Australia Pacific LNG Project

Volume 3: Gas Pipeline

Chapter 17: Traffic and Transport

Contents

17. Traffic and transport 1
17.1 Introduction 1
17.1.1 Purpose 1
17.1.2 Scope of work 1
17.1.3 Legislative framework 5
17.2 Methodology 11
17.2.1 Road network 11
17.2.2 Rail network 16
17.2.3 Shipping network 16
17.2.4 Air services 17
17.2.5 Cumulative analysis 17
17.3 Existing environment 17
17.3.1 Existing road network 17
17.3.2 Existing rail network 21
17.3.3 Existing shipping network 22
17.3.4 Existing air services 22
17.4 Project traffic 23
17.4.1 Description and location of proposed pipeline 23
17.4.2 Road traffic 24
17.4.3 Shipping traffic 28
17.5 Potential impacts 28
17.5.1 Road network 28
17.5.2 Rail network 34
17.5.3 Shipping network 37
17.5.4 Air services network 39
17.6 Mitigation and management 39
17.6.1 Road links 40
17.6.2 Rail Network 49
17.6.3 Shipping network 52
17.6.4 Air services network 52
17.7 Conclusions 53
17.7.1 Assessment outcomes 53

17.7.2 Commitments 61

Figures

Figure 17.1 Main transmission pipeline construction routes 4
Figure 17.2 Peak daily traffic generated during gas pipeline construction 26
Figure 17.3 Auckland Point conceptual layout 38

Tables

Table 17.1 Cross referencing with other EIS chapters 3
Table 17.2 Government acts and regulations 5
Table 17.3 Policy and network planning documents 7
Table 17.4 Roadway link capacities 14
Table 17.5 Adopted maximum AADTs for various levels of service 14
Table 17.6 State-controlled roads 18
Table 17.7 Local roads 18
Table 17.8 Existing traffic volumes 19
Table 17.9 Crash risk parameters 21
Table 17.10 Traffic generated during construction 25
Table 17.11 Traffic generated from pipeline construction 26
Table 17.12 Pipeline construction routes 27
Table 17.13 Banana Shire Council roads impacted 29
Table 17.14 Western Downs Regional Council roads impacted 30
Table 17.15 Gladstone Regional Council roads impacted 31
Table 17.16 Stock route classification 33
Table 17.17 Material by rail transport program 35
Table 17.18 Pipe transport task by corridors 35
Table 17.19 Road/rail crossing points within the study area 36
Table 17.20 Banana Shire Council roads 41
Table 17.21 Western Downs Regional Council roads 42
Table 17.22 Gladstone Regional Council roads 43
Table 17.23 Pavement rehabilitation impacts 45
Table 17.24 Maintenance impact 45
Table 17.25 Summary of environmental values, sustainability principles, potential impacts and mitigation measures 54

17. Traffic and transport

17.1 Introduction

17.1.1 Purpose

This chapter of the environmental impact statement (EIS) forms the traffic and transport impact assessment of the gas pipeline element of the Australia Pacific LNG Project (the Project). The assessment addresses the traffic and transport impacts associated with the development, construction and operation of the gas pipeline. It identifies the nature, magnitude and significance of the traffic and transport impacts and identifies appropriate measures for impact management and mitigation, which are designed to reduce negative impacts and maximise the positive benefits.

The traffic and transport technical report in Volume 5 Attachment 35 underpins the outcomes summarised in this chapter. It provides a detailed technical assessment of the impact on the whole transport network from all elements of the Australia Pacific LNG project (the Project), including the gas pipeline. It covers the background, methodology, potential impacts, impact assessment and mitigation measures for each mode of transport across the whole transport network.

Australia Pacific LNG recognises that the construction and operation of the gas fields could create environmental and community impacts and that successful management of these impacts will be crucial throughout the life of the Project. To this end, the assessment of this project across all disciplines has incorporated recognised sustainability principles.

Of Australia Pacific LNG's 12 sustainability principles, the key relevant principles for the traffic and transport component of the EIS are:

- Minimising adverse environmental impacts and enhancing environmental benefits associated with Australia Pacific LNG's activities, products or services; conserving, protecting, and enhancing where the opportunity exists, the biodiversity values and water resources in its operational areas
- Identifying, assessing, managing, monitoring and reviewing risks to Australia Pacific LNG's workforce, its property, the environment and the communities affected by its activities.

17.1.2 Scope of work

The gas pipeline extends approximately 450km, from the LNG facility on Curtis Island to Miles. The pipe is made up of 42 inch, 36 inch and 30 inch diameter sections, constructed in 18m segments.

Transporting pipe segments from the port to laydown yards and coating facilities may begin in the first half of 2011 and continue for approximately 12 months. Pipe segments will be transported from Auckland Point in Gladstone or the Port of Brisbane to coating facilities located along the pipeline route. After coating, the pipe segments will be transported to laydown yards before final placement in the gas pipeline right of way.

Construction of the gas pipeline is expected to begin in April 2012 and continue for approximately 18 months. The traffic assessment of the construction of the pipeline has been based on the assumption of work commencing near The Narrows crossing in the north proceeding south towards Miles, but following a recent ecological assessment aimed at minimising the risk of weed spread, it is now proposed to construct the pipeline from south to north. Both options will be further studied in the front

end engineering development (FEED) stage of the Project. However, the impacts on the traffic and transport network for either option will be similar in terms of traffic generated and routes adopted.

In this chapter, the impacts of additional traffic generated by the construction of the pipeline are discussed, this includes a description of the existing transport infrastructure of the surrounding region, transport tasks and routes required by the Project, potential impacts and mitigation measures and proposed infrastructure alterations. This chapter relates predominately to the infrastructure outside of Gladstone. Impacts from constructing and operating the gas field infrastructure and the Curtis Island LNG facility, such as impacts on the Port of Gladstone, shipping movements and road intersections within the Gladstone area are discussed in Volume 2 Chapter 17 and Volume 4 Chapter 17 respectively.

The traffic and transport technical report in Volume 5 Attachment 35, assesses the impact of all the project elements across the study area. This includes the gas fields study area, the gas pipeline corridor to Gladstone, and the area on Curtis Island allocated to the LNG facility.

The study area for the gas pipeline is generally along the gas pipeline corridor from Curtis Island near Gladstone through to Miles. This is shown in Figure 17.1.

The pipeline study area is a portion of the total network investigated by this study and is also where the gas pipeline traffic will have the greatest impact. Although the gas pipeline development will generate traffic outside of this area, the investigation of the impact of the whole project on regional roads determined that roads outside the gas pipeline study area will be negligibly impacted by the development of the gas pipeline only. For example, transporting pipes from Auckland Point via the Port Access Road/Dawson Highway will peak at less than 65 vehicles a day which is less than 1% of the total vehicles on this section of road. The Guidelines for the Assessment of Road Impacts of Developments state that Department of Transport and Main Roads (DTMR) generally considers a development's road impacts to be insignificant if the development generates an increase in traffic on state-controlled roads of no more than five percent of existing levels.

The analyses detailed in this chapter relates to a maximum development scenario. The Project configuration, timing, workforce requirements, route selection and materials requirements assumed in this chapter describe information as it is currently understood and depict the 'maximum case' scenario in terms of traffic and transport impacts. Consequently, any future changes to the Project made by Australia Pacific LNG, such as a decrease in workforce requirements, or change in location of a gas plant, are not likely to have an impact on the transport network greater than what is reported in this study.

Terms of reference

The Department of Infrastructure and Planning (DIP) has produced the terms of reference (TOR) for the Project EIS (December 2009). These provided the base assessment criteria for the Project. A series of issues to be addressed were identified for transport, including the need to describe and assess existing transport conditions, the proposed project and the likely impact of this project on the network, and the proposed mitigation measures. The TOR for traffic and transport are given in Volume 5 Attachment 35, along with the issues raised in the TOR and where in the report the issue has been addressed.

Traffic generated by the Project may result in impacts outside of the scope of works of this traffic and transport report but which are addressed in other chapters of the EIS. Table 17.1 identifies the chapters within Volumes 2, 3 and 4 of this EIS where issues identified in this report are further assessed.

Table 17.1 Cross referencing with other EIS chapters

Transport related issue	Chapter in EIS where addressed
Likelihood of product spill	Hazard and risk – Volume 3 Chapter 22, Volume 3 Chapter 22, and Volume 4 Chapter 22
Quarantine management/ spreading of weeds/pests	Terrestrial ecology – Volume 3 Chapter 8, Volume 3 Chapter 8, and Volume 4 Chapter 8
Waste management	Waste – Volume 3 Chapter 16, Volume 3 Chapter 16, and Volume 4 Chapter 16
Greenhouse gas emissions	Greenhouse gases – Volume 3 Chapter 14, Volume 3 Chapter 14, and Volume 4 Chapter 14
Projected construction and operational workforce	Social impact – Volume 3 Chapter 20, Volume 3 Chapter 20, and Volume 4 Chapter 20
Impact of project shipping on marine environment	Marine ecology – Volume 3 Chapter 10, Volume 3 Chapter 10, and Volume 4 Chapter 10
Construction and use of roads and other project infrastructure in flood prone areas	Water resources – Volume 3 Chapter 11, Volume 3 Chapter 11, and Volume 4 Chapter 11
Impact on bridges of heritage value along roads used by project traffic	Shared cultural heritage – Volume 3 Chapter 19, Volume 3 Chapter 19, and Volume 4 Chapter 19

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INSET

Rockhampton
Mount Morgan
Temporary accommodation facility 1
Proposed LNG facility
Laydown 1
Gladstone
Laydown 2
Laydown 3
Temporary accommodation facility 2
Biloela
Miriam Vale
0 20km

SEE INSET

Mount Morgan
Gladstone
Baralaba
Biloela
Miriam Vale
Moura
Temporary accommodation facility 3
Laydown 4
Monto
Theodore
Temporary accommodation facility 4
Biggenden
Taroom
Gayndah
Temporary accommodation facility 5
Injune
Laydown 5
Wandoan
Goomeri
Temporary accommodation facility 6
Kingaroy
Roma
Wallumbilla
Miles
Chinchilla
Surat
Dalby
Tara
Oakey
Toowoomba
Millmerran

147.00 148.00 149.00 150.00 151.00 152.00
-24.00 -25.00 -26.00 -27.00 -28.00

0 25 50km
SCALE - 1 : 1,800,000 (at A3)
Latitude / Longitude
Geocentric Datum of Australia 1994
N

QLD NT SA NSW
Area of Interest
Taroom Monto Roma Surat Dalby Toowoomba
MAP KEY 0 100km

LEGEND

- Town
- Aircraft facility
- Railway
- Road
- Study area

Proposed pipeline construction

- Gas pipeline route
- Construction route
- Temporary accommodation facilities / laydown

Walloons Gas Fields Development Areas

- Talinga / Orana
- Dalwogan
- Kainama
- Gilbert Gully
- Combabula / Ramyard
- Woleebee
- Carinya
- Condabri

Source Information

Roads, Towns
Department of Main Roads 2009
Gas pipeline route, laydown areas and temporary accommodation facilities
Supplied by Origin Energy on 03/11/2009

AUSTRALIA PACIFIC LNG PROJECT

Volume 3 Chapter 17
Figure 17.1 Main transmission pipeline construction routes

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17.1.3 Legislative framework

17.1 Government acts and regulations

Many parts of the legislation and policies that Queensland and local governments administer are relevant to transport operations. Together with the terms of reference, these provide the reference point for undertaking this assessment. Key documents are identified in Table 17.2 along with their purpose and relevance to the Project.

Table 17.2 Government acts and regulations

Legislation	Objective or purpose of legislation	Relevance to the Project
Transport Infrastructure Act 1994	Encourages effective integrated planning and efficient management of a system of transport infrastructure.	Provides a basis for road impact assessment. Provides road design requirements and policy objectives for efficient use of the network, and identifies the capital roads program. Outlines statutory requirements for rail safety.
Transport Operations (Road Use Management) Act 1995	Establishes a scheme to manage vehicles, drivers and access to the road network.	Identifies compliance requirements and procedures.
Road Transport - Heavy Vehicle Driver Fatigue Act 2006 (as amended 29 September 2008)	The Act is a national model law that is intended to provide the basis for nationally consistent transport laws. The legislation makes all parties in the supply chain legally responsible for preventing driver fatigue. The new laws apply to both trucks and buses	As identified under the relevant Queensland legislation below mitigation measures identified in this chapter comply with this requirement.
Transport Operations (Road Use Management – Fatigue Management) Regulation, 2008	Provides safe management of the fatigue of drivers using fatigue-regulated heavy vehicles.	Establishes regulations for fatigue management. As the Project involves long distance road travel, managing driver hours to ensure road safety is vital.
AusLink (National Land Transport) Act 2005	The objective of this Act is to assist national and regional economic and social development by the provision of Commonwealth funding aimed at improving the performance of land transport infrastructure.	The Commonwealth provides funding to a number of state-controlled highways used by project traffic and that may require alterations.
Transport Infrastructure (State Controlled Roads) Regulation, 2006	Provides regulations for access, road works and ancillary works encroaching on state-controlled roads.	Establishes regulations to be adhered to for pipelines crossing state-controlled roads.

Legislation	Objective or purpose of legislation	Relevance to the Project
Civil Aviation Act 1988	Establishes the Civil Aviation Safety Authority (CASA) and a regulatory framework for maintaining, enhancing and promoting the safety of civil aviation.	Defines the legislative requirements for operating air services used by the Project.
Land Protection (Pest and Stock Route Management) Act 2002	Provides pest management requirements for land and stock route network management.	Establishes requirements for instances when the pipeline and new/improved access roads cross or impact stock routes in the study area.

Policy and network planning documents

Table 17.3 lists the various local and Queensland government planning and policy documents relevant to transport. Other regulatory and non-regulatory plans and policies relevant to the Project are provided in Volume 3 Chapter 6 – Land use and planning.

Table 17.3 Policy and network planning documents

Policy and network planning document	Objective or purpose	Relevance to the Project
The Gladstone Integrated Regional Transport Plan 2001–2030	Sets out a comprehensive framework for future development of Gladstone's regional transport network, for the next 30 years.	Matters of particular interest to the Project include: • Improved facilities at Auckland Point and Fisherman's Landing, including improved road and rail access • Improved air services at Gladstone Airport and retained option of Kangaroo Island as a future alternative airport.
The Roads Implementation Program 2008/09–2012/13	Details DTMR projects that have been allocated funds and includes information about the funding allocation and expected timing of proposed works.	The most significant road works project proposed in the Project area is the DTMR $70 million commitment to improve the Dawson Highway (Gladstone-Biloela) along the Calliope Range. This will greatly assist traffic movement along this section of road, including pipeline construction traffic. Road works are proposed to occur between 2009 and 2011. The alteration will improve road alignment and reduce grades.
Development Scheme for the Gladstone State Development Area	The Gladstone State Development Area (GSDA) is some 28,000ha in area and incorporates lands situated to the north-west of Gladstone and on the southern part of Curtis Island, and includes the gas pipeline corridor. The GSDA was established to provide land for large-scale industrial development. The development scheme, which is supported by a number of policies, is a land use planning instrument administered by the Queensland Coordinator-General for the purpose of guiding future development in the GSDA.	The GDSA Development Scheme provides a land use approval process for the assessment of development proposals. Under this process, an application for a material change of use is made, and is assessed by the Coordinator-General against the provisions of the development scheme. Generally, all other development under the *Sustainable Planning Act 2009* (unless exempt) is assessed by the relevant assessment manager such as the Gladstone Regional Council or the Gladstone Ports Corporation. When assessing a material change of use application, the Coordinator-General has regard to the intent, objectives and purposes of the land use designations and policies within the development scheme.

Policy and network planning document	Objective or purpose	Relevance to the Project
Development Scheme for the Callide Infrastructure Corridor State Development Area	The Callide Infrastructure Corridor State Development Area is an infrastructure corridor to provide for the co-location of underground pipelines to transport coal seam gas from Callide to the GSDA. The corridor is approximately 44 kilometres long and is generally 200m wide. In specific areas where environmental, geographic and construction issues exist, the corridor is wider for pipe separation and construction purposes.	The development scheme, which is supported by a number of policies, is a land use planning instrument administered by the Queensland Coordinator-General for the purpose of guiding future development in the Callide Infrastructure Corridor State Development Area. Preferred land uses for the corridor are animal husbandry, gas transportation infrastructure, and to a lesser degree services infrastructure. The development scheme's operation is similar to that described above for the GSDA.
Gladstone Regional Council planning scheme(s) Council currently administers the Gladstone Plan, Calliope Shire Planning Scheme and Planning Scheme for Miriam Vale. There is an overall regional council plan in preparation	These plans provide the regulatory framework for development approval relating to Council infrastructure and other developments. Transport is proposed to play a key role in the new regional council planning scheme	The Project will bring about an increase in Gladstone's traffic, and consultation with Council will play a crucial part in the Project's mitigation measures
Coal Rail Infrastructure Master Plan, 2nd Ed., 2008	Seeks to identify the phased expansion of rail infrastructure to meet future expected growth.	Rail has been identified as an option to assist the Project's freight task.
Gladstone Ports Corporation 50-year Strategic Plan, 2008	Identifies potential port developments and provides a plan to enhance the ports readiness to accommodate the continuing stable and sustainable growth of Gladstone's industry.	An efficient and safe port operation is crucial for successful delivering the Project. Working closely with the Gladstone Ports Corporation will be important when considering mitigation measures.
Gladstone Airport Development Plan, 2008	Provides for a range of alterations. This includes improving passenger terminal facilities, and extending and strengthening the runway to enhance jet aircraft operations.	Project staff will use Gladstone Airport, so potential impacts and mitigation measures have been framed to support the airport's development plans

Policy and network planning document	Objective or purpose	Relevance to the Project
Gladstone City Council Walk - Cycle Network Improvement Plan, 2006	Seeks to expand the existing limited and largely fragmented network, and aims to improve the relatively low level of cycle use.	Proposed road and intersection alterations seek to include pedestrian and cyclist facilities
Draft Port of Gladstone Western Basin Master Plan, 2009	The Department of Infrastructure and Planning prepared this plan under Section 10(2) of the *State Development and Public Works Organisation Act 1971*. It was specifically prepared in response to the numerous LNG projects proposed for Gladstone. It provides a framework for developing the Western Basin and a basis for consistent assessment of the cumulative impacts of the LNG industry and other proposals. It identifies, over the next 30 years to 2039: • Current and future land and marine uses • Infrastructure development, including pipeline corridors, transport networks and potential bridge access to Curtis Island • Port activities • Common-user channels • Dredging and disposal options. It also examines conservation areas and the potential for environmental areas to be set aside as part of the required mitigation measures. To support the draft master plan, consultants prepared the Port of Gladstone Western Basin Master Plan study.	This is currently a draft plan so it is not endorsed government policy. It is not intended as a replacement for existing legislation and regulations for LNG projects, including this EIS assessment. But it will provide a framework for the area's development.

Policy and network planning document	Objective or purpose	Relevance to the Project
Western Downs Regional Council Planning Scheme(s) There is an overall regional council plan in preparation. Council currently administers the Chinchilla, Murilla and Taroom Town planning schemes	These plans provide for regulating, implementing and administering each area's specific planning scheme. The plans include a statement of objectives and relevant criteria for implementing the regional strategic plan. For transport policies, these schemes primarily address planning controls relating to new development, such as car parking standards and access arrangements.	A portion of the pipeline is contained within the Western Downs Regional Council.
Banana Shire Planning Scheme	Sets out the regulatory and policy framework for general development within the Shire. For transport policies, this scheme primarily addresses planning controls relating to new development, such as car parking standards and access arrangements.	The Project raises key issues for this Shire, including impacts from: • Project staff using local airports • The gas pipeline crossing utility corridors, stock routes and local roads • Project vehicles increasing traffic on local roads.

17.2 Methodology

In this section, the methodology adopted to assess potential impacts of constructing and operating the gas pipeline on the transport network is discussed.

This assessment of the transport network was undertaken within the following parameters:

- It is assumed that 18m is the maximum length of gas pipe segments to be transported by road. This complies with available transportation vehicles, current legislation and access provisions
- Movement of material and personnel to site will be primarily by road based transport, although the use of the rail network for the movement of some construction material has been investigated and is identified as an alternative scenario
- Construction personnel will be transported to and from temporary accommodation facilities by bus
- Brisbane, Miles and Roma are proposed to have distribution centres for compiling, storing and managing construction and operational materials for the gas pipeline. Miles is proposed to act as the primary distribution centre for the Project. Wherever practicable materials and consumables such as food will be sourced from local suppliers or Australian manufacturers
- Pipe will be imported as uncoated pipe with application of a coating to be applied at a coating facility to be established in the project area.

17.2.1 Road network

Assessment timeframe

The year 2010 has been selected as the starting point for assessment purposes.

The DTMR's publication 'Guidelines for Assessment of Road Impacts of Development' indicates that, for staged developments, the planning horizon should be 10 years after the final stage opens. Therefore, the timeframe for the assessment of any works continues until 2032, as the fourth and final LNG production train of the LNG facility is assumed to be fully operational by the year 2022.

Traffic analysis scenarios

In general, the traffic scenarios modelled in the assessment were as follows:

- Background – this assessment was undertaken with the background traffic within the assessment timeframe and factored by the appropriate growth rates
- Background plus development – this assessment was undertaken with background traffic plus the addition of the traffic generated from the Project
- Background plus development and regionally-significant projects – this assessment was undertaken with background traffic plus the addition of the Project's traffic, and with the traffic generated from other regionally-significant projects.

The assessment of intersection performance was undertaken for the following:

- Year 2010 – as detailed above, this is the first year of the Project's assessment period

- Year 2013 – this year is the first peak traffic generation year of the Project that is associated with the construction of LNG trains one and two. This coincides with the construction of the gas pipeline
- Year 2019 – this year represents the second peak traffic generation year of the Project that is associated with the construction of LNG trains three and four. This coincides with the operation of trains one and two. While an earlier peak occurs in 2013, 2019 will be more critical as it will be combined with a higher background traffic component
- Year 2032 – as detailed above, this is the final year of the Project's assessment period.

Assessment triggers

According to the Guidelines for Assessment of Road Impacts of Development, a project's road impacts are considered insignificant if the project generates an increase on state-controlled roads of less than five percent of existing levels. In the event the project generates an increase of more than five percent then the impact is deemed to be potentially significant and the impact needs to be assessed.

Growth rates

During the analysis period, there is predicted to be a background increase in traffic volumes due to growth in the region and independent of the Project. The growth rates are based on:

- Years 2008–2020 – applying the historic 10-year average growth rate based upon the assumption that this growth rate continues to 2020
- Years 2020–2032 – applying a decaying growth rate based on the assumption that this 10-year growth rate is not realistically expected to continue, and a more modest growth rate would occur. This was calculated by reducing the 2010 growth rates by 20% in 2032 and interpolating for the years in between. This reflects general background traffic growth, and generally excludes this and other known regionally significant projects currently planned for the study area.

There were two other limitations exercised in the growth rate parameters, as follows:

- Where the 10-year historical growth rate was less than one percent, including roads with negative growth, a growth rate of one percent per annum. was adopted
- Where the 10-year historical growth rate was greater than five percent, a rate of five percent was adopted for the first 10 years. The growth rate then decays as detailed above.

Sketch planning model

A sketch planning model was developed to identify project-generated traffic. A sketch model is a transport model that aims to simplify or streamline the forecasting of traffic volumes. The Australia Pacific LNG sketch model has been developed in a series of spreadsheets, with additional coding of traffic distribution and routes in GIS. Full details on the structure, use and capability of this model are found in the traffic and transport technical report in Volume 5 Attachment 35.

Road components analysed

When determining the impact of the Project, four components of the road infrastructure network were analysed. These were road link, intersection, pavement and bridge capacity.

Road link, intersection and pavement capacity were assessed using the sketch planning model which combined background traffic and growth rates with project-generated traffic. The impact of the Project on bridges was assessed qualitatively, as only limited bridge condition data was made available for this assessment. The methodology used to determine the Project's impacts are presented below (Section 17.2.1) for each of these components.

Road link capacity analysis

The following methodology was adopted to assess the road links within the gas pipeline study area:

- Identify the road links within the study area that could be utilised by project traffic
- Identify planned road alterations within the study area
- Gather all available data on existing traffic volumes on the road links within the study area
- Input traffic data into the sketch model
- Analyse the network over the analysis period of 2010 to 2032, by factoring the average annual daily traffic by the appropriate growth rates to determine background traffic to road links
- Identify and report deficiencies in the existing network (i.e. where road capacity is exceeded)
- Add project traffic to existing background traffic to calculate increased traffic due to the Project
- identify the road links where the Project traffic has a significant impact (i.e. where project traffic exceeds five percent of existing traffic)
- For the road links deemed to have been significantly impacted by the Project, determine alteration requirements to maintain road link safety and capacity
- Determine whether alteration needs to be brought forward due to project traffic, and by how many years
- Repeat assessment for traffic generated by regionally-significant projects.

The capacity assessment of the road links has been generally based on the approach outlined in Austroads Guide to Traffic Engineering Practice – Part 2. The capacities identified in Table 17.4 are based on a level of service (LOS) E.

Level of Service (LOS) is a qualitative measure describing traffic operational conditions on a road and the perception of these conditions by motorists and/or passengers. Six levels are used, from A to F. LOS A represents free flow conditions in which individual drivers are virtually unaffected by the presence of other drivers.

LOS C is a level where most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre on a road. LOS F represents congested conditions which experience large delays.

Table 17.4 provides a summary of the adopted capacities for various road links within the gas pipeline study area.

Table 17.4 Roadway link capacities

Roadway type	Capacity (vehicles per day)
Rural, two lanes	16,000
Rural, four lanes with median	40,000
Urban, two lane	18,000
Urban, four lane no median, no access control	30,000
Urban, four lane with median, no access control	36,000

The road link capacity analysis for rural roads has also considered the operating level of service (LOS). Extended operation on rural road links at LOS D and E is considered intolerable. Table 17.5 summarises the maximum average annual daily traffic (AADT) for various levels of service as per the Austroads guidelines for rural roads.

Table 17.5 Adopted maximum AADTs for various levels of service

Road link type	AADT for level of service				
	A	B	C	D	E
Rural, two lane	1,200	3,00	5,500	8,400	16,000
Rural, four lane	13,200	18,000	24,000	30,400	40,000

Intersection capacity analysis

The following methodology was adopted to undertake the intersection impact assessment in the gas pipeline study area:

- Identify intersections within the study area that could be significantly impacted by project traffic. Intersections were initially identified as those on road links where project traffic could be more than five percent of existing background traffic
- Obtain background AM/PM peak hour traffic volumes for the intersections from the sketch model
- Analyse the existing intersection operation over the assessment timeframe
- Identify intersections that reach capacity within the assessment timeframe, and the year at which the capacity is reached
- Obtain background plus development AM/PM peak hour traffic volumes for intersections from the sketch model
- Analyse existing intersection operation over the assessment timeframe for background plus development traffic
- Identify intersections that reach capacity within the assessment timeframe and the year at which capacity is reached for background plus development traffic
- For intersections that reach capacity within the assessment timeframe, determine intersection alterations required to maintain intersection capacity throughout the assessment timeframe

- Repeat the assessment for traffic generated by regionally-significant projects to determine cumulative impacts.

The SIDRA Intersection 3.2 analysis program was used to analyse key intersections for each of the analysis scenarios. This program calculates the operation of intersections based on input parameters, including geometry and traffic volumes.

Output from the SIDRA intersection analyses provides values for the degree of saturation, queue lengths and delays. The degree of saturation is a volume-to-capacity ratio and is a common variable for assessing intersection performance. The adopted upper limits for an intersection performing satisfactorily were as follows:

- Un-signalised priority intersections: 0.80
- Roundabouts: 0.85
- Signalised intersections: 0.90.

These degrees of saturation limits are based upon the Guidelines for Assessment of Road Impacts of Development limits. A degree of saturation exceeding these values indicates that the intersection is nearing operational capacity. Above these values, users of the intersection are likely to experience unacceptable levels of service and delay.

Pavement capacity analysis

The following methodology was adopted for the impact assessment of pavements on state-controlled roads in the gas pipeline study area:

- Identify the road links within the study area that could be significantly impacted by project traffic (i.e. where project traffic exceeded five percent of existing background traffic)
- Obtain all available data about existing traffic volumes, vehicle classification, conditions and roughness on these road links
- Calculate current equivalent standard axles (ESA) to the road links
- Identify the year that the existing pavement would reach terminal roughness based on background traffic and determine the corresponding ESA. This represents the remaining life of the road link pavement in ESAs and provides the year at which, under normal operating conditions, rehabilitation would be required
- Obtain the Project traffic ESAs from the sketch model and add these to the background ESAs to calculate the increases pavement loading due to the Project
- Determine the year at which the existing pavement will reach terminal roughness based on background plus project ESAs. This year represents the year when pavement rehabilitation would be required due to project traffic.

The pavement analysis has two components – the impact to the timing of the pavement rehabilitation and the increased maintenance required to the network due to project traffic. The assessment was based on comparing the cumulative ESA loads with and without the Project during the analysis period.

The cumulative number of ESAs loaded onto the roadway segment to the terminal year was calculated based on the ESA loading along the haulage routes. The background volumes were based on classified average annual daily traffic (AADT) volumes, with a cumulative heavy vehicle growth rate equivalent to the normal background traffic growth.

For this analysis, a value of 2.9 ESAs for each heavy vehicle was applied for the Bruce Highway and 3.2 ESAs for each heavy vehicle was used for all other state-controlled roads.

Terminal roughness values for the various road links were broadly based on Figure 2.2 of the Pavement Rehabilitation Manual, Queensland Transport, 1992. In general, rural roads were assumed to be equivalent to secondary roads, with a terminal roughness of 175. With the exception of the Bruce Highway, all other roads were assigned a terminal roughness of 120 which was consistent with assumptions presented in the Gladstone LNG (Santos/PETRONAS) and Queensland Curtis LNG Project (QGC/BG) environmental impact statements.

Pavement impacts on local roads could not be performed because of the lack of condition data and historic deterioration rates to these roads.

As pavement impact is a cumulative assessment, separate consideration of the other regionally-significant projects was not required. The impacts of these projects are to be assessed in isolation, to determine individual project contribution to pavement rehabilitation.

Bridge capacity analysis

Bridges along roads used by project traffic and potentially impacted by the Project were identified and assessed. The assessment was based on information sourced from the DTMR database and site inspections of the haul routes.

The assessment included considering the potential loads to the bridges due to project traffic, as well as physical constraints such as the height and width of the bridges. Data was only available for bridges located on the state-controlled road network.

17.2.2 Rail network

The EIS assessed the following impacts on rail:

- Transport of workers
- Transport of pipe segments
- Pipeline crossings on the rail network.

The analysis methodology for determining the impact on the rail network was based on assessing the capacity of the existing network, and determining what additional infrastructure would be required. This was undertaken in consultation with Queensland Rail (QR).

The primary sources of information used to address these requirements were:

- QR Coal Rail Infrastructure Master Plan
- QR Working Papers 2nd Edition October 2008
- QR staff.

17.2.3 Shipping network

The following methodology was adopted to assess the Project's impact on shipping infrastructure:

- Review the documentation produced by a range of organisations. Sixteen separate specialist reports were reviewed during the course of this assessment, including computer simulation modelling of proposed shipping operations through the Great Barrier Reef Marine Park

- Consult with a range of agencies including the Gladstone Ports Corporation (GPC), Maritime Safety Queensland (MSQ), the Great Barrier Reef Marine Park Authority (GBRMPA), the Gladstone Regional Council (GRC), the Australia Quarantine and Inspection Service (AQIS), Queensland Police and the Australian Customs and Border Protection Service (ACBPS).

Investigation of the use of the shipping network included assessing the environmental and safety issues arising from the increase in shipping in the marine environment, and operations at Auckland Point. These are further described in Volume 4 Chapter 17 (LNG facility) and Volume 5 Attachment 35. It is currently envisaged to import 70% of the pipeline through the Port of Gladstone and 30% of the pipeline through the Port of Brisbane.

17.2.4 Air services

The Project's impact on air services was assessed by comparing project traffic to airport capacity and current flight schedules. Discussions have been held with the Western Downs Regional Council, Banana Regional Council and Gladstone Regional Council about current operations and requirements for any future alterations to airports/aerodromes identified as potentially being impacted by the Project.

17.2.5 Cumulative analysis

A combination of quantitative and qualitative assessment was used to analyse the cumulative impact of other regionally-significant projects on the traffic and transport impact assessment of the gas pipeline element of the Australia Pacific LNG Project.

A review of the Department of Infrastructure and Planning's website was carried out to identify other regionally-significant projects that may impact the transport network. Not all projects outlined in the list could be assessed because of the lack of information available within the public domain.

Projects that were included in the analysis were as follows:

- Central Queensland Gas Pipeline (Arrow)
- Gladstone LNG (Santos/PETRONAS)
- Gladstone LNG Project – Fisherman's Landing
- Queensland Curtis LNG Project (QGC/BG)
- Gladstone Pacific Nickel
- Surat to Gladstone Pipeline (Arrow/Shell)
- Wandoan Coal Mine
- Wiggins Island Coal Terminal
- Surat Basin Railway.

These are further described in Volume 5 Attachment 35.

17.3 Existing environment

17.3.1 Existing road network

A number of key state-controlled roads within the study area may be impacted by the gas pipeline traffic, and these are listed and described in Table 17.6. These roads will carry construction and/or

operational traffic throughout the life of the Project. Sections of these roads do extend outside the gas pipeline study area but are referenced and assessed within this document because journeys along these roads do not always begin or terminate at the study area's boundaries.

Table 17.6 State-controlled roads

Road name	Description
Dawson Highway	The Dawson Highway is a state-controlled road that connects Gladstone with the Central Highlands. The portion of the Dawson Highway relevant to this chapter extends from the Bruce Highway to the Leichhardt Highway. The road is a designated Type 1 road train route. The speed limit is generally 100km/hr with 60km/hr zones in urban areas.
Burnett Highway	The Burnett Highway runs north-south and meets the Leichhardt Highway at Dululu and the Bruce Highway near Rockhampton, and continues south of Biloela into the South Burnett region. The section of highway impacted by the gas pipeline extends from Biloela to Thangool. The road is signposted at 100km/hr with 60km/hr zones through towns.
Leichhardt Highway	The Leichhardt Highway extends north from Goondiwindi on the Queensland/New South Wales border, to the Capricorn Highway west of Rockhampton. The section of the Dawson Highway impacted by the gas pipeline is from the Dawson Highway at Banana to Miles. The road is a two lane undivided rural road with a speed limit generally of 100km/hr and 60km/hr zones through towns. The road is a designated haul route for Type 1 road trains, and 23m and 25m B-doubles. There are only a limited number of overtaking lanes provided on the Highway. The Leichhardt Highway is a national and state funded highway maintained under contract by the relevant local council within the Project study area.
Warrego Highway	The Warrego Highway is a state-controlled road extending west from Ipswich through Toowoomba, Dalby, Miles and Roma. It terminates in Charleville at the Mitchell Highway. The section of highway relevant to the gas pipeline extends from Dalby at the study area boundary to Roma. The road is an undivided two lane rural road signposted at 100km/hr, with 60km/hr zones through towns. The Warrego Highway is a national and state funded highway maintained under contract by Maranoa and Western Downs Regional Councils within the Project study area.

In addition to the state-controlled roads within the gas pipeline study area, the Project also potentially impacts a number of council-controlled roads. Local roads potentially impacted by the gas pipeline's traffic are listed and described in Table 17.7.

Table 17.7 Local roads

Road name	Description
The Narrows Road	The Narrows Road is a Gladstone Regional Council road connecting accommodation facility 1 and laydown area 1 with the Bruce Highway, south of Mount Larcom. The road has not been inspected, but is unsealed with a trafficable width of approximately 8–10m.
Argoon Kilburnie Road	Argoon Kilburnie Road is a Banana Regional Council road connecting accommodation facility 3 and laydown area 2 with the Dawson Highway. The road has not been inspected, but is sealed rural road with a trafficable width of approximately 6.3m.
Winston Street	Winston Street is a Banana Regional Council road connecting the Burnett Highway to Des Burton Drive, through to the Biloela (Thangool) Airport. The road has not been inspected, but is a sealed urban road with a trafficable width of approximately 10m.

Road name	Description
Des Burton Drive	Des Burton Drive is a Banana Regional Council road connecting Winston Street to Aerodrome Road, through to the Biloela (Thangool) Airport. The road has not been inspected, but is a sealed urban road with a trafficable width of approximately 5m.
Aerodrome Road	Aerodrome Road is a Banana Regional Council road connecting Winston Street and Des Burton Drive to the Biloela (Thangool) Airport. The road has not been inspected, but is a sealed urban road with a trafficable width of approximately 5m.
Crowsdale Camboon Road	Crowsdale Camboon Road is a Banana Regional Council road connecting accommodation facility 3 with the Dawson Highway. The road has not been inspected, but is a partially sealed rural road with a trafficable width varying between 5m and 6m.
Defence Road	Defence Road is a Banana Regional Council road connecting accommodation facility 4 with the Leichhardt Highway. The road has not been inspected, but is a partially sealed rural road with a trafficable width varying between 5m and 7m.
Windeyer Road	Windeyer Road is a Western Downs Regional Council road connecting the Leichhardt Highway to Roche Creek Road, through to accommodation facility 5. The road has not been inspected, but is a partially sealed rural road with a trafficable width of approximately 6m.
Roche Creek Road	Roche Creek Road is a Western Downs Regional Council road connecting Windeyer Road to Bungaban Road, through to accommodation facility 5. The road has not been inspected, but is a sealed rural road with a trafficable width of approximately 6m.
Bungaban Road	Bungaban Road is a Western Downs Regional Council road connecting Roche Creek Road to Ponty Pool Road, through to accommodation facility 5. The road has not been inspected, but is a sealed rural road with a trafficable width of approximately 6m.
Ponty Pool Road	Ponty Pool Road is a Banana Regional Council road connecting accommodation facility 5 with Bungaban Road, through to the Leichhardt Highway. The road has not been inspected, but it is a partially sealed rural road with a trafficable width varying between 5m and 8m.
Welsh's Road	Welsh's Road is a Western Downs Regional Council road connecting the Leichhardt Highway to L Tree Creek Road, through to accommodation facility 6. The road has not been inspected, but is an unsealed rural road with a trafficable width of approximately 7m.
L Tree Creek Road	L Tree Creek Road is a Western Downs Regional Council road connecting Welsh's Road to accommodation facility 6. The road has not been inspected, but is an unsealed rural road with a trafficable width of approximately 8m.

Annual average daily traffic (AADT) data was obtained from the DTMR for the state-controlled road links within the gas pipeline study area. The traffic volume information is summarised in Table 17.8. Similar data was not available for council-controlled roads, but traffic volumes on local roads are estimated to be less than 150 vehicles per day.

Table 17.8 Existing traffic volumes

Road name	DTMR no.	Section	AADT 2009
Dawson Highway	46A	Bruce Highway to Taragoola Road (Ch 19.05 to 21.75)	6,169
		Taragoola Road to Gladstone Monto Road (Ch 21.75 to 25.69)	1,279

Road name	DTMR no.	Section	AADT 2009
		Gladstone Monto Road to Argoon Kilburnie Road (Ch 25.69 to 101.15)	1,030
		Argoon Kilburnie Road to Sheperdsons Road (Ch 101.15 to 113.87)	900
		Sheperdsons Road to Tognolini Baldwin Road (Ch 113.87 to 116.97)	1,227
		Tognolini Baldwin Road to Burnett Highway (Ch 116.97 to 119.9)	6,200
	46B	Burnett Highway to Burnett Highway (Ch 0.0 to 1.37)	5,304
		Burnett Highway to Belldeen Greycliffe Road (Ch 1.37 to 26.8)	1,572
		Belldeen Greycliffe Road to Leichhardt Highway (Ch 26.8 to 45.69)	1,196
Burnett Highway	41D	Mullers Lane to 1.0km south of Dawson Highway (Ch 85.531 to 92.811)	1,800
		1.0km south of Dawson Highway to Dawson Highway (Ch 92.811 to 93.811)	2,500
Leichhardt Highway	26A	Dawson Highway to Eidsvold Theodore Road (Ch 105.22 to 162.34)	860
		Eidsvold Theodore Road to Glenmoral Roundstone Road (Ch 162.34 to 170.29)	750
		Glenmoral Roundstone Road to 7.5km south of Isla Delusion Road (Ch 170.29 to 192.23)	520
		7.5km south of Isla Delusion Road to Joynsons Road (Ch 192.23 to 238.958)	430
		Joynsons Road to Roma Taroom Road (Ch 238.958 to 256.508)	510
	26B	Roma Taroom Road to Jackson Wondoan Road (Ch 0.0 to 60.47)	680
		Jackson Wondoan Road to Warrego Highway (Ch 60.47 to 127.61)	643
Warrego Highway	18D	Leichhardt Highway/Dawson Street to Leichhardt Highway west of Miles (Ch 0.0 to 1.135)	2,911

Bridges

In the Darling Downs Region, there is one bridge with load restrictions that is relevant to the construction of the gas pipeline. This bridge is located on Dogwood Creek, just outside of Miles. The restrictions include minimum axle spacing of 1.8m centres, maximum axle load of 10 tonne per axle and a 10km/hr speed limit.

Traffic incident history

Information on the traffic incident history from April 2003 to March 2008 for the gas pipeline study area was obtained from the DTMR. For each state-controlled road link within the study area, the ratio of the number of crashes per million vehicle kilometres travelled (C/MVKT) was calculated. Table 17.9 outlines the level of risk, according to C/MVKT ratios, assigned to these links.

Table 17.9 Crash risk parameters

C/MVKT range	Risk
0–0.5	Low risk
0.5–1.0	Medium risk
1.0–1.5	High risk
> 1.5	Very high risk

Within the gas pipeline study area, the only road link with a high risk ratio is the Warrego Highway just west of Dalby, which has a crash risk ratio of 1.19. This section of highway is a two-lane divided road with a 60km/hr speed limit. Most accidents have occurred at the Condamine Street intersection.

Roads prone to flooding

Within the gas pipeline study area, the existing Queensland and local government road infrastructure crosses a number of water courses and/or is located in a floodplain and is therefore susceptible to flooding.

Some of the key flood-affected roads that provide access to the gas pipeline include the Warrego Highway crossing of Dogwood Creek at Miles and the Leichhardt Highway.

Public and active transport network

Within the gas pipeline study area, the public transport network includes school bus services and a limited taxi service in some of the towns. Due to the limited road network and the dispersed nature of residents in relation to schools, the majority of the roads used by project traffic are also school bus routes.

Stock routes

Stock routes are pathways for travelling stock on roads, reserves, unallocated state land and pastoral leases. Queensland's stock route network enables pastoralists to move livestock on the hoof around Queensland’s main pastoral districts. This provides an alternative to trucking and other contemporary transport methods. There are a number of stock routes within the gas pipeline study area.

17.3.2 Existing rail network

There are two railway systems in the vicinity of the gas pipeline study area. These are the Moura system and the Western system.

The Moura system services the coal mines of Dawson, Baralaba, Boundary Hill and Callide. Coal is transported to the Gladstone Power Station, Comalco Aluminium Refinery, Queensland Alumina Limited (QAL) and the Port of Gladstone at Auckland Point. The route is a single line with passing loops, which have recently been extended to allow 'Blackwater' size trains to operate in this system.

There are a number of major plans for this system identified in Queensland Rail's Coal Rail Infrastructure Master Plan, 2008. This includes providing for additional capacity with more passing loops constructed, line duplication, and coverage to industrial areas extended. No passenger service is planned.

The Western System includes all lines west of Ipswich. The line operates between Toowoomba and Roma. This line carries a mix of long distance passenger trains, grain trains, and general freight, livestock, and coal trains. Coal is the predominant traffic between Toowoomba and Macalister. Outside of the grain season, at least 70% of the trains per week are transporting coal.

The frequency of trains varies depending on seasonal traffic. Outside of the grain season, traffic levels are in the range of four to six trains per day. There are no current published plans for significant alterations to this rail system. The existing rail network within the study area currently crosses the Warrego Highway at grade crossings at three locations:

- West of Miles, close to the Leichhardt Highway north/Warrego intersection
- At Miles, immediately south of Leichhardt south/Warrego intersection
- At Chinchilla, close to the Warrego Highway/Wambo Street intersection.

17.3.3 Existing shipping network

Australia Pacific LNG has identified two ports it may use to import pipe for the gas pipeline. These are the Port of Gladstone and the Port of Brisbane. However, the major impacts on shipping relate primarily to constructing and operating the LNG facility.

The Port of Gladstone lies within a large natural harbour and is administered by the GPC. It is proposed that 70% of the pipeline be imported and transported to site through Auckland Point.

The Port of Brisbane is the major trading port for Queensland and is administered by the Port of Brisbane Corporation. It is proposed that 30% of the pipeline be imported and transported to site through the Port of Brisbane. The Port has 28 operating berths, and over 7,700m of quay line at the Port of Brisbane and upriver facilities.

A full description of the existing shipping at both the Port of Gladstone and the Port of Brisbane is provided Volume 5 Attachment 35 and Volume 4 Chapter 17.

17.3.4 Existing air services

The construction of the gas pipeline will impact the Gladstone, Biloela, and Miles airports.

The Gladstone Airport is currently operated by the Gladstone Regional Council. The airport caters primarily for business travellers and freight activities associated with the region's developed and emerging industrial complexes. Regular public transport services are currently provided by QantasLink, primarily using Dash 8 Series Q400 aircraft that can cater for 74 passengers.

Eight flights a day operate out of the Gladstone Airport from Monday to Friday, with reduced services at the weekends. Approximately 50 people are employed at the airport.

Since 1998, the airport expansion has been guided by a development plan which the Aerodrome Board updated in 2004. This update focused on current and likely future aircraft types and numbers, and stronger growth in passenger numbers than previously forecast.

The 2004 plan was based on the airport continuing to cater for up to Code 3 aircraft such as the Q400, E170 and similar 70-seat capacity aircraft. Operations by larger Code 4C aircraft such as the E190, B717, B737 and A320 were considered. However, the 2004 plan concluded that catering for larger aircraft was not justified by forecast activity if the existing service frequency was maintained. It also concluded that significant pavement strengthening would be required to allow unrestricted operations by these aircraft.

The plan was updated again in 2008. At this time, it was identified that the runway required strengthening due to deterioration following the introduction of regular Q400 services. It was also recognised that the runway profile was not compliant with Civil Aviation Safety Authority regulations, and would require re-profiling or a modified taxiway to cater for larger aircraft.

Plans to cater for larger aircraft have been considered and the runway has been lengthened to allow for larger Code 4C aircraft. Pavement strength remains a constraint to catering for regular Code 4C aircraft services, but this may be overcome by further asphalt strengthening.

The plan concludes that, with the altered and/or new facilities, the current airport site will cater for projected long-term air travel growth in the Gladstone region beyond the 2027/28 planning horizon. This would be at an appropriate level of service and continued convenience to the travelling public.

The Biloela Airport at Thangool is operated by the Banana Regional Council. The airport services Biloela and the other Banana Shire towns of Moura, Thangool, Jambin, Goovigen, Baralaba, Theodore, Banana, Wowan, and Dululu. It caters for flights to and from Brisbane and Blackwater. The 1520 m long runway is sealed and has an apron capacity for two aircraft. QantasLink operate a Dash 8 fleet out of the Biloela Airport, which is mainly made up of Q200 aircraft seating 36 passengers.

The Miles aerodrome is approximately 12 km south of Miles and is classified as an aircraft landing area. It is not registered or certified, there are no regular passenger transport services, and it is currently only used occasionally by eight-seater aircraft but is capable of accepting larger aircraft. There is an apron capacity for two aircraft and a small terminal.

Western Downs Regional Council administers the aerodrome and there are currently no published plans to alter the facility.

17.4 Project traffic

17.4.1 Description and location of proposed pipeline

The gas produced within the gas fields will be transported to the LNG facility via the gas pipeline. The buried steel pipeline is approximately 450km in length, and may include a future booster compression station (or stations) to enable operation at a higher pressure and/or flow regime. Slight alterations in pipeline length are not expected to significantly change the project traffic generated or its distribution.

The designated starting point of the pipeline is near the township of Miles. There will also be a separate lateral pipeline connecting the Woleebee gas field to the pipeline. The gas pipeline consists of three main sections:

- Woleebee lateral – 30 inch (762mm) pipe, 38km long
- Miles to Woleebee lateral junction – 36 inch (914mm) pipe, 44km long
- Woleebee lateral junction to Curtis Island – 42 inch (1067mm) pipe, 362km long.

17.4.2 Road traffic

Proposed activities

The process for transporting and constructing the gas pipeline is as follows:

- Pipe segments are transported from either Auckland Point or Brisbane via a coating facility to laydown areas located along the pipeline transport route. It is assumed that 70% of the pipe will come from Gladstone and 30% from Brisbane
- Temporary accommodation facilities are established along the pipeline route during construction
- The gas pipeline is progressively constructed near a temporary accommodation facility. As each section is completed, the accommodation facility is relocated further along the route to service the construction of the next section.

Construction staff

A portion of construction staff are proposed to use temporary accommodation facilities located along the pipeline route. On average, 600 people are expected to reside in the main temporary accommodation facility, working 12-hour shifts for four weeks on and nine days off. In addition to the main construction crew, there will be specialist crews of up to 200 people working elsewhere and they will reside in separate temporary accommodation facilities or local accommodation. They will be carrying out clearing, restoration, and construction in the Callide Range and crossing The Narrows.

Overall, it is assumed that 10% of the staff will travel by vehicle to site, with 90% being transferred by bus. After working the four week roster, non-local staff will be transported by bus to the nearest airport for flights to their usual place of residence. The airports used for the staff rotations are proposed to be Gladstone, Miles and Biloela.

With respect to the transfer of personnel to the nearest airport, under some circumstances the full pipeline construction workforce may need to be demobilised in a short timeframe. To achieve this, a combination of transport modes would be utilised, i.e. not all personnel would be transported by bus to the nearest airport.

During construction, temporary accommodation facilities will operate for about 90 to 140 days, depending on the length of pipe being built at that particular location.

Operational staff

It is proposed that Australia Pacific LNG staff operating out of offices at either end of the gas pipeline will undertake periodic pipeline inspections and maintenance.

Construction traffic

Gas pipeline construction is proposed to commence in April 2012 and be completed by October 2013. To meet this schedule, transport of the pipe segments to the laydown yards needs to begin in March 2012 at the latest, but it may begin as early as 2011 subject to manufacturing and delivery timing.

The main traffic generated by gas pipeline construction is the transport of pipe segments. If the pipeline is to be moved by road transport then a 25m extendable semi-trailer may be used to transport the 18m long segments. Each load would contain two pipe segments of the 42 inch and 36 inch diameters and three pipe segments of the 30 inch diameter. To transport the pipe, a total of 11,900

truck loads may be required for a 9 to 12 month period, with an average daily traffic volume of 32 truck loads (65 trips daily) during that time.

There may also be additional pipe movement from the laydown yard to the work front in situations where the laydown yard is remote from the site. However, where practicable, this traffic will use the gas pipeline right of way. It is preferable that the right of way be accessed at 10km intervals via the local road network.

If transported by rail, the pipe segments may have to be transported to laydown points at Miles and Moura, and then moved by road to their destinations. This may require construction of rail sidings and support facilities at these destinations. A preliminary assessment of these locations has indicated that this is feasible although additional infrastructure may be required. In addition, alterations of existing facilities may be required at Auckland Point and the Port of Brisbane.

The option to utilise rail is being further investigated in consultation with QR. Recent indications from QR are positive, and there may be opportunities to provide rolling stock and appropriate ancillary services to allow transport of the pipe by rail. However, for the purpose of this assessment, it has been assumed all pipes will be transported by road from Gladstone and Brisbane ports. This provides a 'maximum case' assessment for road impacts.

Table 17.10 outlines the potential traffic generated while constructing the gas pipeline and establishing temporary accommodation facilities.

Table 17.10 Traffic generated during construction

Item	Quantity
Pipeline transport from Gladstone	8,600 truck loads
Pipeline transport from Brisbane	3,300 truck loads
Civil machinery required for pipeline construction and temporary accommodation facility establishment	36 deliveries
Concrete	203 deliveries
Mess, office and ancillary facilities	140 deliveries originating from Gladstone (40% and Brisbane (60%)
Fuel	12,000 litres/day during pipeline construction, with one delivery per day
Waste disposal	Two pickups per week
Potable water	Three deliveries per day
Non-potable water	One delivery per day

The water requirement shown above is not the entire water requirement for the Project. Other water, such as water required for testing, was assumed to be conveyed to site via pipelines from the gas wells or other approved sources near the pipeline and recycled onsite to minimise transport requirements. Water may also be captured and recycled onsite.

Operational traffic

Compared to construction traffic volumes there will be negligible traffic volumes generated by pipeline inspections and maintenance activities.

Traffic generation

Figure 17.2 provides details of the estimated traffic generation when constructing the gas pipeline.

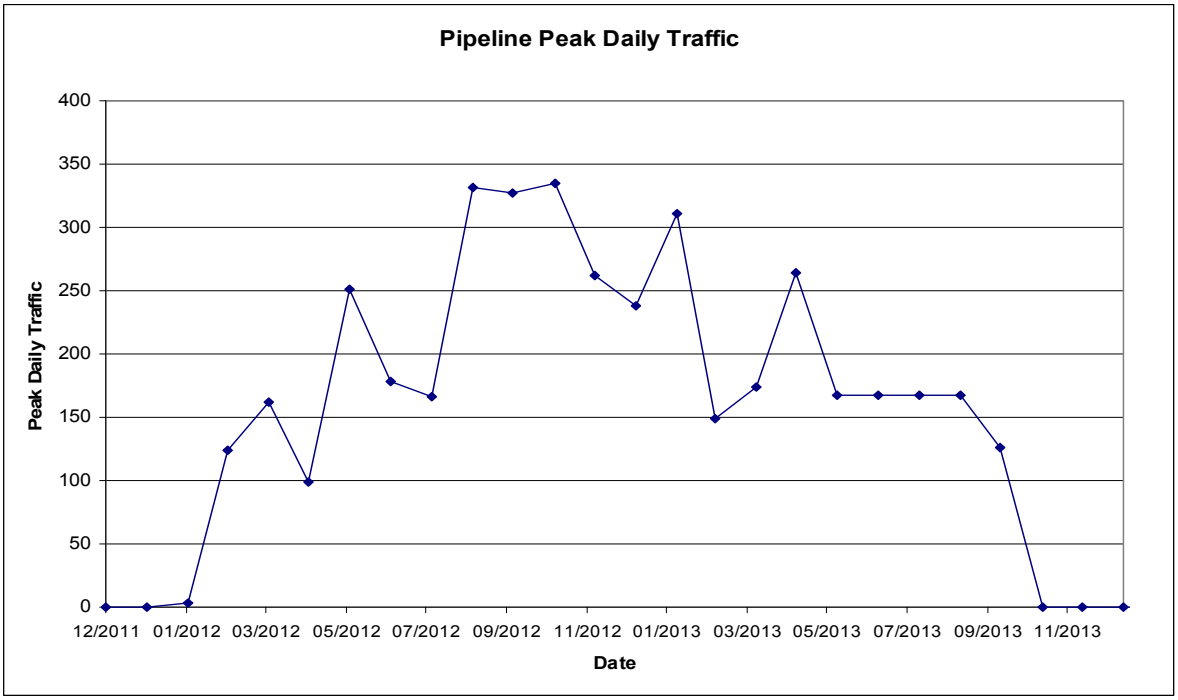

Figure 17.2 Peak daily traffic generated during gas pipeline construction

Table 17.11 provides a summary of the estimated peak hour, peak daily and average daily road-based traffic generation from gas pipeline construction.

Table 17.11 Traffic generated from pipeline construction

		2011	2012	2013	2014
Peak hour traffic	Heavy vehicles	0	28	26	0
	Light vehicles	0	14	14	0
	All vehicles	0	42	39	0
Peak daily traffic	Heavy vehicles	0	280	256	0
	Light vehicles	0	55	55	0
	All vehicles	0	335	311	0
Average daily traffic	Heavy vehicles	0	96	54	0
	Light vehicles	0	5	6	0
	All vehicles	0	101	60	0

As noted in Table 17.11, the peak daily traffic generated from the pipeline construction is 335 trips a day. This occurs when the following activities are being undertaken:

- When the main accommodation facility is moved from one site to the next, additional traffic movements will occur
- The staff bound for accommodation facility 4 leave site on the shift change – 72 trips per day
- Pipe segments are being moved from the Gladstone and Brisbane ports to laydown area 5 – 65 trips per day
- Pipe segments are being moved from laydown area 4 to the right of way near accommodation facility 4 – 72 trips per day
- Miscellaneous fuel, waste, water and food trucks service existing accommodation facilities – 28 trips per day.

Traffic distribution

Traffic routes adopted for constructing the gas pipeline are provided in Table 17.12.

Table 17.12 Pipeline construction routes

Item	Origin	Destination	Route
Pipe delivery	Gladstone	Lay down area 1	Gladstone Port Access Road, Gladstone-Mt Larcom Road, then The Narrows Road (a council-controlled road)
		Lay down area 2	Gladstone Port Access Road, Gladstone-Mt Larcom Road, Dawson Highway
		Lay down area 3	Gladstone Port Access Road, Gladstone-Mt Larcom Road, Dawson Highway, then Argoon Kilburnie Road (a council-controlled road)
		Lay down areas 4 and 5	Gladstone Port Access Road, Gladstone-Mt Larcom Road, Dawson Highway, Leichhardt Highway
	Brisbane	Lay down area 5	Warrego Highway through Dalby and Miles, then north onto Leichhardt Highway
Staff movements	Gladstone Airport	Accommodation facility 1	Dawson Highway, Gladstone-Mt Larcom Road, then The Narrows Road (a council-controlled road)
		Accommodation facility 4	Dawson Highway, Leichhardt Highway, then Defence Road (a council-controlled road)
	Biloela Airport	Accommodation facility 2	Des Burton Drive, Winston Street, Aerodrome Road (all council-controlled roads), then Burnett Highway, north on Dawson Highway at Biloela, then onto Argoon Kilburnie Road (a council-controlled road)
		Accommodation facility 3	Des Burton Drive, Winston Street, Aerodrome Road (all council-controlled roads), then Burnett Highway and south on Dawson Highway, then Crowsdale Camboon Road (a council-controlled roads)

Item	Origin	Destination	Route
	Miles Aerodrome	Accommodation facility 5	Leichhardt Highway north through Miles, then on council-controlled roads: Windeyer Road, Roche Creek Road, Bungaban Road and Ponty Pool Road
		Accommodation facility 6	Leichhardt Highway north through Miles, then on Welsh's Road and L Tree Creek Road (both council-controlled roads)

17.4.3 Shipping traffic

It is assumed 70% of the pipeline will be imported through the Port of Gladstone and 30% through the Port of Brisbane.

To maintain supply to the work fronts, it may be necessary to import approximately 38km of pipe a month for 12 months, or 50km of pipe a month for nine months, depending on the final schedule. This equates to around 2,000 to 2,800 pipe segments per ship that may need to be transported from the port to the coating facilities, en-route to the laydown yards.

Negotiations are currently underway with shipping companies, to determine the shipping requirements for the import of the pipeline. Initial estimates indicate that two ships per month may be required to import the pipeline. This is based on a 30,000DWT cargo ship with a 9.5m draft.

17.5 Potential impacts

17.5.1 Road network

Road links

State-controlled roads

The traffic generated from gas pipeline construction does not bring forward the need to alter any state-controlled road links within the gas pipeline study area. This includes both the Australia Pacific LNG gas pipeline construction and the cumulative impact of other regionally-significant projects.

Within the gas pipeline study area, the road links that project traffic uses will operate with a level of service of C or better during the construction period. This is considered satisfactory.

Local roads

Gas pipeline construction may impact on the local road network within the gas pipeline study area. For each local road, the average and peak daily project traffic for pipeline construction has been determined and used to assess impacts. The impact on local roads is provided in Table 17.13, Table 17.14 and Table 17.15.

Although traffic count data for the council roads identified below is not available it is expected that these roads would on average carry less than 150 vehicles per day.

Table 17.13 Banana Shire Council roads impacted

Road name	Trafficable width (m)	Type	Surface	Average daily project traffic	Peak daily project traffic	Peak daily traffic year	Nature of project traffic
Argoon-Kilburnie Road	6.3	Rural	Sealed	36	180	2012	This is the access road to laydown area 3 and accommodation facility 2. Heavy and light traffic will impact this road.
Aerodrome Road	5	Urban	Sealed	5	17	2012	This is a local access road to the Biloela Airport. Bus and light traffic will impact this road during gas pipeline construction.
Crowsdale Camboon Road	5–6	Rural	Sealed and unsealed	10	112	2012	The Project will moderately impact this road during gas pipeline construction, as it is a local access road to accommodation facility 3 and lies adjacent to the pipeline route.
Defence Road	5–7	Rural	Sealed and unsealed	22	170	2012	The Project will moderately impact this road for a short period during gas pipeline construction, as it is the local access road to accommodation facility 4.
Des Burton Drive	5	Urban	Sealed	5	17	2012	This is a local access road to the Biloela Airport. bus and light traffic will impact the road during gas pipeline construction.
Ponty Pool Road	8	Rural	Unsealed	14	160	2013	The Project will moderately impact this road for a short period during gas pipeline construction, as it is the local access road to accommodation facility 5.
Winston Street	10	Urban	Sealed	5	17	2012	This is a local access road to the Biloela Airport. It will be impacted by bus and light traffic during pipeline construction.

Table 17.14 Western Downs Regional Council roads impacted

Road name	Trafficable width (m)	Type	Surface	Average daily traffic	Peak daily traffic	Peak daily traffic year	Nature of project traffic
Bungaban Road	6	Rural	Sealed	14	160	2013	The Project will moderately impact this road for a short period during main gas pipeline construction, as it is a local access road from the Leichhardt Highway to accommodation facility 5.
L Tree Creek Road	8	Rural	Unsealed	36	178	2013	The Project will moderately impact this road for a short period during main gas pipeline construction, as it is a local access road from the Leichhardt Highway to accommodation facility 6.
Ponty Pool Road	5 – 8	Rural	Sealed and Unsealed	14	160	2013	The Project will moderately impact this road for a short period during main gas pipeline construction, as it is a local access road to accommodation facility 5.
Roche Creek Road	6	Rural	Sealed	14	160	2013	The Project will moderately impact this road for a short period during main gas pipeline construction, as it is a local access road to accommodation facility 5.
Welsh's Road	7	Rural	Unsealed	36	178	2013	The Project will moderately impact this road for a short period during main gas pipeline construction, as it is a local access road from the Leichhardt Highway to accommodation facility 6.
Windeyer Road	6	Rural	Sealed and unsealed	14	160	2013	The Project will moderately impact this road for a short period during main pipeline construction, as it is a local access road from the Leichhardt Highway to accommodation facility 6.

Table 17.15 Gladstone Regional Council roads impacted

Road name	Trafficable width (m)	Type	Surface	Average daily traffic	Peak daily traffic	Peak daily traffic year	Nature of project traffic
The Narrows Road	8	Rural	Unsealed	36	180	2012	This is the access road to accommodation facility 1 and laydown area 1. Light and heavy traffic will impact the road during gas pipeline construction.

Intersections

The transport of the pipe segments and traffic associated with the gas pipeline construction is proposed to generate maximum peak hour traffic of 42 trips, as outlined in Table 17.11. This low level of traffic generation is unlikely to impact the operation of intersections within the gas pipeline study area.

The state-controlled signalised Dawson Highway/Koriboe Street intersection in Biloela was identified for analysis, based on the potential for project traffic to significantly impact intersection operation. The existing intersection will operate within the capacity for the full planning horizon under background traffic only.

Intersections of state-controlled roads with council-controlled roads used by the Project for gas pipeline construction will be impacted on by increased turning movements and alterations may be required.

Pavement rehabilitation and maintenance

The Project will contribute to the accelerated deterioration of some of the road pavements in the gas pipeline study area.

A maximum case development scenario may see the Project bring forward the need for rehabilitation by more than one year, and in some instances the project traffic may have an impact of greater than five percent of the existing traffic volume. Roads conforming to these conditions within the study area are detailed in Section 17.6.1.

Bridge capacity and constraints

Gas pipeline construction will utilise the Dogwood Creek Bridge on the Warrego Highway. Around 80 additional vehicles may pass over the bridge daily during construction period. The vehicle loads associated with gas pipeline construction are unlikely to be affected by load restrictions for the bridge.

Traffic incident history

In Section 17.3.1, the Warrego Highway was identified as a road link falling within a 'very high risk' or 'high risk' category. This was based on the number of crashes per million vehicle kilometres travelled.

This highway has a road crash risk of 1.19. The Project is predicted to add a further 123 vehicles per day to this road segment, including around 19 additional light vehicles and 104 additional heavy vehicles.

Oversized vehicles

During gas pipeline construction, no oversized and/or overweight vehicles are proposed to be used to transport project material.

Roads prone to flooding

A riverine flooding investigation was carried out, including modelling various scenarios within the gas pipeline study area. The outcomes of this investigation are outlined in the 'Flood Investigation for Talinga Coal Seam Gas Development' report by WorleyParsons (2008).

This report concluded that most Queensland and local government roads experience a degree of inundation during storm events. Some major road corridors, such as the Warrego Highway and

Leichhardt Highway, were also shown to suffer from inundation in the 10-year average recurrence interval (ARI) rainfall event at a number of locations. Some of the key roads affected provide access to the gas pipeline. This includes the Warrego Highway and Leichhardt Highway. New access roads to the temporary accommodation facilities may also cross water courses or be located on floodplains.

The Project will limit traffic movement during and after flood events, in line with local traffic control measures.

Public and active transport network

Due to the limited road network within the gas pipeline study area, project traffic will inevitability travel along roads also used as school bus routes.

Stock route

Queensland's stock route network, as currently mapped by the Department of Environment and Resource Management (DERM), will be crossed by the gas pipeline and access roads on a number of occasions.

The final gas pipeline route alignment, associated construction and service access roads, has not been fully finalised to date. As such, a detailed assessment is not possible at this stage. Full details of the potential impacts will be provided in relevant traffic management plans, once alignments, timing, construction methods and operations are confirmed.

The level of impact will be partly related to present day levels, as defined in the stock route classifications identified in Table 17.16.

Table 17.16 Stock route classification

Classification	Cattle equivalent for a five year period
Primary	>9000
Secondary	3000–9000
Minor	<3000
Inactive	Local and unrecorded movements

The degree of impact is defined as follows:

- Minor – the underground pipeline crosses a stock route, temporarily severing access during the construction period. A stock route road is used to deliver construction material for a short time
- Moderate – an at-grade access track or another project infrastructure item crosses a stock route, possibly requiring some local area modification to the route such as slight realignment or a gated crossing. A stock route road is a primary haul route during the construction phase, but access is maintained. Long term impacts would be minimal and would include temporary severance interruption during construction and occasional use of an access track for inspections and maintenance impacts
- Significant – a processed new facility and/or access track severs the route, requiring realignment or closure of the stock route access at this point.

Most of the impacts are expected to fall into the minor category as the pipeline will be buried. The requirement for new or altered roads that impact stock routes is also limited.

Environmental impacts

Project traffic will utilise existing and new roads that may need to be constructed to access the temporary accommodation facilities and gas pipeline right of way. This may cause of the following environmental impacts:

- Dust control – it is acknowledged that dust generation on roads used by project traffic during construction and operational phases may impact on roadside vegetation, the safety and general comfort of other road users, and adjoining land uses
- Weed, pest and disease control – it is acknowledged that the Project is located within a weed and pest control area. The movement of project vehicles throughout the study area increases the risk of spreading weeds and pests
- Noise – it is acknowledged that the Project will increase road traffic noise levels, particularly during construction, but it is not expected that the Project traffic will result in accepted noise thresholds for adjacent residences being exceeded.
- Product spill – It is acknowledged that the Project may increase the risk of product spill during the transportation of materials by road, such as fuel.

Any environmental impacts associated with the construction of new roads will be documented in the detailed design phase of the Project, while mitigations will be specified in this phase.

17.5.2 Rail network

Transport of workers

There is currently no passenger rail network operating within the gas pipeline study area. A long distance passenger rail service operates along the coast between Brisbane and Cairns, but does not stop in Gladstone.

At this point, the option of transporting workers by rail has been dismissed. It is highly unlikely that QR or Queensland Transport would contemplate increased investment in passenger rolling stock, passenger facilities, or passenger subsidisation for daily commuting to and from a construction project.

While passenger trains do operate on the Western Line, their schedules and operations are designed around long distance operation. Trains only pick up and let passengers off at major locations.

Therefore, the main impact on rail will be to under track crossings and transporting pipe segments, materials, and workers by road across and near rail.

Transport of pipe segments

The pipe segments required for gas pipeline construction could possibly be transported by rail, to laydown areas at Moura and Miles. The pipe segments would be sourced from Auckland Point and the Port of Brisbane.

An estimate of the transport task has been made, based on the information contained in Section 17.4 of this report. This information is presented in Table 17.17 and Table 17.18 below. Pipe segments were assumed to be 18m long.

Table 17.17 Material by rail transport program

Type	Material	Diameter (inches)	No. of segments	Mass (tonnes)	Start transport	End transport
Main pipeline	Steel	42	19,912	233,189	1/03/2012	12/02/2013
Main pipeline	Steel	36	2,439	24,387	1/03/2012	12/02/2013
Main pipeline	Steel	30	2,054	17,013	1/03/2012	12/02/2013
TOTAL				274,589		

Table 17.18 Pipe transport task by corridors

Type	Average delivery rate segments/ wk	Main peak delivery rate average segments/ wk	Gladstone – Moura average segments/ wk	Brisbane – Miles average segments/ wk	Townsville – Moura average segments/ wk	Total task
Main pipeline	401	801	280	120	-	401
Main pipeline	49	98	34	15		49
Main pipeline	41	83	29	12		41
High pressure	908	1817	636	272		908
Gathering network	76	152			76	76
TOTALS			979	420	76	1,475

If transported by rail, the pipe segments would have to be transported to laydown points at Miles and Moura, and then moved by road to their destinations. This may require construction of rail sidings and support facilities at these destinations.

A preliminary assessment of these locations has indicated that this is feasible, but additional infrastructure would be required. An alteration of existing facilities may also be required at Auckland Point and the Port of Brisbane. The use of rail will continue to be investigated.

The Western Line is crossed twice by the Warrego Highway near Miles and Chinchilla, and once by the Leichhardt Highway in Miles. The details of the crossings and project traffic impact on these crossings is detailed in Table 17.19.

Table 17.19 Road/rail crossing points within the study area

Rail line	Current operation on line	Road – rail crossing location description	Crossing type	Highway crossing	Chainage	AADT - current	Speed limit	Additional total project traffic
Western Line between Toowoomba and Roma	Line carries a mixture of long distance passenger trains, grain trains, general freight and coal (coal represents most train trips) Averages 4-6 trains a day	West of Miles, close to Leichhardt Highway north/Warrego intersection	Active control, such as flashing lights and signage	Warrego Highway	Ch 1.135 – 44.099	1,497	80kph	138
Western line between Toowoomba and Roma	As above	Miles immediately south of Leichhardt south /Warrego intersection	Active control as above	Leichhardt Highway	Ch 0.00-32.020	489	60kph	278
Western line between Toowoomba and Roma	As above	Chinchilla, close to Warrego Highway/Wambo Street intersection	Active control as above	Warrego Highway	Ch 80.175-83.155	2,751	60kph	45

17.5.3 Shipping network

The primary impact on the shipping network will come from constructing and operating the LNG facility. This is discussed in detail in Volume 4 Chapter 17.

The primary concerns relating to impacts on the shipping network are environmental and safety issues associated with increased shipping numbers in the Port of Gladstone, and the impact of storing materials at Auckland Point and the operations of the Port.

Environmental and safety issues

The additional two ships per month required for importing the pipeline will have a negligible impact on shipping operations.

Auckland Point operations

It is estimated that 70% of the pipe will be imported through Auckland Point. Facilities may need to be constructed to facilitate importing and transporting the pipe segments to meet the proposed schedule.

At a meeting with GPC in October 2009, representatives of the GPC indicated that a proposed area has been set aside at Auckland Point for the construction activities of a number of LNG projects.

This conceptual layout is reproduced in Figure 17.3. GPC considers that this area will be sufficient to cater for all of the proposed developments, but all concepts developed to date are indicative. Discussions are ongoing with the GPC about the nature of these facilities.

Cumulative impacts

Increased shipping

The impact of increased shipping in Gladstone Harbour, when all developments in the area are being constructed and/or are operational, is discussed in Volume 4 Chapter 17. The construction and operation of the LNG facility will have the greatest impact on shipping.

Auckland Point layout

GPC is confident that the proposed LNG projects' material storage requirements can be accommodated within the land available at Auckland Point. This includes any temporary storage required for the gas pipeline.

Common access to ferry loading facilities. Area to be closed to transport vehicles during trtansfer of personnel

Area 1 to be reconfigured to account for transhipment of materials

Common area for rail access to be extended to cover section of rail track adjacent to Area 1

ACCESS ROAD 2

AREA 1

AREA 2

Shared parking facilites for personnel and transit sheds for limited amenities and waiting areas (Suitable for up to four proponents - flexibility required on individual areas based on demand)

ACCESS ROAD 1

AREA 3

Pipe/storage area to be subdivided to account for holding capacity for two train loads per proponent (nominally 200 pipes)

AREA 4

QGC pipe set down

LOCALITY MAP

LEGEND

- Plant and trans-shipment of personnel holding area
- Pipe laydown area
- Proposed road

AREA 1 (Freight) = 4.03 hectares
AREA 2 (Personnel) = 7.48 hectares
AREA 3 (Rail Loadout Pipe) = 0.91 hectares
AREA 4 (Pipe Layout) = 11.07 hectares
PROPOSED ROAD AREA = 0.85 hectares
LENGTH ACCESS ROAD 1 = 671.04 metres
LENGTH ACCESS ROAD 2 = 191.47 metres

Source Information

Satellite imagery
Captured by GeoEye-1 on 24 March 2009

0 125m 250m

SCALE - 1 : 5,000 (at A3)

Map Grid of Australia Zone 56
Geocentric Datum of Australia 94

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AUSTRALIA PACIFIC LNG PROJECT

Volume 3 Chapter 17
Figure 17.3 Auckland Point Conceptual Layout

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17.5.4 Air services network

Gladstone Airport

The Gladstone Airport will be impacted by gas pipeline construction personnel operating out of accommodation facility 1 (The Narrows crossing) during shift changes when personnel are bussed to and from the airport.

Based on the assumption that all personnel operating out of accommodation facility 1 undertake a shift change during the one day, it is estimated that up to 150 people in any one day may pass through the airport during the pipeline construction period. It is noted that staggered rosters would be adopted if peak workforce numbers using the airport are an issue with respect to airport operations.

Cumulative impacts

During the construction of the pipeline out of accommodation facility 1 (The Narrows crossing), construction of LNG facilities on Curtis Island will be undertaken by not only Australia Pacific LNG but also by Queensland Curtis Island LNG and Gladstone LNG. It has been estimated, based on a rotating shift pattern that during the pipeline construction period up to 80 Australia Pacific LNG personnel constructing the LNG facility may pass through the airport. Up to an additional 120 personnel associated with the construction of the LNG facility for the Queensland Curtis Island LNG and Gladstone LNG may pass through the airport in any one day during the same period.

In order to minimise the potential impacts, Australia Pacific LNG will work with industry to optimise roster timings and reduce daily passenger movement peaks.

Miles aerodrome

The Miles aerodrome is impacted by the pipeline construction personnel during shift changes when personnel are bussed to and from the aerodrome.

Based on a rotating shift pattern is estimated that up to 120 people in any one day may pass through the aerodrome during 2013-2014.

Biloela Airport

The Biloela Airport is impacted by the pipeline construction personnel during shift changes when personnel are bussed to and from the airport.

Based on a rotating shift pattern is estimated that up to 120 people in any one day may pass through the airport during 2013-2014.

17.6 Mitigation and management

The analyses discussed in this chapter relates to a maximum development scenario. The Project configuration, timing, workforce requirements, route selection and materials requirements assumed in this chapter describe information as it is currently understood and depict the 'maximum case' scenario in terms of traffic and transport impacts. Consequently, any future changes to the Project made by Australia Pacific LNG, such as a decrease in workforce requirements, are not likely to have an impact on the transport network greater than what is reported in this study.

Actual mitigations implemented will be determined based on the final, approved project development plan.

17.6.1 Road links

State-controlled roads

As discussed in Section 17.5.1, there are no requirements for link alterations in the state-controlled network that are directly associated with gas pipeline construction.

Council roads

The gas pipeline traffic impacts a number of council-controlled roads, and the nature, magnitude and significance of this impact has been discussed in Section 17.3.1. Appropriate measures for impact mitigation have been identified which aim to reduce any negative impacts and maximise the positive benefits for adjacent land owners and road users. The broad mitigation strategy developed for local roads is a Type A strategy described below.

Where the project traffic is associated only with the construction of a pipeline including access to camps, the project traffic will be of a low level (less than 150 vehicles per day) and should occur over a short duration of two to three months. Depending on traffic volume and load type for local roads impacted it is proposed to alter the local road to a minimum unsealed six metre formation.

This will enable two heavy vehicles to pass safely. Where the peak daily project traffic is above 150 vehicles per day the formation width may be increased to eight metres. The alteration may involve re-sheeting of the existing gravel pavement to provide a pavement of suitable strength to cater for the increased heavy vehicle traffic generated by the Project.

During construction more regular maintenance of the road should be undertaken including regular grading and dust control in accordance with an approved traffic management plan and where required to maintain safety.

It is anticipated that detailed negotiation will be held with the relevant authority with respect to the appropriate mitigation strategies for the local road network.

Generally, insufficient information was available from the regionally significant projects included in this report to enable a cumulative assessment of the local roads network. While details of the roads to be utilised by other projects were given in some of the other environmental impact statements, either the roads to be utilised by others were different or the timing of the use of the road by others was different to the timing proposed for the Project.

Potential alterations which may be considered are given in Table 17.20, Table 17.21 and Table 17.22 below. Australia Pacific LNG will work with the Australian, Queensland and local governments and industry in regard to the potential alterations, monitoring and maintenance required to meet the increased demands on local infrastructure.

Table 17.20 Banana Shire Council roads

Road name	Trafficable width (m)	Type	Surface	Average daily project traffic	Peak daily project traffic	Peak daily traffic year	Nature of project traffic	Mitigation proposed
Argoon-Kilburnie Road	6.3	Rural	Sealed	36	180	2012	This is the access road to laydown area 3 and accommodation facility 2. It will be impacted by heavy and light traffic.	Type A (8m)
Aerodrome Road	5	Urban	Sealed	5	17	2012	This is a local access road to the Biloela Airport. It will be impacted by bus and light traffic during gas pipeline construction.	Type A (6m)
Crowsdale Camboon Road	5–6	Rural	Sealed and unsealed	10	112	2012	This road is moderately impacted by the Project during pipeline construction, as it is a local access road to accommodation facility 3 and lies adjacent to the gas pipeline route.	Type A (8m)
Defence Road	5–7	Rural	Sealed and unsealed	22	170	2012	This road is moderately impacted by the Project for a short period during pipeline construction, as it is the local access road to accommodation facility 4.	Type A (8m)
Des Burton Drive	5	Urban	Sealed	5	17	2012	This is a local access road to the Biloela Airport. It will be impacted by bus and light traffic during pipeline construction.	Type A (6m)
Ponty Pool Road	8	Rural	Unsealed	14	160	2013	This road is moderately impacted by the Project for a short period during pipeline construction, as it is the local access road to accommodation facility 5.	Type A (8m) Formation width currently adequate

Road name	Trafficable width (m)	Type	Surface	Average daily project traffic	Peak daily project traffic	Peak daily traffic year	Nature of project traffic	Mitigation proposed
Winston Street	10	Urban	Sealed	5	17	2012	This is a local access road to the Biloela Airport. It will be impacted by bus and light traffic during pipeline construction.	Type A (6m) Formation width currently adequate

Table 17.21 Western Downs Regional Council roads

Road name	Trafficable width (m)	Type	Surface	Average daily project traffic	Peak daily project traffic	Peak daily traffic year	Nature of project traffic	Mitigation proposed
Bungaban Road	6	Rural	Sealed	14	160	2013	This road is moderately impacted by the Project for a short period during construction of the main pipeline, as it is a local access road from the Leichhardt Highway to accommodation facility 5.	Type A (6m) Formation width currently adequate
L Tree Creek Road	8	Rural	Unsealed	36	178	2013	This road is moderately impacted by the Project for a short period during construction of the main pipeline as it is a local access road from the Leichhardt Highway to accommodation facility 6.	Type A (8m) Formation width currently adequate
Ponty Pool Road	5–8	Rural	Sealed and Unsealed	14	160	2013	This road is moderately impacted by the Project for a short period during construction of the main pipeline as it is a local access road to accommodation facility 5.	Type A (6m)
Roche Creek	6	Rural	Sealed	14	160	2013	This road is moderately impacted by the Project for a short	Type A (6m)

Road name	Trafficable width (m)	Type	Surface	Average daily project traffic	Peak daily project traffic	Peak daily traffic year	Nature of project traffic	Mitigation proposed
Road							period during construction of the main pipeline as it is a local access road to accommodation facility 5.	Formation width currently adequate
Welsh's Road	7	Rural	Unsealed	36	178	2013	This road is moderately impacted by the Project for a short period during construction of the main pipeline as it is a local access road from the Leichhardt Highway to accommodation facility 6. It is likely that the unsealed surface will require frequent grading to maintain surface condition.	Type A (6m) Formation width currently adequate
Windeyer Road	6	Rural	Sealed and unsealed	14	160	2013	This road is moderately impacted by the Project for a short period during construction of the main pipeline, as it is a local access road from the Leichhardt Highway to accommodation facility 6. It is likely that the unsealed surface will require frequent grading to maintain surface condition.	Type A (6m) Formation width currently adequate

Table 17.22 Gladstone Regional Council roads

Road name	Trafficable width (m)	Type	Surface	Average daily project traffic	Peak daily project traffic	Peak daily traffic year	Nature of project traffic	Mitigation proposed
The Narrows Road	8	Rural	Unsealed	36	180	2012	This is the access road to accommodation facility 1 and laydown area 1. It will be impacted by light and heavy traffic during pipeline construction.	Type A (8m)

Intersection capacity

State-controlled roads

As discussed in Section 17.5.1, there are no proposed intersection alterations on the state-controlled network directly associated with the construction of the gas pipeline.

Council roads

As discussed in Section 17.5.1, a number of rural intersections of state-controlled roads with council-controlled roads will be used by project traffic associated with gas pipeline construction.

There will be no intersection capacity issues associated with these intersections. However, the intersections will need to be assessed during the detailed design stage, to determine if other alterations are required.

Assessment should include reviewing all the intersections to ensure adequate safe intersection sight distance is being achieved. If the required safe intersection sight distance is not currently available, the intersection should be altered to achieve the required sight distance.

The DTMR Road Planning and Design Manual provides the intersection form when minor roads meet state-controlled roads. The warrants are based on the number of turning movements, compared with the through movements on the state-controlled roads. Based on the through movement volume on the state-controlled roads at intersections with council-controlled roads, and the anticipated project turning volumes, it is anticipated that the intersection forms will be required to be a minimum basic right turn (BAR) and basic left turn (BAL) treatment.

The only exception to this will be the intersection of the Bruce Highway with The Narrows Road, which will be used by the Project to access the gas pipeline construction camp 1 and laydown area 1. Due to the higher volume of traffic on the Bruce Highway, it is likely that the treatment at this intersection will be required to be a channelised right-turn treatment with a short right turn slot, or CHR (S).

Australia Pacific LNG will work with government and industry in regard to the potential alterations, monitoring and maintenance.

Intersections of construction accommodation access to state-controlled roads

A number of temporary accommodation facilities or laydown area access roads associated with gas pipeline construction will access directly onto state-controlled roads. The final locations of the intersections should be selected, to ensure that safe intersection sight distance is achieved for the speed environment on the state-controlled road. It is likely that, based on the turning volumes in/out of the temporary accommodation facility, that the intersection forms may be a minimum basic right turn (BAR) and basic left turn (BAL) treatment.

Intersections of laydown area and accommodation facility access roads with council-controlled roads

Where a laydown access road or temporary accommodation facility access road intersects with a council-controlled road, the access location should be selected to ensure that safe intersection sight distance is achieved, for the local access road speed environment. It is anticipated that the intersection form would be a minimum basic right turn (BAR) and basic left turn (BAL) treatment.

Pavement rehabilitation

Table 17.23 details significantly impacted roads within the gas pipeline study area that may require rehabilitation during the assessment period.

Table 17.23 Pavement rehabilitation impacts

DTMR region	Road name	Chainage	Rehab year no project	Rehab year with project	Bring forward with project
Darling Downs	18D – Warrego Highway	Ch 0 to 1.135	2028	2026	1.9
	26B – Leichhardt Highway	Ch 60.47 to 127.61	2020	2018	1.8
	26C – Leichhardt Highway	Ch 0 to 32.02	2019	2010	8.6

Road maintenance

The maintenance for the various road links was based on the Project's proportional use (by ESA) of the road over the analysis period. Roads that are impacted by more than five percent of the existing traffic volumes are shown in Table 17.24.

Table 17.24 Maintenance impact

DTMR region	Road name	Chainage
Darling Downs	18D - Warrego Highway	Ch 0 to 1.135
	26B - Leichhardt Highway	Ch 60.47 to 127.61
	26C - Leichhardt Highway	Ch 0 to 32.02
Fitzroy	46A – Dawson Highway	Ch 25.69 to 101.15

Australia Pacific LNG will work with the Australian, Queensland, local government and industry in regard to potential maintenance requirements to meet the increased demands on regional infrastructure.

Bridge capacity and constraints

The load restrictions on the Dogwood Creek Bridge are unlikely to affect pipeline construction traffic, and no mitigation measures will be required.

Traffic incident history

The majority of crashes on the Warrego Highway west of Miles are at the intersection of Condamine Street. The traffic generated from gas pipeline construction will increase traffic on this road by approximately 1.6%. This is not expected to increase the number of crashes in this road segment.

Australia Pacific LNG recognises that road safety is a vital part of project operations. A range of operational health and safety measures covering the operation of project vehicles will be in place to reduce the risk of motor vehicle accidents.

Driver training

There are two driver training programs offered to employees working on gas fields projects:

- 'Urban to outback'
- Onsite driver training.

The first program is targeted at employees who drive from city-based office locations to field sites. The course covers driving and vehicle use policies, vehicle checks, defensive strategies, driver fatigue and vehicle operation, particularly on gravel roads.

The onsite course is designed for people who work at gas fields such as Spring Gully and Talinga.

Over 260 employees have completed these courses since the beginning of last year. Origin, on behalf of Australia Pacific LNG is considering further options for extending these programs to more employees.

Driver fatigue

The Project will aim to reduce private vehicle use as much as possible during construction, by providing transport to site, from designated pick up areas or to and from the local airport for fly in/out staff. Journey management plans for vehicle travel will incorporate fatigue management considerations.

Construction and ongoing service deliveries to project facilities will be in accordance with a safe travel transport management strategy and relevant transport regulations. This will include strict adherence to driver travel and required rest periods and the adoption of safe driving techniques.

Oversized vehicles

No oversized and/or overweight vehicles are proposed to be used during gas pipeline construction.

Decommissioning and rehabilitation of temporary accesses

Accesses to temporary accommodation facilities, laydown areas and stockpile sites that have been constructed as part of the Project will be decommissioned unless relevant Australian, Queensland or local government agencies or landowners agree with the Project to leave them in place.

Access to construction sites

A number of temporary accommodation facility roads and local roads associated with the construction of the gas pipeline will access directly onto state-controlled roads. The final locations of the new intersections will be selected to ensure that safe intersection sight distance is achieved for the speed environment on the state-controlled road. It is expected, based on the turning volumes in/out of the camps and facilities that the new and existing intersection forms are likely to be a minimum basic right turn and basic left turn treatment. This will be assessed as part of the traffic management plan.

Accesses to temporary facilities, lay down areas and stockpile sites that have been constructed as part of the Project will be decommissioned unless relevant federal, Queensland or local authorities or landowners agree to leave them in place.

Site access to construction sites will be arranged by the relevant contractor. However, access provisions are likely to include measures such as fencing, signage including health and safety requirements and security measures.

Stock route mitigation

Measures undertaken to minimise the impact on stock routes may include:

- Planning operations in close cooperation with DERM, local councils and pastoralists
- Constructing project infrastructure to avoid stock routes, as far as practicable.

Post construction, stock routes will be rehabilitated to meet the surrounding conditions. It is also expected that access would be maintained, or in some cases improved where practicable.

Road flooding

In the event that a section of the Queensland or council road network becomes impassable during periods of flooding, alternative routes may be used if safe and practicable. Should access not be achievable during prolonged flooding events, then construction activities may need to be shut down and demobilised for a period.

The Project will limit traffic movement during and after flood events, in line with local traffic control measures. The analysis has not identified any alterations of any waterway crossings on the state-controlled network. Some access roads will need to be constructed to access gas pipeline infrastructure.

When road locations, designs and level of flood immunity are finalised, it is proposed that further hydraulic modelling be carried out. This will ensure impacts are minimised and mitigation of any changes to flood behaviour does not adversely impact upstream or downstream properties. This is discussed in Volume 5 Attachment 25 and Volume 3 Chapter 11.

Public and active transport network

As indicated in Section 17.5.1, the project traffic will travel along roads used as school bus routes. The project traffic management plan will consider measures to limit this impact during school drop-off and pick up times. The social impact aspect is discussed in Volume 3 Chapter 20.

Environmental impacts

New roads will need to be constructed to access gas pipeline infrastructure. In determining the location of these facilities, consideration has been given to the proximity of existing roads and the local environment.

During all phases (construction, operation and ongoing road maintenance) of this project, sustainability measures will be implemented that will provide long term community benefits while minimising traffic impacts. The Project will also adopt road construction practices and technologies to reduce environmental impact and energy use, as far as practicable. In addition, the requirements of the *Environmental Protection Act 1994*, Main Roads Design Manual 2004, and other relevant legislation will be adhered to ensure environmental impacts will be are kept to a minimum as far as practicable. These will be consistent with Volume 3 Chapter 8.

Earthworks, vegetation clearing, erosion, and runoff will be minimised as far as practicable, and sediment control and weed management measures will be put in place as per Volume 3 Chapter 5.

Dust control

Australia Pacific LNG may implement conventional measures to minimise, as far as practicable the generation of dust by project vehicles during construction. This may include regular application of water at appropriate locations, following DTMR standard specification MRS11.02 – Provision for Traffic.

Weed, pest and disease control

Australia Pacific LNG will participate in proactive weed management and will work closely with regional councils. This is detailed in Volume 3 Attachment 15. Origin's weed management procedure will also be used to ensure that the risk of weed contamination is minimised.

Noise control

Australia Pacific LNG will implement a traffic management plan to minimise, as far as practicable, the potential impacts of road traffic noise from project traffic. This may include speed controls on project vehicles, management of night-time traffic along roads adjacent residential or other sensitive land uses.

Spill control

Australia Pacific LNG will implement a traffic management plan to minimise, as far as practicable, the potential impacts of product spill during the transportation of product and materials. This may include the use of suitably qualified fuel transport operators giving consideration to vehicle maintenance, driver training and cleanup procedures as part of emergency response plans.

Traffic management plan

For all road based construction activity associated with the Project, a traffic management plan will be developed during the front end engineering design (FEED) stage of the Project. The plan will be developed in conjunction with the relevant Queensland and local authorities and the local community.

The traffic management plan will address the movement of heavy vehicles associated with the Project throughout the road network, by:

- Setting routes to be used by the heavy vehicles, generally restricted to existing heavy haul routes
- Restricting heavy vehicle movements during certain times of the day or week, such as on routes which traverse school zones
- Restricting vehicle speeds near residences
- The possible installation of temporary or permanent signage in high risk areas to warn road users of increased heavy vehicle activities.

This traffic management plan will also address maintaining access for emergency vehicles and measures to be taken to prevent public access to project sites. Conventional construction methods are expected to be used when constructing infrastructure works within the road reserve to mitigate the Project's impacts. At the FEED stage, traffic management plans will be prepared according to DMR Specification MRS11.02 Provision for Traffic and the Manual of Uniform Traffic Control Devices (MUTCD). Australia Pacific LNG's road construction contractors will be required to implement the plan when carrying out the works.

Pipe crossings

The proposed method of crossing is determined by the road formation, current road use and the existence of any utilities within the road corridor. Construction methods are generally open cut, bored, or in rare cases HDD. Casings would be rare in design of a pipeline/road crossing, and are discouraged for corrosion reasons.

Open cut

This construction method will generally be applied to crossing of unformed or gravel tracks and roads typically found in the rural locations. These are either council-controlled or privately owned and maintained. They normally provide access to farms and some rural residential properties and carry very low volumes of traffic.

Consultation with the relevant council and affected land owners will be undertaken prior to any construction works. During construction, alternative access arrangements will be provided following a traffic management plan. Access will be restored when works are completed.

Boring or HDD

Boring is the advancing of an auger in a straight line from one pit to another on either side of a roadway. Pipe boring may be undertaken when the pipeline needs to cross a railway, state-controlled road, or a local road if permission to open cut a trench is not granted. HDD is the drilling of a curved line from surface underground to surface. HDD may be undertaken at waterway crossings or at underground services where boring cannot be undertaken. In either case, the pipeline will be built and constructed following the relevant standards and regulations, including Australian Standard AS 2885 Pipeline – Gas and Liquid Petroleum, the DTMR standard specification MRS 11.02, and Australian Standard AS 4799-2000 Installation of Underground Utility Services and Pipelines with Railway Corridors.

17.6.2 Rail Network

Material transport by rail from Gladstone

Rail transport from the Gladstone requires the integration of port facilities and rail capabilities. Gladstone Container Terminal is owned by the Central Queensland Ports Authority and is operated as a multi-user facility. Current terminal operators are Patricks Stevedores, K&S Freighters, and KG Smith & Co.

The facility is designed to handle all forms of containerised, break-bulk and general cargoes. A port survey is currently underway, and this will provide detailed information on the port's handling capacity. Additional handling opportunities or constraints may arise from the survey. If rail transport is considered, the following modifications to Queensland Rail infrastructure may be required:

- Additional sidings may be required unless demand on Queensland rail systems is not reduced.
- Currently, it is reported that there is a locomotive and wagon shortage in Queensland and additional locomotives and wagons maybe required
- Initial logistic calculations suggest that an additional port laydown area may be required to enable vessels to unload at normal port rate, and not be delayed by the rail option
- The missing southern rail link between Theodore and Wandoan and other local phantom lines, if operational, would make the rail option more attractive

- The length of the Project's pipe (18m) may be an issue, with limitations on weight and length on existing wagons and rail lines being exceeded in some cases. Eighteen metre wagons exist but are scarce and the quantities required for the Project may exceed the current available wagons.

Material transport by rail is an environmentally sustainable solution that will reduce road congestion and damage, decrease the potential for motor vehicle/heavy vehicle accidents and lessen the impacts on the transport network.Apart from the additional infrastructure that may be required, there are several logistic constraints that require consideration, such as:

- Transporting the pipe by rail from Gladstone increases handling. It is recognised that this may increase health, safety and environment concerns and additional handling procedures may be required
- The increased handling may result in an increased risk of damage to the pipe
- The cost and construction duration of additional sidings at laydown areas or within the Gladstone Port is not currently unknown however the infrastructure must be in place to facilitate transport of the pipe segments (2011/12).
- The rail lines are already heavily utilised. Coal traffic on the rail lines currently takes precedence and has daily scheduled movements. However, there may exist opportunities of greater priority in the future if the demand of coal decrease.

Material transport by rail from Brisbane

The Brisbane Multimodal Terminal is the interface between rail, road and container terminals at the Port of Brisbane.

The integration of these transport modes, a dual-gauge rail link, and the location of the Brisbane Multimodal Terminal behind the container terminals enables the movement of large volumes of interstate and intrastate cargo into and out of the port by rail.

QR National and Pacific National run services to the Brisbane Multimodal Terminal, connecting the port to major and regional Queensland centres, as well as the eastern capital cities of Sydney and Melbourne.

The Brisbane Multimodal Terminal can track freight containers moving through it. Freight forwarders, shipping lines and road-transport operators can carry out an online search to locate their containers at the Brisbane Multimodal Terminal.

While the rail option from Brisbane appears attractive, Australia Pacific LNG's initial discussions with Queensland Rail in August 2009 identified the following constraints:

- Brisbane to Miles rail traffic is currently 90% saturated due to carriage of coal, grain and livestock. This leaves limited opportunity for increased freight movements, especially the volumes potentially required by the Project
- The length of the Project's pipe (18m) may be an issue, with limitations on weight and length on existing wagons and rail lines being exceeded in some cases. Eighteen metre wagons exist but are scarce, and the quantities required for the Project may exceed the current available wagons
- The Toowoomba range may also prove to be a challenge as constraints on total weight and dimension capacity would need to be considered prior being railed

- Transporting the pipe by rail from Brisbane increases handling. It is recognised that this may increase health, safety and environment concerns and additional handling procedures may be required
- The increased handling may result in an increased risk of damage to the pipe.

The decision on road versus rail transport or a combination of both can only be made when the discussions with QR are complete.

Pipeline crossings

There are four under-track crossings in the gas pipeline study area:

a) Moura Short Line, north of the Davis Road Crossing

b) Dawson Valley Branch Railway, between Argoon and Dakenba, adjacent to Jambin-Dakenba Road

c) Moura Short Line, along Dawson Highway

d) North Coast Line in Aldoga, adjacent to the Gladstone-Mt Larcom Road.

The installations will be required to be carried out to Queensland Rail and Australian Standards AS 4799-2000 Installation of Underground Utility Services and Pipelines with Railway Boundaries. This includes:

- Minimum 2000m cover to top of track
- Minimum 1200mm cover to bottom of table drain
- Heavy wall pipe between the boundaries of the rail reserve
- Pipeline warning signs on both sides of the rail reserve
- Concrete slabs beneath any table drains, unless the depth of cover under the drain exceeds 2m
- Crossing to be at nominal 90 degrees unless otherwise specifically approved
- Pipe may or may not be cased, subject to negotiations with authorities.

The location of each pipe crossing for rail will have to be investigated beforehand. It would be desirable to avoid a pipe crossing where there is an existing passing loop or duplicated track, or where one is planned. If this is unavoidable, the pipeline crossing should be engineered for future construction being carried out over it.

The crossing at Aldoga will require investigation. QR is planning for expansion of traffic, while the plans for the Gladstone area, in locations which could affect gas pipeline planning, include:

- Developing the Moura Link, from the Moura Line to Aldoga
- Constructing a new rolling stock maintenance and provisioning yard at Aldoga
- Quadruplicating the North Coast Line between Mt Larcom and the new Wiggins Island infrastructure
- Installing additional tracks along the East End Mine branch line
- Providing for future tracks
- Providing rail access for third party operators.

Road/rail crossings

Three road/rail crossing points within the project area (Table 17.19) are currently managed by active control measures including flashing lights and signage. The increase in traffic at the crossings due to the Project is not considered a warrant to increase controls.

17.6.3 Shipping network

Mitigation options for addressing the impact of gas pipeline construction on the shipping network are described in Volume 5 Attachment 35. The pipeline will only require an additional two ships a month.

17.6.4 Air services network

Gladstone Airport

As stated in Section 17.5.4, up to 150 people in any one day associated with the construction of the gas pipeline may use the Gladstone Airport. The current airport can cater for Dash 8-400 aircraft capable of carrying 70 persons. Therefore, to cater for the impact of the gas pipeline construction, up to an additional two Dash-400 aircraft movements may be required. This is not expected to impact the operations of the airport. As passengers will be arriving by bus to the airport, there is not expected to be a significant impact on parking.

An estimate of the cumulative impacts of a number of projects being constructed during the pipeline construction period has been made, in particular the movement of personnel associated with the construction of LNG facilities on Curtis Island. A conservative estimate of the passenger movements under this scenario would indicate approximately 80 additional passenger movements during the pipeline construction peak associated with the construction of the Australia Pacific LNG facility, and a further additional 120 passenger movements associated with the construction of the Queensland Curtis Island LNG and Gladstone LNG facilities. Therefore, to cater for the impact of the LNG facility construction during the pipeline construction, up to an additional three Dash-400 aircraft movements may be required.

Australia Pacific LNG will work with the Gladstone Regional Council and relevant government agencies and service providers to determine the most appropriate options for the use of Gladstone Airport.

Miles aerodrome

As stated in Section 17.5.4, up to 120 people in any one day associated with the construction of the gas pipeline may use the Miles aerodrome during the peak construction period. The current aerodrome can cater for Dash 8-200 aircraft capable of carrying 36 persons. Therefore, to cater for the impact of the gas pipeline construction, up to an additional four Dash-200 aircraft movements may be required.

Australia Pacific LNG will work with Western Downs Regional Council and relevant government agencies and service providers to determine the most appropriate options for the use of Miles Aerodrome.

Biloela Airport

As stated in Section 17.5.4, up to 120 people in any one day associated with the construction of the gas pipeline may use the Biloela Airport during the peak construction period. The current aerodrome

can cater for Dash 8-200 aircraft capable of carrying 36 persons. Therefore, to cater for the impact of the gas pipeline construction, up to an additional four Dash-200 aircraft movements may be required.

Australia Pacific LNG will work with Banana Shire Council, QantasLink and relevant government agencies and service providers to determine the most appropriate options for the use of Biloela Airport.

17.7 Conclusions

17.7.1 Assessment outcomes

A summary of the environmental values, sustainability principles, potential impacts and mitigation measures for traffic and transport for the gas pipeline is presented in Table 17.25. This table also includes the residual risk for traffic and transport.

A risk assessment has been undertaken to identify potential risks, causes and consequences from traffic and transport. Mitigation measures to reduce the risks have been nominated and the residual risk has been calculated. Further details of the project risk assessment methodology are provided in Volume 1 Chapter 4.

Table 17.25 Summary of environmental values, sustainability principles, potential impacts and mitigation measures

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
Road					
The wellbeing of the local community and businesses. Efficient, sustainable and supportive transport network for all members of the local and business community. Flora and fauna habitat protection.	Identifying, assessing, managing, monitoring and reviewing risks to Australia Pacific LNG's workforce, its property, the environment and the communities affected by its activities	Increased congestion and delay on road network.	Additional volumes of oversize, heavy and light vehicle traffic due to quantity of materials required to construct and operate Project components.	Work with Australian, Queensland and local governments and industry in regard to infrastructure alterations which may be required to meet the increased demands on the regional and local transport network which may include access road construction, flood mitigation measures and intersection and road alterations. Aim to reduce light vehicle use as much as possible during construction by providing transport to site, from designated pick up areas or to and from the local airport for fly in/out staff using busses. Develop traffic management and logistic plans to provide the safe and efficient movement of people and materials, following regulations and requirements of regulatory agencies.	Medium
	Identifying, assessing, managing, monitoring and reviewing risks to Australia Pacific LNG's workforce, its property, the	Damage and increased wear-and-tear on the existing road infrastructure due	Additional volumes of oversize, heavy and light vehicle traffic due to quantity of materials required to construct and operate Project components.	Work with Australian, Queensland and local governments and industry in regard to infrastructure alterations which may be required to meet the increased demands on the regional and local transport network	Medium

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
	environment and the communities affected by its activities	to heavy vehicles.	Use of unsealed roads.	which may include access road construction, flood mitigation measures, intersection and road alterations, pavement rehabilitation and road maintenance. Develop traffic management and logistic plans to provide the safe and efficient movement of people and materials, following regulations and requirements of regulatory agencies.	
	Minimising adverse environmental impacts and enhancing environmental benefits associated with Australia Pacific LNG's activities, products or services; conserving, protecting, and enhancing where the opportunity exists, the biodiversity values and water resources in its operational areas Identifying, assessing, managing, monitoring and reviewing risks to Australia Pacific LNG's workforce, its property, the	Increased risk of accidents on the road network resulting in Fatalities and injuries to persons Injury/death of fauna Damage to property Impact on company reputation Release of containments to the environment	Additional volumes of oversize, heavy and light vehicle traffic due to quantity of materials required to construct and operate Project components. Increased long distance road travel. Vehicle defect or failure Incorrect management of load on vehicle Vehicle defect or failure Inadequate vehicle selection Collision (wildlife, fixed objects including power lines, third party vehicles)	Work with Australian, Queensland and local governments and industry in regard to infrastructure alterations which may be required to meet the increased demands on the regional and local transport network which may include access road construction, flood mitigation measures, intersection and road alterations, pavement rehabilitation and road maintenance. Aim to reduce light vehicle use as much as possible during construction by providing transport to site, from designated pick up areas or to and from the local airport for fly in/out staff using busses. Work with Australian, Queensland and local governments and industry to improve road safety through clear road signage, improve road alignments and intersection geometry	High

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
	environment and the communities affected by its activities	(product spill)	Road conditions and road design Driver error / Fatigue Environmental conditions and adverse weather Inadequate vehicle servicing and/or maintenance Environmental hazards such as glare from sunrise and sunset Lack of adequate awareness of vehicle movements associated with the project by local stakeholders Excessive speed and failure to follow road rules Poor visibility and line of sight viewing on regional road Lack of adequate planning Not following vehicle and transportation procedures Lack of adequate awareness of vehicle movements associated with the project by local stakeholders	To reduce the risk of accidents to employees and other transport network users from projects operations, Australia Pacific LNG will develop and implement detailed traffic management plans and transport and logistics management plans for construction and operating the project infrastructure. These plans will incorporate safety measures to be implemented. Consultation and project operations information provided to local residents Liaise with local police and road authorities A range of operational health and safety measure covering the operation of project vehicles will be in place to reduce the risk of motor vehicles accidents. • Provide driver's training to relevant Australia Pacific LNG staff. Contractors will be required to have health and safety management system which includes safe driving. • Emergency Response and Crisis procedures • Health safety and environment management plans and procedures	

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
				• Journey management plans • Drug and alcohol testing • Licensed bus drivers • Inductions, driver training and awareness notices • Use of appropriate project vehicles including safety features for vehicles • Regular vehicle and equipment servicing • Fire extinguishers in vehicles • Escort vehicles for oversized or heavy vehicles • Road side signage used for road works, dust suppression activities • GPS tracking system installed in project and hire vehicles • Road suitability selection assessment process	
	Minimising adverse environmental impacts and enhancing environmental benefits associated with Australia	Increased risk of adverse impact on the environment such as air pollution,	Additional volumes of oversize, heavy and light vehicle traffic due to quantity of materials required to construct and operate Project components.	Work with Australian, Queensland and local governments and industry in regard to infrastructure alterations which may be required to meet the increased demands on the regional and local transport network	Medium

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
	Pacific LNG's activities, products or services; conserving, protecting, and enhancing where the opportunity exists, the biodiversity values and water resources in its operational areas Identifying, assessing, managing, monitoring and reviewing risks to Australia Pacific LNG's workforce, its property, the environment and the communities affected by its activities	noise, dust, land take, loss of habitat, runoff, pest and weed spread. Release of containments to the environment (product spill, oil leaks Inappropriate disposal of wastes such as cigarette butts, cans and food wrappers due to social behaviour Transportation and spread of pest and noxious weed Entanglement of flora species in vehicle exhaust system causing fire	Need to alter or construct new roads Use of unsealed roads. Construction of new access tracks. Not following vehicle and transportation procedures	which may include access road construction, flood mitigation measures, intersection and road alterations, pavement rehabilitation and road maintenance. Aim to reduce light vehicle use as much as possible during construction, by providing transport to site, from designated pick up areas or to and from the local airport for fly in/out staff. Journey management plans for vehicle travel will incorporate fatigue management considerations Develop traffic management and logistic plans to provide the safe and efficient movement of people and materials, following regulations and requirements of regulatory agencies. Environmentally sensitive road/bridge construction methodologies. During the construction, operation and ongoing maintenance of existing and new roads, measures will be implemented to ensure environmental impacts are reduced, as far as practicable, and works will also be carried out in accordance with the requirements of the *Environmental Protection Act 1994*, the Main Roads Design Manual 2004, and other relevant legislation	

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
		Injury/death of fauna		Australia Pacific LNG will implement conventional measures to reduce, as far as practicable the generation of dust by project vehicles during construction. Australia Pacific LNG will participate in pro-active weed management and will work closely with regional councils. This will include wash down requirements (hygiene inspection and declaration) for vehicles coming from known weed infested areas, including training on company and own vehicles During all phases (construction, operation and ongoing road maintenance) of this project, sustainability measures will be implemented that will provide long term benefits while limiting traffic impacts, as far as practicable. Inductions, driver training and awareness notices	
Air					
The wellbeing of the local community and businesses. Efficient, sustainable and	Identifying, assessing, managing, monitoring and reviewing risks to Australia Pacific LNG's workforce, its property, the	Increased congestion and delay at local airports and aerodromes	Movement of construction staff at breakdown/shift changes. Inadequate capacity at airport/aerodrome to support	Work with Western Downs, Gladstone Regional and Banana Shire Councils and relevant government agencies and service providers to determine the most appropriate use of the relevant airport/aerodromes.	Medium

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
supportive transport network for all members of the local and business community. Flora and fauna habitat protection.	environment and the communities affected by its activities		larger aircraft. Infrastructure not available or services reduced due to airport construction works.	Develop management and logistic plans to provide the safe and efficient movement of people and materials, following regulations and requirements of regulatory agencies. Manage work rosters to avoid peak times.	

17.7.2 Commitments

To reduce the risk of accidents to employees and other transport network users from project operations, Australia Pacific LNG will develop and implement detailed traffic management plans and transport and logistics management plans for constructing and operating the gas pipeline. These plans will incorporate safety measures to be implemented across all relevant modes of transport.

A range of operational health and safety measures covering the operation of project vehicles will be in place to reduce the risk of motor vehicle accidents. Australia Pacific LNG will adopt Origin's health and safety management system for the operations of the gas pipeline.

Australia Pacific LNG will:

- Rehabilitate, post construction, impacted stock routes
- Work with Australian, Queensland and local governments and industry in regard to infrastructure alterations which may be required to meet the increased demands on the regional and local transport network which may include access road construction, flood mitigation measures, intersection and road modifications, pavement rehabilitation and road maintenance
- Decommission access roads to temporary facilities, laydown areas and stockpile sites that have been constructed as part of the Project, unless relevant government agencies or landowners agree with Australia Pacific LNG to leave them in place
- Implement measures to reduce, as far as practicable, the generation of dust by project vehicles
- Participate in pro-active weed management and will work closely with regional councils
- Minimise impacts to existing road and rail infrastructure crossings through the use of construction techniques such as boring.