EnergyAustralia

Delta electricity

Appendix B
Revised Traffic Assessment

MARULAN GAS TURBINE FACILITIES

SUBMISSIONS RESPONSE & PREFERRED PROJECT REPORT

VOLUME 2 | APPENDICES | May 2009

URS

REPORT

Marulan Gas Turbine Facility, Traffic Impact Assessment

Prepared for

EnergyAustralia and Delta Electricity

2 March 2009

43177585

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Introduction Section 1

1.1 Background

Delta Electricity and EnergyAustralia are proposing to develop two separate gas turbine power generating Facilities collocated at the Marulan Site (referred herein as the "Project"). A gas pipeline and other shared infrastructure servicing both Facilities would also be constructed along with high voltage transmission lines connecting each facility to the nearby TransGrid 330kV Marulan Switchyard.

URS Australia Pty Ltd (URS) was commissioned by Delta Electricity and EnergyAustralia to prepare a Traffic Impact Assessment (TIA) of the proposed Marulan Gas Turbine Facilities.

1.2 Project Overview

Delta Electricity Facility

The development of Delta Electricity's Gas Turbine Facility would comprise the following elements:

- gas turbine facility including ancillary equipment, process control system and administration facilities; and
- associated infrastructure, such as a connection to the electricity transmission line, connection to the gas inlet receiver, internal roads and water storage.

The implementation of the proposed gas turbine Facility would be carried out in two stages:

- **Stage 1:** Two open cycle gas turbines with a total capacity in the range of 250 to 350 MW. Each turbine could have a capacity in the order of 125 to 175 MW depending on the final equipment selection.
- **Stage 2:** Conversion to combined cycle facility to generate electricity for intermediate/base load electricity demand. The proposed capacity of the Stage 2 combined cycle plant is in the range of 400 to 450 MW.

Delta Electricity may seek Minister for Planning's approval and progress with the construction and operation of Stage 2 directly.

EnergyAustralia Facility

The development of EnergyAustralia's Gas Turbine Facility would comprise the following elements:

- gas turbine facility including ancillary equipment, process control system and administration facilities; and
- associated infrastructure, such as a connection to the electricity transmission line, connection to the gas inlet receiver, internal roads and water storage.

Construction would be undertaken in a single stage.

The proposed gas turbine facility for EnergyAustralia would comprise two open cycle gas turbines. Each turbine could have a capacity in the order of 175 MW, producing a total nominal Facility output of 350 MW.

Shared Infrastructure

The Project includes the construction of linear infrastructure, including:

- a gas pipe line;
- access roads; and
- transmission lines.

Section 1 Introduction

1.3 Site Location

The Marulan Site (Site) is located on Canyonleigh Road, Brayton, approximately 12 kilometres northeast of the village of Marulan. The Site is 19.6 kilometres from the Marulan Highway turnoff and 10 kilometres from the Canyonleigh-Brayton Road turnoff. The site location is illustrated in **Figures 1-1** and **1-2**.

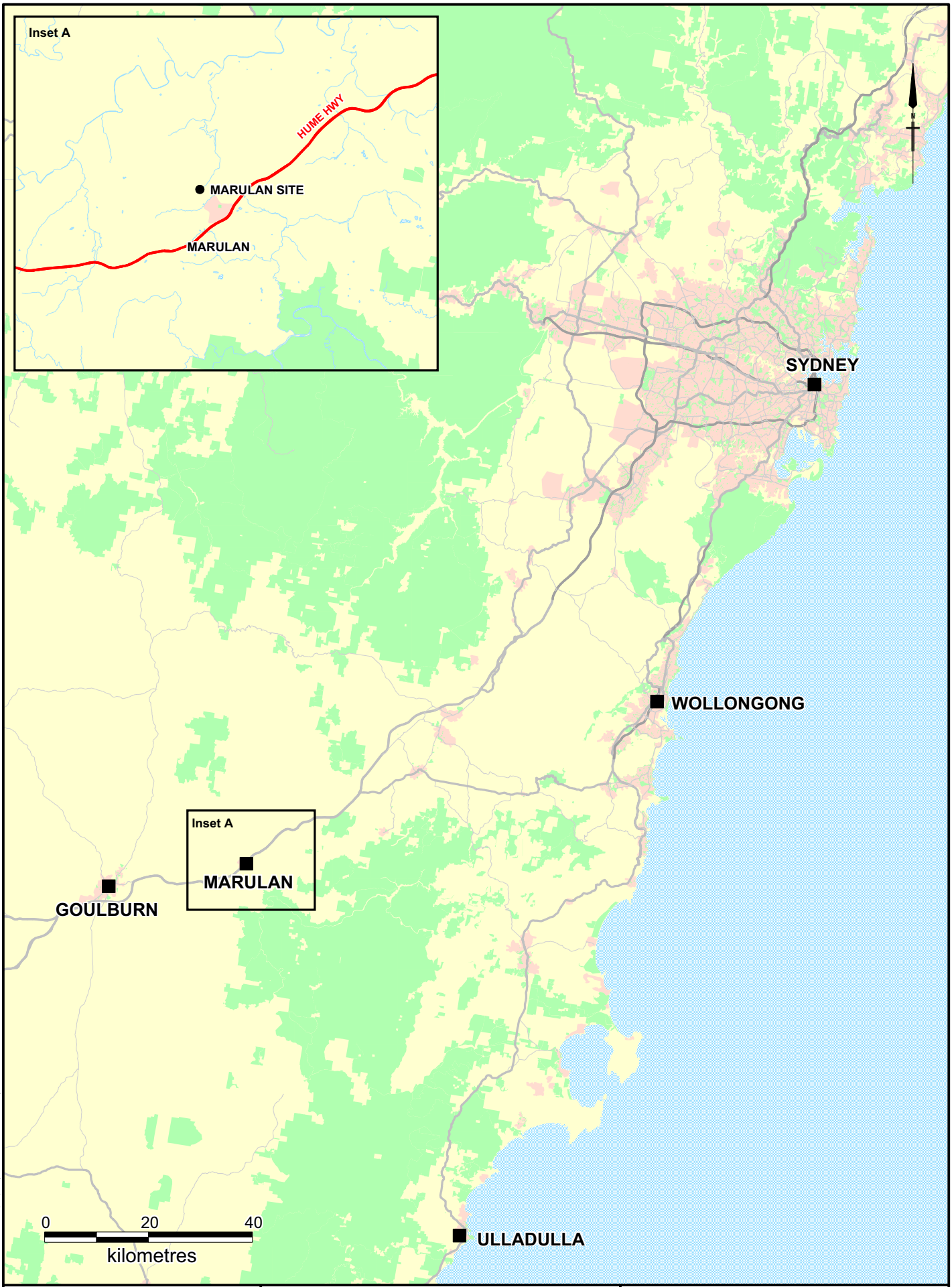
An indicative route for the transmission lines and access road on the Marulan site is shown in **Figure 1-3.** The exact layout and position of this infrastructure would be finalised during the detailed design phase of the Project.

The exact location of the gas pipeline will be finalised at the detailed design phase and, subject to the Minister's determination, will be subject to a separate project application. Delta Electricity and EnergyAustralia are currently considering route options for the gas pipe line within an identified corridor of land, with further studies and assessment underway. When potential route options for the gas pipeline have been considered, easements or other appropriate rights of tenure will be negotiated.

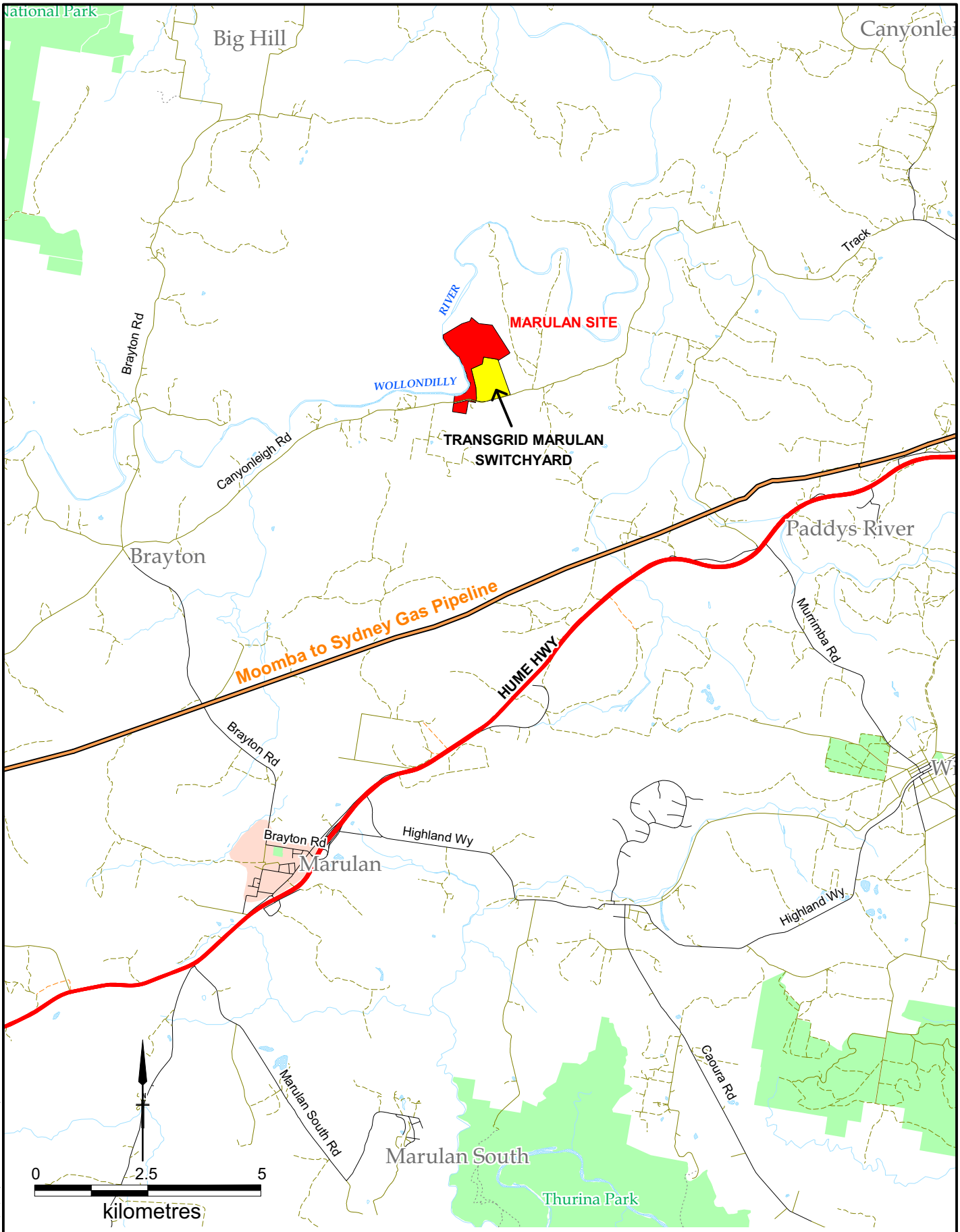
1.4 Report Structure

The remainder of this report is structured in the following Sections:

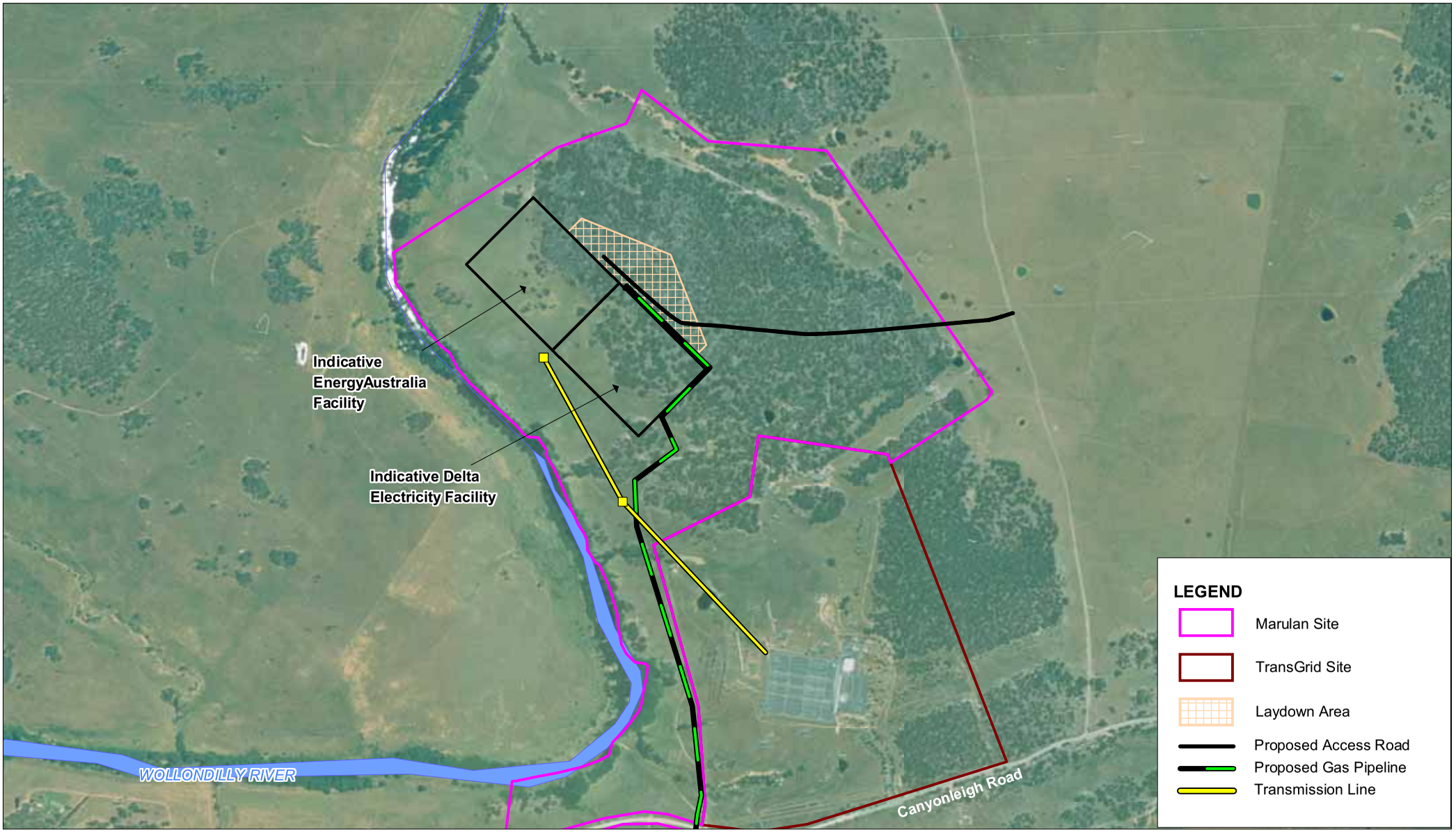
- **Section 2** describes the existing conditions of the road environment in the locality of the Project as well as the locality of the Moss Vale Sewage Treatment (STP) facility, which is being assessed for the purpose of potentially transporting water to the Project site;
- **Section 3** details the traffic generation associated with the Delta Electricity Gas Turbine Facility, including traffic during construction and operation of the Facility;
- **Section 4** details the traffic generation associated with the EnergyAustralia Gas Turbine Facility, including traffic during construction and operation of the Facility;
- **Section 5** summarises the cumulative traffic generation for both the Delta Electricity and EnergyAustralia Facilities established in Sections 3 and 4;
- **Section 6** identifies the impacts of the cumulative traffic generation determined in Section 5; and
- **Section 7** provides the mitigation and management measures to be implemented in order to minimise the impacts identified in Section 6.



Client: DELTA ELECTRICITY AND ENERGYAUSTRALIA	Project: MARULAN GAS TURBINE FACILITIES	Title: **REGIONAL LOCATION MAP**
URS	Drawn: AJW; Approved: NB; Date: 09/01/2008; Job No: **43177371**; File No: 43177371-001J.wor	Figure: **1-1**



Client	Project	Title
DELTA ELECTRICITY AND ENERGYAUSTRALIA	MARULAN GAS TURBINE FACILITIES - TRAFFIC ASSESSMENT	**LOCAL CONTEXT MAP**
URS	Drawn: AO | Approved: NB | Date: 03/03/2009	Figure: **1-2**
	Job No: **43177371** | File No: 43177371-206.wor	



0 200 400
metres

Source: Delta Electricity, EnergyAustralia

Client: DELTA ELECTRICITY AND ENERGYAUSTRALIA	Project: MARULAN GAS TURBINE FACILITIES - TRAFFIC ASSESSMENT		Title: **INDICATIVE LOCATION AND LAYOUT**
URS	Drawn: AO	Approved: NB	Date: 04/03/2009
	Job No: **43177371**	File No: 43177371-228.wor	Figure: **1-3**

Section 2 Existing Conditions

2.1 General

The regional road network is dominated by the Hume Highway (State Highway 31), which connects 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 Marulan Site would be accessed via Brayton Road and Canyonleigh Road. Brayton Road heads in a north-west direction from the Marulan township. Approximately 9 kilometres along Brayton Road from the Marulan township, Canyonleigh Road branches to the east off Brayton Road. The Site is located approx 9 kilometres along Canyonleigh Road from the Brayton Road intersection. The entry point to the Marulan Site is located to the east of the TransGrid Switchyard. The entry road to the site initially utilises an easement over the entry road to the University of Sydney property, as illustrated in **Figures 1-1** and **1-2**.

The preferred route for transporting equipment and construction materials would be via the Hume Highway, Brayton Road and Canyonleigh Road. During the initial operation of the Facilities this is also likely to be the access route to the Site.

A number of current and potential water sources, including potable and recycled water have been identified to provide water quantities which could meet and exceed the requirements of the proposed Facilities. These include:

- the Marulan water supply network;
- Marulan sewage treatment plant; and
- Moss Vale sewage treatment plant.

Any of the above water servicing options for each of the Facilities' water demands could be adopted in conjunction or in combination with the other options and Site storm water run-off. These water sources would require transport to the Marulan Site (refer to **Figure 2-1**).

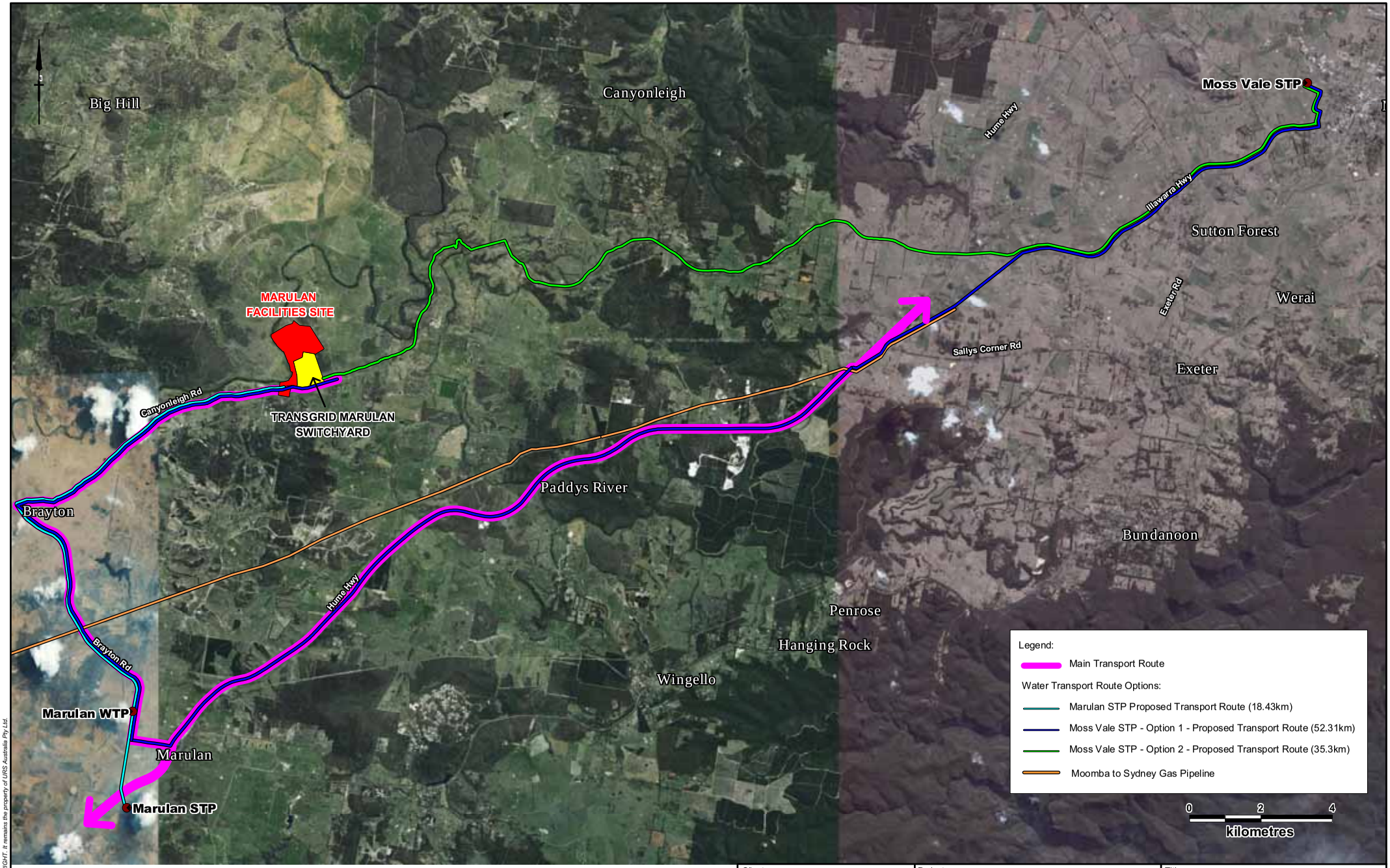
Transporting water from Moss Vale Sewage Treatment Plant (STP) could be achieved via two potential routes:

- Route Option 1: via Kennedy Close, Creek Street, Illawarra Highway then onto Hume Highway, Brayton Road and Canyonleigh Road to the Site;
- Route Option 2: via Kennedy Close, Creek Street, Illawarra Highway then onto Canyonleigh Road to the Site.

Transport from the Marulan water treatment plant or Marulan sewage treatment plant would be via Brayton Road and Canyonleigh Road.

The feasibility of constructing a pipeline from these facilities would be considered and subject to further consultation, detailed design and approvals, however for the purposes of this assessment trucking of water supply for the Facilities has been assumed.

The following subsections provide a description of the existing road conditions and lane configurations, existing traffic volume estimates and Levels of Service based on the traffic volume estimates in accordance with *Guide to Traffic Engineering Practice, Part 2: Roadway Capacity* (AUSTROADS, 1994).



Source: GHD, Integrated Water Management Strategy, November 2008

Client: DELTA ELECTRICITY AND ENERGY AUSTRALIA

Project: MARULAN GAS TURBINE FACILITIES - TRAFFIC ASSESSMENT

Drawn: AO | Approved: NB | Date: 04/03/2009

Job No: 43177371 | File No: 43177371-232.wor

Title: **PROPOSED FACILITY TRANSPORT ROUTES**

Figure: **2-1**

Section 2 Existing Conditions

2.2 Level of Service

Rural Roads - Two-Lane, Two-Way

In accordance with the *Guide to Traffic Engineering Practice, Part 2: Roadway Capacity* (AUSTROADS, 1999), the Levels of Service relevant to rural local roads are summarised in **Table 2-1**. The threshold volumes for the vehicles per day (vpd) associated with each Level of Service, are based on the combined counts for both directions. These traffic volumes account for total vehicle movements.

Table 2-1 Levels of Service Rural Two-Way, Two-Lane Roads

Level of Service	Traffic Volume Threshold (Rolling Terrain)	Traffic Volume Threshold (Level Terrain)	Definition
A	700 vpd	1,600 vpd	Free-flow conditions with a high degree of freedom for motorists to select speed and manoeuvre within traffic flow
B	1,800 vpd	3,200 vpd	Stable flow conditions, reasonable freedom to select speed and manoeuvre within traffic flow
C	3,500 vpd	5,300 vpd	Stable flow conditions, restricted freedom to select speed and manoeuvre within traffic flow
D	5,300 vpd	9,000 vpd	Approaching unstable flow conditions, severely restricted to select speed and manoeuvre within traffic flow
E	9,900 vpd	15,200 vpd	Close to capacity, virtually no freedom to select speed and manoeuvre within traffic flow. Small increases in traffic volume would generally cause operational problems.

Roads operating at a Level of Service of C or better are generally considered to have acceptable flow conditions.

2.3 Gas Turbine Facility Locality

Canyonleigh Road

Canyonleigh Road is generally a two-lane, two-way configuration, with a width of approximately 5.5 metres along its length. For a length of approximately 1.5 kilometres from Brayton Road, Canyonleigh road is sealed with no linemarking. Between the sealed section and the site access Canyonleigh Road consists of an unsealed gravel surface. The section of unsealed road is approximately 8.6 kilometres as measured using GIS (URS, November 2008). The grade along Canyonleigh Road is generally between three and five percent.

Canyonleigh Road is a rural road, which provides access to rural properties, traversing drainage culverts and cattle grids between Brayton Road and the Site access. On the approach to the TransGrid Switchyard there are several overhead high voltage wires and towers.

Canyonleigh Road west of the Marulan Site access is unsealed and undulating for most of its length to the Hume Highway. It consists of cattle grid crossings and fences for grazing, and numerous rural property accesses. For this reason, it is considered inappropriate for the transportation of water from the Moss Vale STP.

A traffic island separates the two traffic directions on Canyonleigh Road at its intersection with Brayton Road. This is depicted in **Figure 2-2**.

Figure 2-2 Canyonleigh Road / Brayton Road Intersection, towards East

Source: URS, February 2008.

In the absence of traffic count data for Canyonleigh Road, the two-way traffic volumes in **Table 2-2** have been estimated based on the number of dwellings by applying a trip rate in accordance with *RTA Guide to Traffic Generating Developments*, version 2.2 (RTA, October 2002).

Section 2 Existing Conditions

Table 2-2 Canyonleigh Road Traffic Volume Estimates

Estimated Number of Dwellings[1]	Average Daily Trips[2]	Average Peak Trips[3]
52	470	50

Source: URS, November 2008.

Notes:

1. The total number of residential properties accessed via Canyonleigh Road was determined using GIS aerial photography. Residences between Brayton Road and the Site were included in this count;
2. Calculated using a daily vehicle trip rate of 9.0 trips per dwelling per weekday, in accordance with RTA *Guide to Traffic Engineering Developments*, version 2.2 (RTA, October 2002);
3. Calculated using a peak hour vehicle trip rate of 0.85 trips per dwelling per hour, in accordance with RTA *Guide to Traffic Engineering Developments*, version 2.2 (RTA, October 2002); and
4. Traffic volumes are rounded to the nearest ten.

For the purpose of this study, it is assumed that through-traffic volumes are likely to be negligible, since Canyonleigh Road is unsealed for a large portion of its length and the road primarily traverses grazing properties with cattle grid crossings and fences.

It is understood that anecdotally there are indications that traffic may increase during times of cattle transport and harvesting that there may be higher peaks however it has been assumed that traffic is generally generated by residences along this route and therefore these periods have not been considered. In any event, this road currently carries a relatively low volume of traffic.

Based on the Levels of Service summarised in **Table 2-1** and the estimated traffic generation, Canyonleigh Road is currently operating at Level of Service A.

Brayton Road

Brayton Road spans two Local Government Areas, which are Upper Lachlan Shire Council and Goulburn Mulwaree Council. Between Canyonleigh Road and Marulan township, Brayton Road has a sealed width of approximately 5.7 to 6.5 metres. The speed limit on this section of Brayton Road is 100 kilometres per hour. The alignment of Brayton Road is typical of a rural road with a combination of flat sections and rolling terrain.

Through Marulan, Brayton Road traverses a residential area, with dwellings located on both sides between George Street and Wollondilly Street. West of Wollondilly Street, residential dwellings are only located on the northern side of Brayton Road. The sealed carriageway for the section of Brayton Road passing through Marulan is between 10 and 11.8-metres wide.

Overhead transmission lines cross Brayton Road at various locations. Additionally, several bridge and culvert crossings are located along Brayton Road. These elements would be subject to assessment as part of the permit process for use by any over-mass, over-dimension vehicles.

Traffic counts were conducted along Brayton Road for the Gunlake Quarry Project Environmental Assessment (Christopher Hallam and Associates, February 2008). These surveys were conducted over one week in May 2007 in the following locations:

- Brayton Road, south of Johnniefelds Quarry; and
- Brayton Road, east of Wollondilly Street.

For the purpose of this TIA, URS has adopted these traffic counts as the most recent data available. **Table 2-3** summarises the results of the counts at these locations.

Table 2-3 Brayton Road Traffic Count Data (Two-Way Traffic Volumes)

Location	Period	Weekday Average	Weekly Average	Maximum
South of Johnniefelds Quarry	AM Peak (vehicles per hour)[1]	33		36
	PM Peak (vehicles per hour)[2]	25		30
	Daily Traffic (vehicles per day)	400	373	443
	Total for week			2,616
East of Wollondilly Street	AM Peak (vehicles per hour)[1]	59		63
	PM Peak (vehicles per hour)[2]	73		77
	Daily Traffic (vehicles per day)	891	864	925
	Total for week			6,051

Source: Christopher Hallam and Associates, February 2008.

Notes:

1. AM peak period is assumed between 0700 and 0900 hours;
2. PM peak period is assumed between 1600 and 1800 hours

The traffic counts indicate that Brayton Road carries approximately 400 vehicles per day south of Johnniefelds Quarry and approximately 900 vehicles per day east of Wollondilly Street. Of the traffic volumes in **Table 2-3**, around 31.1 percent were heavy vehicles for weekdays on Brayton Road south of Johnniefelds Quarry, with 14.2 percent accounting for vehicle classes 6 to 13, which represent articulated heavy vehicles.

For the count location east of Wollondilly Road, approximately 14.4 percent were heavy vehicles for weekdays, with 7.8 percent accounting for vehicle classes 6 to 13, which represent articulated vehicles. This proportion of heavy vehicles is typically high for residential roads.

Based on the Level of Service criteria presented in **Table 2-1** and the traffic count data, Brayton Road is currently operating at Level of Service A during peak hours at both count locations. At the count station east of Wollondilly Street, the terrain is considered relatively level.

Hume Highway

The Hume Highway is classified National Highway 31. It is part of the Auslink National Network and is a vital link for road freight to transport goods between Sydney and Melbourne. For approximately 92 percent of its length in NSW and in close proximity to Marulan, the Hume Highway consists of a dual carriageway (two lanes each direction) with a posted speed limit of 110 kilometres per hour.

The RTA count station on the Hume Highway nearest to the Project site, north of the railway line, Marulan, records an Annual Average Daily Traffic (AADT) two-way volume of 28,062 vehicles per day (RTA, 2003).

Red Hills Road

Red Hills Road is a rural road, which intersects with the Hume Highway at-grade. On the Hume Highway there is a 65-metre right-turn bay provided for southbound vehicles to turn into Red Hills Road. Considering the Hume Highway speed limit of 110 kilometres per hour, the length of this right-turn bay is substandard. The sight distance for vehicles turning out of Red Hills Road is very good. Approximately 400 metres south of the Red Hill Road / Hume Highway intersection is a truck parking area.

Section 2 Existing Conditions

At its intersection with the Hume Highway, Red Hills Road has a sealed carriageway width of approximately 8.1 metres. The remainder of Red Hills Road has a sealed carriageway width of between 5.7 and 6.9 metres and consists of one culvert crossing, a number of bends and rolling terrain. The alignment of Red Hills Road is designed for local traffic.

Traffic counts were conducted on Red Hills Road for the Gunlake Quarry Project Environmental Assessment (Christopher Hallam and Associates, February 2008). These surveys were conducted over one week in May 2007 west of the Hume Highway.

For the purpose of this TIA, URS has adopted these traffic counts as the most recent data available. **Table 2-4** summarises the results of the counts at this location.

Table 2-4 Red Hills Road Traffic Count Data (Two-Way Traffic Volumes)

Location	Period	Weekday Average	Weekly Average	Maximum
West of Hume Highway	AM Peak (vehicles per hour)[1]	7		9
	PM Peak (vehicles per hour)[2]	7		9
	Daily Traffic (vehicles per day)	75	65	95
	Total for week			459

Source: Christopher Hallam and Associates, February 2008.

Notes:

1. AM peak period is assumed between 0700 and 0900 hours;
2. PM peak period is assumed between 1600 and 1800 hours

As **Table 2-4** indicates the traffic volumes on Red Hills Road are very low. Heavy vehicles account for approximately 13.5 percent of the weekly traffic volumes, which is typical of a rural access road.

It is noted that as part of the Gunlake Quarry Project Environmental Assessment, upgrades are proposed to Red Hills Road. These are discussed further in **Section 7.2**.

2.4 Moss Vale STP Locality

The Moss Vale STP site is accessed via the Illawarra Highway, Kennedy Close and Creek Street. The following subsections describe the existing conditions of these roads, which would be considered when determining the route for the potential transportation of water from Moss Vale STP to the Facilities.

Illawarra Highway

The Illawarra Highway (State Highway No. 25) is an east-west highway connecting the Illawarra coastal plain with the Hume Highway and Southern Highlands. The highway has been experiencing a steady increase in heavy vehicle traffic due to the expansion of port facilities at Port Kembla.

The RTA count station nearest to the Moss Vale STP is located west of Waite Street and has a recorded AADT of 11,341 vehicles per day (RTA, 2003).

Kennedy Close

Kennedy Close consists of a two-lane two-way configuration and is a local road. Residential dwellings are located on both sides of Kennedy Close. The access road to the Moss Vale STP intersects with Kennedy Close with give-way control.

There are no traffic counts available for this road. However, the traffic volume on Kennedy Close is expected to be in a similar order as the other non-freeway and non-arterial rural roads discussed in this section.

Based on the number of residential lots (Google Maps, 2008) and discussion with the Moss Vale Sewage Treatment Works facility (15 December 2008), the traffic volumes for Kennedy Close were estimated using the *RTA Guide to Traffic Generating Developments*, version 2.2 (RTA, October 2002) trip generation rates. It is estimated that Kennedy Close carries approximately 600 vehicles per day, with around three percent accounting for heavy vehicles.

Creek Street

Creek Street is a two-lane two-way configuration and is a local road. Residential dwellings are located on both sides of Creek Street for most of its length. There are a number of recreational areas along this road. Creek Street intersects with the Illawarra Highway with stop-control.

There are no traffic counts available for this road. However, the traffic volume on Creek Street is expected to be in a similar order as the other non-freeway and non-arterial rural roads discussed in this section.

Based on the number of residential lots (Google Maps, 2008) and discussion with the Moss Vale Sewage Treatment Works facility (15 December 2008), the traffic volumes for Creek Street were estimated using the *RTA Guide to Traffic Generating Developments*, version 2.2 (RTA, October 2002) trip generation rates. It is estimated that Creek Street carries approximately 1,300 vehicles per day, with around three percent accounting for heavy vehicles.

2.5 Summary

Table 2-5 summarises the roads assessed in this Traffic Impact Assessment and states the source of the data for existing traffic volumes and estimates.

Table 2-5 Routes Assessed in Traffic Assessment

Route	Portion	Existing Traffic Data	Facilities	Water trucking – Marulan STP / WTP	Water trucking – Moss Vale STP
Canyonleigh Road	From the Brayton Road intersection to the Facility Site access	Estimated based on the number of dwellings by applying a trip rate in accordance with *RTA Guide to Traffic Generating Developments*, version 2.2 (RTA, October 2002).	✓	✓	✓
Brayton Road	East-west portion from Hume Highway	Traffic counts were conducted along Brayton Road for the Gunlake Quarry Project Environmental Assessment (Christopher Hallam and Associates, February 2008).	✓	✓	✓

Section 2 Existing Conditions

Route	Portion	Existing Traffic Data	Facilities	Water trucking – Marulan STP / WTP	Water trucking – Moss Vale STP
Brayton Road	North-south portion to the Canyonleigh Road intersection	Traffic counts were conducted along Brayton Road for the Gunlake Quarry Project Environmental Assessment (Christopher Hallam and Associates, February 2008).	✓	✓	✓
Red Hills Road		Traffic counts were conducted along Brayton Road for the Gunlake Quarry Project Environmental Assessment (Christopher Hallam and Associates, February 2008).	✓ (option)		✓ (option)
Hume Highway		RTA count station on the Hume Highway nearest to the Project site, north of the railway line, Marulan	✓	✓	✓
Illawarra Highway		Estimated based on the number of dwellings by applying a trip rate in accordance with *RTA Guide to Traffic Generating Developments*, version 2.2 (RTA, October 2002).			✓
Kennedy Close		Estimated based on the number of dwellings by applying a trip rate in accordance with *RTA Guide to Traffic Generating Developments*, version 2.2 (RTA, October 2002) and discussion with Moss Vale STP regarding existing operations.			✓
Creek Street		Estimated based on the number of dwellings by applying a trip rate in accordance with *RTA Guide to Traffic Generating Developments*, version 2.2 (RTA, October 2002) and discussion with Moss Vale STP regarding existing operations.			✓

Equipment Transportation

Section 3

3.1 Introduction

The large gas turbine, generator and high voltage transformer components are to be imported into Australia and transported to site by special road convoy. Typically the components might be up to 14 metres in length and five metres in width, 5.5 metres in height and weigh up to 400 tonnes.

3.2 Route Selection

It is anticipated the majority of heavy plant items would be transported from the Sydney or Wollongong metropolitan area along State Route 69 (Appin Road and Narellan Road) then the Hume Highway during the construction stage. However, the supplier and transporter may also elect to transport the heavy plant items from interstate, subject to a detailed heavy transport study.

When assessing the route for equipment transportation, the following elements are considered:

- grade along each route;
- width of cross-section;
- degree of works required to accommodate over-mass, over-dimension vehicles;
- cost; and
- directness of route.

It is anticipated that detailed condition surveys would be undertaken of all local roads prior to the transportation of gas turbine components and other ancillary equipment, and following the completion of construction. The condition assessment would determine potential damage to the road corridors as a result of the Project. The condition surveys would meet the requirements of RTA, Goulburn Mulwaree Council and Upper Lachlan Shire Council.

As part of the route selection process, a survey of the entire haulage route would be conducted by the civil contractor and would include:

- detailed maps;
- load limits on roads and structures;
- curves and grades along route;
- width and heights of tunnels along route;
- location of overhead powerlines;
- identification of areas that could be used for short-term parking; and
- any obstructions that could restrict transportation of the gas turbine components and equipment.

The final route selection would be the responsibility of the civil contractor and would be based on the results of the road condition assessment and road survey. The final route selection would then be submitted for approval to the Department of Planning as part of the Construction and Environmental Management Plan (CEMP).

Section 4 Delta Electricity Facility Traffic Generation

4.1 Equipment Transportation

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 the Delta Electricity facility.

An estimate of the vehicles required to deliver the gas turbine components and equipment is summarised in **Table 4-1**. The traffic generation associated with equipment transportation is assumed to be conducted during site establishment and limited to off-peak periods. This component has not been considered in the construction traffic generation.

Table 4-1 Turbine Components and Equipment Delivery Vehicle Requirements

Component	**Traffic Generation**		
	Semi-Trailer	Over-size	Over-mass
Cranes	9		
Bulldozers		1	
Scrapers		2	
Graders		2	
Excavators		5	
Backhoe excavators		3	
Compactor, rollers		5	
Turbine components			24[1]
Total	**9**	**18**	**24**

Notes:

1. Assumed six convoys of up to four over-mass / over-sized vehicles towing one multi-wheel transport unit.
2. It is assumed for the purpose of this study that the equipment delivered for use in Stage 1 would remain on-site for use in Stage 2, negating the need for additional transportation of equipment.

4.2 Construction Traffic

An estimate of the number of construction vehicle movements is summarised in **Table 4-2**. Construction traffic generation has been based upon typical construction practices and activities and the anticipated levels of staffing that are expected within each development stage. These estimates include construction personnel, delivery of water for construction purposes, removal of excavated material, delivery of construction materials and the transportation of equipment and plant.

Table 4-2 Construction Traffic Generation for Each Stage

	Duration (months)	**Vehicle Movements per Month**		**Vehicle Movements per Week**		**Vehicle Movements per Day**	
		Heavy	**Light**	**Heavy**	**Light**	**Heavy**	**Light**
Average	12	528	2112	132	528	24	96
Peak	3	1056	4224	264	1056	48	192

The construction traffic generation estimates indicate that the traffic volumes that are expected to occur in the peak three month period are double the expected monthly average over a twelve month period. For the

purposes of this assessment, the peak traffic volumes have been adopted to represent the worst case scenario. The peak daily construction traffic including heavy vehicles and light vehicles equates to 240 vehicle movements per day, which accounts for the 48 heavy vehicle movements plus the 192 light vehicle movements associated with the peak traffic generation.

Water Requirements - construction

The construction phase, which is approximately 12 to 18 months for each Facility, is estimated to have a water requirement of six to eight kilolitres per day. This requirement takes into account the following assumptions:

- number of construction personnel;
- minor allowances for wet trades during construction (for example, bricklaying / blocklaying and rendering) to small areas only;
- all concrete batching is off-site;
- no on-site construction camp or canteen facility (for example mess rooms. Showers and toilet facilities allowed for);
- no consumption for fire-fighting purposes considered; and
- no allowance for water sprays for dust control.

It is noted that water sprays for dust control could be considerable, depending on a number of aspects such as the condition of the road network and prevailing weather conditions. Water requirements for the construction of the Facilities could be up to 100 kilolitres per day during hot dusty windy weather.

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

4.3 Water Transportation - operation

To meet the operational water requirements for both the Delta Electricity Facility and EnergyAustralia 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 STP;
- Moss Vale STP; and/or
- Site stormwater runoff.

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

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

Section 4 Delta Electricity Facility Traffic Generation

- **Stage 1:** It is estimated that for a 40-day operational period per year approximately two trucks per day, equating to four vehicle movements per day, would be required to provide the water volume necessary for the operation;
- **Stage 2:** It is estimated that for a 330-day operational period per year approximately 6.5 trucks per day, equating to 13 vehicle movements per day, would be required to provide the water volume necessary for operation;
- To initially charge the system (to fill the raw water storage tank to approximately 800 kilolitres), 27 tanker deliveries would be required. It is 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; and
- The water requirement for the Delta Electricity Stage 1 Facility is 2.3 mega litres per annum and Delta Electricity Stage 2 Facility is 63.5 mega litres per annum; and
- Water is delivered to Site in 30,000-litre tankers.

4.4 Operation and Maintenance Traffic

For Stage 1, it is likely that minimal permanent staff would be required since the gas turbine control system would be automated. However, routine inspections of the plant have been assumed. **Table 4-3** summarises the staff requirements and traffic generation for both stages of the Delta Electricity Facility. In order to present a worst-case scenario, it is assumed there is no car-pooling amongst employees, for example, each employee uses their own private transport to and from the site each day. It is assumed that all vehicle trips are made by light vehicle.

Table 4-3 Operation and Maintenance Staff Requirements and Traffic Generation

Task	Stage 1		Stage 2	
	Staff	Vehicle Movements per Day	Staff	Vehicle Movements per Day
Shift operating teams	2	4	10	20
Mechanical maintenance			2	4
Electrical maintenance			2	4
Station Manager			1	2
Production Manager			1	2
Store-person			1	2
Secretary			1	2
General maintenance / contractors	2	4	2	4
Total	**4**	**8**	**20**	**40**

Source: Burns and Roe Worley Pty Ltd, 13 September 2006.

Delta Electricity Facility Traffic Generation

Major facility maintenance phase

Major maintenance is expected to generate additional traffic of up to 60 vehicles per maintenance period. Such activities would occur relatively infrequently, that is every six years or more, and would last approximately three to six weeks. For traffic analysis purposes a peak daily value of 120 vehicle movements per day for the Delta Electricity Facility has been adopted which follows the construction traffic paradigm of peak volume being twice the average value.

Section 5 EnergyAustralia Facility Traffic Generation

5.1 Equipment Transportation

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 a single stage for the EnergyAustralia Facility.

An estimate of the vehicles required to deliver the gas turbine components and equipment is summarised in **Table 5-1**. The traffic generation associated with equipment transportation is assumed to be conducted during site establishment and limited to off-peak periods. This component has not been considered in the construction traffic generation.

Table 5-1 Turbine Components and Equipment Delivery Vehicle Requirements

Component	**Traffic Generation**		
	Semi-Trailer	Over-size	Over-mass
Cranes	9		
Bulldozers		1	
Scrapers		2	
Graders		2	
Excavators		5	
Backhoe excavators		3	
Compactor, rollers		5	
Turbine components			24[1]
Total	**9**	**18**	**24**

Notes:

1. Assumed six convoys of up to four over-mass / over-sized vehicles towing one multi-wheel transport unit.

5.2 Construction Traffic

The number of predicted construction vehicle movements is summarised in **Table 5-2**. Construction traffic generation has been based upon usual construction practices and activities and the anticipated levels of staffing that are expected for the construction of the EnergyAustralia Facility. These estimates include transport of water required for construction, construction material delivery and removal, construction personnel to and from the site and transportation of plant and equipment.

Table 5-2 Construction Traffic Generation

	Duration	**Vehicle Movements per Month**		**Vehicle Movements per Week**		**Vehicle Movements per Day**	
		Heavy	**Light**	**Heavy**	**Light**	**Heavy**	**Light**
Average	12	528	2112	132	528	24	96
Peak	3	1056	4224	264	1056	48	192

These estimates indicate that the traffic volumes that are expected to occur in the peak three month period are double the expected monthly average over a twelve 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 and light vehicles equates to 240 vehicle movements per day, which accounts for the 48 heavy vehicle movements plus the 192 light vehicle movements associated with the peak traffic generation..

Water Requirements

The construction phase, which is approximately 12 to 18 months for the EnergyAustralia Facility, is estimated to have a water requirement of six to eight kilolitres per day. This requirement takes into account the following assumptions:

- number of construction personnel;
- minor allowances for wet trades during construction (for example, bricklaying / blocklaying and rendering) to small areas only;
- all concrete batching is off-site;
- no on-site construction camp or canteen facility (for example mess rooms. Showers and toilet facilities allowed for);
- no consumption for fire-fighting purposes considered; and
- no allowance for water sprays for dust control.

It is noted that water sprays for dust control could be considerable, depending on a number of aspects such as the condition of the road network and prevailing weather conditions. Water requirements for the construction of the EnergyAustralia Facility could be up to 100 kilolitres per day during hot dusty windy weather.

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

5.3 Water Transportation

To meet the operational water requirements for both the Delta Electricity Facility and EnergyAustralia 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 STP;
- Moss Vale STP; and/or
- Site stormwater runoff.

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

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

- it is estimated that for a 40-day operational period per year approximately ten trucks per day, equating to 20 vehicle movements per day would be required to provide the water volume necessary for the operation of the EnergyAustralia Facility;

Section 5 EnergyAustralia Facility Traffic Generation

- 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 has therefore not been included in this assessment;
- the water requirement for the EnergyAustralia Facility is 12 mega litres per annum; and
- water is delivered to Site in 30,000-litre tankers.

5.4 Operational Traffic

During the operational phase, the number of staff required for the EnergyAustralia Facility is expected to average two full time staff on-site with two contract staff for support service, which is a total of four staff per day. This equates to a traffic generation of eight light vehicle movements per day.

Major Facility Maintenance

Major maintenance is expected to generate additional traffic of up to 60 vehicles per maintenance period. Such activities would occur relatively infrequently, that is every six years or more, and would last approximately three to six weeks. For traffic analysis purposes a peak daily value of 120 vehicle movements per day for the EnergyAustralia Facility has been adopted which follows the construction traffic paradigm of peak volume being twice the average value.

Cumulative Traffic Generation

6.1 Construction Staging

It has been assumed that the construction of the Delta Electricity Facility will be undertaken in the following main stages:

1) Site preparation.

2) Stage 1 plant construction.

3) Convert the initial open cycle plant constructed in Stage 1 to a combined cycle plant for Stage 2.

It has been assumed that the construction of the EnergyAustralia Facility will be undertaken in two main stages: site preparation and plant construction.

The exact timing of the construction of these two Facilities is unknown at this time. The overlap in the staging of the construction will affect the predicted peak traffic conditions so it is assumed that traffic will be generated under the following conditions:

- The Site works are assumed to be undertaken at the same time for both Facilities and would take approximately six months to complete. This scenario is addressed in the *Traffic Assessment for Site Preparation Works* for the *Concept Application*.
- The EnergyAustralia Facility would be constructed in one stage and it has been assumed that this would take 12 months to complete. The Delta Electricity Facility would be constructed in two stages and it has been assumed construction would take 12 months for the first stage and 18 months for the second stage.

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:

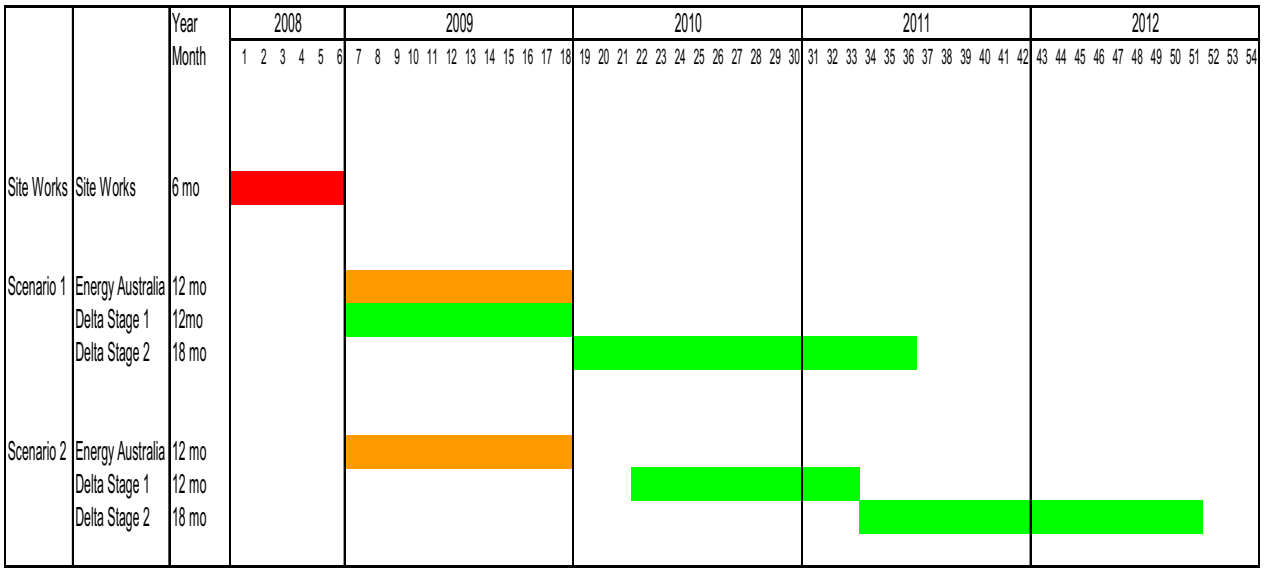
- Scenario 1: Two Facilities constructed at the same time, including EnergyAustralia and Delta Electricity Stage 1 followed some time after completion of Stage 1 by Delta Electricity Stage 2.
- Scenario 2: EnergyAustralia Facility is constructed first with some time lag to the construction of Delta Electricity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

Of the two scenarios, Scenario 1 represents the worst case in terms of peak traffic volumes. The relationship of the elements of these two scenarios is presented graphically in **Figure 6-1**.

It is noted that as stated in the Environmental Assessment, at this time the expected sequencing of the construction of the two Facilities is that EnergyAustralia would progress before Delta Electricity. Therefore Scenario 1 is a conservative peak traffic assumption.

Section 6 Cumulative Traffic Generation

Figure 6-1 Construction Scenarios



6.2 Equipment Transportation

As the Facilities are being constructed either simultaneously or consecutively, the total 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 number of over-dimensional vehicles could occur within a peak period of up to six months for Scenario 1 or spread over eighteen months for Scenario 2.

An estimate of the vehicles required to deliver the gas turbine components and equipment is summarised in **Table 6-1**. The traffic generation associated with equipment transportation is assumed to be conducted during site establishment and limited to off-peak periods. This component has not been considered in the construction traffic generation.

Table 6-1 Turbine Component and Equipment Delivery Vehicle Requirements

Component	**Traffic Generation**		
	Semi-Trailer	Over-size	Over-mass
Cranes	18		
Bulldozers		2	
Scrapers		4	
Graders		4	
Excavators		10	
Backhoe excavators		6	
Compactor, rollers		10	
Turbine components			48[1]
Total	**18**	**36**	**48**

Notes:

1. Assumed six convoys of up to four over-mass / over-sized vehicles towing one multi-wheel transport unit.

6.3 Construction Traffic

Construction Scenario 1

This scenario assumes that the two Facilities are constructed at the same time. The estimates for Stage 1 data shown in **Table 6-2** include construction of both the EnergyAustralia Facility and Stage 1 of the Delta Electricity Facility. It is assumed that traffic generated for each of these Facilities would be very similar throughout the construction phase. The estimates for Stage 2 shown in **Table 5-1** include only construction of Stage 2 of the Delta Electricity Facility.

Table 6-2 Construction Traffic Generation Estimates - Scenario 1

	Duration (months)	Vehicle Movements per Month		Vehicle Movements per Week		Vehicle Movements per Day	
		Heavy	Light	Heavy	Light	Heavy	Light
EnergyAustralia Facility PLUS Delta Electricity Stage 1 Facility							
Average	12	1056	4224	264	1056	48	192
Peak	3	2112	8448	528	2112	96	384
Delta Electricity Stage 2 Facility							
Average	12	528	2112	132	528	24	96
Peak	3	1056	4224	264	1056	48	192

The table shows that the traffic volumes that are expected to occur in the peak three-month period are double the expected monthly average over a twelve-month period. For the purposes of this assessment, the peak traffic volumes have been adopted to represent the worst-case scenario.

The peak daily construction traffic including heavy vehicles and light vehicles equates to 480 vehicle movements per day for Scenario 1, which accounts for the EnergyAustralia and Delta Electricity Stage 1 Facilities being constructed at the same time. The 480 vehicle movements per day accounts for 96 heavy vehicle movements and 384 light vehicle movements per day, associated with the peak construction traffic generation for Scenario 1.

The peak daily construction traffic including heavy vehicles and light vehicles equates to 240 vehicle movements per day for the Delta Electricity Stage 2, which accounts for 48 heavy vehicle movements and 192 light vehicle movements per day associated with peak construction traffic generation.

Construction Scenario 2

The assumption for this scenario is that the two Facilities are constructed consecutively, that is, one Facility is completed then the other one starts, with some time lag. **Table 6-3** summarises the traffic generated for this scenario. The local network would experience lower peak construction traffic than the Scenario 1, however construction would occur over a longer period, as Delta Electricity Stage 2 would require an additional 18 months to finalise the works for a total construction period of up to 51 months.

Section 6 Cumulative Traffic Generation

Table 6-3 Construction Traffic Generation Estimates - Scenario 2

	Duration (months)	Vehicle Movements per Month		Vehicle Movements per Week		Vehicle Movements per Day	
		Heavy	Light	Heavy	Light	Heavy	Light
EnergyAustralia Facility OR Delta Electricity Stage 1 Facility							
Average	12	528	2112	132	528	24	96
Peak	3	1056	4224	264	1056	48	192
Delta Electricity Stage 2 Facility							
Average	12	528	2112	132	528	24	96
Peak	3	1056	4224	264	1056	48	192

The table indicates that the traffic volumes that are expected to occur in the peak three-month period are double the expected monthly average over a twelve-month period. For the purposes of this assessment, the peak traffic volumes have been adopted, which is representative of the worst-case scenario.]

The peak daily construction traffic including heavy vehicles and light vehicles equates to 240 vehicle movements per day for Scenario 2, which accounts for the EnergyAustralia and Delta Electricity Stage 1 Facilities being constructed sequentially. The 240 vehicle movements per day accounts for 48 heavy vehicle movements and 192 light vehicle movements per day, associated with the peak construction traffic generation.

The peak daily construction traffic for Delta Electricity Stage 2 remains unchanged from Scenario 1, with a total of 240 vehicle movements per day, accounting for 48 heavy vehicle movements and 192 light vehicle movements per day, associated with the peak construction traffic generation.

6.4 Water Transportation

Potential water sources for the Delta Electricity and EnergyAustralia Facilities for potable, recycled and stormwater were identified in Sections 4.3 and 5.3.

To summarise the water transportation associated with the Delta Electricity and EnergyAustralia Facilities, the following assumptions have been made:

- Regular daily vehicle movements for operations staff of some 16 to 48 vehicle movements per day. This 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 equating to 20 vehicle movements per day, would be required to provide the water volume necessary for operation of the Facility.
- **Delta Electricity Stage 1 Facility:** It is estimated that for a 40-day operational period per year, approximately two trucks per day equating to four vehicle movements per day, would be required to provide the water volume necessary for the operation of the Facility.
- **Delta Electricity Stage 2 Facility:** It is estimated that for a 330-day operational period per year, approximately 6.5 trucks per day, equating to 13 vehicle movements per day, would be required to provide the water volume necessary for operation.

- 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.

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

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

6.5 Operational Traffic

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 light vehicle movements per day.

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 up to 48 light vehicle movements per day.

For the purpose of this study it is assumed that all operational trips to and from the site would be via Brayton Road, turning east onto Canyonleigh Road. It is assumed that these trips would occur within the usual weekday peak periods.

Major Facility Maintenance Phase

Major maintenance is expected to generate 20 to 60 vehicle movements in the peak hour and 25 to 120 vehicle movements per day. Such activities would occur relatively infrequently, approximately every six years or more, and would last in the order of three to six weeks. This assumes that maintenance occurs on one facility only at any one time. It would be unlikely that both facilities would be off-line for maintenance together.

Section 7 Cumulative Impact Assessment of Traffic Generation

7.1 Access Arrangements

The access road into the Marulan Site has been considered in two portions:

- Access Road - University Road: being the portion over the existing University of Sydney property access road via Canyonleigh Road; and
- Access Road - New Site Access Road: new portion of road into the Marulan Site via University Road.

Access Road - University Road

The access to the site from Canyonleigh Road uses an existing road easement along the northern side of the University of Sydney property and the TransGrid Switchyard. The route currently consists of a gravel surface and has grades of up to eight percent. These grades would need to be adjusted through earthworks and the road requires widening to suit construction traffic. The final design of the access road would be determined in detailed design.

Access Road - New Site Access Road

Three alignment options were developed for the access road within the Site, as illustrated in **Figure 7-1**. The alignment options all connect to University Road at the same point adjacent to the high voltage transmission line easement. Option B was determined as the preferred alignment. The preferred route optimised the cost of construction and the impact on existing vegetation within the Site based on the vegetation studies at that time. Option C represents the worst-case scenario for the amount of vegetation required for clearing. 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 clearing. The detailed design phase will refine the alignment of this access road.

Further studies of the vegetation were undertaken identifying an area of vegetation as an Endangered Ecological Community (Box-Gum Woodland) and further refinements were undertaken for Option D-1 to avoid this EEC. Subsequently Option D-2 was developed and is the proposed alignment.

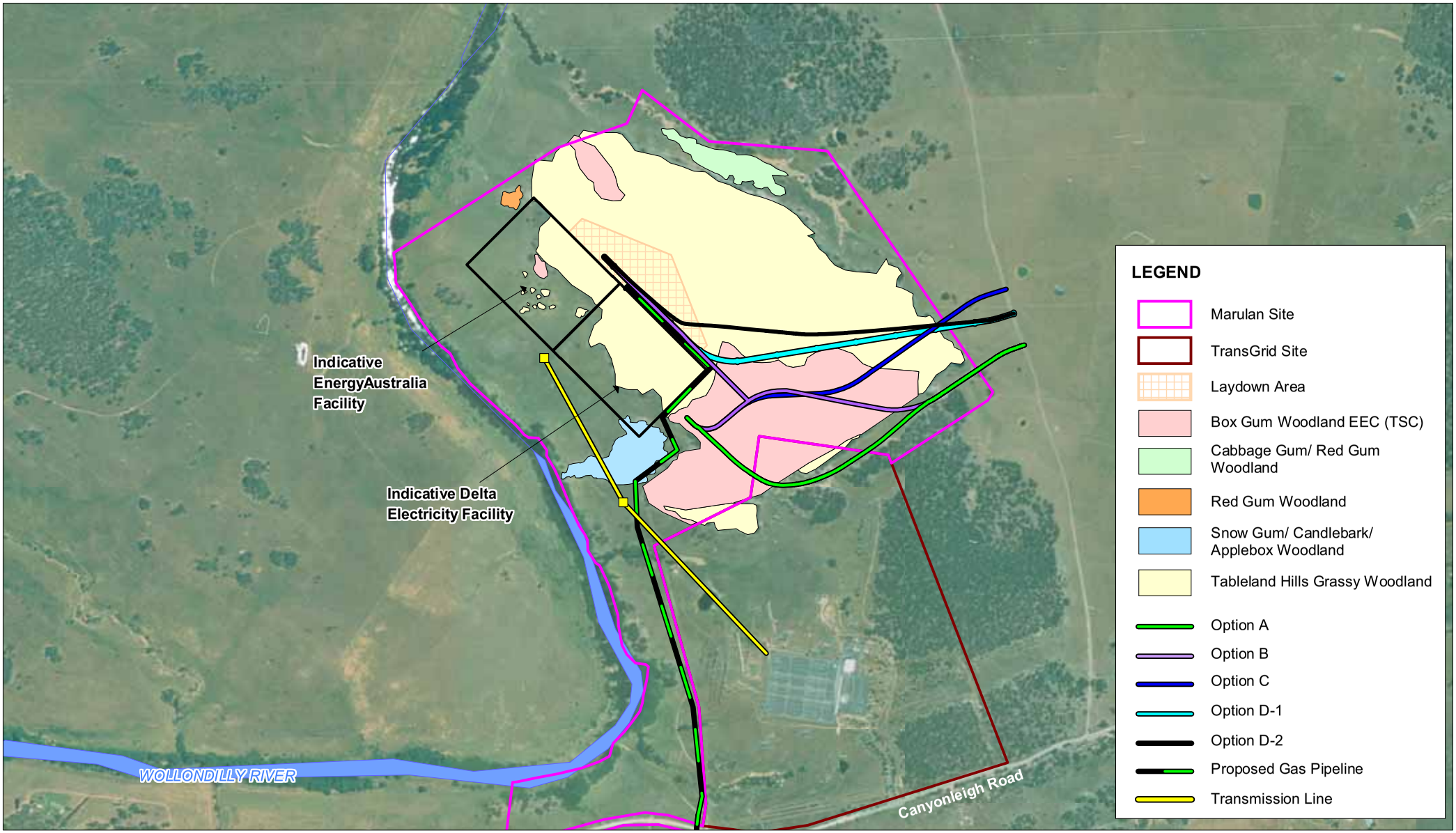
7.2 Surrounding Development – Approved Gunlake Quarry Project

The approved Gunlake Quarry Project proposes the development of a quarry, located off Brayton Road approximately eight kilometres north-west of Marulan township.

Ultimate production levels would be realised in Stage 2 of the Gunlake Quarry Project, with 500,000 tonnes per annum, which has an estimated traffic generation of 100 heavy vehicle movements per day.

For Stage 1 of the Gunlake Quarry Project, the truck haulage route is proposed along Brayton Road from the site to the Hume Highway. Stage 1 road works include the widening of Brayton Road to provide a seven-metre sealed pavement, between the Gunlake Quarry site and the access to Johnniefelds Quarry. A roundabout is proposed for the intersection of Brayton Road and George Street.

For Stage 2 of the Gunlake Quarry Project, it is proposed to construct a new by-pass route connecting Brayton Road with Red Hills Road, which connects with the Hume Highway. This by-pass route would consist of a seven-metre sealed pavement. The intersection of Red Hills Road and the Hume Highway would be restricted to left-in / left-out control. This would require vehicles travelling south on the Hume Highway to proceed south past Red Hills Road to the Marulan truck checking station. At this interchange, vehicles would make a U-turn manoeuvre at the proposed roundabout at the Brayton Road / George Street intersection, to return to the northbound carriageway of the Hume Highway in order to make a left-turn into Red Hills Road.



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Source: Delta Electricity, EnergyAustralia

Client: DELTA ELECTRICITY AND ENERGYAUSTRALIA	Project: MARULAN GAS TURBINE FACILITIES - TRAFFIC ASSESSMENT	Title: **ROAD ACCESS OPTIONS**
URS	Drawn: AO; Approved: NB; Date: 04/03/2009 Job No: **43177371**; File No: 43177371-231.wor	Figure: **7-1**

7.3 Impacts on Existing Road Conditions

Based on the existing conditions and the cumulative traffic generation for the Project, the impacts on the local road network, relative to their Levels of Service, are summarised in the following subsections. These impacts assume construction Scenario 1 is adopted to account for the worst-case scenario.

Construction Phase

The main impacts from construction traffic are likely to occur:

- during the morning peak between 0700 and 0900 when construction staff and early delivery vehicles coincide with the Brayton Road peak;
- through regular daily traffic generated by delivery trucks for equipment, plant and materials with intermittent peaks associated with concrete pours; and
- occasionally, outside of peak periods, through the delivery of large equipment (turbines, generators, transformers) from Port to the site.

The impact of construction traffic has been reviewed with respect to:

- traffic capacity on the roads surrounding the site;
- transportation of water via roads surrounding the Moss Vale STP;
- safety; and
- access for over-mass and over-dimension vehicles.

Operational phase

The operational phase for the Project has been assumed to include traffic associated with both Facilities. This would generate regular daily vehicle trips of up to 48 vehicle movements per hour in peak periods.

Provision of water supply for the plant cooling and process water would be by truck. The traffic generation associated with this activity has been included in the impacts assessment.

It is assumed that parking would be provided on-site for plant employees and business vehicles in accordance with RTA and Council requirements.

Major facility maintenance phase

Major maintenance is expected to generate additional traffic of up to 60 vehicles per day. Such activities would occur relatively infrequently, approximately every six years or more, and would last in the order of three to six weeks. For traffic analysis purposes a peak daily volume of 120 vehicle movements per day per Facility has been adopted to account for the worst-case scenario.

7.3.1 Gas Turbine Facility Locality

Canyonleigh Road

The impact on Canyonleigh Road with respect to increased traffic volumes is summarised in **Table 7-1**. All traffic volumes account for total vehicle movements.

Table 7-1 Estimated Weekday Traffic Flow Impacts – Canyonleigh Road

Activity	Average Daily Traffic (Construction)	Average Daily Traffic (Operation)[1]	Average Daily Traffic (Major Maintenance)
No Development			
Traffic Flow	470	470	470
Level of Service	A	A	A
With Development (Scenario 1)			
Construction Traffic Flow during peak construction month	480	0	0
Major Facility Maintenance after 6 years	0	0	120
Water Delivery	0	33	33
Operational Traffic	0	48	48
Total Traffic Flow during peak construction month	950[2]	551[4]	671[5]
Percentage Change (from No Development)	+102%	+17%	+43%
Midblock Level of Service (LoS)	A	A	A
With Development (Scenario 2)			
Construction Traffic Flow during peak construction month	240	0	0
Major Facility Maintenance after 6 years	0	0	120
Water Delivery	0	33	33
Operational Traffic	0	40	48
Total Traffic Flow during peak construction month	710[3]	551[4]	671
Percentage Change (from No Development)	+51%	+17%	+43%
Midblock Level of Service (LoS)	A	A	A

Notes:

1. Operational traffic assumes completion of the Project.
2. Approximately 25 percent heavy vehicle component;
3. Approximately 27 percent heavy vehicle component;
4. Approximately 26 percent heavy vehicle component;
5. Approximately 27 percent heavy vehicle component; and
6. Levels of Service are in accordance with Guide to Traffic Generating Practice, Part 2: Roadway Capacity (AUSTROADS, 1999).

Analysis of **Table 7-1** for the Project indicates the following key elements:

- Peak traffic during construction would be approximately 102 percent higher for Scenario 1 than current levels. Despite this increase in daily traffic volumes, the Level of Service for Canyonleigh Road remains unchanged at Level of Service A.

- Peak traffic during normal operation of the Project would be approximately 17 percent higher than current traffic levels.
- Peak traffic during times of major Facility maintenance (expected approximately every six years for a period of up to six weeks) is approximately 43 percent higher than current traffic levels.

In the peak periods the Level of Service is maintained at Level of Service A, which is acceptable for Canyonleigh Road during the periods indicated.

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 this scenario is unlikely to occur.

Brayton Road

The impact on Brayton Road, south of Johnniefelds Quarry with respect to increased traffic volumes is summarised in **Table 7-2**. The traffic flows presented in **Table 7-2** do not include the traffic generated by the approved Gunlake Quarry Project. All traffic volumes account for total vehicle movements.

Table 7-2 Estimated Weekday Traffic Flow Impacts – Brayton Road, South of Johnniefelds Quarry

Activity	Average Daily Traffic (Construction)	Average Daily Traffic (Operation)[1]	Average Daily Traffic (Major Maintenance)
No Development			
Traffic Flow	400	400	400
Level of Service	A	A	A
With Development (Scenario 1)			
Construction Traffic Flow during peak construction month	480	0	0
Major Facility Maintenance after 6 years	0	0	120
Water Delivery	0	33	33
Operational Traffic	0	48	48
Total Traffic Flow during peak construction month	880[2]	481[4]	601[5]
Percentage Change (from No Development)	+120%	+20%	+50%
Midblock Level of Service (LoS)	B	A	A
With Development (Scenario 2)			
Construction Traffic Flow during peak construction month	240	0	0
Major Facility Maintenance after 6 years	0	0	120
Water Delivery	0	33	33
Operational Traffic	0	40	48
Total Traffic Flow during peak construction month	640[3]	473[4]	601
Percentage Change (from No Development)	+60%	+18%	+50%
Midblock Level of Service (LoS)	A	A	A

Notes:

1. Operational traffic assumes completion of the Project.
2. Approximately 55 percent heavy vehicle component;
3. Approximately 27 percent heavy vehicle component;
4. Approximately 26 percent heavy vehicle component;
5. Approximately 26 percent of heavy vehicle component; and
6. Levels of Service are in accordance with Guide to Traffic Generating Practice, Part 2: Roadway Capacity (AUSTROADS, 1999).

Analysis of **Table 7-2** for the Project indicates the following key elements, which is relevant to the traffic count station south of Johnniefelds Quarry:

- Peak traffic during construction would be approximately 120 percent higher for Scenario 1 than current levels. The Level of Service for Brayton Road decreases to Level of Service B. This is still considered an acceptable Level of Service for the operation of Brayton Road.
- Peak traffic during normal operation of the Project would be approximately 20 percent higher than current levels. The Level of Service remains unchanged at Level of Service A.
- Peak traffic during times of major Facility maintenance (expected approximately every six years for a period of up to six weeks) would be approximately 50 percent higher than current levels.

The impact on Brayton Road, east of Wollondilly Street with respect to increased traffic volumes is summarised in **Table 7-3**. The traffic flows presented in **Table 7-3** do not include the traffic generated by the approved Gunlake Quarry Project. All traffic volumes account for total vehicle movements.

Table 7-3 Estimated Weekday Traffic Flow Impacts – Brayton Road, east of Wollondilly Street

Activity	Average Daily Traffic (Construction)	Average Daily Traffic (Operation)[1]	Average Daily Traffic (Major Maintenance)
No Development			
Traffic Flow	900	900	900
Level of Service	A	A	A
With Development (Scenario 1)			
Construction Traffic Flow during peak construction month	480	0	0
Major Facility Maintenance after 6 years	0	0	120
Water Delivery	0	33	33
Operational Traffic	0	48	48
Total Traffic Flow during peak construction month	1,380[2]	981[4]	1,101[5]
Percentage Change (from No Development)	+53%	+9%	+22%
Midblock Level of Service (LoS)	A	A	A
With Development (Scenario 2)			
Construction Traffic Flow during peak construction month	240	0	0
Major Facility Maintenance after 6 years	0	0	120
Water Delivery	0	33	33
Operational Traffic	0	40	48
Total Traffic Flow during peak construction month	1,140[3]	973[4]	1,101

Section 7 Cumulative Impact Assessment of Traffic Generation

Activity	Average Daily Traffic (Construction)	Average Daily Traffic (Operation)[1]	Average Daily Traffic (Major Maintenance)
Percentage Change (from No Development)	+27%	+8%	+22%
Midblock Level of Service (LoS)	A	A	A

Notes:

1. Operational traffic assumes completion of the Project.
2. Approximately 20 percent heavy vehicle component;
3. Approximately 20 percent heavy vehicle component;
4. Approximately 17 percent heavy vehicle component;
5. Approximately 15 percent heavy vehicle component; and
6. Levels of Service are in accordance with Guide to Traffic Generating Practice, Part 2: Roadway Capacity (AUSTROADS, 1999).

Analysis of **Table 7-3** for the Project indicates the following key elements, which is relevant to the traffic count station east of Wollondilly Street:

- Peak traffic during construction would be approximately 53 percent higher for Scenario 1 than current levels. The Level of Service for Brayton Road remains unchanged at Level of Service A for this location.
- Peak traffic during normal operation of the Project would be approximately 9 percent higher than current levels. The Level of Service remains unchanged at Level of Service A.
- Peak traffic during times of major Facility maintenance (expected approximately every six years for a period of up to six weeks) would be approximately 22 percent higher than current levels.

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 same reasons noted above in regard to Canyonleigh Road.

The approved Gunlake Quarry Project includes the following recommended road works for Brayton Road:

- Widening between the Gunlake Quarry site and the Johnniefelds Quarry to provide a seven-metre sealed pavement.
- Construction of a roundabout at the intersection of Brayton Road and George Street.
- Construction of an intersection on Brayton Road with new by-pass to Red Hills Road.

Assuming that the construction phase for the Facilities occurs when the Gunlake Quarry Project is in Stage 2 of its proposal, an additional 100 heavy vehicle movements per day generated by the Gunlake Quarry Project would be added to the traffic flows estimated in **Table 7-2** and **7-3**. The heavy vehicle movements generated by Stage 2 of the Gunlake Quarry Project would utilise Brayton Road for a short section between the proposed Red Hills Road by-pass and the Gunlake Quarry access. Therefore, in conjunction with the construction traffic for the Gas Turbine Facilities the operation of Brayton Road is likely to remain in line with the results presented in **Table 7-2** for the majority of its length, with the exception of the section between the Red Hills Road by-pass and the Gunlake Quarry Access. For this section of Brayton Road (south of Johnniefelds Quarry), however, the Level of Service would remain at B for Scenario 1 and A for Scenario 2 of this Project.

Following the construction of the Red Hills Road by-pass, water delivery vehicles during the operational phase of the Facilities could utilise this route to minimise the number of heavy vehicles accessing the section of Brayton Road, which passes through Marulan.

Hume Highway

Based on the RTA count station on the Hume Highway nearest to the Project Site, north of the railway line, Marulan, the traffic generated by Scenario 1 during construction (worst-case) and the operation of the Facilities would be negligible compared to the existing traffic volumes and impacts are likely to be insignificant. The Hume Highway is an existing freight route between Sydney and Melbourne and is therefore designed to accommodate significant volumes of heavy vehicles.

7.3.2 Moss Vale STP Locality

Illawarra Highway

During the operation of the Facilities, should water be sourced from Moss Vale STP, up to 33 water tankers are likely to use the Illawarra Highway. Considering the existing traffic volume on the Illawarra Highway, these additional vehicle movements are likely to have an insignificant impact on the operation of this route and will be absorbed into the existing traffic flow.

Kennedy Close

During the operation of the Facilities, should water be sourced from Moss Vale STP, up to 33 water tankers are likely to use the Kennedy Close. It is assumed that since this road is used as an access route to the Moss Vale STP, the road is suitable for water tanker use and the additional vehicles are likely to have minimal impact of the existing road environment.

The use of Kennedy Close by water delivery vehicles would be considered in a detailed Traffic Management Plan for the overall operation of the Project.

Creek Street

During the operation of the Facilities, should water be sourced from Moss Vale STP, up to 33 water tankers are likely to use Creek Street. It is assumed that since this road is used as an access route to the Moss Vale STP, the road is suitable for water tanker use and the additional vehicles are likely to have minimal impact of the existing road environment.

Similarly to Kennedy Close, the use of Creek Street by water delivery vehicles would be considered in a detailed Traffic Management Plan for the overall operation of the Project.

Section 8 Mitigation and Management Measures

8.1 Equipment Transportation

The civil contractor would be responsible for developing the Transport Plan as part of obtaining approvals from the RTA and Local Councils. Preliminary mitigation measures proposed for minimising impacts associated with the transportation of turbine components and equipment include:

- Commissioning a licensed haulage contractor, with the experience and equipment required to transport over-mass, over-dimension loads. The contractor would have a working knowledge of the approvals process and an established relationship with the relevant road authorities. The civil contractor would be responsible for:
  - applying for and obtaining the relevant approvals for the haulage of all turbine components and associated equipment;
  - the final route selection and provision of a detailed Transport Plan, including mode of transport, schedule for transport and requirements for modifications to existing infrastructure;
  - compliance with approvals and permits obtained from the relevant road authorities;
  - meeting the requirements of construction schedules, including on-time delivery of turbine components and equipment, whilst complying with the requirements of the permits and approvals;
  - conduct a detailed road survey and conditions assessment before haulage and after haulage; and
  - meet the requirements of the Traffic Management Plan, such the implementation of warning signage at key location along the haulage route.
- A Traffic Management Plan would be developed to ensure impacts are minimised during haulage and safety principles are maintained throughout the activities. This would include the development of a community consultation plan.
- Design of access points to the Site to comply with requirements of the RTA, Goulburn Mulwaree Council and Upper Lachlan Shire Council, ensuring safety is maintained and vehicle access is appropriate for the design vehicles.
- The design and construction of the internal road access is suitable for over-mass, over-dimension vehicle access.

A significant portion of the haulage route along Canyonleigh Road is unsealed. The sealing of Canyonleigh Road between Brayton Road and the Site access would improve access for haulage vehicles and minimise wearing damage of the road.

Along the Brayton Road portion of the access route, widening of the route will be required to enable passage of over-mass, over-dimension vehicles. Further assessment and planning would be required in the detailed design phase to identify and cater for any necessary remedial treatments to facilitate passage once the actual weight and dimensions of the proposed plant are known.

8.2 Construction Traffic

A detailed Traffic Management Plan would be developed for the construction phase of the project in accordance with *Traffic Control at Worksites*, Version 3.1 (RTA, April 2006). Traffic Management Plan would include:

- Hours of haulage, which do not impose on peak periods and school pick-up and drop-off times, limiting the number of trips per day.
- Haulage routes, including the source locations and their access points as well as access points for the site.
- Design and construction of access from Canyonleigh Road in accordance with RTA and Council requirements.
- Design and construction of site access roads to allow safe movement within the site.
- A community consultation plan to ensure the local residents are informed prior to and during haulage activities. This would include the provision of a dedicated telephone contact line for community issues to be registered and addressed.
- The design of temporary works required to accommodate the haulage vehicles along Brayton Road and Canyonleigh Road, including intersection treatments, speed zoning, traffic control devices such as signage and linemarking and modifications to street furniture and structures.
- Deviation of traffic, pedestrians and cyclists during haulage at sensitive or busy locations.
- Designated areas within the site for truck turning movements, parking, loading and unloading.
- Sequence for implementing traffic works and traffic management devices.
- Safety principles for haulage activities, such as speed limits around the site and procedures for activities.
- Procedures for inspections and record keeping for maintaining traffic control measures.

A significant portion of the route along Canyonleigh Road which would be utilised by construction traffic is unsealed. The sealing of Canyonleigh Road between Brayton Road and the site access would improve access for haulage vehicles and minimise wearing damage of the road.

8.3 Operational Traffic

Operational traffic is likely to have minimal impact on the existing road network compared to the traffic generated by the construction phase.

At the commencement of the operational phase, the mitigation measures identified for the equipment transportation and construction traffic would be completed. An additional mitigation measure associated with operational traffic involves the development of a detailed Traffic Management Plan for the operational phase, which would detail the procedures for moving around the site, transportation of water from the preferred source, unloading facilities for water trucks and parking provision for delivery vehicles, employees and maintenance vehicles.

Section 8 Mitigation and Management Measures

8.4 Summary of Mitigation Measures

Table 8-1 summarises the mitigation and management measures to minimise the impacts of traffic generated by the Project.

Table 8-1 Summary of Mitigation and Management Measures

Mitigation Measure	Implementation		
	Design	Construction	Operation
Development of detailed Transport Plan (including obtaining approvals) for the transportation of turbine components and equipment.	✓	✓	
A Traffic Management Plan would be developed as part of the Construction Environmental Management Plan and Operation Environmental Management Plan addressing detailed traffic management measures and include measures to address: ○ Safety ○ Potential hazards – eg flooding, stock ○ Maintenance of road ○ Cumulative impacts with other movements for quarries		✓	✓
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; ○ identify any flood potential and remedial works required for the access to the Site along Brayton and Canyonleigh Road; and ○ in consultation with Goulburn Mulwaree and Upper Lachlan Shire Councils.	✓		
Construct new access roads within the Marulan Site.		✓	