines are located within this LCU.

The landscape quality of this LCU has been rated as moderate.

| CHARACTER | LANDSCAPE QUALITY RATING | | |
|---|---|---|---|
| | LOW | MODERATE | HIGH |
| LANDFORM & SCALE | | | |
| LANDCOVER | | | |
| SETTLEMENT & HUMAN INFLUENCE | | | |
| MOVEMENT | | | |
| RARITY | | | |
| INTERVISIBILITY WITH ADJACENT LANDSCAPES | | | |

TABLE 7: LCU 2 Bodangora Landscape Quality Rating

Entry to Wellington Airport and Bodangora Village

Mitchell Creek

Improved pature and retained vegetation

### VIEWS:

From this LCU it is likely the proposed wind farm will be visible due to its close proximity. However views from this LCU are generally contained by a combination of local variations in topography and foreground vegetation. Some roadside vegetation may obstruct views from locations within the LCU, however for the most part views are generally open.

### TOPOGRAPHY:

The topography of the Bodangora LCU is generally low to undulating hills with elevations ranging from 280-400m. There are a number of small local rises throughout the LCU. The landscape is slightly inclined with 3 - 10% slopes over 1000 - 3000 m long.

### ROADS / INFRASTRUCTURE:

Driel Creek Road and Gillinghall Road run north from Bodangora through the LCU connecting with Spicers Creek Road to the north. A number of minor unnamed and a few gated roads run from Driel Creek Road and Gillinghall Road providing access to isolated homesteads and paddocks. The roads are generally unsealed and have a low intermittent use.

### VEGETATION:

The majority of the LCU is cleared grazing land with a moderate coverage of retained open woodland vegetation on sloping land and hill tops. Vegetation consists predominantly of open woodland communities dominated by a white box - yellow box - white cypress. A sparse coverage of retained vegetation is also associated with drainage lines and roadsides through the LCU. There are also scattered isolated kurrajong trees in open pasture areas.

### LAND USE:

Bodangora Village is located within the LCU and is identified by a slightly increased density of rural residential properties. Wellington airport is a small airstrip located approximately 1km south west of Bodangora Village. Land use is generally dominated by dryland cropping including wheat, canola and oats. Improved pasture occurs through the LCU for the grazing of cattle and sheep producing lamb and wool. Some areas remain unimproved and some rocky ridges and hills remain uncleared. A small number of isolated homesteads are located through the LCU. The LCU is generally cleared grazing land however rocky ridges and hills unsuitable for grazing retain native woodland vegetation. A sparse to moderate coverage of riparian vegetation associated with creek lines and drainage lines occurs through the LCU. Some retained vegetation also exists along the roadsides and as screen planting around homesteads.

### WATERCOURSES:

A number of creeklines (Mullion Creek, Mitchell Creek and Direl Creek) run through the LCU draining into the Talbragar River to the north. A number of smaller drainage lines are spread through the LCU approximately 500- 1000 metres apart.

## 5.2.3 LCU 3: MOUNT BODANGORA

The Mount Bodangora LCU comprises an area of moderately vegetated landscape associated with Mount Bodangora. The LCU covers a large area of land to the north and south of Mudgee Road, incorporating a number of isolated homesteads associated with both Mudgee Road and Twelve Mile Road to the south.

The landscape quality of this LCU has been ranked as moderate.

| CHARACTER | LANDSCAPE QUALITY RATING<br>LOW MEDIUM HIGH |
|---|---|
| LANDFORM & SCALE | |
| LANDCOVER | |
| SETTLEMENT & HUMAN INFLUENCE | |
| MOVEMENT | |
| RARITY | |
| INTERVISIBILITY WITH ADJACENT LANDSCAPES | |

TABLE 8: LCU 3 Mount Bodangora Landscape Quality Rating

Mount Bodangora

Gunnegalgerie Road


Mudgee Road

### VIEWS:

Views from this LCU are generally contained by local rises and foreground vegetation. Mount Bodangora is a local high point which is visible from most areas within the local context. Views from this LCU towards the proposed wind farm development would be limited by variations in topography and vegetation obstructing views.

### TOPOGRAPHY:

Topography of the Mount Bodangora LCU is characterised by undulating low hills ranging from 440 - 650 metres above sea level. Slopes are gently to moderately inclined with slopes approximately 200-500 metres. Local relief varies between 40- 80m. Mount Bodangora is located within the LCU at an elevation of 743 metres. Mount Bodangora is a local high point and landmark visible from most areas within the study area. Ranges associated with Uulunga to the south are moderately vegetated.

### ROADS / INFRASTRUCTURE:

Mudgee Road dissects the LCU and is a major travel corridor within the region utilised by heavy vehicles, local residents and tourists. Some minor local roads run off Mudgee Road servicing isolated homesteads. Gunnegalderie Road runs off Mudgee Road to the south connecting with Twelve Mile Road, an unsealed road south of Mudgee Road.

### VEGETATION:

A moderate coverage of retained open woodland vegetation generally occurs through this LCU. Riparian vegetation associated with creek lines is typical through the LCU. The slopes of Mount Bodangora are densely vegetated with open woodland vegetated dominated by white box, grey box and red gum. Kurrajong trees occur throughout the LCU, typically on hill tops.

### LAND USE:

The land use is generally grazing on both unimproved pasture and some improved pasture. Isolated homesteads are located throughout the LCU.

### WATERCOURSES:

The LCU incorporates small creek lines and drainage lines that runs into Mitchell Creek and Mullion Creek. These creek lines are generally identified by a sparse to moderate coverage of riparian vegetation.