15 SHIPPING TRANSPORT

15.1 INTRODUCTION

This chapter describes the proposed shipping activities associated with the Queensland Curtis LNG (QCLNG) Project through both the construction and operation phases. It addresses shipping activities within the bounds of the Port of Gladstone, and also discusses proposed shipping of LNG through Australian territorial waters outside the Port of Gladstone, focussing primarily on transit through the Great Barrier Reef Marine Park (GBRMP).

This chapter assesses existing shipping activities, describes in detail shipping activities proposed by the Project, and discusses potential impacts on existing shipping.

Potential impacts of Project shipping, which have been assessed in other chapters of this volume include:

- marine ecology both within the Port of Gladstone and within the GBRMP (assessed in Volume 5, Chapter 8)
- air quality within the Gladstone region (assessed in Volume 5, Chapter 12)
- noise in the Gladstone region (assessed in Volume 5, Chapter 13)

Detailed assessment of hazard and risk issues associated with liquefied natural gas (LNG) and propane shipping is provided in *Volume 5, Chapter 18*, addressing:

- transit through the GBRMP
- transit through the Port of Gladstone
- unloading of LNG /unloading of propane.

The Project environmental objective for shipping transport is: to ensure that Project shipping does not impact on ecological health, public amenity or safety of those who use or are in proximity to waterways utilised by Project shipping or live near these services.

15.2 DESCRIPTION OF EXISTING SHIPPING ACTIVITIES

In order to assess potential impacts arising from Project shipping activities, a comparison with existing shipping activities and waterway usage is required. A summary of existing shipping activities is provided below, for the following waters:

1. the Port of Gladstone
2. the GBRMP
3. shipping routes within the Torres Strait, to the north of the GBRMP within Australian Territorial waters.

15.2.1 Port of Gladstone

The Port of Gladstone (the Port) is located on the central Queensland coast, 525 km of Brisbane and just south of the Tropic of Capricorn at

- latitude of 23°49.61′S
- longitude 151°34.6′E[1].

The Port forms an integral part of the city of Gladstone, with the Port under the control of the Gladstone Ports Corporation (GPC), a Government Owned Corporation under the *Government Owned Corporation Act 1993* (Qld).

For further detail on the location and setting of the Port refer to *Volume 5, Chapter 8*. Tidal ranges, current velocities and water depths (bathymetry included in *Volume 5, Figure 5.8.4*) are also discussed in *Volume 5, Chapter 8* and proposed changes to existing channel configurations are described in *Volume 6*.

15.2.1.1 Current Shipping Activity and Projected Growth

Commercial Shipping

The Port of Gladstone is Queensland's largest multi-commodity port and houses the worlds 4th largest coal export terminal[2]. It has grown steadily and continues to capitalise on its key assets of:

a. sheltered location, which reduces downtime for shipping operations

b. proximity to regions of natural resources – principally coal and ore

c. deep water.[3]

Cargo handled through the Port totalled 76.5 million tonnes in the 2007-08 financial year, with import cargoes accounting for 21 per cent and export for 79 per cent of the tonnage handled[4]. A breakdown of throughput by industry, as outlined in the GPC 2007-08 Annual Report, is shown in *Figure 5.15.1*. Cargoes from the Port were exported to a total of 36 countries, including Australia, in the 2008 calendar year[5].

1 Port of Gladstone Port Information Handbook 2008 http://www.cqpa.com.au/Pages/Publications/PortInfoBook/Port%20Information%20Handbook%202008.pdf

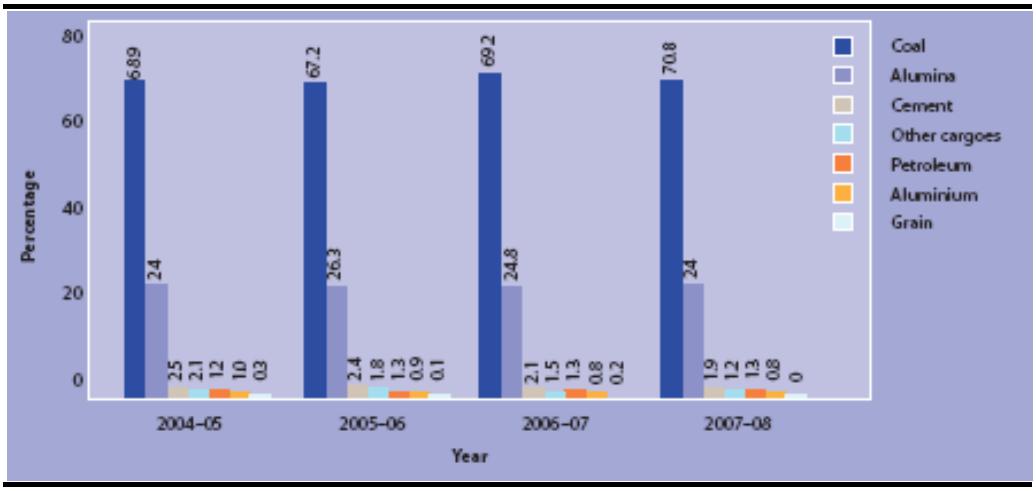
2 Gladstone Ports Corporation: Annual Report 2007-08 http://www.gpcl.com.au/pdf/AnnualReports/GPC%20Annual%20Report%202007-08%20WEB.pdf

3 Drennan, Captain T, 2008. *Queensland LNG: Marine Site Selection Study* (unpublished report for BG International Limited by Eagle Lyon Pope Port and Marine Consultants, Report No ELP-55327-0408-57288-Rev 1, 18 April 2008)

4 Gladstone Ports Corporation: Annual Report 2007-08

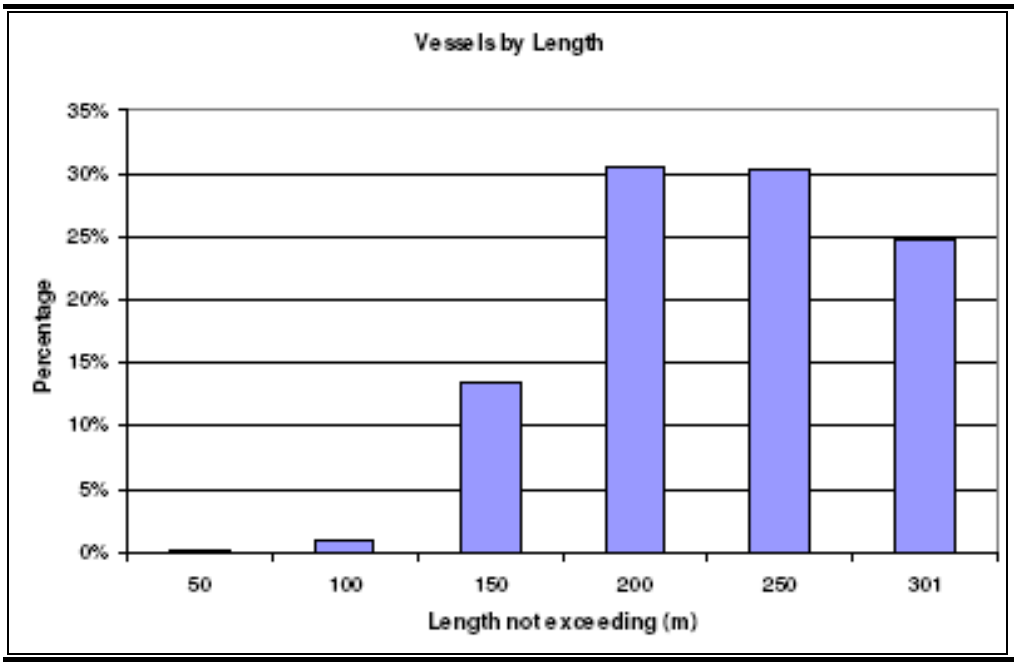
5 Gladstone Port Corporation Cargo Statistics Selections (accessed March 2009): http://www.cqpa.com.au/viewcontent/ShippingStatistics/CargoComparisonsSelection.aspx

Figure 5.15.1 Port of Gladstone Throughput by Industry



The Port of Gladstone can accommodate vessels up to 220,000 deadweight tonnes (DWT)[6]. A summary of typical ship sizes utilising the Port is provided in *Figure 5.15.2* and *Figure 5.15.3*[7]. This indicates that approximately 55 per cent of Gladstone commercial vessels have an overall vessel length of greater than 200 m and approximately 60 per cent exceed 10 m draught.

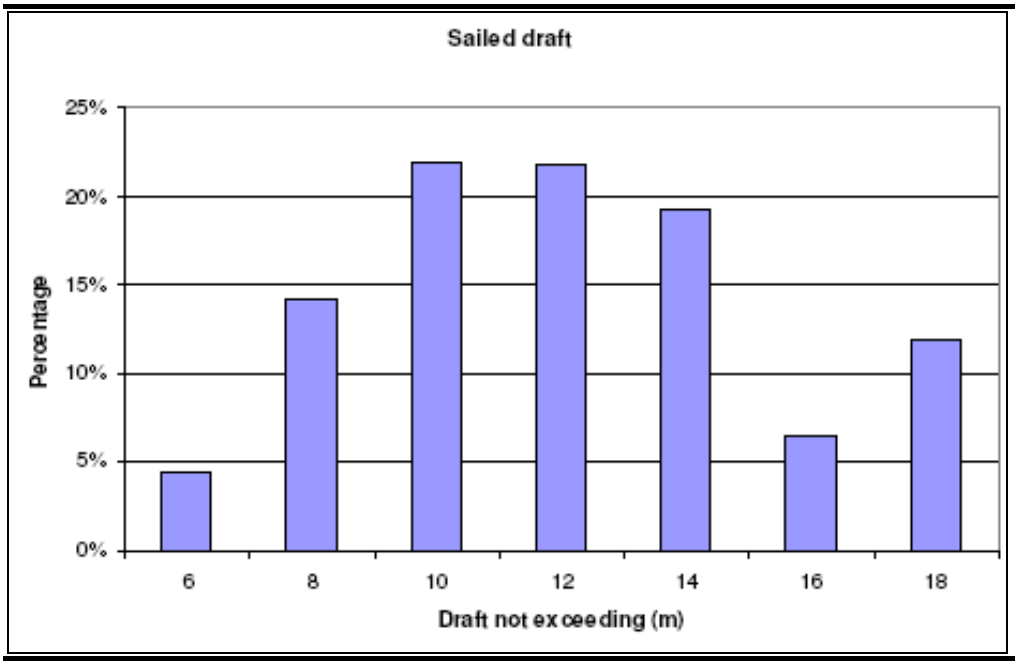
Figure 5.15.2 Distribution of Gladstone Shipping by Vessel Length Overall (LOA)



6 Gladstone Ports Corporation: Annual Report 2007-08

7 Based on data provided by GPC, as reported in Drennan, Captain T, 2008. *Queensland LNG: Marine Site Selection Study* (unpublished report for BG International Limited by Eagle Lyon Pope Port and Marine Consultants, Report No ELP-55327-0408-57288-Rev 1, 18 April 2008)

Figure 5.15.3 Distribution of Gladstone Shipping By Sailed Draft



Cargoes shipped through Gladstone have increased from 60 million tonnes in 2004 to 78.8 million tonnes in the 2008 calendar year (imports plus exports), with total vessels (imports plus exports) increasing from 1130 (2004) to 1470 (2008)[8] shown in *Table 5.15.1* and *Figure 5.15.4*.

While the trend is for increasing cargo tonnage and vessels over time, current volumes are far short of the planned Port capacity of 300 million tonnes of export capacity per year within the next 50 years[9]

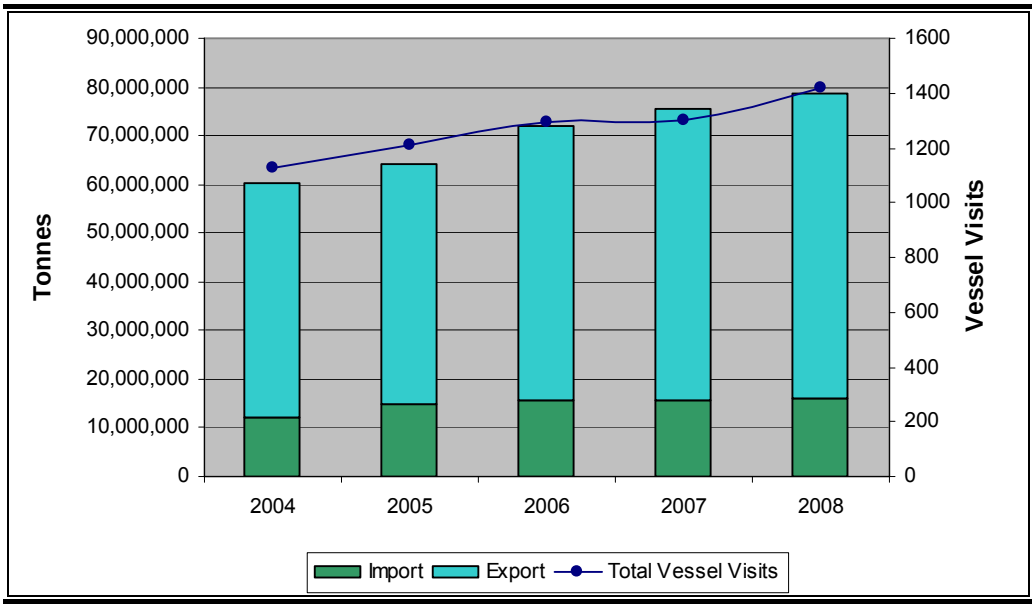
Table 5.15.1 Gladstone Shipped Cargo Tonnages, 2004 – 2008

	Cargo (Tonnes)			Vessels		
Year	**Import**	**Export**	**Total**	**Import**	**Export**	**Total**
2004	12,031,80	48,246,721	**60,278,523**	302	828	**1130**
2005	15,024,756	49,327,321	**64,352,077**	360	847	**1207**
2006	15,562,546	56,454,607	**72,017,153**	391	900	**1291**
2007	15,666,227	59,734,696	**75,400,923**	392	911	**1303**
2008	16,189,653	62,611,295	**78,800,948**	437	980	**1417**

8 Table based on data sourced from Gladstone Port Corporation Cargo Statistics Selections (accessed March 2009): http://www.cqpa.com.au/viewcontent/ShippingStatistics/CargoComparisonsSelection.aspx

9 Gladstone Ports Corporation Port of Gladstone 50 Year Strategic Plan (Update 2008): http://www.gpcl.com.au/pdf/final_low_cmm5087gpcl_50_year_strategic.pdf

Figure 5.15.4 Gladstone Shipped Tonnages and Vessel Visit, 2004-2008



As outlined in *Volume 2, Chapter 13,* frequency of LNG vessels will vary subject to the mix of vessels being used as well as the degree of spiking of LNG. However, indicatively approximately 60 LNG vessels per year will be loaded per operational LNG process train, for approximately 180 vessels per year once three trains are operating.

Pilotage, Vessel Traffic Services and Towage

The Port of Gladstone currently operates a Vessel Traffic Service (VTS) which regulates shipping movements within the Port and allocates the berthing priority, pilot bookings, tug requirements, etc. All vessels over 20 m in length are required to report to the Gladstone VTS when navigating within the Port[10]. This operates on a constant basis with oversight of the Port and approaches by means of:[11]

- Automatic Identification System (AIS) to identify and provide information on vessels approaching the port
- radar (via single radar station located on Gatcombe Head)
- Closed circuit television (CCTV) on Auckland Point which can be panned and zoomed to provide coverage of shipping in channels adjacent to the main Port berths.

Pilotage in Gladstone is provided by the port pilotage department of Maritime Safety Queensland (MSQ). There are currently 20 pilots on the Gladstone roster (including the pilotage manager) of which seven are available at any given time. All pilots have a captains' certificate and have regularly undertaken simulation training at the Australian Maritime College (AMC) either for skills maintenance and development or for examining the feasibility of proposed new port developments.[12]

10 Hutchison, R, 2008. *Gladstone Port LNG Ship Transit Risk Assessment.* unpublished report by Lloyds Register for NG LNG Services Ltd,

11 Drennan, Captain T, 2008. *Queensland LNG: Marine Site Selection Study* (unpublished report for BG International Limited by Eagle Lyon Pope Port and Marine Consultants,

12 Drennan, Captain T, 2008. *Queensland LNG: Marine Site Selection Study* (unpublished report for BG International Limited by Eagle Lyon Pope Port and Marine Consultants,

Pilots typically board vessels at the Fairway Buoy as shown in *Figure 5.15.12* for transit through the outer harbour, with an additional pilot (or pilots) to board within the harbour as required. The pilots have requested that two pilots board LNG vessels at the Fairway Buoy. This practice will be reviewed with industry after the first six months of operations.

The QCLNG Project has been working with the Gladstone Harbour Master and pilots in several areas, including cooperating on shipping simulations of LNG vessels in the harbour, as a key component of planning for LNG shipping within the Port.

Port towage is provided by a commercial supplier under licence from GPC, with towage licences renewed approximately every seven years by competitive tender. Currently five tugs are maintained in the Port with bollard pull ratings as follows:[13]

- 2 x 46 tonne bollard pull
- 3 x 62 tonne bollard pull.

As described in *Volume 2, Chapter 13* of this EIS, it is suggested that four tugs will be required per LNG ship associated with the Project, including:

- two 62 tonne or equivalent capacity (sourced from existing tug fleet or as replaced by existing capacity)
- two 80 tonne bollard pull tugs, required in addition to the existing tug fleet (three 80 tonne tugs to be in place, with one spare tug to allow for downtime/maintenance).

The two 80 tonnes tugs will be escort tugs from the Fairway Buoy to the Gatcombe Channel. Shipping simulations indicate that escort tugs are not required to transit the harbour channels, but they will be used to assist the ship in the event of engine or rudder failure.

Bunkering

Gladstone is a bunkering port both for ships calling to load or discharge cargo, and for ships calling solely for bunkering. Bunkering is currently undertaken by a commercial contractor operating a self-propelled bunker barge. Bunker transfers take place at the vessels' berth, at the South Tree Anchorage, or at the outer anchorage.[14]

Emergency response capacity

MSQ has ownership of two key emergency response plans for the Port, including:

- a Marine Emergency Response Plan which provides procedures regarding collision, grounding, etc)
- an Oil Spill Response Plan.

13 Port of Gladstone Port Information Handbook 2008

14 ibid

Recreational Boating

In addition to commercial shipping described above, there are approximately 13,000 marine licenses and 6,890 recreational vessels registered in Gladstone. The Gladstone Sailing Club has approximately 200 sailing members and between 6,000 and 7,000 social members. The Harbour, Auckland Creek, The Narrows and Graham Creek are popular areas for boating, sailing and fishing, with The Narrows and Graham Creek traditionally popular safe harbours for smaller private sailing vessels during storms and cyclones.

15.2.2 Great Barrier Reef

Shipping Routes

Major shipping routes within the GBRMP can be divided into an Inner and Outer Route, with a number of additional channels connecting these. These are described by the Australian Maritime Safety Authority as follows:

"*The inner route extends north-south between the GBR and the Queensland coast from Torres Strait to Gladstone in the south. The northern section from Torres Strait to Cairns is most restricted and passage through these waters involves navigation within confined waters for a long period, normally 40 hours. The inner route is well charted and marked with navigational aids.*

The outer route commences at the eastern limit of the Torres Strait (the Great North East Channel), continuing southwards through the Coral Sea and rejoining the Queensland coast near Sandy Cape, south of Gladstone. The outer route was surveyed and charted to international standards in 1997, encouraging a greater number of vessels, particularly oil tankers, to use the outer route."[15]

Following consultation with MSQ, QGC has decided that BG Group-operated LNG shipping associated with the Project will use the outer route only for westbound cargoes and ships returning in ballast from Western Ports. Shipping destined for northern Asia ports will avoid the Torres Strait, transiting the Coral Sea and Western Pacific. Some shipping may cross the Pacific Ocean bound for the Americas.

The anticipated QCLNG Project LNG shipping route starts from the Gladstone Fairway Buoy to the outer route via the Capricorn Channel or Curtis Channel Entrance, then along the outer route toward Torres Strait and then traverses the Torres Strait. The total length of the route, from Sandy Cape (north of Brisbane) to the western approaches to the Torres Strait (Booby Island) is approximately 1,344 nautical miles[16]. Key features relating to ship transit are provided below.

Entrance to the outer route from the Fairway Buoy is via either of two routes: (i) proceeding north (red line in *Figure 5.15.5* and then east (dark green line in *Figure 5.15.5*) through the Capricorn Channel or (ii) proceeding south (dark blue line in *Figure 5.15.5*) through the Curtis Channel.

North of the GBRMP the vessels will transit Torres Strait between Cape York and Papua New Guinea. This is an important international shipping lane and

15 Great Barrier Reef Review Steering Committee, July 2001. *Review of Ship Safety and Pollution Prevention Measures in the Great Barrier Reef*.

16 Lloyds Register, (2009) *Transit Risk Study for LNG and LPG Ships Passing Through Water in and Near the Great Barrier Reef.*

contains more than 100 islands and numerous coral cays, exposed sand banks and reefs. The narrowest point in Torres Strait between Cape York and Papua New Guinea is approximately 150 km wide.

Owing to significant cyclonic activities, high currents, high tidal fluctuations, high shipping traffic (including seasonal fishing activities) and environmental and culturally sensitive nature of the area, there is compulsory pilotage, compulsory reporting and a high degree of navigational control along this portion of the route[17]. The Torres Strait Pilotage Area is shown in *Figure 5.15.6.*

Management of Shipping within the Great Barrier Reef Marine Park

A discussion on the management of shipping within the GBRMP, including key agencies, governing legislation (including applicable international conventions), and specific shipping management measures, is included in *Volume 5, Chapter 8* of this EIS.

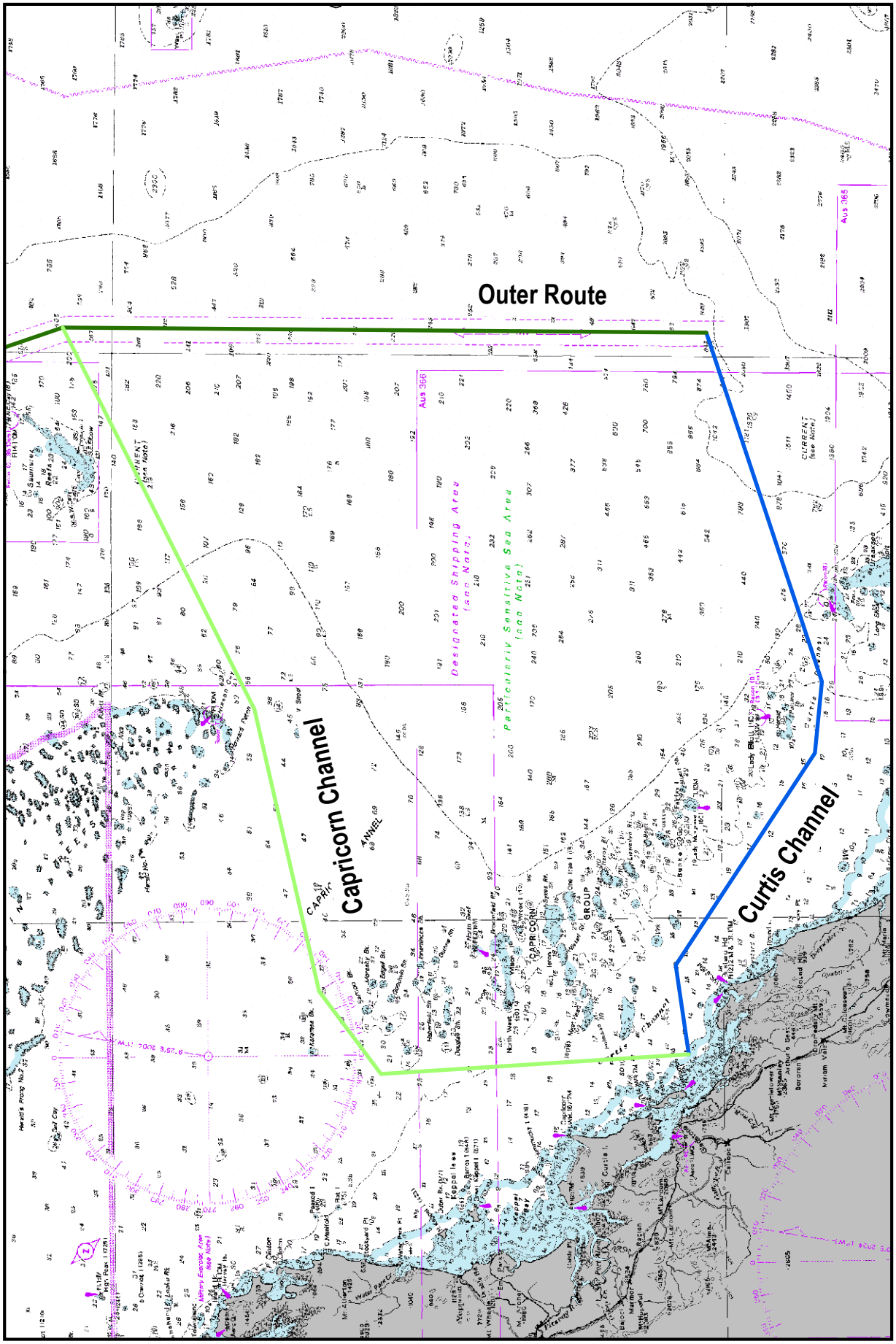
When transiting the GBRMP, ships may only navigate within the designated shipping area and the general use zone (note that under the *Great Barrier Reef Marine Park Zoning Plan 2003,* LNG carriers are classified as "ships", regardless of length).

The designated shipping area has been placed to minimise the impact on the shipping industry while having regard for Australia's international obligations. It takes into account past and forecast vessel usage patterns in the inner and outer shipping routes, existing recommended tracks and proposed new routes[18]. The designated shipping area as specified by the Great Barrier Reef Marine Park Authority (GBRMP) is shown in *Figure 5.15.7*[19].

17 ibid

18 ibid

19 Sourced from Great Barrier Reef Marine Park Authority



QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: Proposed Shipping Routes outside of Port of Gladstone
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: KP	Volume 5 Figure 5.15.5	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not to be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved: DS	File No: 0086165b_EIS_ST_GIS005_F5.15.5	
	Date: 17.06.09	Revision: 0	

Figure 5.15.6 Torres Strait Shipping Channels

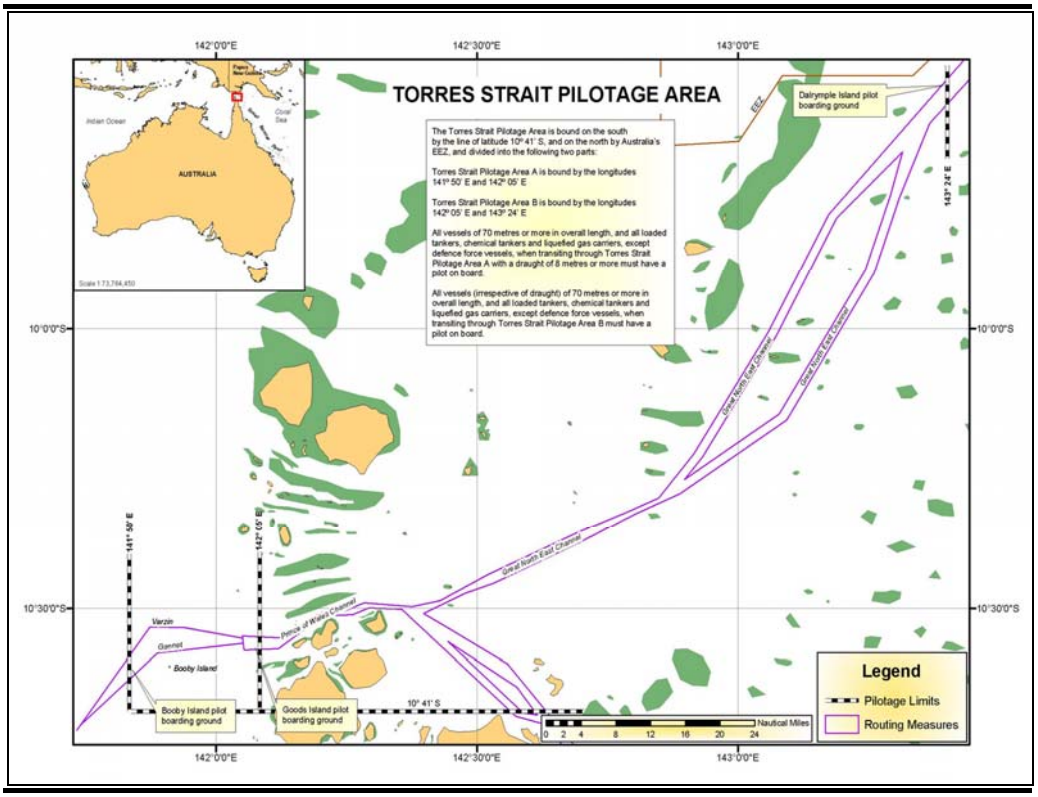
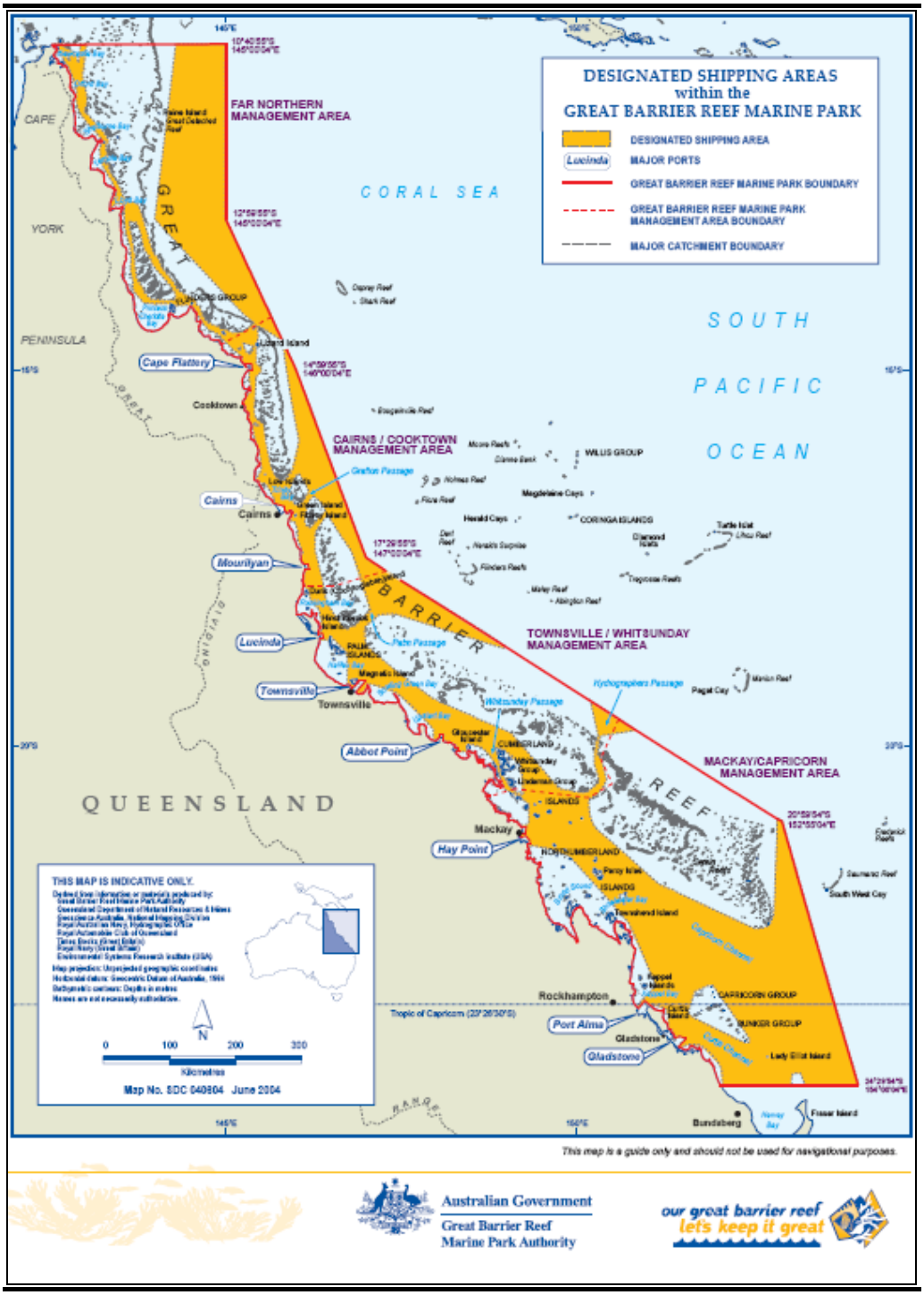


Figure 5.15.7 Designated Shipping Area within the Great Barrier Reef Marine Park



Current Shipping Activities in the Great Barrier Reef

There is significant shipping traffic in the GBR and Torres Strait areas. A summary of the approximate numbers of different types of ships/vessels that ply these areas is provided in *Table 5.15.2*[20].

20 Table derived from data provided by Great Barrier Reef Shipping Review Steering Committee (2001), "*Review of Ship Safety and Pollution Prevention Measures in the Barrier Reef*" and *Great Barrier Reef & Torres Strait Shipping Impact Study*, as summarised in Lloyds Register, 2009. *Transit Risk Study for LNG and LPG Ships Passing Through Water in and Near the Great Barrier Reef.*

Table 5.15.2 Shipping Trends in GBR and Torres Strait

Ship/Vessel Type	Description of Activity	No. of Movements Per Year
Bulk carriers	Carrying coal, bauxite, nickel ores, raw sugar, alumina, silica sand	2,520
Oil tankers	Refined oil products	600
Containers	Carrying containers	1,440
General cargo ships	Carrying general cargo	1,320
Other large ships	Various	120
Tourism vessels	Tourism	1,500
Commercial and recreational fishing vessels	Fishing and commerce	25,000

Most movements of large ships (bulk carriers, tankers, containers general cargo ships and others) listed in *Table 5.15.2* are via the inner route. Only a fraction of these ships use the outer route. The actual distribution of the number of ships that use the outer route and the portion from Gladstone Fairway Buoy to the outer route is uncertain.

As described by Lloyds Register[21], recent studies[22, 23] on ship transit in the GBR have identified a number of incidents, mainly collision and groundings. These incidents have also been reported in incident databases of the Australian Transportation Safety Board (ASTB) from 1982 to December 2008. On the basis of these studies and databases, Lloyds Register has prepared a summary of incidents for the GBR, Torres Strait and outer route/coral sea areas for the period from 1985 to 2008, provided in *Table 5.15.3*.

Table 5.15.3 Summary of incidents in the GBR and Torres Strait – 1985-2008

Type of Incident	Area		
	GBR	Torres Strait	Outer Route/ Coral Sea
Collision	16	-	-
Grounding	12	9	1
Other	-	2*	2**
Total Incidents	28	10	4
*1 equipment failure; 1 founder:			
**1 cargo shift; 1 man overboard			

It is noted that the majority of incidents occurring in the GBR take place in the inner route.

21 Lloyds Register, 2009. *Transit Risk Study for LNG and LPG Ships Passing Through Water in and Near the Great Barrier Reef.*

22 Great Barrier Reef Shipping Review Steering Committee (2001), "*Review of Ship Safety and Pollution Prevention Measures in the Barrier Reef*"

23 Queensland Transport and Great Barrier Reef Marine Park Authority "*Oil Spill Risk Assessment for the Coastal Waters of Queensland and The Great Barrier Reef Marine Park*", Brisbane, Australia, August 2000

15.3 PROJECT SHIPPING ACTIVITIES

15.3.1 Construction

Shipping activities associated with construction relate to:

- transfer of personnel and equipment between Gladstone and the LNG Facility site on Curtis Island, staging out of Auckland Point. Details of the proposed activities and transport infrastructure are included in the LNG Facility Construction Description provided in *Volume 2, Chapter 13*. Indicative numbers of personnel ferries and personnel ferry journeys (by month) are reproduced from *Volume 2, Chapter 13* in *Figure 5.15.8* for easy reference.
- delivery of plant, materials and equipment to the LNG Facility site on Curtis Island, is through a combination of barges shipping directly to the Materials Offloading Facility (MOF) on Curtis Island and by transfer across Gladstone Harbour from the Auckland Point staging facility. Detailed breakdown of cargoes proposed is provided in *Volume 2, Chapter 13*. Indicative numbers of cargo deliveries to the MOF (by month) throughout the construction phase are reproduced from *Volume 2, Chapter 13* in *Figure 5.15.9* for easy reference.

15.3.1.1 *Quarantine and Customs*

Proposed quarantine and customs arrangements associated with construction activities are described in *Volume 2, Chapter 13.*

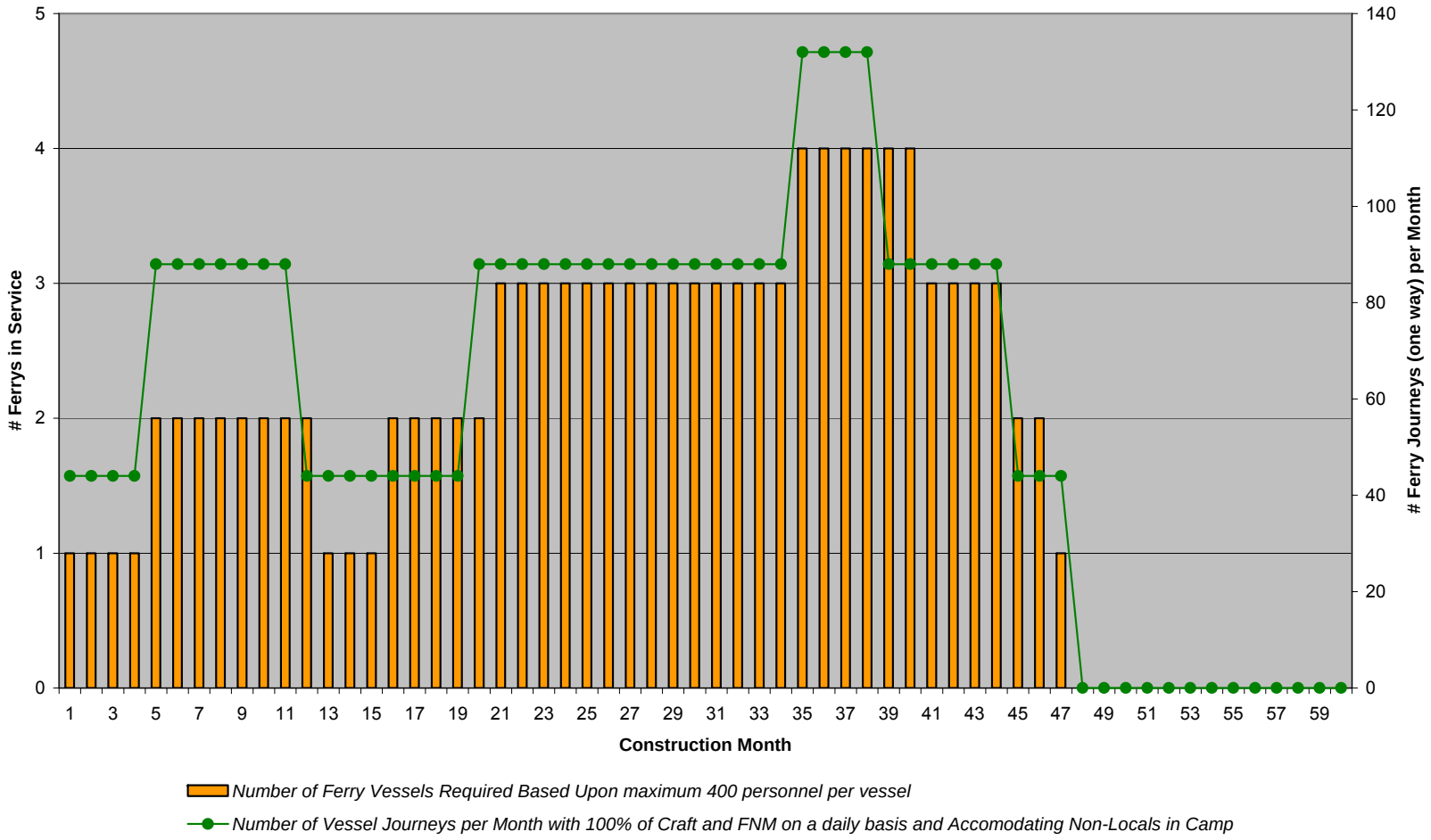
15.3.1.2 *Vessel Acceptance Standards*

Personnel ferries used within the Port of Gladstone will comply with the BG Group Offshore Marine Assurance Standard[24]. This requires the following minimum activities to be undertaken:

- **Vessel acceptance standard:** prior to approval for use in a QGC activity, all vessels employed in marine activity, whether contracted or sub-contracted, will be inspected according to the International Marine Contractors Association (IMCA) ”Common Marine Inspection Document”. This inspection will be performed by a suitably qualified inspector from an approved marine contractor or the BG Group Global LNG Shipping (GLS) Offshore Marine Assurance Superintendent. Vessels that have undergone an IMCA Common Marine Inspection within the previous 12 months will not require another prior to being accepted providing that:
  - the latest inspection report is available for review
  - any “high” risk observations have been closed out
  - an inspection is undertaken on the anniversary of the last inspection.

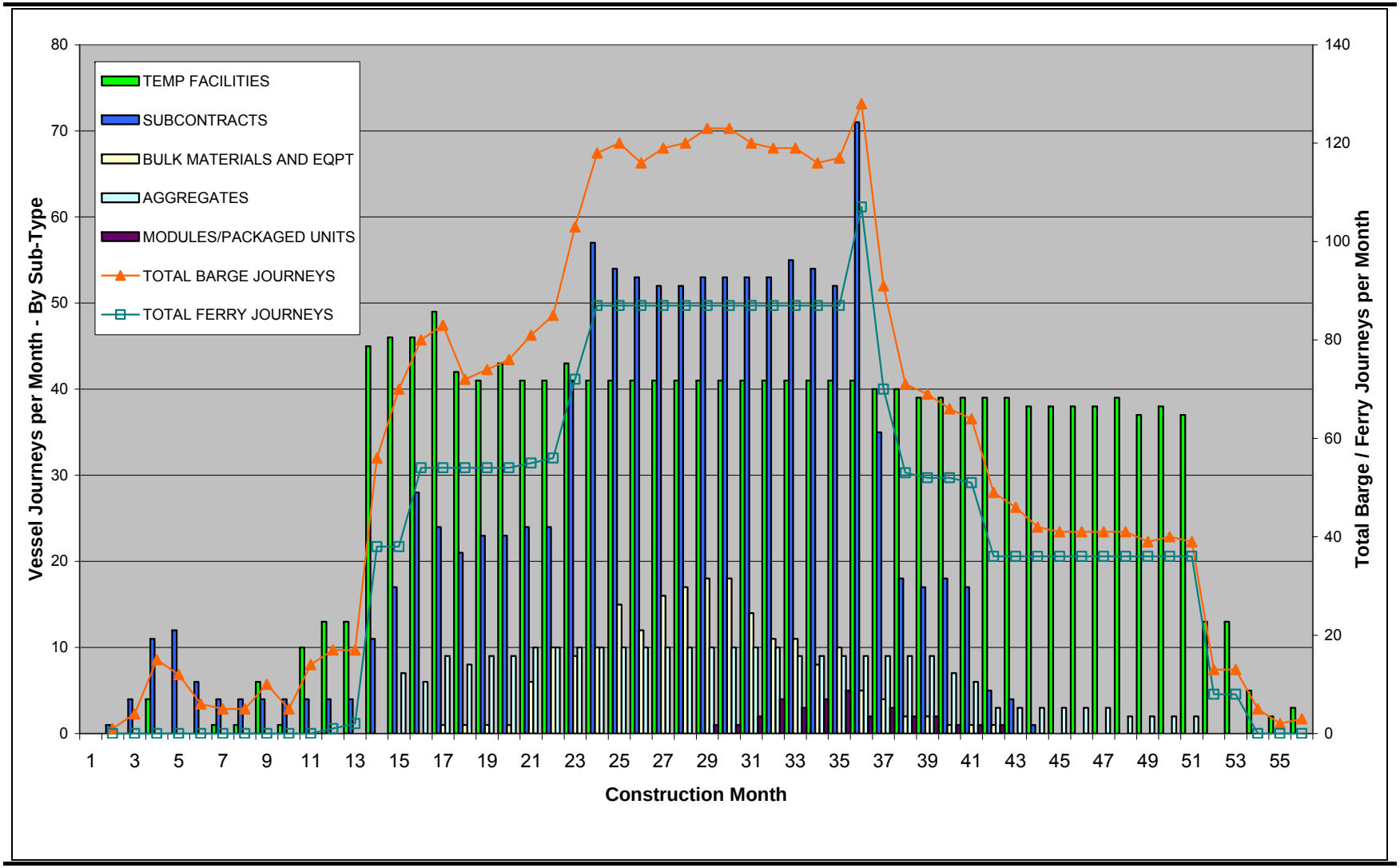
24 BG Group, 2009. *BG Standard: Marine - Offshore Marine Assurance Standard*. unpublished BG document, document number BGA-LNG-MAR-TS-0001

Figure 5.15.8 Indicative Personnel Ferry Movements by Construction Month



Note: Number of Ferries and Ferry Journeys based on #'s of personnel. After Month 46 numbers decrease sufficiently that water taxis will be used instead of the larger ferry

Figure 5.15.9 Indicative Cargo Deliveries to Curtis Island MOF, by Construction Month



- **Security**: all vessels and port facilities will comply with the provisions of the *International Ship and Port Facility Security Code* (ISPS Code)[25] Parts A&B.
- **Vessel Safety Management**: Any vessel contracted by, or on behalf of, the QCLNG Project will have a structured and documented safety management system (SMS). All systems shall demonstrate that quality management and quality system elements meet the requirements of the International Maritime Organization (IMO)[26] regulations on the International Safety Management Code for the Safe Operation of Ships (ISM Code) and for Pollution Prevention (MARPOL). The ISM Code has been added to Chapter IX of the International Convention for the Safety of Life at Sea (SOLAS) and is now mandatory.
- **Vessel Age**: Vessels on long-term charter will be less than 25 years' old at the expiry of the fixed term; except for AHTS (Anchor Handling and Tug Supply) Vessels where this age limit is reduced to 15 years. This requirement may be waived subject to approval from the BG Group Shipping and Marine Assurance group.

15.3.2 Operations

15.3.2.1 LNG and Propane Shipping

As described in *Volume 2, Chapter 9,* LNG/Propane shipping activities during Project operation will include:

- regular transit of LNG tankers, with up to 60 LNG vessels per year to be loaded per operational LNG process train (approximately 180 vessels per year once three trains are operating). The number of vessels will vary subject to the mix of vessels used as well as the degree of spiking of LNG required (fewer ship loadings will be required if no spiking of LNG is required)
- infrequent transit of ships carrying propane. The number of vessels will vary subject to commercial requirements related to the high heating value (HHV) of LNG exported and therefore the amount of LNG spiking required. The number of vessels will also depend on the size of vessels used. However, indicatively, this will be one propane vessel per month once three trains are operational
- ancillary activities.

LNG ships throughout operations will typically be owned by BG Group or chartered by BG Group, although on rare occasions vessels not chartered by BG Group may be used. At the time of compiling this EIS, BG Group had a core fleet of nine ships, comprising seven bareboat chartered ships (ships chartered without crew or provisions) of 145,000 m^3 cargo capacity and steam turbine propulsion and two ships of 138,000 m^3 cargo capacity and

25 http://www.infrastructure.gov.au/transport/security/maritime/isps/index.aspx

26 http://www.imo.org/

steam turbine propulsion which are long-term time chartered (charted for a specified time period). Four additional owned vessels of 170,000 m^3 cargo capacity are under construction for delivery commencing in 2010. These new vessels will be dual-fuel diesel electric propulsion.

BG Group contracts additional shipping as required on a short, medium, and long-term basis to capture business opportunities and maintain a balanced shipping position. The flexible fleet consists of seven to 15 ships of various sizes.

The shipping fleet connects LNG supply with high value gas markets worldwide.

Vessel Types

While vessel types, sizes and configurations will vary over the lifetime of the Project, the typical LNG vessel will range between 125,000 m^3 and 180,000 m^3 LNG capacity and LPG vessels between 38,000 m^3 and 85,000 m^3. All LNG and LPG vessels used will be of double-hull designs as mandated by the International Gas Code (IGC). LNG vessels will have one of the following types of cargo tank design (or as superseded by future design over the life of the Project):

(a) the single walled spherical design by Moss (Moss)

(b) the dual membrane design by Gaz Transport and TechniGaz (GTT)[27]

(c) IHI's SPB containment design, which may be used in future LNG ship construction.

The Moss spherical cargo tank design consists of a spherical insulated tank shell. A steel dome is provided above deck to protect the primary tank shell. These types of tanks are completely self–supporting, do not form part of the ship's hull and do not contribute to the hull strength. Each LNG/LPG carrier typically has four to six cargo tanks. The cargo load is transferred to the structure of the LNG carrier by a metal skirt attached to the equator of the sphere.

The membrane type tanks consist of thin primary barriers, or membranes, which are supported through the insulation by the hull of the LNG carrier. These tanks are not self-supporting, with the inner hull of the LNG vessel forming the load bearing structure of the tank.

The inner hull is lined with the GTT Mark III integrated tank system, consisting of a thin and flexible membrane, called the primary barrier, which bears against a supporting insulation structure embodying a secondary barrier and further secondary insulation bolted and glued to the inner hull. The thin, flexible primary barrier is surrounded by an insulation structure and a flexible secondary barrier. This secondary barrier is then surrounded by a further secondary insulation structure, and bolted and glued to the inner hull.

Schematics of these two tank types are provided in *Figure 5.15.10* and *Figure 5.15.11*[28].

27 Lloyds Register, 2009. *Transit Risk Study for LNG and LPG Ships Passing Through Water in and Near the Great Barrier Reef.*

28 Figures sourced from Lloyds Register, 2009. *Transit Risk Study for LNG and LPG Ships Passing Through Water in and Near the Great Barrier Reef.* Unpublished report by Lloyds Register for BG LNG Services Ltd, Report No. HOU/MCS/Q09-001 Rev. 0, 30 January 2009

Figure 5.15.10 Moss Spherical Tank Design

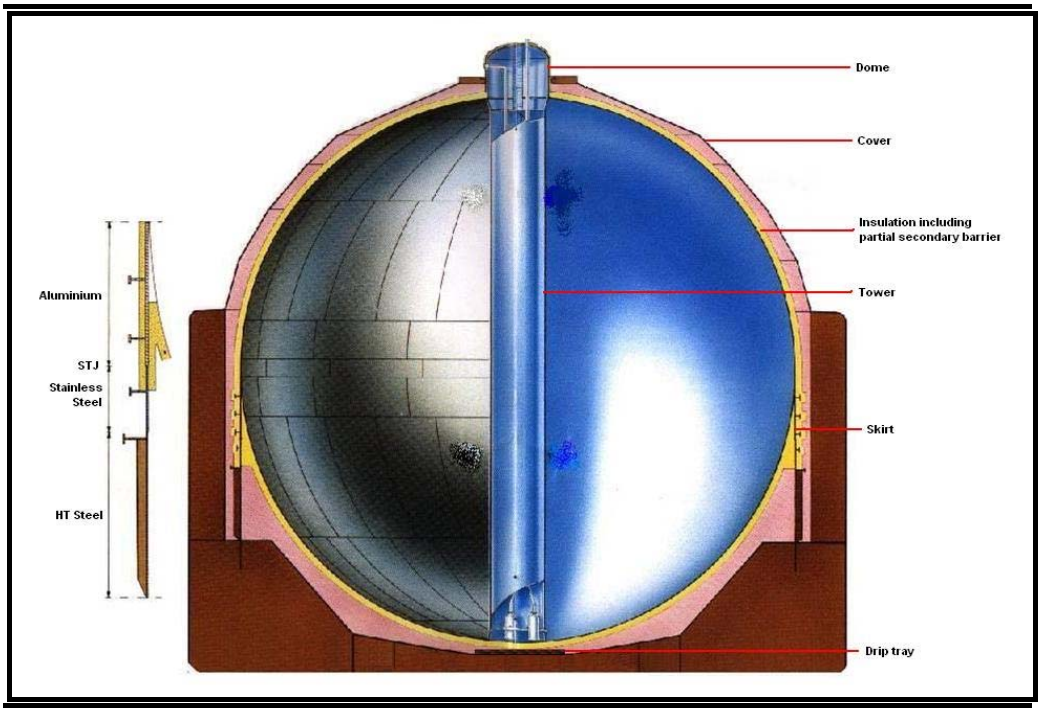
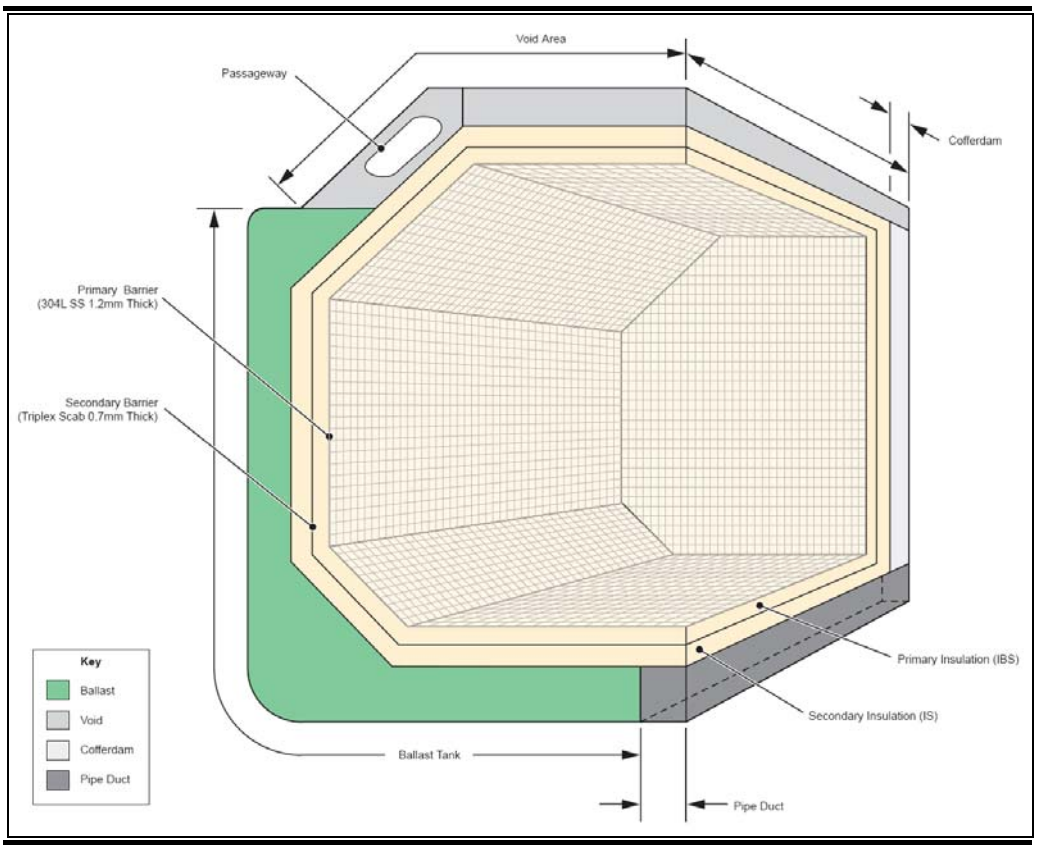


Figure 5.15.11 Dual Membrane Tank Design



LPG carriers fall into three main types: (i) fully-pressurized, (ii) semi-pressurized and semi-refrigerated, and (iii) fully-refrigerated. Fully-refrigerated LPG carriers are most economical for long-haul transport

due to their large cargo capacity (up to 100,000 m³). It is anticipated that LPG carriers used for the QCLNG Project will be fully-refrigerated prismatic. A double-hull level of containment is attained by a double-bottom construction and self-supporting tank design (where the hull acts as a secondary barrier).

A summary of key parameters of the maximum and minimum LNG and LPG vessels anticipated to be used for the QCLNG Project (berth design range) is included in *Table 5.15.4*[29], although as noted previously, some variation to the proposed LNG/LPG vessel fleet may occur over the life of the Project.

Table 5.15.4 Indicative Summary of Project Key LNG and LPG Vessel Parameters

Parameter	Units	LNG		LPG	
		Min	Max	Min	Max
Ship/class size		125 k	180 k	38k	85k
Type of containment (membrane or spherical)		S	M	M	M
Length overall	*m*	294	298	180	226
Breadth	*m*	42	46	29.2	36.6
Design (load) draught TD	*m*	12	12	9.3	11.4
Loaded draught displacement	*t*	101,603	121,400	41,173	73,561
Ballast draught	*m*	10	9.8	6.5	7.5
Number of cargo tanks		6	4	3 P&S	4 P&S
Unloading time (not including connect-disconnect time)	*h*	12	12	14	17.5

Shipping Quality Assurance and Control

All LNG vessels owned or chartered by BG Group will be subject to inspections by accredited inspectors under the Ship Inspection Report Programme (SIRE) conducted under the auspices of the Oil Companies International Marine Forum (OCIMF). SIRE is a program focussing tanker industry awareness on the importance of meeting satisfactory tanker quality and ship safety standards.

In addition, all ships carrying BG Group cargo have an annual SIRE inspection, except vessels more than 15 years old as these must have a SIRE inspection every six months. SIRE inspectors and qualifications are determined by OCIMF.

As described in the SIRE Vessel Inspection Questionnaire,[30] the program requires that participating submitting companies follow a uniform Vessel Inspection Procedure comprising an Inspection Element and a Report Element.

- The **Inspection Element** uses a series of detailed inspection

29 BG Report: General, 2008. *QCLNG Project Marine Basis of Design* (unpublished report Rev A Oct 08, Document No. QCLNG-HOU-GEN-DNB-RPT-0033)

30 Oil Companies International Marine Forum, 2008. Ship Inspection Report (SIRE) Programme: Vessel Inspection Questionnaires for Oil Tankers, Combination Carriers, Shuttle Tankers, Chemical Tankers and Gas Carriers. 2008 Edition, Rev2 14 November 2008

questionnaires as appropriate for the type of vessel inspected. These questionnaires address issues associated with safety and pollution prevention. Inspectors who are employed, or contracted by submitting companies, must (with certain exceptions) answer all these questions.

- The **Report Element** is developed from the completed electronic questionnaire that is submitted by the Inspector, either directly to the SIRE web site, or to the submitting company for further processing prior to transmission to the vessel operator and to SIRE.

Vessels either owned by, or under long-term charter to BG Group, will be inspected by a BG Group Marine Assurance Superintendent. Short-term chartered vessels may be inspected by an approved inspector.

As part of its approach to fleet management BG Group has adapted the OCIMF Tanker Management and Self Assessment (TMSA) program. The TMSA provides ship operators with a means to improve and measure their own management systems by assessing safety management systems against listed performance indicators.

BG Group's expectation is that vessel owners/technical managers should maintain a minimum TMSA score of two in all areas. TMSA submissions to OCIMF should be updated annually. BG Group also conducts its own assessment of vessel owners through annual office audits using an internal owner assessment process which incorporates the TMSA, as well as BG Group Standards, HSSE standards and Asset Integrity Standards.

Chartered vessels older than 15 years are required to have a structural assessment from an acceptable class society. A vessel must have a minimum Condition Assessment Program rating of two before it is acceptable for use by BG Group.

BG Group has minimum ship officer experience requirements. Masters are expected to have a minimum four years seagoing and two years LNG experience. Chief Officers are expected to have a minimum two years seagoing and one year LNG experience. The minimum LNG combined experience of the Master, Chief Officers and Gas Engineer should be at least four years.

BG Group audits terminals every two years using the OCIMF Terminal Baseline Criteria tool, with interim visits annually.

Ballast Water Management

In July 2001, the Australian Quarantine Inspection Service (AQIS)[31] implemented mandatory ballast water management requirements for vessels engaged in international shipping. For ships arriving from outside Australian waters, where the potential risk is deemed to be high, the three approved options for the management of ballast water are:

- full ballast water exchange at sea
- tank to tank transfers

31 Department of Agriculture, Fisheries and Forestry (2008) *Australian Ballast Water Management Requirements*. Version 4 – March 2008. www.aqis.gov.au

- no discharge of high risk ballast water in Australian waters.

For the QCLNG Project, LNG vessels will comply with these requirements through open sea sequential empty/refill of ballast tanks[32]. Alternative methods of ballast water treatment are being investigated and studied by BG Group. However, none have proved acceptable to date.

Health/Quarantine/Customs

A system of radio pratique (license to enter port on assurance from the captain to authorities that the vessel is free from contagious disease) has been adopted for vessels with Gladstone as a first Australian port provided they are regular callers from disease free areas[33].

LNG Operations in Port of Gladstone

LNG vessel operations within the Port of Gladstone are described in *Volume 2, Chapter 9* of this EIS as summarised and expanded below.

Shipping Channels

LNG and LPG vessel transit through the Port of Gladstone will be along existing shipping channels from the outer harbour to the Targinie Channel[34]:

- The South Channel leads from the Fairway Buoy to the harbour entrance. This channel has two 40° bends and consists of three joined straight channels – Wild Cattle Cutting, Boyne Cutting and Golding Cutting. The entrance to the harbour is to the south of Gatcombe Head on Facing Island and at the entrance to Gatcombe Channel. The Golding Bypass Channel and a Gatcombe Bypass Channel are not suitable for LNG vessels due to depth restrictions and will, therefore, not be used
- The Gatcombe Channel passes close to the Boyne Smelter Wharf. To the west of the Boyne Smelter Wharf is the Auckland Channel and the Auckland Bypass Channel. The Auckland Bypass Channel is not suitable for LNG carriers due to depth restrictions and will not be used
- The Auckland Channel leads to the Barney Point Wharf. The Clinton Channel and the Clinton Bypass Channel passes from the Barney Point Wharf to the Clinton Coal Wharf
- From the Clinton Coal Wharf the Targinie Channel leads towards the Fisherman's Landing Wharf. Access to the QCLNG Project loading jetty and shipping berth will be via a new channel along Curtis Island to the north-west from the Targinie Channel.

Configuration of the existing channels within the Port of Gladstone are shown in *Figure 5.15.12,* with proposed new channel and swing basins and indicative proposed locations of new navigational markers shown in *Figure* 5.15.13*.*

32 BG Report: General, 2008. *QCLNG Project Marine Basis of Design* (unpublished report Rev A Oct 08, Document No. QCLNG-HOU-GEN-DNB-RPT-0033)

33 Port of Gladstone Port Information Handbook 2008 http://www.cqpa.com.au/Pages/Publications/PortInfoBook/Port%20Information%20Handbook%202008.pdf

34 Hutchison, R, 2008. *Gladstone Port LNG Ship Transit Risk Assessment.* unpublished report by Lloyds Register for NG LNG Services Ltd, Report No. NAO0800507-01 Revision #, 29 December 2008

Channel widths and depths (including widening and/or deepening of existing channels to allow LNG and LPG vessel transit) and associated dredging requirements, are described in detail in *Volume 6*.

Anchorage

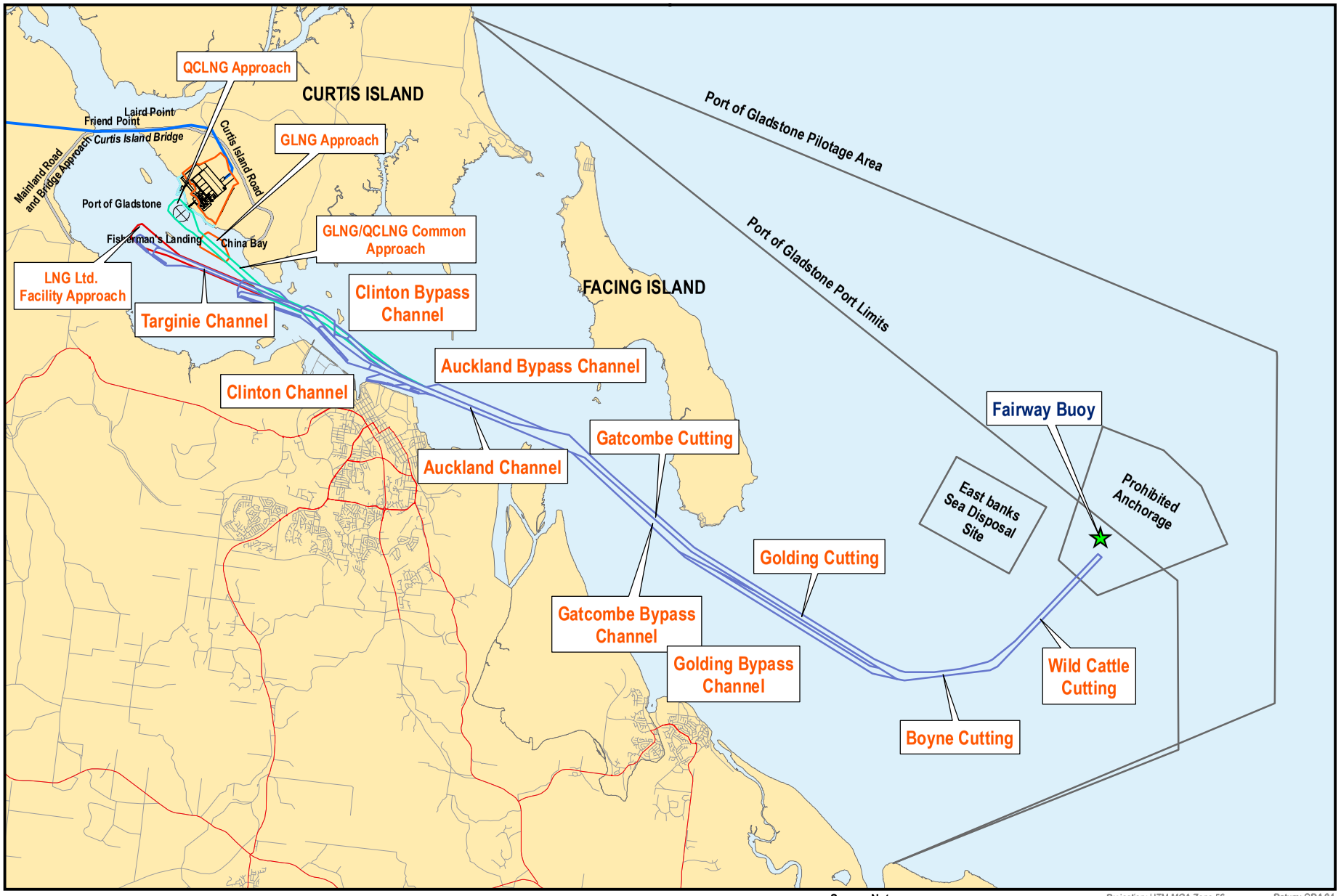
Anchorage for LNG vessels while awaiting transit through the Port of Gladstone to the LNG Facility will be within an extension to the bounds of the existing anchorage and pilot boarding area for the Port of Gladstone, with the existing anchorage area extended eastward to allow for an additional three anchorages. The LNG anchorage area is outside the Port Limit (but still inside the Pilotage Area) beyond the Fairway Buoy and out of any ship routes to or from Gladstone.

Shipping Buffer Zone within Port of Gladstone

The Gladstone Harbourmaster currently requires one-hour separation for outbound Capesize bulkers and 30 minutes for Panamax coal bulkers. Discussions with the Harbour Master are ongoing, but the current proposed port rule is for a half hour separation for LNG tankers at the beginning of the transit (i.e. outer areas of Gladstone Harbour), potentially increasing throughout the transit.

A final determination regarding these requirements will be forthcoming from the Harbour Master. However, the risk assessment of the transit indicates that the likelihood of an incident leading to a release of cargo is sufficiently low that no additional LNG specific safety zones for navigation through the harbour will be required. Further detail on risk assessment undertaken is provided in *Volume 5, Chapter 18*.

The channel configuration allows a passing zone along the 7 m depth parallel Golding channel. Small ships going the opposite direction will pass the LNG vessels in the parallel Golding channel.



Legend

- Proposed QCLNG Site Boundary
- Indicative Wet Lease Area
- QCLNG Footprint Plant Layout
- Proposed Export Pipeline
- Curtis Island Road/ Bridge Corridor
- Area Extents
- Existing Channels
- Fairway Buoy
- GLNG/QCLNG Common Approach
- QCLNG Facility Approach
- LNG Ltd. Facility Approach
- GLNG Facility Approach

Source Note:
Port Areas: Gladstone Ports Corporation
Channel Locations: Gladstone Ports Corporation, HR Wallingford
StreetPro Australia - Pitney Bowes MapInfo
Curtis Island Road/Bridge - Connell Wagner

Projection: UTM MGA Zone 56 Datum: GDA 94

0 1.25 2.5 5 km

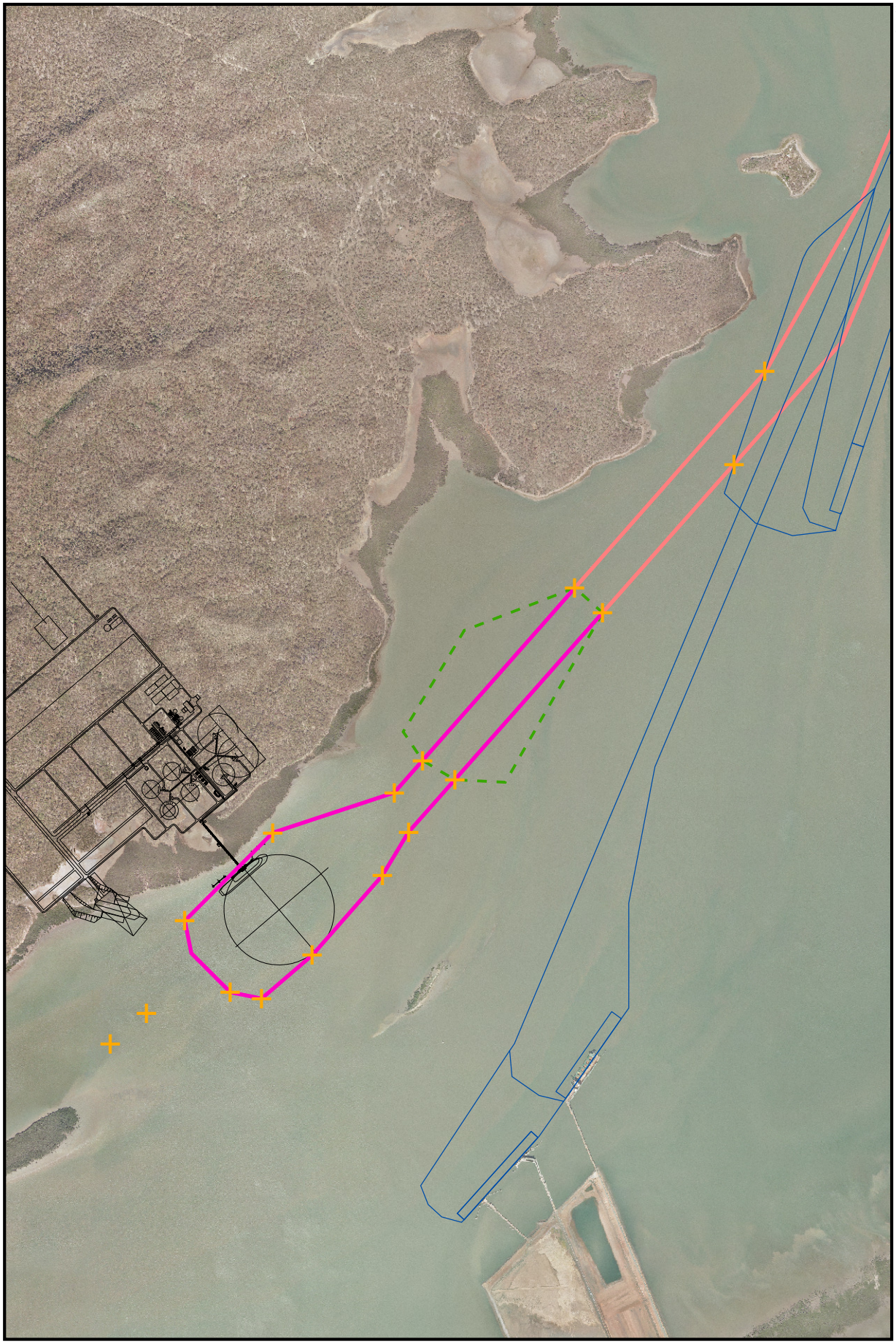
N

Project: Queensland Curtis LNG Project
Client: QGC - A BG Group business
Drawn: KP
Approved: DS
Date: 26.05.09
Revision: 1
Volume 5 Figure 5.15.12
File No: 0086165b_EIS_ST_GIS003_F5.15.12

Title: Existing Shipping Channels within the Port of Gladstone

Queensland Curtis LNG — A BG Group business

Environmental Resources Management Australia Pty Ltd



QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: Indicative Layout of Navigation Aids for Project Channel and Swing Basin
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: KP	Volume 5 Figure 5.15.13	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not to be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved: DS	File No: 0086165b_EIS_ST_GIS001_F5.15.13	
	Date: 11.03.09	Revision: 0	

At the berth, a 250 m safety zone (preliminary and to be refined in consultation with Gladstone Harbour Master) from the manifold will be applied to exclude small boats and uncontrolled ignition sources during cargo operations. The safety zone will be patrolled by the standby tug while a ship is loading. As most LNG vessels are approximately 50 m across the beam, this zone will be in the order of 200 m from the side of the LNG ship. Buoys will be deployed to demarcate this area.

While the berth is unoccupied, a 50m safety zone will be applied to exclude small boats and uncontrolled ignition sources (the size of this safety zone is still subject to finalisation in consultation with the Regional Harbour Master).

A nominal 300 m construction safety zone around the MOF is assumed (with the size of this construction safety zone still subject to finalisation in consultation with the Regional Harbour Master). The construction safety zone will be demarcated with marker buoys and notices to mariners will be put in place in consultation with the Regional Harbour Master and as required by MSQ.

Navigation Aids

A combination of new fixed and floating aids will be used, primarily on the new channel north of Targinie Channel. The final configuration of these will be subject to the outcome of ongoing shipping simulations. The Gladstone Harbour Master and pilots have been involved in some simulations, and will have final say in, and approval of, navigation layout.

While aids to navigation on common channels (channels which may be utilised by other projects) are not yet finalised, indicative layout of navigation aids specific to the Project channel and Swing Basin are shown in *Figure 5.15.13.*

A carry-on pilot positioning unit will be provided to marine pilots for precisely locating the vessel within the channels, indicating position, speed, and rate of turn independent of the ship's navigational systems. The vessel's progress will be monitored by radar. All vessels will have a minimum of one pilot on board through the Port of Gladstone commencing at the Fairway Buoy (or as otherwise directed by the Gladstone Harbour Master).

Other Navigation Requirements

The following additional requirements will be put in place for all LNG/LPG vessels associated with the Project:

- an indicative upper limit on wind speed of 30 knots (still to be finalised) will apply to pilot boarding and berthing operations within the Port of Gladstone
- initially transit of Gladstone Harbour and berthing will be undertaken in daylight, in order to ensure that pilots are familiar with LNG vessels and ship captains are familiar with the harbour. After approximately six months, 24-hour access through the harbour to the berth is anticipated
- visibility controls on harbour transit and berthing will be as specified by the Gladstone Harbour Master.

Bunkering, Provisioning and Waste

Bunkering (refuelling) of LNG/LPG vessels may be undertaken within the Port of Gladstone as part of normal operations. This activity would be carried out by the Port bunkering contractor at berth (i.e. alongside the LNG jetty). If undertaken, bunkering will not be carried out while LNG loading or propane unloading is in progress.

Food and other consumables may be loaded onto vessels direct from barges while a vessel is at jetty, either before or after LNG loading or propane unloading operations. Removal of solid wastes may also be undertaken via unloading direct to barge by crane off vessel, with waste to be disposed of by an appropriately licensed waste management contractor. MARPOL prohibits disposal of garbage within 25 nm of land and food waste within 12nm of land. In the case of Queensland, nearest land is taken from the reef. No removal or discharge of liquid waste is anticipated while vessels are within Gladstone harbour.

Sewage

LNG and LPG vessels will have secondary sewage treatment facilities on board. In accordance with the *Transport Operations (Marine Pollution)* Act *1995* (Queensland) (TOMPA) vessels associated with the Project will not discharge sewage and sullage within the Port of Gladstone. Sewage and sullage may be discharged in accordance with the *TOMPA Act 1995* beyond 1 nm from land.

15.3.2.2 Operations Logistics

As noted in *Volume 2, Chapter 9* (*Section 9.9*), operational and maintenance personnel will be accommodated in Gladstone City and commute to the LNG Facility across Gladstone Harbour daily, staging out of the new facility to be located behind RG Tanner Wharf. Regular vessel transit for normal operations will include:

- one water taxi at change of shift, plus additional movement of personnel on an as-needs basis throughout the day
- daily ferries carrying waste and supplies to and from site.

15.4 ASSESSMENT OF IMPACTS, AND MANAGEMENT AND MITIGATION MEASURES

An assessment of impacts on existing shipping activities and summary of management and mitigation measures proposed is outlined below. As noted previously, detailed assessment of impacts on marine ecology (within the Port of Gladstone and the GBRMP), noise, and air quality are described in separate chapters in *Volume 5*. Hazard and risk associated with shipping is discussed in detail in *Volume 5, Chapter 18*.

15.4.1 Impacts on Existing Shipping and Boating Activities

15.4.1.1 Construction

Construction shipping will include up to 135 one way personnel ferry journeys

per month at peak (Auckland Point to Curtis Island), plus approximately 70 barge journeys (direct to MOF) per month from construction month 24 to 36, plus additional ferry journeys from Auckland Point to Curtis Island for transport of consumables and equipment and for waste removal from site. Given that in 2008 a total of 1,417 cargo vessels (excluding pleasure craft) transited Gladstone harbour, this represents a significant increase in raw numbers of vessel movements. However, the overall impact on non-Project shipping and boating activities is anticipated to be less than the raw numbers suggest due to the fact that:

- ferries used will be high speed, relatively low draft (not constrained to existing major shipping channels) and highly manoeuvrable, therefore, they will be able to operate around bulk carriers utilising the Port of Gladstone without significant impact on Port shipping operations
- construction will be undertaken over approximately four years, but for much of this period the number of Project vessel movements will be significantly less than the peak numbers described above.

A 300 m safety zone will be applied to the MOF for construction (the size of this construction safety zone is still subject to finalisation in consultation with the Regional Harbour Master). This zone will be out of existing shipping channels and will not impact on the movement of large vessels within the Port. However, recreational vessels do utilise the channel between Curtis Island and South Passage Island and this safety zone will place a constraint on vessel movement within this area. The extent of the proposed safety zone is shown in *Figure 5.15.14*, demonstrating that even with the 300 m safety zone there is adequate access and water depth between Curtis Island and South Passage Island for recreational craft to continue to use this passage with minimal constraint.

15.4.1.2 Operations: LNG/LPG Vessels

Port of Gladstone

Once all three LNG process trains are operational, approximately 180 LNG vessels and approximately 12 LPG vessels per year will be loaded/unloaded at the LNG Facility. This represents an approximately 12.5 per cent increase on cargo vessel visits to the Port of Gladstone in 2008 and an approximate 15 per cent increase in Port of Gladstone total cargo throughput. Proposed LNG vessels are comparable in size to Capesize bulk coal carriers which currently transit the Port.

However, the Port Strategic Plan envisages an increase in planned Port capacity to 300 million tonnes of export capacity per year within the next 50 years[35], nearly four times the 2008 throughput. Project LNG and LPG shipping is well within the expectations of the Port Strategic Plan, and is a viable component of the current and projected future role of the Port of Gladstone as a strategic industrial port for Queensland.

While transit times for LNG vessels through the Port of Gladstone will vary, they significantly dependant upon:

- tidal conditions (ebb or flood, stage and height of tide)

35 Gladstone Ports Corporation Port of Gladstone 50 Year Strategic Plan (Update 2008): http://www.gpcl.com.au/pdf/final_low_cmm5087gpcl_50_year_strategic.pdf

- meteorological conditions (including wind and impacts of rain/fog on visibility)
- other shipping activities within the harbour at the time of transit.

Shipping simulations undertaken to date suggest indicative transit times as summarised in *Table 5.15.5*. The LNG ships will be escorted by four tugs in the inner channels and two tugs in the outer channels. The escort tugs' top speed will be 13 knots, but will able to make only 10 knots when tethered to the LNG carrier.

Great Barrier Reef Marine Park

Vessels similar in size to the proposed LNG vessels currently transit the GBRMP on a regular basis, with an estimated 6,000 movements of large vessels (bulk carriers, oil tankers, container carriers, general cargo ships, and other large ships) within the GBR and Torres Strait annually (refer *Table 5.15.2)*.

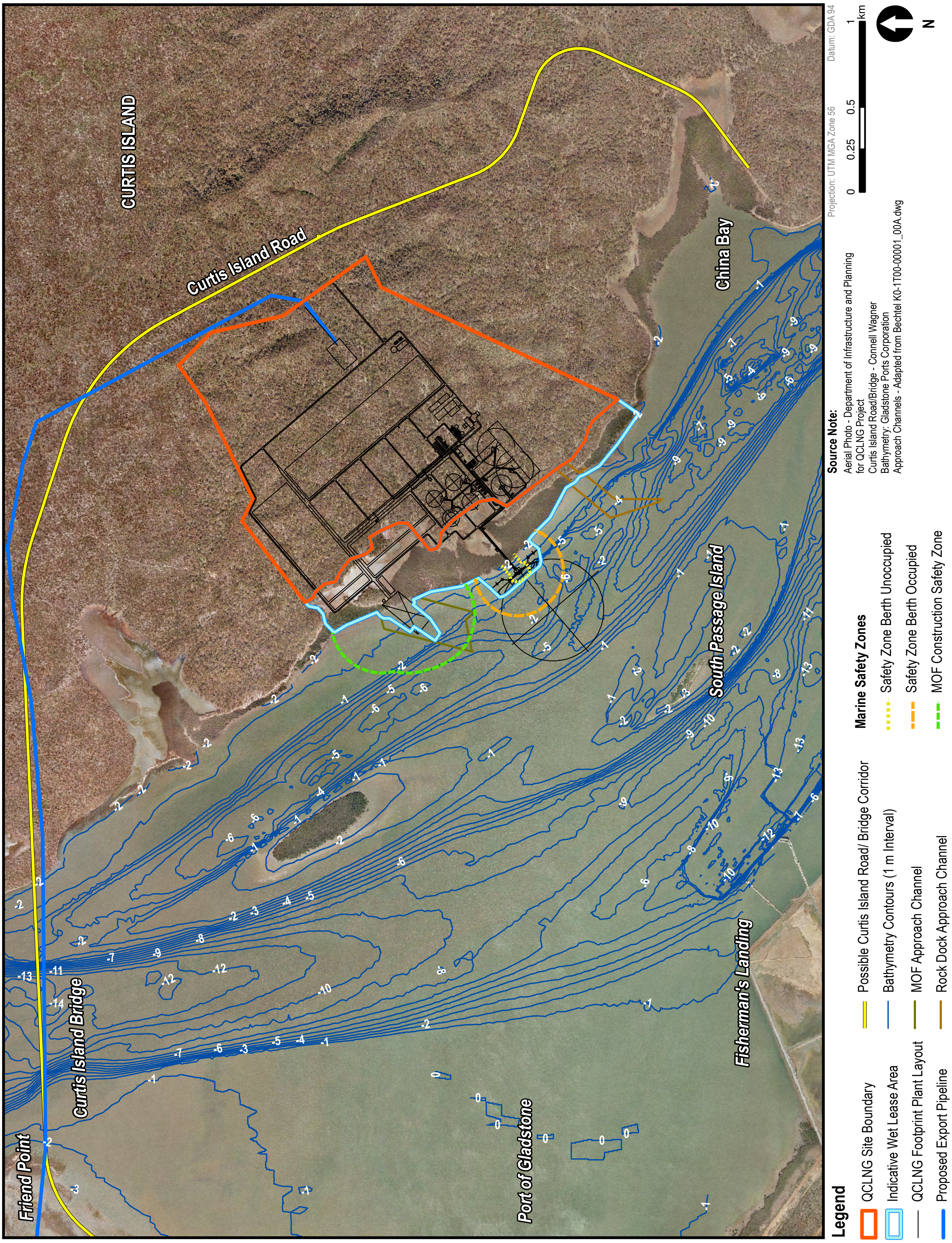
Movement of LNG vessels through the Curtis and Capricorn Channels and along the Outer Route of the GBR is not qualitatively different to existing shipping operations with regard to size and vessel operation; and the anticipated numbers of LNG and LPG vessels represent only an approximate 6 per cent increase on the current movements of large vessels within the GBR and Torres Strait.

Operations: Logistics Vessels

As described, logistics vessels during normal operations will include a water taxi at shift start and end (plus additional movement of personnel on an as-needs basis throughout the day), as well as daily ferries carrying waste and supplies to and from site. Vessels will stage out of the proposed new operational staging facility to be constructed behind the existing RG Tanna Wharf.

Water taxis and ferries used will be high speed, relatively low draught and highly maneuverable. These vessels, despite the anticipated numbers of daily vessel movements, are anticipated to be able to operate without appreciable impact on bulk shipping operations.

During major maintenance shutdowns at the LNG Facility, additional ferries and water taxis will transfer personnel and equipment from the operational staging facility to Curtis Island. Vessels used will be similar to those used for normal operations and during the construction phase.



QUEENSLAND CURTIS LNG A BG Group business	Project **Queensland Curtis LNG Project**	Title **Indicative Facility Marine Safety Zones**
	Client **QGC - A BG Group business**	
ERM Environmental Resources Management Australia Pty Ltd	Drawn KP / Approved DS / Date 06.02.09	**Volume 5** **Figure 5.15.14** File No: 0086165b_EIS_ST_GIS004_F5.15.14 Revision 2

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Table 5.15.5 Indicative LNG Vessel Transit Times Through Port of Gladstone

	Incoming	Outgoing
Fairway Buoy – Gatcombe Channel "G2"	1.2 hours	1.2 hours
Gatcombe "G2" – Targinie "T3"	1.4 hours	1.4 hours
Targinie "T3" – QCLNG Jetty	0.5 hours	0.5 hours
Turning at swing basin	0.5 hours	
Total Transit	3.6 hours	3.1 hours

15.4.2 Tugs and Pilots

15.4.2.1 Tug Boat Operations

As noted in Section *15.2.1,* towage in the Port is provided by a commercial supplier currently operating five tugs. Shipping simulations undertaken indicate that each LNG vessel transit through the Port will require four tugs, of which two can be sourced from the existing tug fleet (2 x 62 tonne bollard pull) with an additional two 80 tonne bollard pull tugs required as escort tugs between the Fairway Buoy and Gatcombe Channel.

It is proposed that three 80 tonne bollard pull tugs be incorporated into the GPC tug fleet to service LNG operations. This will provide one spare tug for downtime/maintenance. QGC and other port users pay for tug service at each port call. The tug service is a controlled activity as defined by GPC (ref. Port Notice 03/06). The tug contractor is guaranteed a minimum rate of return by GPC with rates being set accordingly between GPC and the tug contractor.

QGC will work with and enter into appropriate commercial/contractual arrangements with the tug contractor and in consultation with GPC to ensure that adequate tug capacity is provided.

Tug operators in the Port of Gladstone are experienced in management of bulk carriers in the Port. However, handling characteristics of LNG vessels vary from current vessel characteristics in the Port of Gladstone, due to a range of factors including:

- different loaded and unloaded draught
- higher windage on LNG vessels than on similar size vessels (e.g. Capesize coal carriers)
- varying manoeuvrability due to different plant thrust including use of bow thrusters
- lower loaded tonnage of LNG vessels compared to similar size vessels.

The QCLNG Project has been working with, and will continue to work with, the tug fleet operator and tug masters to ensure that tug masters are adequately trained in management of LNG vessels. This has been and will continue to be undertaken primarily through involvement in shipping simulations focussing on LNG vessel movement within the Port of Gladstone under a range of conditions, with simulations used to develop transit parameters and operational limits and determine the required channel width and test the

effectiveness of the use of tugs.

Four rounds of simulations have been undertaken to confirm:

- the adequacy of Gladstone channels for LNG ships
- any necessary improvements required
- the level of escort tugs required to cope with a casualty
- the size of the Swing Basin
- the number of tugs required to berth a vessel.

Training for pilots and tug masters will be undertaken prior to arrival of the first LNG carrier.

15.4.2.2 Pilotage

As with tug boat operators, the QCLNG Project has undertaken shipping simulations exercises for LNG vessels in the Port of Gladstone with input from the Gladstone Harbour Master and pilots. Training of pilots through shipping simulation, in cooperation with the Harbour Master, will be ongoing and as required throughout the life of the Project. Pilots will be trained on LNG ship handling characteristics and emerging scenarios in the simulation.

Once the existing pilots are trained for LNG ship handling, new pilots will be trained according to the requirements of MSQ. It is expected that new pilots will rapidly become familiar with vessels that regularly call at the port.

In addition, harbour transit will be undertaken during daylight hours only for the first six months of operation, to allow tug masters, pilots and LNG vessel captains to gain familiarity with operation of LNG vessels in Gladstone harbour before 24 hour shipping operations commence.

15.4.3 Potential Foreshore Damage

Potential foreshore damage arising from transit though the outer harbour up to the Clinton Channel will be qualitatively similar to impacts arising from current and ongoing transit of bulk vessels through these waterways.

Transit of LNG vessels along the proposed new channel from the existing Targinie Channel to the LNG jetty (including manoeuvring in the Swing Basin) represents extension of bulk shipping operations into a new area of Gladstone, with attendant potential for impacts on the foreshore.

The closest point on the mainland to the proposed new Shipping Channel/Swing Basin is the eastern extremity of the dredge reclamation area at Fisherman's Landing, approximately 1.85 km south east of the western side of the swing basin. Given this distance and existing shipping operations within the Targinie Channel to Fisherman's Landing, potential mainland foreshore damage arising from QCLNG Project LNG shipping operations is expected to be minor to negligible.

At its closest point to Curtis Island the proposed new channel from Targinie Channel to the QCLNG Project swing basin will pass approximately 250 m from Hamilton Point on Curtis Island. Once in the swing basin itself, LNG vessels will be manoeuvred to berth approximately 50 m from the existing line

of mangroves. Vessel speed through the new LNG spur channel will be approximately 5 knots passing Hamilton Point and decreasing as the vessel approaches the Swing Basin. Once inside the Swing Basin, the vessel will come to a stop while it is turned around by tugs for mooring and bow-out departure.

Along Hamilton Point, at the closest point of approach, the coast is characterised by a rocky foreshore with some fringing mangroves in small bays. Adjacent to the swing basin the coastline is characterised by fringing mangroves on tidal mudflats (refer *Volume 5, Chapter 8* for details on mangrove extent and quality). Current tidal flows in the area are estimated at up to 2 to 3 knots.[36]

15.5 CONCLUSION

Shipping activities associated with the construction and operation of the LNG Component were assessed for their impact on existing shipping and boating activities in Australian territorial waters, through the Great Barrier Reef Marine Park and within the bounds of the Port of Gladstone. The potential for foreshore damage from Project-related shipping was considered as were requirements for tugs and pilots.

During construction of the LNG Facility, shipping activities will include barge and ferry movements from Auckland Point to Curtis Island to transfer personnel, equipment, materials and waste to and from the LNG Facility site. This will result in a significant increase in vessel movements within the Port of Gladstone during the peak construction phase. However, as ferries will be high speed, manoeuvrable and will not be constrained to existing major shipping channels, impacts on other port shipping operations are not anticipated to be significant. Water taxis and ferries will have a negligible impact on bulk shipping operations during the LNG Facility's operational phase, when they will be required in lower numbers.

A nominal 300 m construction safety zone around the MOF will not extend into existing major shipping channels and will, therefore, not impact on the movement of large vessels within the port. However, this construction safety zone will pose a minor constraint to the movement of smaller recreational vessels between Curtis Island and South Passage Island.

The predicted increase in cargo vessel visits to the Port of Gladstone is well within the expectations of the Port Strategic Plan. LNG shipping is a viable component of the current and projected future role of the Port of Gladstone as a strategic industrial port for Queensland.

However, the proposed shipping buffer zone for LNG and LPG vessels transiting the port will impact on recreational users. This impact will be influenced by transit time as well as tidal and meteorological conditions. Indicative transit times are 3.6 hours for incoming LNG vessels and 3.1 hours for outgoing LNG vessels.

Additional tugs, to escort LNG carriers, will be required to augment the Port of Gladstone's current tug fleet. QCG will work with and enter into appropriate

36 Queensland Government: Maritime Safety Queensland, 2002. *Gladstone Boating Safety Chart*.

commercial/contractual arrangements with the tug contractor to ensure adequate tug capacity. Tug masters and pilots will continue to undergo specific training to manage LNG vessels.

Taking into account the distance between the proposed new Swing Basin and Shipping Channel and the foreshore on the mainland, potential foreshore damage is expected to be negligible to minor. A summary of the impacts outlined in this chapter is provided in *Table 5.15.6*.

Table 5.15.6 Summary of Impacts for Shipping Transport

Impact assessment criteria	Assessment outcome
Impact assessment	Negative
Impact type	Direct
Impact duration	Long-term (life of Project)
Impact extent	Local
Impact likelihood	Extremely unlikely for potential mainland foreshore damage and impacts to existing large vessel movements through the Great Barrier Reef Marine Park and the Port of Gladstone High for impacts on existing recreational users during transit of LNG/LPG vessels through the Port of Gladstone

Overall assessment of impact significance: Minor, as movement restrictions imposed on recreational users during LNG/LPG vessel transit through the Port of Gladstone are temporary and geographically limited.

Increases in shipping/vessel movements associated with the construction and operation of the LNG Facility are not expected to significantly impact on large vessel movements within the Great Barrier Reef Marine Park. The predicted increase in cargo vessel visits to the Port of Gladstone is well within the expectations of the Port Strategic Plan and is a viable component of the current and projected future role of the Port of Gladstone as a strategic industrial port for Queensland.