10.1 Introduction

This traffic and transport assessment addresses the traffic related impacts associated with the construction, operation and maintenance of the Facilities.

The assessment of the traffic impacts was conducted for the following Project components:

- impact of Common Shared Works (refer to **Appendix E**) being the:
  - bulk earthworks for preparation of the pad for the two Facilities; and
  - construction of an access road into the site from Canyonleigh Road.
- impact of construction of the Facilities (beyond earthworks) assuming a worst case scenario for construction (refer to respective *Project Applications*); and
- cumulative impact of operation and maintenance of the Facilities (refer to respective *Project Applications*).

10.2 Methodology

The assessment has been conducted using the following methodology:

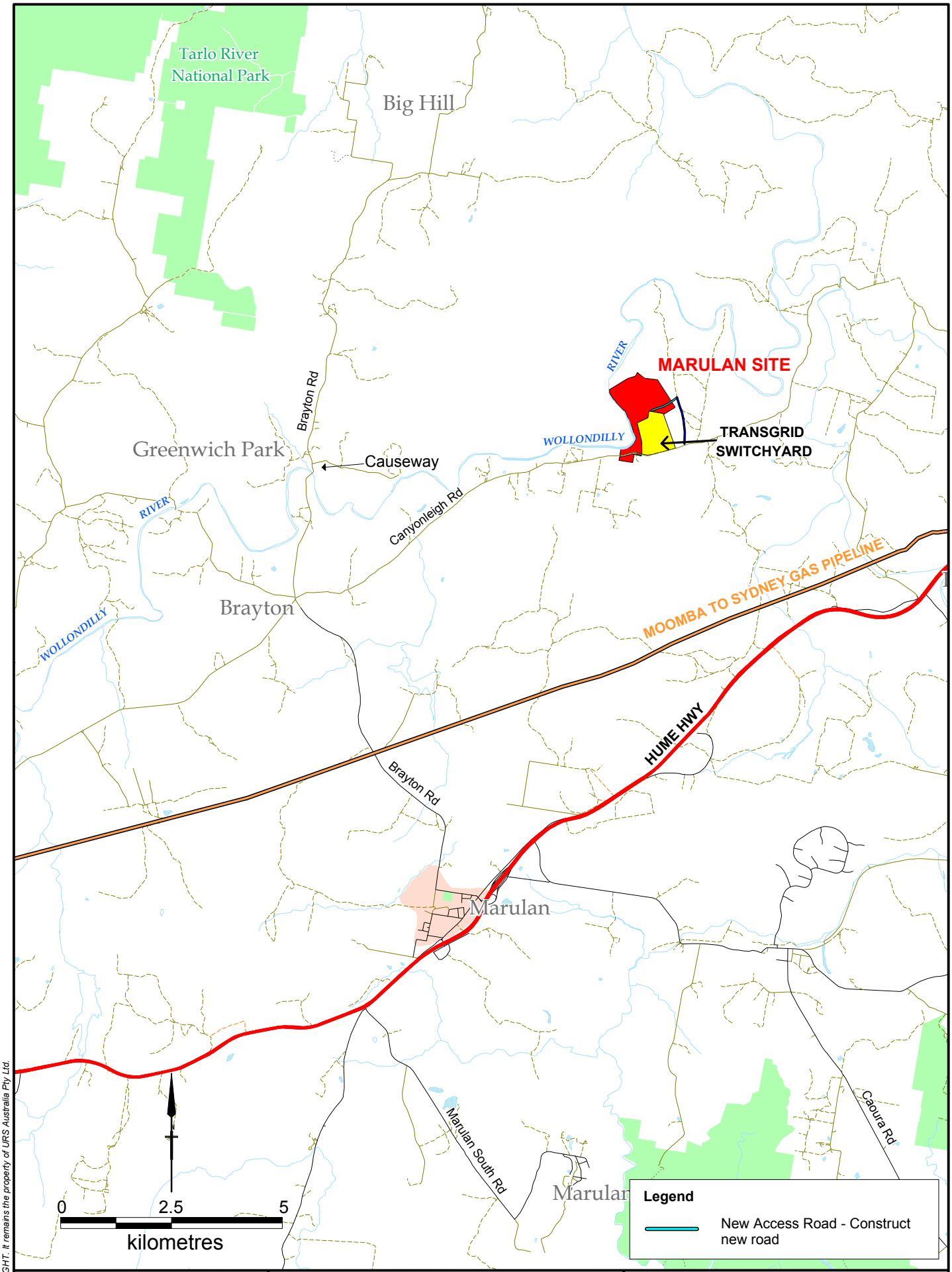
- present an overview of the existing traffic context and road environs;
- calculate the traffic growth of the existing Site (without the Facilities) from historical traffic data at the adjacent traffic counting stations nominally over a 10 year period;
- calculate the traffic generation for the above components of the Project;
- calculate the resulting impact of the Project nominally over a 10 year period; and
- provide recommendations / mitigation measures (e.g. road / intersection upgrades) that may be required to mitigate the impacts of the Project.

10.3 Existing Environment

10.3.1 Existing context

The regional road network is dominated by the Hume Highway (State Highway 31) which runs between Sydney and Melbourne. The town of Marulan is located some 130 kilometres south west of Sydney and 20 kilometres east of the regional centre of Goulburn. The Site would be accessed from Brayton Road that leaves Marulan and heads to the north west.

Approximately four kilometres north of Marulan, Canyonleigh Road branches to the east off Brayton Road and passes the TransGrid Switchyard site. Further along Canyonleigh Road beyond the TransGrid Switchyard is the entry road to the Site initially utilising an easement over the entry road to the University of Sydney property (refer to **Figure 10-1**).



Client: DELTA ELECTRICITY AND ENERGYAUSTRALIA	Project: MARULAN GAS TURBINE FACILITIES	Title: **REGIONAL ROAD NETWORK**
URS	Drawn: AJW; Approved: NB; Date: 21/05/2008 Job No: **43177371**; File No: 43177371-128.wor	Figure: **10-1**

10.3.2 Existing road environs

Brayton Road is a 6.5 metre wide sealed road from Marulan to the junction with Canyonleigh Road. There are overhead transmission lines and a pedestrian pavement alongside the road at this location.

Two kilometres from the Hume Highway junction there is a narrow two lane bridge. The load capacity of the bridge is currently unknown. There are several other narrow points that are located at approximately five and nine kilometres along the route on Brayton Road and Canyonleigh Road.

Approximately 3.5 kilometres west of Marulan overhead transmission lines cross Brayton Road. Culverts along this section of Brayton Road are generally narrow, extending approximately only one metre beyond the sealed width of the roadway. The majority of these structures are faulty and shallow.

At approximately five kilometres along the route from Marulan, the road further narrows to five metres in some sections.

The route to the Marulan Site leaves Brayton Road at Canyonleigh Road. Initially Canyonleigh Road is a 5.5 metre wide sealed road but as the distance away from Brayton Road increases, the road changes to a gravel surface.

A traffic island separates the two traffic directions along Canyonleigh Road at the junction.

The grade along this route is generally less than 3 % to 5 %. Other features along the route include drainage culverts, cattle grids and as the route approaches the TransGrid switchyard, there are several overhead high voltage wires and towers.

Brayton Road spans two local government areas: Upper Lachlan Shire Council and Goulburn Mulwaree Council.

10.3.3 Traffic

Historical Average Annual Daily Traffic (AADT) is not available for either Canyonleigh Road or Brayton Road in the relevant locations for the Project. However, analysing data from adjacent stations within the network shows a clear and consistent trend that indicates the number of vehicles using these roads in the relevant locations. This analysis show a growth of 4 % which has been used to estimate the traffic over the period, from 2008 to 2018 (**Table 10-1**).

It is assumed that construction of the Common Shared Works will occur in 2008. The period 2009-2011 covers Facility construction under two development scenarios (refer to **Section 10.5.1**). The years 2012 and 2013 are typical years in which the Facilities are in full operation. 2018 is a typical year in which one of the Facilities undergoes a major maintenance shut-down.

Table 10-1 represents the base traffic growth without either Facility being present. By the year 2018 the estimated traffic will be 1064 vehicles per day, which represents an operational Level of Service ‘B’, that is, between 900 and 2300 vehicles per day.

Table 10-1 Predicted Weekday Traffic Flow for Canyonleigh and Brayton Roads - No Development

Year	2008	2009	2010	2011	2012	2013	2018
Daily Traffic Flow	719	747	777	808	841	874	1064
Midblock Level of Service (LoS)	A	A	A	B	B	B	B

10.4 Impact Assessment – Common Shared Works

Construction Traffic Generation

The main impacts from construction generated traffic occur:

- during the morning 7:00 to 8:00 am peak hour when construction staff and early delivery vehicles coincide with the Brayton Road peak; and
- through regular daily traffic generated by delivery trucks for equipment and plant.

The impacts of the construction traffic have been reviewed with respect to:

- traffic capacity on Brayton Road and Canyonleigh Road;
- safety; and
- oversize vehicles.

The number of vehicle movements is summarised in **Table 10-2** and has been based on usual construction practices and activities and the anticipated level of staffing that is expected during Common Shared Works (bulk earthworks).

Site works for the two Sites is assumed to occur at the same time over a period of approximately six months as a worst case scenario and assumed for the purposes of this assessment to be completed by end of 2008.

Table 10-2 Bulk Earthworks Traffic Movements

	Duration (Months)	Per Month		Per Week		Per Day	
		HV	LV	HV	LV	HV	LV
Average	6	660	1320	165	330	30	60
Peak	3	1320	2640	330	660	60	120

HV=Heavy vehicles
LV= Light vehicles

Table 10-2 shows that the traffic volumes that are expected to occur in the peak three month period are double the expected average over a six month period. For the purposes of this assessment, the peak traffic volumes have been adopted as this represents the worst case. The peak daily construction traffic including heavy vehicles (HV) and light vehicles (LV) totals 180 vehicles per day (i.e., 60 + 120 = 180).

Local Road Network Performance

For the Common Shared Works phase the predicted increase in traffic volume is shown in **Table 10-3**.

Table 10-3 Predicted Weekday Traffic Flow in Canyonleigh and Brayton Roads - Common Shared Works

YEAR	2008
No Development	
Daily Traffic Flow	719
Midblock Level of Service (LoS)	A
With Development	
Daily Construction Traffic Flow during peak construction month	180
Daily Total Traffic Flow during peak construction month	899
Percentage Change (from No Development)	25%
Midblock Level of Service (LoS)	A

Analysis of **Table 10-3** for the Common Shared Works (bulk earthworks) phase shows the following:

- peak construction traffic for earthworks is approximately 25 % higher than without the development for the worst case where earthworks for the two Facilities are undertaken at the same time; and
- in the peak periods the level of service will be LoS A, which is the same case as the scenario without the development, therefore acceptable levels of service are maintained along Canyonleigh and Brayton Roads during these periods.

Mitigation Measures

The following specific mitigation measures are considered necessary for the Common Shared Works:

- further assessments to:
  - review what works may be required to bridges, causeways, traffic islands, intersections and drainage culverts along Canyonleigh and Brayton Roads to facilitate the construction and operation of the Facilities;
  - identify and cater for any necessary remedial treatments to facilitate passage to the Site along Canyonleigh and Brayton Roads once the actual weight and dimensions of the proposed plant are known; and
  - be undertaken in consultation with Goulburn Mulwaree and Upper Lachlan Shire Councils.
- pre construction evaluation of pavement condition of Brayton Road (between George Street intersection and Canyonleigh Road intersection) and Canyonleigh Road (from intersection of Brayton Road to the Site) to be undertaken;

- post construction evaluation of pavement condition of Brayton Road (between George Street intersection and Canyonleigh Road intersection) and Canyonleigh Road (from intersection of Brayton Road to the Site) to be undertaken to determine remedial action required following passage of oversized vehicles;
- transport of over-mass and over- dimensional loads to be undertaken under RTA and NSW Police permit conditions and approved routes.
- access road - New Site Access Road within the Site:
  - three alignment options were developed for the access road within the site. The alignment options all connect to University Road at the same point adjacent to the high voltage transmission line easement. A preferred alignment was determined and is shown in **Figure 10-2** (Option B). The preferred route optimises the cost of construction and the impact on existing vegetation within the site. Option C is also presented in **Figure 10-2**. It is noted that for the purposes of other environmental assessment studies Option C has been used as it is the worst case scenario in terms of vegetation clearing. Detailed design will refine the alignment.
  - this new access road within the Site would be constructed prior to earthworks commencing.

Other general mitigation measures are summarised in **Table 10-5**.

10.5 Impact Assessment – Facilities

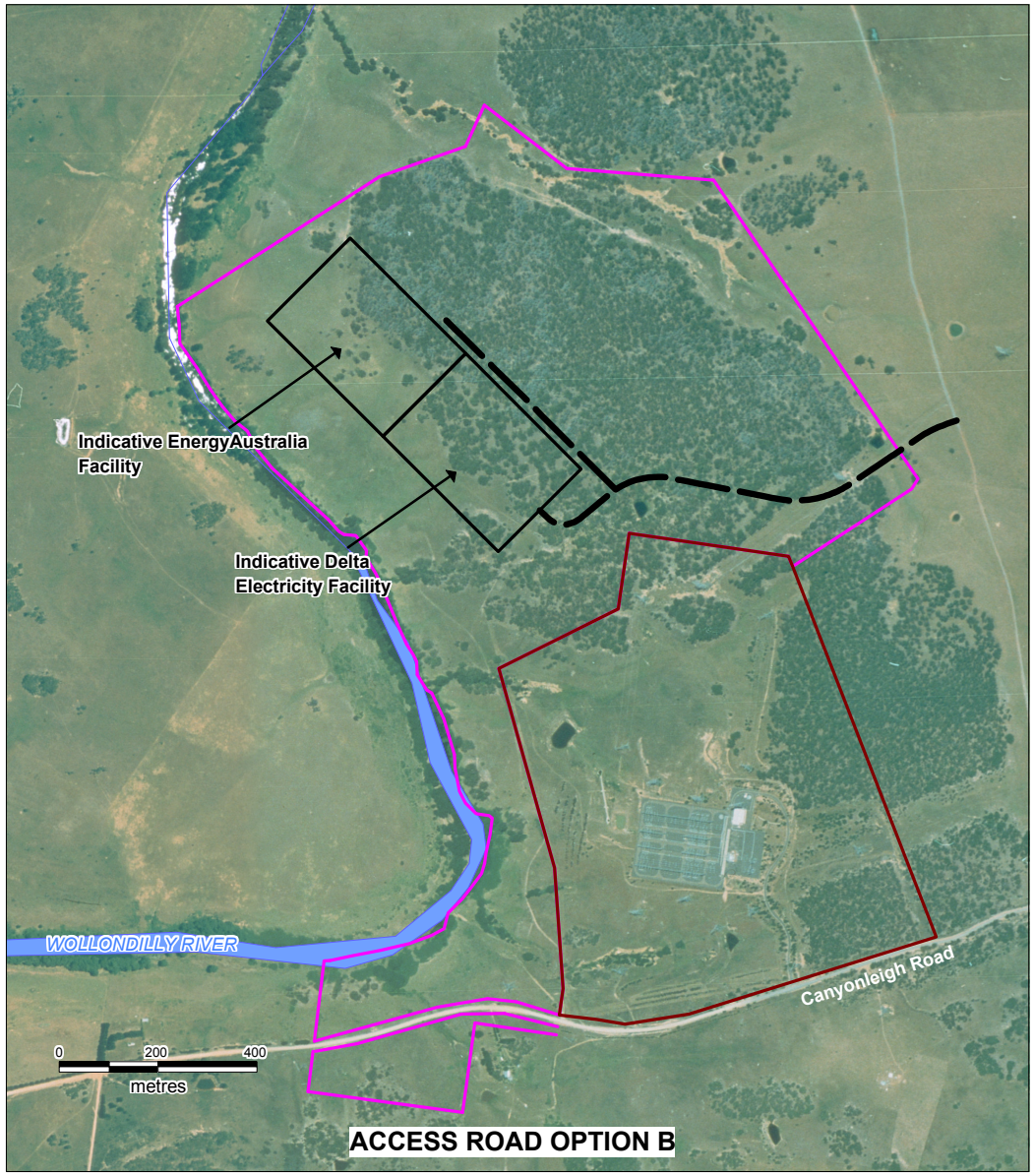
10.5.1 Construction

Construction works for the EnergyAustralia and Delta Electricity Facilities could occur either together or sequentially. Several scenarios can be foreseen for construction that will influence traffic generation. Of the scenarios considered, two scenarios provide limits as to the expected traffic during construction and operation of the two Facilities:

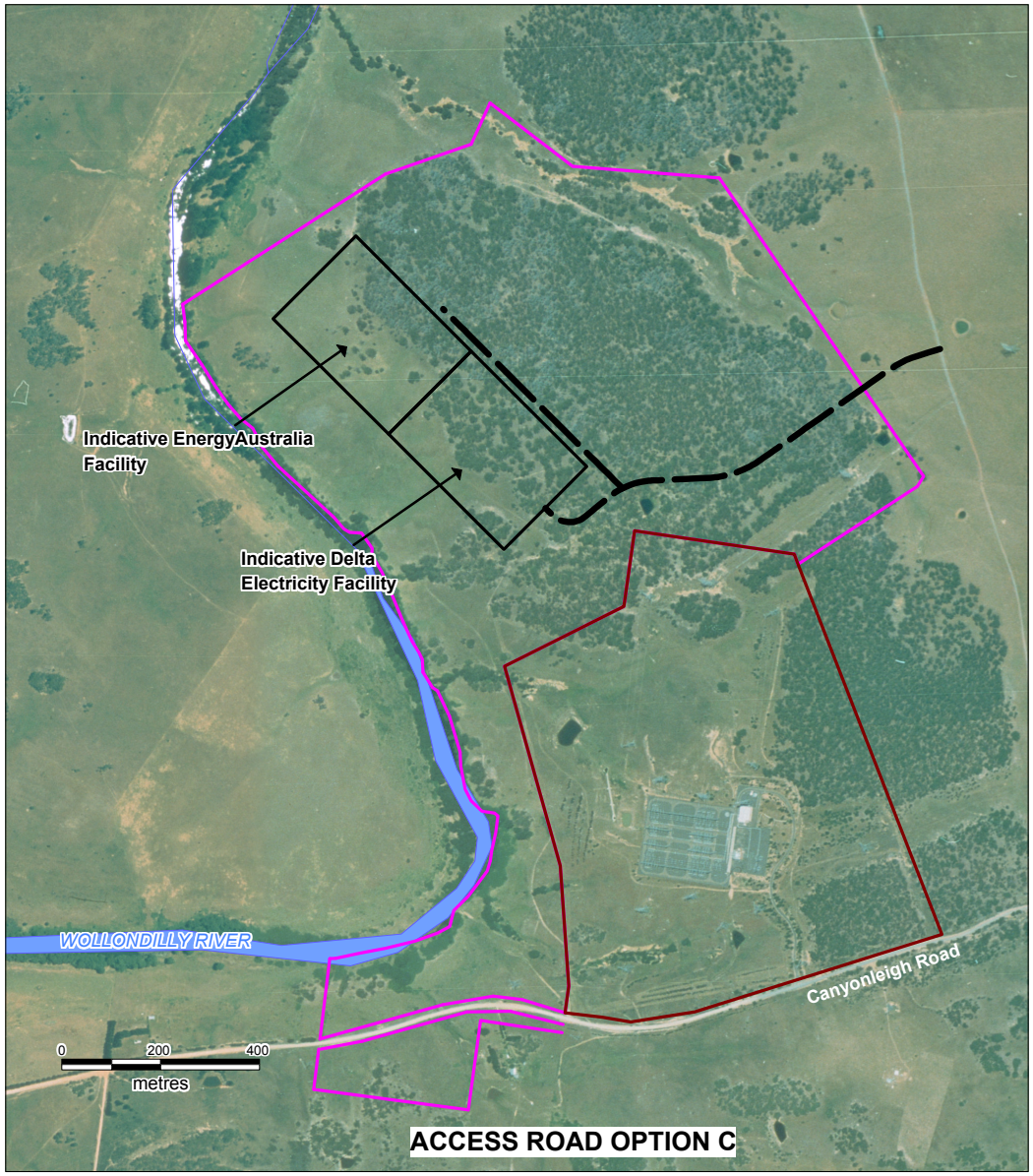
- Scenario 1: Two Facilities constructed at the same time, including EnergyAustralia and Delta Electricity Stage 1 followed some time after completion of Stage 1 by Delta Electricity Stage 2.
- Scenario 2: EnergyAustralia Facility is constructed first with some time lag to the construction of Delta Electricity Stages 1 and 2.

The EnergyAustralia Facility would be constructed entirely in one stage which has been assumed to take 12 months. The Delta Electricity Facility would be constructed in two stages with the first stage being assumed to take 12 months and 18 months for Stage 2.

The respective *Project Applications* present the traffic generation data for the two construction scenarios.



ACCESS ROAD OPTION B



ACCESS ROAD OPTION C

Legend

Marulan Site

TransGrid Site

Source: Delta Electricity, Energy Australia

Client	DELTA ELECTRICITY AND ENERGYAUSTRALIA
Project	MARULAN GAS TURBINE FACILITIES
Title	**ACCESS ROAD PREFERRED OPTIONS**
Drawn: AJW	Approved: NB	Date: 14.03.08
Job No: **43177371**	File No: 43177371-129.wor
Figure: **10-2**	

Chapter 10 Traffic and Transportation

Construction Stage Water Requirements

The construction phase (approximately 12 to 18 months for each Facility) water requirement is estimated to be 6-8 kL per day but could be in the order of 100 kL per day in hot dusty weather for supply for water carts. The assumptions for this requirement are detailed in **Chapter 4** and **Chapter 14**.

It is assumed that traffic generated from construction water delivery would be in the order of 4 trucks per week but in adverse weather conditions could be in the order of 3 trucks per day. This is not a significant increase compared to other construction traffic and has not been considered further in the traffic assessment.

Over-dimensional and Over-mass Transport

The large gas turbine, generator and high voltage transformer components are to be imported into Australia and transported to Site by special road convoy. A total of six over-dimensional and/or over mass escorted truck convoys of pre-assembled gas turbine, generator and transformer units would occur in each stage for each Facility.

It is anticipated the majority of heavy plant items would be transported from the Sydney or Wollongong metropolitan area along State Route 69 then Hume Highway during the construction stage. However, the supplier and transporter may also elect to transport the heavy plant items from Melbourne.

When assessing the route to carry the heavy plant items, the following issues are addressed:

- horizontal and vertical carriageway alignments;
- horizontal and vertical clearances to overhead obstructions (power lines, bridges, vegetation);
- bridge approaches;
- vehicle loading capabilities on structures;
- roadside furniture (traffic signal hardware, directional signposting, lighting, poles); and
- temporary stop locations.

Further assessments would be undertaken to identify and cater for any necessary remedial treatments to facilitate passage to Site along Canyonleigh and Brayton Roads once the actual weight and dimensions of the proposed plant are known. The assessment would review what works may be required to bridges, causeways, traffic islands, intersections and drainage culverts to facilitate the construction and operation of the Facilities. This would be done in consultation with Goulburn Mulwaree and Upper Lachlan Shire Councils.

As two Facilities are being constructed the number of over dimensional vehicles would be double that for a single Facility. The timing of these vehicles would vary with each construction scenario. The total number of over-dimensional vehicles would be 12 and would occur within a peak period of up to six months for Scenario 1 or spread over eighteen months for Scenario 2.

10.5.2 Operation

Operation Traffic Generation

During the operational phase of EnergyAustralia Facility and Delta Electricity Stage 1 Facility staff levels are expected to average some four full time staff on site and four contract staff for support services. This will generate 16 vehicle trips per day (i.e., 8 x 2).

During the operational phase of the EnergyAustralia Facility and Delta Electricity Stage 2 Facility, operational staff levels are expected to be up to 20 full time staff with four full time contract staff generating some 48 vehicle trips per day (i.e., 24 x 2).

To meet the operational water requirements for both the EnergyAustralia Facility and Delta Electricity Facility, a number of current and potential water sources, including potable, recycled and stormwater have been identified. The potential sources for water have been considered for the combined requirements of both the Delta Electricity and EnergyAustralia Facilities. Water source options include:

- Marulan Water Supply network;
- Marulan Sewage Treatment Plant;
- Moss Vale sewage treatment plant; and/or
- Site stormwater runoff.

Water would be trucked to the Site to meet the operational requirements for the Facilities.

For the purpose of this traffic assessment the following assumptions have been made:

- regular daily vehicle movements for operational staff of some 16 to 48 vehicle trips per day which is significantly lower than estimated levels of construction traffic generation, and can readily be accepted by the road network;
- **EnergyAustralia Facility:** It is estimated that for a 40 day operational period per year approximately 10 trucks per day (i.e. 20 vehicle trips per day) would be required to provide the water volume necessary for the operation;
- **Delta Electricity Stage 1 Facility:** It is estimated that for a 40 day operational period per year approximately 2 trucks per day (i.e. 4 vehicle trips per day) would be required to provide the water volume necessary for the operation;
- **Delta Electricity Stage 2 Facility:** It is estimated that for a 330 day operational period per year approximately 6.5 trucks per day (i.e. 13 vehicle trips per day) would be required to provide the water volume necessary for operation;
- traffic generated for water delivery at the water source is likely to be low compared to existing traffic volumes and unlikely to have significant impacts at the water source locations and therefore have not been considered further; and
- although additional water trucks may be required to initially charge the system (to fill the raw water storage tank), it has been assumed that this would be an infrequent occurrence and would be spread over a nominal time period and therefore has not been included in this assessment.

Estimations of the water delivery requirements are based on the following assumptions:

- the water requirement for the EnergyAustralia Facility is 12 ML per annum, Delta Electricity Stage 1 Facility is 2.3 ML per annum; and Delta Electricity Stage 2 Facility is 63.5 ML per annum; and
- water is delivered to Site in 30,000 L tankers.

Major Maintenance Phase

Major maintenance is expected to generate additional traffic of up to 60 vehicles per day during the peak. Such activities would occur relatively infrequently, say every six years or more, and would last approximately three to six weeks. For traffic analysis purposes 120 vehicles trips per day per Facility has been adopted.

10.5.3 Local Area Network Performance

The analysis presented in **Table 10-4** includes the construction traffic, operational traffic and maintenance traffic for the period commencing with construction of the Facilities in 2009 through to maintenance in 2018.

The data in **Table 10-4** is developed based on the following assumptions:

- construction traffic is the same for each Facility;
- Scenario 1 has twice the construction traffic during Stage 1 as two Facilities are under construction;
- Scenario 2 has only one Facility under construction at any time;
- construction complete in 2011 for Scenario 1;
- construction complete in 2012 for Scenario 2;
- 2012/2013 assumed years of typical operation;
- 2018 nominally assumed year of maintenance;
- only one Facility undergoes major Facility maintenance at any one time with operation of the other Facility assumed at the same time (assumed maintenance for EnergyAustralia with operation of Delta Electricity Stage 2 being the worst case); and
- water delivery based on 30,000 L truck capacity.

Table 10-4 Predicted Weekday Traffic Flow in Canyonleigh and Brayton Roads

Year	2009	2010	2011	2012	2013	2018
	Construction Stages				Nominal year of operation	Nominal year of major maintenance
No Development						
Daily Traffic Flow	747	777	808	841	874	1064
Midblock Level of Service (LoS)	A	A	B	B	B	B
With Development, Scenario 1						
Daily Construction Traffic Flow during peak construction month	480	240	240	0	0	0
Major Facility Maintenance after 6 years	0	0	0	0	0	120
Operational Traffic	0	16	48	48	48	40
Water Delivery	0	24	24	33	33	33
Daily Total Traffic Flow during peak construction month	1227	1057	1120	922	955	1257
Percentage Change (from No Development)	64 %	36 %	39 %	10 %	9 %	18 %
Midblock Level of Service (LoS)	B	B	B	B	B	B
With Development, Scenario 2						
Daily Construction Traffic Flow during peak construction month	240	240	240	240	0	0
Major Facility Maintenance after 6 years						120
Operational Traffic	0	8	16	48	48	40
Water Delivery	0	20	24	33	33	33
Daily Total Traffic Flow during peak construction month	987	1045	1088	1162	955	1257
Percentage Change (from No Development)	32 %	34 %	35 %	38 %	9%	18 %
Midblock Level of Service (LoS)	B	B	B	B	B	B

Analysis of **Table 10-4** for the two Facilities shows the following:

- peak traffic during construction is approximately 64 % higher than without the development for the worst case Scenario 1 where the two Facilities are constructed at the same time;
- peak operation traffic during normal operations is approximately 10 % higher than without the development; and
- peak operation traffic during times of major Facility maintenance (expected approximately every six years for a period of up to six weeks) is approximately 18 % higher than without the development.

In the peak periods the level of service will be LoS B, which is still acceptable for the standard of road under consideration; therefore, acceptable levels of service are maintained along Canyonleigh and Brayton Roads during these periods.

While the worst case scenario (Scenario 1) is for construction of the two Facilities occurring at the same time, it is noted that the assessment is very conservative for the following reasons:

- traffic volumes for the peak three months of construction traffic were assumed to continue for the whole construction period of 12 months; and
- peak three months of construction traffic were assumed to occur at the same time for both Facilities however, construction of the EnergyAustralia Facility is likely to occur before the construction of the Delta Electricity Facility and therefore it is unlikely that the peak three months for the two Facilities will coincide.

Mitigation Measures

A summary of mitigation measures include the following:

- Further assessments to:
  - review what works may be required to bridges, causeways, traffic islands, intersections and drainage culverts along Canyonleigh and Brayton Roads to facilitate the construction and operation of the Facilities;
  - identify and cater for any necessary remedial treatments to facilitate passage to the Site along Canyonleigh and Brayton Roads once the actual weight and dimensions of the proposed plant are known; and
  - be undertaken in consultation with Goulburn Mulwaree and Upper Lachlan Shire Councils.
- A pre construction evaluation of pavement condition of Brayton Road (between George Street intersection and Canyonleigh Road intersection) and Canyonleigh Road (from intersection of Brayton Road to the Site) to be undertaken;
- A post construction evaluation of pavement condition of Brayton Road (between George Street intersection and Canyonleigh Road intersection) and Canyonleigh Road (from intersection of Brayton Road to the Site) to be undertaken to determine remedial action required following passage of oversized vehicles;
- Transport of over-mass and over- dimensional loads to be undertaken under RTA and NSW Police permit conditions and approved routes.

Figure 10-1 presents a summary of the proposed mitigation measures.

10.6 Impact Assessment – Gas Pipeline

Construction of the gas pipeline is expected to occur over several weeks and is estimated to generate a small amount of vehicular traffic on local roads. Further assessment of the traffic generation will occur in the Project Approval phase for that component.

10.7 Mitigation Measures

Table 10-5 presents a summary of the traffic mitigation measures. The phase of implementation is indicated in the table by *Cons* – Construction *Ops* – Operation and *Design.*

Table 10-5 Summary of Mitigation Measures

Mitigation Measure	Implementation of Mitigation Measures		
	Common Shared Works	Facilities	Gas Pipeline
Further traffic assessments undertaken: – to review what works may be required to bridges, causeways, traffic islands, intersections and drainage culverts along Canyonleigh and Brayton Roads to facilitate the construction and operation of the Facilities; – to identify and cater for any necessary remedial treatments to facilitate passage to the Site along Canyonleigh and Brayton Roads once the actual weight and dimensions of the proposed plant are known; and – in consultation with Goulburn Mulwaree and Upper Lachlan Shire Councils.	✓ (Design & Cons)	✓ (Design & Cons)	
Pre construction evaluation of pavement condition of Brayton Road (between George Street intersection and Canyonleigh Road intersection) and Canyonleigh Road (from intersection of Brayton Road to the Site).	✓ (prior to Cons)		
Post construction evaluation of pavement condition of Brayton Road (between George Street intersection and Canyonleigh Road intersection) and Canyonleigh Road (from intersection of Brayton Road to the Site) to determine remedial action required following passage of oversized vehicles.		✓ (post- Cons)	
Transport of over-mass and over- dimensional loads to be undertaken under RTA and NSW Police permit conditions and approved routes.	✓ (Cons)	✓ (Cons)	