



H

Port Alma

H



Port Alma



Report

GLNG EIS Supplement

Port Alma Assessment

NOVEMBER 2009

Prepared for
Santos
32 Turbot Street
Brisbane, Qld 4000
42626473

URS

Project Manager:



Brian Connellan
Environmental Scientist

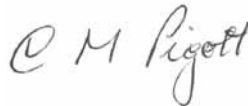
URS Australia Pty Ltd

**Level 16, 240 Queen Street
Brisbane, QLD 4000
GPO Box 302, QLD 4001
Australia**

T: 61 7 3243 2111

F: 61 7 3243 2199

Project Director:



Chris Pigott
Senior Principal

Reviewer:



Jim Barker
Associate Environmental
Scientist.

Date:

November 2009

Reference:

42626473/1/C

Status:

Final

© Document copyright of URS Australia Pty Limited.

The contents of this report are and remain the intellectual property of the addressee of this report and are not to be provided or disclosed to or used by third parties without the addressee's consent.

URS Australia and the addressee of this report accept no liability to third parties of any kind for any unauthorised use of the contents of this report and reserve their right to seek compensation for any such unauthorised use.

Document delivery

URS Australia provides this document in either printed format, electronic format or both. URS considers the printed version to be binding. The electronic format is provided for the client's convenience and URS requests that the client ensures the integrity of this electronic information is maintained. Storage of this electronic information should at a minimum comply with the requirements of the Commonwealth Electronic Transactions Act (ETA) 2000.

Where an electronic only version is provided to the client, a signed hard copy of this document is held on file by URS and a copy will be provided if requested.

Table of Contents

Executive Summary	iv
1 Introduction and Background	1
1.1 Regulatory Approvals Framework	2
1.1.1 Approval under Petroleum Legislation.....	2
1.1.2 Conclusion.....	4
2 Description of Proposed Activities.....	8
2.1 Shipping.....	8
2.1.1 Vessel Restrictions.....	9
2.1.2 Berth Facilities at Port Alma	9
2.2 Trucking.....	9
2.2.1 Unloading, Loading and Temporary Storage Activities.....	9
2.2.2 Haulage Routes.....	10
3 Assessment of Environmental Values and Potential Impacts	12
3.1 Port Alma	12
3.1.1 Marine Ecology and Coastal Environment.....	12
3.1.2 Noise and Vibration	12
3.1.3 Land Use and Planning	13
3.1.4 Social and Community	13
3.2 Bajool-Port Alma Road.....	15
3.2.1 Noise and Vibration	15
3.2.2 Traffic and Transport.....	15
3.3 Laydown Area (Lot 96)	17
3.3.1 Soils.....	17
3.3.2 Contaminated Land	17
3.3.3 Nature Conservation.....	18
3.3.4 Aquatic Ecology.....	18
3.3.5 Surface Water	19
3.3.6 Groundwater.....	19
3.3.7 Noise and Vibration	20
3.3.8 Land Use / Planning.....	21
3.3.9 Social and Community	21
4 Conclusions.....	23

4.1	Port Alma	23
4.2	Bajool-Port Alma Road	23
4.3	Laydown Area (Lot 96)	23
5	References	24
6	Limitations	25

Figures

Figure 1-1	Port Alma	5
Figure 1-2	Regional Map Port Alma	6
Figure 1-3	Port Alma Laydown Area	7
Figure 2-1	Haulage Route from Port Alma to the Pipeline/CSG Fields Construction Sites	11

Appendices

Appendix A	Port Alma Social Impact Assessment
Appendix B	Port Alma Noise Assessment
Appendix C	Port Alma Land Use and Planning
Appendix D	Port Alma Traffic and Transportation Assessment
Appendix E	Laydown Area Site Photographs

Abbreviations

Abbreviation	Description
AHD	Australian Height Datum
ASS	Acid Sulphate Soils
CSG	Coal Seam Gas
DEEDI	Department of Employment, Economic Development and Innovation
DERM	Department of Environment and Resource Management
DIP	Department of Infrastructure and Planning
DTMR	Department of Transport and Main Roads
EIS	Environmental Impact Statement
GLNG	Gladstone Liquefied Natural Gas
GPC	Gladstone Ports Corporation
GRT	Gross Register Tonnage
ha	Hectare
IPA	Integrated Planning Act
LOA	Length Overall
m bgl	Metres Below Ground Level
RHM	Regional Harbour Master
t	Tonne

Executive Summary

Port Alma is being considered as an alternate port facility to receive, temporarily store and handle, and dispatch imported pipe and other material to the gas transmission pipeline construction sites and, potentially, the coal seam gas (CSG) fields. The use of Port Alma will reduce the pressure on Gladstone port facilities, and indirectly the Gladstone community, as well as providing an alternative road access route for delivery of materials to the gas transmission pipeline construction sites and CSG fields.

Imported construction materials will be unloaded directly onto trucks at the existing Port Alma facility and transported to an existing, temporary laydown area on the Bajool-Port Alma Road (Lot 96). From here, the pipe will be dispatched (via trucks) to various locations along the gas transmission pipeline route, and potentially the CSG fields.

Accordingly, three components are involved:

- The use of existing facilities at Port Alma;
- The Bajool-Port Alma Road; and
- The laydown area (Lot 96).

Section 2 describes the proposed activities, including the shipping of pipe and associated material and the trucking of this material to the laydown area.

Section 3 assesses the environmental impacts on the port, the Bajool-Port Alma Road and the laydown area.

An increase in traffic along with associated noise is the most significant impact. The measures that will be implemented to mitigate these impacts are:

- During transportation and handling of pipe joints, care will be taken to avoid metal against metal banging including lining the truck trailers with a rubber mat;
- Minimising the use of truck exhaust brakes;
- Ensuring regular maintenance of vehicles and equipment; and
- Providing access to information for the community and maintaining positive relations with the residents.

Introduction and Background

This report describes the proposed alternative logistics solution for the transportation of gas transmission pipeline and potentially CSG field materials. Port Alma has been proposed for use as an alternative port facility and transport route to import materials (including larger cargo such as compression kits and engines, pipes and bends) to minimise pressure on Gladstone port facilities and the Gladstone community.

The Queensland Department of Transport and Main Roads (DTMR) have expressed concern regarding Santos proposal to operate all the pipeline transport requirements out of Gladstone due to:

- The volume of the transport task (possibly up to 6,000 round trip truck movements for pipe and bends);
- The size of the trucks if 18 m pipe lengths are to be transported; and
- Concerns from Gladstone stakeholders.

Port Alma is the deep sea port for Rockhampton and provides both import and export facilities and services. It is situated approximately 60 km from Rockhampton on the southern tip of the Fitzroy River Delta, close to the mouth of Raglan Creek (Figure 1-2).

The port currently is used for the import of ammonium nitrate, explosives, and general and break bulk cargoes. Material exported from the port includes ammonium nitrate, tallow, explosives and other general cargoes.

Existing facilities installed at the port include:

- Three docks capable of accepting vessels up to 30,000 Gross Register Tonnage (GRT);
- An undeveloped 67 hectare port owned stockpile area (laydown area) on the Bajool-Port Alma road approximately 20 km from the port;
- Two container yards and a bulk store of 540 m²;
- Stevedoring capacity; and
- Dockside crane of 25 ton capacity.

The port's draft is 7 m on low tide and 10 m on high tide. There are no rail facilities adjacent to the port.

Port Alma has no established laydown area. Santos is currently negotiating with Gladstone Port Corporation (GPC) for access to a parcel of land (Lot 96) owned by GPC located on the Bajool-Port Alma Road, approximately 20 km west of Port Alma and 6 km east of Bajool. Lot 96 covers a total area of 67 ha, approximately 7 ha of which have been used as a storage site for various projects in the past. Santos is currently negotiating with GPC about all available land, including port land and Lot 96. The site has been fenced at the front (refer to Figure 1-3). The site is devoid, to a large extent, of vegetation (remnant or regrowth). It has been previously covered with a gravel hardstand base which is now in a state of disrepair and interspersed with various grasses. Minor works will need to be completed on the laydown area, including hardstand and temporary office facilities. These works have been assessed in Section 3.3. Refer to Appendix E for general photographs of the Laydown Area within Lot 96.

This report describes the environmental values, potential impacts and proposed mitigation measures for the receiving of materials at Port Alma, transfer to the laydown area and operations at the laydown area. Impacts associated with the transportation of materials from the laydown area to the CSG fields and pipeline corridor are described in Attachment C.

1 Introduction and Background

1.1 Regulatory Approvals Framework

Port Alma is being considered as an alternate port facility to receive, temporarily store and handle, and dispatch imported pipe and other material to the gas transmission pipeline construction sites and, potentially, the CSG fields

The activities to be undertaken within the Port Alma option are considered to be an extension of those activities undertaken within the existing Port Alma facility, with the additional requirements for the construction and operation of the GLNG components. It is envisaged that formal consultation with the appropriate regulatory authorities, Rockhampton Regional Council, GPC, DEEDI and the Department of Infrastructure and Planning will assist in establishing the most appropriate regulatory approvals path.

The environmental values discussed and impact assessments undertaken as part of this report will be used as a basis for the key statutory approvals required for the construction of described works and the operation of Port Alma. The environmental impacts that will need to be assessed using this approval process include, but not limited to, the following:

- Marine ecology and coastal environment impacts;
- Traffic impacts;
- Noise and vibration impacts; and
- Social impacts.

It is intended that Santos proposed pipeline licence area will encompass the Port Alma activities such that to the extent the activities are incidental to the construction and operation of the pipeline, they will be governed by the Petroleum and Gas (Production and Safety) Act 2004 (Qld) (P&G Act). The Port Alma port facilities may also be utilised for temporary storage, handle and dispatch of materials for the CSG fields. These activities are seen as a natural extension of the port's existing use and will not require further land use approvals.

1.1.1 Approval under Petroleum Legislation

Where activities are authorised under the P&G Act certain exemptions from the application of the IPA approvals process apply:

- Planning approvals - If a development is for an activity authorised under the P&G Act and it occurs in the area of petroleum tenure, that development will be exempt from assessment against the Fitzroy Planning Scheme under IPA; and
- Vegetation clearance - Where clearing occurs within the area of a petroleum authority, a development permit is not required for vegetation clearance as such clearance is a specified purpose under IPA.

For Port Alma, to the extent the activities are a start of a new use or a material change in the intensity of the use, the GPC Land Use Plan will apply and exemptions under IPA available to activities authorised under the P&G Act will not be relevant.

Material Change of Use (planning) approvals

Activities undertaken outside the area of the proposed pipeline licence or which are not classified as "incidental activities" to the pipeline licence will need to be assessed against IPA and the Fitzroy Planning Scheme.

1 Introduction and Background

The use of Lot 96 for the temporary laydown area for the temporary storage of construction materials before dispatch of materials may require assessment under the Fitzroy Planning Scheme as its land designation is within the Rural Zone and the proposed activities are defined within the industrial purpose as a warehouse.

Appendix C further outlines land use and planning requirements at Port Alma.

Lot 96 lies within the Rural Zone of the Fitzroy Planning scheme. The proposed activities on lot 96 are included within the purpose definition of the Fitzroy Shire Planning Scheme as a “Warehouse” which means:

- “any premises used for the storage of goods, items, merchandise or materials in large quantities pending their:
 - Distribution; or
 - Sale to persons who in most instances (minimum of 90 % of persons) purchase for the purposes of resale only”.

All uses in the Industrial Use class are impact assessable. The assessment categories and relevant assessment criteria for an industrial activity (Warehouse) within the Rural Zone are as follows;

- Land uses and works are located and designed so as not to have significant negative impacts on natural values of the environment;
- Land uses and works must have no significant impact on the amenity of adjoining premises or surrounding area;
- Land uses are located such that the potential impacts of noise from major roads and rail lines are reduced;
- Land uses and works are located, and include mitigation measures that are sufficient to protect the amenity of the area and capacity for existing and approved uses to continue to operate;
- Are sufficient to protect the opportunities for existing and approved uses to expand in allocated /zoned land; and
- All new uses and works are to be located, designed and managed in ways that maximise the efficiency of the town infrastructure, and compatibility with other uses, works, cultural heritage features and natural or cultural resources.

Lot 96 is located on the Bajool-Port Alma Road, approximately 20 km west of Port Alma and 6 km east of Bajool. The lot and plan ID is 96DS186 and the parish code is 4161. All activities that include transportation of materials for development in the initial stages of the GLNG Project will be trucked from the port via Bajool-Port Alma Road, to the intersection with the Bruce Highway, then north towards Rockhampton on the Bruce Highway connecting to the Capricorn Highway before heading south on the Leichardt highway and will negate the need for any transportation through Rockhampton city.

Development at Port Alma will occur within Strategic Port Land, currently the subject of the GPC Land Use Plan.

The Land Use Plan for the Gladstone and Port Alma Ports is currently under review with a statement of proposals published for comment; as a result this report will provide assessment information based on the proposed recommendations to the Land Use Plan review.

1 Introduction and Background

1.1.2 Conclusion

It is intended that Santos proposed pipeline licence area will encompass the Port Alma activities such that to the extent the activities are incidental to the construction and operation of the pipeline, they will be governed by the *Petroleum and Gas (Production and Safety) Act 2004 (Qld)* (P&G Act). Assessment under the GPC Land Use Plan will be required for those activities within the port precinct (Strategic Port Land).

The proposed activities within Port Alma are seen as a natural extension of the existing function of the port and will not place any additional constraints on existing activities or reduce the port's capacity in terms of potential cargo and visiting ships.

Activities undertaken outside the area of the proposed pipeline licence or which are not classified as "incidental activities" to the pipeline licence will need to be assessed against IPA and the Fitzroy Planning Scheme. It is recognised however that Lot 96 is under the tenure of the Port and is included within the port's Land Use Plan as Strategic Port Land and as being within an area designated for future compatible land use activities that provide support for the port.

Santos will consult with the GPC, DIP, DEEDI and the Rockhampton Regional Council to ensure the activities undertaken in this component of the GLNG Project are assessed appropriately. This report outlines those environmental impacts that may be expected to occur from the proposed activities.

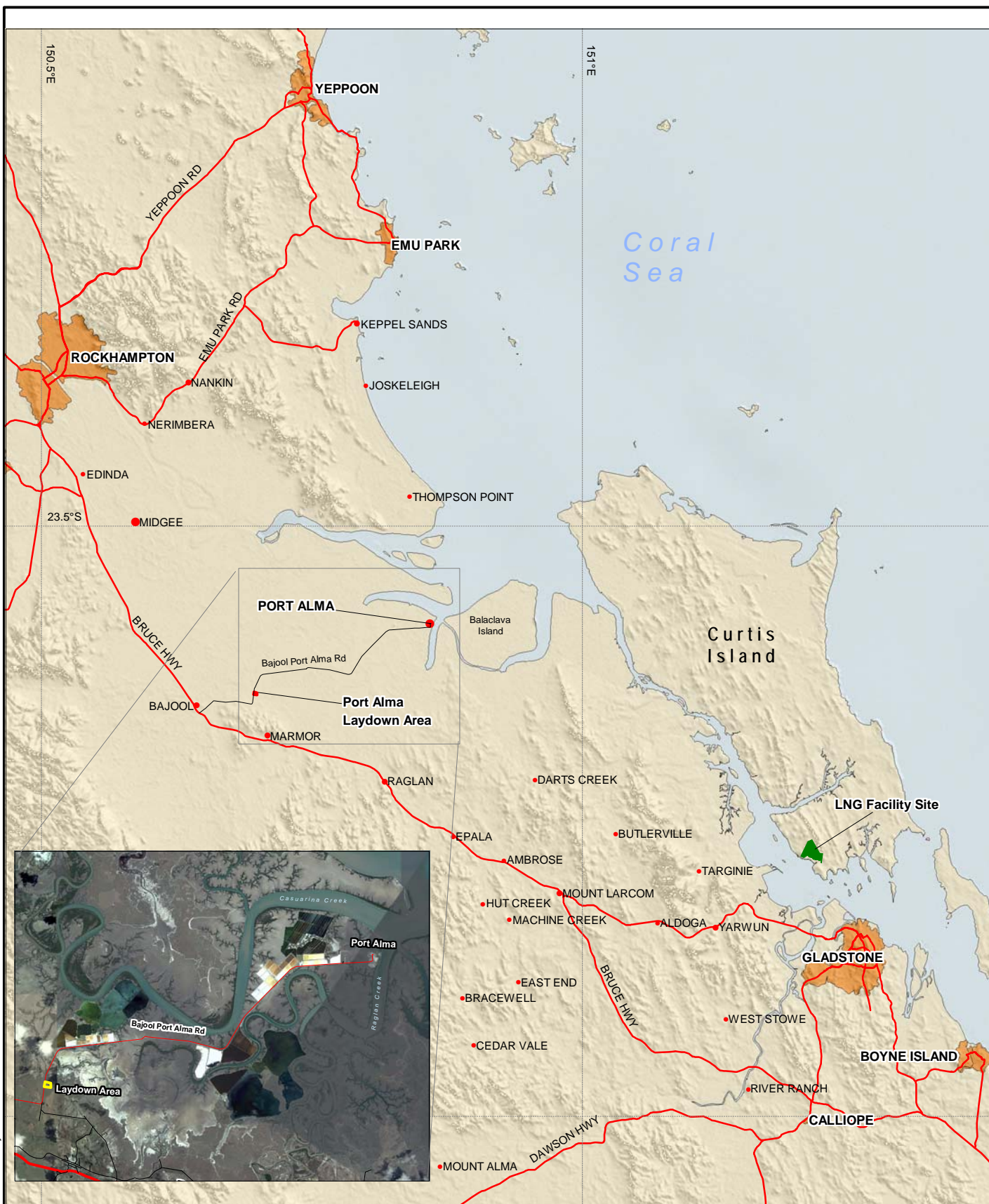
1 Introduction and Background

Figure 1-1 Port Alma



Source: Gladstone Ports Corporation, Port Alma, Port Information Handbook, 2006. Accessed on: <http://www.gpcl.com.au/>



This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.



0 10 20Km

Scale 1:500,000 (A4)
Datum: GDA94



Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

Client 	Project GLADSTONE LNG PROJECT ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT PORT ALMA		Title REGIONAL LOCATION MAP PORT ALMA	
	Drawn: CA	Approved: JB	Date: 22-10-2009	
	Job No: 4262 6440 /6220	File No: 42626440-g-2136.wor		Figure: 1-2 Rev: A A4



0 250m 500m
Scale 1:20,000 (A4)
Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

Client		Project			Title		
		GLADSTONE LNG PROJECT ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT PORT ALMA			PORT ALMA LAYDOWN AREA		
		Drawn: CA	Approved: JB	Date: 22-10-2009	Figure: 1-3		Rev:A
Job No:4262 6440 /6220		File No: 42626440-g-2137.wor		A4			

Description of Proposed Activities

Port Alma is being considered as an alternate port facility to receive, temporarily store and handle, and dispatch imported pipe and other material to the GLNG gas transmission pipeline construction sites and, potentially the CSG fields. The use of Port Alma will reduce the pressure on Gladstone port facilities, and indirectly the Gladstone community, as well as providing an alternative road access route for delivery of materials to the gas transmission pipeline construction sites and CSG fields. The proposal involves all pipe and materials for the Arcadia Valley fields and 50 % of the pipe and materials for the Fairview fields being delivered via Port Alma.

Imported construction materials will be unloaded directly onto trucks at the existing Port Alma facility and transported to an existing, temporary laydown area on the Bajool-Port Alma Road (Lot 96). From here, the pipe will be dispatched (via trucks) to various locations along the gas transmission pipeline route and potentially the CSG fields. The laydown area will be operational for the duration of pipeline construction (12 to 15 months).

This option comprises the use of existing facilities (e.g. existing port infrastructure and laydown area), with no new construction activities proposed, although some minor works upgrading infrastructure are required.

For the Port Alma option to be considered, upgrading works are required for sections of the Bajool-Port Alma Road. Maintaining the haulage route is of primary concern to DTMR, both regarding traffic volumes and protecting the condition of the road.

2.1 Shipping

The number and frequency of ships using Port Alma will depend on the type of vessel used and the availability of the vessels. Depending upon the pipe numbers per vessel with the D or E class, there may be 30 ships using the port over a 12 to 15 month period. Two types of vessels have been proposed to be used:

- D Class Vessel; and
- E Class Vessel.

D class vessels have a length of approximately 157 m over all and a total capacity of around 21,670 m³. The D class vessel has the following floor space:

- Tank top = 1,440 m²;
- Tween deck (2nd level) = 1,790 m²; and
- Weather deck = 2,250 m².

Typically “E” class vessels are the type of vessels that fit the profile for this port. The “E” class vessel has a net pay load of between 15,000 tonnes and 28,000 tonnes depending upon the hull configuration and the weight of the product that is being transported.

The mean spring tide range at Port Alma is 3.8 m and the mean neap tide range is 1.7 m.

All cargo will be unloaded from the ships straight onto trucks and transported to the laydown area at Lot 96 as there are no stockpile / storage facilities at the jetty.

There are no new shipping related construction activities proposed for Port Alma.

2 Description of Proposed Activities

2.1.1 Vessel Restrictions

The maximum length overall (LOA) of vessels using Port Alma is typically 180 m depending on vessel capability. The following restrictions will apply.

- Vessels less than 165 m – no restrictions;
- Vessels between 165 m and 173 m – on individual merits;
- Vessels between 173 m and 180 m – bow thrusters plus individual merits; and
- Vessels greater than 180 m – with approval by the Gladstone Regional Harbour Master (RHM) (Queensland Government, 2009).

2.1.2 Berth Facilities at Port Alma

Figure 1-1 provides an overview of the existing berth facilities.

Number 1 Berth:

This berth includes a concrete deck of dimensions 18.5 m wide and 169 m long and is designed to take a super-imposed weight of 2.73 tonnes per square metre. This berth is suitable for all general cargo. There is a mooring dolphin situated north of the berth to accommodate mooring lines from vessels required to moor over the north end of the berth.

Number 2 Berth:

This berth includes a concrete deck of dimensions 18.5 m wide and 122 m long, and is designed to take a super-imposed weight of 3.83 tonnes per square metre. There is a mooring dolphin situated 49 m south of this berth, which can safely accommodate mooring lines from vessels required to moor over the south end of the berth. This berth is in a continuous line with Number 1 Berth, to provide 291 m of mooring space plus the above mentioned dolphins at either end.

Number 3 Berth:

This berth consists of four berthing dolphins in line with Number 1 Berth and Number 2 Berth, with mooring dolphins at both ends to give an overall length of 238 m. It is normal practice to place head lines on the south end of Number 2 Berth from larger vessels using the dolphin berth. There is a distance of 49 m between the south end of Number 2 Berth and the mooring dolphin. All dolphins are of concrete construction. This berth is currently used for loading tallow.

2.2 Trucking

2.2.1 Unloading, Loading and Temporary Storage Activities

Once all the cargo is unloaded from the ships it will be transported to the proposed laydown area (Lot 96) for storage. A combination of singles, B doubles and extendable trailers up to 24 m in length will be used to transport the material from Port Alma to the laydown area.

The number of pipes per truck will depend on the length of the pipe (i.e. whether 12 m or 18 m pipes are used) which will determine whether capacity is three or four pipes per truck. For a ship that carries a load of 4,000 pipes, this will equate to 1,000 trips. If a ship carries 6,000 pipes, this equates to 1,500

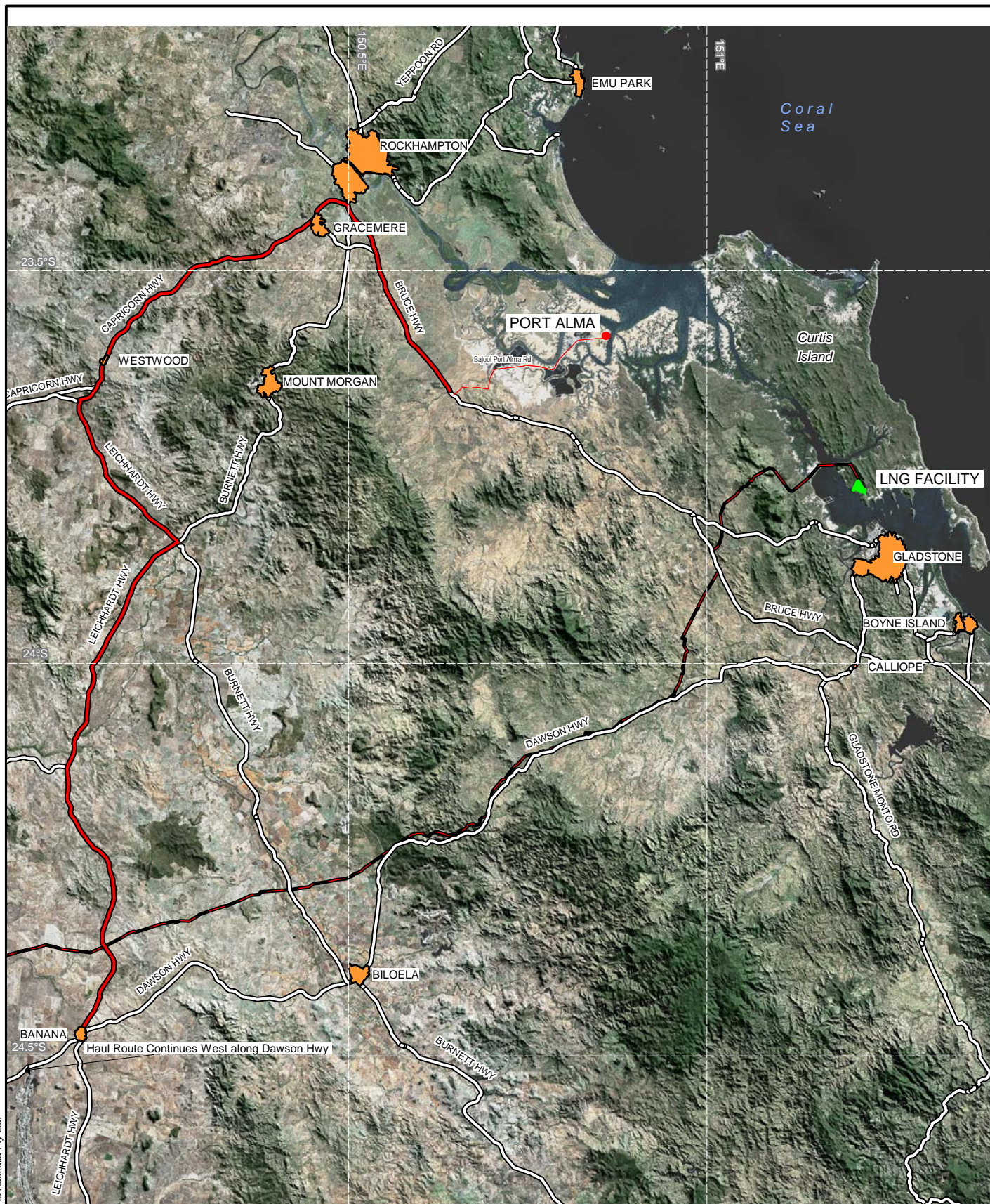
2 Description of Proposed Activities

trips (or truck movements). The number of pipes per ship, and therefore the number of truck movements, is dependent on the size of the pipe used.

The cargo will be unloaded at the laydown area from the trucks via a combination of forklift, franner cranes and cranes (single and dual lift) for temporary storage. The franner cranes have the capacity to unload 20 to 100 tonne loads. The cargo will then be reloaded onto trucks for transport to the various construction sites along the gas transmission pipeline corridor or throughout the CSG fields.

2.2.2 Haulage Routes



Figure 2-1 below provides details of the proposed haulage routes from Port Alma to the CSG fields. Materials will be trucked from the port via Bajool-Port Alma Road, connect to the Bruce Highway, then travel north towards Rockhampton on the Bruce Highway connecting to the Capricorn Highway before heading south on the Leichhardt Highway. This route avoids trucking materials through Gladstone. This route is based on a combination of distance, likely gradients for the haulage fleet and discussions with Department of Transport and Main Roads (DTMR). Refer to Section 1.1 of Appendix D of this report for an assessment of the proposed haulage routes.



0 12.5 25km
Scale 1:750,000 (A4)
Datum: GDA94

- Proposed Haul Route
- GLNG Gas Transmission Pipeline (September 2009)
- Highway

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

<p>Client</p> 	<p>Project</p> <p>GLADSTONE LNG PROJECT ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT PORT ALMA</p>			<p>Title</p> <p>HAULAGE ROUTES FROM PORT ALMA TO THE GT PIPELINE/CSG FIELDS CONSTRUCTION SITES</p>	
	<p>Drawn: CA</p>	<p>Approved: JB</p>	<p>Date: 03-11-2009</p>	<p>Figure: 2-1</p>	
	<p>Job No: 4262 6440 /6220</p>	<p>File No: 42626440-g-2158.wor</p>		<p>Rev: B</p>	<p>A4</p>

3 Assessment of Environmental Values and Potential Impacts

3

Assessment of Environmental Values and Potential Impacts

The following section provides an overview of the assessment criteria most relevant to Port Alma, with land use, transport and noise identified as key issues. The proposed site has been heavily disturbed in preparation for industrial use so an assessment of ecological values was not undertaken.

Set out below is an assessment of the environmental values, impacts and mitigation measures for:

- The existing Port Alma facility;
- The Bajool-Port Alma Road; and
- Lot 96 (the laydown area).

3.1 Port Alma

3.1.1 Marine Ecology and Coastal Environment

Summary of Existing Environmental Values

Port Alma is an existing operating port. There is no resident population at Port Alma. Apart from the port and salt extraction activities, the area is relatively undisturbed.

Description of Impacts

There will be an incremental increase in shipping activity, however this is estimated to be only approximately 30 ships over a 12 to 15 month period and will follow existing shipping paths, therefore impacts are not considered to be significant.

Due to the small amount of shipping traffic and the fact that existing shipping paths will be used there will be minimal impacts.

Mitigation

All shipping activities will follow all relevant Australian Standards and be conducted in accordance with GPC requirements.

3.1.2 Noise and Vibration

A noise assessment was undertaken to assess the impacts of increased traffic at the Port, the laydown area and the Bajool-Port Alma Road. For further information regarding the noise assessment of Port Alma please refer to Appendix B – Port Alma Noise Assessment.

Summary of Existing Environmental Values

Port Alma is an existing operating port with adequate facilities available. No additional construction is required.

3 Assessment of Environmental Values and Potential Impacts

Description of Impacts

Noise impacts associated with the port would include traffic noise (i.e. idling trucks) and the unloading of pipe and other materials.

Mitigation

During transportation and handling of pipe joints, care will be taken to avoid metal against metal banging including lining the truck trailers with a rubber mat.

3.1.3 Land Use and Planning

Further information pertaining to Land Use and Planning can be found in Appendix C – Port Alma Land Use and Planning.

Summary of Existing Environmental Values

The existing Land Use Plans for the ports of Gladstone and Port Alma are currently under review with a statement of proposals developed for consultation. The *Transport Infrastructure Act 1994 (Qld)*, establishes the regime under which Port Authorities operate, with the Port Authorities being the assessment manager for all assessable development on Strategic Port Land.

Description of Impacts

The proposed activities at Port Alma are seen as a natural extension of the existing function of the port and should not place any additional constraints on existing activities that are recognised as having significant benefits to the state and national economy. The proposed activities will not reduce the port's capacity in terms of potential cargo and visiting ships and is expected to provide local employment opportunities.

The review of the Port's Land Use Plan provides for land being available for future expansion and development to meet the region's long term and strategic needs. The proposal will not interfere with the land use planning and design requirements identified for the port's strategic growth.

3.1.4 Social and Community

Summary of Existing Environmental Values

Port Alma is an existing operating port with adequate facilities available. No additional construction is required.

Description of Impacts

The workforce increase anticipated for Port Alma associated with its use for the GLNG Project is not likely to result in significant social impacts, either positive or negative. The proximity to the communities of Rockhampton, Gladstone, Mt Larcom and Bajool indicate that there is sufficient local supply of labourers to meet the project workforce demands.

The following key considerations were used in the determination that potential social impacts would be low and therefore not require additional assessment:

- Low workforce requirement (<25);

3 Assessment of Environmental Values and Potential Impacts

- Low potential to relocate workers to area for employment;
- Port Alma is approximately 26 km from Bajool, the closest community; and
- Port Alma is an existing operation and is therefore not a new development.

Mitigation

Santos will conduct a consultation program as part of this option, prior to commencement of port activities. Additional management measures may be required based on the information collected from the consultation program, although this is not anticipated based on the information currently available. Mitigation will not be required for low level impacts, however Santos will consult with area stakeholders to determine real and perceived issues and address them as part of the consultation program.

3 Assessment of Environmental Values and Potential Impacts

3.2 Bajool-Port Alma Road

Material off loaded at Port Alma will be transferred by truck 20 km west to a laydown area. This section describes the assessment of the noise and traffic impacts from the materials transfer process. It does not consider the environmental impacts of any road upgrade activities. If the Port Alma option is considered, upgrading works would be required for sections of the Bajool-Port Alma Road. Maintaining this haulage route is of primary concern to DTMR both regarding traffic volumes and protecting the condition of the road. Santos will consult with the relevant local and state authorities (e.g. local council/s, Department of Transport and Main Roads) to determine an appropriate model (including financing and impact assessment requirements) for any required road upgrade works.

3.2.1 Noise and Vibration

An assessment has been undertaken for the length of the Bajool-Port Alma Road to the intersection with the Bruce Highway. For further information regarding the noise assessment of Port Alma please refer to Appendix B – Port Alma Noise Assessment.

Summary of Existing Environmental Values

There are no sensitive receptors (e.g. residential properties) located between Port Alma and the laydown area and a small amount (between 10 and 15 residential properties) between the laydown area and the community of Bajool at a distance of approximately 50 m from the roadside.

Description of Impacts

Noise impacts from use of the Bajool-Port Alma Road between Port Alma and Bajool will be restricted to additional truck movements and associated traffic noise.

Mitigation

Mitigation measures for traffic noise are to include the following:

- Horn signals to be kept at a low volume, where possible;
- Minimise the usage of truck exhaust brakes; and
- Maintain strong relations with residents, including a clear complaints procedure.

3.2.2 Traffic and Transport

A traffic and transport assessment has been undertaken for the Port Alma option and is provided in Appendix D – Port Alma Traffic and Transportation Assessment. Summary findings are provided below.

Summary of Existing Environmental Values

Existing daily traffic along the Bajool-Port Alma Road includes approximately 240 vehicles, with 88 (36.72 %) of them being heavy vehicles. The road has a speed limit of 100 km/h (reducing to 60 km/h through Bajool).

3 Assessment of Environmental Values and Potential Impacts

Description of Impacts

Intersection analysis has been undertaken for the Port Alma option.

Analysis has been conducted to identify the pavement impacts of the heavy vehicle movements to and from the development (GTP corridor and CSG fields). The assessment includes both the construction and operational stages of the development and is undertaken from the start of construction in 2010 through to 2034.

There will be an increase in vehicle traffic – Annual Average Daily Traffic (AADT) of 432 vehicles with 44.5 % of them being heavy vehicles.

The Port Alma option proposes 60 to 70 daily heavy vehicle movements over a 12 month period, with lower volumes on-going for the remainder of the CSG construction period to 2034.

Mitigation

Pavement impact analysis indicates that the GLNG Project will increase the maintenance costs for a number of sections of road for a number of scenario years tested. Negotiation of Santos contribution towards these works will be undertaken with relevant agencies. However, the extent of any contribution to be made by Santos is matter for discussion and resolution between Santos and relevantly each DTMR, local authorities and the Coordinator-General (depending on the status of the road network).

3 Assessment of Environmental Values and Potential Impacts

3.3 Laydown Area (Lot 96)

The proposed laydown area is located within Lot 96 20 km west of Port Alma and 6 km east of Bajool. The lot and plan ID is 96DS186 and the parish code is 4161. The site is cleared and has hosted laydown activities in the past.

3.3.1 Soils

Summary of Existing Environmental Values

An assessment of the current site was undertaken with the site being considered degraded with low environmental values. The site is devoid of much of the originally present vegetation, with various grasses located around the site. There is also laid gravel hardstand areas interspersed throughout the site.

Description of Impacts

A full cut and scrape of the site will be required as well as hardstanding.

Mitigation

Appropriate erosion control will be included in construction works as required.

3.3.2 Contaminated Land

Summary of Existing Environmental Values

The site has previously been used as a laydown area and there are areas of used construction materials around the site. There are selected existing areas of potential concern within the proposed laydown area. These include:

- Discarded tyres and tyre stockpiles: this is classed as a commercial / industrial regulated waste;
- Fuel / hydrocarbon storage areas: drums are localised in the one area, however, evidence of additional drums storage areas (currently unused) are noted on site;
- Discarded machinery / waste stockpiles: heavy metals, waste oils, hydrocarbons;
- Spoil / stockpiles: could potentially be imported fill (clean or contaminated), or could be excess spoil from burial of other waste;
- Unknown past use of site (before laydown area): previous infrastructure, potential for spills; and
- Pesticide use (potential) from vegetation management, etc.

Description of Impacts

Site preparation work will include clearing, including cut and scrape activities.

Site operations will include the use of plant/machinery to store, handle and transport pipe material, with associated storage and handling of fuels.

3 Assessment of Environmental Values and Potential Impacts

Mitigation

All debris will be removed from the site in consultation with the site owner. If any evidence of land contamination exists, a baseline site assessment shall be conducted.

An investigation will be carried out in accordance with: the *Draft Guidelines for the Assessment & Management of Contaminated Land in Queensland*, May 1998 (DERM formally DoE, 1998).

3.3.3 Nature Conservation

Summary of Existing Environmental Values

The laydown area has been previously used as an industrial / transport / storage facility. The previous uses have resulted in a highly altered expanse that is predominantly devoid of native vegetation. Piles of spoil and machinery on the site may act as habitat for common reptiles and feral rodents. Vegetation present consists primarily of common native and exotic grasses. Occasional shrubs and trees are present throughout the site; many appear to be planted or weedy. Otherwise, the site has limited habitat value.

Description of Impacts

A full scrape of the site will be required.

Mitigation

An ecological assessment will be conducted prior to any clearing, including an assessment for weeds to ensure that seeds or other reproductive material is not transported to other destinations. It is expected to be very limited given the condition of the land.

3.3.4 Aquatic Ecology

Summary of Existing Environmental Values

A constructed farm dam is utilised by a variety of aquatic birds. The presence of macropod scats indicates that these species are utilising the dam for drinking. It is unlikely to act as critical habitat for any species.

Description of Impacts

No alteration is expected to the dam.

Mitigation

Visual monitoring of the dam shall be carried out during any construction activities as well as management of the dam throughout the use of the laydown area. A rehabilitation strategy will be completed if it is to be filled in.

3 Assessment of Environmental Values and Potential Impacts

3.3.5 Surface Water

Summary of Existing Environmental Values

The site is flat and low lying. There are no designated watercourses on site. A significant proportion of the proposed laydown area is occupied by a dam. The history of this dam is unknown. The site is located relatively close to the tidal inundation area and the site drains to the estuary.

Given the previous use of the site as a laydown area and its current ownership, it is likely that the predominant environmental value applicable to the water present within the dam is expected to be for biological integrity of ecosystems (moderately disturbed). No other surface waters of significance were identified on site.

Description of Impacts

Laydown of infrastructure elements (pipe, building materials, non-leaching/reactive materials (e.g. inert gravel, etc.)) are not expected to have any material effect on surface water resources. However, the movement of vehicles on site and any earthworks associated with the operation of the laydown area may give rise to sediment movement on site. Storage of liquid (e.g. hydrocarbons or other chemicals) may impact on surface water quality if any spills are not contained and site runoff occurs.

Mitigation

To manage potential impacts on surface water the following shall occur:

- The main laydown areas to be located away from the on site dam;
- Appropriate sediment and erosion controls shall be installed on site for any earthworks proposed;
- Any proposed on site vegetation clearance shall not encroach within 10 m of the on site dam;
- If laydown areas are to be hard surfaced, a stormwater management plan shall be prepared; and
- Storage of chemicals to occur within a bunded area. These storage areas will have spill control measures and regular inspection regimes in order to prevent and monitor activities that could potentially lead to contamination of surface waters. Bunded areas for liquid storage shall be provided with spill clean-up kits in accordance with the relevant Australian Standards. All transfer of liquids will be controlled and managed to prevent spillage outside bunded areas. Potential for leaks and spills from operating equipment will be reduced by ensuring that all equipment is well maintained. Solid reactive/leachable materials shall be stored on hardstand areas with run-off managed through collection, storage, treatment and disposal as necessary.

3.3.6 Groundwater

Summary of Existing Environmental Values

The site is low lying and close to a tidal inundation area, therefore depth to groundwater is likely to be shallow (4-5 m bgl) with the groundwater unconfined to semi-confined. Groundwater may also be brackish to saline with a freshwater lens floating on top. The surface lithology is likely to comprise Quaternary age deposits clay, silt, sand and gravel of the intermediate terraces of the Fitzroy River flood plain alluvium overlying thinly interbedded fine-grained sandstone and siltstone and thick beds of conglomerate of the Late Devonian to Early Carboniferous Mount Alma Formation. The main water bearing unit is expected to be the Fitzroy River flood plain alluvium.

3 Assessment of Environmental Values and Potential Impacts

Existing environmental value and use is expected to be for biological integrity of ecosystems (moderately disturbed). It does not appear to be used currently but may be proposed to be used in the future for storage. It is likely to be too saline or of limited sustainable supply for supply as drinking water or for industrial use.

Description of Impacts

Laydown of infrastructure elements (pipe, building materials, non-leaching / reactive materials (e.g. inert gravel, etc.)) are not expected to have any effect on groundwater resources. Storage of liquid (e.g. hydrocarbons) or solid reactive / leaching materials (saline soils, etc.) may cause deterioration in groundwater quality (contamination) if allowed to leach / recharge into the groundwater.

Mitigation

To manage potential contamination of groundwater, storage of chemicals or solid reactive / leachable materials will be undertaken in a controlled manner. The storage areas will have spill control measures and regular inspection regimes in order to prevent and monitor activities that could potentially lead to contamination of groundwater. Spill control measures for liquid storage facilities will include concrete slab bases that are bunded and include oil-water separators installed on all hydrocarbon above-ground storage, refuelling, and work shop areas. Bunded areas for liquid storage will be provided with spill clean-up kits in accordance with the relevant Australian Standards. All transfer of liquids will be controlled and managed to prevent spillage outside bunded areas. Potential for leaks and spills from operating equipment will be reduced by ensuring that all equipment is well maintained. Solid reactive/leachable materials will be stored on hardstand areas with run-off managed through collection, storage, treatment and disposal as necessary. The expected low permeability of the surface alluvial soils will enable isolation and remediation of potential spills. Any accidental spills will be assessed on a case by case basis and remediated, which may include excavation and disposal of any contaminated soil to a licensed facility, in accordance with the requirements of DERM.

3.3.7 Noise and Vibration

A noise assessment was undertaken to assess the impacts of increased traffic associated with the laydown area. For further information regarding the noise assessment of Port Alma please refer to Appendix B – Port Alma Noise Assessment.

Summary of Existing Environmental Values

The nearest sensitive receptors to the laydown area at Lot 96 are 1.4 km away (residential buildings).

Description of Impacts

The following construction noise sources were addressed in the assessment of the laydown area:

- Loaders (loading and unloading of pipe materials);
- Forklifts;
- Cranes (Franner cranes and larger); and
- Idling trucks.

As the location does not have any sensitive receptors closer than 350 m (offset buffer distance), noise impacts associated with construction will not be significant.

3 Assessment of Environmental Values and Potential Impacts

Mitigation

As the laydown area does not have sensitive receptors closer than 350 m, mitigation measures for noise associated with activities at Lot 96 during the construction phase of the GLNG Project should not be required; however, the following will be implemented during work performed during evening and night time periods:

- Quietest plant and equipment that can economically undertake the work should be selected, when possible;
- Regular maintenance of equipment;
- Construction work to occur, when possible, between 6:30 am and 6:30 pm;
- Where possible, avoid the coincidence of plant and equipment working simultaneously close together;
- Operators of construction equipment to be made aware of the potential noise problems and of noise reducing techniques;
- Reduce noise when loading and unloading pipes (try avoid metal against metal banging noise); and
- Utilise existing community consultation framework to provide access to information for the community and maintain positive relations with residents.

3.3.8 Land Use / Planning

Further information pertaining to Land Use and Planning can be found in Appendix C – Port Alma Land Use and Planning.

Summary of Existing Environmental Values

The site for the proposed laydown area is located within the Rural Zone land designation, in the south eastern portion of the Rockhampton Regional Council area (formerly the Fitzroy Shire) adjacent to the Bajool-Port Alma Road, having been chosen for its strategic location and access to the port.

The land surrounding the site is typically rural with industrial areas to the west and north-west that include an extractive industry use. The remaining area surrounding the site is vacant land.

Description of Impacts

Traffic through the pastoral properties along the haul-route and south of the Bajool community is the only the expected land use impact from the proposed use. As the proposed use of the site is a temporary nature it will not interfere with the infrastructure planned for the region.

Mitigation

Consultation with adjacent property owners shall be undertaken to better understand the traffic and transport requirements prior to the commencement of the project. Consultation with the Bajool community to address concerns regarding traffic impacts shall also be conducted.

3.3.9 Social and Community

A social impact assessment was undertaken to assess the impacts of the laydown area on social and community infrastructure. The full Port Alma Social Impact Assessment can be found in Appendix A.

3 Assessment of Environmental Values and Potential Impacts

Summary of Existing Environmental Values

The laydown area at Lot 96 is approximately 6 km from the small community of Bajool and approximately 1.4 km to the nearest residential property.

Description of Impacts

The following key considerations were used in the determination that potential social impacts would be low and therefore not requiring additional assessment:

- Low workforce requirement (<25);
- Low potential to relocate workers to area for employment; and
- The laydown area is approximately 7 km from Bajool, the closest community.

Mitigation

Santos will conduct a consultation program with landholders and local residents as part of this option. Mitigation will not be required for low level impacts, however, Santos will consult with area stakeholders to determine real and perceived issues and address them as part of the consultation program.

Conclusions

4.1 Port Alma

As Port Alma is an existing port and there is no new construction activity proposed there are no anticipated significant impacts. There will be the possibility of noise impacts at the port due to the unloading of pipe and associated materials, however, mitigation measures are not proposed due to the distance of the port to sensitive receptors.

4.2 Bajool-Port Alma Road

The Bajool-Port Alma Road is approximately 26 km in length, with the laydown area located approximately 20 km from Port Alma and 6 km from Bajool. Pipe materials will be shipped to Port Alma via ship and trucked to the laydown area at Lot 96.

There are no residential properties between Port Alma and the laydown area and only a small number between the laydown area and Bajool, meaning impacts to the surrounding communities will be minimal.

The Bajool-Port Alma Road will require upgrading to accommodate the proposed increase in traffic. Santos will consult with relevant agencies regarding road works required. However, the extent of any contribution to be made by Santos is matter for discussion and resolution between Santos and relevantly each of the DTMR, local authorities and the Coordinator-General (depending on the status of the road network).

4.3 Laydown Area (Lot 96)

The laydown area on Lot 96 is currently vacant, however, it has previously been used as an industrial storage facility and this has resulted in a modified site devoid of significant vegetation communities. There is a constructed farm dam on site which will be managed / monitored depending on its intended use.

The site will require minor grading. Before any earth works commence a limited ecological assessment will be carried out as well as a baseline contaminated land assessment to confirm the site's current ecological and contamination status.

References

Gladstone Ports Corporation, 2006, Port Alma, Port Information Handbook. Accessed on: <http://www.gpcl.com.au/>

Queensland Government, 2009, Port Procedures and Information for Shipping – Port Alma. Accessed on: http://www.msq.qld.gov.au/Home/Shipping/Port_procedures/

Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 15 July 2009.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between 13 October 2009 and 8 November 2009 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

Appendix A Port Alma Social Impact Assessment



Report

GLNG EIS Supplement

Port Alma Social Impact Assessment

NOVEMBER 2009

Prepared for
Santos

Level 22
32 Turbot Street
Brisbane, Qld 4000

42626456

URS

Project Manager:



Chris Sunderland
Sociologist and
Consultation Specialist

URS Australia Pty Ltd

**Level 16, 240 Queen Street
Brisbane, QLD 4000
GPO Box 302, QLD 4001
Australia**

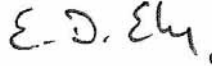
**T: 61 7 3243 2111
F: 61 7 3243 2199**

Project Director:



Chris Pigott
Senior Principal

Reviewer:



Ed Ely
Senior Principal

Date:

November 2009

Reference:

42626456/R/Rev 1.2

Status:

Final

© Document copyright of URS Australia Pty Limited.

The contents of this report are and remain the intellectual property of the addressee of this report and are not to be provided or disclosed to or used by third parties without the addressee's consent.

URS Australia and the addressee of this report accept no liability to third parties of any kind for any unauthorised use of the contents of this report and reserve their right to seek compensation for any such unauthorised use.

Document delivery

URS Australia provides this document in either printed format, electronic format or both. URS considers the printed version to be binding. The electronic format is provided for the client's convenience and URS requests that the client ensures the integrity of this electronic information is maintained. Storage of this electronic information should at a minimum comply with the requirements of the Commonwealth Electronic Transactions Act (ETA) 2000.

Where an electronic only version is provided to the client, a signed hard copy of this document is held on file by URS and a copy will be provided if requested.

Table of Contents

1	Methodology and Baseline.....	1
1.1	Methodology.....	1
1.2	Assumptions	1
1.3	Baseline	1
2	Impact Assessment	2
3	References.....	4
4	Limitations	5

Tables

Table 2-1	Social Components and Impact Potential from the Port Alma Option.....	2
-----------	---	---

Abbreviations

Abbreviation	Description
ABS	Australian Bureau of Statistics
EIS	Environmental Impact Statement
GLNG	Gladstone Liquefied Natural Gas (project)
km	Kilometre
Mt	Mount

Methodology and Baseline

1.1 Methodology

The Port Alma option social assessment is based on a high level assessment of the information provided by Santos and a brief desktop assessment. This method was used for the following reasons:

- Exact workforce details were not available but are assumed to be approximately 25 new positions available at the Port;
- The distance between Port Alma and Rockhampton is approximately 60km and between Gladstone and Port Alma is approximately 90km which is commutable daily; and
- Rockhampton city population was 63,169 (ABS, 2008a) and Rockhampton statistical district was 74,530 (ABS, 2008b) in 2007. Gladstone Regional Council population was 55,523 with Gladstone city accounting for 30,731 as of June 30, 2007 (Santos, 2009). This suggests the region is capable of providing workers with the types of skills required to unload and stockpile materials at an existing port. The population of Bajool was 292 in 2006 (ABS, 2006).

The assessment was conducted at a desktop level given the details of the Port Alma option and the proximity to sufficient local labour pools. For details on the Port Alma option see the Project Description section of the EIS Supplement.

1.2 Assumptions

The following assumptions were applied to the assessment of the social aspects of the Port Alma option:

- Anticipated workforce numbers are approximately 25 individuals, all of which would be indirect workers for the project hired by the port;
- The majority of additional hires for the project demands on the port would be labourers, forklift operators and drivers;
- Workers could be locally sourced (Bajool/Gladstone/Rockhampton area) and therefore no relocation requirements are anticipated; and
- A separate traffic assessment will examine the increase in traffic volumes, and assess the impacts on:
 - Intersections;
 - Traffic patterns; and
 - Road safety.

1.3 Baseline

Information collected for the Social Impact Assessment (EIS Appendix Z) (Santos, 2009) was used for this supplement. Information on some local populations was researched and can be found in the methodology section (Section 1.1).

Impact Assessment

A detailed social impact assessment is not required for the Port Alma option based on the anticipated workforce requirements and location of the Port. The scale of this option is less than 25 individuals for the construction phase of the gas transmission pipeline which is approximately two years in duration. After this peak there may be a scaling back in workforce to adjust to the reduced levels of materials being shipped through the Port. The CSG Field materials will continue to be shipped through Port Alma for the duration of the construction and operations phases.

The workforce increase anticipated for Port Alma associated with its use for the GLNG Project is therefore not likely to result in significant social impacts, both positive and negative. The proximity to the community of Rockhampton (~60 km), as well as Gladstone (~90 km), Mt Larcom (~58 km) and Bajool (~26 km) indicate that there is sufficient local supply of labourers to meet the project workforce demands.

The following key considerations were used in the determination that potential social impacts would be low and therefore not requiring additional assessment:

- Low workforce requirement (<25);
- Low potential to relocate workers to area for employment;
- Port Alma is approximately 26 km from Bajool, the closest community; and
- Port Alma is an existing operation and is therefore not a new development.

A material lay down and storage area will need to be developed for the site though the location is not likely to have an impact on the community of Bajool. Should significant works occur at the Port requiring a large workforce that could impact local communities, a more detailed assessment would be required at that time. Table 2-1 presents the social components considered and an assessment of the impact potential from the project.

Table 2-1 Social Components and Impact Potential from the Port Alma Option

Social/Economic Component	Impact Potential	Brief explanation
Health and Wellbeing	Low	Workforce is anticipated less than 25. If all workers were sourced outside the area and relocated it would not put noticeable strain on local health services or affect local wellbeing in a negative manner.
Education	Low	No/very few children are anticipated to relocate to the area and require schooling.
Training Opportunities	N/A	Santos will not be hiring workers directly and does not anticipate any training programs required to meet workforce requirements.
Community Demographics and Dynamics	Low	Workforce is anticipated to be sourced locally. If workers are relocated their numbers would not be sufficient to have a noticeable impact on community demographics and dynamics.
Economic Opportunities	Low	There are slight economic opportunities for businesses along the transportation route including service stations, restaurants and convenience stores. Any worker relocations to the area would positively impact local businesses though at a very low level.
Employment Opportunities	Low	There are local employment opportunities for the potential workforce increases required to manage the project demands on the port. These would be a low positive impact on the communities in the area.
Community Safety	Low	Workforce concerns are low even if all positions were filled from imported workers from outside the area (within 100km), which is unlikely. Road safety measures are discussed in the traffic assessment.

2 Impact Assessment

The social impacts associated with the Port Alma option are predominantly associated with traffic increases (as discussed in the separate Traffic and Transportation section) and employment/economic opportunities. Traffic and Transportation issues include increased traffic (especially heavy trucks). This increase poses the following increased risks associated with vehicle travel in the area:

- Increased potential for road delays from slower moving heavy vehicles, vehicles turning onto the highway, and changes in traffic patterns;
- Increased potential for accidents;
- Increased potential for driver frustrations; and
- Increased traffic activity on the Bajool - Port Alma Road and Bruce Highway resulting in potential disturbances to daily routines.

For details on the traffic assessment see Appendix D of this report (Attachment H).

Santos will conduct a consultation program as part of this option. Additional social impact assessment may be required based on the information collected from the consultation program though this is not anticipated at this time based on the current information available. Mitigation is not required for low level impacts however Santos will consult with area stakeholders to determine real and perceived issues and address them as part of the consultation program.

References

- ABS, 2006. Census QuickStats: Bajool, Queensland. SSC35127 STATE: QLD. Released at 11:30 AM (Canberra Time) 25 October 2007.
- ABS, 2008a. Estimated Resident Population, Local Government Areas, Queensland. 3218.0 Regional Population Growth, Australia. Released at 11.30am (Canberra time) 31 March 2008.
- ABS, 2008b. Estimated Resident Population, Statistical Districts, Australia. 3218.0 Regional Population Growth, Australia. Released at 11.30am (Canberra time) 31 March 2008.
- Santos 2009, Santos GLNG - Social Impact Statement, GLNG Environmental Impact Statement.

Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 15 July 2009.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared October 1, 2003 and is based on the information provided and assumptions approved at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.



URS Australia Pty Ltd
Level 16, 240 Queen Street
Brisbane, QLD 4000
GPO Box 302, QLD 4001
Australia

T: 61 7 3243 2111

F: 61 7 3243 2199

www.ap.urscorp.com

Appendix B Port Alma Noise Assessment



HEGGIES

REPORT 20-2014-R11

Revision 0

**Santos Gladstone LNG
Port Alma
Noise Assessment**

PREPARED FOR

URS Australia Pty Ltd
Level 16, 240 Queen Street
Brisbane QLD 4000

13 NOVEMBER 2009

HEGGIES PTY LTD
ABN 29 001 584 612



Santos Gladstone LNG

Port Alma

Noise Assessment

PREPARED BY:

Heggies Pty Ltd

Ground Floor, Suite 7, 240 Waterworks Road Ashgrove QLD 4060 Australia
Telephone 61 7 3858 4800 Facsimile 61 7 3858 4801
Email brisbane@heggies.com Web www.heggies.com

DISCLAIMER

Reports produced by Heggies Pty Ltd are prepared for a particular Client's objective and are based on a specific scope, conditions and limitations, as agreed between Heggies and the Client. Information and/or report(s) prepared by Heggies may not be suitable for uses other than the original intended objective. No parties other than the Client should use any information and/or report(s) without first conferring with Heggies.

The information and/or report(s) prepared by Heggies should not be reproduced, presented or reviewed except in full. Before passing on to a third party any information and/or report(s) prepared by Heggies, the Client is to fully inform the third party of the objective and scope and any limitations and conditions, including any other relevant information which applies to the material prepared by Heggies. It is the responsibility of any third party to confirm whether information and/or report(s) prepared for others by Heggies are suitable for their specific objectives.



Heggies Pty Ltd is a Member Firm of the Association of Australian Acoustical Consultants.



Heggies Pty Ltd operates under a Quality System which has been certified by SAI Global Pty Limited to comply with all the requirements of ISO 9001:2008 "Quality management systems - Requirements" (Licence No 3236).

This document has been prepared in accordance with the requirements of that System.

DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
20-2014-R11	Revision 0	13 November 2009	Glyn Cowie	Mark Caslin	Mark Caslin



EXECUTIVE SUMMARY

PROJECT DESCRIPTION

An option has been proposed for the shipping of pipe joints to Port Alma (approximately 50 km north-west of Gladstone). This option would include transporting the pipe joints to a nearby temporary lay down area at Lot 96 (on the Bajool – Port Alma Road). Pipe joints would then be transported onto designated lay down areas at Roma and along the gas transmission pipeline route.

A comprehensive assessment has been undertaken of the potential noise impacts associated with activities at Port Alma and Lot 96 (including traffic noise) during the construction phase of the GLNG Project.

The noise assessment methodology and noise criteria used for this assessment are as per Heggies GLNG EIS Noise and Vibration Report – 20-2014-R1R4 dated 22 May 2009.

NOISE CRITERIA

Construction

Activities which occur at Port Alma and Lot 96, which are associated with the construction phase of the GLNG Project (ie transportation and handling of pipe joints), are assessed against the construction noise criteria, as shown below.

Summary of Construction Noise Criteria

	Construction Noise	
	Monday to Saturday (6:30am to 6:30pm)	Monday to Saturday (6:30pm to 6:30am); Sundays and Public Holidays
Residential	No limit	50 dBA L _{Amax}

Road Traffic

Where Port Alma and Lot 96 are adding vehicles to an existing or upgraded road, it is appropriate to consider the incremental change in noise levels due to the changes in traffic volume.

For assessment purposes, it is common to set the threshold of significance in relation to changes in the noise emission level from roads at 2 dBA.

CONSTRUCTION NOISE ASSESSMENT

Construction noise associated with activities at Port Alma and Lot 96 during the construction phase of the GLNG Project were predicted to achieve the 50 dBA L_{Amax} sleep disturbance noise criteria due to the offset buffer distance to the nearest sensitive receptors being greater than 350 m.

ROAD TRAFFIC NOISE ASSESSMENT

The predicted increase in road traffic noise associated with Port Alma and Lot 96 vehicle movements along Bajool – Port Alma Road was predicted to be great than 2 dBA during the construction phase of the GLNG Project. Therefore, mitigation measures were considered.



EXECUTIVE SUMMARY

MITIGATION MEASURES

Construction

It is predicted that activities at Port Alma and Lot 96 during the construction phase of the GLNG Project should not adversely affect the nearest sensitive receptors. However, noise mitigation strategies beyond the implementation of “best practice” techniques (as discussed in AS 2436-1981 “*Guide to Noise Control on Construction, Maintenance and Demolition Sites*”) should be considered and implemented at Lot 96 during work performed during the evening and night-time periods (6.30pm to 6.30am) or on Sundays/Public holidays.

Road Traffic

The expected increase in road traffic noise level associated with Port Alma and Lot 96 vehicle movements along Bajool – Port Alma Road was predicted to be 3.1 dBA during the construction phase of the GLNG Project.

The nearest sensitive receptor to Bajool – Port Alma Road is approximately 50 m from the road edge.

The GLNG Project related construction activities associated Port Alma and Lot 96 are expected to be short-term and nearest sensitive receptors are already likely to be experiencing exceedances of the 50 dBA L_{Amax} sleep disturbance noise criteria. Mitigation measures were recommended to limit adverse impacts on nearby sensitive receivers to Bajool – Port Alma Road from vehicle movements associated with Port Alma and Lot 96 during the construction phase of the GLNG Project:

- Heavy vehicle movements between Lot 96 and the Bajool township should be limited to between 6:30am and 6:30pm, Monday to Saturday;
- Heavy vehicle to be fitted with residential class mufflers;
- Minimise the usage of truck exhaust brakes; and
- Residents are to be made aware of the times and duration that they will be affected.



TABLE OF CONTENTS

1	INTRODUCTION	6
2	NOISE CRITERIA	7
2.1	Road Traffic Noise Criteria	7
3	MODELLING METHODOLOGY	7
3.1	SoundPLAN	7
3.2	CONCAWE	7
3.3	CoRTN Road Traffic Noise Prediction Method	8
3.4	Construction Noise	8
4	RESULTS AND ASSESSMENT	9
4.1	Construction Noise	9
5	TRANSPORTATION – ROAD TRAFFIC NOISE	9
5.1	Vehicle Movements	9
5.2	Road Traffic Noise	9
6	MITIGATION MEASURES	10
6.1	Construction Noise	10
6.2	Road Traffic Noise	11
7	CONCLUSION	12
Table 1	Summary of Construction Criteria	7
Table 2	Summary of Typical Maximum Sound Power Levels for Lay Down Areas at Port Alma and Lot 96	8
Table 3	Off-set Distances from Lay Down Areas to Achieve the Noise Criteria	9
Table 4	Existing and Future Traffic Patterns for Port Alma	9
Table 5	Increase in Road Traffic Noise Levels due to Construction Vehicles – Port Alma and Lot 96	10
Figure 1	Port Alma, Lot 96 and Bajool Township	6



1 INTRODUCTION

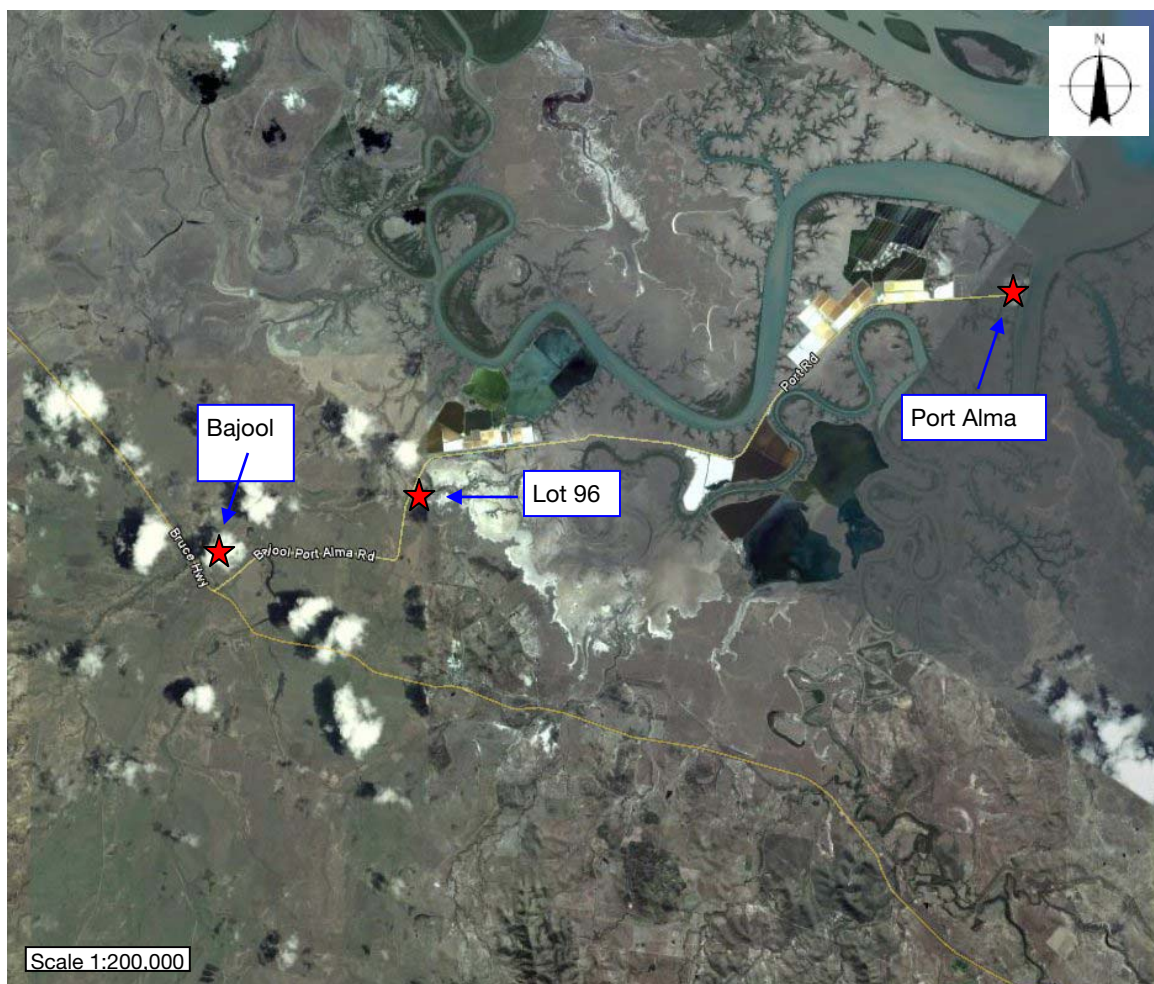
An option has been proposed for the shipping of pipe joints to Port Alma (approximately 50 km north-west of Gladstone). This option would include transporting the pipe joints to a nearby temporary lay down area at Lot 96 (on the Bajool – Port Alma Road). Pipe joints would then be transported onto designated lay down areas at Roma and along the gas transmission pipeline route.

The following section assesses the potential noise impacts associated with the traffic noise as well as noise from the handling (unloading and loading) of the pipe joints.

The noise assessment methodology and noise criteria used for this assessment are as per Heggies GLNG EIS Noise and Vibration Report – 20-2014-R1R4 dated 22 May 2009.

Figure 1 shows the location of Port Alma, Lot 96 and the nearby township of Bajool.

Figure 1 Port Alma, Lot 96 and Bajool Township





2 NOISE CRITERIA

Activities which occur at Port Alma and Lot 96, which are associated with the construction phase of the GLNG Project (ie transportation and handling of pipe joints), are assessed against the construction noise criteria (see **Table 1**).

The limiting noise criteria for GLNG Project construction related activities at Port Alma and Lot 96 are summarised in **Table 1** below.

Table 1 Summary of Construction Noise Criteria

	Construction Noise	
	Monday to Saturday (6:30am to 6:30pm)	Monday to Saturday (6:30pm to 6:30am); Sundays and Public Holidays
Residential	No limit	50 dBA L _{Amax}

2.1 Road Traffic Noise Criteria

Incremental Change in Road Traffic Noise Levels

Where the project is adding vehicles to an existing or upgraded road it is appropriate to consider the incremental change in noise levels due to the changes in traffic volume.

A change of up to 3 dBA in the level of a dynamic noise (such as passing vehicles) is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness.

It is acknowledged that people will probably notice increased traffic based on visual clues and perception of vehicle pass-by frequency before they will objectively notice an increase in the average noise level.

For assessment purposes it is common to set the threshold of significance in relation to changes in the noise emission level from roads at 2 dBA.

3 MODELLING METHODOLOGY

3.1 SoundPLAN

Due to the large spatial area between Port Alma / Lot 96 and the nearest sensitive receptors, predictions have been carried out at various off-set distances from GLNG Project related construction activities conducted at Port Alma and Lot 96. The off-set distance predictions are then used to determine the distances at which the appropriate noise criteria would be achieved. Noise predictions for activities are based on the conservative assumption that there is flat, soft ground between the noise source and the receiver.

3.2 CONCAWE

All noise predictions for Port Alma and Lot 96 have been carried out utilising the CONCAWE prediction methodology within SoundPLAN, with the exception of road traffic noise predictions (which have been carried out using the CoRTN prediction method).

The CONCAWE prediction method is specially designed for large facilities and incorporates the influence of wind effects and the stability of the atmosphere.



The statistical accuracy of environmental noise predictions using CONCAWE was investigated by Marsh (Applied Acoustics 15 - 1982). Marsh concluded that CONCAWE was accurate to ± 2 dBA in any one octave band between 63 Hz and 4 kHz and ± 1 dBA overall.

3.3 CoRTN Road Traffic Noise Prediction Method

The Calculation of Road Traffic Noise (CoRTN) 1988 prediction technique was utilised to calculate the change in road traffic noise levels from the project.

These calculations account for traffic volumes, composition, vehicle speed, road gradient and the road surface. CoRTN is the recommended road traffic noise prediction technique in *Main Roads Code of Practice* [2008].

The road transport noise assessment methodology has been performed by calculating how traffic changes would alter the LA10(18hour) traffic noise level along the roadways using the CoRTN prediction algorithms. The LA10(18hour) parameter is the average of the hourly LA10 traffic noise level between the hours of 6 am and midnight.

Road traffic noise impacts associated with the GLNG Project construction phase are discussed in **Section 5**.

3.4 Construction Noise

The assessment methodology for determining noise impacts associated with activities at Port Alma and Lot 96 during the construction phase of the GLNG Project is discussed in the following section. This section addresses the assessment of the following construction noise sources:

- Loaders;
- Forklifts;
- Cranes (Franner cranes and larger);
- Dockside crane (Port Alma only); and
- Idling trucks.

A list of the proposed construction equipment to be used and their associated maximum sound power level (sourced from Heggies' database) is presented in **Table 2**.

Table 2 Summary of Typical Maximum Sound Power Levels for Lay Down Areas at Port Alma and Lot 96

Item	Maximum SWL (dBA)
Loader	110
Forklift	104
Truck Crane	111
Dockside Crane	102
Idling Truck	110

Predicted construction noise levels will inevitably depend upon the number of plant items and equipment operating at any one time and on their precise location relative to the receiver(s). Therefore a receiver will experience a range of values representing "minimum" and "maximum" construction noise emissions depending upon:

- The location of the particular construction activity (ie if the plant item of interest were as close as possible to or further away from the receiver of interest); and
- The likelihood of the various items of equipment operating simultaneously.



4 RESULTS AND ASSESSMENT

4.1 Construction Noise

Based on the noise sources associated with Port Alma and Lot 96 as stated in **Table 3**, an off-set buffer distance was predicted at which compliance with the 50 dBA L_{Amax} sleep disturbance noise criterion is achieved (see **Table 3**).

Table 3 Off-set Distances from Lay Down Areas to Achieve the Noise Criteria

Process	Relevant Sleep Disturbance Criterion (L_{Amax}) (dBA)	Off-set Buffer Distance (m)
Unloading pipe joints at Port Alma and Lot 96 lay down areas	50	350

The nearest sensitive receptors to Port Alma and Lot 96 are approximately 15 km and 1.4 km respectively. As neither location has sensitive receptors closer than 350 m, mitigation measures for noise associated with activities at Port Alma and Lot 96 during the construction phase of the GLNG Project should not be required.

5 TRANSPORTATION – ROAD TRAFFIC NOISE

5.1 Vehicle Movements

Existing and future traffic patterns (supplied by GLNG) for Port Alma are summarised in **Table 4**, and have been assumed for the purpose of assessing the road traffic noise impact associated with activities at Port Alma and Lot 96 during the construction phase of the GLNG Project.

Table 4 Existing and Future Traffic Patterns for Port Alma

Road / Section	Existing Traffic			Future Traffic		
	AADT	% HV	Speed (km/h)	AADT	% HV	Speed (km/h)
Bajool Port Alma Road – Bajool to Port Alma	240	36.7%	100	432	44.5%	100
Bajool Port Alma Road – Bajool Township	500	20.0%	60	692	29.5%	60

Note: AADT – Annual Average Daily Traffic
% HV – Percentage of Heavy Vehicles

5.2 Road Traffic Noise

The effect of construction phase related traffic on the noise emission from roadways near Port Alma and Lot 96 has been assessed. This assessment has been performed by calculating how traffic volume changes on the surrounding road network, attributable to Port Alma and Lot 96, would alter the $LA_{10(18\text{hour})}$ level of noise emission from roadways using the CoRTN prediction algorithms. The $LA_{10(18\text{hour})}$ parameter is the average of the hourly LA_{10} traffic noise level between the hours of 6 am and midnight.

Based on the traffic volumes and compositions described in **Table 4**, **Table 5** shows the expected increase in road traffic noise levels associated with vehicle movements along Bajool - Port Alma Road during the construction phase of the GLNG Project.



Table 5 Increase in Road Traffic Noise Levels due to Construction Vehicles – Port Alma and Lot 96

Road Segment	Predicted Increase in LA10(18hour) Noise Level (dBA)
Bajool - Port Alma Road: Bajool to Port Alma	+3.1
Bajool - Port Alma Road: Bajool Township	+2.5

Note 1: **Bold** numbers indicate an incremental change in noise level of greater than 2 dBA.

The expected increase in road traffic noise levels associated with vehicle movements along Bajool – Port Alma are all predicted to be greater than 2 dBA during the construction phase of the GLNG Project, therefore adverse impacts are anticipated.

6 MITIGATION MEASURES

6.1 Construction Noise

It is recommended that where possible, activities at Port Alma and Lot 96 associated with the construction phase of the GLNG Project be carried out between 6:30am and 6:30pm, Monday to Saturday, when ambient noise levels are higher. Regulatory agencies specifically try to encourage construction during these hours by not any applying specific noise criteria.

Section 4.1 shows that the 50 dBA L_{Amax} sleep disturbance noise criteria would be achieved for noise emission from activities at Port Alma and Lot 96 during the construction phase of the GLNG Project due to the distance to the nearest sensitive receptors being greater than 350 m.

Although it is predicted that activities at Port Alma and Lot 96 during the construction phase of the GLNG Project should not adversely affect nearby sensitive receptors, the following noise mitigation strategies should be considered and implemented at Lot 96 during work performed during the evening and night-time periods (6.30pm to 6.30am) or on Sundays/Public holidays.

AS 2436-1981 “*Guide to Noise Control on Construction, Maintenance and Demolition Sites*” sets out numerous practical recommendations to assist in mitigating construction noise emissions. Noise control strategies that should be considered for construction activities carried out on the mainland marine facilities are listed below.

Source Noise Control Strategies

- Quietest plant and equipment that can economically undertake the work should be selected, wherever possible.
- Regular maintenance of equipment in order to keep it in good working order.

Work Practice Control Strategies

- Construction work to occur, wherever possible, within the daytime period (6:30am to 6:30pm).
- Where practicable, avoid the coincidence of plant and equipment working simultaneously close together.
- Operators of construction equipment to be made aware of the potential noise problems and of techniques to minimise noise emission through a continuous process of operator education.
- For transportation and handling of pipes joints, special care needs to be considered to avoid metal against metal banging noise during transportation operations. This can be avoided by lining the truck trailers with a rubber mat and in a similar way isolate between the pipes.



Community Liaison Strategies

- Utilise existing community consultation framework to provide access to information for the community and maintain positive relations with residents.

The following details elaborate further on the strategies outlined above and should be examined and implemented in critical areas wherever practical.

Work Practice Controls

- Reversing alarms within construction areas cannot be avoided for safety reasons. Consideration should therefore be given to sourcing so-called “quiet” white-noise alarms whose annoying character diminishes quickly with distance and self-adjusting alarms which adjust emission levels relative to the local background noise level.
- Horn signals should be kept at a low volume, where feasible.

Source Noise Controls

- Mobile plant and other diesel powered equipment to be fitted with residential class mufflers.
- Minimise the usage of truck exhaust brakes.

Community Liaison Controls

- Construction site personnel are to be made aware of all community attitudes and complaints.
- Residents are to be made aware of the times and duration that they will be affected. Making residents aware of likely future occurrence of noise significantly reduces annoyance and allows people to make arrangements accordingly.
- Implement as part of the broader community involvement plan, a well-planned, focussed community awareness programme inviting representative groups of the community to a short, concentrated noise and vibration briefing prior to commencement of works near or within their community.
- Provision of a complaints phone number.
- A nominated person is to receive, log, track and respond to complaints within an appropriate timeframe and to record what actions were taken.

6.2 Road Traffic Noise

Section 5.2 shows that the expected increase in road traffic noise levels associated with vehicle movements along Bajool – Port Alma are all predicted to be greater than 2 dBA during the construction phase of the GLNG Project.

The nearest sensitive receptors to Bajool – Port Alma Road are up to approximately 50 m from the road edge. Although the expected increase in road traffic noise level associated with vehicle movements along Bajool – Port Alma Road is predicted to be up to 3.1 dBA, this increase is anticipated to only be short-term during the construction phase of the GLNG Project. Further, due to the current vehicle volumes and heavy vehicle percentages, it is expected that these sensitive receptors already experience exceedances of the 50 dBA L_{Amax} sleep disturbance noise criteria. However, the following mitigation measures are recommended to limit adverse impacts on nearby sensitive receivers to Bajool – Port Alma Road from vehicle movements associated with Port Alma and Lot 96 during the construction phase of the GLNG Project:

- Heavy vehicle movements between Lot 96 and the Bajool township should be limited to between 6:30am and 6:30pm, Monday to Saturday.



- Diesel powered equipment to be fitted with residential class mufflers.
- Minimise the usage of truck exhaust brakes.

Residents are to be made aware of the times and duration that they will be affected. Making residents aware of likely future occurrence of noise significantly reduces annoyance and allows people to make arrangements accordingly.

7 CONCLUSION

A comprehensive assessment has been undertaken of the potential noise impacts associated with activities at Port Alma and Lot 96 (including traffic noise) during the construction phase of the GLNG Project.

The findings of this assessment are of follows:

- Construction noise associated with activities at Port Alma and Lot 96 during the construction phase of the GLNG Project are predicted to achieve the 50 dBA L_{Amax} sleep disturbance noise criteria due to the offset buffer distance to the nearest sensitive receptors being greater than 350 m.
- The predicted increase in road traffic noise associated with Port Alma and Lot 96 vehicle movements along Bajool – Port Alma Road is predicted to be great than 2 dBA during the construction phase of the GLNG Project. The GLNG Project related construction activities associated with Port Alma and Lot 96 are expected to be short-term and the nearest sensitive receptors are already likely to be experiencing exceedances of the 50 dBA L_{Amax} sleep disturbance noise criteria. Mitigation measures are recommended to limit adverse impacts on nearby sensitive receivers to Bajool – Port Alma Road from vehicle movements associated with Port Alma and Lot 96 during the construction phase of the GLNG Project:
 - Heavy vehicle movements between Lot 96 and the Bajool township should be limited to between 6:30am and 6:30pm, Monday to Saturday;
 - Heavy vehicle to be fitted with residential class mufflers
 - Minimise the usage of truck exhaust brakes; and
 - Residents are to be made aware of the times and duration that they will be affected.

Appendix C Port Alma Land Use and Planning

20 October 2009
Project No. 42626440

Level 16
240 Queen Street
BRISBANE
Qld 4000

Attention: Brian Connellan

Subject: Port Alma Land & Planning

1 Land Use and Planning

1.1 Site Description

Port Alma is being considered as an alternate port facility to reduce the pressure on Gladstone port facilities, and the Gladstone community, by providing an alternative road access route for delivery of materials to the pipeline construction sites and CSG fields. The imported construction materials will be unloaded directly onto trucks at the existing Port Alma facility and transported to a temporary laydown area on the Bajool-Port Alma Road (Lot 96). The pipe and materials will then be dispatched (via trucks) to various locations along the pipeline route, and potentially the CSG fields.

The Port Alma Shipping Terminal is accessed by public road and sea. It is adequately served by road transport. A rail siding to Port Alma is situated at Bajool approximately 27 kilometres by road (towards the Bruce Highway). The proposed use of Port Alma Shipping Terminal is defined as being in accordance with the ports strategic intent.

The site for the proposed Port Alma transport and storage (laydown) facility is located in the south eastern portion of the Rockhampton Regional Council area (formerly the Fitzroy Shire) on Lot 96 on DS186 adjacent the Bajool-Port Alma Road, having being chosen for its strategic location and access to the port.

The land surrounding the site is typically rural with industrial areas (including the strategic port land and extractive industry uses) to the west and north-west that include an extractive industry use (Cheetham salt Ltd Port Alma Operations). The remaining area surrounding the site is vacant land; the Bajool community being the closest residential area to the subject site. Though the proposed use of this site is in association with petroleum activities and may not be considered as assessable development under the local government planning scheme, it is prudent to assess what impacts there may be to better understand the nature of the site and possible constraints.

1.1.1 Rockhampton Whole of Region Plan

The regional plan for the Rockhampton Regional Council area (an amalgamation of the Livingstone, Mount Morgan, Fitzroy and Rockhampton local government areas) is in the investigation stage with the Rockhampton Whole of Region Planning project having recently been put out to tender.

1.1.2 Land Use Plan Review for Port Alma

The existing Land Use Plan for the port of Gladstone and Port Alma are currently under review with a statement of proposals developed for consultation. The Transport Infrastructure Act 1994 establishes the regime under which Port Authorities operate with the Port Authorities being the assessment manager for all assessable development on Strategic Port Land

The review of the Port Alma Land Use Plan will provide a more detailed assessment framework for future proposals within the strategic port land area. The amended Land Use Plan will be required to:

- contain details of Strategic Port Land
- coordinate and integrate the “core matters” relevant to the land use plan;
- establish desired environmental outcomes (the vision);
- include measures to achieve the desired environmental outcomes (for example, land use designations/zones, codes, etc);
- prepare and release a Statement of Proposals; and consider State interests as part of the Land Use Plan process.

The proposed activities for the GLNG project at Port Alma are seen as a natural extension of the existing function of the port and place no constraints on existing activities that are recognised as having significant benefits to the state and national economy. The proposed activities will not reduce the port’s capacity in terms of potential cargo and visiting ships and is expected to provide local employment opportunities.

The review of the Land Use Plan provides for land being available for future expansion and development of the Ports to meet the region’s long term and strategic needs. The proposal will not interfere with the land use planning and design requirements identified for the port’s strategic growth.

It is envisaged that once the proposed development requirements for the Port Alma facilities are fully investigated by Santos, the assessment of the proposal will be undertaken by the Port Authority with a higher degree of rigour than previous proposals, considering the establishment of detailed assessment criteria arising from the review.

1.1.3 Fitzroy Shire Planning Scheme

Assessment of the land use and planning constraints will be undertaken by referencing the Fitzroy Shire Planning Scheme which is the current legislative planning instrument for this area.

The site for proposed Port Alma storage facility is located within the Rural Zone with the defined purpose proposed being "Warehouse", which means:

- *any premises used for the storage of goods, items, merchandise or materials in large quantities pending their:*
 - *Distribution; or*
 - *Sale to persons who in most instances (minimum of 90% of persons) purchase for the purposes of resale only.*

The term includes any display area up to 20m² and/or office ancillary to the Warehouse.

Desired Environmental Outcomes

The following are the desired environmental outcomes provided within the planning scheme that address appropriate aspects of this project.

Social Elements

- *f) Development is located and managed where ever possible to ensure the long term protection and conservation of the significant cultural heritage values of the Shire.*

The site has been chosen for its logistical relationship with Port Alma and is not within areas or adjacent to sites that are identified within the plan as having significant cultural heritage values.

Environmental Elements

- *The potential downstream impacts of development are minimised so as to reduce risks to the Great Barrier Reef catchment, which drains into the Great Barrier Reef World Heritage Area.*

Although located within the catchment for the Great Barrier Reef, the scope of activities to be undertaken on this site are mainly storage on hard stand areas with minimal disturbance to the land and no discernable disturbance to surrounding areas and as such will not pose a risk or threat to areas downstream.

Economic Elements

- *t) Port Alma remains an important port and industrial node in the Shire through ensuring adjoining land and vital transport routes are managed by the Planning Scheme to protect against the encroachment of incompatible land uses.*

The proposed use of the land has a direct nexus with the port (Port Alma) and would be described as being a compatible use of land. The GLNG Project will directly benefit the region through its use of the port facilities and adjacent land for the construction and operational aspects.

- *v) The efficiency of infrastructure, including telecommunication, electricity transmission and distribution networks, and transport networks, is maintained and future extensions are well planned.*

As the proposed use of the site is of a temporary nature it will not interfere with the infrastructure planned for the region, nor will the continuing use of the port impact on development of infrastructure and services to land within and adjacent the proposed site. It should be noted that if the proposed use was assessable against the planning scheme then as defined within the Industrial Use Class the proposed activities would be Impact assessable.

Reference to the Fitzroy Shire Overlay Maps has been made to further assess the constraints related to the proposed site. The following maps have been identified as being relevant for the purposes of assessment:

Agricultural Land Class Overlay Map B2

- The proposed site is classed as C2, a category not identified as Good Quality Agricultural Land;

Bushfire Prone Land Overlay Map B9

- The proposed site is identified as being of low fire risk;

Key Resource Area Overlay Map B12

- The proposed site is identified as being adjacent a key resource area, however there is some inaccuracy to this assessment due to poor graphics on the overlay map;

Marine Wetland Overlay Map B13

- The proposed site is identified as being adjacent to but not within the marine wetland designation;

Acid Sulphate Soil Overlay Map B20

- Although graphics for overlay are quite poor it appears that the proposed site is within the 20m contour

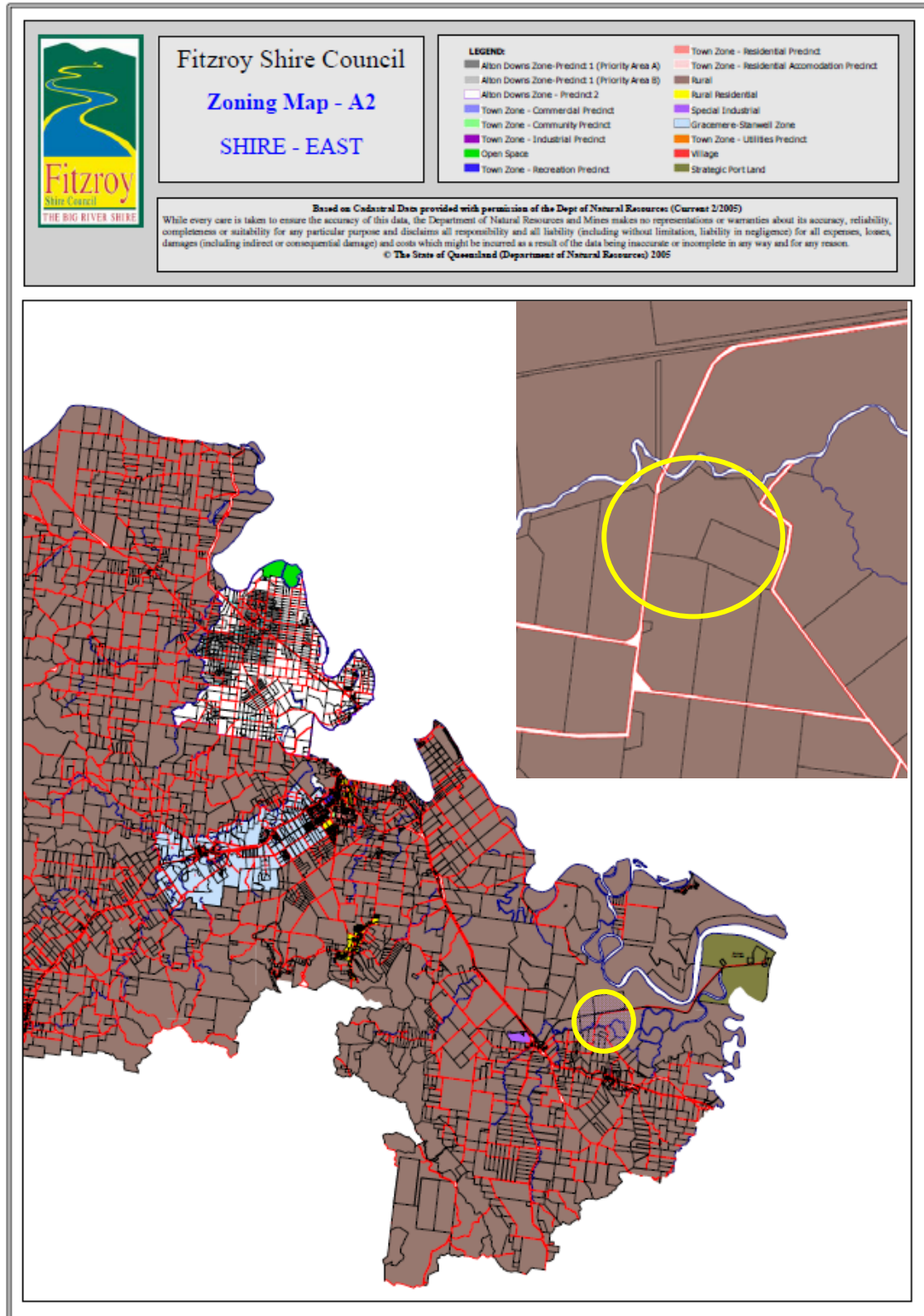
Erosion Prone Land Overlay Map B21

- The proposed site is adjacent to but not within the erosion prone areas.

1.1.4 Fitzroy Shire Planning Scheme

The site itself lies within the Rural Zone which extends to the majority of the surrounding area for several kilometres (refer Port Alma Planning Scheme Map).

Fitzroy Shire Planning Scheme 'Zone Map A2' (site circled)



Brian Connellan

20 October 2009
Page H

Yours sincerely
URS Australia Pty Ltd

A handwritten signature in dark ink, appearing to read 'Wayne Jarrett', with a stylized flourish at the end.

Wayne Jarrett

Appendix D Port Alma Traffic and Transportation Assessment

Brisbane Office
Level 11 Green Square Nth Tower
515 St Paul's Terrace
Locked Bag 4006, Fortitude Valley
Queensland 4006 Australia
Tel: (07) 3310 2401
Fax: (07) 3369 9722

Gold Coast Office
Level 2 Emerald Lakes Town Centre
1/3321 Central Place, Carrara
PO Box 391, Nerang
Queensland 4211 Australia
Tel: (07) 5502 1585
Fax: (07) 5502 1586

Perth Office
Cardno Centre
2 Bagot Road
PO Box 155, Subiaco
Western Australia 6904 Australia
Tel: (08) 9273 3888
Fax: (08) 9388 3831

Sydney Office
910 Pacific Highway, Gordon
New South Wales 2072 Australia
Tel: (02) 9496 7700
Fax: (02) 9499 3902



GLNG Supplementary Environmental Impact Statement – "Port Alma" Option

*Prepared for URS
Australia PTY LTD*

December 2009

Contents	Page Number
EXECUTIVE SUMMARY	1
1.0 INTRODUCTION	1
1.1 Document Intent	1
1.2 Project Description	1
1.3 Staging	1
1.4 References	2
2.0 PROPOSED DEVELOPMENT	3
2.1 Site 1 – Coal Seam Gas Fields	3
2.2 Site 2 – Gas Transmission Pipeline Alignment	3
3.0 IMPACT ASSESSMENT METHODOLOGY	4
3.1 Assessment Scenarios	4
4.0 INTERSECTION IMPACT ASSESSMENT	7
4.1 Intersection Impact Assessment Methodology	7
4.2 Background Traffic	7
4.3 Traffic Peak Hour Periods	7
4.4 Intersection Analysis	7
4.5 Project Mitigation Summary	34
5.0 ROADWAY LINK CAPACITY IMPACT ASSESSMENT	36
5.1 Background Traffic Volumes	36
5.2 Development Traffic Impacts	36
5.3 Project Mitigation Summary	36
6.0 PAVEMENT IMPACT ASSESSMENT	39
6.1 Pavement Rehabilitation Requirements	39
6.2 Road Maintenance Requirements	40
6.3 Project Mitigation Summary	42
6.4 Bajool-Port Alma Road Condition	42
7.0 SUMMARY AND CONCLUSIONS	43
7.1 Development Proposal	43
7.2 Development Traffic	44
7.3 Impact Mitigation – All Components	44
Final Conclusion	48

TABLES:



1	Total GLNG Trips
2	GLNG Required Roadway Link Upgrades
3.1	Overall Project Peak Traffic Generation – Peak Hour
4.1	Gladstone-Mt Larcom Rd/Calliope River Rd/Targinie Rd – SIDRA Results
4.2	Gladstone-Mt Larcom Rd/Calliope River Rd/Targinie Rd – Upgraded SIDRA Results
4.3	Gladstone-Mt Larcom Rd/Hanson Rd/Landing Rd – SIDRA Results
4.4	Gladstone-Mt Larcom Rd/Calliope River Rd/Targinie Rd – Upgraded SIDRA Results
4.5	Hanson Road/Red Rover Road – SIDRA Results
4.6	Hanson Road/Red Rover Road – Upgraded SIDRA Results
4.7	Hanson Road/Blain Drive/Alf O'Rourke Drive – SIDRA Results
4.8	Hanson Road/Blain Drive/Alf O'Rourke Drive – Upgraded SIDRA Results
4.9	Bruce Highway/Gladstone-Mount Larcom Road – SIDRA Results
4.10	Glenlyon Road/Port Access Road/Railway Street – SIDRA Results
4.11	Dawson Highway/Glenlyon Road/Bramston Street – SIDRA Results
4.12	Dawson Highway/Glenlyon Road/Bramston Street – Upgraded SIDRA Results
4.13	Dawson Highway/Don Young Drive– SIDRA Results
4.14	Dawson Highway/Don Young Drive– Upgraded SIDRA Results
4.15	Dawson Highway/Blain Drive/Herbertson Street – SIDRA Results
4.16	Dawson Highway/Blain Drive/Herbertson Street – Upgraded SIDRA Results
4.17	Dawson Highway/Philip Street – SIDRA Results
4.18	Dawson Highway/Aerodrome Road – SIDRA Results
4.19	Dawson Highway/Aerodrome Road – Upgraded SIDRA Results
4.20	Bruce Highway/Dawson Highway – SIDRA Results
4.21	Bruce Highway/Dawson Highway – Upgraded SIDRA Results
4.22	Bruce Highway/Calliope River Road Intersection – SIDRA Results
4.23	Intersection Analysis Summary
5.1	Midblock Capacity Breakpoints
6.1	Road Rehabilitation Impacts – GLNG Project Contribution Estimates
6.2	Pavement Impact Costs
7.1	Total GLNG Trips
7.2	GLNG Roadway Link Upgrades – “No Bridge” Option

FIGURES:

- 4.1 Gladstone-Mt Larcom Rd/Calliope River Rd/Targinie Rd –Existing Layout
- 4.2 Gladstone-Mt Larcom Rd/Calliope River Rd/Targinie Rd – Upgrade Layout
- 4.3 Gladstone-Mt Larcom Rd/Hanson Rd/Landing Rd - Existing Layout
- 4.4 Gladstone-Mt Larcom Rd/Landing Rd/Hanson Rd – Upgrade Layout
- 4.5 Hanson Road/Red Rover Road – Existing Layout
- 4.6 Hanson Road/Red Rover Road – Upgraded Layout
- 4.7 Hanson Road/Blain Drive/Alf O'Rourke Drive – Existing Layout
- 4.8 Hanson Road/Blain Drive/Alf O'Rourke Drive – Upgraded Layout
- 4.9 Bruce Highway/Gladstone - Mount Larcom Road – Existing Layout
- 4.10 Glenlyon Rd/Gladstone Port Access Rd/Railway St – Existing Layout
- 4.11 Dawson Highway/Glenlyon Road/Bramston Street – Existing Layout
- 4.12 Dawson Highway/Glenlyon Road/Bramston Street – Upgraded Layout
- 4.13 Dawson Highway/Don Young Drive - Existing Layout
- 4.14 Dawson Highway/Don Young Drive - Upgraded Layout
- 4.15 Dawson Highway/Blain Drive/Herbertson Street – Existing Layout
- 4.16 Dawson Highway/Blain Drive/Herbertson Street – Upgraded Layout
- 4.17 Dawson Highway/Philip Street – Existing Layout
- 4.18 Dawson Highway/Aerodrome Road – Existing Layout
- 4.19 Dawson Highway/Aerodrome Road – Upgraded Layout
- 4.20 Bruce Highway/Dawson Highway – Existing Layout
- 4.21 Bruce Highway/Dawson Highway – Upgraded Layout
- 4.22 Bruce Highway/Calliope River Road – Existing Layout

APPENDICES:

- D1 Project Trip Generation and Distribution Summary Tables
- D2 Peak Hour Volumes for Intersection Assessment Scenarios
- D3 Midblock Assessment Volumes
- D4 Pavement Impact Assessment Summary

Document Control					
GLNG Supplementary Environmental Impact Statement – “Port Alma” Option					
Version	Date	Author		Reviewer	
		Name	Initials	Name	Initials
Draft	16 October 2009	Michael Gillies	Initial Signed	Stephen Harkins	Initial Signed
1	27 October 2009	Michael Gillies	Initial Signed	Stephen Harkins	Initial Signed
2	8 November 2009	Michael Gillies	Initial Signed	John Olsen	Initial Signed
3	8 December 2009	Michael Gillies		John Olsen	

"© 2009 Cardno All Rights Reserved. Copyright in the whole and every part of this document belongs to Cardno and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person without the prior written consent of Cardno."

EXECUTIVE SUMMARY

Scope of the Report

This document is an appendix report to the “supplementary base case” assessment for the traffic impacts within the “GLNG Supplementary Environmental Impact Statement – Traffic Report,” submitted by Cardno Eppell Olsen (CEO) in October 2009 for the GLNG Project. It is not intended that this document is as a stand-alone document and as such it should be used and interpreted in combination with the CEO supplementary base case report.

The supplementary base case scenario assumes pipe and materials for construction of the gas transmission alignment and coal seam gas (CSG) fields will be delivered by trucks from the RG Tanna wharves (in Gladstone). The alternative assessed within this report assumes that pipe and materials will be delivered by trucks from Port Alma, instead of from Gladstone (RG Tanna), in order to reduce vehicle trips on the road network within Gladstone. This alternative is known in this document as the “Port Alma” option.

This “Port Alma” option assessment is a new scenario and as such was not previously reported in the EIS Report.

Development Traffic

Traffic generation has been based on estimated material quantities for construction works and assumptions about delivery frequency. Trips associated with construction and operations equipment and workforce have also been estimated. Assumptions about the origin and destination of trips have been made including allowances for the establishment of workers accommodation. All assumptions for the traffic generation of the gas transmission pipeline and CSG fields under the “Port Alma” option are documented in Section 2 of this report, and all other project components remain unchanged from the supplementary base case scenario. A summary of the total road trips associated with each component over the life of the project (2010 through 2034) is shown in Table 1.

Table 1

Total GLNG Trips

Component	Estimated Total Trips (life of project)
CSG fields	6,681,150
Gas Transmission Pipeline	572,350
LNG liquefaction and export facility	3,691,100
Total	10,944,600

Intersection Capacity Impact Assessment

A capacity impact assessment has been undertaken for 13 intersections around Gladstone to determine what, if any, differences in impacts and mitigation requirements there are between the “Port Alma” option and the supplementary base case. To mitigate the impact of the development on intersections within Gladstone for the “Port Alma” option, it is recommended that the following intersections be upgraded with upgrading contributions recommended under some circumstances.

Gladstone-Mt Larcom Road/Calliope River Road/Targinie Road

The following works are recommended:

- short left slip lane on southern leg (Calliope River Road).

This mitigation ensures that the intersection operates acceptably in both the background traffic scenario and the “with development” scenario at all peak periods.

Gladstone-Mt Larcom Road/Landing Road/Hanson Road

The intersection of Gladstone-Mt Larcom Road/Landing Road/Hanson Road operates above practical capacity due to development traffic. Modifying the intersection from a priority intersection to a single lane roundabout enables the intersection to operate adequately for all scenarios tested.

Hanson Road/Red Rover Road intersection

The following works are recommended to mitigate background capacity constraints of the intersection through 2024:

- addition of a right-turn lane on the western approach of Hanson Road and additional circulating lane to accommodate the movement; and
- a short right turn lane on the southern leg (Red Rover Road).

Duplication of Hanson Road is being planned by DTMR. In lieu of the developer implementing the upgrading works identified above, the option of making a contribution to the intersection upgrade could be considered. The development traffic forms 1.2% of the combined background and development traffic in 2012. This would allow intersection improvements to be incorporated into the four lane upgrading works.

Hanson Road/Blain Drive/Alf O'Rourke Drive intersection

The following works are recommended:

- continuous left-turn lane from the south approach (Blain Drive); and
- right-turn lane on the western approach and additional circulating lane to accommodate the movement.

Duplication of Hanson Road is being planned by DTMR. In lieu of the developer implementing the upgrading works identified above, the option of making a contribution to the intersection upgrade could be considered. The development traffic forms 0.9% of the combined background and development traffic in 2012. This would allow intersection improvements to be incorporated into the four lane upgrading works.

Dawson Highway/Blain Drive/Herbertson Street

The following works are recommended:

- short left slip lane on southern leg of Dawson Highway; and
- pavement marking of left lane on western leg to allow all turn movements.

The improvements ensure the operation of the intersection is no worse compared to the background traffic scenario as it relates to the existing intersection form.

An intersection upgrading concept has been developed, however there is no currently available concepts from DTMR to determine compatibility. The cost of the GLNG proposed upgrade is approximately \$240,000.

Dawson Highway/Philip Street

The intersection exceeds its practical capacity with background traffic alone and the addition of development traffic worsens the impacts further. DTMR are planning upgrade works and the option of making a contribution to the intersection upgrade could be considered. The development traffic forms 5.5% of the combined background and development traffic in 2012.

Dawson Highway/Don Young Drive

The following works are recommended for the intersection to operate:

- short left slip lane on western leg (Don Young Drive).

As Gladstone Regional Council is planning a form of grade separation at this intersection for the Kirkwood Road project (to align with Don Young Drive), the performance of the intersection is likely to be far superior to that of the current layout. However, there is no timing proposed for this work. It is proposed that the option of making a contribution to the short left slip lane upgrade could be considered. The development traffic forms 4.6% of the combined background and development traffic in 2024.

It is noted that the proposed mitigations are identical to those required for the supplementary base case option except for potential contribution percentages at Dawson Highway/Philip Street and Dawson Highway/Don Young intersections due to the varying traffic volumes from the supplementary base case. This is due to the majority of relocated truck movements to Port Alma occurring prior to the worst case assessment years and that the LNG facility construction has the dominant effect on intersection impacts.

Roadway Link Capacity Impact Assessment

Roadway link analysis has been undertaken based on daily road link volumes with and without the proposed development. The adopted capacity thresholds for this assessment include:

Assessment of roadway segment capacity was undertaken for each year of the expected GLNG Project life (2010 to 2034). Brought forward cost contributions are recommended on any link where the development creates the need to bring forward the timing of upgrades by one year or more.

To mitigate the impact of the development on mid-block capacity, it is recommended that the developer pay an appropriate portion of the bring forward cost of upgrading the sections of road summarised in Table 2. The location of these upgrade works is shown on Figure 3 in the “GLNG Supplementary Environmental Impact Statement – Traffic Report”.

Table 2 *GLNG Required Roadway Link Upgrades*

Road	Section	Upgrade	Bring Forward (years)	% Developer Contribution (% 2009 Cost)
Gladstone-Mount Larcom Road	Red Rover Road to Power Station (1.0 km)	2 to 4 lanes	1.2 yrs	1.9%
	Power Station to Reid Road (5.0 km)	2 to 4 lanes	1.2 yrs	1.9%

This cost of the upgrade works is unknown, but if the construction costs were to be discounted back from the required upgrade year to 2009 at a rate of 7%, the developer could expect to pay the percentage shown in Table 2 as a percent of the construction cost (2009 \$) of the upgrade.

Pavement Impact Assessment

This analysis relates only to heavy vehicle movements of the GLNG Project and includes both the construction and operation phases from 2010 to 2034. The GLNG Project is estimated to generate approximately 3,426,750 heavy vehicle trips over the life of all project components. The pavement assessment comprises two components; the timing of pavement rehabilitation and whether there is a need to bring forward the works, and the increased need for regular pavement maintenance.

Pavement Rehabilitation

Three road segments on the Carnarvon Highway and nine road segments on the Dawson Highway have been identified as requiring pavement rehabilitation works one or more years earlier with the GLNG project than with background traffic in addition to Bajool-Port Alma Road. The bring forward cost of the required works is approximately \$5.02M based on pavement rehabilitation rates supplied by Department of Transport and Main Roads (DTMR).

Road Maintenance

A five percent (5%) significance criterion has been adopted for the assessment based on DTMR guidelines. This warrant is triggered in the assessment period for a number of the links and the additional cost of maintaining the roads impacted by the proposed development is \$17,412,100 at a 2009 dollar value. Negotiation of the developer's contribution towards these works will be required.

Impact Mitigation – Specific Project Components

The impact mitigations for the gas transmission pipeline and CSG fields are expected to be identical to those proposed for the supplementary base case scenario because all aspects of these components have remained unchanged under the “Port Alma” option.

Conclusion

The “Port Alma” option results in the same number of trips compared to the supplementary base case scenario. The quantitative impacts of the “Port Alma” option for the GLNG Project have been found to be comparable to those found for the supplementary base case assessment of the GLNG Project, with the following notable comments:

- intersection impacts and mitigations within Gladstone are equivalent to those in the supplementary base case. This is due to the majority of relocated truck movements to Port Alma occurring prior to the worst case assessment years. Although there is some variation in peak hour traffic volumes in the assessment years, these have not been significant to reduce the mitigation requirements proposed for the supplementary base case;

- there is only an additional 31,807 vehicle-km compared to the supplementary base case option. This is compared to the 11,074,000 vehicle-km reduction related to the “Material by Rail” option. This is due to the distances between the CSG fields and the Gladstone and Port Alma ports being very similar;
- roadway segment capacity improvements for the “Port Alma” option are for the same sections as in supplementary base case; and
- pavement impacts for pavement rehabilitation are \$239,500 more than the supplementary base case. Road maintenance costs are approximately \$39,200 more for the “Port Alma” option. The main reason for this \$278,700 increase in cost is due to the requirements of the Bajool-Port Alma Road. The upgrades proposed by the developer would remove the pavement rehabilitation requirements of this road section;

1.0 INTRODUCTION

1.1 Document Intent

This document is an appendix report to the “supplementary base case” assessment for the traffic impacts within the “GLNG Supplementary Environmental Impact Statement – Traffic Report,” submitted by Cardno Eppell Olsen (CEO) in October 2009 for the GLNG Project. It is not intended that this document is as a stand-alone document and as such it should be used and interpreted in combination with the CEO supplementary base case report.

This report provides the assessment of an alternative to the supplementary base case scenario, which assumes material for the construction of the gas transmission pipeline and for the construction of the coal seam gas (CSG) field works at Arcadia and half of Fairview is shipped to Gladstone to be trucked to site. This alternative assumes that pipe and other materials will be shipped to, and trucked from, Port Alma in order to reduce vehicle trips on the road network within Gladstone. The assumption made is that pipe will be transported by road from Port Alma north along the Bruce Highway, west along the Capricorn Highway and then south along the Leichhardt Highway before heading west on the Dawson Highway from Banana. This alternative is known in this appendix report as the “Port Alma Use” option.

This document presents only the information relevant to changes in methodology and analysis inputs necessary to determine the traffic impacts of using Port Alma for transport of materials for the gas transmission pipeline and northern CSG fields. Traffic generation estimates are provided only for the gas transmission pipeline and northern CSG fields, as it is the only GLNG Project components affected by the option assessment. All other information for the trip generation of the southern components of the LNG facility and access road, and bridge to Curtis Island are presented in the supplementary base case traffic report. Thus, this report is not intended as a stand-alone document and should be used and interpreted in combination with the CEO supplementary base case report “GLNG Supplementary Environmental Impact Statement – Traffic Report”.

1.2 Project Description

Refer to the Section 1.3 of the March 2009 “GLNG Environmental Impact Statement – Traffic Report”.

1.3 Staging

Refer to the Section 1.4 of the March 2009 “GLNG Environmental Impact Statement – Traffic Report”.

1.4 References

Refer to the Section 1.5 of the March 2009 “GLNG Environmental Impact Statement – Traffic Report”.

2.0 PROPOSED DEVELOPMENT

The following section presents the inputs and assumptions used in estimating the traffic generation of the LNG facility under the option that pipe and materials for the gas transmission pipeline and a proportion of the coal seam gas (CSG) fields will be delivered by ship to Port Alma and transferred by truck to the construction sites.

All inputs for workforce numbers and quantities of plant/materials are identical to the supplementary base case. The primary differences seen in this option assessment are the traffic movement patterns. Construction and Operations traffic for the GLNG Project is provided at Appendix D1.

2.1 Site 1 – Coal Seam Gas Fields

Refer to the Section 2.1 of the March 2009 “GLNG Environmental Impact Statement – Traffic Report”.

2.2 Site 2 – Gas Transmission Pipeline Alignment

Refer to the Section 2.2 of the March 2009 “GLNG Environmental Impact Statement – Traffic Report” and the November 2009 “GLNG Supplementary Environmental Impact Statement – Traffic Report”.

3.0 IMPACT ASSESSMENT METHODOLOGY

Refer to the Section 5.0 of the March 2009 “GLNG Environmental Impact Statement – Traffic Report”.

3.1 Assessment Scenarios

Intersection analysis was undertaken for the supplementary base case assessment for years 2012, 2014 and 2024. A review of the peak hour traffic generated by all components of the GLNG Project was undertaken to ensure these years are consistent for the “Port Alma” option assessment. Table 3.1 compares the total peak hour trips generated by the GLNG Project under the supplementary base case as well as for the option without the proposed bridge.

The “Port Alma” option results in the same number of trips been developed to that of the base report. For all years the total peak hour traffic generation is identical. Table 3.1 shows that the peak of GLNG Project traffic for the “Port Alma” option is in 2012, consistent with the supplementary base case.

Table 3.1 Overall Project Peak Traffic Generation – Peak Hour

Year	Total Peak Hour Trips		% Difference
	Supplementary base case	Port Alma Option	
2010	257	257	0%
2011	765	765	0%
2012	829	829	0%
2013	377	377	0%
2014	376	376	0%
2015	511	511	0%
2016	502	502	0%
2017	353	353	0%
2018	418	418	0%
2019	553	553	0%
2020	540	540	0%
2021	388	388	0%
2022	371	371	0%
2023	332	332	0%
2024	326	326	0%
2025	329	329	0%
2026	325	325	0%
2027	325	325	0%
2028	325	325	0%
2029	324	324	0%
2030	326	326	0%

It should be noted though, that these identical numbers of trips do not mean that identical trip routes or lengths occur between the supplementary base case and the “Port Alma” option as the latter specifically relocates truck movement origins (for gas transmission pipeline and CSG fields materials) from within Gladstone to Port Alma.

As such, the Gladstone intersections have been analysed for this “Port Alma” to allow comparison with the supplementary base case and other options in the “GLNG Supplementary Environmental Impact Statement – Traffic Report”.

For consistency with the supplementary base case assessment, the following scenarios were assessed for intersection capacity impacts for the “Port Alma” option:

- 2012 background;
- 2012 background plus development;
- 2014 background;
- 2014 background plus development;
- 2024 background;
- 2024 background plus development.

Midblock capacity and pavement impacts were assessed for each year of the project life under both “background” and “background plus development” scenarios.

4.0 INTERSECTION IMPACT ASSESSMENT

Intersection analysis has been undertaken for the “Port Alma” option to provide a basis of comparison to the intersection impacts of the supplementary base case scenario. The analysis for the “Port Alma” option is necessary because of changes in traffic volumes due to the re-routing of pipe and material for the gas transmission alignment and (as a proportion) for the CSG fields from Port Alma (instead of Gladstone within the supplementary base case) as discussed in Section 2.

4.1 Intersection Impact Assessment Methodology

Refer to the Section 6.1 of the March 2009 “GLNG Environmental Impact Statement – Traffic Report”.

4.2 Background Traffic

Refer to the Section 6.2 of the March 2009 “GLNG Environmental Impact Statement – Traffic Report”.

4.3 Traffic Peak Hour Periods

Refer to the Section 6.3 of the March 2009 “GLNG Environmental Impact Statement – Traffic Report”.

Intersection peak hour traffic volumes for each peak hour of analysis and assessment year are provided at Appendix D2.

4.4 Intersection Analysis

Refer to the Section 6.7 of the November 2009 “GLNG Supplementary Environmental Impact Statement – Traffic Report”.

4.4.1 Gladstone - Mount Larcom Road/Calliope River Road/Targinie Road Intersection

The Gladstone-Mount Larcom Road/Calliope River Road/Targinie Road intersection is an existing four-way priority intersection with the major movement east west along Gladstone-Mount Larcom Road, as shown on Figure 4.1. The results of the SIDRA analysis for this intersection are shown in Table 4.1. DTMR count data from 2006 was utilised in the assessment.

Figure 4.1

**Gladstone-Mt Larcom Rd/Calliope River Rd/Targinie Rd –
Existing Layout**

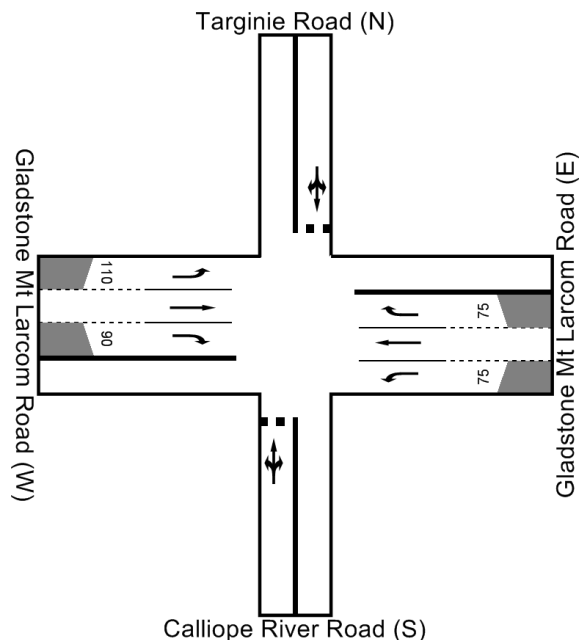


Table 4.1

**Gladstone-Mt Larcom Rd/Calliope River Rd/Targinie Rd –
SIDRA Results**

Existing Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.46	6 sec	22 m	0.53	7 sec	28 m	-
	AM Late	0.19	4 sec	6 m	0.23	4 sec	8 m	-
	PM	0.21	5 sec	8 m	0.27	5 sec	11 m	-
2014	AM Early	0.53	8 sec	29 m	0.55	8 sec	31 m	-
	AM Late	0.19	4 sec	6 m	0.21	5 sec	7 m	-
	PM	0.22	6 sec	8 m	0.24	6 sec	9 m	-
2024	AM Early	0.79	11 sec	60 m	0.83	12 sec	69 m	-
	AM Late	0.31	5 sec	12 m	0.34	5 sec	14 m	-
	PM	0.26	5 sec	10 m	0.29	5 sec	11 m	-

The analysis of the Gladstone-Mount Larcom Road/Calliope River Road/Targinie Road intersection indicates that the intersection will operate above capacity in its current form in 2024 with the addition of development traffic. This will mean that mitigation works will be required at this intersection for it to operate in 2024 with development traffic.

For the Gladstone-Mount Larcom Road/Calliope River Road/Targinie Road intersection to operate a short left slip lane was added to the southern leg of the intersection. Figure 4.2 below shows the proposed layout of this intersection with Table 4.2 below showing the results of the SIDRA analysis of this intersection for just the 2024 traffic.

Figure 4.2 **Gladstone-Mt Larcom Rd/Calliope River Rd/Targinie Rd –
Upgraded Layout**

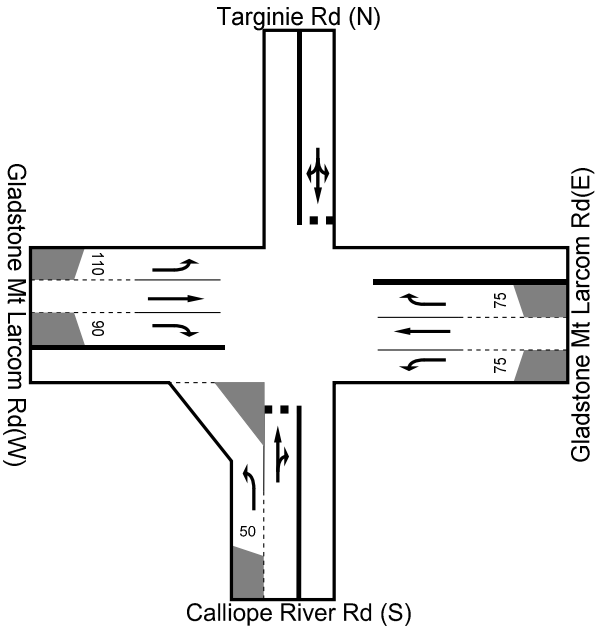


Table 4.2 **Gladstone-Mt Larcom Rd/Calliope River Rd/Targinie Rd –
Upgraded SIDRA Results**

Upgrade Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2024	AM Early	0.70	9 sec	41 m	0.73	10 sec	46 m	-
	AM Late	0.27	5 sec	10 m	0.29	5 sec	11 m	-
	PM	0.24	5 sec	9 m	0.27	5 sec	10 m	-

The intersection in its proposed form with a short left slip lane will be able to accommodate the intersection with development traffic for all scenarios up to and including 2024.

4.4.2 Gladstone - Mount Larcom Road/Hanson Road/Landing Road Intersection

The Gladstone-Mount Larcom Road/Hanson Road/Landing Road intersection is currently a three-way priority intersection. DTMR traffic count data from 2007 was utilised in the assessment of the intersection.

The analysis results for this intersection are summarised in Table 4.3 with the existing intersection form shown on Figure 4.3.

Figure 4.3 Gladstone-Mt Larcom Rd/Hanson Rd/Landing Rd - Existing Layout

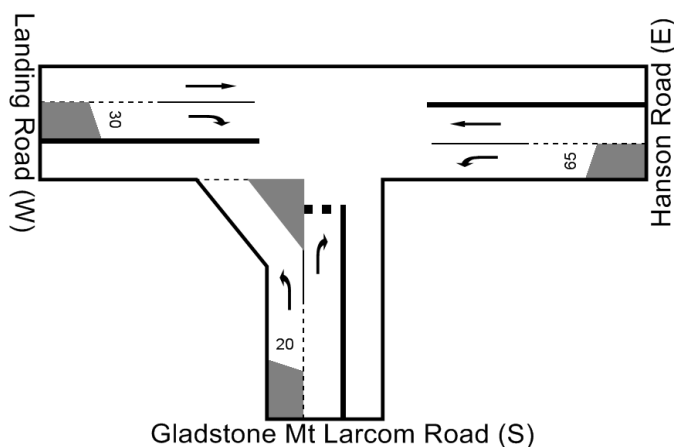


Table 4.3 Gladstone-Mt Larcom Rd/Hanson Rd/Landing Rd – SIDRA Results

Existing Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.40	8 sec	22 m	0.50	9 sec	31 m	-
	AM Late	0.33	9 sec	16 m	0.37	10 sec	20 m	-
	PM	0.39	9 sec	22 m	0.50	9 sec	29 m	-
2014	AM Early	0.45	8 sec	27 m	0.53	8 sec	35 m	-
	AM Late	0.34	9 sec	17 m	0.37	8 sec	20 m	-
	PM	0.40	9 sec	23 m	0.49	8 sec	30 m	-
2024	AM Early	0.69	10 sec	59 m	0.85	12 sec	98 m	-
	AM Late	0.56	10 sec	43 m	0.61	10 sec	49 m	-
	PM	0.59	10 sec	41 m	0.77	11 sec	63 m	-

Table 4.3 indicates that this intersection will operate above capacity in 2024 in its current form with the expected development traffic. A single lane roundabout was tested to see how it would operate in 2024 with development traffic. The results of this analysis are shown in Table 4.4 with the layout shown on Figure 4.4.

Figure 4.4

**Gladstone-Mt Larcom Rd/Landing Rd/Hanson Rd –
Upgraded Layout**

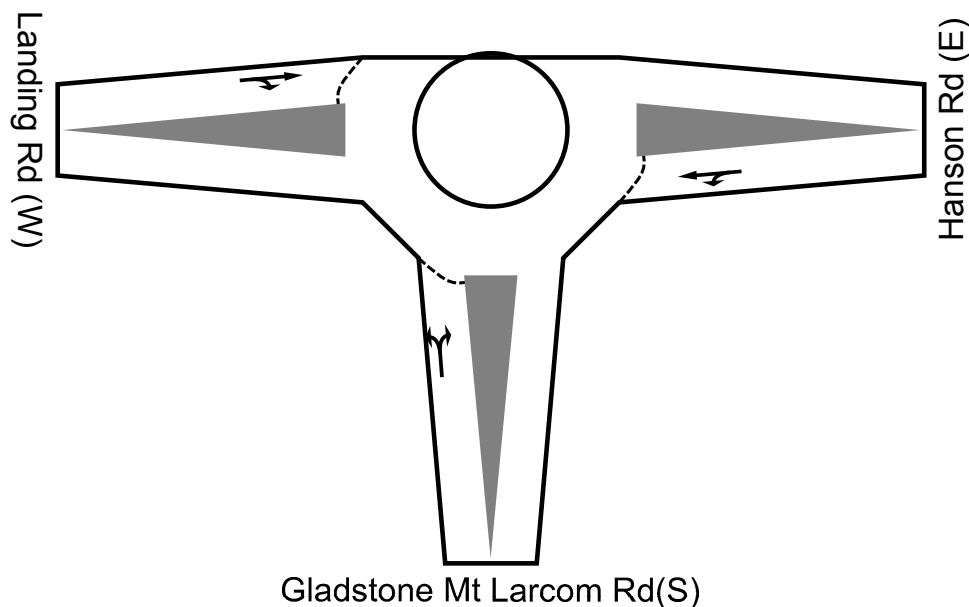


Table 4.4

**Gladstone-Mt Larcom Rd/Calliope River Rd/Targinie Rd –
Upgraded SIDRA Results**

Upgrade Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2024	AM Early	0.39	6 sec	27 m	0.52	9 sec	40 m	-
	AM Late	0.30	5 sec	21 m	0.35	9 sec	25 m	-
	PM	0.34	5 sec	29 m	0.40	8 sec	36 m	-

The proposed layout enables the Gladstone-Mount Larcom Road/Hanson Road/Landing Road intersection to operate below capacity for all scenarios tested.

The Department of Transport and Main Roads has undertaken corridor planning for the duplication of Hanson Road to four lanes to accommodate background traffic volumes, which is also a recommendation within the GIRTP. If the four-lane cross-section is to be built, the Hanson Road/Red Rover Road intersection would likely become a two-lane roundabout or traffic signals. The roundabout concept for the corridor planning is far greater than the upgrades identified above and would create adequate spare capacity to accommodate the proposed GLNG Project traffic.

4.4.3 Hanson Road/Red Rover Road intersection

The Hanson Road/Red Rover Road intersection is an existing three-leg single-lane roundabout, with two approach lanes on the eastern approach and one lane on the other approaches. The circulating roadway of the roundabout accommodates two circulation lanes between Hanson Road (east) and Red Rover Road (south) to allow improved capacity for the left turn movement. This intersection was analysed for both the background traffic scenario and background plus development scenario.

The existing intersection form is shown on Figure 4.5 with assessment results provided in Table 4.5.

Figure 4.5 *Hanson Road/Red Rover Road – Existing Layout*

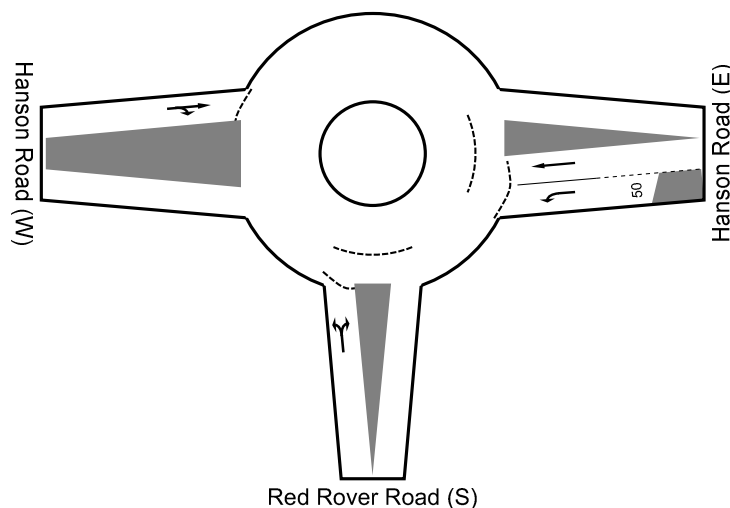


Table 4.5 *Hanson Road/Red Rover Road – SIDRA Results*

Existing Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	1.45	201 sec	1693 m	1.51	227 sec	1868 m	-
	AM Late	0.31	7 sec	16 m	0.31	7 sec	16 m	-
	PM	0.92	7 sec	189 m	0.93	7 sec	209 m	-
2014	AM Early	2.27	586 sec	3526 m	2.49	709 sec	3987 m	-
	AM Late	0.33	7 sec	17 m	0.34	7 sec	18 m	-
	PM	1.02	38 sec	715 m	1.05	68 sec	1054 m	-
2024	AM Early	3.48	1231 sec	5546 m	3.76	1420 sec	6060 m	-
	AM Late	0.46	7 sec	27 m	0.47	7 sec	28 m	-
	PM	1.05	60 sec	954 m	1.08	97 sec	1403 m	-

The SIDRA analysis indicates that the intersection will exceed its practical capacity in all years tested under the background traffic scenario. The GLNG Project traffic does not increase the number of peak hour periods during which the intersection operates above practical capacity. As DOS values significantly in excess of 1.00 become less reliable, it can be inferred that there is no significant project impacts beyond 2014 i.e. that the impacts are related to construction traffic.

Additional analysis was undertaken to determine the upgrades necessary to mitigate the 2012 PM peak hour operations for the “with development” scenario. It was determined that the following upgrades will be sufficient to bring intersection operations below background conditions in 2012:

- addition of a right-turn pocket on the western approach; and
- widening of the circulatory roadway to accommodate the additional lane.

The results of the SIDRA analysis with the above upgrades are presented in Table 4.6 and the upgraded intersection form is shown on Figure 4.6.

Figure 4.6

Hanson Road/Red Rover Road – Upgraded Layout

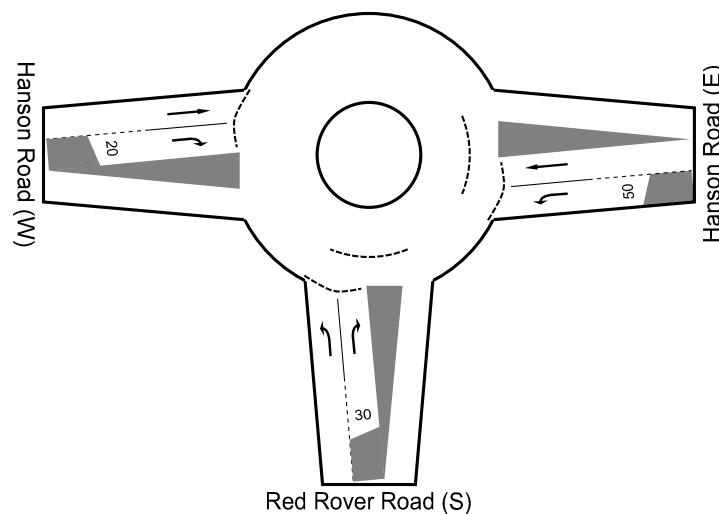


Table 4.6 Hanson Road/Red Rover Road – Upgraded SIDRA Results

Upgraded Roundabout Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.59	6 sec	41 m	0.78	13 sec	93 m	-
	AM Late	0.22	6 sec	11 m	0.23	6 sec	12 m	-
	PM	0.68	5 sec	68 m	0.68	5 sec	69 m	-
2014	AM Early	0.60	6 sec	47 m	1.30	118 sec	1160 m	-
	AM Late	0.22	6 sec	12 m	0.25	6 sec	12 m	-
	PM	0.72	6 sec	79 m	0.72	6 sec	80 m	-
2024	AM Early	0.65	7 sec	54 m	2.20	482 sec	3444 m	-
	AM Late	0.30	7 sec	18 m	0.33	7 sec	18 m	-
	PM	0.70	6 sec	72 m	0.71	6 sec	73 m	-

The SIDRA results shown in Table 4.6 indicate that the proposed intersection upgrades will mitigate “with development” traffic operations to below those found for the “background” scenario with the existing intersection form for all assessment years and peak hours (as shown in Table 4.5). Though the GLNG Project traffic impacts are mitigated, the intersection was still found to have additional capacity constraints due to background traffic.

It is important to note that the Department of Transport and Main Roads has undertaken corridor planning for the duplication of Hanson Road to four lanes to accommodate background traffic volumes, which is also a recommendation within the GIRTP. If the four-lane cross-section is to be built, the Hanson Road/Red Rover Road intersection would likely become a two-lane roundabout or traffic signals. The roundabout concept for the corridor planning would create adequate spare capacity to accommodate the proposed GLNG Project traffic.

In lieu of the developer implementing the upgrade works identified above, the option of making a contribution to the intersection upgrade could be considered. The development traffic forms 1.2% of the combined background and development traffic in 2012. This would allow intersection improvements to be incorporated into the four lane upgrading works.

4.4.4 Hanson Road/Blain Drive/Alf O’Rourke Drive intersection

The Hanson Road/Blain Drive/Alf O’Rourke Drive intersection is an existing four-way single-lane roundabout, as shown on Figure 4.7. The SIDRA results of this intersection analysis are shown in Table 4.7 below.

Figure 4.7 *Hanson Road/Blain Drive/Alf O’Rourke Drive – Existing Layout*

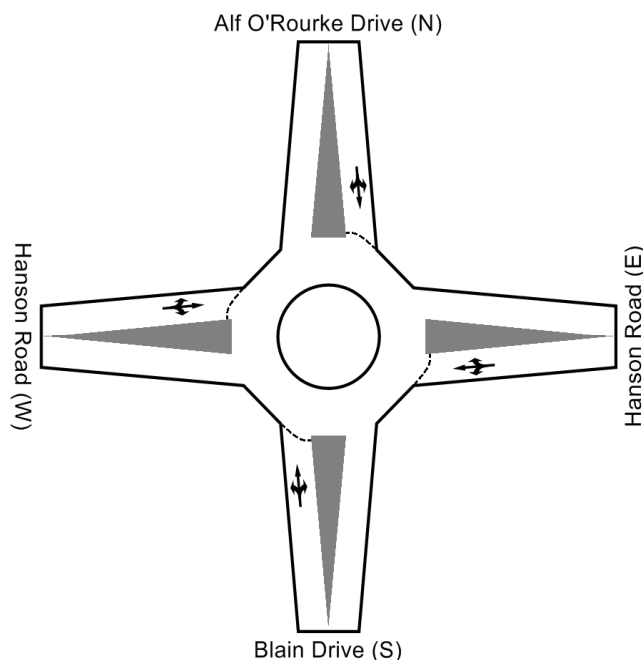


Table 4.7 *Hanson Road/Blain Drive/Alf O’Rourke Drive – SIDRA Results*

Existing Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	1.38	307 sec	3206 m	1.37	318 sec	3306 m	-
	AM Late	0.49	8 sec	37 m	0.49	8 sec	38 m	-
	PM	0.78	15 sec	97 m	0.80	17 sec	103 m	-
2014	AM Early	1.53	447 sec	4395 m	1.56	465 sec	4529 m	-
	AM Late	0.52	8 sec	41 m	0.52	8 sec	41 m	-
	PM	0.90	26 sec	165 m	0.93	30 sec	198 m	-
2024	AM Early	1.97	756 sec	6579 m	2.14	784 sec	6722 m	-
	AM Late	0.74	13 sec	92 m	0.74	13 sec	93 m	-
	PM	1.09	63 sec	542 m	1.13	72 sec	655 m	-

The analysis undertaken indicates that in its current form the intersection will operate above its practical capacity in all assessment years in the AM early peak and in the 2024 PM peak period under the background traffic scenario. A review of Table 4.7 shows that operations with the GLNG Project traffic are almost identical to that of background traffic operations.

To mitigate the background capacity constraints through 2024, a left-turn bypass lane is required on the south leg with a short downstream receiving lane on the west leg of the intersection. Additionally, a right-turn pocket is required on the west leg with additional circulating width to accommodate the added lane. The upgraded intersection layout is shown on Figure 4.8 with the SIDRA results for the upgraded intersection analysis shown in Table 4.8.

Figure 4.8 Hanson Road/Blain Drive/Alf O’Rourke Drive – Upgraded Layout

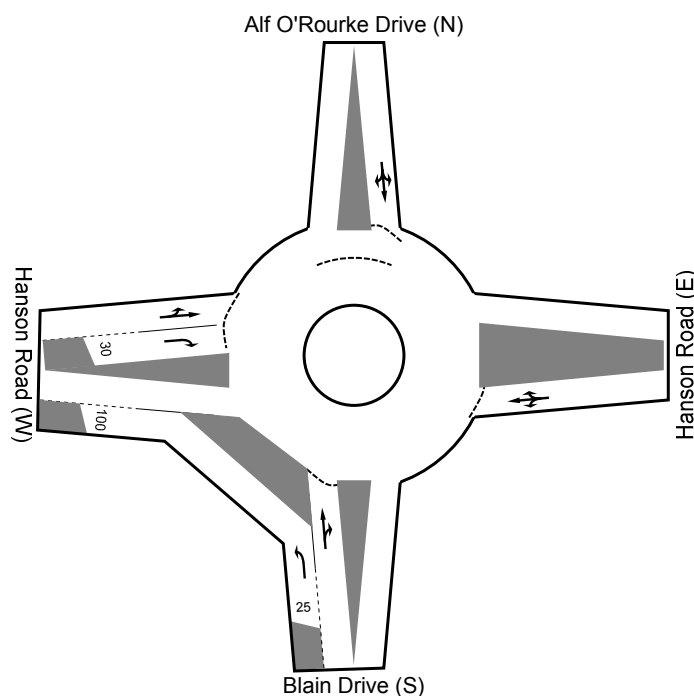


Table 4.8 Hanson Road/Blain Drive/Alf O’Rourke Drive – Upgraded SIDRA Results

Upgraded Roundabout Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.56	7 sec	48 m	0.58	7 sec	51 m	-
	AM Late	0.45	7 sec	33 m	0.46	7 sec	34 m	-
	PM	0.70	11 sec	84 m	0.71	11 sec	88 m	-
2014	AM Early	0.61	7 sec	60 m	0.63	7 sec	63 m	-
	AM Late	0.48	8 sec	37 m	0.49	8 sec	37 m	-
	PM	0.77	12 sec	110 m	0.78	12 sec	113 m	-
2024	AM Early	0.77	9 sec	103 m	0.78	9 sec	110 m	-
	AM Late	0.69	9 sec	80 m	0.69	9 sec	82 m	-
	PM	0.89	16 sec	185 m	0.89	16 sec	191 m	-

It is important to note that both the Gladstone Pacific Nickel Refinery Project and the Wiggins Island Coal Terminal Project have identified impacts and recommend mitigation measures to provide a two-lane roundabout at this location.

Additionally, the Department of Transport and Main Roads has undertaken corridor planning for the duplication of Hanson Road to four lanes to accommodate background traffic volumes, which is also recommended in the GIRTP. If the four-lane cross-section is to be built (and subsequent two-lane roundabout at Blain Drive/Alf O'Rourke Drive), these upgrades to Hanson Road and the intersection would create adequate spare capacity to accommodate background traffic and the proposed GLNG Project traffic.

In lieu of the developer implementing the upgrading works identified above, the option of making a contribution to the intersection upgrade could be considered. The development traffic forms 0.9% of the combined background and development traffic in 2012. This would allow intersection improvements to be incorporated into the four-lane upgrading works

4.4.5 Bruce Highway/Gladstone - Mount Larcom Road Intersection

The Bruce Highway/Gladstone-Mount Larcom Road intersection is an existing three-way priority intersection with the major movement north-south along the Bruce Highway, as shown on Figure 4.9. The SIDRA analysis results for this intersection are shown in Table 4.9 below. The analysis indicates the intersection will operate adequately in all assessment scenarios with background traffic and with the addition of GLNG Project traffic.

Figure 4.9 Bruce Highway/Gladstone - Mount Larcom Road – Existing Layout

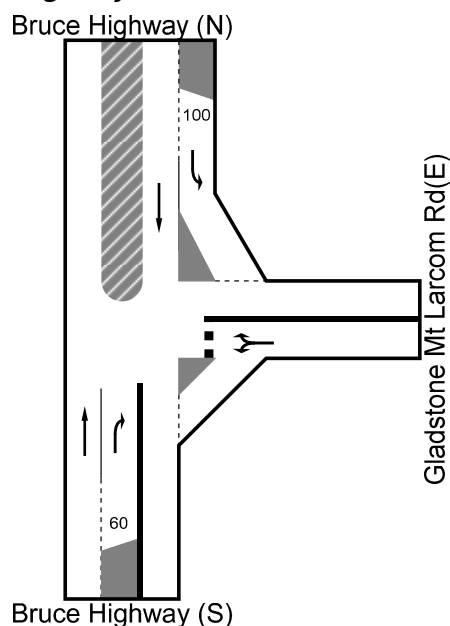


Table 4.9 Bruce Highway/Gladstone-Mount Larcom Road – SIDRA Results

Existing Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.18	7 sec	8 m	0.18	7 sec	8 m	-
	AM Late	0.22	6 sec	9 m	0.22	6 sec	10 m	-
	PM	0.26	6 sec	11 m	0.27	7 sec	11 m	-
2014	AM Early	0.20	7 sec	9 m	0.21	7 sec	9 m	-
	AM Late	0.25	6 sec	11 m	0.26	6 sec	11 m	-
	PM	0.30	7 sec	13 m	0.31	7 sec	14 m	-
2024	AM Early	0.32	7 sec	17 m	0.33	7 sec	18 m	-
	AM Late	0.47	8 sec	27 m	0.48	8 sec	28 m	-
	PM	0.46	8 sec	27 m	0.48	8 sec	29 m	-

4.4.6 Glenlyon Road/Gladstone Port Access Road/Railway Street Intersection

The Glenlyon Road/Gladstone Port Access Road/Railway Street intersection is an existing four-way signalised intersection, as shown on Figure 4.10. The SIDRA analysis results for the intersection are shown in Table 4.10.

Figure 4.10 Glenlyon Rd/Gladstone Port Access Rd/Railway St – Existing Layout

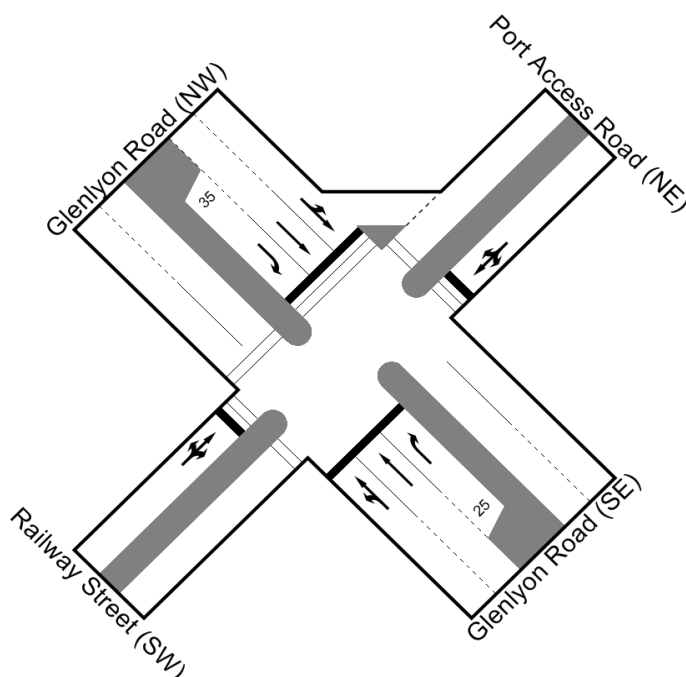


Table 4.10 Glenlyon Road/Port Access Road/Railway Street – SIDRA Results

Existing Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.53	24 sec	92 m	0.63	25 sec	101 m	100 sec
	AM Late	0.64	22 sec	165 m	0.64	22 sec	168 m	100 sec
	PM Late	0.59	18 sec	146 m	0.63	20 sec	155 m	100 sec
2014	AM Early	0.45	26 sec	90 m	0.45	26 sec	92 m	100 sec
	AM Late	0.67	22 sec	175 m	0.67	22 sec	180 m	100 sec
	PM Late	0.63	17 sec	157 m	0.63	17 sec	159 m	100 sec
2024	AM Early	0.51	26 sec	103 m	0.51	26 sec	103 m	100 sec
	AM Late	0.87	33 sec	315 m	0.87	33 sec	318 m	100 sec
	PM Late	0.76	18 sec	208 m	0.77	18 sec	212 m	100 sec

Table 4.10 above indicates that this intersection will operate adequately in all assessment scenarios with background traffic and with the addition of GLNG Project traffic.

4.4.7 Dawson Highway/Glenlyon Road/Bramston Street Intersection

The Dawson Highway/Glenlyon Road/Bramston Street intersection is an existing four-way signalised intersection, as shown on Figure 4.11. Analysis of this intersection was undertaken with the results shown in Table 4.11.

Figure 4.11 Dawson Highway/Glenlyon Road/Bramston Street – Existing Layout

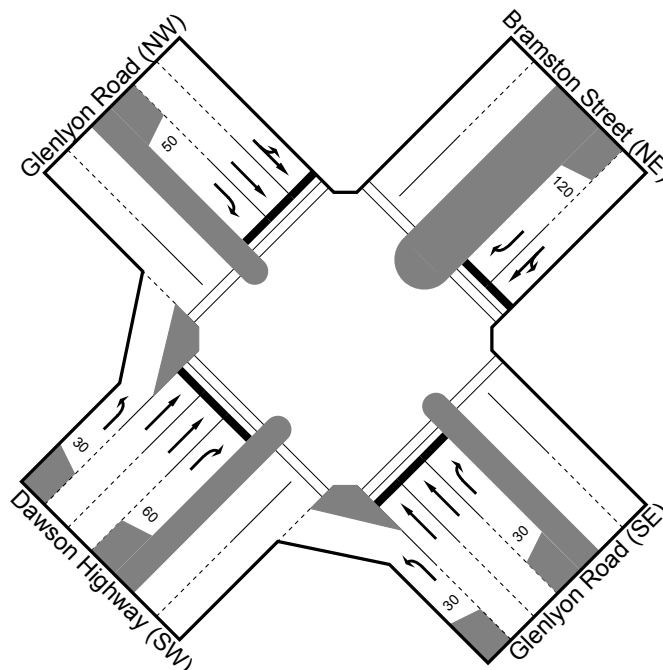


Table 4.11 Dawson Highway/Glenlyon Road/Bramston Street – SIDRA Results

Existing Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.86	25 sec	87 m	0.93	24 sec	87 m	90 sec
	AM Late	1.00	66 sec	318 m	1.02	66 sec	360 m	90 sec
	PM	0.71	28 sec	130 m	0.75	29 sec	135 m	90 sec
2014	AM Early	0.74	25 sec	92 m	0.75	25 sec	92 m	90 sec
	AM Late	1.00	63 sec	334 m	1.00	63 sec	334 m	90 sec
	PM	0.75	28 sec	142 m	0.75	28 sec	141 m	90 sec
2024	AM Early	1.00	43 sec	156 m	1.00	42 sec	156 m	140 sec
	AM Late	1.18	308 sec	1423 m	1.20	281 sec	1517 m	140 sec
	PM	0.94	39 sec	222 m	0.94	40 sec	234 m	90 sec

Table 4.11 above indicates that this intersection will exceed its practical capacity in 2012 due to background traffic. Further review of the table shows that the intersection operations with GLNG development traffic are almost identical to those for background traffic conditions and the development is not making the capacity constraints significantly worse.

Figure 4.12 below shows the short lane extensions required to mitigate the development impact to being no worse than background operating conditions, with the results shown in Table 4.12. Because the development traffic has minimal impact on the intersection, no mitigation works are recommended.

Programmed improvements at this intersection have been identified in the RIP for 2009/2010 (\$100,000). DTMR advise that these works will include phasing changes and lane marking changes to improve operation of the traffic signals. The works also include an asphalt overlay.

Figure 4.12

Dawson Highway/Glenlyon Road/Bramston Street –
Upgraded Layout

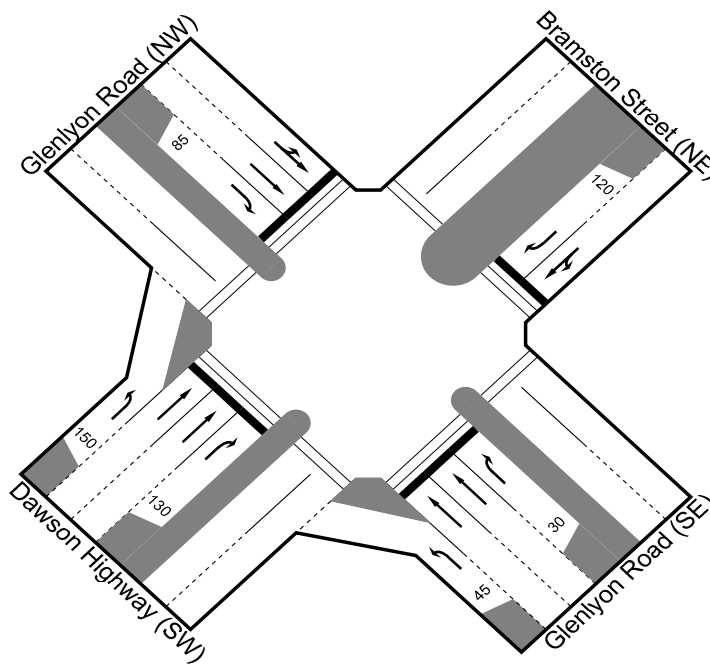


Table 4.12

Dawson Highway/Glenlyon Road/Bramston Street –
Upgraded SIDRA Results

Upgraded Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.38	22 sec	84 m	0.41	23 sec	87 m	100 sec
	AM Late	0.85	35 sec	190 m	0.85	35 sec	190 m	100 sec
	PM	0.65	28 sec	135 m	0.67	29 sec	138 m	100 sec
2014	AM Early	0.38	23 sec	86 m	0.38	23 sec	86 m	100 sec
	AM Late	0.89	39 sec	211 m	0.89	39 sec	211 m	100 sec
	PM	0.71	29 sec	147 m	0.70	28 sec	147 m	100 sec
2024	AM Early	0.49	25 sec	103 m	0.50	25 sec	105 m	100 sec
	AM Late	1.09	140 sec	659 m	1.10	141 sec	659 m	100 sec
	PM	0.87	35 sec	214 m	0.88	27 sec	222 m	100 sec

4.4.8 Dawson Highway/Don Young Drive Intersection

The Dawson Highway/Don Young Drive intersection is an existing three-way priority intersection, as shown on Figure 4.13. The SIDRA analysis results for this intersection are shown in Table 4.13. The analysis indicates the intersection will exceed practical capacity in the 2024 PM peak period under the background traffic scenario, however Gladstone Regional Council planning for the Kirkwood Road project indicates Kirkwood Road will align with Don Young Drive and form a grade separated intersection providing far superior intersection performance. However, there is no timing proposed for this work.

Figure 4.13

Dawson Highway/Don Young Drive - Existing Layout

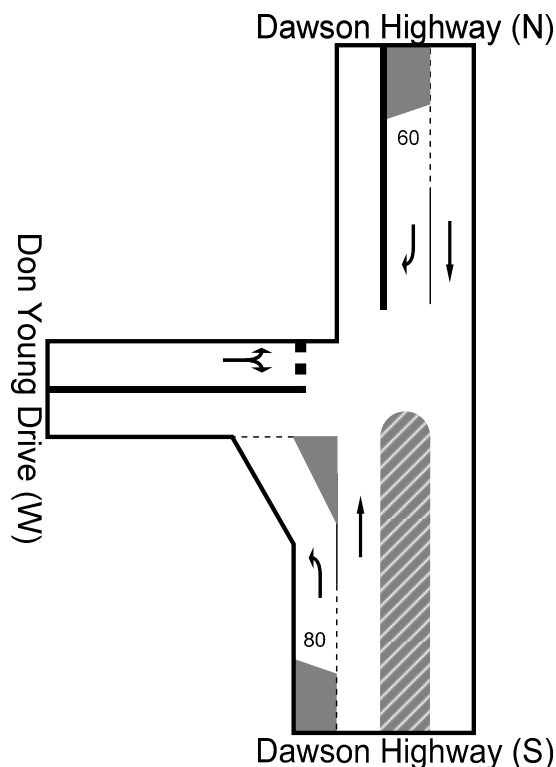


Table 4.13 *Dawson Highway/Don Young Drive– SIDRA Results*

Existing Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.23	5 sec	8 m	0.29	5 sec	11 m	-
	AM Late	0.33	4 sec	13 m	0.37	4 sec	15 m	-
	PM	0.45	5 sec	22 m	0.51	6 sec	26 m	-
2014	AM Early	0.26	5 sec	9 m	0.29	5 sec	11 m	-
	AM Late	0.36	4 sec	14 m	0.39	4 sec	15 m	-
	PM	0.54	6 sec	30 m	0.57	6 sec	32 m	-
2024	AM Early	0.44	6 sec	17 m	0.48	6 sec	20 m	-
	AM Late	0.78	7 sec	41 m	0.81	7 sec	44 m	-
	PM	0.88	12 sec	90 m	0.92	14 sec	113 m	-

The existing intersection layout in its current form does not operate adequately in the 2024 PM peak due to the background traffic. A layout was determined that enabled the intersection to operate adequately for all scenarios tested. The layout for this is shown below on Figure 4.14 with the results of the SIDRA analysis shown in Tale 4.14.

Figure 4.14 *Dawson Highway/Don Young Drive - Upgraded Layout*

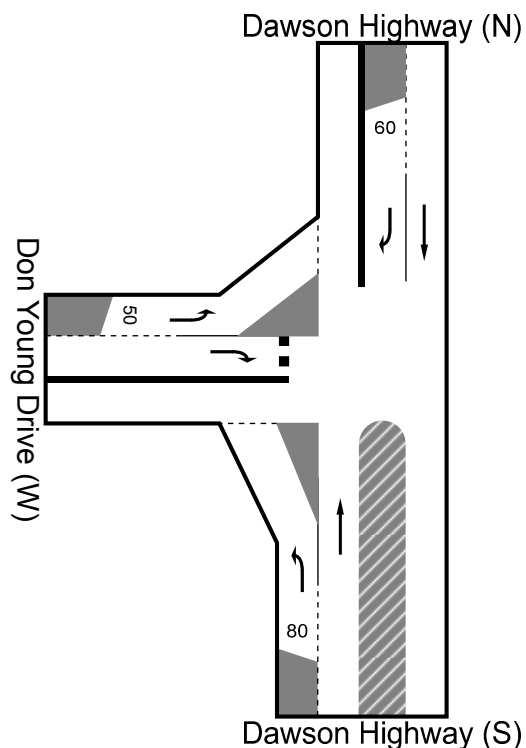


Table 4.14 Dawson Highway/Don Young Drive– Upgraded SIDRA Results

Upgraded Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2024	AM Early	0.40	6 sec	15 m	0.41	6 sec	15 m	-
	AM Late	0.73	6 sec	34 m	0.74	6 sec	34 m	-
	PM	0.75	8 sec	43 m	0.79	8 sec	47 m	-

In lieu of the developer implementing the upgrade works identified above, the option of making a contribution to the intersection upgrade could be considered. The development traffic forms 4.6% of the combined background and development traffic in 2024. This would allow intersection improvements to be incorporated into the potential future grade separation works.

4.4.9 Dawson Highway/Blain Drive/Herbertson Street Intersection

The Dawson Highway/Blain Drive/Herbertson Street intersection is an existing four-way, two-lane roundabout, as shown on Figure 4.15. The SIDRA analysis results for this intersection are shown in Table 4.15.

Figure 4.15 Dawson Highway/Blain Drive/Herbertson Street – Existing Layout

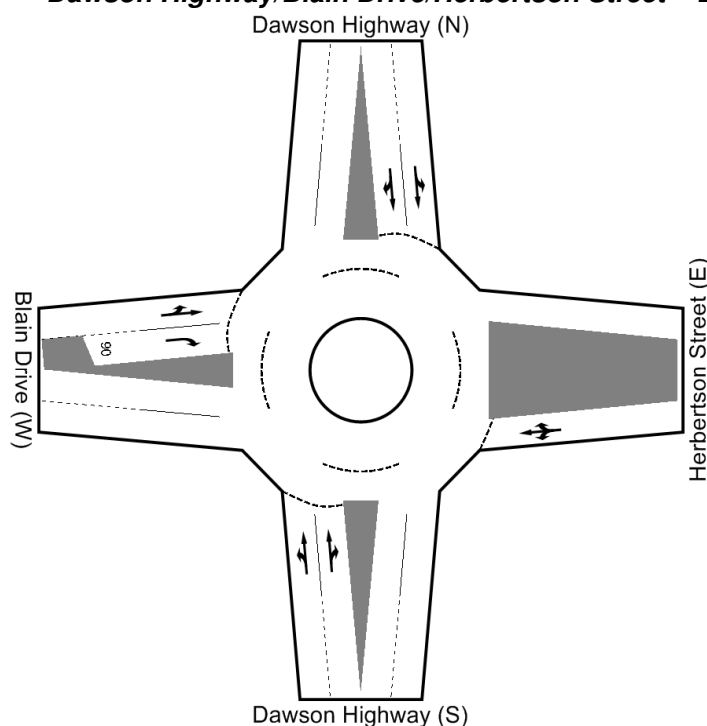


Table 4.15 Dawson Highway/Blain Drive/Herbertson Street – SIDRA Results

Existing Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.73	7 sec	64 m	0.83	8 sec	102 m	-
	AM Late	0.36	5 sec	19 m	0.39	5 sec	21 m	-
	PM	0.89	20 sec	137 m	1.11	107 sec	785 m	-
2014	AM Early	0.77	7 sec	79 m	0.79	7 sec	88 m	-
	AM Late	0.39	5 sec	20 m	0.39	5 sec	21 m	-
	PM	0.92	27 sec	170 m	0.98	41 sec	248 m	-
2024	AM Early	0.87	9 sec	128 m	0.87	9 sec	128 m	-
	PM Early	0.51	6 sec	32 m	0.51	6 sec	33 m	-
	PM	1.32	252 sec	1999 m	1.32	257 sec	2033 m	-

The SIDRA analysis indicates that under background traffic volumes the practical capacity is exceeded in all PM peaks and the 2024 AM peak. No further peak periods are adversely affected by the addition of development traffic. The 2012 PM in the “with development” scenario operates at a notably higher DOS than with background only the impacts are due construction traffic.

The intersection was tested with an upgraded roundabout form, including the addition of a left slip lane on the southern leg of the Dawson Highway and the conversion of the shared left/through lane on Blain Drive to accommodate all movements. Figure 4.16 below shows the intersection form needed to mitigate background traffic conditions. The analysis results are shown in Table 4.16. The improvements ensure the operation of the intersection is no worse compared to the background traffic scenario as it relates to the existing intersection form.

Figure 4.16

**Dawson Highway/Blain Drive/Herbertson Street –
Upgraded Layout**

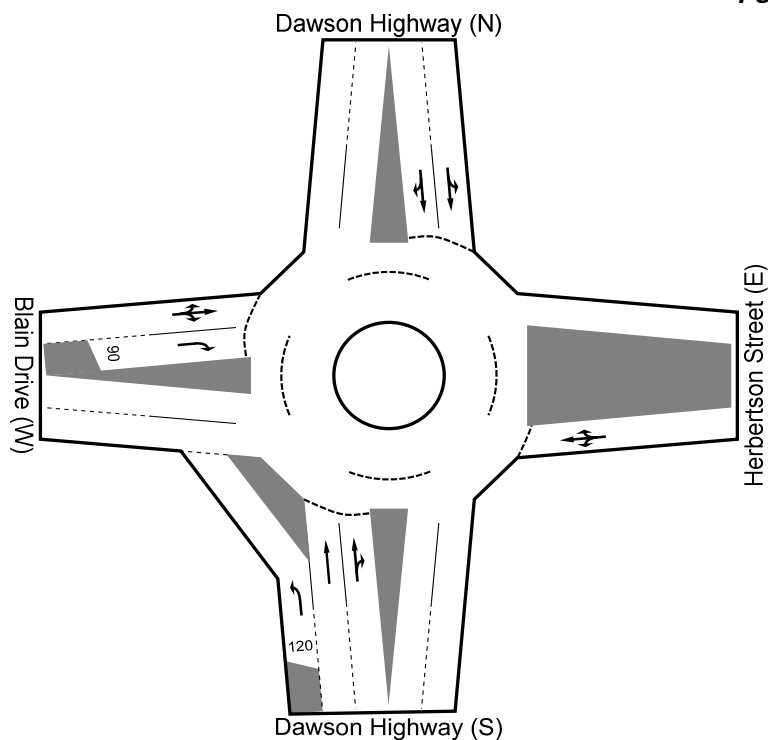


Table 4.16

**Dawson Highway/Blain Drive/Herbertson Street –
Upgraded SIDRA Results**

Upgraded Layout – Signalised								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2014	AM Early	0.76	6 sec	71 m	0.78	7 sec	80 m	-
	AM Late	0.30	5 sec	15 m	0.30	5 sec	15 m	-
	PM	0.72	9 sec	54 m	0.74	10 sec	57 m	-
2024	AM Early	0.84	7 sec	107 m	0.84	7 sec	107 m	-
	PM Early	0.42	5 sec	23 m	0.41	5 sec	23 m	-
	PM	1.01	31 sec	324 m	1.03	33 sec	342 m	-

4.4.10 Dawson Highway/Philip Street Intersection

The Dawson Highway/Philip Street intersection is an existing four-leg, two-lane roundabout with signals on the eastern and western legs that are triggered if there are long queues on the Dawson Highway. The intersection was tested as a roundabout as shown on Figure 4.17. The SIDRA analysis results for this intersection are shown in Table 4.17.

Figure 4.17

Dawson Highway/Philip Street – Existing Layout

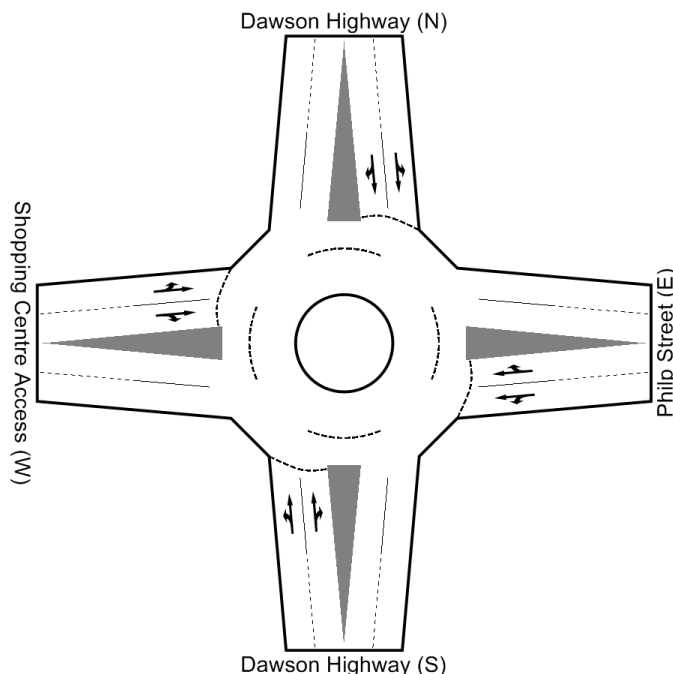


Table 4.17

Dawson Highway/Philip Street – SIDRA Results

Existing Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.74	12 sec	79 m	0.89	17 sec	146 m	-
	AM Late	0.94	16 sec	194 m	0.97	22 sec	276 m	-
	PM	1.17	192 sec	1389 m	1.29	306 sec	2582 m	-
2014	AM Early	0.76	13 sec	86 m	0.82	15 sec	109 m	-
	AM Late	1.00	30 sec	377 m	1.01	38 sec	460 m	-
	PM	1.22	225 sec	1838 m	1.27	271 sec	2327 m	-
2024	AM Early	1.00	41 sec	361 m	1.07	88 sec	795 m	-
	AM Late	1.45	441 sec	4550 m	1.47	460 sec	4724 m	-
	PM	1.69	633 sec	4753 m	1.76	691 sec	5232 m	-

The SIDRA analysis shows in its current form, this intersection will operate above its practical capacity in 2012 under the background traffic scenario. Discussions with DTMR indicate that resolution of background capacity issues is currently underway, with options such as full signalization of the intersection and a bypass road parallel to Dawson Highway being considered.

Because the planned upgrades to the intersection are not known, further testing of the intersection was not undertaken. Based on Table 4.17 above, the GLNG project traffic increases the DOS of the intersection by a maximum of 12%, which is in 2012. During the subsequent analysis years (2014 and 2024), the expected development traffic increases intersection DOS by only approximately 7%. The option of making a contribution to the intersection upgrade could be considered. The development traffic forms 5.5% of the combined background and development traffic in 2012.

4.4.11 Dawson Highway/Aerodrome Road Intersection

The Dawson Highway/Aerodrome Road intersection is an existing four-way signalised intersection, as shown on Figure 4.18. The results of SIDRA analysis for this intersection are shown in Table 4.18.

Figure 4.18

Dawson Highway/Aerodrome Road – Existing Layout

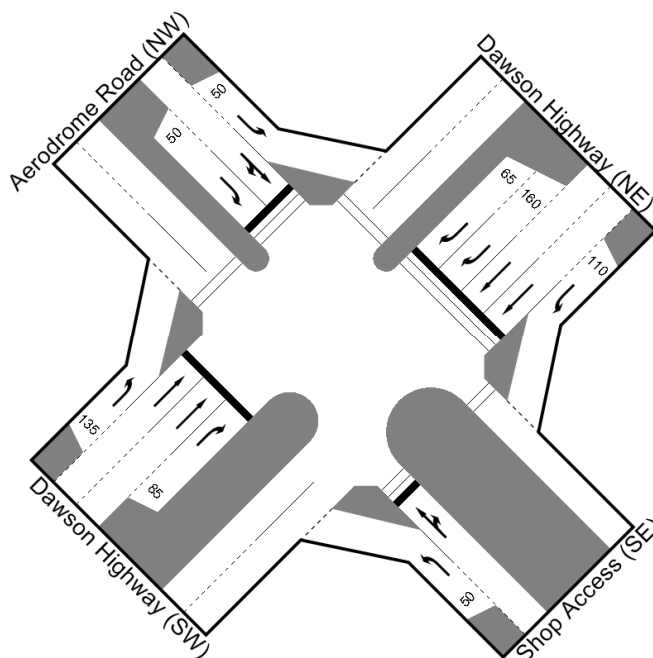


Table 4.18 Dawson Highway/Aerodrome Road – SIDRA Results

Existing Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.68	33 sec	101 m	0.88	45 sec	150 m	120 sec
	AM Late	1.00	63 sec	379 m	1.00	55 sec	357 m	120 sec
	PM	0.93	51 sec	231 m	1.00	64 sec	337 m	120 sec
2014	AM Early	0.56	33 sec	100 m	0.59	32 sec	108 m	120 sec
	AM Late	1.00	50 sec	325 m	1.00	54 sec	353 m	120 sec
	PM	1.00	67 sec	310 m	1.00	67 sec	329 m	120 sec
2024	AM Early	0.81	41 sec	142 m	0.85	43 sec	161 m	120 sec
	AM Late	1.10	101 sec	704 m	1.10	109 sec	756 m	120 sec
	PM	1.11	143 sec	858 m	1.14	166 sec	999 m	120 sec

The analysis shows that in its current form the Dawson Highway/Aerodrome Road intersection will operate above practical capacity in the 2012 AM late peak and PM peak periods under the background traffic scenario. Further review of Table 4.18 shows that the intersection operations with GLNG development traffic are almost identical to those for background traffic conditions.

For the intersection to operate with development traffic volumes below background traffic operation for the existing layout, the two right turn lanes from the Dawson Highway turning into Aerodrome Road have been extended and the left slip lane from Aerodrome Road has been extended within the SIDRA model. This upgraded layout and the SIDRA analysis of this upgraded intersection are shown below on Figure 4.19 and Table 4.19. In addition to physical upgrades to the intersection, in the 2024 late AM peak scenario the signal cycle length should be optimised (increased from 120 to 130 seconds). It is noted that this upgrade responsibility rests with DTMR as the development traffic has negligible impact and capacity constraints are due to background traffic.

Figure 4.19

Dawson Highway/Aerodrome Road – Upgraded Layout

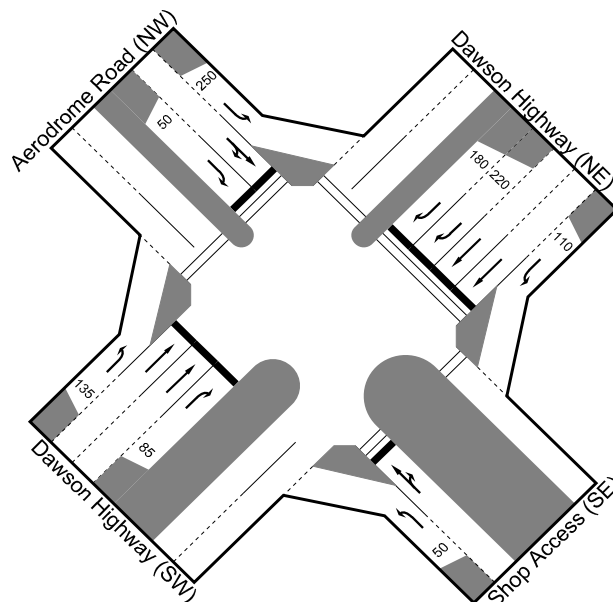


Table 4.19

Dawson Highway/Aerodrome Road – Upgraded SIDRA Results

Upgraded Signalised Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.38	27 sec	90 m	0.47	27 sec	110 m	120 sec
	AM Late	0.70	26 sec	167 m	0.70	30 sec	196 m	120 sec
	PM	0.66	33 sec	160 m	0.73	34 sec	187 m	120 sec
2014	AM Early	0.32	24 sec	83 m	0.34	24 sec	88 m	120 sec
	AM Late	0.69	28 sec	197 m	0.70	29 sec	198 m	120 sec
	PM	0.65	32 sec	163 m	0.67	32 sec	174 m	120 sec
2024	AM Early	0.43	26 sec	110 m	0.45	26 sec	116 m	120 sec
	AM Late	0.97	49 sec	400 m	1.00	54 sec	400 m	120 sec
	PM	0.83	38 sec	247 m	0.86	39 sec	268 m	120 sec

4.4.12 Bruce Highway/Dawson Highway Intersection

The Bruce Highway/Dawson Highway intersection is an existing four-way priority intersection, as shown on Figure 4.20. The SIDRA analysis results for this intersection are shown in Table 4.20.

Figure 4.20

Bruce Highway/Dawson Highway – Existing Layout

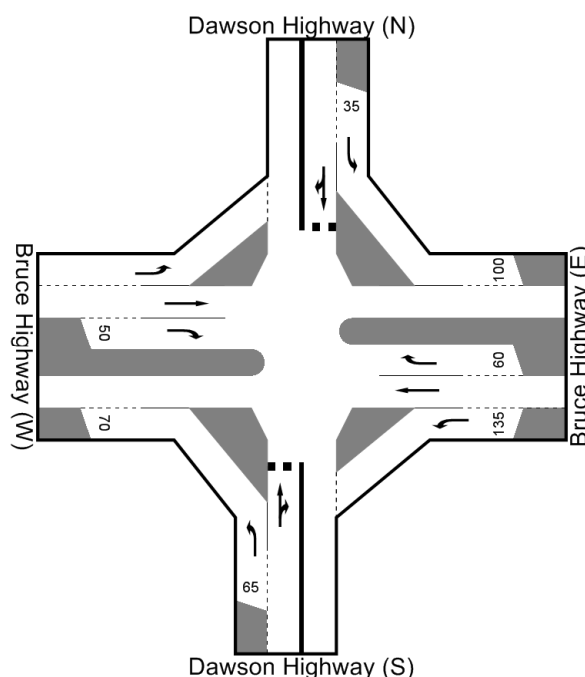


Table 4.20

Bruce Highway/Dawson Highway – SIDRA Results

Existing Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.91	16 sec	127 m	1.00	31 sec	248 m	-
	AM Late	1.85	683 sec	3149 m	1.90	734 sec	3345 m	-
	PM	0.55	10 sec	35 m	0.59	11 sec	40 m	-
2014	AM Early	1.02	38 sec	286 m	1.03	46 sec	335 m	-
	AM Late	2.13	907 sec	3905 m	2.15	923 sec	3951 m	-
	PM	0.62	11 sec	43 m	0.64	10 sec	46 m	-
2024	AM Early	1.95	651 sec	3087 m	1.98	673 sec	3175 m	-
	AM Late	4.74	3105 sec	8237 m	4.82	3127 sec	8270 m	-
	PM	1.02	43 sec	336 m	1.05	57 sec	421 m	-

The analysis shows that in its current form the Bruce Highway/Dawson Highway intersection will operate above its practical capacity in 2012 in both AM peak hours due to background traffic. The intersection is expected to operate over its practical capacity in all peak hours in 2024 due to background traffic. Therefore the capacity constraint at the Bruce Highway/Dawson Highway intersection is due to the anticipated levels of background traffic.

As a potential upgrading, a signalized layout has been assessed as shown on Figure 4.21 below and with results in Table 4.21. Review of Tables 4.22 and 4.23 shows that operations “with development” are almost identical to background conditions in 2014 and 2024. This demonstrates the relatively minor impact of GLNG traffic.

Figure 4.21

Bruce Highway/Dawson Highway – Upgraded Layout

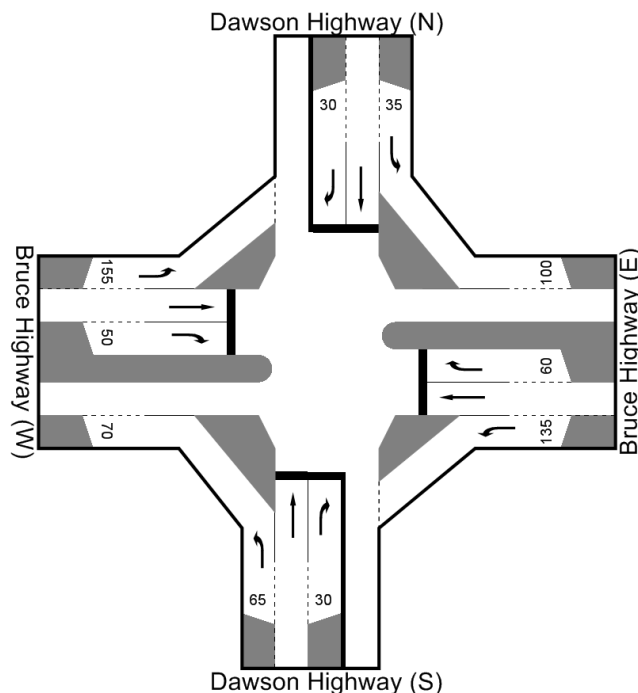


Table 4.21

Bruce Highway/Dawson Highway – Upgraded SIDRA Results

Upgraded Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.36	16 sec	78 m	0.37	17 sec	80 m	90 sec
	AM Late	0.53	17 sec	124 m	0.54	18 sec	126 m	90 sec
	PM	0.25	16 sec	53 m	0.26	16 sec	55 m	90 sec
2014	AM Early	0.39	17 sec	84 m	0.39	17 sec	85 m	90 sec
	AM Late	0.58	18 sec	137 m	0.58	18 sec	138 m	90 sec
	PM	0.27	16 sec	57 m	0.28	16 sec	59 m	90 sec
2024	AM Early	0.55	18 sec	123 m	0.55	18 sec	126 m	90 sec
	AM Late	0.82	22 sec	253 m	0.82	22 sec	255 m	90 sec
	PM	0.38	16 sec	83 m	0.39	16 sec	84 m	90 sec

DTMR has recently stated it has future plans to upgrade this intersection to mitigate the existing capacity constraints. However, at present DTMR has made no consideration of the form of upgrade has been made for the upgrade. Due to the significant capacity constraints, it is expected that any such upgrading would create adequate spare capacity for future operations including the addition of the proposed GLNG traffic.

Any future upgrade is expected to create adequate spare capacity for future operations, including the addition of the proposed GLNG Project trips. The analysis shows that the need for the works is driven by background growth with no impact discernable for the GLNG Project.

4.4.13 Bruce Highway/Calliope River Road Intersection

The Bruce Highway/Calliope River Road intersection is an existing three-way priority intersection, as shown on Figure 4.22. The SIDRA analysis results for this intersection are shown in Table 4.22. This intersection was found to operate adequately in its current form.

Figure 4.22

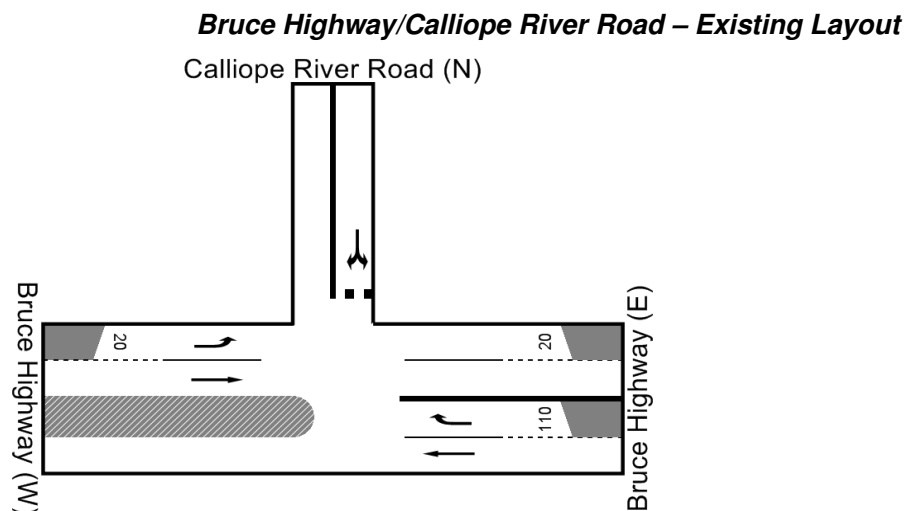


Table 4.22 Bruce Highway/Calliope River Road Intersection – SIDRA Results

Existing Layout								
Year	Period	Background			With Development			Cycle Time
		DOS	Delay	Queue	DOS	Delay	Queue	
2012	AM Early	0.06	4 sec	2 m	0.06	4 sec	2 m	-
	AM Late	0.07	1 sec	1 m	0.07	1 sec	1 m	-
	PM	0.07	3 sec	3 m	0.07	3 sec	2 m	-
2014	AM Early	0.07	4 sec	2 m	0.06	4 sec	2 m	-
	AM Late	0.08	1 sec	1 m	0.08	1 sec	1 m	-
	PM	0.08	3 sec	3 m	0.09	3 sec	3 m	-
2024	AM Early	0.08	4 sec	3 m	0.09	4 sec	3 m	-
	AM Late	0.11	1 sec	2 m	0.11	1 sec	2 m	-
	PM	0.11	2 sec	3 m	0.11	3 sec	4 m	-

4.5 Project Mitigation Summary

Table 4.23 summarises the intersection analysis and any works required to mitigate development impacts for the “Port Alma” option. It is noted that the proposed mitigations are identical to those required for the supplementary base case option except for potential contribution percentages at Dawson Highway/Philip Street and Dawson Highway/Don Young intersections due to the varying traffic volumes from the supplementary base case. This is due to the majority of relocated truck movements to Port Alma occurring prior to the worst case assessment years and that the LNG facility construction has the dominant effect on intersection impacts.

Table 4.23

Intersection Analysis Summary

Intersection	Existing Layout	Upgrade Year Background Traffic	Upgrade Year Development Traffic	Upgrade Treatment
Gladstone - Mount Larcom Rd/Calliope River Rd/Targinie Rd	Four -way channelised priority intersection	-	2024	GLNG upgrades: <ul style="list-style-type: none"> Short left slip lane on south leg (Calliope River Road)
Gladstone - Mount Larcom Rd/Hanson Rd/Landing Rd	Three-way channelised priority intersection	-	2024	GLNG upgrades: <ul style="list-style-type: none"> Upgrade to a single lane roundabout
Hanson Rd/Red Rover Rd	Two-lane roundabout	By 2012	By 2012	GLNG upgrades: <ul style="list-style-type: none"> Short right turn lane on west leg of Hanson Road Short right turn lane on south leg (Red Rover Road) Additional circulating width <p><i>Note:</i> Duplication of Hanson Road is being planned by DTMR. In lieu of the GLNG Project implementing the upgrading works identified above, the option of making a contribution to the intersection upgrade could be considered. Development traffic forms 1.2% of the combined background and development traffic in 2012. This would allow intersection improvements to be incorporated into the four lane upgrading works.</p>
Hanson Rd/Blain Dr/Alf O'Rourke Dr	Single-lane roundabout	By 2012	By 2012	GLNG upgrades: <ul style="list-style-type: none"> Short right-turn lane on west leg (Hanson Road) and additional circulating width Continuous left-turn lane from south leg (Blain Drive) <p><i>Note:</i> Duplication of Hanson Road is being planned by DTMR. In lieu of the GLNG Project implementing the upgrading works identified above, the option of making a contribution to the intersection upgrade could be considered. The development traffic forms 0.9% of the combined background and development traffic in 2012. This would allow intersection improvements to be incorporated into the four lane upgrading works.</p>
Bruce Hwy/Gladstone - Mount Larcom Rd	Three-way channelised priority intersection	-	-	No GLNG contribution is anticipated. The existing form has sufficient capacity for all scenarios.
Glenlyon Rd/Railway Street/Port Access Rd	Four-way signalised intersection	-	-	No GLNG contribution is anticipated. The existing form has sufficient capacity for all scenarios.
Dawson Hwy/Glenlyon Rd/Bramston St	Four-way signalised intersection	By 2012	By 2012	No GLNG contribution is anticipated. The intersection exceeds practical capacity with background traffic but the development does not make the intersection operation significantly worse. Programmed improvements at this intersection have been identified in the RIP for 2009/2010 (\$100,000). DTMR advise that these works will include phasing changes and lane marking changes to improve operation of the traffic signals.
Dawson Hwy/Don Young Dr	Three-way channelised priority intersection	By 2024	By 2024	GLNG contribution is anticipated. <ul style="list-style-type: none"> Short left slip lanes to/from Dawson Highway <p>The intersection exceeds practical capacity with background traffic in 2024 but the development does not make the intersection operation significantly worse. Due to Council planning for grade separation, the option of making a contribution to the intersection upgrade could be considered. The development traffic forms 4.6% of the combined background and development traffic in 2024. This would allow intersection improvements to be incorporated into the four lane upgrading works.</p>
Dawson Hwy/Blain Dr/Herbertson St	Two-lane roundabout	By 2012	By 2012	GLNG upgrades: <ul style="list-style-type: none"> Short left slip lane on southern leg (Dawson Highway) Pavement marking of left lane on western leg to allow all turn movements <p>The improvements ensure the operation of the intersection is no worse compared to the background traffic scenario with the existing intersection form.</p>
Dawson Hwy/Philip St	Two-lane roundabout	By 2012	By 2012	GLNG contribution to intersection upgrade based on use by development traffic. Intersection exceeds practical capacity with background traffic. Development traffic creates further impact. DTMR are planning upgrade works and the option of making a contribution to the intersection upgrade could be considered. The development traffic forms 5.5% of the combined background and development traffic in 2012.
Dawson Highway/Aerodrome Rd	Four-way signalised intersection	By 2012	By 2012	No GLNG contribution is anticipated. The intersection exceeds practical capacity with background traffic but the development does not make the intersection operation significantly worse.
Bruce Hwy/Dawson Hwy	Four-way channelised priority intersection	By 2012	By 2012	No GLNG contribution is anticipated. The intersection exceeds practical capacity with background traffic but the development does not make the intersection operation any worse.
Bruce Hwy/Calliope River Rd	Three-way channelised priority intersection	-	-	No GLNG contribution is anticipated. The existing form has sufficient capacity for all scenarios.

5.0 ROADWAY LINK CAPACITY IMPACT ASSESSMENT

Roadway link capacity analysis has been undertaken for the “No Bridge” option to provide a basis of comparison to the roadway link capacity impacts of the supplementary base case scenario. The analysis for the “No Bridge” option is necessary to determine the difference from the supplementary base case of the road impacts with no bridge construction traffic and the re-routing of personnel and delivery trips destined to Curtis Island.

5.1 Background Traffic Volumes

Refer to the Section 7.1 of the March 2009 “GLNG Environmental Impact Statement – Traffic Report”. The projected “background” and “background plus development” traffic volumes are included at Appendix D3.

5.2 Development Traffic Impacts

A review of the background plus development volumes revealed that no additional roadway segments reach the capacity threshold because of the GLNG Project traffic. Further detailed examination of the critical road sections was carried out to determine if the capacity breakpoint was reached earlier due to addition of GLNG development traffic. This exercise serves to determine the “bring forward” cost responsibility of the proposed development on segments it significantly impacts.

Table 5.1 below indicates, for the road segments that reach capacity, the years when the capacity threshold is reached under “background” as well as “background plus development” traffic. The volumes at the years of failure are also included along with the number of years the proposed development brings forward the need for road upgrades compared to background traffic.

Bring forward cost contributions are recommended on any section where the development creates the need to bring forward upgrades by one year or more, as outlined in the DTMR Guidelines for Assessment of Road Impacts of Development. Based on Table 5.1, the GLNG Project is responsible for a contribution to the bring forward cost of two sections (approximately 6km) of Gladstone-Mount Larcom Road.

5.3 Project Mitigation Summary

To mitigate the impact of the GLNG Project on mid-block capacity, it is recommended that the GLNG Project pay an appropriate portion of the bring forward cost of the upgrading from two to four lanes of the following sections of road:

- Gladstone-Mount Larcom Road from Red Rover Road to Power Station (approximately 1.0km) – bring forward 1.2 years from 2025 to 2024;
- Gladstone-Mount Larcom Road from Power Station to Reid Road (approximately 5.0km) – bring forward 1.2 years from 2025 to 2024.

This cost of the upgrade works is unknown but if the construction costs were to be discounted back from 2025 and 2024 at an inflation rate of 7% (specified by DTMR), the GLNG Project could expect to pay the cost difference of approximately 1.9% of the total cost. DTMR has started the planning work to duplicate Gladstone-Mount Larcom Road to four lanes and negotiation with DTMR regarding the timing of the planned upgrade (not currently in the RIP) and the GLNG Project contribution is recommended.

The roadway link capacity impacts of the “Port Alma” option presented above are on the same road sections found in the supplementary base case assessment.

Table 5.1

Midblock Capacity Breakpoints

Road	Section	Background Traffic		Background + Development Traffic		Bring Forward Amount (years)
		Volume	Year	Volume	Year	
Dawson Highway (46A)	Blain Drive to Philip Street	36,360	2029	36,360	2029	0
Dawson Highway (46A)	Philip Street to Penda Avenue	37,154	2018	36,664	2017	0.6
Dawson Highway (46A)	Penda Avenue to Chapman Drive	36,323	2025	36,025	2024	0.7
Dawson Highway (46A)	Harvey Road to Bruce Highway	15,147	2034	15,232	2034	0
Dawson Highway (46A)	Tognalini - Baldwin Road to Biloela	15,074	2026	15,078	2026	0
Gladstone - Mt Larcom Road	Hilderbrand Street to Blain Drive	18,268	2034	18,043	2033	0.4
Gladstone - Mt Larcom Road	Blain Drive to Red Rover Road	18,403	2022	18,046	2021	0.2
Gladstone - Mt Larcom Road	Red Rover Road to Power Station	18,338	2025	18,456	2024	1.2
Gladstone - Mt Larcom Road	Power Station to Reid Road	18,338	2025	18,456	2024	1.2
Bruce Highway	Burnett Highway to Capricorn Highway	15,250	2032	15,250	2032	0
Gladstone – Bernaraby Road	Dawson Highway to Sun Valley Road	36,504	2029	36,504	2029	0
Gladstone – Bernaraby Road	French Street to Gen Eden Drive	15,431	2019	15,431	2019	0
Gladstone – Bernaraby Road	Glen Eden Drive to South Trees Drive	15,431	2019	15,431	2019	0
Gladstone – Bernaraby Road	South Trees Drive to Boyne Island Road	15,431	2019	15,431	2019	0
Warrego Highway	Ruthven Street to Peachy Street	36,939	2019	36,972	2019	0
Warrego Highway	Peachy Street to Fifth Avenue	36,144	2023	36,184	2023	0
Warrego Highway	Fifth Avenue to Higgins Street	18,565	2011	18,670	2011	0
Warrego Highway	Higgins Street to Park Street	18,263	2026	18,281	2026	0
Warrego Highway	Park Street to Airport	18,322	2012	18,375	2012	0
Warrego Highway	Airport to Troys Road	18,425	2021	18,003	2020	0.1
Warrego Highway	Troys Road to Oakey Biddeston Road	18,026	2022	18,059	2022	0
Warrego Highway	Dalby Cecil Plains Road to Cunningham Street	15,028	2032	15,035	2032	0
Warrego Highway	Cunningham Street to Rail Line	15,389	2027	15,407	2027	0
Capricorn Highway	Bruce Highway to Gavial Gracemere Road	15,358	2009	15,389	2009	0

6.0 PAVEMENT IMPACT ASSESSMENT

Refer to the Section 8.0 of the March 2009 “GLNG Environmental Impact Statement – Traffic Report”.

6.1 Pavement Rehabilitation Requirements

The impact on pavement rehabilitation considers the existing and terminal roughness deficiency. Utilising an existing pavement roughness count, the year at which a pavement reaches its terminal roughness is then calculated. A pavement roughness increase of three counts per annum has also been adopted, with a terminal roughness of 110 counts for the Bruce Highway and 120 counts utilised for other State Controlled roads.

The cumulative number of ESAs loaded onto the roadway segment to the terminal year is then calculated based on the ESA loading along the haulage routes. The background volumes are based on classified AADT volumes with a cumulative heavy vehicle growth rate of 3% per annum. For the Bruce Highway a value of 2.9 ESAs for each heavy vehicle is applied. For all other state controlled roads 3.2 ESAs for each heavy vehicle are used. These ESAs are as specified by DTMR.

The classified development heavy vehicle volume is then used to determine additional annual ESA loadings produced along the haulage routes as a result of development traffic added to the network. The annual background and development ESA loading is combined and the cumulative number of ESAs on a given link is then calculated for successive years.

The year when cumulative ESA loading reaches terminal roughness is compared between without development and with development scenarios and the difference in time between the two scenarios is then established.

Detailed results for the pavement impact analysis are provided at Appendix D4

Contributions towards pavement rehabilitation would be made only where the development would bring forward the need for rehabilitation by more than one year. The road sections that meet this criterion are shown in Table 6.1 below.

Of the road sections found to warrant bring forward cost contributions by the GLNG Project, one was identified in the RIP to have scheduled rehabilitation prior to the planned development bring forward date, negating the need for GLNG contributions. Thus the following road section was not included in Table 6.1:

- Carnarvon Highway – Injune to Fairview CSG field access (25km): Widening and reconstruction scheduled in RIP for 2007-2013 (currently underway).

Three road segments on the Carnarvon Highway and nine road segments on the Dawson Highway have been identified as requiring pavement rehabilitation works one or more years earlier with the GLNG project than with background traffic. In addition to these road sections the length of Bajool-Port Alma Road requires pavement rehabilitation works one or more years earlier.

The “% of total cost” column shown in the table below represents the percentage of the total rehabilitation work costs (in 2009 \$) that the developer is responsible for. Cost input data for rehabilitation of roads has been provided by DTMR Central Region and includes costs of rehabilitation based on road seal width and cost inflation and discount rate of 7% per annum. Based on these inputs, the brought forward cost of the required works is approximately \$5.02M (2009 \$).

6.2 Road Maintenance Requirements

The obligations for the maintenance of the state controlled road network impacted upon by the proposed development have been calculated by dividing the number of development ESAs loaded onto a particular roadway segment by the background ESAs for an analysis year. This has been reported as a percentage for each link and each year of the development from 2010 until 2034 in the detailed assessment.

A five percent (5%) significance criterion has been adopted for the assessment based on DTMR guidelines. This warrant is triggered in the assessment period for a number of the links. Based on these triggered criteria and using the DTMR given information for annual maintenance costs and inflation (7% per annum) in calculating the net present value, the cost of maintaining the roads impacted by the proposed development is \$17,412,100 at a 2009 dollar value.

In terms of a cost per heavy vehicle trip generated by the various components of the GLNG Project, based on the estimated 3,426,727 heavy vehicle trips generated over the life of the project, the cost will be approximately \$5.08 per vehicle trip. As a cost per heavy vehicle kilometre travelled, the cost will be \$0.064 per vehicle kilometre travelled.

Table 6.1

Road Rehabilitation Impacts – GLNG Project Contribution Estimates

Road	Section	Direction	Length (km)	Rehabilitation Year		Bring Forward Amount (years)	% of Total Cost	Bring Forward Cost Contribution
				Without Development	With Development			
Dawson Highway 46 C	Moura Township to CH.30	Westbound (G)	11.0	2020.0	2018.7	6.5%	9	\$120,744
Dawson Highway 46 C	CH.41 to District Boundary	Westbound (G)	4.0	2018.7	2017.4	6.5%	9	\$43,907
Carnarvon Highway 24D	CH. 33m to CH.73 (Roma)	Northbound (G)	40.0	2017.0	2015.3	8.5%	8	\$506,046
Carnarvon Highway 24D		Southbound (A)	40.0	2017.0	2015.4	8.0%	8	\$476,278
Carnarvon Highway 24D	CH. 3m to CH. 18 Roma - Taroom Road	Northbound (G)	15.0	2016.7	2015.5	6.0%	9	\$151,985
Carnarvon Highway 24D		Southbound (A)	15.0	2016.7	2015.5	6.0%	9	\$151,985
Carnarvon Highway 24D	Roma - Taroom Road to Injune	Northbound (G)	72.0	2018.7	2016.8	9.5%	9	\$1,155,090
Carnarvon Highway 24D		Southbound (A)	72.0	2018.7	2016.9	9.0%	9	\$1,094,295
Dawson Highway 46 C	Boundary to Fitzroy Development 85A Intersection	Westbound (G)	6.6	2024.7	2023.1	8.0%	9	\$89,165
Dawson Highway 46 C	Fitzroy Dev. 85A Intersection to Duaringa/Woorabinda Intersection	Westbound (G)	6.2	2019.3	2016.7	13.0%	9	\$136,111
Dawson Highway 46 C	Duaringa/Woorabinda Intersection to Woorabinda/Duaringa Intersection	Westbound (G)	7.2	2021.7	2020.2	7.5%	9	\$91,191
Dawson Highway 46 C	Woorabinda/Duaringa to 46C/85B Intersection	Westbound (G)	8.2	2020.3	2018.8	7.5%	9	\$103,857
Dawson Highway 46 C	46C/85B Intersection to Prospect Creek Culvert	Westbound (G)	9.2	2025.7	2024.1	8.0%	9	\$124,290
Dawson Highway 46 C	Prospect Creek Culvert to Duaringa/Bauhinia Intersection	Westbound (G)	40.0	2028.9	2027.4	7.5%	8	\$446,511
Dawson Highway 46 C	Duaringa/Bauhinia Intersection to KM 137.5	Westbound (G)	11.2	2020.5	2019.1	7.0%	6	\$87,516
Bajool-Port Alma Road	End Point to Bruce Highway	Westbound (A)	25.2	2015.9	2014.2	8.5%	6	\$239,486
TOTAL								\$5,018,459

6.3 Project Mitigation Summary

The analysis of the pavement impact of the development on the state controlled road network indicates that the GLNG Project will increase the maintenance costs for a number of sections of road for a number of scenario years tested. Table 6.2 below shows the additional maintenance and rehabilitation costs. Negotiation of the developer's contribution towards these works will be required.

Table 6.2

Pavement Impact Costs

Component Cost	Amount (2009 \$)
Pavement Rehabilitation Cost	\$5,018,500
Pavement Maintenance Cost	\$17,412,100
Total Developer Pavement Impact Cost	\$22,430,600

The pavement rehabilitation impacts and developer contributions for the “Port Alma” option is identical to that found for the supplementary base case scenario. This is because the road segments found to need rehabilitation are in the western portions of the project study area, where only the gas transmission pipeline and CSG fields contribute to the development traffic added to the roads. These two components do not change for the “Port Alma” option.

The pavement maintenance costs for the “Port Alma” option are approximately \$278,700 higher than for the supplementary base case scenario. This increase is mostly due to the impacts caused on the Bajool Port Alma Road. This is addressed further in Section 6.4.

6.4 Bajool-Port Alma Road Condition

Bajool-Port Alma Road is a 100km/h two way two lane road approximately 40km in length. It is currently used by the salt industry and for movement of explosives and fuel (it is a designated haulage route for Dangerous Goods).

Significant sections of the road are sub-standard, in terms of pavement condition (with tight curves and narrow pavement widths), such that it would be expected to fail with an increase in heavy vehicles.

Therefore, the road is in need of significant maintenance and upgrading for its existing uses, and with the addition of GLNG traffic would require further substantial upgrading also. Such works would be required to avoid failure (and subsequent closure) of the Dangerous Goods haulage route.

7.0 SUMMARY AND CONCLUSIONS

This document is an appendix report to the “GLNG Supplementary Environmental Impact Statement – Traffic Report,” submitted by Cardno Eppell Olsen (CEO) in October 2009 which is presented as the “supplementary base case” assessment for the traffic impacts of the GLNG Project.

This appendix report provides the assessment of an alternative to the supplementary base case scenario, which assumes material for the construction of the gas transmission pipeline and for the construction of the CSG field works at Arcadia and half of Fairview will come into Port Alma instead of Gladstone. This alternative assessed assumes that pipe and other materials will be moved through Port Alma in order to reduce vehicle trips on the road network within Gladstone. The assumption made is that pipe will be transported by road from Port Alma north along the Bruce Highway, west along the Capricorn Highway and then south along the Leichhardt Highway before heading west on the Dawson Highway from Banana. This alternative is known in this document as the “Port Alma” option.

This document presents only the information relevant to changes in methodology and analysis inputs necessary to determine the traffic impacts of using Port Alma for transport of materials for the gas transmission pipeline and northern CSG fields. Traffic generation estimates are only provided for the gas transmission pipeline and northern CSG fields, as it is the only GLNG Project components affected by the option assessment. All other information for the trip generation of the southern components of the CSG fields, LNG facility and access road, and bridge to Curtis Island are presented in the supplementary base case traffic report. Thus, this report is not intended as a stand-alone document and should be used and interpreted in combination with the CEO supplementary base case report “GLNG Supplementary Environmental Impact Statement – Traffic Report”.

7.1 Development Proposal

The GLNG Project includes construction and operations of the proposed CSG field expansions in the Surat and Bowen Basins (Roma and surrounds), a proposed LNG liquefaction and export facility (LNG facility) on Curtis Island approximately 5km northwest of Gladstone, and a proposed 435km gas transmission pipeline linking the CSG fields to the LNG facility.

All aspects of the development proposal and project staging remain unchanged from the supplementary base case scenario in this “Port Alma” option assessment, except for the following construction deliveries made to Port Alma (rather than RG Tanna in the supplementary base case), and trucked to site:

- pipeline and materials for the gas transmission alignment;
- pipeline and materials for the Arcadia CSG field;
- pipeline and materials (50%) for the Fairview CSG field.

7.2 Development Traffic

Traffic generation has been based on estimated material quantities for construction works and assumptions about delivery frequency. Trips associated with construction and operations equipment and workforce have also been estimated. Assumptions about the origin and destination of trips have been made including allowances for the establishment of workers accommodation.

All assumptions for the traffic generation under the “Port Alma” option are documented in Section 2 of this report, and all other project components remain unchanged from the supplementary base case scenario. A summary of the total road trips associated with each component over the life of the project is shown in Table 7.1. The “Port Alma” option results in the same number of trips generated in the base scenario.

Table 7.1

Total GLNG Trips

Component	Estimated Total Trips (all years)
CSG fields	6,681,150
Gas Transmission Pipeline	572,350
LNG liquefaction and export facility (including bridge and dredge material site)	3,691,100
TOTAL	10,944,600

7.3 Impact Mitigation – All Components

To mitigate the impact of the GLNG Project on the state controlled and local government road networks under the “Port Alma” option a number works and upgrading contributions are recommended. These requirements are summarised below and intersection and midblock capacity upgrades for the Gladstone area are summarised on Figure 13.3 in the “GLNG Supplementary Environmental Impact Statement – Traffic Report”.

7.3.1 Gladstone Intersections

To mitigate the impact of the development on intersections within Gladstone, it is recommended that the developer contribute to upgrades at the following intersections:

Gladstone-Mt Larcom Road/Calliope River Road/Targinie Road

The following works are recommended:

- short left slip lane on southern leg (Calliope River Road).

This mitigation ensures that the intersection operates acceptably in both the background traffic scenario and the “with development” scenario at all peak periods.

Gladstone-Mt Larcom Road/Landing Road/Hanson Road

The intersection of Gladstone-Mt Larcom Road/Landing Road/Hanson Road operates above practical capacity due to development traffic. Modifying the intersection from a priority intersection to a single lane roundabout enables the intersection to operate adequately for all scenarios tested.

Hanson Road/Red Rover Road intersection

The following works are recommended to mitigate background capacity constraints of the intersection through 2024:

- addition of a right-turn lane on the western approach of Hanson Road and additional circulating lane to accommodate the movement; and
- a short right turn lane on the southern leg (Red Rover Road).

Duplication of Hanson Road is being planned by DTMR. In lieu of the developer implementing the upgrading works identified above, the option of making a contribution to the intersection upgrade could be considered. The development traffic forms 1.2% of the combined background and development traffic in 2012. This would allow intersection improvements to be incorporated into the four lane upgrading works.

Hanson Road/Blain Drive/Alf O’Rourke Drive intersection

The following works are recommended:

- continuous left-turn lane from the south approach (Blain Drive); and
- right-turn lane on the western approach and additional circulating lane to accommodate the movement.

Duplication of Hanson Road is being planned by DTMR. In lieu of the developer implementing the upgrading works identified above, the option of making a contribution to the intersection upgrade could be considered. The development traffic forms 0.9% of the combined background and development traffic in 2012. This would allow intersection improvements to be incorporated into the four lane upgrading works.

Dawson Highway/Blain Drive/Herbertson Street

The following works are recommended:

- short left slip lane on southern leg of Dawson Highway; and
- pavement marking of left lane on western leg to allow all turn movements.

The improvements ensure the operation of the intersection is no worse compared to the background traffic scenario as it relates to the existing intersection form.

An intersection upgrading concept has been developed, however there is no currently available concepts from DTMR to determine compatibility. The cost of the GLNG proposed upgrade is approximately \$240,000.

Dawson Highway/Philip Street

The intersection exceeds its practical capacity with background traffic alone and the addition of development traffic worsens the impacts further. DTMR are planning upgrade works and the option of making a contribution to the intersection upgrade could be considered. The development traffic forms 5.5% of the combined background and development traffic in 2012.

Dawson Highway/Don Young Drive

The following works are recommended for the intersection to operate:

- short left slip lane on western leg (Don Young Drive).

As Gladstone Regional Council is planning a form of grade separation at this intersection for the Kirkwood Road project (to align with Don Young Drive), the performance of the intersection is likely to be far superior to that of the current layout. However, there is no timing proposed for this work. It is proposed that the option of making a contribution to the short left slip lane upgrade could be considered. The development traffic forms 4.6% of the combined background and development traffic in 2024.

7.3.2 Mid-block Capacity

To mitigate the impact of the development on mid-block capacity under the “No Bridge” option, it is recommended that the developer pay an appropriate portion of the brought forward cost of the upgrading from two to four lanes of the sections of road summarised in Table 7.2.

Table 7.2 GLNG Roadway Link Upgrades – “No Bridge” Option

Road	Section	Upgrade	Bring Forward (years)	% Developer Contribution (% 2009 Cost)
Gladstone-Mount Larcom Road	Red Rover Road to Power Station (1.0 km)	2 to 4 lanes	1.2 yrs	1.9%
	Power Station to Reid Road (5.0 km)	2 to 4 lanes	1.2 yrs	1.9%

The cost of the upgrade works is unknown but if the construction costs were to be discounted back from the upgrade year to 2009 at an inflation rate of 7% (specified by DTMR), the developer could expect to contribute the percentage shown in Table 7.2 as a percent of the net present construction cost (2009 \$) of the upgrade.

7.3.3 Pavement Impacts

Pavement Rehabilitation

Two road segments on the Carnarvon Highway, one road segment on the Warrego Highway and one road segment on the Dawson Highway have been identified as requiring pavement rehabilitation works one or more years earlier with the GLNG Project than with background traffic. The brought forward cost of the required works is approximately \$5.02M based on pavement rehabilitation rates supplied by DTMR.

Road Maintenance

The obligations for the maintenance of the state controlled road network impacted upon by the development have been calculated by dividing the number of development ESAs loaded onto a particular link by the background ESAs for an analysis year. The additional cost of maintaining the roads impacted by the proposed development is \$17,412,100 at a 2009 dollar value. Negotiation of the developer’s contribution towards these works will be required.

Bajool-Port Alma Road Condition

Significant sections of the approximately 40km Bajool-Port Alma Road pavement are in a poor condition, and have tight curves and narrow pavement widths. The analysis of the existing pavement indicates that an increase in heavy vehicle movements would cause the pavement to fail.

Maintaining the Dangerous Goods haulage route of the Bajool-Port Alma Road is of primary concern to DTMR both regarding traffic volumes and protecting the condition of the road. For Port Alma to be considered, significant and timely upgrading works would be required for significant sections to allow additional traffic in conjunction with the significant maintenance already required due to existing background traffic.

7.4 Final Conclusion

The “Port Alma” option results in the same number of trips compared to the supplementary base case scenario. The quantitative impacts of the “Port Alma” option for the GLNG Project have been found to be comparable to those found for the supplementary base case assessment of the GLNG Project, with the following notable comments:

- intersection impacts and mitigations within Gladstone are equivalent to those in the supplementary base case. This is due to the majority of relocated truck movements to Port Alma occurring prior to the worst case assessment years. Although there are some reductions in traffic volumes these have not been significant enough to reduce the mitigation requirements proposed for the supplementary base case;
- there is only an additional 31,807 vehicle-km compared to the supplementary base case option. This is due to the distances between the CSG fields and the Gladstone and Port Alma ports being very similar;
- roadway segment capacity improvements for the “Port Alma” option are for the same sections as in supplementary base case; and
- pavement impacts for pavement rehabilitation are \$239,500 more than the supplementary base case. Road maintenance costs are approximately \$39,200 more for the “Port Alma” option. The main reason for this \$278,700 increase in cost is due to the requirements of the Bajool-Port Alma Road. The upgrades proposed by the developer would remove the pavement rehabilitation requirements of this road section.

Appendix D1

Project Trip Generation and Distribution Summary

Transportation and Traffic Specialists

Level 11 Green Square North Tower
515 St Paul's Terrace
Locked Bag 4006 Fortitude Valley
Queensland 4006 Australia
Telephone: 07 3310 2401
Facsimile: 07 3369 9722
Email: transportqld@cardno.com.au
www.cardno.com.au/eo

Our Ref: CE005780: MG

Date: 16 November 2009

DESIGN NOTE

**GLNG PROJECT SUPPLEMENTARY ENVIRONMENTAL IMPACT STATEMENT – TRAFFIC REPORT
APPENDIX D2 – PEAK HOUR VOLUMES FOR INTERSECTION ASSESSMENT SCENARIOS**

This design note replaces the information provided at Appendix D2. Due to the size of Appendix D2 it was removed. If this information is required it is available upon request.

Appendix D2 Information

This appendix is similar to Appendix G of the March 2009 “GLNG Environmental Impact Statement – Traffic Report” by Cardno Eppell Olsen. The basis of the information in this appendix is to show the following:

- trip generation assumptions and requirements for the intersection analysis of the GLNG Project;
- trip distribution assumptions and requirements for the intersection analysis of the GLNG Project.

This appendix contains all information relevant to determining how the intersection operation would occur for the GLNG Project for the “Port Alma” option, taking into account the various components of the project.

Appendix D3

Midblock Assessment Volumes

Transportation and Traffic Specialists

Level 11 Green Square North Tower
515 St Paul's Terrace
Locked Bag 4006 Fortitude Valley
Queensland 4006 Australia
Telephone: 07 3310 2401
Facsimile: 07 3369 9722
Email: transportqld@cardno.com.au
www.cardno.com.au/eo

Our Ref: CE005780: MG

Date: 16 November 2009

DESIGN NOTE

GLNG PROJECT SUPPLEMENTARY ENVIRONMENTAL IMPACT STATEMENT – TRAFFIC REPORT

APPENDIX D3 – MIDBLOCK ASSESSMENT VOLUMES

This design note replaces the information provided at Appendix D3. Due to the size of Appendix D3 it was removed. If this information is required it is available upon request.

Appendix D3 Information

This appendix is similar to Appendix H of the March 2009 “GLNG Environmental Impact Statement – Traffic Report” by Cardno Eppell Olsen. The basis of the information in this appendix is to show the trip distribution assumptions and requirements for the midblock analysis of the GLNG Project for the “No Bridge” option. The analysis process involved tasks such as:

- determine development and background volumes;
- determine distribution for the various components of the GLNG Project;
- determine background and development volumes on the road links;
- analyse volumes to determine link volumes compared to road capacities;
- determine road upgrades required;
- determine developer contributions required.

This appendix contains all information relevant to how the midblock assessment has been undertaken for the “Port Alma” option of the GLNG Project, taking into account the various components of the project.

Appendix D4

Pavement Impact Assessment Summary

Transportation and Traffic Specialists

Level 11 Green Square North Tower
515 St Paul's Terrace
Locked Bag 4006 Fortitude Valley
Queensland 4006 Australia
Telephone: 07 3310 2401
Facsimile: 07 3369 9722
Email: transportqld@cardno.com.au
www.cardno.com.au/eo

Our Ref: CE005780: MG

Date: 16 November 2009

DESIGN NOTE

GLNG PROJECT SUPPLEMENTARY ENVIRONMENTAL IMPACT STATEMENT – TRAFFIC REPORT

APPENDIX D4 – PAVEMENT IMPACT ASSESSMENT SUMMARY

This design note replaces the information provided at Appendix D4. Due to the size of Appendix D4 it was removed. If this information is required it is available upon request.

Appendix D4 Information

This appendix is similar to Appendix I of the March 2009 “GLNG Environmental Impact Statement – Traffic Report” by Cardno Eppell Olsen. The basis of the information in this appendix is to show the trip distribution assumptions and requirements for the pavement impact analysis of the GLNG Project for the “No Bridge” option. The analysis process involved tasks such as:

- determine development and background heavy vehicle volumes;
- determine distribution of heavy vehicle for the various components of the GLNG Project;
- determine background and development heavy vehicle volumes on the road links;
- analyse heavy vehicle volumes to determine ESA's;
- determine pavement rehabilitation costs;
- determine pavement maintenance costs.

This appendix contains all information relevant to how the pavement impact assessment has been undertaken for the “Port Alma” option of the GLNG Project, taking into account the various components of the project.

Appendix E Laydown Area Site Photographs

Plate 6-1 General View of Laydown Area within Lot 96



Plate 6-2 View of Laydown Area with Discarded Construction Material Stockpiled in Background



Plate 6-3 **General View of Site with Larger Trees on the Boundary**



Plate 6-4 **Example of Discarded Construction Material on Site**



Appendix E

Plate 6-5 **Dam on South Western Corner of Laydown Area**



Plate 6-6 **General View of Dam on the Site**





URS Australia Pty Ltd
Level 16, 240 Queen Street
Brisbane, QLD 4000
GPO Box 302, QLD 4001
Australia

T: 61 7 3243 2111

F: 61 7 3243 2199

www.ap.urscorp.com