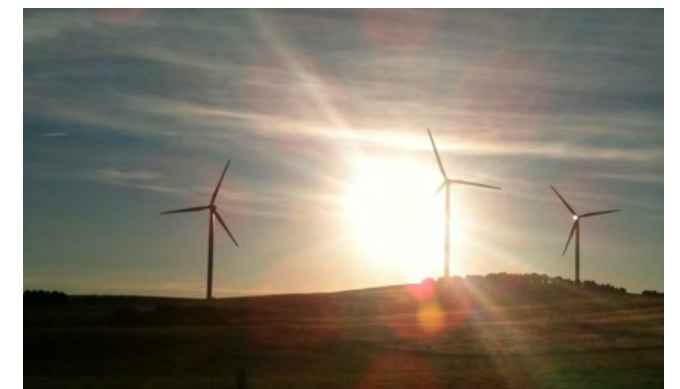
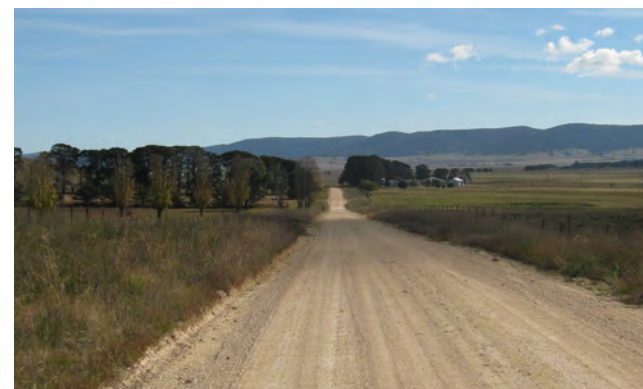
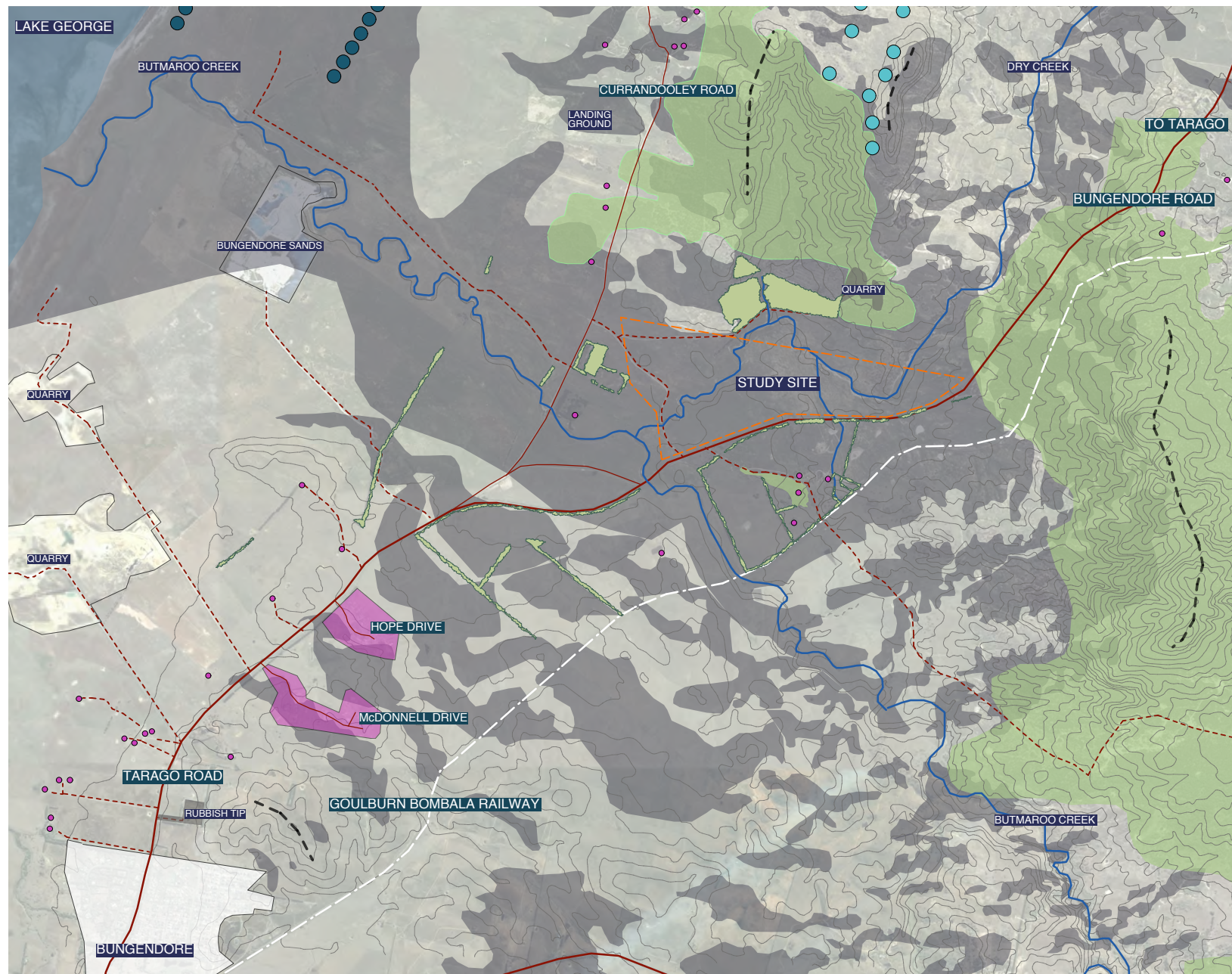


Appendix F Visual Assessment

VISUAL Impact Assessment



Proposed CAPITAL SOLAR FARM

1279 Tarago Road, BUNGENDORE, NSW

Prepared for: INFIGEN ENERGY

Project No: 0629 Issue: A Date: 24/09/2010



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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 Capital Solar Farm located to the east of Lake George near Bungendore NSW.

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 the potential visual impact of the proposal within the defined visual catchments.

Survey work for the study was undertaken during June 2010 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 concerning measures to mitigate any impacts arising from potential development.

1.2 Objectives

The report addresses the requirements related to the preparation of a visual impact assessment as part of the environmental assessment outlined in the Director-General's requirements (DGR).

The DGR states the report must:

- provide a comprehensive assessment of the landscape character and values and any scenic or significant vistas of the area potentially affected by the project. 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;
- include a full assessment of the visual impacts associated with the solar farm, including identification and documentation of all key viewing points and corridors particularly from identified sensitive lands. This should also include the associated transmission line. Alternative pole designs should be presented and assessed and the potential for under grounding in sensitive locations should also be assessed;
- 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 the solar farm;
- provide an assessment of the feasibility, effectiveness and reliability of proposed mitigation measures and any residual impacts after these measures have been implemented; and
- provide an assessment of the potential for reflectivity from the panels and associated infrastructure, and any safety impacts for motorists or aircraft.

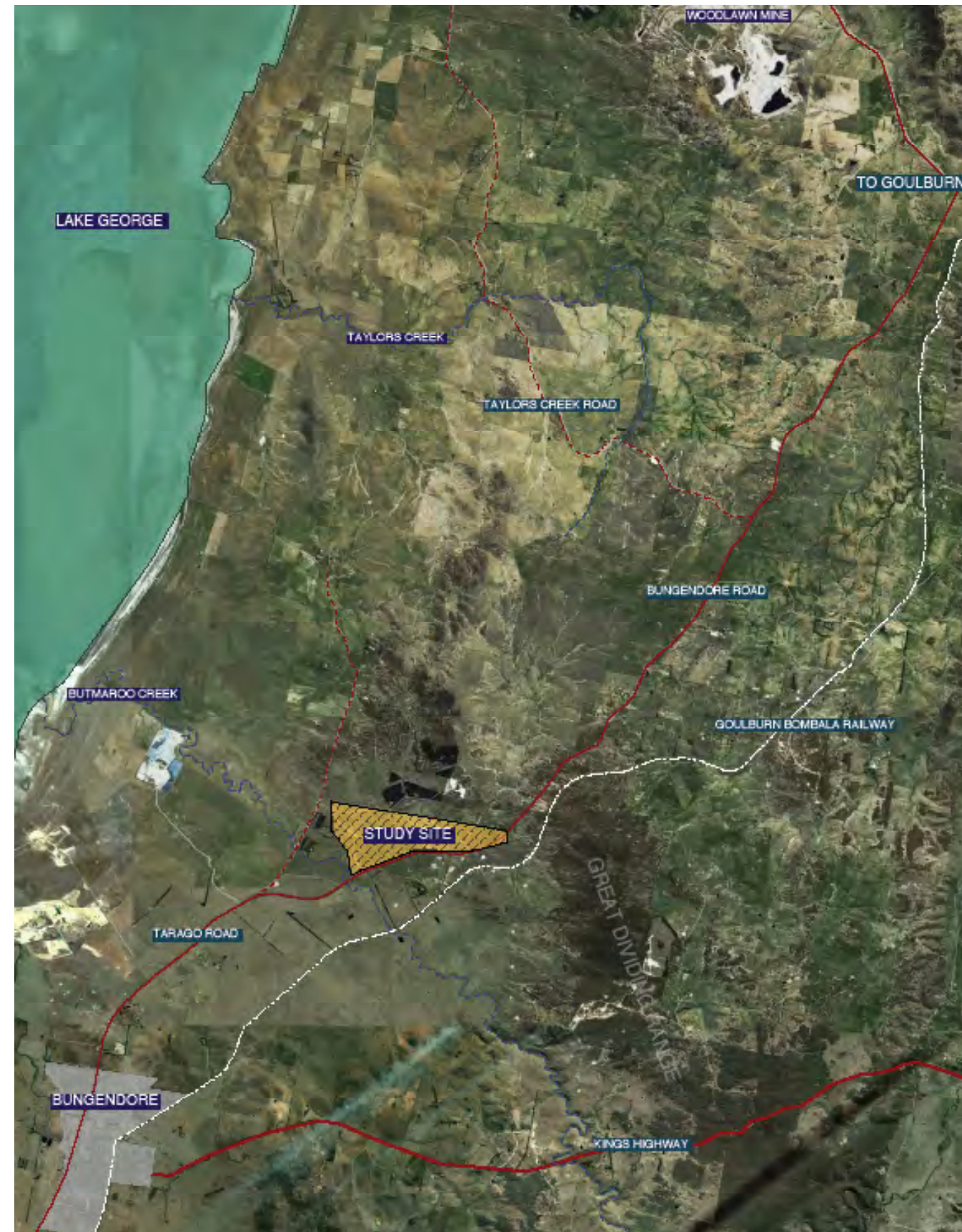


Figure 1: Site Locality Plan

2.0 Study Method

2.1 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 waterforms (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.

2.2 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 (EDAW, 2000).

VISUAL SENSITIVITY TABLE (URBIS)					
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.

2.0 Study Method (contd.)

2.3 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.

2.4 Visual Impact

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 (EDAW, 2000).

VISUAL IMPACT TABLE				
		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.

2.5 Methodology

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 five stages as noted below:

1. A description of the existing visual environment, including the identification and appraisal of visual catchments/landscape units;
2. the undertaking of a viewpoint analysis to identify sites likely to be affected by development within the investigation zone;
3. a photographic survey using a 50mm fixed lens on a 1:6 ASP Sensor (80mm 35mm SLR equiv) digital camera and a handheld GPS unit to record position and altitude;
4. an assessment of visual impacts; and,
5. the preparation of recommendations for impact mitigation and suggestions for suitable development to maintain the area's visual quality.

The purpose of the above methodology is to reduce the amount of subjectivity entering into impact assessment and to provide sufficient data to allow for third party verification of results.

2.6 Community Consultation

The degree to which viewers will be impacted is a result of an individuals personal response to the solar farm. This report is intended to be a tool to assist individuals in making an informed decision on the visual impact.

Community consultation was undertaken at the Bungendore War Memorial Hall in Mongolo Street on Friday the 30th July 2010.

The response from the community was generally supportive of the proposed development. The main concern for residents was how the development would appear and the impacts on the existing character of the landscape.

3.0 Existing Visual Character

3.1 Regional Context

The Study Site is located approximately 35km north east of Canberra and 50km south of Goulburn. The closest town is Bungendore which is located roughly 6.5km south west of the site along Tarago Road. The Study Site sits to the east of Lake George at the base of the Great Dividing Range.

The proposed site is located on Southern Tablelands rural land, typical of the Bungendore/Tarago area. The Southern Tablelands land is characterised by undulating topography, forested ridge lines and cleared grazing lands. Lake George is a distinctive feature of the Southern Tablelands, located approximately 6km west of the Study Site.

The Great Dividing Range is a feature of the landscape, extending along the east and to the north of the Study Site. The Great Dividing Range in this area reaches a high point of approximately 935m at Hammonds Hill, immediately north of the Study Site.

The plain on the eastern edge of Lake George is typified by flat, cleared grazing land, some of which has been disturbed for the quarrying of sands and gravel. Drainage from the Study Site is to Lake George, through a series of Creek lines running through the project area.

The Tarago/Bungendore Road runs north east from Bungendore to Tarago and forms the southern perimeter of the Study Site. Running in the same direction a few hundred metres south of Tarago/Bungendore Road is the Goulburn Bombala Railway.

Bungendore is the main township in the area located at the crossroads of Bungendore and Tarago Roads, and south of Lake George. The town is a popular tourist centre, steeped in history with a number of buildings and precincts under heritage protection. The town has experienced recent growth in the form of residential housing, as Bungendore is now considered a dormitory suburb of Canberra.

3.2 Site Description

The Study Site is located on 1279 Tarago Road, Bungendore which is located within the Palerang Council LGA. The Study Site is located off Tarago Road approximately 6km north east of Bungendore and approximately 6.5km east of the e southern extent of Lake George.

The site sits within the Butmaroo Creek catchment. Topography is generally flat with a gentle grade associated with the Great Dividing Range sloping upwards in a northeasterly direction. Scattered individual native trees occur throughout the landscape which is typically open grazing land. Localized planting of exotic trees occur in the form of windbreaks and amenity planting around existing homesteads. These windbreak plantings also occur along roadsides consisting predominantly of lineal bands of mature exotic pines, which have become a cultural feature of the landscape.

Built elements within the landscape include 66kV power lines which dissect the north-western edge of the site and 330kV power lines along the north-western edge of the Study Site. The Capital Hill Wind Farm is located directly north of the site, with wind turbines sited along the ridge line of Big Hill and Hammond's Hill.

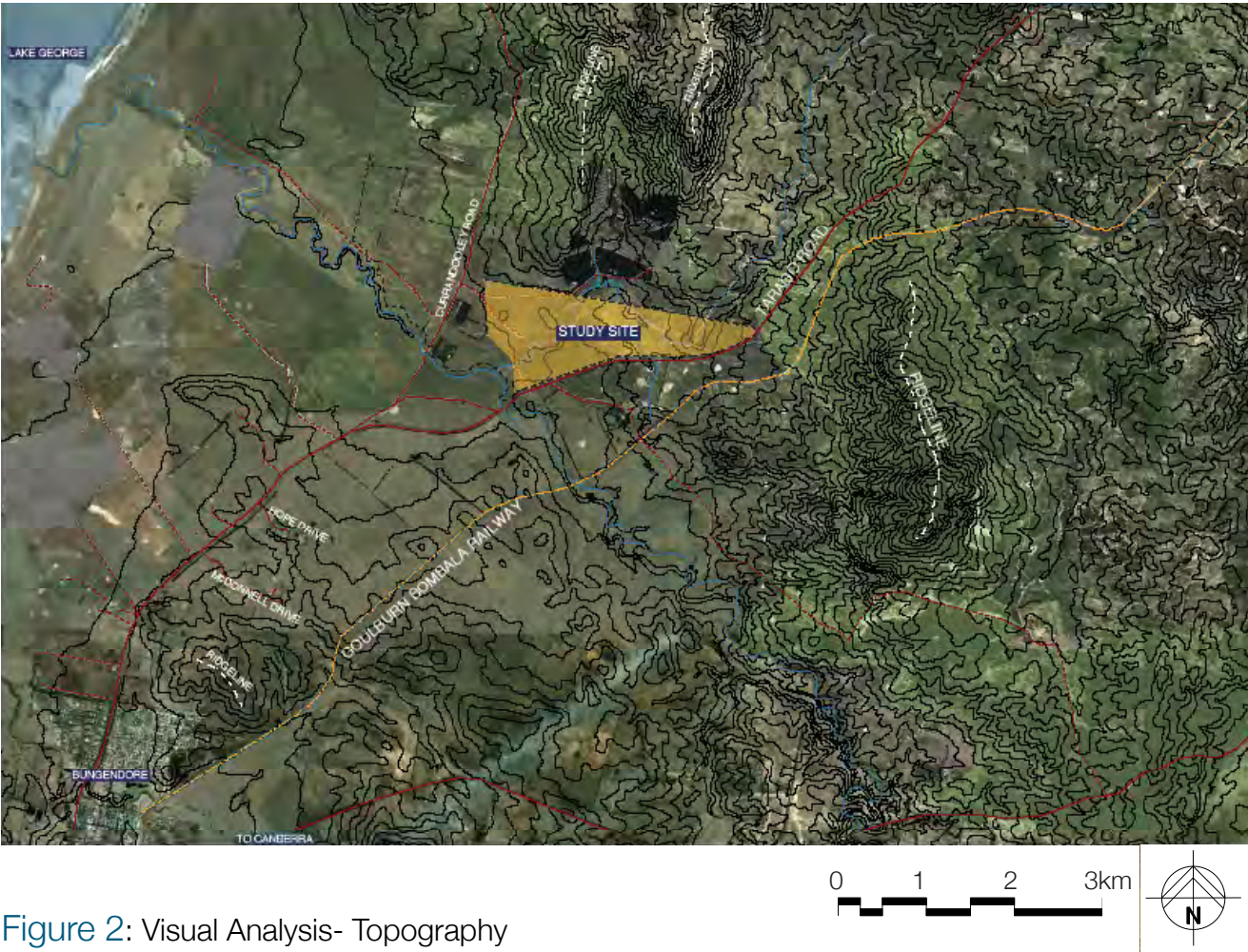


Figure 2: Visual Analysis- Topography

3.0 Existing Visual Character (contd.)

3.3 Visual Setting

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

The landscape character can be defined as 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 existing landscape context of the site and its surrounding environment are classified into homogeneous units of landscape character. These Landscape Character Units are summarised below and form the elements of the local visual context, the quality of the LCU reflects, the visual amenity.

Landscape Character Units for the purpose of this assessment are defined as:

- LCU 1: Bungendore Rural Plain
- LCU 2: Tarago-Bungendore Road
- LCU 3: Hammonds Hill

The landscape character units are identified in figure 3 on the following page. The landscape character of areas surrounding the site are described in the following section.

3.3.1 LANDSCAPE CHARACTER SURROUNDING THE SITE

North of the Site

To the north of the site, the topography rises towards the ridge line of Hammonds Hill, and the associated Capital Wind Farm turbines. Hammonds Hill is dominated by natural woodland vegetation beyond a pine plantation sited adjacent to the quarry access road at the base of Hammonds Hill. Bungendore Quarry is located approximately 500m north of the Site, and an associated unsealed access road extends along the northern boundary of the Study Site.

East of the Site

East of the Study Site, the area is bounded by the Sand Hills, which form a part of the Great Dividing Range. The topography of this area is typically undulating resulting in a visual barrier. Dense woodland vegetation occurs to the east of the Study Site which extends across Tarago Road.

South of the Site

The southern perimeter of the Study Site is defined by Tarago Road. Tarago Road runs in a generally south easterly direction from Tarago to Bungendore. A band of mature exotic pine plantings define the edge of properties along Tarago Road and provides protection against prevailing winds. On the southern side of Tarago Road, the landscape is slightly undulating, and characterised by cleared pastoral land. A small number of rural residential properties are located on this land. Beyond Tarago Road, the Goulburn-Bombala Railway runs from Goulburn to Bungendore.

West of the Site

Lake George sits approximately 6km to the west of the site on the eastern edge of the Lake George Range. The low-lying landscape between Lake George and the Study Site is characterised by flat, mostly cleared pastoral land. The landscape has been disturbed for quarries. A number of mature pine wind break plantings extend along property boundaries in this area predominately to provide protection from prevailing western winds.

Currandooley Road

Currandooley Road runs in a north-south direction to the west of the Site perpendicular to Tarago Road. The road is mostly unsealed and generally utilised for access to the various homesteads and properties. Currandooley Road dissects Butmaroo Creek which drains into Lake George.

Tarago Road

The southern extent of the Study Site is bordered by Tarago Road. Tarago Road is a minor road which connects the towns of Tarago and Bungendore. The sealed road follows undulating topography and is characterised by embankments and screen plantings which alter views. In the vicinity of the Study Site, Tarago Road is bordered by mature plantings of exotic pine plantings on its southern edge, creating a visual barrier. A band of established poplars along the western end of the study site along Tarago Road, add to the scenic visual character of the area.

Bungendore

Bungendore is the main township in the area and is located at the crossroads of Bungendore and Tarago Roads, and south of Lake George. The topography of Bungendore is generally flat. Isolated residential subdivisions are located on the eastern side of Tarago Road on west facing slopes.

3.0 Existing Visual Character (contd.)

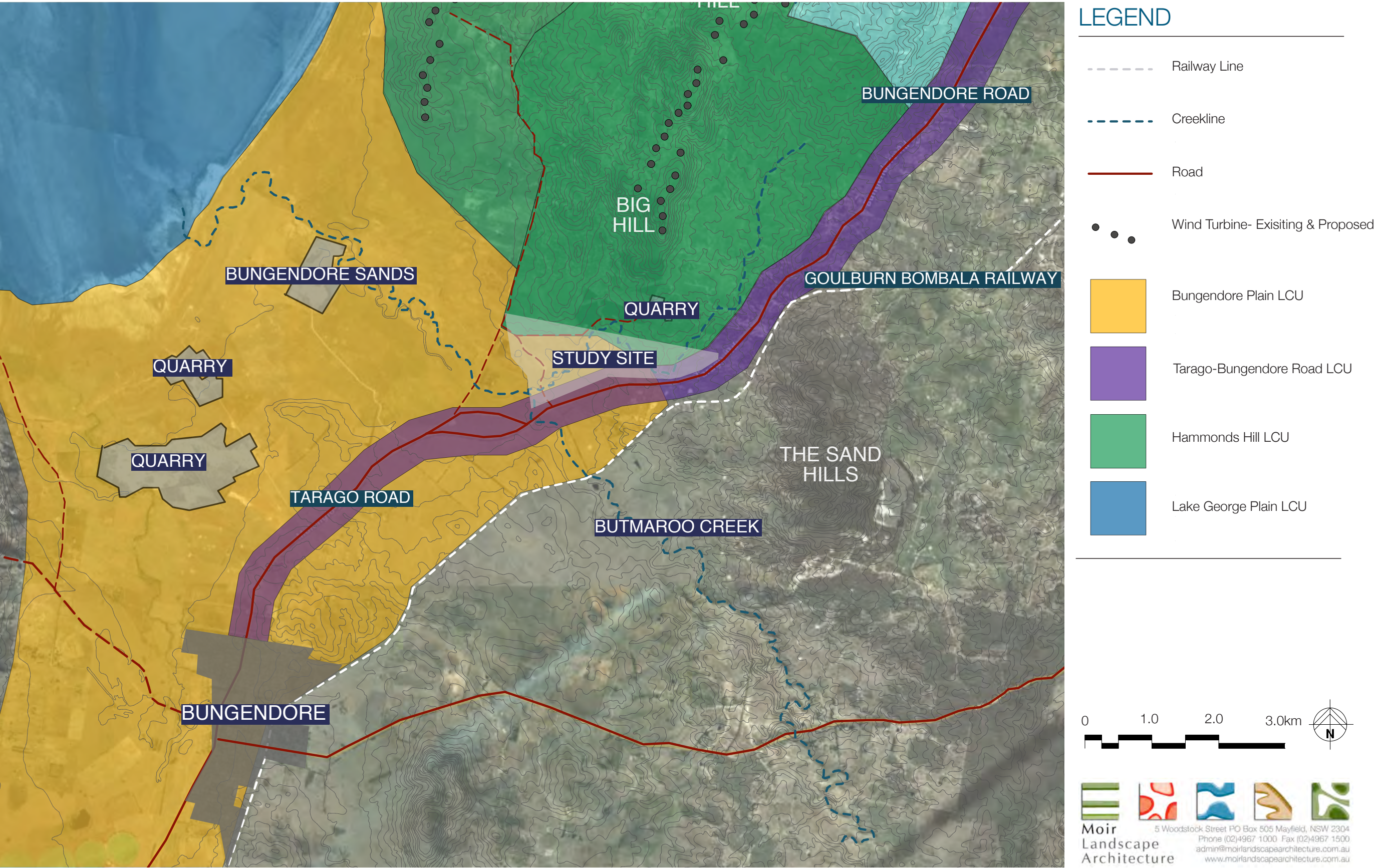


Figure 3: Landscape Character Units

3.0 Existing Visual Character (contd.)

LCU 1: Bungendore Rural Plain

Escarpments and steep ranges adjoin the west and east sides of Lake George. The open flat valley to the south of the lake is referred to as the Bungendore Plain. This LCU incorporates the relatively flat rural plains, the township of Bungendore and recent rural residential subdivisions northeast of the township.

Key features include:

VIEWS:

Views to Lake George Range to the west and the Great Dividing Range to the northeast. From Bungendore Road views to Lake George and the study site are partially obscured by a combination of vegetation (especially along Turallo Creek) and the relatively flat topography of the area. The existing Capital Wind Farm is visible on the Hammonds Hill ridge line at a distance of approximately 9kms (to the nearest turbine from Bungendore).

TOPOGRAPHY:

The topography of this LCU is generally flat, pastoral land. Land to the north east of Bungendore on the eastern side of Tarago Road is undulating.

ROADS / INFRASTRUCTURE:

Tarago/Bungendore Road traverses the LCU providing access between the Federal Highway and the town. The southern extents of Lake Road, Tarago Road and Currandooley Road also form part of this LCU. Minor unnamed farm roads provide access to properties and homesteads.

VEGETATION:

The majority of the plain is pasture grasses. Trees occur in scattered clumps or linear bands associated with roads or windbreaks. Two creek lines traverse the unit. Butmaroo Creek is largely devoid of any vegetation however Turallo to the south has established natural vegetation for the majority of its length.

CULTURAL ACTIVITIES:

Land between the Federal Highway and Bungendore is primarily utilised for grazing. Occasional homesteads on the northern and southern side of Bungendore Road contribute to the patterning through the built form and cultural plantings creating small focal points in the landscape. Bungendore show ground is located south of Bungendore Road approximately 2.5km out of the town centre. Two sand mines occur on the relatively flat land between the southern extents of Lake George and Tarago Road.

BUNGENDORE

Bungendore is the main township in the area located at the crossroads of Bungendore and Tarago Roads, and south of Lake George. Bungendore forms part of the Palerong Local Government Area (LGA). The town is a popular tourist centre, steeped in history with a number of buildings and precincts under heritage protection. The town has experienced recent growth in the form of residential development and is considered a dormitory suburb of Canberra. The LCU encompasses rural residential estates north east of Bungendore and east of Tarago Road. Prior to European settlement the area was occupied by the Ngarigu people.



Homestead with wind break planting and paddock within Bungendore Plain LCU .



Established exotic roadside planting between Tarago Road and paddock within the Bungendore Plain LCU.

3.0 Existing Visual Character (contd.)

LCU 2: Tarago-Bungendore Road

Bungendore/Tarago Road extends along the southeastern edge of the Study Area in a generally northeast direction from the town of Bungendore to Tarago. The road transects the Bungendore Rural Plain LCU and Hammond’s Hill LCU, yet is included as a separate LCU due to the distinct character of the road. As it reaches Bungendore, Tarago Road connects with the Kings Highway which then continues to Canberra. Tarago Road is generally utilised by residents and the occasional heavy transport and in this context, is identified as a minor road.

Key features include:

VIEWS:

Travelling southwest along Tarago/Bungendore Road from Tarago towards Bungendore, glimpse views of turbines from the existing Capital Wind Farm are visible due to variations in the topography and density of vegetation coverage. Embankments and variations in topography associated with the Great Dividing Range screen views. Traveling in the opposite direction (northeast) along Tarago/Bungendore Road views of the existing wind farm are prominent due to the flat topography and direction of travel.

TOPOGRAPHY:

The topography varies throughout the LCU, ranging from flat to undulating. Traveling north east along Tarago/Bungendore Road, the topography is typical of the Bungendore plain, flat and low-lying. After the road dissects Dry Creek at the base of the Sand Hills, the topography rises and becoming undulating as it runs through the Great Dividing Range.

ROADS / INFRASTRUCTURE:

Tarago/Bungendore Road runs from Braidwood Road, in the north and to the Kings Highway in the south in a northwesterly direction, connecting to the Federal Highway. A number of unsealed and private access roads stem from Bungendore/Tarago Road. A few hundred meters to the south of Tarago Road is the Goulburn-Bombala Railway.

VEGETATION:

For the most part, Tarago/Bungendore Road runs through cleared pastoral land, generally devoid of native vegetation. Mature exotic bands of pines utilised as visual and wind buffers border Tarago Road associated with property and paddock edges. Some portions of native woodland exists, generally associated with rises in topography and creek lines.

CULTURAL ACTIVITIES:

Land along Bungendore/Tarago Road is primarily utilised for grazing. Occasional homesteads contribute to the cultural value. The road is mainly used by residents and by heavy transport vehicles associated with the quarries and rubbish tip located along the road.



Bungendore Road.



Embankments along Tarago Road.



Pine wind break planting along Tarago Road.

3.0 Existing Visual Character (contd.)

LCU 3: Hammonds Hill

Hammonds Hill LCU is generally defined by the extent of Hammonds Hill and Big Hill. The LCU encompasses land to the north of the Site, bounded by Bungendore Plain to the south, Lake George to the west and Tarago/Bungendore Road to the east. The LCU is characterised by a steep rise in topography and density of vegetation associated with Hammonds Hill ridgeline. The existing wind turbines of Capital Wind Farm dominate the ridgelines.

Key Features Include:

VIEWS:

Due to the relatively inaccessible nature of Hammonds Hill, views from the LCU were considered to be of low significance. When traveling west along Tarago Road the ridge line of Hammonds Hill provides a backdrop to the proposed solar farm site and obscures views beyond the Lake George. The existing wind turbines sited along the ridge are visible from a range of viewpoints within the study area.

TOPOGRAPHY:

The topography of Hammonds Hill LCU is steep, consisting of the ridge line which extends from Big Hill to the south, to Hammonds Hill in the north. At its highest point, the ridge line reaches 930m above sea level on Hammonds Hill.

ROADS/INFRASTRUCTURE:

Currandooley Road (which transects the LCU) is an unsealed road providing access to rural properties on the edge of Lake George. The ridge line is occupied by the Hammonds Hill Group of wind turbines (29 turbines in total) associated with the existing Capital Wind Farm.

VEGETATION:

Vegetation within the Hammonds Hill LCU is defined by a cleared pasture. Remnant woodland vegetation occurs along the Hammonds Hill ridge line. A pine plantation is located along the southern base of Big Hill immediately north of the Site.

CULTURAL ACTIVITIES:

The site is characterised by the wind turbines sited along the ridge line of Hammonds Hill. The southern end of the LCU is dominated by a large pine plantation and the Bungendore Quarry. Occupied cottages and homesteads associated with Currandooley Road are also located within the LCU.



Remnant vegetation along the ridgeline of Hammonds Hill.



Hammonds Hill group of wind turbines associated with Capital Wind Farm.



View looking towards the ridgeline of Hammonds Hill from Bungendore Quarry.

3.0 Existing Visual Character (contd.)

LCU 4: Lake George Plain

The Lake George Plain LCU encompasses the open expanse of Lake George, the Federal Highway and rest areas, the northern section of Lake Road and the relatively uninhabited western fringe of Lake George. Lake George, located immediately west of the proposed wind farm, is approximately 25 kilometres long and 10 kilometres wide. It is long, large and extremely shallow with a relatively small catchment. The Lakes depth ranges from 1.5-7.5m when filled however in many areas it is only 0.8-1.0 metres deep.

Key features include:

VIEWS:

The existing Capital Wind Farm is located on the eastern side of Lake George and is clearly visible from the western edge of the lake. Unimpeded views are generally only available for motorists traveling in a southbound direction as dense vegetation between the divided road of the Federal Highway limits views for northbound traffic. Views to the west are restricted by a steep wooded escarpment known as the Lake George Range. Weereewa lookout forms the most southern point where views across Lake George from the Federal Highway are available.

TOPOGRAPHY:

The escarpment known as ‘Lake George Range’ forms an abrupt interface to the west of the flat and expansive topography of Lake George at a height of approximately 800m above sea level. The Great Dividing Range also contrasts with the flat expanse of Lake George to the east, visually containing the LCU.

ROADS / INFRASTRUCTURE:

The Federal Highway follows the western edge of the Lake for an approximate distance of 11 km. The highway forms the major transport connection between Sydney and Canberra. A secondary, minor road, Lake Road, is accessed off Bungendore Road and follows the lakes edge to the southwest. The road terminates at Silver Wattle Point, approximately 6km to the north of the southwestern most point of the Lake. The road is mostly unsealed, providing access to a small number of rural dwellings.

VEGETATION:

The Western escarpment has dense coverage of native vegetation. Lake George comprises an open expanse of pasture grasses devoid of trees with a fluctuating coverage of water.

CULTURAL ACTIVITIES:

Three rest areas are located along the Lake George edge of the Federal Highway with views in an easterly direction across the lake. The VC rest areas form part of the Remembrance Drive between Sydney and Canberra, and honour those Australians who were awarded the Victoria Cross for acts of valour. Pastoral land across Lake George is for the most part inaccessible and when dry, is primarily used for grazing. Activities within and around the Lake include scientific research, grazing of sheep (when dry) and fishing after high water and stocking of fish. Hang gliders also utilise the Lake George escarpment.



Lake George from Federal Highway.



Federal Highway at base of Lake George Range.

3.0 Existing Visual Character (contd.)

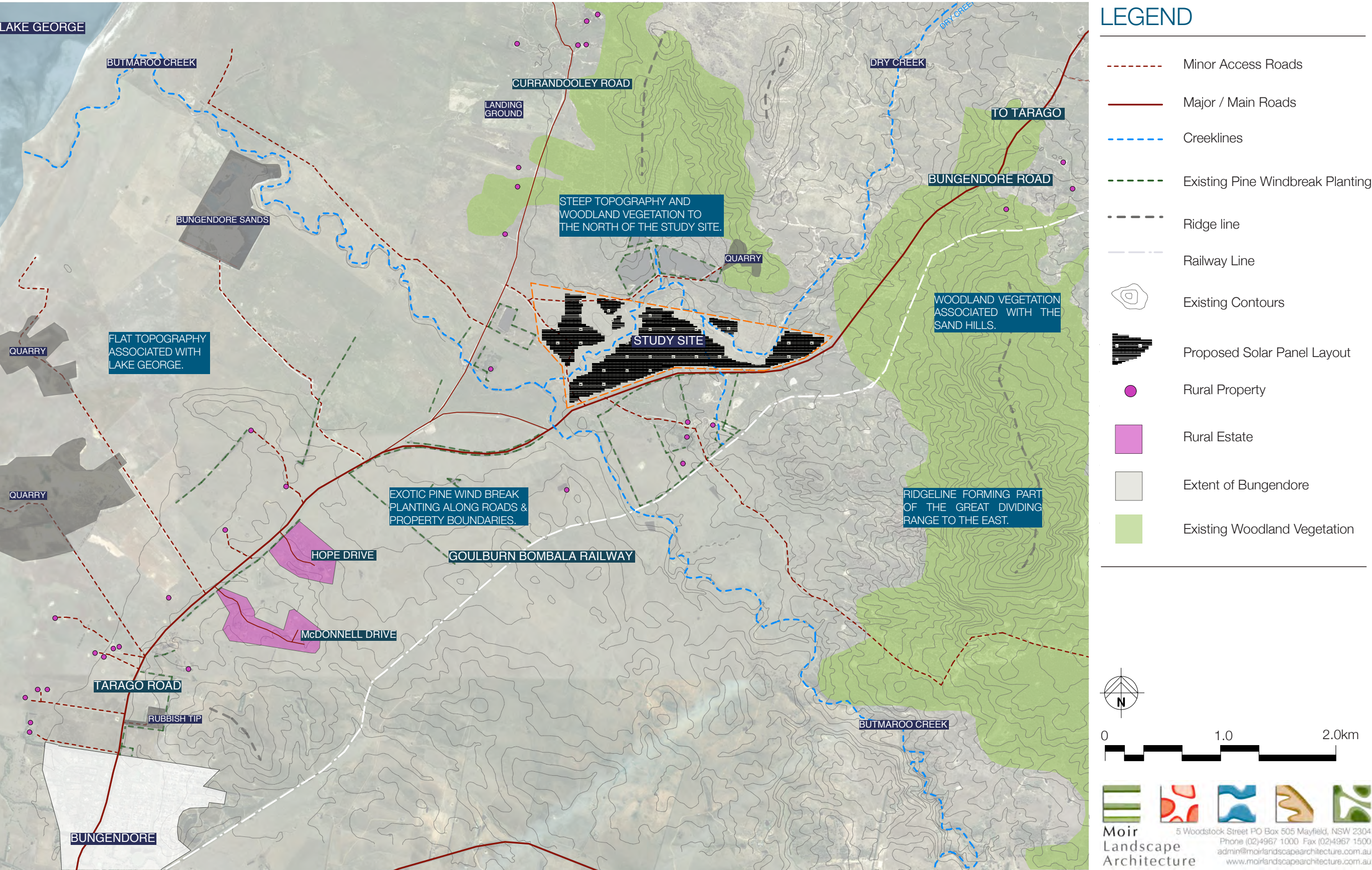


Figure 4: Visual Site Analysis- Existing Site Conditions

4.0 The Proposal

4.1 Proposal Description

Infegen-Suntech Pty Ltd have identified Lake George as a site for a potential photovoltaic (PV) solar farm as part of the Federal Government’s Solar Flagships Program. The Solar Flagships Program form part of the Federal Government’s \$5.1 billion expanded Clean Energy Initiative. Of this, \$1.5 billion has been committed to the support of the construction of up to four large scale, grid-connected, solar farms which will have a significant role in, contributing to Australia’s Renewable Energy Target (RET) of 20% renewable energy by 2020.

4.1.1 SOLAR FARM LAYOUT

The proposal consists of the development of a photovoltaic (PV) Solar Farm located approximately 6.5km north west of Bungendore, to the east of Lake George. This is a desirable location for a solar farm due to the solar radiation and close proximity to existing network infrastructure. The Solar Farm is proposed to cover an area of approximately 60 hectares at 1279 Tarago Road, Bungendore.

The Solar Farm is proposed to consist of approximately 150,000 solar PV panels mounted on fixed frames approximately 2.3m above the ground. The Solar Farm has a potential operating capacity of 30-50MW, which is equivalent to supplying 10,000 homes with energy.

The layout of the solar panels, as shown in figure 6, is sited in rows and orientated towards the north. The southern edge of the site sits adjacent the northern edge of Tarago Road, for approximately 3kms.

4.1.2 ASSOCIATED INFRASTRUCTURE

To facilitate the construction and ongoing maintenance of an access road is proposed around the perimeter of the Site. Lateral roadways extend from the perimeter road providing access to the panels, invertors and transformers. It is proposed that the solar farm will be connected to the existing substation through a single circuit OH power line which will extend along the northern perimeter of the site. The proposed panels are connected to transformers (31 in total) which connect with underground cables circuits. The site is bounded by a security fence along the perimeter road.

The Solar Farm is proposed to connect to the existing Capital Substation to the north of the site.

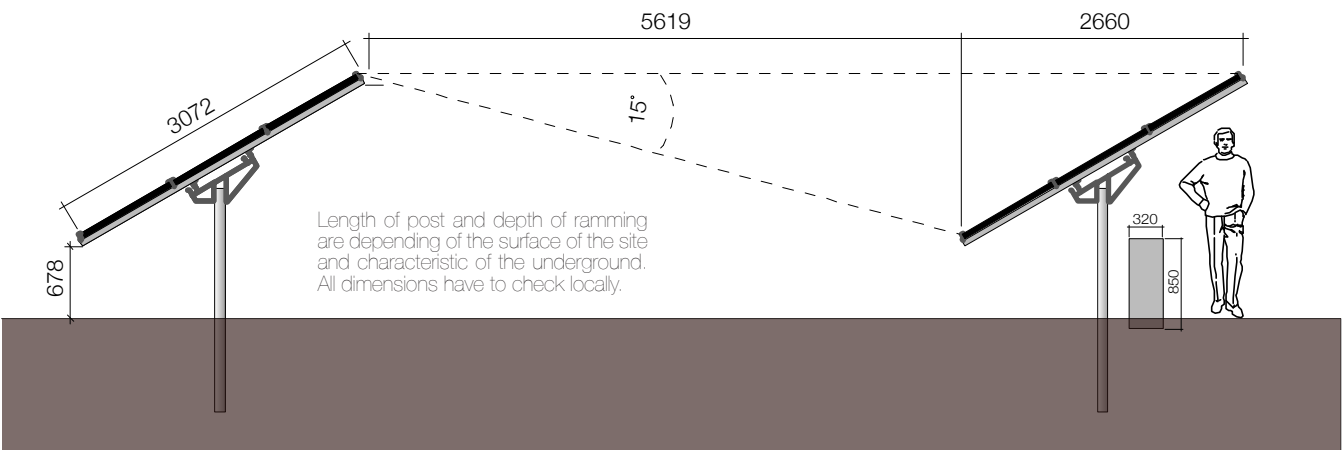


Figure 5: Typical Solar Panel elevation 1:100.

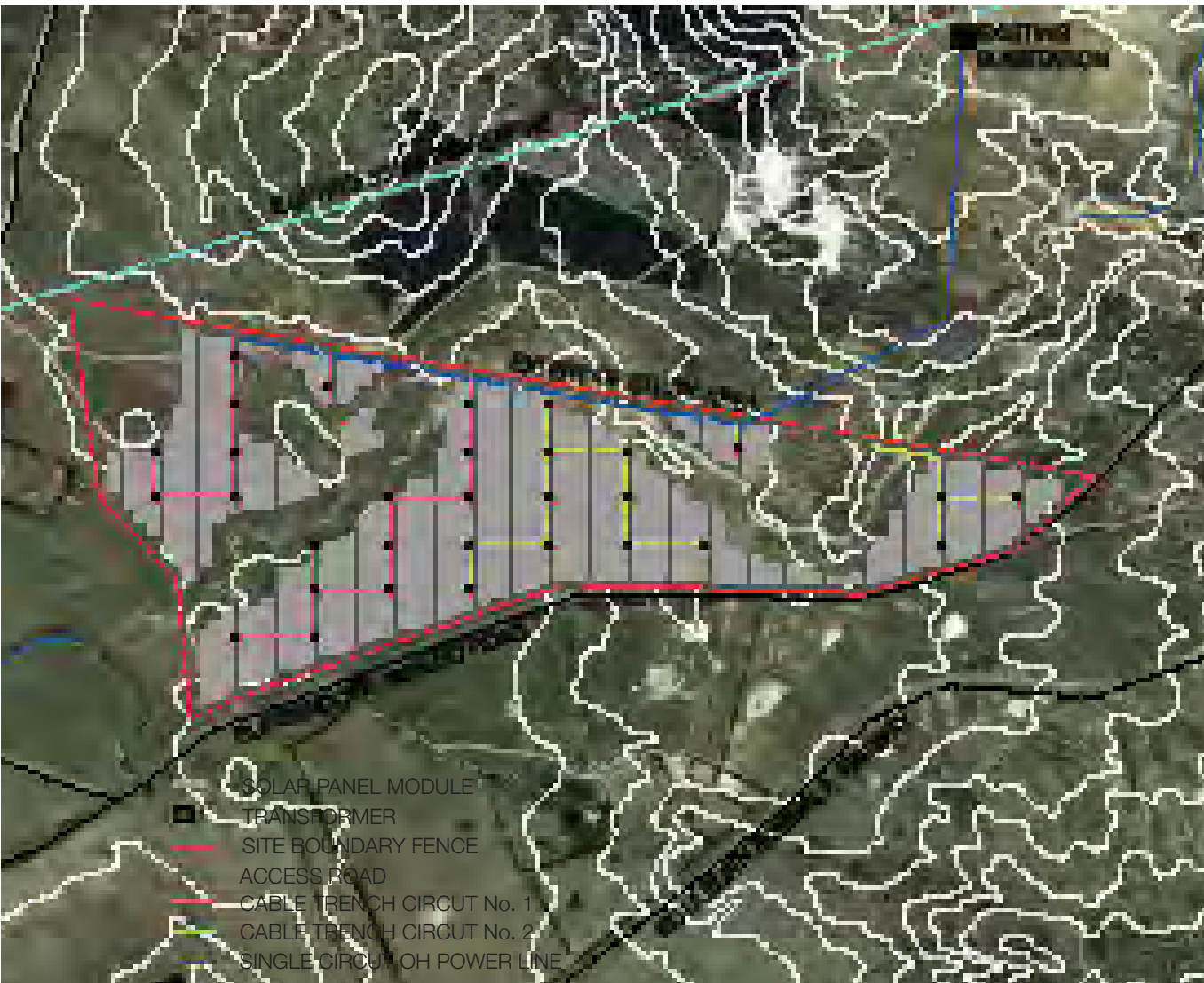


Figure 6: Proposed Solar Farm Site Layout

