13.1 Introduction

The assessment involved an evaluation of the visual character of the surrounding landscape, and an assessment of the potential visual impacts that could result from the construction and operation of the Facilities and associated infrastructure on the Marulan Site.

The main objective of the visual impact assessment was to determine the potential impact of the proposed Facilities and associated infrastructure on people living and working in, or travelling through surrounding areas.

Details of the various components and structural elements associated with the proposed Facilities are described in detail in **Chapter 4**. The assessment of visual amenity was conducted by Green Bean Design. This chapter presents a summary of the visual impact assessment. The key visual aspects of the EnergyAustralia and Delta Electricity Facilities are presented in their respective *Project Applications*.

13.2 Methodology

The methodology for this assessment comprised the following activities:

- a desktop study to identify the potential view catchment of the proposed Facilities referencing topographic maps and aerial photographs of the Site and surrounding area to identify potential view locations to be verified during the fieldwork component of the assessment;
- fieldwork to confirm the potential extent of visibility of the proposed Facilities and to determine the various view locations from which the proposed Facilities could potentially be visible;
- an assessment of visual impact, based on the combination of two factors: the level of visibility or extent to which the Facility structures would be visible from surrounding areas, and the degree of visual contrast between the structures and the landscape surrounding the Site that would form the visible background from surrounding view locations;
- the preparation of a series of cross sections to provide a representative sample of view locations from around the Site;
- site visits to further ascertain the visual impacts on those residences considered to have a high visual impact; and
- the preparation of visual simulations to illustrate the cumulative impact at residences with a high visual impact.

13.2.1 Visual Impact

The potential visual impact of the proposed Facilities result primarily from a combination of the following factors:

- site topography, existing visual screening and the final design of the Facilities and associated infrastructure (relative to surrounding areas); and

- the degree of visual contrast between the proposed Facilities and the landscape surrounding the Site that would form the background from surrounding view locations.

The potential visual impact from particular view locations is strongly dependent on the level of visibility from that location, which in turn is dependent on a number of criteria that are defined in **Table 13-1**.

13.2.2 Visibility

Visibility is a measure of the extent to which the proposed Facilities and associated infrastructure would be visible from surrounding areas, the relative number of viewers, the period of the view, view distance and context of the view.

The underlying rationale for this component of the visual assessment is that if any part of the proposed Facilities and associated infrastructure are not visible from a particular area then the potential visual impact will be nil. Similarly, if the number of people who would potentially see any part of the proposed Facilities and associated infrastructure is low, then the visual impact would be low compared to a situation in which a large number of people have the same view. Distance is a strong influence on potential visual impact as the proportion of the total view occupied by the structure decreases with distance and atmospheric effects reduce the visual contrast between the structure and the surrounding landscape.

13.2.3 Visual Assessment Criteria

The potential visual impact of the proposed Facilities from key view situations has been assessed against the criteria described in **Table 13-1**.

Table 13-1 Visibility Criteria

Criteria	Definition
Number of Viewers	
High	>1000 people per day
Moderate	500-1000 people per day
Low	250-500 people per day
Very Low	<250 people per day
View Distance	
Long	>2 km
Medium	1 km – 2 km
Short	500 m – 1 km
Very short	<500 m
Period of View	
Long term	>120 minutes
Moderate term	1 – 120 minutes
Short term	<1 minute

The levels of visibility resulting from various combinations of the above criteria are listed in **Table 13-2**.

Table 13-2 Visibility Criteria Matrix

	Long Distance			Medium Distance			Short Distance			Very Short Distance		
Period of View	**L**	**M**	**S**	**L**	**M**	**S**	**L**	**M**	**S**	**L**	**M**	**S**
High No. of Viewers	M	L	L	H	M	M	H	H	M	H	H	H
Medium No. of Viewers	L	L	L	M	M	L	H	M	M	H	H	M
Low No. of Viewers	L	L	L	M	L	L	M	M	L	H	M	L
Very Low No. of Viewers	L	L	L	L	L	L	L	L	L	M	L	L

Period of View L=long, M=moderate, S=short
Levels of visibility L=low, M=medium and H=high (The visibility level from view locations where there are no views toward the Facility is recorded as Nil).

13.2.4 Built Form

For the purpose of this visual assessment, the following assumptions of the built form were made:

- the Facilities would be located to the west of a gently sloping low ridgeline falling north west from around 626 m AHD to the Wollondilly River corridor at around 590 m AHD;
- the proposed Facilities would be constructed on a generally level platform approximately 605 m AHD;
- the gas turbine exhaust stacks would be the tallest built elements of the Facilities, and assumed in this assessment to extend to a height of around 635 m AHD for the EnergyAustralia Facility, and around 645 m AHD for the Delta Electricity Facility;
- the Delta Electricity Facility Stage 2 (combined cycle) will also include the construction of an air cooled condenser which is assumed in this assessment to extend to a height around 637 m AHD; and
- the proposed transmission line route would generally follow the 598 m AHD contour to the south east of the construction footprint.

These assumptions about the built form may be refined during detailed design.

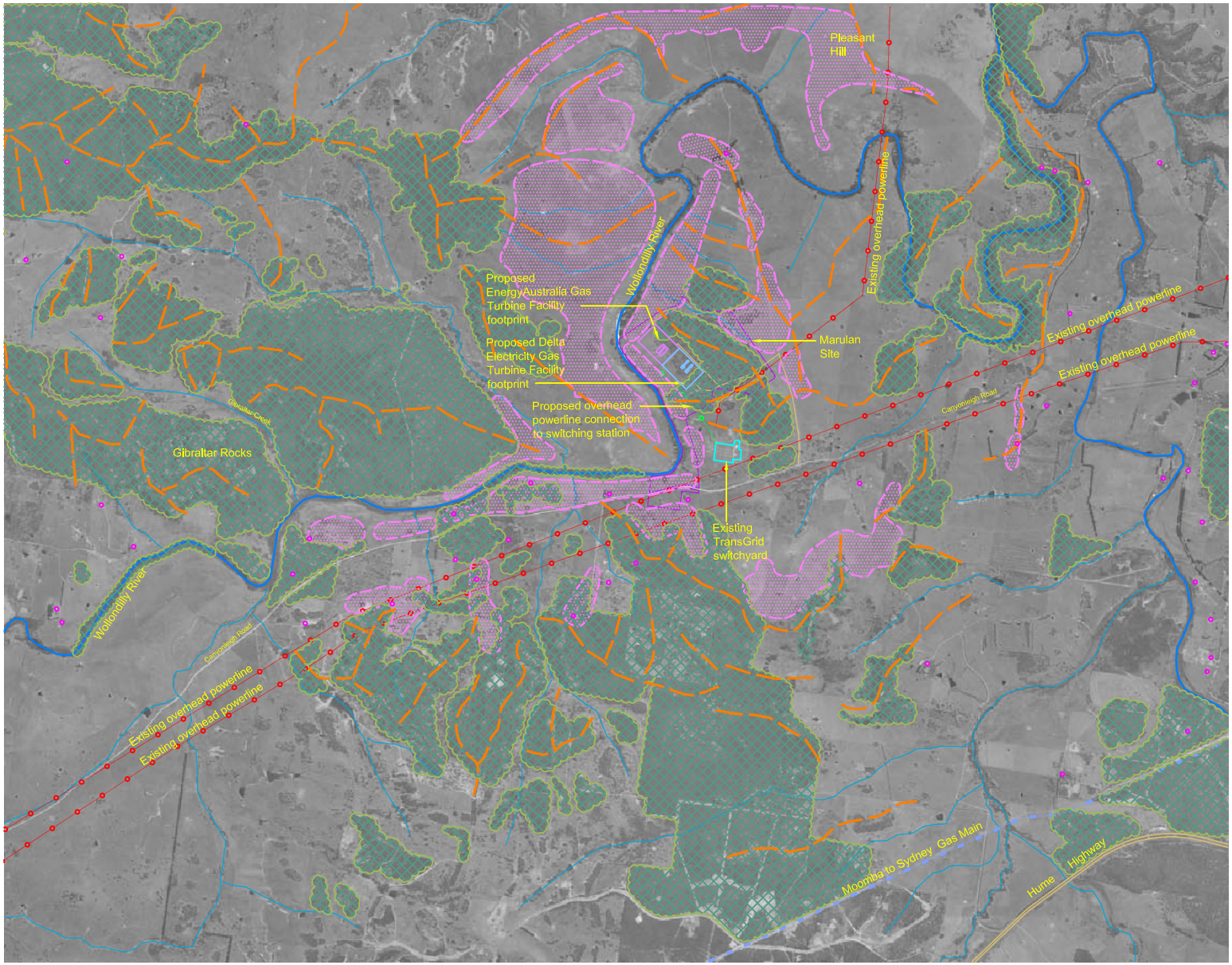
13.2.5 View Catchment

The potential view catchment for the proposed Facility is illustrated in **Figure 13-1** and key visibility aspects are summarised below:

- the potential view catchment is generally restricted to local views within the adjacent University of Sydney property and to areas of land to the south and south west of the Facilities located between the Wollondilly River and Canyonleigh Road;
- the view catchment would include potential views toward the exhaust stacks as well as other structures within the Facilities and associated infrastructure;

Chapter 13 Visual Amenity

- views toward some of the built structures of the proposed Facilities may also occur from a small number of surrounding view locations on elevated ground to the south of Canyonleigh Road, although the majority of these would occur from vacant rural land and in a small number of instances from land surrounding residences;
- the proposed Facilities are unlikely to be directly visible to motorists travelling along Canyonleigh Road. Indirect views toward the Site are partially screened by a combination of landform and vegetation along the road corridor. There is some potential for indirect views toward the construction footprint through gaps in roadside vegetation to the south of the Facilities;
- trees and undulating landform generally block potential views from residential properties to the west of the proposed Facilities, although a small area of land on a ridgeline to the west of the Site was identified as having a potential view across the top of the Site area. Views from this location would generally be restricted to the upper portions of the Facilities structures; and
- there were no dedicated public lookouts identified in the immediate area that would have views to the proposed Facilities.



LEGEND

- MARULAN SITE AREA
- NOTED — DELTA ENERGY FACILITY INDICATIVE FOOTPRINT
- NOTED — ENERGYAUSTRALIA FACILITY INDICATIVE FOOTPRINT
- NOTED — PROPOSED OVERHEAD POWERLINE
- NOTED — EXISTING TRANSGRID SWITCHYARD
- EXISTING RESIDENTIAL BUILDING OR OTHER BUILT STRUCTURE
- EXISTING OVERHEAD POWERLINE
- NOTED — MOOMBA TO SYDNEY GAS MAIN - EXISTING
- RIDGELINES AND SPURS
- VEGETATION
- RIVER, CREEK OR GULLY DRAINAGE LINE
- POTENTIAL VIEW CATCHMENT

NOTE:
Roads, boundaries and buildings have not been surveyed.
All base information obtained from aerial photography and is not survey accurate.

NORTH

800m 0 800 1600 2400 3200 4000m

Client: DELTA ELECTRICITY & ENERGYAUSTRALIA	Project: MARULAN GAS TURBINE FACILITY		Title: POTENTIAL VIEW CATCHMENT
URS	Drawn: AH	Approved: NB	Date: 22/12/07
	Job No: 43177371	File No: 43177371/13-1	Figure: 13-1

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13.2.6 Visual Simulations

In order to illustrate how the proposed Facilities may appear following construction, visual simulations were prepared from residential view locations determined to have a high visual impact.

The visual simulations were generated through the following steps:

- photographs were taken from each of the view simulation locations and recorded with GPS coordinate data;
- visually significant components were modelled;
- the digital photographs were matched with the 3D model using camera angle location and direction as well as reference objects in the photographs; and
- finally the images were imported to Adobe Photoshop for final surface texturing to place the proposed structures within the context of the foreground and background elements of the photographs.

The vista (field of view) for each visual simulation photograph generally exceeds that of the binocular field of view for the average human eye (around 124 degrees) and in some images includes areas of peripheral vision.

13.3 Existing Environment

13.3.1 Site Context

The local character of the landscape around the proposed Facilities is largely dominated by the existing TransGrid switchyard which is located around 500 m to the south of the Site. The landscape to the south of the Site also includes two high voltage overhead transmission line easements, which are generally visible from a wide area around the proposed Facilities. **Figure 13-1** illustrates the visual context of the Site.

The construction footprint for both Facilities is located on gently sloping land falling west toward the Wollondilly River corridor. The river corridor extends along the western boundary of the Site. The Wollondilly River is generally not visible from the Facilities construction footprint or Canyonleigh Road, and is contained by steep embankments with mature tree vegetation growing along each side.

The Site has been partially cleared for grazing. Some woodland occurs to the east of the proposed Facilities, and along a small number of gullies extending across the Site to the river. Some woodland areas occur within the Facilities construction footprint, and it is likely that some tree clearing will be necessary to construct the Facilities, and to install the proposed access road. The amount of vegetation clearing required for the gas pipeline will be assessed as part of its separate *Project Application*.

A small number of rural residential properties are located in the landscape surrounding the proposed Facilities. Most of the residences are not visually prominent from the Facilities generally due to screening by surrounding undulating landform or the presence of trees around them. Visibility from residential properties was determined during the Site analysis and fieldwork carried out as part of the visual assessment process. Additional site visits were also undertaken to further confirm the visual impacts on those residences considered to have a high visual impact.

The landscape surrounding the proposed Facilities contains a number of built elements that contribute to the local visual character, and includes:

- high voltage overhead transmission lines, running parallel to the Canyonleigh Road corridor;
- the TransGrid switchyard;
- a microwave communication tower;
- local sealed and unsealed roads; and
- residential dwellings and agricultural structures.

Key elements that combine to create the visual character of the area are illustrated in the photographs in **Plate 13-1**, taken from a number of selected viewpoints.

The following photographs illustrate existing views from a number of locations within the landscape surrounding the proposed Facilities, including views toward the existing TransGrid switchyard. Additional photographs are presented in the visual impact assessment reports in the respective *Project Applications*.

Plate 13-1 – Selected Site Photographs

Photo Location 1 – View northeast from Canyonleigh Road on residential property boundary, with views toward the proposed construction footprint above tree line along river corridor.

Photo Location 3 – View east along Canyonleigh Road toward the existing TransGrid switchyard.

13.4 Landform and Drainage

Landform and drainage patterns have a significant influence on the extent to which the proposed Facilities and associated infrastructure may be visible from surrounding areas. Existing landform and drainage features include:

- land immediately surrounding the Site is characterised by a series of ridges, gullies and the Wollondilly River corridor. A prominent ridgeline falling from around the 650 m AHD contour runs north south along the access track leading to the residence R25, with a number of smaller ridgelines and spurs branching off to the northeast and northwest of the ridgeline;
- landform between the ridgelines forms a number of gullies that act as tributaries to the Wollondilly River; and
- the Wollondilly River follows a meandering route to the west and north of the Site. Views from surrounding areas toward the river corridor are generally obscured by mature trees along the river embankments and landform adjacent to the river corridor.

13.5 Assessment of Potential Impacts – Common Shared Works

Potential visual impacts arising from construction activities, such as traffic, use of heavy machinery and the like, would be of a temporary nature. Mitigation measures to reduce visual impacts would be incorporated into the construction environmental management plans.

The proposed access road is unlikely to be visible from the majority of surrounding potential view locations.

The design of the proposed transmission line connection between the proposed Facilities and the existing TransGrid switchyard would be finalised at the detailed design stage; however, it is envisaged it would be a single (spur) overhead transmission line. The conductors may be supported by 35 m tall low profile tubular steel poles at an approximate spacing of 250 m. The existing transmission line towers operating at the TransGrid switchyard are approximately 50 m high. Accordingly, the transmission line connection would not be expected to be as visually prominent as they would be in keeping with the near by existing transmission line towers.

13.6 Assessment of Potential Impacts – Facilities

13.6.1 Visibility of the Facilities

The structures of the proposed Facilities, which are described in **Section 13.3**, are assumed in this assessment to be generally aligned in an east-west direction. Consequently there would be some degree of mutual screening of structures in views from the west and south west. Any structures that are visible at the western end of the Facilities will block potential views to other structures located further east. The exhaust stacks will be the tallest structures in the Facilities.

13.6.2 Visual Contrast

Visual contrast between the proposed Facilities and the background against which they are viewed determines the capacity of the existing landscape setting to visually absorb the new structures without creating a significant change in visual character or producing a reduction in visual quality of the landscape. The capacity to absorb new development is dependent on existing structures, vegetation cover and landform.

At a distance, atmospheric effects could reduce the level of visual contrast between the proposed Facilities and the landscape setting in which they are viewed. The reduced visual contrast could result

in a lower level of visual impact. If the main built elements of the proposed Facilities were dark in tone and non-reflective then the visual contrast may be further reduced.

13.6.3 Visibility Matrix

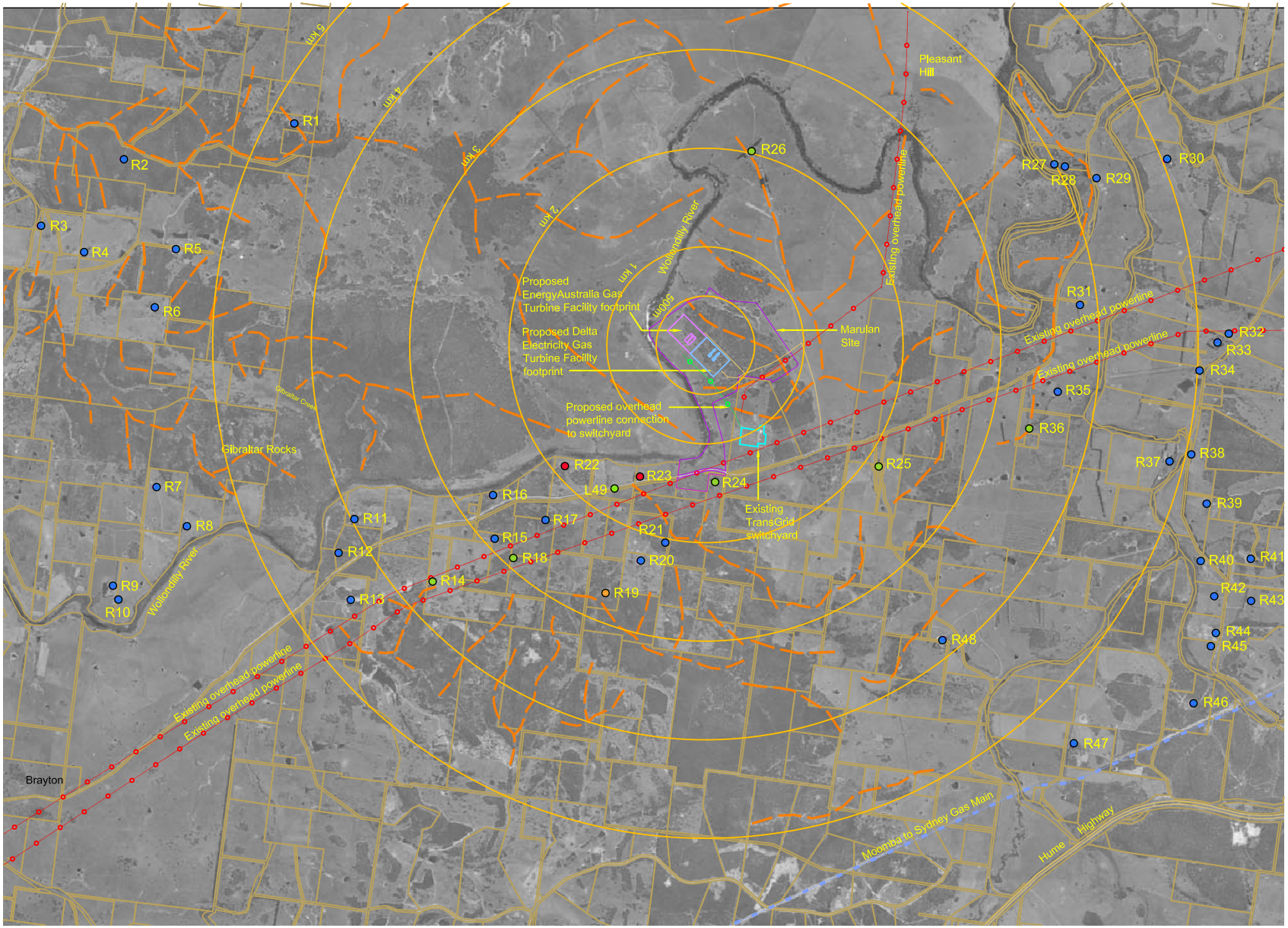
The results of the visibility assessment from view locations identified during the field inspection are summarised below and presented in more detail in the respective *Project Applications*. A total of 49 view locations were identified as part of the visual assessment process, and included views from:

- residential properties;
- vacant/rural land;
- public road corridors (motorists); and
- private access roads.

An assessment of the visibility rating for each view location (refer to **Figure 13-2**) indicated that:

- 39 of the 49 view locations have been determined to have a NIL visibility rating;
- 7 of the 49 view locations have been determined to have a LOW visibility rating;
- 1 of the 49 view locations has been determined to have a MEDIUM visibility rating; and
- 2 of the 49 view locations have been determined to have a HIGH visibility rating.

The majority of potential view locations assessed were determined to have no (nil visibility), or very restricted views (low visibility), toward the proposed Facilities. One view location (R19) was determined to have a medium visibility rating. Two view locations (R22 and R23) were determined to have a high visibility rating. The visual impact assessment concluded that both Facilities would have an overall medium visual impact on people living in or travelling through the local area, although the potential visual impact would be generally low for the majority of people, including residential view locations, in areas surrounding the Facilities.



LEGEND

- MARULAN SITE AREA
- NOTED — DELTA ENERGY FACILITY INDICATIVE FOOTPRINT
- NOTED — ENERGYAUSTRALIA FACILITY INDICATIVE FOOTPRINT
- NOTED — PROPOSED OVERHEAD POWERLINE
- R21 — VIEW LOCATION WITH HIGH VISIBILITY RATING
- R18 — VIEW LOCATION WITH MEDIUM VISIBILITY RATING
- R23 — VIEW LOCATION WITH LOW VISIBILITY RATING
- R19 — VIEW LOCATION WITH NIL VISIBILITY RATING
- EXISTING OVERHEAD POWERLINE
- NOTED — MOOMBA TO SYDNEY GAS MAIN - EXISTING
- RIDGELINES AND SPURS
- INDICATIVE CADASTRAL BOUNDARIES
- R — POTENTIAL VIEW LOCATION (RESIDENTIAL)
- L — POTENTIAL VIEW LOCATION (ROAD)
- DISTANCE MARKER

NOTE:
Roads, boundaries and buildings have not been surveyed. All base information obtained from aerial photography and is not survey accurate.

NORTH

800m 0 800 1600 2400 3200 4000m

Client: DELTA ELECTRICITY & ENERGYAUSTRALIA	Project: MARULAN GAS TURBINE FACILITY		Title: POTENTIAL VIEW LOCATIONS AND VISIBILITY RATINGS FOR THE COMBINED FACILITIES
URS	Drawn: AH	Approved: NB	Date: 15/06/07
	Job No: 43177371	File No: 43177371/13-2	Figure: 13-2

The overall medium visual impact would result from a combination of the following factors:

- two view locations were determined to have a high visibility rating. The visibility criteria (outlined in **Table 13-1**) applied to these view locations indicated a potential low visibility rating (medium distance, long term view and very low number of viewers). However, these view locations were considered to have a relatively confined view catchment due to the influence of local landform and vegetation, and therefore the proposed Facilities would potentially have a greater degree of visibility in the overall view available from areas surrounding these view locations;
- a small number of rural residential properties, including residences located to the south of Canyonleigh Road situated on elevated hillside locations, may have distant views toward and beyond the proposed Facilities;
- the potential view catchment of the proposed Facilities indicates that the majority of views toward the proposed Facilities, or portions of the Facilities where views may be partially screened by vegetation or landform, occur from areas of unoccupied rural landscape generally maintained as pasture;
- the landscape surrounding the proposed Facilities contains built elements similar in form and scale to the proposed Facilities including the TransGrid switchyard, a communications tower, transmission towers, high voltage transmission lines and other associated high voltage transmission infrastructure;
- the exhaust stacks which, at around 30 m – 40 m high, are the tallest structures associated with the proposed Facilities, would only be directly visible from a small number of surrounding properties and the exhaust stacks may be partially screened by landform and vegetation;
- the air cooled condenser at around 32 m high (to be constructed as part of Delta Electricity Stage 2 Facility), would be partially viewed against a backdrop of exiting trees to the east of the Facility on rising ground and would only be directly visible from a small number of surrounding properties;
- an appropriate selection of colour schemes and non-reflective materials would help to minimise visual contrast between the proposed Facilities and tree canopy background from some surrounding view locations;
- tree planting within the Site may provide a visual screen over the long term to minimise potential visual impacts from some surrounding view locations;
- tree planting within selected private residential properties, subject to negotiation and agreement by property owners, may provide long term positive screening potential;
- night-time lighting around the Facilities is likely to be visible from some surrounding locations, including views from a small number of surrounding properties. Night-time lighting may be more visible given the general absence of other significant sources of light. Where practicable, lighting around and within the proposed Facility should be designed and installed to avoid a direct line of sight toward surrounding residences; and
- no visible emissions would be discharged from the turbine exhaust stacks.

13.6.4 Visual Simulations

The visual simulation illustrated on **Figure 13-3** indicates that some portions of the proposed Facilities would be visible from the north side of residence R22. Views toward the Facility would generally occur from a veranda around the north and east sections of the residence, as well as from some areas of the lawn below the veranda.

Some structures within the lower portions of the Facilities will be screened by a ridgeline falling south east toward the river, although the upper portions of the Delta Electricity exhaust stacks and Stage 2 condenser will be visible generally against a backdrop of trees, with a partial section of these elements visible above the horizon.

The EnergyAustralia Facility would be largely screened by a combination of landform and vegetation. The upper portions of the exhaust stacks will be visible from some sections of the veranda.

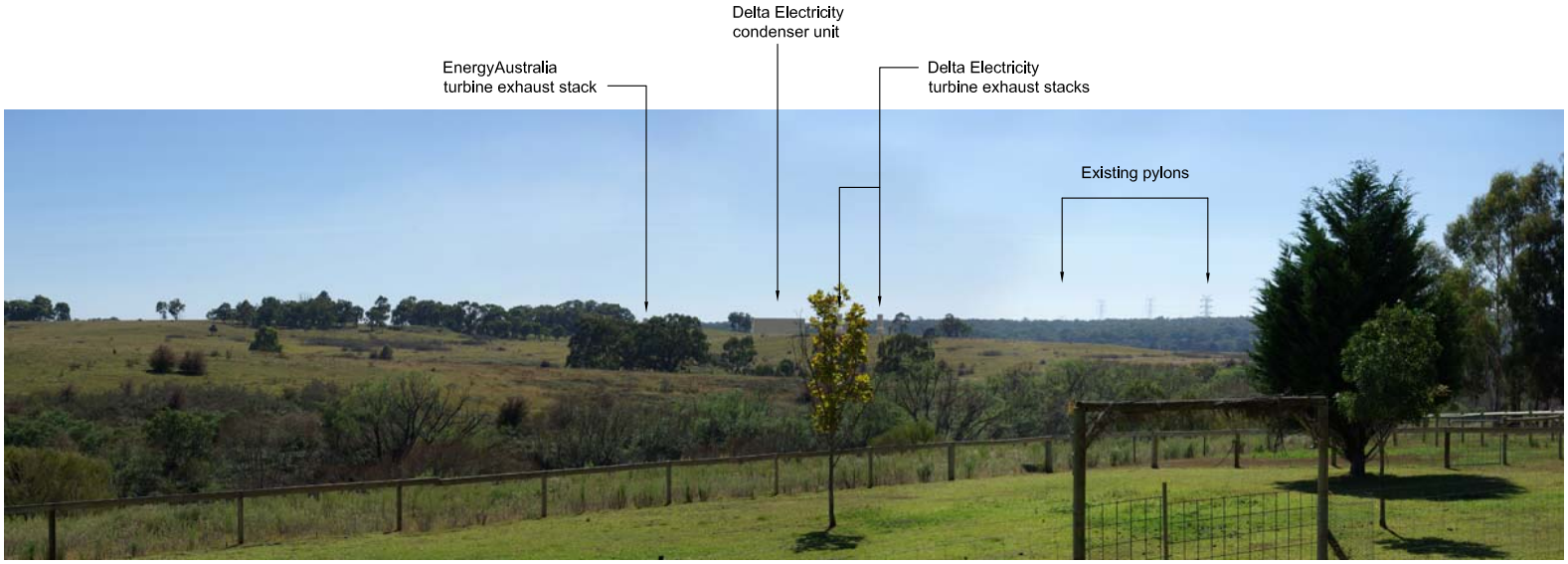
The juvenile Plane tree, planted in the lawn area below the veranda, may increase in size over the long term, and screen the majority of the Delta Electricity Facility. However, as the Plane tree is a deciduous species it will lose its leaves through autumn and winter and provide a lesser degree of screening throughout the winter season.

The visual simulation illustrated in **Figure 13-4** indicates that portions of the proposed Facilities would be visible from the general development envelope of the proposed dwelling at view location R23. Views toward the Facilities would generally occur from the north facing sections of the proposed dwelling.

Some structures within the lower portions of the Facilities will be screened by a ridgeline falling south east toward the river together with trees along the river corridor. The majority of trees along the river in the foreground view are Willow trees and will lose their leaves during autumn and winter, and therefore provide a lesser degree of screening throughout the winter season.

The upper portions of the Delta Electricity exhaust stacks and Stage 2 condenser would be generally visible against a backdrop of trees, with a partial section of these elements visible above the horizon. The upper portions of the EnergyAustralia Facility would be partially visible through tree foliage, and would extend to around the same height of the trees beyond the Facility.

Existing View from R22 - North facing verandah

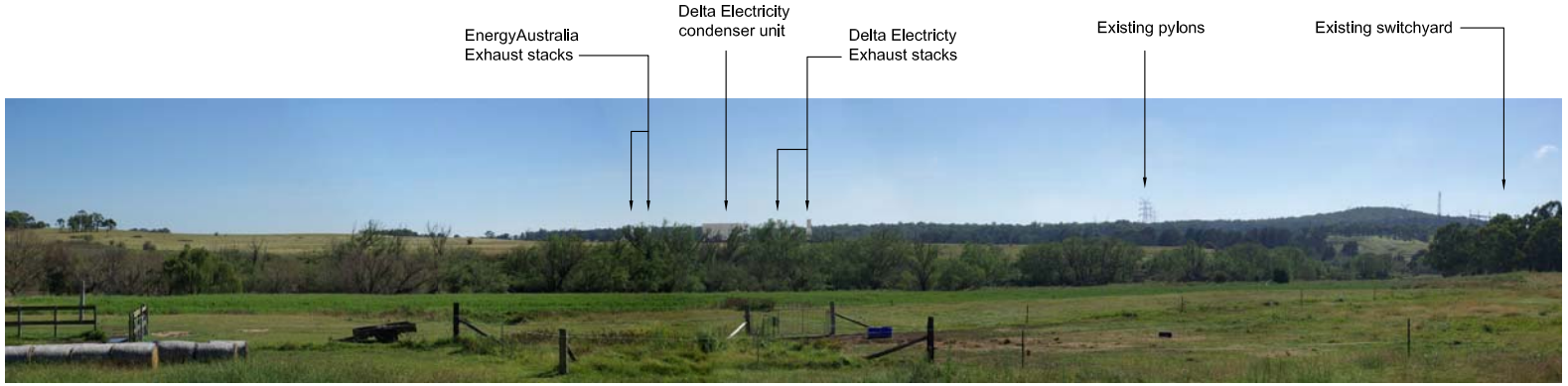


Proposed View from R22 - North facing verandah

NOTE:
Roads, boundaries and buildings have not been surveyed. All base information obtained from aerial photography and is not survey accurate.

Client: DELTA ELECTRICITY & ENERGYAUSTRALIA	Project: MARULAN GAS TURBINE FACILITY	Title: VISUAL SIMULATION LOCATION 22 FOR THE COMBINED FACILITIES
URS	Drawn: AH | Approved: NB | Date: 22/12/07	Figure: 13-3
	Job No: 43177371 | File No: 43177371/13-5	

Existing View from R23 - Location of proposed dwelling



Proposed View from R23 - Location of proposed dwelling

NOTE:
Roads, boundaries and buildings have not been surveyed. All base information obtained from aerial photography and is not survey accurate.

Client: DELTA ELECTRICITY & ENERGYAUSTRALIA	Project: MARULAN GAS TURBINE FACILITY		Title: VISUAL SIMULATION LOCATION 23 FOR THE COMBINED FACILITIES
URS	Drawn: AH	Approved: NB / Date: 22/12/07	Figure: 13-4
	Job No: 43177371	File No: 43177371/13-6	

13.7 Assessment of Potential Impacts – Gas Pipeline

Potential visual impacts arising from construction activities associated with the gas pipeline, such as traffic, use of heavy machinery and the like would be of a temporary nature. Where practicable, vegetation removed to construct the gas pipeline would be replanted. Mitigation measures to reduce visual impacts would be incorporated into a CEMP.

A more detailed assessment of the visual impacts associated with the construction and operation of the gas pipeline will be undertaken as part of a separate *Project Application*.

13.8 Mitigation Measures

While the overall potential visual impact of the proposed Facilities has been assessed as medium**,** the following mitigation measures may potentially reduce the level of visual impact.

The indicative mitigation measures involve a combination of strategies to potentially reduce the visual contrast between the visible structures of the Facilities and the surrounding landscape.

13.8.1 Structures

- Subject to CASA requirements, where practicable, colour and texture of structures in the proposed Facilities should be appropriate and utilise non-reflective materials. The colour of structures in the proposed Facilities should be selected to minimise visual contrast between structures and their background and textures should utilise non-reflective materials. This would potentially minimise the visual contrast between the structures and the tree-covered slopes and ridgelines surrounding the proposed Facilities.

13.8.2 Screen Planting

- Tree and shrub planting would be carried out within the general site area to provide additional screening to views from surrounding properties. Consideration to be given to planting on each mounding within the Site.
- Where practicable, tree planting within selected private residential properties to be considered, subject to negotiation and agreement by property owners.

13.8.3 Lighting

- Lighting design would avoid direct line of sight from properties surrounding the proposed Facilities.
- Top of the exhaust stacks would not have lighting unless requested by CASA.
- Where practicable, security lighting would not spill onto surrounding residences.

13.8.4 Summary of Mitigation Measures

A summary of the visual mitigation measures is presented in **Table 13-4**. The phase of implementation is indicated in the table by *Cons* – Construction *Ops* – Operation, Design and Planning.

Chapter 13 Visual Amenity

Table 13-4 Summary of Visual Mitigation Measures

Mitigation Measures	Implementation of mitigation measure		
	Common Shared Works	Facilities	Gas Pipeline
Subject to CASA requirements, where practicable, colour and texture of structures in the proposed Facilities should be appropriate and utilise non-reflective materials		✓ (Design)	
Tree and shrub planting would be carried out within the general site area to provide additional screening to views from surrounding properties. Consideration to be given to planting on mounding within the Site.		✓ (Design, Cons & Ops.)	
Where practicable, tree planting within selected private residential properties would be considered, subject to negotiation and agreement by property owners.		✓ (Design & Ops.)	
Lighting design would avoid direct line of sight from properties surrounding the proposed Facilities.		✓ (Design & Ops.)	
Top of the exhaust stacks would not have lighting unless requested by CASA.		✓ (Design & Ops.)	
Measures would be employed to avoid light spill from security lighting onto surrounding residences.		✓ (Design & Ops.)	
Further assessment of impact on visual amenity of the Gas Pipeline would occur at Project Approval Stage			✓ (Planning)