QGC – TRANSPORT STUDIES (PIPELINE COMPONENT)

Road impact assessment report – March 2009

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INTRODUCTION

This report sets out the impact assessment on transport infrastructure of the construction and operation of the transmission pipelines component of the Queensland Gas Company's (QGC) proposed Liquefied Natural Gas (LNG) Project.

The three proposed pipelines are as follows:

- *Export pipeline:* A 380 km gas transmission line from approximately 9 km east of Miles to an LNG processing plant at Curtis Island on the northern side of Gladstone Harbour (Appendix A)
- *Upstream infrastructure corridor (UIC):* Approximately 210 km of gas pipeline (collection header) and parallel water pipeline, spanning from south-west of Dalby at its eastern end to the south-west of Wandoan at its western end (Appendix C)
- *Lateral pipeline:* A 153 km gas transmission line from the vicinity of the existing Fairview gas fields in the west, spanning east until it intersects the export pipeline.(Appendix F)

This report examines the quantity of traffic generated during the construction of the pipelines as well as quantifying the impact which this traffic will have on the state controlled road network throughout the areas affected by the construction.

The impact on the state controlled network for the duration of construction for the pipelines has been assessed in accordance with Queensland's Department of Main Roads *Guidelines for assessment of road impacts of development* (2006) (DMR Guidelines) for this report.

The assessment of impacts for local government controlled road network will be on the basis of agreement between QGC and the relevant authority on the condition of affected roads prior to the project traffic using particular roads. These roads will be maintained to a similar minimum standard while project traffic is using the road and after project traffic ceases to use the road.

DEVELOPMENT / ROAD USE PROFILE

Project description

The project involves the development of three gas transmission pipelines. The collection header will transport the majority of the supply of CSG from the Surat Basin in southern Queensland to the start of the export pipeline, located approximately 9 km east of Miles. QGC has also made provisions for existing coal seam gas (CSG) fields adjacent to the export pipeline to provide an aggregation of gas supplies to the Gladstone market via a lateral pipeline.

Haulage options

Seven alternative haulage options were assessed to determine the most efficient means of hauling the pipes along the state controlled network to specific construction sites.

Of the seven options, *Option 1B* (Landing point Gladstone with single haulage route along the Dawson and Leichhardt highways) is the preferred option when considering all aspects of road haulage between the ports and the project site for coated pipe. On this basis only Option 1B is considered further in this report.

Time span of haulage

The export pipeline and the collection header will be constructed at the same time. The supply of 1050 mm diameter pipe will be at a rate of 40 km/month (combined) for both pipelines over a period of 15 months. The current procurement program alternates the delivery between the two pipelines month by month.

Haulage is scheduled to commence in December 2010 and cease in May 2012. Supply to the lateral pipeline would not occur until the supply to the other pipelines is completed at the earliest, and may not occur until several years later.

Surrounding road network details

The haulage operation involves long distance movements over the state controlled road network. The majority of the state controlled roads have two bitumen sealed lanes and varying widths of sealed and unsealed shoulders. Pavement conditions vary on the roads that will be affected by the pipeline component haulage.

There are one and two lane timber bridges on the Eidsvold–Theodore Road and on the Roma–Taroom Road. The load capacity of these bridges will be sourced from the regional offices of the Department of Main Roads.

Local roads will need to be accessed by trucks when entering site. The majority of local roads are unsealed, paved roads which vary from 4 m to 8 m wide.

There are load restrictions on some bridges, particularly on local government controlled roads.

Description of proposed vehicles

The transportation of the components for the pipelines will be undertaken using conventional articulated vehicles, i.e. semitrailers and/or B double. Vehicles carrying the 1050 mm diameter pipeline materials will be extended semitrailers.

Transport of some construction equipment such as dozers and side boom tractors may require over-dimension permits.

PAVEMENT IMPACT ASSESSMENTS

Current pavement loadings

The current pavement loadings on the state controlled road network have been assessed using traffic count volumes, proportion of heavy vehicles and annual growth rates provided by the Department of Main Roads (DMR) regions.

The ESAs per vehicle class included in the traffic counts is the average of the particular vehicle fully loaded and completely unloaded (tare weight only). The average ESAs per commercial vehicle on each road ranged between 2.52 and 4.36.

On the local government controlled roads there is no data from which to derive traffic loadings. The majority of the local government controlled roads are unsealed.

The construction of the pipelines will, on some roads, be of relatively short duration and, while the daily impact is significant, the impact over a 12 month period may not be regarded as significant. The road elements on state controlled roads where the total generated ESA is greater than 5% of the annual traffic loading are listed in the Table 1.

Table 1 Generated pavement loading greater than 5% annual pavement loading

Road	Section	Proportion of annual pavement loading
Leichhardt Highway	Westwood–Taroom 104–170 km	19–44%
	Taroom–Miles	20–32%
	Miles–Goondiwindi 32–53 km	5.63%
Burnett Highway	Monto–Biloela	9–15%
Dawson Highway	Gladstone–Biloela	8–28%
	Biloela–Banana	7–20%
	Banana–Rolleston	5–7%
Surat Developmental Road	Surat–Tara 0–40 km & 119–147 km	6%-13%
Dalby–Kogan Road	19–47 km	12.5%
Eidsvold–Theodore Road		<5–30%
Kogan–Condamine Road		27 %
Jackson–Wandoan Road		36–67%
Roma–Taroom Road	84–149 km	58%

Contributions to road maintenance to ameliorate the impact of the haulage on road sections listed in Table 1 require further analysis and negotiation with DMR.

On all of the local government controlled roads the increases in the traffic volumes on unsealed roadways will need to be addressed on a road by road basis. The increased traffic will mean additional wear on the road surface, dust affecting visibility, and more rapid deterioration in riding quality from corrugations. The options will be:

- additional road maintenance in the form of additional light grading, heavy grading and gravel re-sheeting
- widening the existing unsealed road formation and additional maintenance
- paving and sealing the more highly trafficked roads, e.g. local government controlled roads providing access to construction sites.

The extent of this increased maintenance will depend on the actual amount of haulage that occurs on these roads.

TRAFFIC OPERATIONS ASSESSMENT

Road link analysis

The traffic generated by the development of the pipelines will not reduce the current level of service on the state controlled road network as set out in Table 2.

Table 2 Level of service over state controlled roads

Road	Section	Current AADT	Generated traffic volumes (VPD)	Existing level of service	New level of service
Warrego Highway	Dalby–Miles	2100–6500	412–522	B–D	B–D
	Miles–Roma	1200–3000	222–506	A–B	A–B
Leichhardt Highway	Westwood–Taroom	500–2200	190	A–B	A–B
	Taroom–Miles	600–700	230–336	A	A
	Miles–Goondiwindi	300–3400	110–310	A–B	A–B
Bruce Highway	Benaraby–Rockhampton	3500–4600	368	C	C
Moonie Highway	Dalby – St George	1300–6400	152–264	A–C	A–C
Burnett Highway	Monto–Biloela	700–2400	186	A–B	A–B
Dawson Highway	Gladstone–Biloela	900–28,700	176–230	A–E	A–E
	Biloela–Banana	1300–5500	136	A–C	A–C
	Banana–Rolleston	200–1700	114	A	A
Gladstone – Mt Larcom Road		2900–9000	114–208	B–D	B–D
Carnarvon Highway	Injune–Rolleston	300–400	176–230	A	A
Eidsvold–Theodore Road		80–800	134–414	A	A
Surat Developmental Road	Surat–Tara	300–2200	110	A–B	A–B
	Tara–Dalby	600–2200	110–342	A–B	A–B
Dalby–Kogan Rd		300–500	288–454	A	A
Kogan–Condamine Road		130	442	A	A
Chinchilla–Tara Road		350–720	202	A	A
Jackson–Wandoan Road		70–200	264–466	A	A
Roma–Taroom Rd		50–300	188	A	A

The traffic volumes generated by the project do not alter the levels of service on the state controlled road network, notwithstanding that the volume increase on some roads is in excess of 200%.

Intersection analysis

For the purpose of assessing the impact on the operations of intersections, it is assumed that the peak hour truck movement is 10% of the daily traffic, i.e. 11 trips per hour through Gladstone. On the same basis, the peak hour truck movement through Toowoomba is six trips per hour. These additional volumes will not have any impact on the operation of signalised intersections through these cities.

For intersections in rural areas, the peak hour is similarly based on 10% of the daily heavy vehicle movement. This will increase the hourly heavy vehicle volume by 6–30 vehicles in the peak hour on roads with current AADT of less than 2000 or 200 vehicles in the peak hour.

The access to the construction camps will have the most traffic impact on the road network. These accesses will affect the roads with AADTs of less than 2000. The maximum number of vehicles leaving and entering each camp at any one period is 100 vehicles. The average delay to vehicles entering and leaving the camps either at the camp access itself or at intersections on the road network will on average be less than 2 seconds with on average only one vehicle queued.

Road use management plan

The haulage of materials will be via conventional vehicles.

IMPACT MITIGATION FOR ROADS

State controlled roads

The impacts on the state controlled road network are summarised as follows:

- no change in the current levels of service caused by increased traffic
- the increase in traffic volumes on the Jackson–Wandoan Road may require the widening of the pavement to two lanes over the existing narrow floodways.

The haulage operations will have to comply with the load restrictions on bridges.

Cost / Contribution Methodology have not been identified at this stage on any roads.

Local government controlled roads

As the majority of the local government roads are unsealed, the increase in traffic volume on the roads listed in Appendices B, E and G may be significant. The appropriate treatments for these roads will be negotiated with the relevant local government councils. The amelioration could be:

- more regular maintenance grading
- gravel re-sheeting
- dust suppression
- paving and sealing roads near construction camps
- upgrade of intersections where sight distances do not meet standards.

The haulage operations will have to comply with the load limits on bridges.

1 Introduction

This report sets out the impact assessment on transport infrastructure of the construction and operation of the transmission pipelines component of the Queensland Gas Company's (QGC) proposed Liquefied Natural Gas (LNG) Project.

The pipelines component involves the development of three gas transmission pipelines to provide 3–4 million tonnes of LNG per annum to the international market.

The three proposed pipelines are as follows:

- *Export pipeline:* A 380 km gas transmission line from approximately 9 km east of Miles to an LNG processing plant at Curtis Island on the northern side of Gladstone Harbour (Appendix A)
- *Upstream infrastructure corridor (UIC):* Approximately 210 km of gas pipeline (collection header) and parallel water pipeline, spanning from south-west of Dalby at its eastern end to the south-west of Wandoan at its western end (Appendix C)
- *Lateral pipeline:* A 153 km gas transmission line from the vicinity of the existing Fairview gas fields in the west, spanning east until it intersects the export pipeline.(Appendix F)

This report examines the quantity of traffic generated during the construction of the export pipeline, UIC pipelines and lateral pipeline, as well as quantifying the impact which this traffic will have on the state controlled road network throughout the areas affected by the construction. The traffic is expected to be generated from:

- construction personnel; work based and non-work based trips
- pipe-carrying trucks
- transportation of field joint coating
- quarry transport
- heavy plant for construction, e.g. bulldozers, graders, rollers, excavators, loaders, side boom tractors, padding machines, wheel ditching machines and water trucks
- transportation of scraper station facilities
- transportation of meter station facilities.

The impact on the state controlled network for the duration of construction for the pipelines has been assessed in accordance with Queensland's Department of Main Roads *Guidelines for assessment of road impacts of development* (2006) (DMR Guidelines) for this report.

The distribution of the traffic generated onto the local government controlled network cannot be defined at this stage as the routes along the local government controlled network have not been determined. As the majority of the local government controlled network is unsealed, the rate of deterioration under the project traffic is not predictable to any degree of accuracy. The assessment of impacts for this road network will be on the basis of agreement between QGC and the relevant authority on the condition of affected roads prior to the project traffic using particular roads. These roads will be maintained to a similar minimum standard while project traffic is using the road and after project traffic ceases to use the road.

2 Development / road use profile

2.1 PROJECT DESCRIPTION

The project involves the development of three gas transmission pipelines. The collection header will transport the majority of this supply from the Surat Basin in southern Queensland to the start of the export pipeline, located approximately 9 km east of Miles. QGC has also made provisions for existing coal seam gas (CSG) fields adjacent to the export pipeline to provide an aggregation of gas supplies to the Gladstone market via a lateral pipeline.

To meet the supply demands, a 1050 mm diameter steel pipe will be required for the three pipelines. This size of pipe is not currently produced in Australia and therefore must be sourced from overseas. It has been assumed that the pipe will be shipped to Gladstone and then transported to site by road.

The UIC will contain not only the 1050 mm collection header gas pipeline but also a parallel 525 mm diameter water pipeline which collects water from the wells to a central point for treatment prior to disposal.

The impacts of the construction and operation of the QGC CSG fields are the subject of a separate assessment report and are not considered in this report. However, in the assessment of options for sourcing the 1050 mm pipe via Brisbane this report give considers the cumulative impacts that could be associated with transport requirements for the CSG field and the pipelines along the Warrego Highway through Toowoomba..

The project is being developed under the *State Development and Public Works Organisation Act 1971*.

2.2 HAULAGE OPTIONS

Seven alternative scenarios have been assessed to determine the most efficient means of hauling the pipes to along the state controlled network to specific construction sites.

The numbers of truck hours to haul the pipe material from the landing points in the above scenarios to the construction sites were considered. Travel times for haulage have been based on Queensland's Department of Main Roads *Guide to Queensland roads* (2008), obtained from the DMR website. A comparison of the options is set out below.

Option 1: Landing point Gladstone with the haulage routes split between the Dawson and Leichhardt Highways and the Gladstone–Monto Road.

With the landing point at Gladstone, Option 1 incurs more road haulage hours than Option 1B. Therefore Option 1 will not be assessed further.

Option 1B: Landing point Gladstone with single haulage route along the Dawson and Leichhardt highways

Option 2: Landing points 50% Gladstone and 50% Bundaberg. With the delivery split between Gladstone and Bundaberg incurs more road haulage hours than Option 1B and will not be considered further.

Option 3A: Landing points 40% Gladstone, 30% Bundaberg and 30% Brisbane With the landing points split between the ports of Gladstone, Bundaberg and Brisbane and hauled by road incurs fewer truck hours than Option 1B. However, the logistics of setting up unloading facilities in three ports, plus the loss of flexibility of redirecting delivery of the pipe necessitated by changes in demand for pipe from the field construction crews, would outweigh the benefit of fewer road haulage hours. Option 3A will not be considered further.

Option 3B: Landing points 40% Gladstone, 30% Bundaberg and 30% Brisbane (rail to Miles). This option incurs fewer road haulage hours than Option 3A. However, on the basis of the logistics problems described in Option 3A, Option 3B will not be considered further.

Option 4A: Landing points 50% Gladstone and 50% Brisbane incurs the least amount of road haulage of all of the options that do not include rail to Miles. This is not a preferred option due to the combined effect of both the construction of the pipeline and the construction of the QGC CSG fields. The haulage of the pipeline materials is scheduled for between January 2011 and May 2012 and this will coincide with the peak of development of the CSG fields. The separate analysis shows that the CSG field development will generate approximately 100 heavy vehicles per day along the Warrego Highway through Toowoomba. The analysis for the pipeline indicates that in some months there will be an additional 38 trips per day hauling water pipe for the UIC and 110 trips per day hauling 1050 mm diameter gas pipe (refer to Table 2.3). Therefore under Option 4A there would be an additional 248 trips per day by heavy vehicles hauling materials for the project through Toowoomba. On this basis Option 4A will not be considered further.

Option 4B: Landing points 50% Gladstone and 50% Brisbane (rail to Miles). Incurs the least amount of road haulage of all of the options. This is not preferred a preferred option due to the number of times the pipe is handled and the increased potential for damage to the protective coating. If the pipe were to be imported uncoated, and a coating plant was set up at Miles, this option would become viable. Such a plant would also allow further consideration of Option 3B.

Preferred option

Option 1B becomes the preferred option when considering all road haulage between the ports and the project site for coated pipe. On this basis only Option 1B is considered further in this report.

2.2.2 Location of export pipeline and haul route

The origin of the export pipeline is the Miles Power Station just east of Miles. The pipeline traverses 380 km north-east and passes through the local government areas of Dalby Regional Council, Banana Shire Council and Gladstone Regional Council.

The routes considered for road haulage of all equipment and plant to the export pipeline worksites are taken from Gladstone and hauled along the following state controlled road network elements:

- Dawson Highway 46A (Gladstone–Biloela) and 46B (Biloela–Banana)
- Bruce Highway 10E (Benaraby–Rockhampton)
- Burnett Highway 41D (Monto–Biloela)
- Leichhardt Highway 26A (Westwood–Taroom) and 26B (Taroom–Miles)
- Warrego Highway 18C (Dalby–Miles)
- Gladstone – Mt. Larcom Road 181
- Eidsvold–Theodore Road 454.

The haul routes are shown at Appendix A. The local roads which are expected to be affected by pipeline construction, haulage or construction workers are listed in Appendix B.

2.2.3 Location of UIC and haul route

The 210 km of the UIC will span from the south-west of Dalby at its eastern end to the south-west of Wandoan at its western end. The gas collection header in the UIC is intersected by the export pipeline at the Miles Power station just east of Miles.

The pipe for the 1050 mm gas lateral is expected to be transported from Gladstone, whereas the 525 mm water pipeline is expected to be sourced from Brisbane as it is manufactured in Australia. The following state controlled road network elements are expected to be utilised for the haulage:

- Dawson Highway 46A (Gladstone–Biloela) and 46B (Biloela–Banana)
- Leichhardt Highway 26A (Westwood–Taroom), 26B (Taroom–Miles) and 26C (Miles–Goondiwindi)
- Jackson–Wandoan Road 4302
- Warrego Highway 18A (Ipswich–Toowoomba) including Cohoe Street and Jones Street, Toowoomba
- Warrego Highway 18B (Toowoomba–Dalby) including James Street, Tor Street and Bridge Street, Toowoomba
- Warrego Highway 18C (Dalby–Miles) and 18D (Miles–Roma)
- Dalby–Kogan Road 340
- Chinchilla–Tara Road 341
- Kogan–Condamine Road 342
- Surat Developmental Road 86A (Surat–Tara) and 86B (Tara–Dalby)
- Moonie Highway 35A (Dalby – St George)
- Tara–Kogan Road 3402.

A plan showing the haulage routes from Ipswich is attached in Appendix C. Plans of the haulage routes to and from the stockpile at Wandoan are attached at Appendices D and C.

Local government controlled roads likely to be affected by the development are listed in Appendix E.

2.2.4 Location of lateral pipeline and haul route

The lateral pipeline intersects the export pipeline at approximately 110 km north of Miles and to the south-east of Taroom. The collection end is in the vicinity of the Fairview gas fields west of Taroom. Access to the 153 km of lateral pipeline is predominantly via local government controlled roads.

The routes considered for road haulage of all equipment and plant to the lateral pipeline worksites from Gladstone affect the following state controlled road network elements:

- Dawson Highway 46A (Gladstone–Biloela), 46B (Biloela–Banana) and 46C (Banana–Rolleston).
- Carnarvon Highway 24D (Roma–Injune) and 24E (Injune–Rolleston)
- Leichhardt Highway 26A (Westwood–Taroom) and 26B (Taroom–Miles)
- Roma–Taroom Road 4397.

The haulage route for the lateral pipeline is shown at Appendix F.

Local government controlled roads likely to be affected by the development are listed in Appendix G.

2.2.5 Location of camp sites and haul route

Construction workers will be accommodated in construction camps to be established within designated areas along the length of the export pipeline and UIC. Each camp will be set up to keep the distance of travel to the work area at 60–70 km maximum. Along the export pipeline one camp is proposed to be established north-east of Wandoan, another approximately 50 km south of Biloela, and a third just outside Gladstone at Mount Alma. The two UIC pipeline construction camps are proposed to be located west of Miles and just outside of Kogan. It is anticipated that the construction personnel from the export pipeline will also construct the lateral pipeline, and in this case the travel between the camp and a section of the pipeline will be longer than 60–70 km.

The workers will be housed in accommodation blocks containing up to six rooms with shared ensuites. The camps will each have approximately 115 rooms, five ablution units, two messing units, a recreational room and two office buildings. The pickup point for these buildings is Wacol where they are manufactured. They will be trucked to site over the following listed state controlled roads and assembled:

- Dawson Highway 46A (Gladstone–Biloela) and 46B (Biloela–Banana)
- Leichhardt Highway 26A (Westwood–Taroom) and 26B (Taroom–Miles)
- Eidsvold–Theodore Road 454

- Cunningham Arterial U16 (Ipswich Motorway)
- Cunningham Highway 17A (Ipswich Motorway)
- Warrego Highway 18A (Ipswich–Toowoomba) including Cohoe Street and Jones Street, Toowoomba
- Warrego Highway 18B (Toowoomba–Dalby) including James Street, Tor Street and Bridge Street, Toowoomba
- Warrego Highway 18C (Dalby–Miles) and 18D (Miles–Roma)
- Dalby–Kogan Road 340.

2.3 TIME SPAN OF HAULAGE

The export pipeline and the collection header will be constructed at the same time. The supply of 1050 mm diameter pipe will be at a rate of 40 km/month (combined) for both pipelines over a period of 15 months. The current procurement program alternates the delivery between the two pipelines month by month.

Haulage is scheduled to commence in December 2010 and cease in May 2012. Based on this delivery schedule, construction on the export pipeline would commence in March 2011 and be completed in September 2012, with the construction of the UIC commencing in January 2011 and being completed in December 2012.

Supply to the lateral pipeline would not occur until the supply to the other pipelines is completed at the earliest, and may not occur until several years later.

2.4 HAULAGE REGIME—DAYS AND TIMES OF OPERATION

The nominated haulage regime for analysis is as follows:

Export pipeline

- 1050 mm diameter pipe to come from the preferred landing point of Gladstone
- field joint coating will be sourced via Gladstone
- all pipes will be hauled via road

Upstream infrastructure corridor

- 1050 mm diameter pipe to come from the preferred landing point of Gladstone
- 525 mm diameter pipe will be sourced from Brisbane
- field joint coating will be sourced from Brisbane
- all pipes will be hauled via road

Lateral

- 1050 mm diameter pipe to come from the preferred landing point of Gladstone
- field joint coating will be sourced via Gladstone
- all pipes will be hauled via road.

All other equipment such as the main line valves, scraper stations and meter stations are expected to come via Brisbane. The analysis has not considered the use of rail from Brisbane to Chinchilla or Miles (as discussed in Section 2.2), or that some equipment may come from interstate via Goondiwindi. The nominated routes of haulage of material is considered worst case scenario for the impacts on the road network. Other transport options will be considered during the detailed design phase but do not form part of this study.

Haulage will be undertaken using semitrailers for pipeline and construction camp components as well as the main line valves, scraper stations and meter stations.

Long haulage of items from Gladstone and Brisbane, could be around the clock, i.e., 24 hours per day 7 days per week. However there may be some restriction to trucks travelling between 9pm and 6am through residential areas in provincial cities and townships.

Oversize permits may be required to transport dozers and side boom tractors.

2.5 OPERATIONS

2.5.1 Terminology

For the purpose of this report the following terminology is used:

Trucks The number of truck loads to transport the materials

Trips One trip is the movement of a vehicle from its origin to its destination. The return movement is counted as a separate trip.

2.5.2 Personnel

The required number of construction personnel at any one time is set out in Table 2.1.

Table 2.1 Construction personnel distribution

Number of personnel	Description	Site
400	Construction workers	Export pipeline
400	Construction workers	UIC

For the lateral pipeline, the construction personnel will use one of the export pipeline camps after the camp is no longer required for construction of the export pipeline.

2.5.3 Camp and personnel traffic movements

The export pipeline workers will be housed in the construction camps which will typically service approximately 120–140 km of pipeline with two camps operating at any one time. Hence, 200 personnel will relocate to the final construction camp along the export pipeline route after the construction of a specific section has been completed. The camps located west of Miles and outside of Kogan will operate for the full duration of the UIC construction. It is anticipated that no night works will be conducted on the construction of the pipeline other than possibly to unload pipe materials.

The personnel will work on a roster of 28 days on and 9 days off. There will be 400 construction personnel per pipeline working at any one time and these will be accommodated in 200 personnel camps along the pipeline routes. Personnel will not keep their rooms during the rostered days off and may be assigned different rooms when they return. At the start and end of each work cycle, buses will be used to transport personnel to the nearest airport to minimise traffic movements within the region. For the camp-based work trips, the construction personnel will be transported in four wheel drive utilities to the specified point of construction. It is assumed that there will be two personnel to a vehicle. The trips generated from the camp will include both work and non-work based movements for servicing the camp, offices and workshop. The construction activities of the pipelines will increase the number of vehicles per day within 60–70 km proximity of each of the camps.

The estimated number of vehicles generated by the construction camps is summarised in Table 2.2 Construction camp generated traffic movements, which assumes that employees will not have access to private vehicles given the fly in fly out operation for leave rotation. Non work based trips will be made in buses.

Table 2.2 Construction camp generated traffic movements

Purpose	Description	Employees/ camp	Trips/day	Vehicle occupancy	Trips/day/ camp
Camp servicing	General deliveries	10	1	1	10
Workshop servicing	Deliveries: in and out	10	2	1	20
Personnel	Worker transportation to site	200	2	2	200
Office	Office related activities	10	1	1	10
Personnel	Non work based trips	230	0.4	10	10
Personnel	9 day off trips	76	2 every 9 days	15	10

2.5.4 Spoil transport

It is envisaged that in the development of the three pipelines, spoil will be spread over the pipeline corridors. Spoil will not be hauled over the road network.

2.5.5 Pipe transport

The minimum number of 1050 mm diameter pipes that would be transported on any one truck is two loaded side by side. A structural assessment is required to determine if the two pipes can support the weight of a third pipe. The number of trucks generated by these activities as set out in Table 2.3 is based upon two pipes per truck. Loading three pipes per truck would decrease the number of truck loads and therefore reduce the impact of the traffic volumes generated. Approximately 76 trips per day for each pipeline would be the result of three pipes per truck. While the numbers of trucks per day will be reduced, three pipes per truck will increase the equivalent standard axles (ESA) per truck, and the overall number of ESAs generated will be more than for hauling two pipes per truck.

It is anticipated that 40 km of pipe will be transported monthly to the construction site. The entire delivery will go to each individual pipeline, i.e. 40 km delivered to the export pipeline one month and then 40 km to the UIC the next month.

The UIC water pipe will be transported with a maximum of six 18 m pipes per truck.

Table 2.3 Truck volumes for pipe deliveries

Pipeline description	Approximate length (km)	Pipe diameter (mm)	Pipe length/ truck (m)	Total no. truck loads	Approximate vehicle trips/day
Export pipeline	380	1050	36	10,421	110*
Gas collection header	210	1050	36	5,841	110*
Water collection header	210	525	108	1,956	38
Lateral	153	1050	36	4,233	110*
Total	**953**			**22,451**	

* *1050 mm diameter pipe materials will be delivered to only one pipeline at any one time.*

As previously discussed in Section 2.2, the proposed haul routes for the larger diameter pipework being hauled from Gladstone and the smaller pipe hauled from Brisbane are via a select number of state controlled and local government controlled roads before entering the QGC's allotted easements and access tracks.

2.5.6 Field joint coating

Prior to backfilling and after grit blasting of the welds, the 1050 mm diameter pipes are covered with an external field joint coating. The coating will be trucked in from Brisbane to the point of construction for the collection header, and from Gladstone to the export pipeline and lateral.

The 525 PE water pipeline will be rubber ring jointed and does not require coating of joints.

The volumes of trucks required for the transport of field joint coating is summaried in Table 2.4

Table 2.4 Truck volumes for field joint coatings

Pipeline description	Approximate length (km)	Garnet weight (tonnes)	Total trucks	Approximate trips/day
Export pipeline	380	1425	64	2
Gas collection header	210	798	42	2
Lateral	153	580	28	2
Total	**743**	**2803**	**134**	

2.5.7 Quarry transport

Pipelines laid in rocky areas may require bedding. This will be preferentially provided from screened spoil with imported material being a last resort. Current pipe backfilling methods utilise the excavated materials from the pipe trench. Hard stand areas for

meter stations and camps will require paving with gravel, and trenchless construction operations will require cement grout.

The backfill material required for the construction of the pipeline bedding and relative construction will be sourced from sections of better excavated materials along the pipeline and will therefore minimise the haulage over both state controlled and local government roads. The sources of suitable materials have not been determined at this stage, but it is anticipated that the quarry source will be within 50 km of the work area. The quantity of sand/backfill illustrated in Table 2.5 has been based on 200 km of the total pipeline length requiring a 100 mm depth of sand/bedding in a 2.0 m wide trench. The amount of quarry material required for each component of the pipeline construction is illustrated in Table 2.5.

For the purpose of the analysis, 10% of the total volumes of the sand bedding and grout required have been assigned to the road adjacent to the worksite. This assignment will, in the majority of the roads, overestimate the number of quarry vehicles on the road, but captures a possible worst case on a small number of road sections.

It has been assumed that haulage of quarry material over any one section of road on any one day would supply one work site only. The number of quarry vehicle trips per day on any one section of road would be 40 maximum over a relatively short period, i.e. less than two weeks.

Table 2.5 Estimated quarry materials required

Item	Material	Volume (m^3)	Approx. weight (tonnes)	Truck loads
Pipeline bedding (total)	Sand/backfill	40,000	96,000	3429
Tunnel boring (total)	Grout	120	288	11
Meter stations (each)	Gravel	250	600	22
Main line valves (each)	Gravel	30	72	3
Mid-line compressors (total)	Gravel	1000	2400	86
Camps (each)	Gravel	3000	7200	258

2.5.8 Transportation of project facilities

The transmission of CSG through the main, UIC and lateral pipelines to Gladstone requires specific facilities for its operation. These above ground facilities include scraper stations, filtration facilities, meter stations, cathodic protection facilities and marker signs. The estimated quantities for the major amenities for each of the pipelines are shown in Table 2.6.

Table 2.6 Truck volumes for facilities haulage

Description	Pipeline description	Number of facilities	Total truck loads
Scraper stations	Export pipeline	3	30
	Gas collection header	2	20
	Lateral	2	20
Meter stations	Export pipeline	2	20
	Gas collection header	0	0
	Lateral	2	20
Inline compressor station (if required)	Export pipeline	1	30
Total			**140**

Construction of these facilities will be staggered and it is expected that a maximum of four loads would occur on any one day over the whole project. The haulage will be via conventional semitrailers.

The construction of the inline compressor station would occur after the pipeline is operational and only if it is found to be necessary.

2.5.9 Construction camp components (modular buildings) transport

Modular buildings will be used to house workers for the duration of pipeline construction, as well as being used for offices, messing units, ablutions and a wet mess with a recreation lounge. A total of four campsites will be established for all pipelines; however, only two will ever be in operation at any one time. The construction camp on the export pipeline would relocate on an as required basis with the progression of the pipe construction along the route. Table 2.7 shows the expected truck movements for the haulage per camp for commissioning and decommissioning.

Table 2.7 Truck volumes for construction of camp per camp

Item	Quantity of item	Units required	Truck loads
Rooms	115	12 m x 3 m	230
Central ablution	5	12 m x 9 m	30
Mess	2	12 m x 33 m	44
Recreation room	1	12 m x 33 m	22
Offices	2	12 m x 33 m	44
Furniture and Fittings			370
Total trucks per camp			**740**

Based on delivery of camp materials over a period of 20 days per camp, the generated traffic is approximately 18 truck trips per day.

2.5.10 Heavy plant equipment transport

The pipeline site preparation and construction requires the use of several different types of heavy plant equipment. Table 2.8 shows the quantity of each specific type of plant expected within the pipeline corridors. It is anticipated that the plant will be transported to site from south-east Queensland via state controlled roads initially, and

remain within the QGC pipeline easement for the duration of that site-specific construction. Table 2.8 includes the trucks to mobilise the plant to the site and demobilise the plant from site.

Table 2.8 Heavy plant required quantities

Plant item	Transported via	Quantity required	Truck loads
Bulldozers	Semitrailer	20	40
Graders	Semitrailer	6	12
Excavators	Semitrailer	30	60
Side boom tractors	Low loader	12	24
Roller	Semitrailer	2	4
Heavy cranes	Independent	2	4
Total			**144**

2.6 ON-SITE ASPECTS

Works for the export and lateral pipelines are contained within a 40 m wide corridor while the collection headers will be within an 80 m wide corridor. The construction corridor widens near water crossings. This corridor is generally on private property where there will be little to no interference with current traffic from the physical construction of the pipeline or parked construction vehicles and plant.

The pipelines cross a number of state controlled and local government controlled roads and rail corridors.

On unsealed and lightly trafficked roads the preferred option is to open trench, subject to the approval of the relevant road authority. Open trenching will require provision of sufficient pavement width around the work for through traffic and appropriate traffic control in accordance with Queensland Department of Main Roads *Manual of uniform traffic control devices* (DMR 2003 Edition). The backfilling of the trench and pavement restoration will be in accordance with the requirements of the relevant road authority standards; however, as the trench will be wide, and it will be possiple to use compaction equipment larger than what is normally used for trench restoration, alternative standards for restoration may be submitted to the relevant road authority.

On the more heavily trafficked roads and where open trenching is not practical for terrain or traffic management considerations, or not approved by the relevant road authority, trenchless construction methods will be used. The location of the pits associated with these methods will be sufficiently clear of the road edge so as not to impact on the safety of the travelling public or the construction personnel.

Trenchless construction methods will be used for all crossings of railway corridors.

Where practicable, existing tracks will be used to provide access for trucks, workers and heavy plant to the easement. Some additional tracks may need to be created. Much of the plant and equipment will travel along the easement with minimal to no interruption of current traffic flows within the area. Some tracks may be used in the operational phase for the maintenance of the pipeline.

The construction camps will be located so that all activities associated with the camps occur clear of the road reserves. Parking and traffic circulation around the parking

areas will not create queues back onto the road carriageway. These camps will be located at points where the maximum distance to site is 60–70 km to enable construction personnel to travel to their designated site and complete a full days work with minimal time spent travelling.

2.7 SURROUNDING ROAD NETWORK DETAILS

2.7.1 Road conditions

The haulage operation involves long distance movements over the state controlled road network as set out in Section 2.4. The majority of the state controlled roads have two bitumen sealed lanes and varying widths of sealed and unsealed shoulders. Pavement conditions vary on the roads that will be affected by the pipeline component haulage. Most state controlled roads are sealed with two lanes. Not all affected roads have been line marked, and some highways show rutting in the wheel paths. The various conditions on the state controlled road network are illustrated in Figures 2.1 to 2.5.

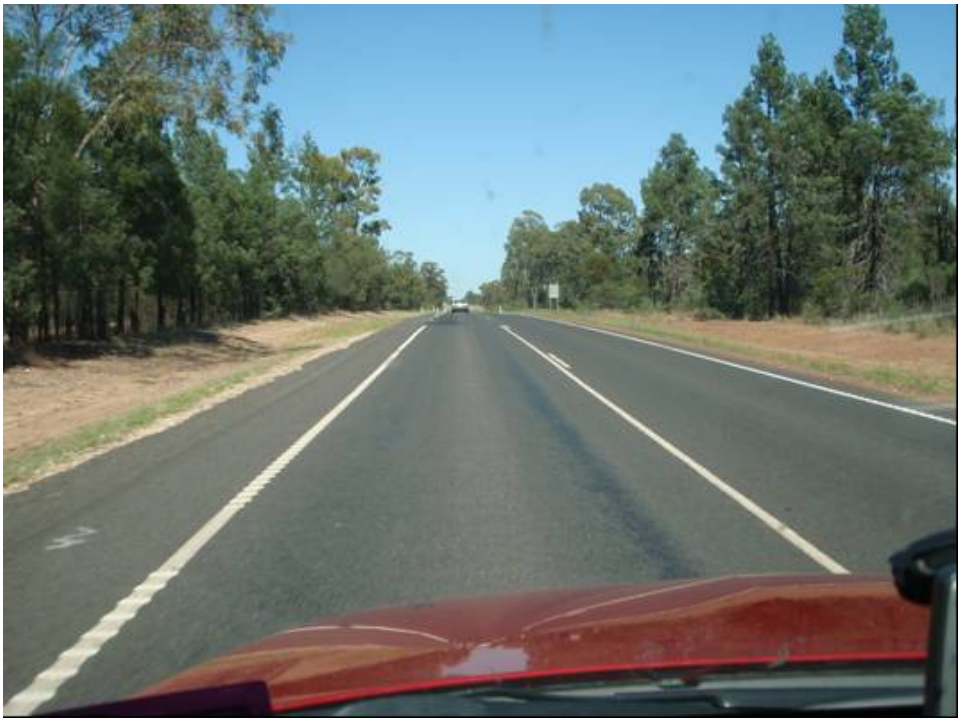

Figure 2.1
WARREGO HIGHWAY 18D (MILES–ROMA)—SEALED SHOULDERS

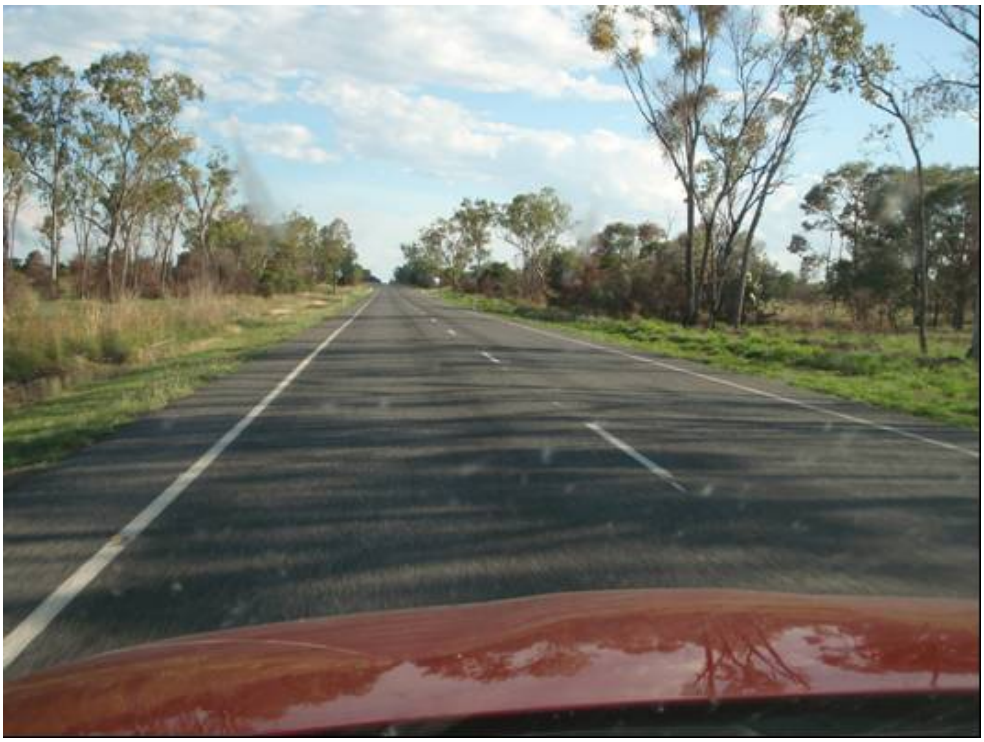

Figure 2.2
LEICHHARDT HIGHWAY 26B (TAROOM–MILES)—SEALED SHOULDERS

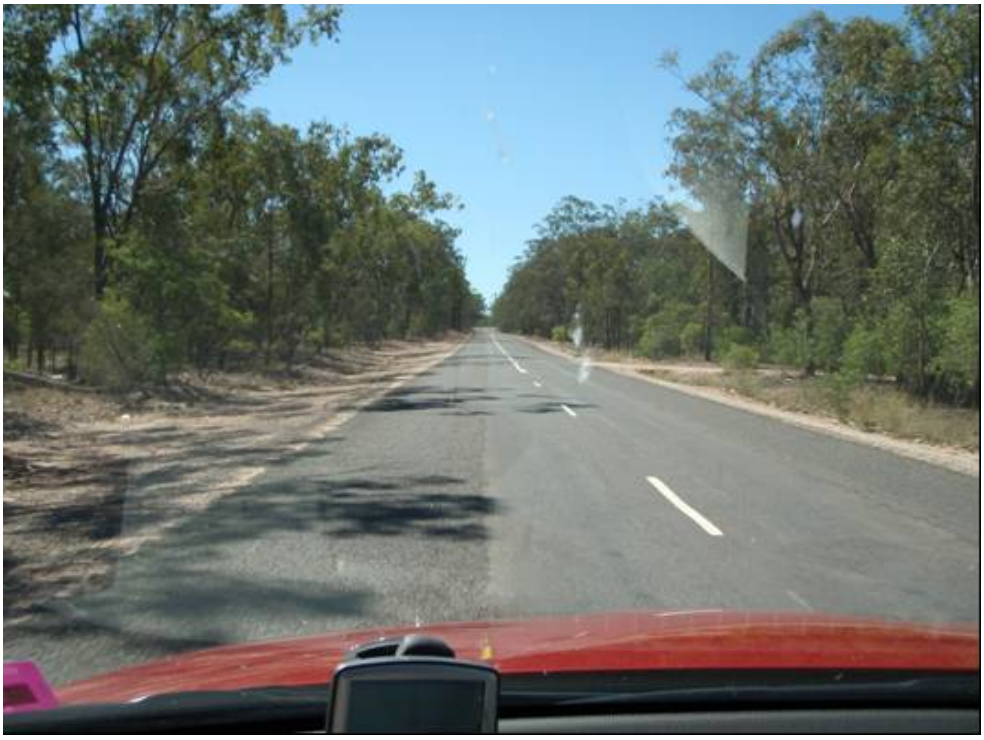

Figure 2.3
KOGAN–CONDAMINE ROAD—UNSEALED SHOULDERS

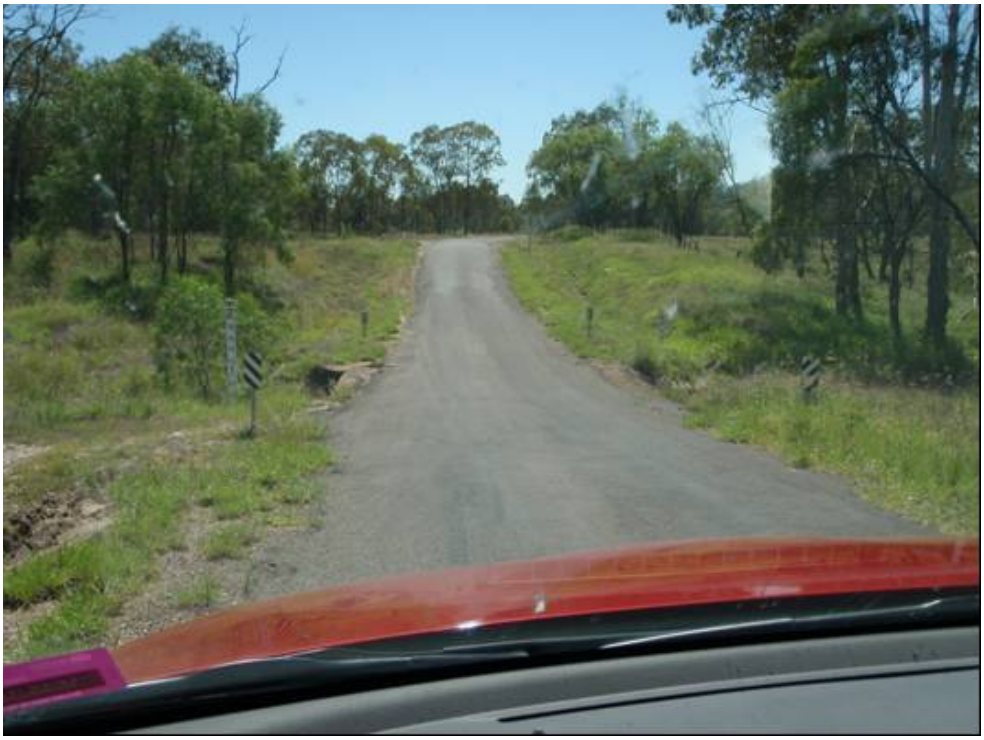

Figure 2.4
JACKSON–WANDOAN ROAD—SINGLE LANE BITUMEN FLOODWAY

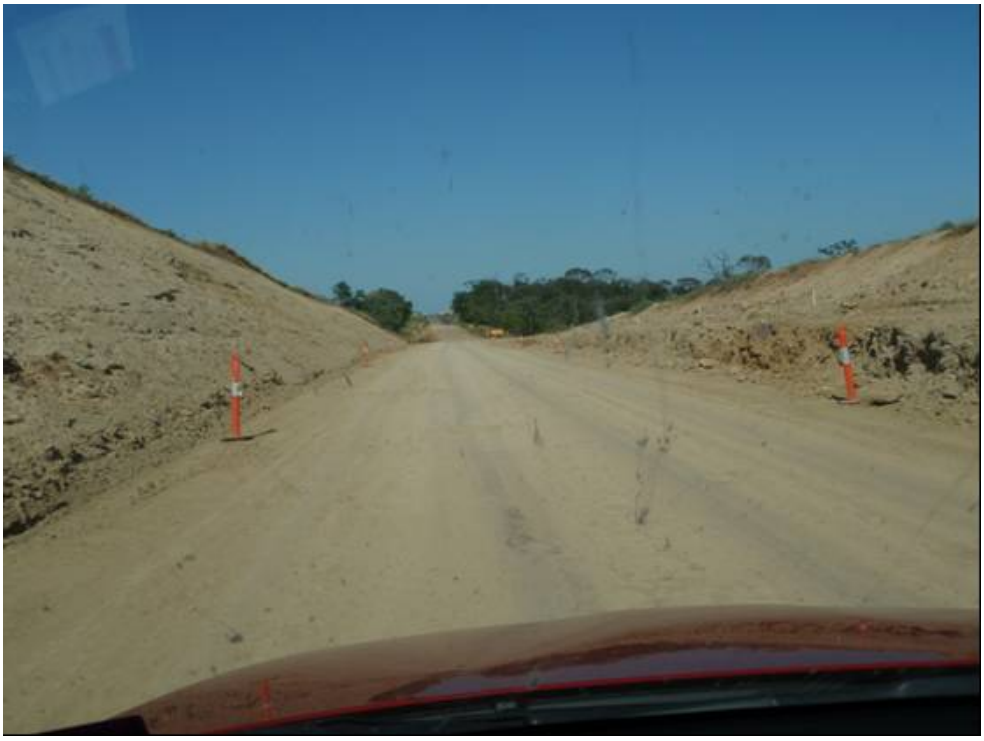

Figure 2.5
SECTION OF ROMA–TAROOM UPGRADE UNDER CONSTRUCTION

There are one and two lane timber bridges on the Eidsvold–Theodore Road and on the Roma–Taroom Road. A one-lane bridge is illustrated in Figure 2.6.

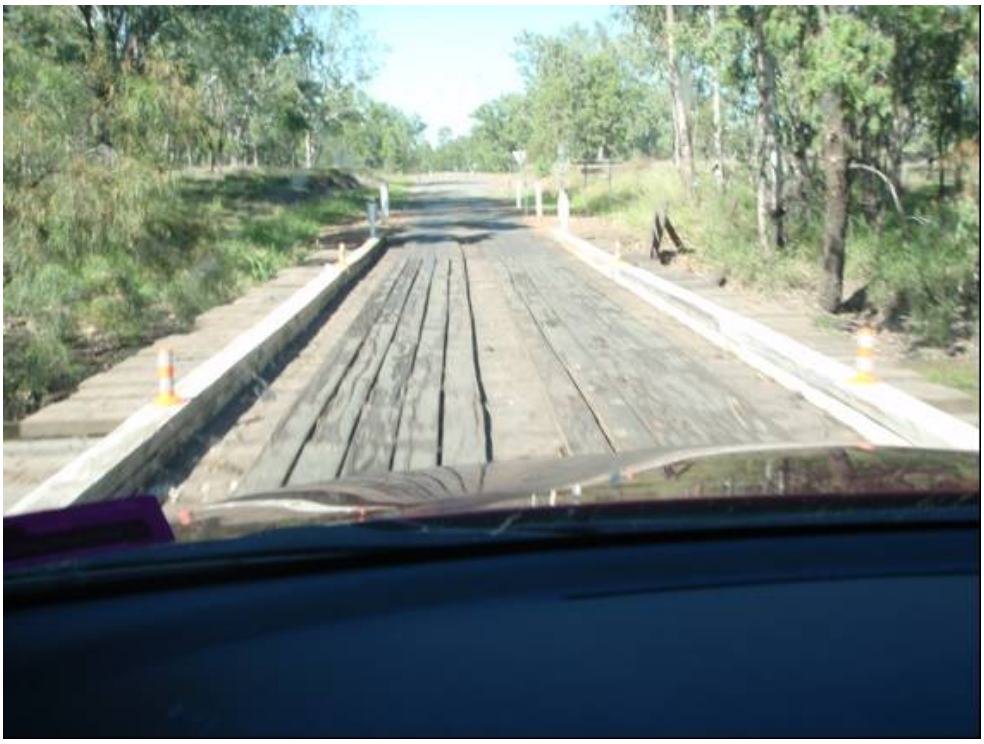

Figure 2.6
A ONE-LANE TIMBER BRIDGE ON THE ROMA–TAROOM ROAD

The load capacity of these bridges will be sourced from the regional offices of the Department of Main Roads.

Local roads will need to be accessed by trucks when entering site. The majority of local roads are unsealed, paved roads which vary from 4 m to 8 m wide as illustrated in Figures 2.7 and 2.8.

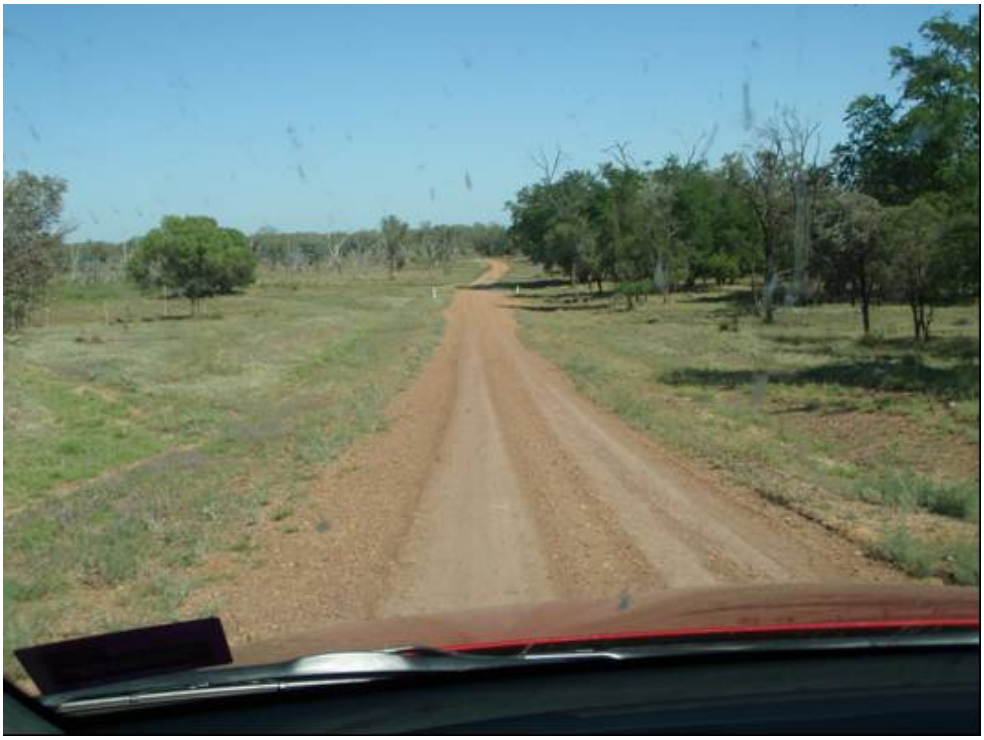

Figure 2.7
INJUNE–ROMA CONNECTION ROAD—PAVED AND UNSEALED

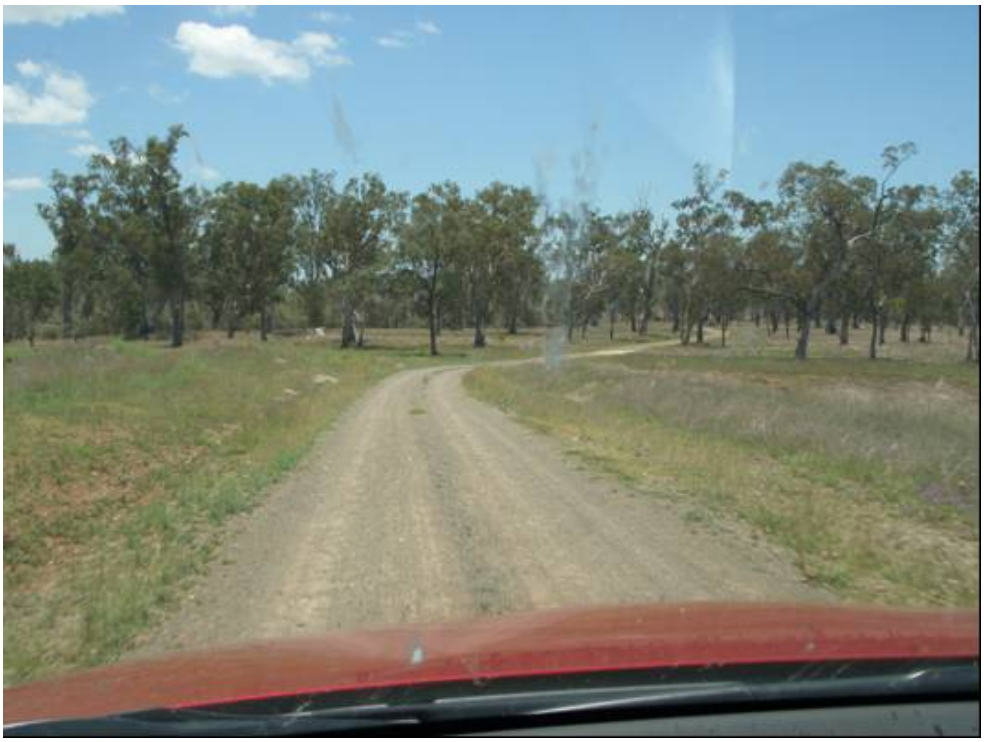

Figure 2.8
RAWBELLE ROAD—PAVED AND UNSEALED

There are load restrictions on some bridges, particularly on local government controlled roads. See Figure 2.9 for an example of load limits.

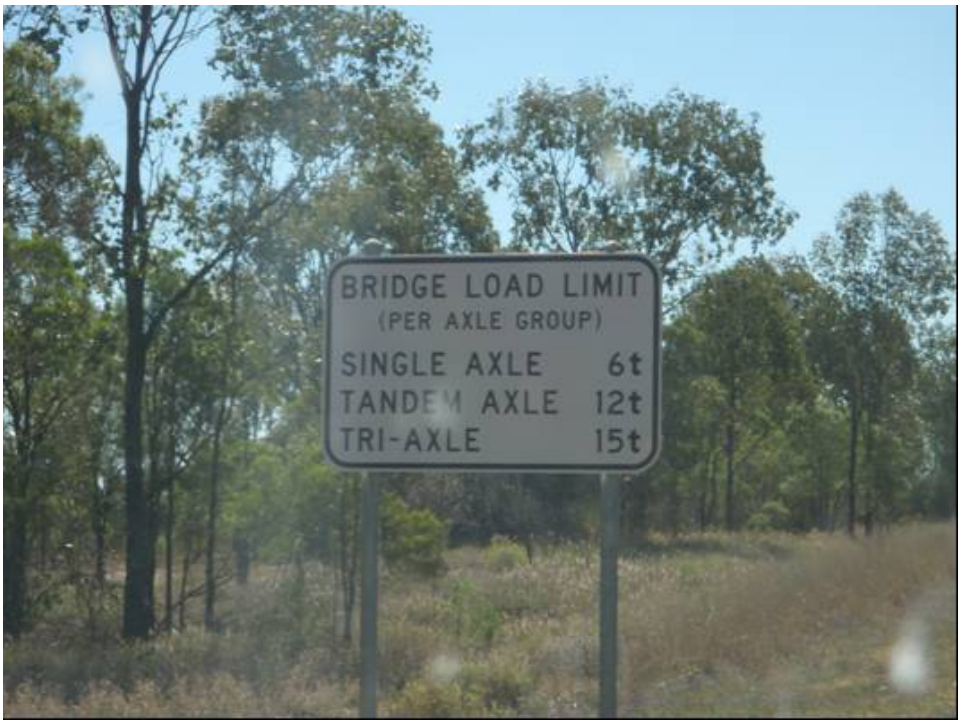

Figure 2.9
LOAD LIMITS ON GREENSWAMP ROAD

The estimated loads for two pipes per truck are 5.5 tonnes on a single steer axle, and 11.5–12 tonnes on the two tandem axle groups on the prime mover and trailer. For the load limits shown in Figure 2.9, it is likely that two pipes per truck could be transported over the bridge on Greenswamp Road. For more restrictive load limits, only one pipe per truck would be permitted.

2.7.2 Other users

The roads affected by the haulage of the materials do not have pedestrian and cycle facilities. There are no cycle lanes on the Warrego Highway neither through Toowoomba nor along Glenlyon Street on the Dawson Highway in Gladstone, where the majority of cycling activities would occur.

Some of the routes are designated school bus routes.

2.7.3 Existing traffic

Data obtained from the Department of Main Roads on the traffic using the various links are summarised in Table 2.9.

Table 2.9 Existing traffic on state controlled road network

Road	Section	AADT	% Trucks	% Articulated	% Road trains
Warrego Highway	Ipswich–Toowoomba	13,000–20,500	5.7–7.5%	4.0–7.0%	3.4–4.7% B-double only
	Toowoomba City	19,800–22,000	5.7–7.1%	3.2–4.2%	2.0–2.4% B-double only
	Toowoomba–Dalby	4400–17,500	2.6–6.6%	1.1–5.5%	0.4–7.8%
	Dalby–Miles	2100–6500	6.6–11.0%	3.5–6.0%	4.8–9.2%
	Miles–Roma	1200–3000	8.1–9.0%	4.1–6.6%	6.8–13.2%
Leichhardt Highway	Westwood–Taroom	500–2200	7.6–9.4%	4.5–8.9%	5.5–11.5%
	Taroom–Miles	600–700	8.4–9.6%	8.5–10.6%	10.8–12.9%
	Miles–Goondiwindi	300–3400	6.3–9.0%	7.8–15.9%	11.9–22.6%
Bruce Highway	Benaraby–Rockhampton	3500–4600	6.6–9.6%	11.2–12.8%	7.5–9.5% B-double only
Burnett Highway	Monto–Biloela	700–2400	7.0–9.6%	1.8–5.3%	0.7–2.6% B-double only
Dawson Highway	Gladstone–Biloela	900–28,700	2.4–10.2%	0.5–5.5%	0.1–10.2% B-double only
	Biloela–Banana	1300–5500	7.6–10.6%	1.9–3.3%	1.1–3.1%
Moonie Highway	Dalby–St George	1300–6400	5.0–8.8%	1.3–4.8%	0.9–4.8%
Gladstone – Mt Larcom Road		2900–9000	6.0–11.1%	2.4–6.3%	1.8–6.5% B-double only
Carnarvon Highway	Roma–Injune	600–1800	7.6–11.7%	3.5–7.5%	5.9–13.7%
Eidsvold–Theodore Road		80–800	7.7–12.6%	2.0–12.9%	0.9–3.9%
Surat Developmental Road	Surat–Tara	300–2200	7.1–11.3%	2.4–4.9%	1.3–3.7%
	Tara–Dalby	600–2200	5.6–11.4%	1.7–4.7%	1.5–4.6%
Dalby–Kogan Road		300–500	8.7–15.4%	4.4–4.8%	5.0–7.5%
Kogan–Condamine Road		130	9.1%	8.7%	16.1%
Chinchilla–Tara Road		350–720	10.7–11.8%	2.4–4.9%	0.5–1.0%
Tara–Kogan Road		160	9.3%	1.3%	0.2%
Jackson–Wandoan Road		70–200	10.6–12.0%	4.4–5.8%	4.1–5.1%
Roma–Taroom Road		50–300	11.7–16.6%	5.3–7.8%	5.3–14.6%

Road	Section	AADT	% Commercial vehicles
Dawson Highway	Banana–Rolleston	200–1700	14.2–29.8%
Carnarvon Highway	Injune–Rolleston	300–400	31.8–36.4%

No traffic data has been obtained from the local government bodies for traffic volumes on local government controlled roads. Based on the traffic volumes on the lower trafficked state controlled roads, the volumes on the majority of local government controlled roads would range between 20 and 200 trips per day..

2.8 DESCRIPTION OF PROPOSED VEHICLES

The transportation of the components for the pipelines will be undertaken using conventional articulated vehicles, i.e. semitrailers and/or B double. Vehicles carrying the 1050 mm diameter pipeline materials will be extended semitrailers.

It is not envisaged that there are any large components requiring the use of heavy load platform vehicles under permit conditions. Should these items arise, the procedures to obtain the necessary permits will be followed. Planning of the haulage will be part of the procurement process for such items to ensure that the road authorities have sufficient time to consider applications.

Construction personnel will be transported between construction camps and the various work sites in four wheel drive utilities. During the operation phase, maintenance workers will travel to site and along the pipeline easement for inspections in four wheel drive utilities.

Transport of some construction equipment such as dozers and side boom tractors may require over-dimension permits.

3 Traffic generation and distribution

3.1 TRAFFIC GENERATION OF THE HAULAGE ACTIVITY

The analysis of traffic impacts on each road is based on the following assumptions:

- haulage between the gas collection header and export pipeline should be 40 km per month combined total with a maximum of 2 km any one day
- the quantities of each component associated with the pipeline development, i.e. pipe, quarry, field joint coating, main line valves, scraper stations, meter stations, compressor station and construction camps
- the type and number of trucks to haul the quantity of each of the above components. The volumes of traffic on any one day are based upon delivery to one facility at any one time. For example 10 truck trips delivering components to one facility will be added to the daily generated traffic. There may be some weeks or months when equipment is delivered to another facility
- the vehicles generated by the haulage of the 1050 mm diameter pipe are based on two pipe lengths per truck.

The distribution of traffic on the state controlled road network is based on the more direct routes from Gladstone and Brisbane to the construction site, depending on the source.

The numbers of vehicles on the state controlled road network are summarised in Table 3.1. The volumes in Table 3.1 are an upper limit for the following reasons:

- They represent the sum of all of any one day's activities.
- There will be three months of delivery of pipe to stockpiles prior to work commencing on site.
- There will be approximately eight months where the pipe delivery will be completed and construction works will be in progress.
- Delivery of equipment for facilities will be in peaks based on high activity over several days followed by no deliveries for weeks or months.

Table 3.1 Peak daily traffic distribution—state controlled roads

Road	Section	Generated construction worker light traffic (VPD)	Generated haulage traffic (VPD)
Warrego Highway	Ipswich–Toowoomba	0	60
	Toowoomba City	0	60
	Toowoomba–Dalby	0	60
	Dalby–Miles	200	60–322
	Miles–Roma	200	22–306
Leichhardt Highway	Westwood–Taroom	0	54–196
	Taroom–Miles	200	166–230
	Miles–Goondiwindi	200	110
Bruce Highway	Benaraby–Rockhampton	200	186
Burnett Highway	Monto–Biloela	200	186
Dawson Highway	Gladstone–Biloela	200	136–230
	Biloela–Banana	0	136
	Banana–Rolleston	0	114
Moonie Highway	Dalby–St George	100	118–264
Gladstone – Mt Larcom Road		200	110
Eidsvold–Theodore Road		200	80–214
Surat Developmental Road	Surat–Tara	0	110
	Tara–Dalby	100	110–242
Dalby–Kogan Road		200	88–254
Kogan–Condamine Road		200	242
Chinchilla–Tara Road		200	2
Tara–Kogan Road		200	2
Jackson–Wandoan Road		200	266
Roma–Taroom Road	84 km–149 km	0	188
Carnarvon Highway	Roma–Injune	0	40
	Injune–Rolleston	0	114–208

Examples of the generated haulage traffic trips are calculated as follows:

- Warrego Highway (Toowoomba–Dalby)

Water pipeline UIC	36
Joint coating UIC	4
Construction camp units	10
Scraper units	20
Meter station units	20

Given that the transportation on any one day will be associated with only the construction camp units or scraper units or meter station units, the adopted daily generated traffic includes the larger trip numbers associated with these facilities. The adopted generated traffic is 60.

- Leichhardt Highway (Taroom–Miles)

1050 mm dia. pipe for export pipeline, collection header and lateral pipeline	110
Joint coating export pipeline	4
Quarry materials	94
Construction camp units	10
Scraper units	10
Meter station units	20

Similarly for the Warrego Highway the adopted daily traffic includes the larger number of trips associated with either the construction camp, or scraper units or meter station units. The adopted daily volume is 230 trips.

For light traffic volumes associated with the construction camp, the construction workers will be travelling to various construction sites along the pipeline and some will be located up the pipeline from the camp and some down the pipeline from the camp. Therefore in most cases the whole of the camp workforce will not be travelling along the same route. The other 60 trips listed in Table 2.2 may also not be on the same roads as the construction camp to work site trips. Two hundred trips per day have been assigned to all roads around the construction site camps.

The local government roads that may be used for activities related to the pipeline construction, haulage and worker transport are listed in Appendix B, Appendix E and Appendix G.

4 Pavement impact assessments

4.1 CURRENT PAVEMENT LOADINGS

The current pavement loadings on the state controlled road network have been assessed using traffic count volumes, proportion of heavy vehicles and annual growth rates provided by the following Department of Main Roads (DMR) regions:

- Wide Bay – Burnett Region
- Fitzroy Region
- Darling Downs Region
- South West Region.

DMR Fitzroy Region nominated 2.9 ESAs per commercial vehicle for the Bruce Highway and 3.2 ESAs per commercial vehicle for other roads in the Fitzroy Region.

DMR Darling Downs, Wide Bay – Burnett and South West Regions were unable to provide ESAs per commercial vehicle. The calculation of the current daily ESAs for each section of state controlled roads within these regions is based on the annual average daily traffic (AADT) and the proportion of trucks, articulated vehicles and road trains. The axle groups for each class of vehicle are assumed as follows:

- truck single axle and tandem dual drive axles
- articulated vehicle single axle and tandem dual drive axles and tandem triaxle on the trailer
- road trains single axle and tandem dual drive axles and tandem dual axles on trailer dollies and rear tandem triaxle on the trailers.

The ESAs per vehicle class is the average of the particular vehicle fully loaded and completely unloaded (tare weight only). The average ESAs per commercial vehicle on each road ranged between 2.52 and 4.36.

The pavement loading over the next 20 years using the growth rates provided by the regions is set out in Appendix H as the Base Case. Where traffic counts show negative growth rates, the calculations adopt a zero growth rate over 20 years. Where the growth rates over the last five years show growth in excess of 5% per annum, a maximum growth rate of 5% over 20 years has been adopted.

On the local government controlled roads there is no data from which to derive traffic loadings. The majority of the local government controlled roads are unsealed.

4.2 PROPOSED HAULAGE DEVELOPMENT LOADINGS

The proposed haulage loadings have been based on haulage vehicles being loaded to the maximum loads as advised by QGC and are summarised in Table 4.1.

The ESAs per vehicle have been calculated using the following parameters:

- 1 ESA on single axle single wheel 5.4 tonnes
- 1 ESA on single axle dual wheels 8.1 tonnes.

Table 4.1 ESAs per commercial vehicle

Vehicle	Haulage	Pay load (tonnes)	Truck load i.e. pay load + tare weight (tonnes)	ESAs
Semitrailer	1050 mm dia. steel pipe	22	36	4.34
Semitrailer	525 mm dia. HDPE pipe	8.1	22.1	1.37
Semitrailer	Field joint coating	23.0	37	5.25
Semi tipper	Quarry	28.0	42.5	5.05
Semitrailer	Modular buildings	3.5	17.5	1.14
Semitrailer	Scraper stations	26.5	42.5	5.1
Semitrailer	Meter stations	26.5	42.5	5.1

The assumed vehicle configurations are single wheel single steer axle, tandem axle dual wheel drive group and the tandem axle dual wheel trailer axle group.

4.3 PROPOSED VEHICLE COMBINATIONS, AXLE TYPES AND CONFIGURATIONS

The proposed vehicle combinations will be semitrailers with possibly a small proportion of B-doubles. It is envisaged that minimal use will be made of road trains as the majority of haul routes include certain state government controlled roads on which road trains cannot travel.

4.4 PAVEMENT IMPACT ASSESSMENT

The assessment of the additional haulage of the pavements on the various elements of the state controlled road network is set out in Appendix I. The traffic loading from the construction has been calculated for the 20 year life of the pavement. In accordance with DMR Guidelines Section 3.3 Criteria 2 ‘Pavement impact assessment’ states: ‘generally pavement impacts need to be assessed for any section of a SCR (State Controlled Road) where the construction or operational traffic generated by the development exceeds 5% of the existing ESA on the road section’. Table 4.2 lists the state controlled roads where the average daily generated ESA is greater than 5% of the current ESA and therefore needs assessment.

Table 4.2 Average ESAs and daily impact

Road	Section	Current average ESA/day	Average generated ESA/day	Daily impact
Warrego Highway	Dalby–Miles 84–126 km	900	88	10%
	Miles–Roma 0.0–45 km	800–1100	117–156	10–20%
Leichhardt Highway	Westwood – Taroom 105 km–256 km	300–700	117–127	20–50%
	Taroom–Miles	400	113–117	30%
	Miles–Goondiwindi 0.0–82 km	200–300	57	20–30%
Bruce Highway	Benaraby–Rockhampton 0.0–46 km	1700–1800	152	10%
Burnett Highway	Monto–Biloela 42–94 km	200–300	139	50–90%
Dawson Highway	Gladstone–Biloela	300–2100	148–161	10–60%
	Biloela–Banana 0.0–46 km	300–800	120	20–40%
	Banana–Rolleston	200–800	163	20–80%
Moonie Highway	Dalby–St George 0.0–51 km	400–600	121–154	20–40%
Gladstone – Mt Larcom Road	0.0–32 km	1000–2100	105–106	10%
Carnarvon Highway	Roma–Injune	400–600	102	20–30%
	Injune–Rolleston	400–500	163–235	40–60%
Eidsvold–Theodore Road	3–144 km	30–110	107–203	120–620%
Surat – Developmental Road	Surat–Tara 120 km–147 km	80–400	57	20–70%
	Tara–Dalby 0.0–41 km	200–300	57–97	20–50%
Dalby–Kogan Road	0.0–52 km	100–200	66–142	30–120%
Kogan–Condamine Road	0.0–72 km	90	108	120%
Tara–Kogan Road	0.0–43 km	20	2	10%
Jackson–Wandoan Road	0.0–81 km	20–40	108	260–470%
Roma–Taroom Road	110–150 km	33	232	700%

The construction of the pipelines will on some roads be of relatively short duration and, while the daily impact is significant, the impact over a 12 month period may not be regarded as significant. The road elements on state controlled roads where the total generated ESA is greater than 5% of the annual traffic loading are listed in Table 4.3.

Table 4.3 Generated pavement loading greater than 5% annual pavement loading

Road	Section	Proportion of annual pavement loading
Leichhardt Highway	Westwood–Taroom 104–170 km	19–44%
	Taroom–Miles	20–32%
	Miles–Goondiwindi 32–53 km	5.63%
Burnett Highway	Monto–Biloela	9–15%
Dawson Highway	Gladstone–Biloela	8–28%
	Biloela–Banana	7–20%
	Banana–Rolleston	5–7%
Surat Developmental Road	Surat–Tara 0–40 km & 119–147 km	6%-13%
Dalby–Kogan Road	19–47 km	12.5%
Eidsvold–Theodore Road		<5–30%
Kogan–Condamine Road		27 %
Jackson–Wandoan Road		36–67%
Roma–Taroom Road	84–149 km	58%

Contributions to road maintenance to ameliorate the impact of the haulage on road sections listed in Table 4.3 require further analysis and negotiation with DMR.

On all of the local government controlled roads the increases in the traffic volumes on unsealed roadways will need to be addressed on a road by road basis. The increased traffic will mean additional wear on the road surface, dust affecting visibility, and more rapid deterioration in riding quality from corrugations. The options will be:

- additional road maintenance in the form of additional light grading, heavy grading and gravel re-sheeting
- widening the existing unsealed road formation and additional maintenance
- paving and sealing the more highly trafficked roads, e.g. local government controlled roads providing access to construction sites.

The extent of this increased maintenance will depend on the actual amount of haulage that occurs on these roads.

5 Traffic operations assessment

5.1 ROAD LINK ANALYSIS

Table 5.1 shows the sections of state controlled road network where the increases in traffic volumes are greater than 5% and are considered to have significant impact on the road network over the period of haulage and construction of the pipelines.

Table 5.1 Impacted state controlled roads

Road	Section	Current AADT	Generated traffic volumes (VPD)	Maximum impact
Warrego Highway	Dalby–Miles 45–126 km	2100–6500	412–522	15–25%
	Miles–Roma 0.0–57 km	1200–3000	222–506	15–25%
Leichhardt Highway	Westwood–Taroom 105–256 km	500–2200	190	30–40%
	Taroom–Miles	600–700	230–336	35–55%
	Miles–Goondiwindi 0.0–82 km	300–3400	110–310	35–65%
Bruce Highway	Benaraby–Rockhampton 0.0–46 km	3500–4600	368	10%
Moonie Highway	Dalby–St George 11–51 km	1300–6400	152–264	10–20%
Burnett Highway	Monto – Biloela 42–94 km	700–2400	186	15–60%
Dawson Highway	Gladstone–Biloela 22–117 km	900–28,700	176–230	10–25%
	Biloela–Banana 2–46 km	1300–5500	136	10%
	Banana–Rolleston	200–1700	114	5–55%
Gladstone – Mt Larcom Road	13–32 km	2900–9000	316	10%
Carnarvon Highway	Injune–Rolleston	300–400	114–208	30–60%
Eidsvold–Theodore Road	78–144 km	80–800	134–414	20–525%
Surat Developmental Road	Surat–Tara 120–147 km	300–2200	110	5–45%
	Tara–Dalby 0.0–41 km	600–2200	110–342	5–55%
Dalby–Kogan Road	0.0–52 km	300–500	288–454	55–145%
Kogan–Condamine Road	0.0–72 km	130	442	340%
Chinchilla–Tara Road	0.0–69 km	350–720	202	30–60%
Jackson–Wandoan Road		70–200	264–466	200–705%
Roma–Taroom Road	110–150 km	90	188	205%

The change in level of service on the roads listed in Table 5.1 attributable to the traffic generated has been assessed.

The level of service generally describes the operational conditions within a traffic stream, and their perception by motorists. These conditions are described in terms of factors such as speed, travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. In general there are six levels of service, from A to F, with level of service A representing the best operation and level F the worst.

Table 5.2 lists the maximum AADTs for various levels of service following the DMR's *Road planning and design manual* (Chapter 5, August 2004) and *Guide to traffic engineering practice—Part 2* (Table 3.9, Austroads, 1988) [GTEP-PT2]. A standard K-factor ratio of 0.1 was adopted and the AADTs in Table 3.9 GTEP-PT2 were adjusted for standard 3.3 m lanes with 1.0 m shoulders as set out in Table 3.3 GTEP-PT2.

Table 5.2 Adopted maximum AADTs for various levels of service

Level of service				
A	B	C	D	E
Level terrain				
2000	4000	6550	11,200	19,000
Rolling terrain				
830	2300	4300	6600	12,300

The traffic generated by the development of the pipelines will not reduce the current level of service on the state controlled road network as set out in Table 5.3.

Table 5.3 Level of service over state controlled roads

Road	Section	Current AADT	Generated traffic volumes (VPD)	Existing level of service	New level of service
Warrego Highway	Dalby–Miles	2100–6500	412–522	B–D	B–D
	Miles–Roma	1200–3000	222–506	A–B	A–B
Leichhardt Highway	Westwood–Taroom	500–2200	190	A–B	A–B
	Taroom–Miles	600–700	230–336	A	A
	Miles–Goondiwindi	300–3,400	110–310	A–B	A–B
Bruce Highway	Benaraby–Rockhampton	3500–4600	368	C	C
Moonie Highway	Dalby – St George	1300–6400	152–264	A–C	A–C
Burnett Highway	Monto–Biloela	700–2400	186	A–B	A–B
Dawson Highway	Gladstone–Biloela	900–28,700	176–230	A–E	A–E
	Biloela–Banana	1300–5500	136	A–C	A–C
	Banana–Rolleston	200–1700	114	A	A

Table 5.3 Continued

Road	Section	Current AADT	Generated traffic volumes (VPD)	Existing level of service	New level of service
Gladstone – Mt Larcom Road		2900–9000	114–208	B–D	B–D
Carnarvon Highway	Injune–Rolleston	300–400	176–230	A	A
Eidsvold–Theodore Road		80–800	134–414	A	A
Surat Developmental Road	Surat–Tara	300–2200	110	A–B	A–B
	Tara–Dalby	600–2200	110–342	A–B	A–B
Dalby–Kogan Road		300–500	288–454	A	A
Kogan–Condamine Road		130	442	A	A
Chinchilla–Tara Road		350–720	202	A	A
Jackson–Wandoan Road		70–200	264–466	A	A
Roma–Taroom Road		50–300	188	A	A

The traffic volumes generated by the project do not alter the levels of service on the state controlled road network, notwithstanding that the volume increase on some roads is in excess of 200%.

5.2 INTERSECTION ANALYSIS

The haulage of the pipeline materials from Gladstone involves 110 trips per day. While haulage may be an around the clock operation, for the purpose of assessing the impact on the operations of intersections, it is assumed that the peak hour truck movement is 10% of the daily traffic, i.e. 11 trips per hour through Gladstone. On the same basis, the peak hour truck movement through Toowoomba is six trips per hour. These additional volumes will not have any impact on the operation of signalised intersections through these cities.

For intersections in rural areas, the peak hour is similarly based on 10% of the daily heavy vehicle movement. This will increase the hourly heavy vehicle volume by 6 - 30 vehicles in the peak hour on roads with current AADT of less than 2000 or 200 vehicles in the peak hour.

The access to the construction camps will have the most traffic impact on the road network. These accesses will affect the roads with AADTs of less than 2000. The maximum number of vehicles leaving and entering each camp at any one period is 100 vehicles. The average delay to vehicles entering and leaving the camps either at the camp access itself or at intersections on the road network will on average be less than 2 seconds with on average only one vehicle queued.

5.3 ROAD USE MANAGEMENT PLAN

The haulage of materials will be via conventional vehicles.

5.4 PERFORMANCE / CONDITION MONITORING OF BRIDGES/STRUCTURES

The haulage will be undertaken with standard truck loads and in the majority of cases no specific measures in relation to bridges will be necessary. This may change if during the course of the development there becomes a need to transport materials or plant on larger vehicles. If heavy load vehicles are required, the capacity of the bridges along the specific routes will be investigated from either the road authority records or separate structural assessment.

The bridges on the state controlled road network do not have signed load limits. The capacity of timber bridges will be sought from the Department of Main Roads to ensure that the structure is capable of withstanding the proposed number and loading of haulage vehicles.

On local government controlled roads, the load limits on the bridges will be complied with. In addition, condition assessments will be undertaken on any timber bridge or culvert if the local government council has not undertaken an assessment.

6 Safety review

6.1 SAFETY CHECK LIST

6.1.1 Intersections and access

Sight distances to the intersections of local government controlled roads with the state controlled roads generally meet the safe intersection criteria. On the local government controlled road network there are intersections where the safe intersection criteria have not been achieved. Each intersection on the local government controlled road network likely to be affected by construction worker traffic will be assessed. The remedial actions could be to find alternative routes or improve the sight distance.

Accesses to camps and pipeline construction sites will be subject to the requirements of the relevant road authority.

6.1.2 Pedestrians, cyclists and motor cyclists

The haulage of the materials is predominately along rural highways and roads. Interaction of haulage vehicles with pedestrians, cyclists and motorcyclists occurs in the cities and towns. The increase in traffic volume along the urban roads is considered to be insignificant, and therefore there is no increase in the safety risk to these other road users.

6.1.3 School bus routes

School bus routes are present along a number of both state controlled and local government controlled roads. Construction worker traffic will be outside the times when the school buses are operating. The number of trucks using local government controlled roads will be fewer than for the state controlled roads. Similarly the number of days materials are hauled over each local road network will be fewer than for the state controlled roads.

Regardless of the road hierarchy, the interaction of haulage traffic and times when children are being picked up or set down by the school bus will be assessed on a road by road basis for all school bus routes. The details of the school bus routes and operators will be sourced from Queensland Transport. Discussions will be held with the operators to determine how to reduce the construction traffic and the bus operations with more emphasis the safety of children waiting for and leaving buses. This may be achieved by restricting construction traffic at particular times on particular roads or re routing construction traffic away from school bus routes.

7 Environmental and other issues

7.1 OVERVIEW

This report forms part of the wider environmental impact study (EIS) for the development of the gas fields in the Surat Basin, construction of a 380 km gas transmission line (and other associated pipelines), a liquefied natural gas plant and export terminal near Gladstone. This section is specific to the construction of the 380 km gas transmission line and other associated pipelines.

7.2 ROAD NOISE

The volume of vehicles generated by construction of the gas transmission line will not generate the need for specific road noise measures. The only noise aspect to be considered is the effect of the increased volume of trucks hauling at night along routes fronted by residences.

7.3 DUST CONTROL

The majority of the state controlled roads affected by the project are sealed.

The majority of the local government controlled roads are unsealed. In the case of unsealed roads, attention will be given to more regular maintenance grading of the unsealed roads with rollers and water trucks to ensure both a smooth running surface and a reduction in the nuisance of dust.

7.4 ROADWORKS IN THE ROAD AND RAIL RESERVE

Works will be conducted within road reserves for the following activities:

- constructing accesses
- pipe road crossings.

Works within road reserves will be subject to the approval of the relevant road authority. The project will have a traffic management plan for work within the reserves. This plan will set out the procedure for preparing traffic control plans (TCPs), submission of TCPs to the relevant authority in advance of the work progressing, obtaining permits from Queensland Police Service and handover to traffic controllers once all approvals are in place.

Pipe crossings will occur on roads with single carriageways, and open trenching of these roads will require either constructing side tracks or reducing the road to one lane-two way operation under traffic controllers as discussed in Section 2.6. In some instances constructing side tracks will not be feasible and delays to traffic with one

lane-two way operations will be unacceptable. In these instances construction will be by trenchless construction methods.

Where approved by the relevant road authority, the pipe crossings will be by open trenching. Where open trenching is not approved the pipes will be installed by trenchless construction methods.

All crossings of rail formations will be by trenchless construction methods.

7.5 ACCESS CONTROL

All access will be unsignalised and the road rules will be iterated with the appropriate regulatory signage. The establishment of access to the camps and pipelines off the road network will be subject to the approval of the relevant road authority.

7.6 ON SITE PARKING REQUIREMENTS

On site parking will be provided for all vehicles associated with the project in the construction camps and the construction sites. Any vehicles associated with construction work within road reserves will be required to park at a safe distance from the road formation.

7.7 ANCILLARY WORKS AND ENCROACHMENTS

Other than pipelines crossing road reserves, there will be no encroachments into road reserves.

7.8 OVER-DIMENSION VEHICLES

At this stage the use of over-dimension vehicles may be required to transport large earthmoving plant (nominally dozers and excavators) along the pipeline alignment. These vehicles will operate within the conditions of the operational permit. The use of these vehicles will be on an ad hoc basis.

8 Impact mitigation for roads

8.1 STATE CONTROLLED ROADS

8.1.1 Impacts

The impacts on the state controlled road network are summarised as follows:

- a significant increase in the volume of traffic using the roads as set out in Table 5.1
- no change in the current levels of service caused by increased traffic as shown in Table 5.3
- the increase in traffic volumes on the Jackson–Wandoan Road may require the widening of the pavement to two lanes over the existing narrow floodways.

The haulage operations will have to comply with the load restrictions on bridges.

8.1.2 Cost / Contribution Methodology

This has not been identified at this stage on any roads.

8.2 LOCAL GOVERNMENT CONTROLLED ROADS

As the majority of the local government roads are unsealed, the increase in traffic volume on the roads listed in Appendices B, E and G may be significant. The appropriate treatments for these roads will be negotiated with the relevant local government councils. The amelioration could be:

- more regular maintenance grading
- gravel re-sheeting
- dust suppression
- paving and sealing roads near construction camps
- upgrade of intersections where sight distances do not meet standards.

The haulage operations will have to comply with the load limits on bridges.

9 References

Queensland Department of Main Roads *Guidelines for assessment of road impacts of development* (2006) Queensland Department of Main Roads

Queensland Department of Main Roads *Manual of uniform traffic control devices* (DMR 2003 Edition) Queensland Department of Main Roads.

Queensland Department of Main Roads *Road planning and design manual* (Chapter 5, August 2004) Queensland Department of Main Roads

Austroads *Guide to traffic engineering practice—Part 2* (Table 3.9, Austroads, 1988) [GTEP-PT2].

Appendix A

HAUL ROUTE – EXPORT PIPELINE

CLIENT: QGC & BG International

PROJECT: Queensland Curtis LNG Project

TITLE: Main Pipeline Haulage Routes

DATE: 8-January-2009

DATA SOURCE:

1:250,000 Topographic Raster copyright Geoscience Australia

> Prepared by Mpele (UK) > Phone: +61-7-3252 8000 > Web: www.mpele.com.au > Email: info@mpele.com.au

SCALE: 1:1,300,000 (A3) GDA94 Lat/Long

-20 0 20 40 60

Kilometres

LEGEND

Main Pipeline Haulage Routes

Main 1050 Construction

PROPOSED PIPELINE ALIGNMENT	REV NO	DATE	SUPPLIED BY
Main Pipeline & KPs	Rev C	05-12-2008	Unide
Collector Lateral & KPs	Rev C	17-11-2008	Unide
Approx. Upstream Infrastructure Contour & KPs	Rev A	26-11-2008	Unide

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AREA OF DETAIL

QUEENSLAND

Gladstone

Condamine

BRISBANE

NT QLD WA SA NSW VIC TAS

Emerald
Blackwater
Springsuyre
Rolleston
Bauhinia
Moura
Banana
Biloela
Gladstone
Rockhampton
Theodore
Cracow
Taroom
Injune
Wandoan
Roma
Miles

SOUTH PACIFIC OCEAN

GREAT BARRIER REEF MARINE PARK

CORAL SEA

WORKSPACE: G:\QGC\QCLNG\Data Work Request\2009-01-08 Collection Lateral Haulage Routes\Collection Lateral Haulage Routes.WOR

MAP: G:\QGC\QCLNG\Maps