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GLNG
PROJECT

Construction Environmental Management Plan to Address Matters of National Environmental Significance for the LNG Facility and Marine Facilities

Document Number 3310-GLNG-4-1.3-0001

Revision History

Revision	Date	Description
9	October 2015	Incorporated DOTE comments
8	August 2015	Annual Update
7	March 2014	Updated to include commissioning activities conducted prior to completion of construction of first LNG train
6	October 2013	Incorporated SEWPaC comments
5	July 2012	Incorporated SEWPaC comments
4	Sept 2012	Provided to SEWPaC for review
3	April 2011	Approved by SEWPaC
2	March 2011	Approved by SEWPaC
1	Feb 2011	Provided to SEWPaC for review

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ABBREVIATIONS

Abbreviation	Description
ADWG	Australian Drinking Water Guidelines
AIM	Audit and Inspection Manager
AQIS	Australian Quarantine and Inspection Service
ASS	Acid Sulphate Soil
BAAM	Biodiversity Assessment and Management
BMP	Biosecurity Management Plan
BNR	Biological Nutrient Removal
BOD	Biological Oxygen Demand
BQCC	Biosecurity Queensland Control Centre
CAMBA	China-Australia Migratory Bird Agreement
CEMP	Construction Environmental Management Plan
CEMP for MNES	GLNG Project Construction Environmental Management Plan to address Matters of National Environmental Significance for the LNG Facility and Marine Facilities
Construction WTP	Construction Water Treatment Plant
CPI	Corrugated Plate Interceptor
CSG	Coal Seam Gas
DAF	Dissolved Air Flotation
DAFF	Department of Agriculture Forestry and Fisheries
DEEDI	Department of Employment, Economic Development and Innovation
DERM	Department of Environment and Resource Management
DMP	Dredging Management Plan
DOTE	Department of the Environment
DPA	Dugong Protection Area

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Abbreviation	Description
DPI&F	Department of Primary Industries and Fisheries
EA	Environmental Authority
EDI	electro-deionisation
EHP	Department of Environment and Heritage Protection
EHS	Environment, Health and Safety
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ERA	Environmentally Relevant Activity
GAWB pipeline	Gladstone Area Water Board pipeline for the supply of potable water to Curtis Island
GBRMPA	Great Barrier Reef Marine Park Authority
GBRWHA	Great Barrier Reef World Heritage Area
GLNG OPL	GLNG Operations Pty Ltd
GPC	Gladstone Ports Corporation Ltd
GRC pipeline	Gladstone Regional Council pipeline to Curtis Island for the disposal of sewage
GSDA	Gladstone State Development Area
GTG	Gas Turbine Generator
GTP	The Gas Transmission Pipeline for the GLNG Project
HAT	Highest Astronomical Tide
IFO	Independent Fauna Observer
JAMBA	Japan-Australia Migratory Bird Agreement
LNG	Liquefied Natural Gas
LNG Facility	The Liquefaction and Export Facility for the GLNG Project

Abbreviation	Description
LNGC	Liquefied Natural Gas Carrier
LoLo	Lift-on/Lift-off
MNES	Matters of National Environmental Significance
MOF	Materials Offloading Facility
NATA	National Association of Testing Authorities
OAMP	Offset Area Management Plan
OEMP	Operational Environmental Management Plan
Operations WTP	Operations Water Treatment Plant
OWTP	Oily Water Treatment Plant
PASS	Potential Acid Sulphate Soil
PETRONAS	PETRONAS Australia Pty Ltd
PLF	Product Loading Facility
Proponents	together, Santos and PETRONAS
QMP	Quarantine Management Plan
QPWS	Queensland Parks and Wildlife Service
RE	Regional Ecosystem
RO	Reverse Osmosis
ROC	Reverse Osmosis Concentrate
RoRo	Roll-on/Roll-off
Santos	Santos Limited
SDPWO Act	State Development and Public Works Organisation Act 1971
SEIS	Supplementary Environmental Impact Statement
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities
SPA	Sustainable Planning Act 2009

Abbreviation	Description
STP	Sewage Treatment Plant
SWRO	Seawater Reverse Osmosis
TIAC	Turbine Inlet Air Chilling
TSS	Total Suspended Solids
TWAF	Temporary Workers Accommodation Facility
WHA	World Heritage Area

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EXECUTIVE SUMMARY

This GLNG Project Construction Environmental Management Plan to address Matters of National Environmental Significance for the LNG Facility and Marine Facilities (CEMP for MNES) has been prepared by GLNG Operations Pty Ltd (GLNG OPL) as Operator on behalf of the Santos Limited and PETRONAS Australia Pty Ltd (the Proponents) to address Matters of National Environmental Significance (MNES) in accordance with federal approvals EPBC No. 2008/4057, for the Liquefied Natural Gas (LNG) facility on Curtis Island, and EPBC No. 2008/4058, for the LNG Marine Facilities.

The scope of this plan covers the construction phase period of the LNG facility and associated marine facilities up until the point at which practical completion of both Train 1 and Train 2 has been reached and the LNG facility has been handed over from GLNG's EPC Contractor Bechtel to GLNG OPL for operation. The construction phase includes commissioning activities. Prior to completion of construction of the first LNG train, GLNG OPL on behalf of the Proponents will prepare and submit for approval by the Minister a separate Operational Environmental Management Plan (OEMP) for implementation during the operational phase.

In addition to the CEMP for MNES, reports, management plans and supplementary information in support of other conditions of approval EPBC No. 2008/4057 and EPBC No. 2008/4058 relevant to the construction phase of the GLNG project can be accessed at http://www.santosglng.com.

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1 INTRODUCTION

Joint venture partners Santos GLNG Pty Ltd, PAPL (Downstream) Pty Ltd, Total GLNG Australia and KGLNG Liquefaction Pty Ltd and their related bodies corporate are developing their Queensland coal seam gas (CSG) resources in the Bowen and Surat Basins in the area between Roma and Emerald. These CSG resources are proposed to be used as feed gas for a liquefied natural gas (LNG) liquefaction and export facility (LNG facility) on Curtis Island, near Gladstone, Queensland.

The GLNG Project includes the following major components:

- CSG fields;
- Gas transmission pipeline (GTP); and
- LNG facility and associated marine facilities.

The LNG facility will be located within the Curtis Island Industry Precinct of the Gladstone State Development Area (GSDA) in the south west section of Curtis Island, and will liquefy the gas to enable it to be transferred to ships for export. Refer to Figure 1-1 for the LNG facility and associated marine facilities site location.

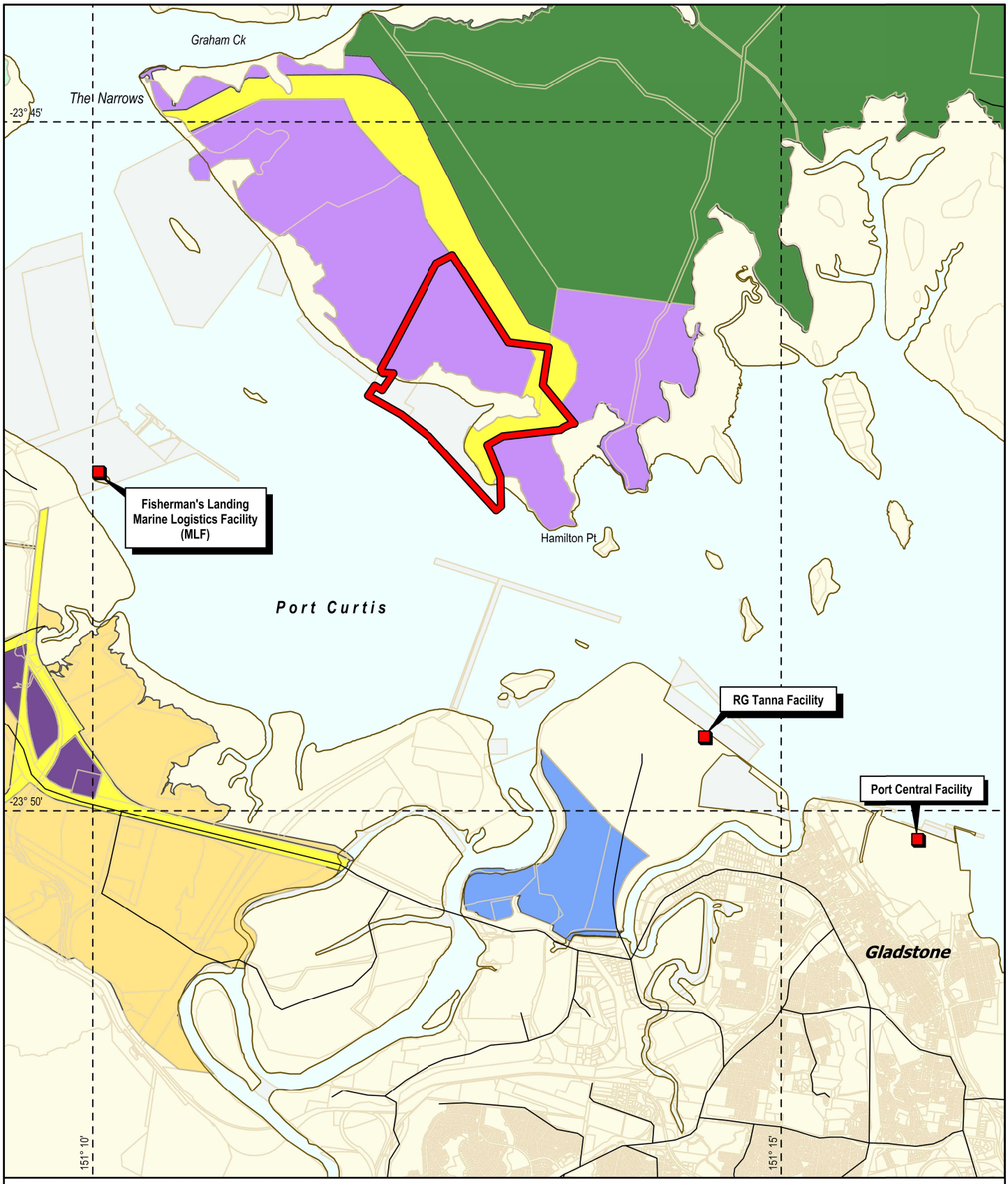
Associated infrastructure to support the LNG facility includes a product loading facility (PLF), a materials offloading facility (MOF) and a haul road linking the MOF with the LNG facility. For the purpose of this document the PLF and MOF will be referred to as "associated marine facilities". Dredging has also been undertaken to facilitate LNG carrier (LNGC) access.

Other components of the Project include mainland marine logistics facilities. These marine logistics facilities will be used to access Curtis Island, and will be situated at Port Central, RG Tanna and Fisherman's Landing.

On 16 July 2007, the Coordinator-General declared the Project to be a 'significant project' for which an Environmental Impact Statement (EIS) is required under the *State Development and Public Works Organisation Act 1971* (SDPWO Act). On 31 March 2008, the GLNG Project was declared a 'Controlled Action' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

During 2008 and 2009, an EIS and a supplementary EIS (SEIS) were prepared for the GLNG Project under the State-Federal bilateral agreement. On 28 May 2010, the Coordinator-General issued his report under the SDPWO Act. On 22 October 2010, the project was granted federal approval under the EPBC Act, via approvals EPBC No. 2008/4057, for the LNG facility on Curtis Island, and EPBC No. 2008/4058, for the associated marine facilities.

GLNG appointed Bechtel as Principal Contractor for the engineering, procurement, construction and commissioning of the LNG facility and associated marine facilities on Curtis Island and the mainland logistics facilities. Construction commenced in 2Q 2011, with first cargo of LNG from the first train scheduled for 2015.



Marine Facility Infrastructure Locations

Boundary from PFL10 Instrument (4 March 2011)

Surveyed Tenure Boundary (30 November 2011)

Gladstone State Development Areas

- Clinton Precinct
- Curtis Island Industry Precinct
- Environmental Management Precinct (Curtis Island)
- Materials Transportation and Services Corridor
- Stuart Oil Shale Reserve Preservation Area
- Yarwun Precinct

LNG

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LNG Facility

LNG Facility and Associated Marine Facilities Site Location

1 0 1 2 3 km

Figure: 1-1 Date: June 2013 File No. GLNG 499a

GDA

1.1 Scope and Objectives

The GLNG Project Construction Environmental Management Plan to address Matters of National Environmental Significance for the LNG Facility and Marine Facilities (CEMP for MNES) has been prepared by GLNG OPL to address the following conditions:

- Conditions 23, 24 and 25 of approval EPBC No. 2008/4057 for the LNG Facility on Curtis Island; and
- Conditions 11 and 12 of approval EPBC No. 2008/4058 for the LNG Marine Facilities.

The scope of this plan covers the construction (including commissioning) phase of the LNG facility and associated marine facilities up until the point at which practical completion of both Train 1 and Train 2 has been reached and the LNG facility has been handed over from GLNG's EPC Contractor Bechtel to GLNG OPL to operate. Prior to completion of construction of the first LNG train, GLNG will prepare and submit for approval by the Minister a separate Operational Environmental Management Plan (OEMP) to manage adverse impacts on MNES which may arise during the operational phase.

The CEMP for MNES applies to the Lots listed in Table 1-1.

Table 1-1 Real property descriptions for Petroleum Facility Licence (PFL) 10

Current Lot Descriptions	Description of Activities
Lot 1 on SP235007 Lot 4 on SP235007	LNG facility
Lot 1 on SP228184	PLF
Lot 4 on SP235936	Haul road
Lot 7 SP239683	MOF

The CEMP for MNES sets out the minimum standards to be implemented. Additional internal procedures, such as activity specific procedures (e.g. for the hydrotesting of the LNG tanks, hydrotesting of plant piping, and pneumatic testing), risk assessments, work method statements and job hazard analysis, will also be developed on an ongoing basis when required to manage environmental risk. Onsite management measures, such as environmental audits and site inspections, will also be implemented.

The objectives of the CEMP for MNES are to document the following:

- Construction and commissioning activities with potential to have an adverse impact on MNES;
- Associated environmental values that have the potential to be impacted by construction activities;

- Environmental mitigation;
- Roles and responsibilities; and
- An integrated plan for monitoring, assessing and mitigating potential impacts;

A number of studies and management plans have been prepared as a requirement of both State and Federal approval conditions, details of which are provided in Table 1-2 below.

Table 1-2 Supporting Documentation

Plan Name	Web Address	Requirement / Comments
Environmental Impact Statement	http://www.santosglng.com	The EIS report was approved by the Coordinator- General (CG) for release for public and advisory agency comment from 20 June to 17 August 2009.
Supplementary Environmental Impact Statement	http://www.santosglng.com	The SEIS was delivered to the Department of Infrastructure and Planning (DIP) on 20 November 2009.
GLNG Project Construction Environmental Management Plan to address Matters of National Environmental Significance for the LNG Facility and Marine Facilities (CEMP for MNES)	http://www.santosglng.com	Condition 23, 24 and 25 (EPBC No. 2008/4057). Condition 11 and 12 (EPBC No. 2008/4058). The CEMP for MNES was originally approved by the \the Department under EPBC Approvals no. 2008/4057 on 21st March 2011 and 2008/4058 on 11th April 2011.
Migratory Shorebird Management Plan	http://www.santosglng.com	Condition 19 and 20 (EPBC No. 2008/4058).
GLNG Shorebird Surveys Report		
GLNG Curtis Island Facility: Water Mouse Survey and Habitat Assessment	http://www.santosglng.com	Condition 32 and 33 (EPBC No. 2008/4057). Condition 17 and 18 (EPBC No. 2008/4058).
Shipping Activity Management Plan	http://www.santosglng.com	Condition 13, 14, 15 and 16 (EPBC No. 2008/4058).

Plan Name	Web Address	Requirement / Comments
GLNG LNG Facility Pre-clearance survey for EPBC-Listed Fauna and Flora Species, Migratory Species and Ecological Communities	http://www.santosglng.com	Condition 20, 21 and 22 (EPBC No. 2008/4057).
Long Term Turtle Management Plan	http://www.santosglng.com	Conditions 34, 35 and 36 (EPBC No. 2008/4057).
Biosecurity Management Plan	http://www.santosglng.com	Condition 30 and 31 (EPBC No. 2008/4057).

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1.1.1 Compliance with EPBC Referral No 2008/4057 Conditions

Cross-references to the section(s) of this CEMP for MNES that address the relevant conditions from EPBC Referral No 2008/4057 are provided in Table 1-3 below.

Table 1-3 Compliance with EPBC Referral No 2008/4057 Conditions

Condition Number	Condition	Cross-Reference to Relevant Sections and Appendices of the CEMP for MNES / Comments
23	Before commencement the proponent must prepare a Construction Environmental Management Plan (CEMP). The CEMP may be submitted in stages (Staged CEMP) in which case commencement of a stage covered by the staged CEMP cannot commence until submitted and approved by the Minister.	• The CEMP for MNES was originally approved in relation to EPBC Approval no. 2008/4057 on 21st March 2011.
25	The CEMP, or a stage of the CEMP, must be submitted for the approval of the Minister. Commencement of the action to which the staged CEMP relates must not occur without the approval in writing of the Minister of the CEMP. The approved plan must be implemented.	
24	The CEMP must address, but not necessarily be limited to, an identification of all activities with potential to have an adverse impact on MNES proposed to be undertaken during the construction of LNG facilities, including the construction camp and supporting facilities. The CEMP must include:	
	(a) design plans showing the type and extent of the works proposed;	• Design plans are provided in Figures 2.1 to 2.10.

	(b) a construction schedule and methodology, including plans and maps showing discharge points and emission controls for all construction stages;		• Sections 2.2 to 2.10; • Figure 2-8; and • Figure 2-10.
	(c) an environmental monitoring and a sampling program which details baseline data collection and provides the basis for ongoing monitoring of specified parameters for the construction and operational phases, including appropriate triggers for mitigation and cessation of works;		• Section 6; and • Appendix 2, Attachment H (GLNG Environmental Monitoring Plan) - Appendix 1 for the Monitoring Matrix which encapsulates environmental monitoring, sampling, specified parameters for construction and commissioning.
	(d) any potential impacts or effects of the proposed works on the environment during both the construction and operational phases and the means by which adverse impacts will be avoided or mitigated;		• Section 4; • Section 5; and • Appendix 2.
	(e) details of the sewage treatment plant and desalination plant, including:	(i) design and operational performance information for sewage treatment and desalination (including acoustic performance of pumps and other machinery);	• Sections 2.7 to 2.8; • Appendix 1; and • Appendix 2.

		(ii) design and operational performance information for any outfalls and diffusers for emissions, including liquid and solid emissions into Port Curtis including detailed analysis of existing water quality, effluent contaminants, acute and chronic toxic effects of contaminants on fauna and flora and any long term ecological effects from outfalls and emissions;	• Sections 2.6 to 2.9; • Sections 4.5 to 4.12; • Appendix 1; and • Appendix 2.
		(iii) a detailed description of impacts from the discharge of treated sewage and brine. Source water quality data and characteristics of additives must be provided, and the disposal methods to be used must be described in the plan. The information must be used to determine the site specific mitigation measures proposed, including monitoring and reporting regimes;	• Sections 2.6 to 2.9; • Section 4.5; • Appendix 1; and • Appendix 2.
		(iv) information on the eco-toxicity of effluent at the point of release, in the mixing zone, and cumulative impacts of contaminants in the marine ecosystem over time;	• Section 4.5.1; and • Appendix 1.
		(v) the assumptions, adequacy and limitations of any modelling used to predict the dimensions and duration of the mixing zone;	• Appendix 1
	(f) details on any other plant, equipment or activities	(i) a description of the plant, equipment or activities;	• Section 2

	that involve emissions to the environment, including:	(ii) design and operational performance information for plant, equipment or activities;	• Section 2
		(iii) the potential for unforseen or accidental incidents and proposed responses to these incidents;	• Section 7.2; and • Appendix 2.
	(g) a detailed list of waste streams including their handling, treatment and disposal arrangements;		• Section 2.6; and • Appendix 2, Attachment R.
	(h) the environmental protection commitments proposed for the activities (including all associated accommodation and recreation activities on the Island) to protect the environmental values under best practice environmental management;		• Appendix 2, Section 2.5; • Appendix 2, Section 3; • Appendix 2, Section 5; and • Appendix 2, Section 6.
	(i) a rehabilitation program for land proposed to be disturbed during construction of all infrastructure (including associated accommodation and recreation activities) on Curtis Island;		• Section 2.11; • Section 5.1; • Appendix 2, Attachment K; and • Additional details concerning rehabilitation will be included in the OEMP.

	(j) details of a response plan, with appropriate triggers, which will be initiated in response to any significant impacts on the environment from the works; and	• Section 5.6; • Appendix 2, Section 4; • Appendix 2, Attachment F; • Appendix 2, Attachment G; • Appendix 2, Attachment N; and • Appendix 2, Attachment Q.
	(k) identification and characterisation of all wastes and emissions produced by the LNG Facility and its associated support infrastructure including its source, handling, treatment, disposal, or release to the environment.	• Section 2.6; • Appendix 2, Attachment D; and • Appendix 2, Attachment R.

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1.1.2 Compliance with EPBC Referral No 2008/4058 Conditions

Cross-references to the section(s) of this CEMP for MNES that address the relevant conditions from EPBC Referral No 2008/4058 are provided in Table 1-4 below.

Table 1-4 Compliance with EPBC Referral No 2008/4058 Conditions

Condition Number	Condition	Cross-Reference to Relevant Sections and Appendices of the CEMP for MNES / Comments
11	For the construction of the marine facilities on Curtis Island and the mainland, the proponent must submit to the Minister a Construction Management Plan which must include:	
	(a) assessment of all potential and real environmental risks to matters protected by the EPBC Act from construction activities;	• Section 4; • Appendix 2, Attachment G; and • Also refer to the GLNG Curtis Island Facility: Water Mouse Survey and Habitat Assessment located at http://www.santosglng.com.

Condition Number	Condition		Cross-Reference to Relevant Sections and Appendices of the CEMP for MNES / Comments
	(b) appropriate measures (for example mitigation measures, performance indicators/trigger levels and corrective actions/management actions) that will ensure that there are no unacceptable impacts on the Great Barrier Reef World Heritage Area, Great Barrier Reef National Heritage Place, EPBC listed threatened species or migratory species. These include:	i. operating procedures to minimise injury to, or mortality of, EPBC Act listed threatened or migratory species from construction activities;	• Section 5; and • Also refer to the Shipping Activity Management Plan, GLNG Curtis Island Facility: Water Mouse Survey and Habitat Assessment and Migratory Shorebird Management Plan located at http://www.santosglng.com.
		ii. reporting mechanisms that ensure reporting to the Minister within one business day of injury to, or mortality of, an EPBC listed threatened or migratory species caused by construction activities;	• Sections 5.9 to 5.14; and • Section 7.2.
		iii. management triggers and contingency measures when construction or pile driving must be varied or suspended;	• Section 5.11
		iv. measures that minimise the risk of introduced marine species, including ballast-water management and vessel inspections for any non-domestic vessels;	• Section 5.8; and • Also refer to the Biosecurity Management Plan located at http://www.santosglng.com.

Condition Number	Condition		Cross-Reference to Relevant Sections and Appendices of the CEMP for MNES / Comments
		v. measures to minimise light emission onto the water from the Product Loading Facility and Material Offloading Facility including such measures as reducing light spill, during construction and operations; and	• Appendix 2, Attachment M.
		vi. responsive actions that will be undertaken in the event contingency measures are employed, including reporting to the Minister.	• Section 7.2; • Appendix 2, Attachment E; • Appendix 2, Attachment F; • Appendix 2, Attachment G; • Appendix 2, Attachment N; • Appendix 2, Attachment O; • Appendix 2, Attachment Q; and • Appendix 2, Attachment T.
12	The Construction Management Plan must be submitted for the approval of the Minister within 20 business days of commencement. The approved plan must be implemented.		The CEMP for MNES was originally approved in relation to EPBC Approval 2008/4058 on 11th April 2011.

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2 PROJECT DESCRIPTION

2.1 Overview

The LNG facility will receive natural gas via a GTP that crosses from the mainland to Curtis Island at the Narrows, north of the site. The GTP enters the LNG facility site at the northern end of the LNG facility (Figure 2-1). When completed, the facility will process the gas through the following stages:

1. Removal of trace hydrogen sulphide gas and carbon dioxide gas from the feed gas stream. If not removed, both gases may freeze in the cryogenic section of the refrigeration section of the plant, resulting in operational problems;
2. Removal of water vapour from the feed gas stream, followed by removal of trace mercury. If not removed, water will freeze in the refrigeration section of the plant, while mercury can damage the refrigeration equipment and could cause a gas release;
3. The clean, dry gas then passes through several stages of refrigeration, where the temperature is progressively lowered resulting in the gas (primarily methane) liquefying. In the final stage of refrigeration, nitrogen present in the feed gas is removed and released to atmosphere. Nitrogen is inert and has no heating value, so would reduce the value of the LNG product if not removed;
4. The LNG is then transferred into cryogenic LNG storage tanks; and
5. When an LNGC arrives, pumps in the LNG storage tanks transfer the LNG product onto the ship at the PLF for export to market.

With a single LNG train in operation, the LNG facility will load approximately one LNGC every 5 - 7 days. With a second train operational, LNGC will be loaded approximately every 2 - 3 days.

In addition to the LNG facility, the following support facilities have been/will be built on Curtis Island to support construction, commissioning and/or operation of the LNG facility:

1. Pioneer Barge Ramp, primarily for receipt of passengers and equipment.
2. MOF. As shown in Figure 2-2a and Figure 2-2b, the MOF is the arrival point for personnel ferries and materials/equipment barges includes:
   a. Passenger Ferry Berth, with capacity for two 400-passenger ferries;
   b. Roll-on/Roll-off (RoRo) Berth, primarily for receipt of equipment and modules to build the LNG facility;
   c. Lift-on/Lift-off Berth (LoLo), for receipt of materials and equipment;
   d. Bulk Aggregate Berth, for receipt of bulk materials.
3. Construction Water Treatment Plant (Construction WTP). A desalination plant to produce fresh and potable water to support construction (including commissioning) of the facility. The Construction WTP plant will be located at the MOF;
4. Concrete Batch Plant, to provide concrete for construction of the LNG facility, also located at the MOF. The concrete batch plant has a designated facility for washing out concrete mixers. The water, which is alkaline, will be captured and

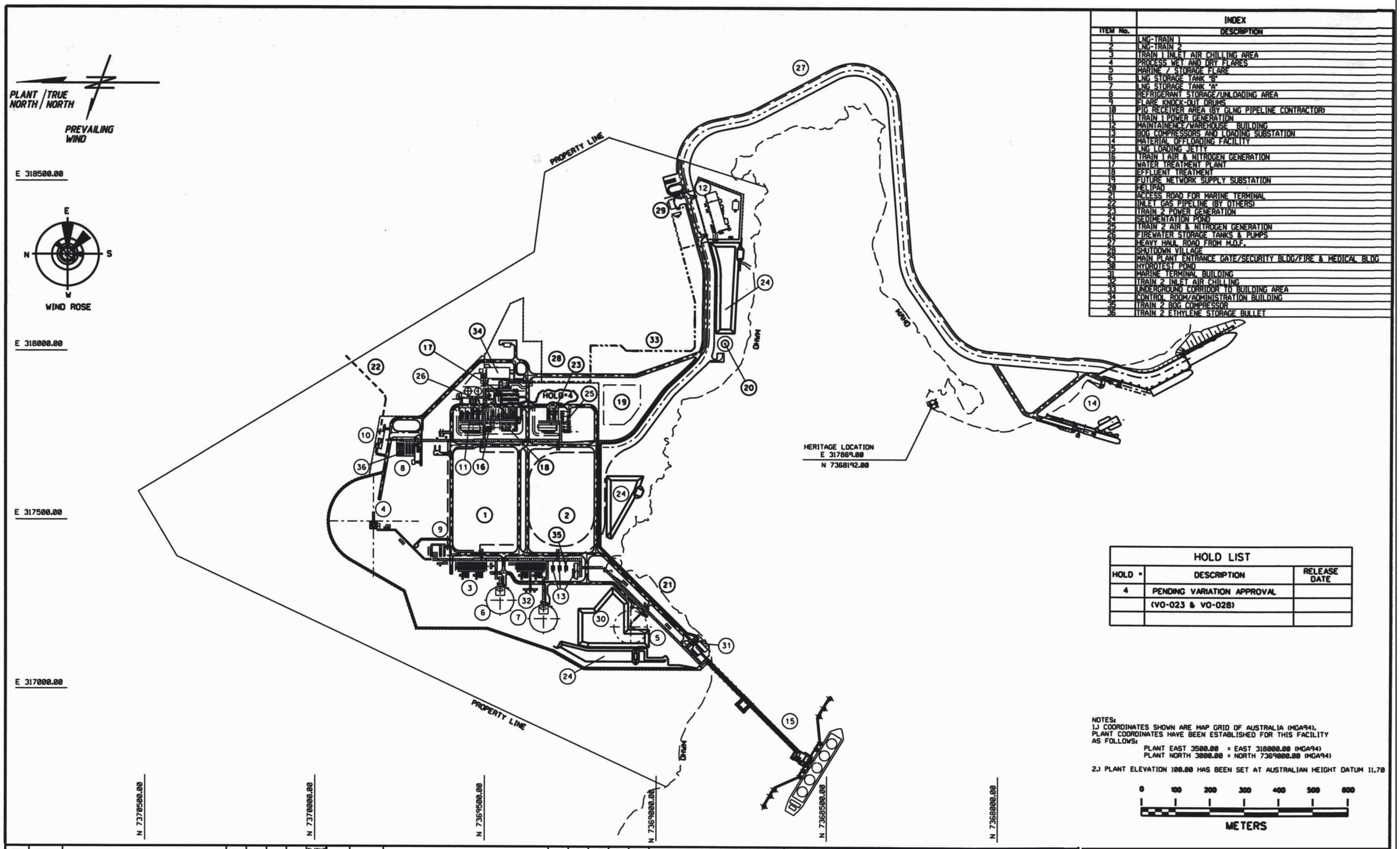
treated to the water discharge standards (pH 6.5 – 8.5) prior to use onsite or discharged to a stormwater basin for removal of any suspended particles;

5. Operations Water Treatment Plant, to produce fresh and potable water to support the operation of the facility, processing raw water supplied from the Gladstone Area Water Board (GAWB) pipeline and potentially condensate from the Turbine Inlet Air Chilling (TIAC) unit;
6. Sewage Treatment Plant (STP) for construction and commissioning to treat sewage to tertiary standard as defined in Regulation 135 (3) under the Sewage Policy 2005 and the Great Barrier Reef Marine Park Regulations 183;
7. Pipeline connection to the Gladstone Regional Council (GRC) pipeline for the disposal of sewage during the operational phase of the project;
8. Pipeline connection to the GAWB pipeline for the supply of potable water; and
9. Temporary Worker Accommodation Facility (TWAF), for accommodation of non-local workers during the construction of the LNG facility.

On the mainland, the following logistics support facilities are provided:

1. Port Central Logistics Centre (see Figures 2-3a and 2-3b), consisting of ferry terminal and RoRo berth for transfer of personnel and equipment to the MOF. The Port Central Logistics Centre is used for transfer of equipment and materials in containers or flat-bed trailers to the island; and
2. RG Tanna Bulk Materials Handling and Logistics Centre (Figure 2-4), consisting of a LoLo berth and a RoRo berth, for the transfer of bulk materials and trucks to the island. The LoLo berth is able to load barges with bulk materials such as aggregates. Temporary bulk materials handling, equipment marshalling and barge mooring facilities at Gladstone Marina and Fisherman's Landing.

The mainland logistics facilities activities are being carried out as approved under the state based requirements and legislation.



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6	LNG STORAGE TANK "B"
7	LNG STORAGE TANK "A"
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HOLD LIST		
HOLD #	DESCRIPTION	RELEASE DATE
4	PENDING VARIATION APPROVAL	
	(VO-023 & VO-028)	

NOTES:
1.) COORDINATES SHOWN ARE MAP GRID OF AUSTRALIA (MGA94). PLANT COORDINATES HAVE BEEN ESTABLISHED FOR THIS FACILITY AS FOLLOWS:
PLANT EAST 3500.00 = EAST 318000.00 (MGA94)
PLANT NORTH 3000.00 = NORTH 7369000.00 (MGA94)
2.) PLANT ELEVATION 100.00 HAS BEEN SET AT AUSTRALIAN HEIGHT DATUM 11.70

0 100 200 300 400 500 600
METERS

NO.	DATE	REVISION	BY	CHK'D	APP.	PEM	CLIENT ACC.
005	Dec-07-2011	ISSUED FOR CONSTRUCTION	DRL	DG	SM/LH	WL	
000	Nov-06-09	ISSUED FOR FEED DESIGN	DRL	DG	SM/TJ	WL	
001	Sept-10-10	ISSUED FOR FEED DESIGN - PLAN C	DRL	DG	SM/LH	WL	
002	Jan-04-2011	RE-ISSUED FOR FEED DESIGN - PLAN C	DRL	DG	SM/LH	WL	
003	Feb-08-2011	RE-ISSUED FOR FEED DESIGN - PLAN C WITH ADDENDUM	DRL	FN	SM/LH	WL	
004	July-15-2011	ISSUED FOR DESIGN	JG	DRL	SM/LH	WL	

BECHTEL 25578

GLNG PLANT PROJECT
TRAIN 1
OVERALL SITE PLAN
CURTIS ISLAND AUSTRALIA

GLNG DWG NO.	REV
3310-50-001	5
SCALE: 1:10,000 ON 11 X 17	
DRAWING NO.	REV.
100-P1-0000-00001	005

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LNG Facility

LNG facility

Figure: 2-1 Date: June 2013 File No. GLNG 499b

TRUE NORTH

PREVAILING WIND

NOTE:
1) MOF CONFIGURATION IS PRELIMINARY. DETAILED DESIGN TO BE DETERMINED AT A LATER DATE.
2) ALL COORDINATES REFER TO THE MAP GRID OF AUSTRALIA (MGA) ZONE 56, DATUM GDA94
3) CONTOURS ARE SHOWN IN METERS. DATUM IS LAT.

R250000 FUTURE EXCLUSION ZONE

X=317560.47
Y=7367906.49

X=317827.91
Y=7367876.39

X=317975.26
Y=7367680.57

S 16D18'31" W

100X25

37X11

37X11

85X25

110000

18000
SLOPED DECK

150000

500000

500000

500000

45000

135X24

POTENTIAL SHEETPILE BULKHEAD

LO/LO BERTH

SLOPED DECK

162X38

RO/RO BERTH

TOE OF FUTURE DREDGED BASIN

TOE OF FUTURE DREDGED CHANNEL

0 50 100
METERS

NO.	DATE	REVISION	BY	CHK'D	APP.	PEM	NO.	DATE	REVISION	BY	CHK'D	APP.	PEM
00A	12-09-2011	PRELIMINARY	CHS	SI	TJ	WI							
00B	01-28-2012	ISSUED FOR REBID	CHS	SI	TJ	WI							

BECHTEL 25501-100

GLNG
MOF GENERAL ARRANGEMENT PLAN

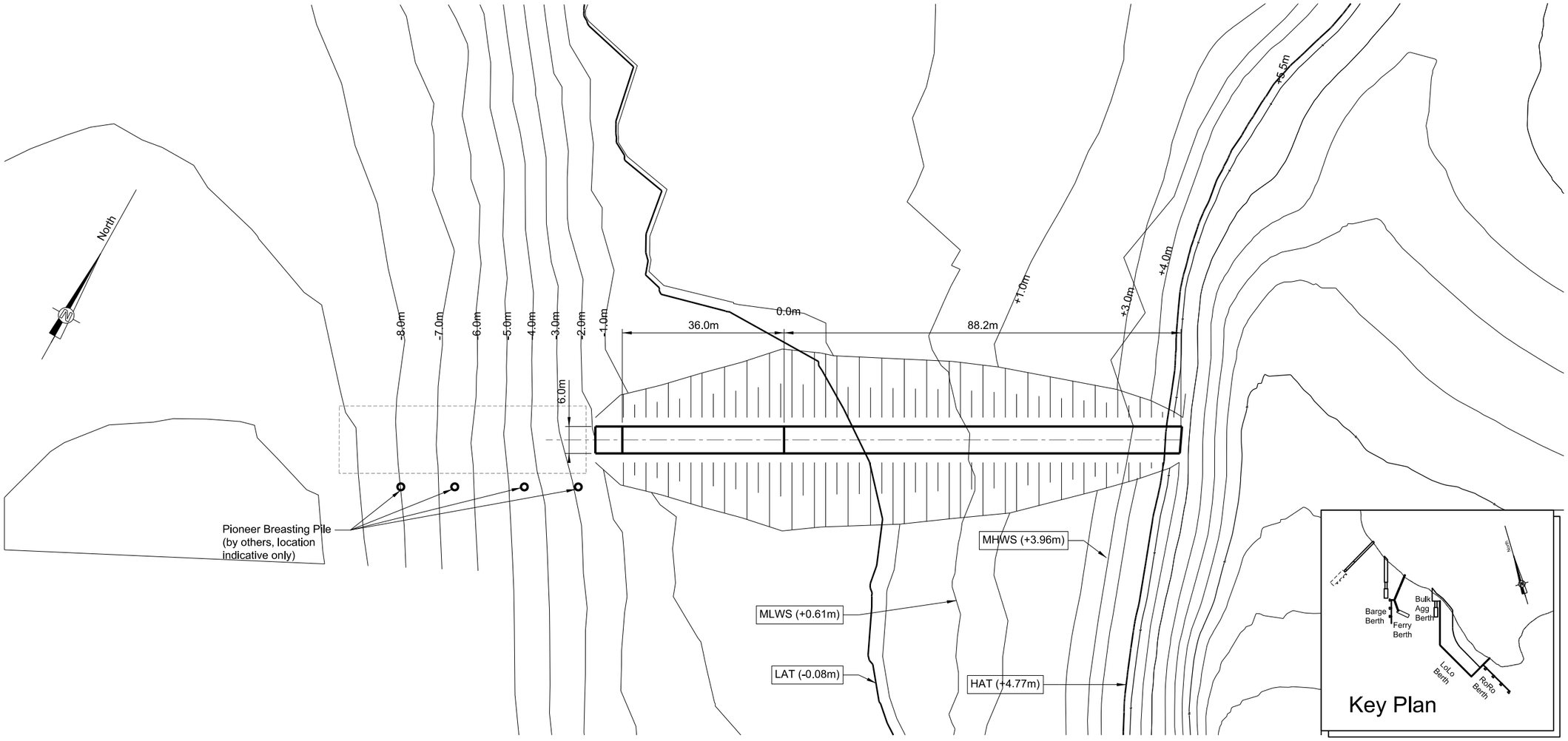
GLNG DWG NO. 3310-50-095 REV.
SCALE:
DRAWING NO. REV.
DRAWING NO. 25501-100-PM-0000-00001 00B
CAD FILE: DATE:

Fuel for the Future

LNG Facility

Material Offloading Facility

Figure: 2-2a Date: June 2013 File No. GLNG 499c



Plan Layout of Temporary Pioneer Facilities

Scale 1:500

ZA

I hereby certify that this drawing is a factual representation of all "As Constructed" works.

Signed: _____ JH Manager Approval

I hereby certify this drawing containing our original design and subsequent modifications as provided by JH in accordance with the design intent.

Signed: _____ RPEQ No. 3753 Date: 22/06/12

0 5 10 20 Metres
Scale 1:500

AS CONSTRUCTED

Issue	Date	By	Chkd	Appd	Description
ZA	21/09/12	RVM	ET	BOS	Re-Issued As Constructed
Z	22/06/12	RVM	ET	BOS	As Constructed
C	05/06/12	RVM	ET	BOS	Revised Pioneer Dock Layout
B	08/09/11	JWH	JM	BOS	Issued for Construction
A	21/04/11	JWH	CA	IMR	Issued for Construction

Client: BECHTEL AUSTRALIA PROPRIETARY LIMITED

Bechtel Document No.: 25577-100-V21-CM00-00461
GLNG Base No.: 3361-BTH-3-3.3-93359-461
GLNG Drawing Code: 3361-40-96598-461

Job Title: GLNG Material Offloading Facilities

Scale at A1: 1:500

Discipline: Structures

ARUP
11 Harvest Terrace, West Perth, Australia
PO Box 629, West Perth, WA 6872
Tel +61 (08) 9322 1400 Fax +61 (08) 9481 1334
www.arup.com.au
John Holland CONSULT AUSTRALIA Member Firm
Arup Pty Ltd ABN 18 000 966 165

Drawing Title: Pioneer Barge Ramp General Arrangement

Drawing Status: As Constructed

Job No	Drawing No	Issue
220822	00160	ZA

LNG Fuel for the Future

LNG Facility

Pioneer Barge Ramp

Figure: 2-2b Date: June 2013 File No. GLNG 499v

GDA

Do not scale

19/09/2012 4:38:11 PM

E 323250 E 323350 E 323450 E 323550 E 323650

N 7362800 N 7362700 N 7362600 N 7362500

GATE #3

500mm GRAVEL PAVED WITH SCREENINGS BUILDING AREA

CONSTRUCT SITE DRAIN

500mm GRAVEL PAVED AND SEALED CAR PARKING

500mm GRAVEL PAVED & SEALED TRAFFICABLE AREAS

EXIST TREE BAND PRESERVED

PEDESTRIAN WALKWAY

CONSTRUCT SITE DRAIN

SITE DRAIN CONNECTS TO EXIST DRAIN

GATE #1

NEW CULVERT CROSSING UNDER ENTRANCE

EXIST DRAIN. WIDENED ALONG SITE FRONTAGE; RIP RAP ROCK LINING ALONG SITE FRONTAGE

NEW CULVERT CROSSING UNDER ENTRANCE

CONCRETE SPOON DRAIN WITH DRAINAGE PIPE BENEATH

SITE WATER SUPPLY

GATE #6

WARNING UNDERGROUND SERVICES - PHONE, FIBRE & WATER

GATE #5

GATE #4

PEDESTRIAN UNDER COVER AREA

300mm GRAVEL PAVED INFILL AREA NO SEAL.

BUS DROP OFF PICK-UP AREA

PERIMETER FENCE

LEASE BOUNDARY

SUBSOIL DRAINAGE HEADER PIPE COLLECTION SYSTEM WITH OUTLET TO EXIST DRAIN

SUBSOIL DRAINAGE (TYP)

EXIST DRAIN

HAUL ROAD

PAVED & SEALED CAR PARKING - TOTAL 472 CAR SPACES 56 MOTORCYCLE SPACES

SITE DRAIN CONNECTS TO EXIST DRAIN

GATE #2

ACCESS ROAD BY OTHERS

8 CAR PARKS

12 CAR PARKS

BUSES PARKING

57 MOTORCYCLE PARKS

59 CAR PARKS

FUTURE CAR PARKS

BUILDING DETAILS (DRAWINGS BY OTHERS)	
1	TRAINING ROOM
2	SECURITY HUT
3	FREIGHT OFFICE
4	CRIB ROOM
5	FERRY OPERATION
6	TOILET MALE
7	TOILET FEMALE
8	TOILET FEMALE
9	TOILET MALE
10	CRIB ROOM
11	SECURITY BUILDING
12	TURNSTYLES

BECHTEL NO:	GLNG NOS:
25577-100-V41-CM00-00071	3310-40-96598-71
	3310-BTH-3-3.3-96598-71

DO NOT SCALE OFF DRAWING
DIMENSIONS METERS UNO

GOLDING

KEVIN HOLT CONSULTING
SURVEYORS AND TOWN PLANNERS

4 Goondoon Street
Gladstone Qld 4680
Phone 07 4972 0105
Fax 07 4972 0238
Email gladstone@kevinholtconsulting.com

SURVEY DATUM:
MGA94 PM701234 RL3.954 AHD

PROPERTY DESCRIPTION:
LOT 300 SP120920 GLADSTONE REGIONAL COUNCIL

AS CONSTRUCTED

AMENDMENTS

ISSUE	DATE	SUBJECT	AUTHORISED
A	1/02/11	CONSTRUCTION	ASC
B	7/02/11	MARINE CONNECTION	ASC
C	1/04/11	BLD LAYOUT & ENT	ASC
D	9/06/11	NEW LAYOUT	ASC
E	28/07/11	NEW BLD LAYOUT	ASC
F	26/11/11	AS CON	ASC

XREF FILES

DRAWING NO.	TITLE.
G1004-1-BASE.DWG	BASE PLAN

DRAWN ASC DATE 08/10

DESIGN ASC DATE 08/10

© Cox Andrews Engineers Pty Ltd

COX ANDREWS ENGINEERS PTL
CONSULTING ENGINEERS
ACN 054 355 252
PH: 4978 4845
FAX: 4978 4825
BRISBANE, GLADSTONE

AUTHORISED FOR ISSUE RPEQ 4321 DATE 26/11/11

GLNG
PORT CENTRAL AREA
OFFICES, CAR PARKING, BUS MARSHALLING & FERRY WAITING GENERAL ARRANGEMENT

FILE NO G01004-1-AP1-01.DWG
JOB NO G1004/2
SCALE 0 15 30 AT A3 SIZE
1:1500 U.N.O.
DRAWING NUMBER G1004-1-AP1-01 ISSUE F SHEET NO. 1

PRINT IN COLOUR

LNG
Fuel for the Future

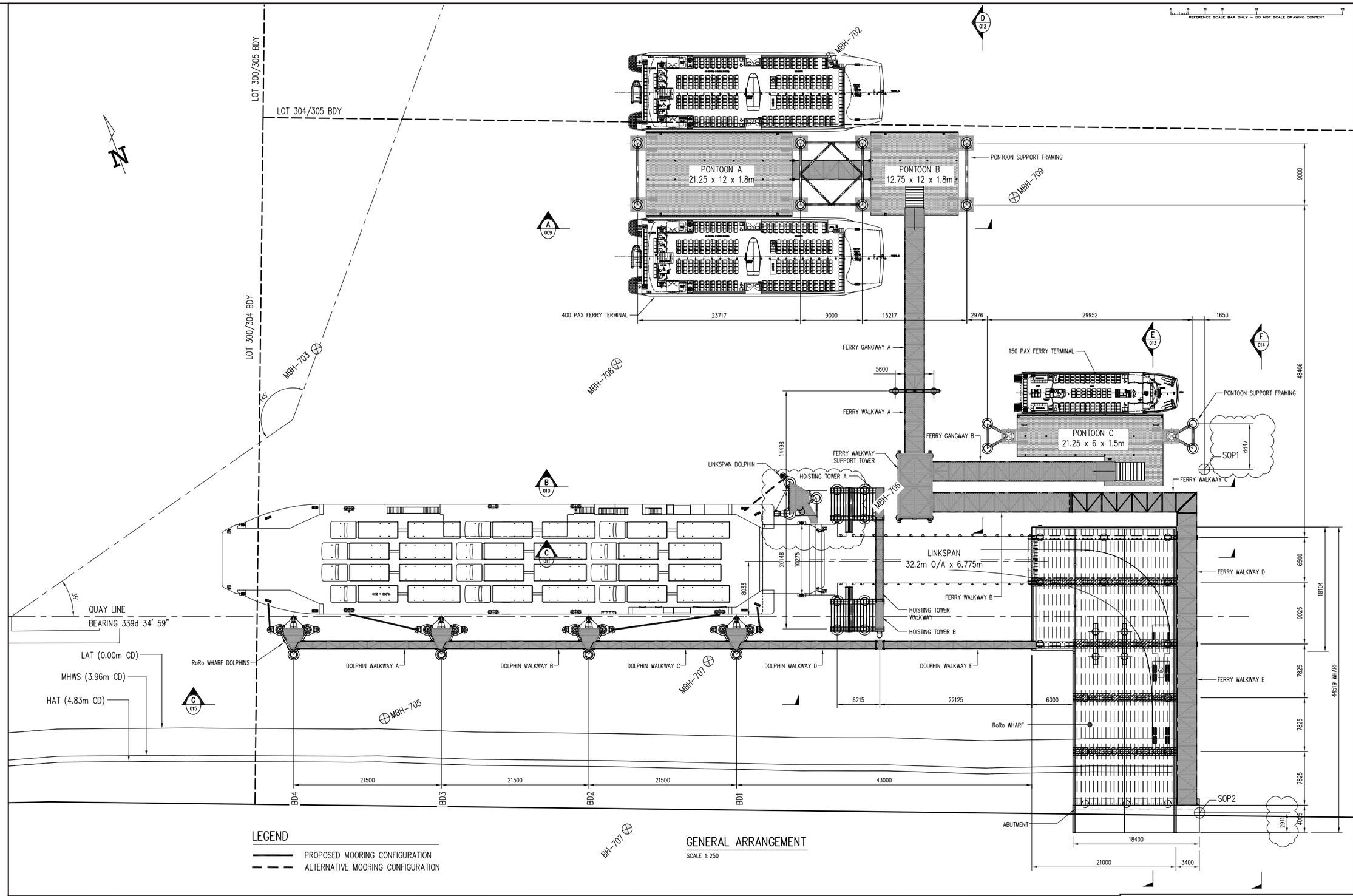
LNG Facility

Port Central

Figure: 2-3a Date: June 2013 File No. GLNG 499d

GDA

D:\Jobs Current\GoldingSantos\Detail Design\Acad\G1004-1-AP1-01(As Con).dwg, 7/12/2011 6:49:29 PM



Issue	Revision	Date	By	App.
P5	PROGRESS ISSUE	16.11.10	TKM	TJM
P4	RE-ISSUED FOR PERMIT	21.10.10	TKM	TJM
P3	ISSUED FOR PERMIT	04.10.10	TKM	TJM
P2	PRELIMINARY ISSUE	17.09.10	TKM	TJM
P1	PRELIMINARY ISSUE	31.08.10	TKM	TJM
6	ISSUED FOR CONSTRUCTION	23.05.11	TKM	TJM
5	ISSUED FOR CONSTRUCTION	16.05.11	TKM	TJM
4	ISSUED FOR CONSTRUCTION	12.05.11	TKM	TJM
3	ISSUED FOR CONSTRUCTION	08.04.11	TKM	TJM
2	ISSUED FOR CONSTRUCTION	03.02.11	TKM	TJM
1	ISSUED FOR CONSTRUCTION	01.02.11	TKM	TJM
0	ISSUED FOR CONSTRUCTION	22.12.10	TKM	TJM
P6	ISSUED FOR PROCUREMENT	03.12.10	TKM	TJM
7	ISSUED FOR CONSTRUCTION	09.06.11	TKM	TJM

GOLDING | LNG | BECHTEL

BONACCI
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ABN 72 010 994 664
Structural, Civil and Infrastructure Engineers
10 Finchley Street (PO Box 1295) Milton Queensland 4064 Australia
Tel : +61 7 3510 7222 Fax : +61 7 3368 1751
Email : bone@bonaccigkl.com
Web Site : www.bonaccigroup.com

Project
GLNG: MAINLAND FACILITIES
PORT CENTRAL
Drawing Title
GENERAL ARRANGEMENT
PLAN

BONACCI Project Ref	B3618
Scale	AS SHOWN
Date	AUG 2010
BECHTEL Doc No.	25577-100-V41-CM00-00007
GLNG Base Doc No.	3310-BTH-3-3.3-96598-7
GLNG Drawing Code	3310-40 -96598-7

ISSUED FOR CONSTRUCTION
Designed T.J.M. | Drawn T.K.M.
Project Director Approved T. J. MEMORY
RPEQ No. 5671
008 | Rev. 7

LNG
Fuel for the Future
LNG Facility

Port Central Marine Facility

Figure: 2-3b Date: June 2013 File No. GLNG 499w

GDA

REFERENCE SCALE BAR ONLY – DO NOT SCALE DRAWING CONTENT

-5 LAT
7364400N
-4 LAT
-3 LAT
-2 LAT
-1 LAT
0 LAT
1 LAT
SOP1
SOP2
SOP3
SOP4
SOP5
SOP6
SOP7
SOP8
SOP9
SOP10
QCLNG DREDGE PROFILE
QCLNG DREDGE LEVEL -4.5 LAT
QUAY LINE
BEARING 128°12'03"
HOLD RETURN WALL DETAILS
SEA-TOW 35
VESSEL SHOWN
MBH-713A
MBH-714
MBH-713
MBH-716
MBH-715
BH-723
BH-722
BH-701
BH-724
BH-702
BH-703
LEASE BDY
TOP OF BANK
QCLNG SITE
GLNG SITE
4.50
6.67
6.57
6.87
6.77
6.47
6.37
7364200N
320800E
321000E

GLNG SITE PLAN
SCALE 1:500

Issue	Revision	Date	By	App.
P5	ISSUED FOR PROCUREMENT	03.12.10	TKM	TJM
P4	PROGRESS ISSUE	16.11.10	TKM	TJM
P3	ISSUED FOR PERMIT	27.10.10	TKM	TJM
P2	ISSUED FOR PERMIT	04.10.10	TKM	TJM
P1	PRELIMINARY ISSUE	16.08.10	TKM	TJM
6	ISSUED FOR CONSTRUCTION	19.09.11	TKM	TJM
5	ISSUED FOR CONSTRUCTION – Rafts ADDED	14.09.11	TKM	TJM
4	ISSUED FOR CONSTRUCTION	18.03.11	TKM	TJM
3	ISSUED FOR CONSTRUCTION	01.03.11	TKM	TJM
2	ISSUED FOR CONSTRUCTION	10.02.11	TKM	TJM
1	ISSUED FOR CONSTRUCTION	01.02.11	TKM	TJM
0	ISSUED FOR CONSTRUCTION	22.12.10	TKM	TJM

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Email : bonq@bonacciqld.com
Web Site : www.bonacciqroup.com

Project
GLNG: MAINLAND FACILITIES
RG TANNA FACILITIES
Drawing Title
GENERAL ARRANGEMENT
GLNG RG TANNA SITE PLAN

BONACCI Project Ref	83618
Scale	AS SHOWN
Date	SEP 2010
BECHTEL Doc No.	25577-100-V41-C900-00043
GLNG Base Doc No.	3310-BTH-3-3.3-86508-43
GLNG Drawing Code	3310-40 -86508-43

ISSUED FOR CONSTRUCTION
Designed TJM
Drawn TKM
Project Director Approved T. J. MEMORY
RPEQ No. 5671
206
Rev. 6

Fuel for the Future

LNG Facility

RG Tanna Bulk Materials Handling and Logistics Centre

Figure: 2-4 Date: June 2013 File No. GLNG 499e

GDA

2.2 Construction Methodology and Sequence

For the main LNG facility areas, the execution strategy is to use predominantly modular construction. Modules are built off-shore and shipped directly to the MOF on Curtis Island.

Elements of the MOF were under the control of the Department of Agriculture Fisheries and Forestry (DAFF) (formerly Australian Quarantine and Inspection Service (AQIS)) for the storage and inspection of all materials and equipment that is directly imported from overseas. A Biosecurity Management Plan[1] (BSMP) was developed in consultation with DAFF and approved by the Minister which applies to direct international import arrivals at the MOF. The BSMP contains measures to prevent the introduction of non-endemic species onto Curtis Island. The BSMP can be accessed at http://www.santosglng.com.

The general methodology and sequence for construction of the LNG plant is as follows:

- Site clearing and earthworks - access to Curtis Island was initially via beach landing near the MOF, from which the Site Civil subcontractor undertook vegetation clearing and site levelling. These activities are described in more detail in Section 2.4.1;
- Construction of the MOF occurred concurrently with the site clearing and bulk earthworks. Dredging for the LNG Facility has been carried out pursuant to approvals held by Gladstone Ports Corporation Ltd (GPC) for the Western Basin Strategic Dredging and Disposal Project including EPBC 2009/4904. MOF construction included dredging 64,700m^3 of material under the GPC's Dredge Management Plan (DMP) using a backhoe dredge. Figure 2-5 identifies the areas dredged on a contour map and includes cross sections of the dredge areas.
- Installation of temporary construction facilities (Figure 2-6) including:
  - Temporary Worker Accommodation Facility (TWAF);
  - Construction offices, construction warehouse, and other temporary construction buildings;
  - Construction WTP;
  - Concrete Batch Plant; and
  - Construction Sewage Treatment Plant; and
  - Multiple work fronts were established from late 2011, starting with the LNG plant (train 1) and the LNG tanks.

Construction was undertaken on multiple fronts throughout 2012 - 2015, with early process commissioning activities starting on the LNG facility 4Q 2014;

[1] Note that the *Biosecurity Management Plan* is referred to as the *Quarantine Management Plan* in Condition 30 and 31 of approval EPBC No. 2008/4057 for the LNG facility on Curtis Island

Commissioning activities will involve the following phases:

Start System Commissioning Activities

- Start-up and testing of utilities (shared by Train 1 and Train 2), e.g. diesel generators, firewater system, nitrogen generators, air compressors, and flare prior to fuel gas entering system.
- Start-up and testing of the four Gas Turbine Generator (GTG) for Train 1.

Start-up Activities (Train 1)

- Introduce hydrocarbons as fuel gas in Train 1 for testing of Process Gas Turbines.
- Initial charge of dessicants, solvent and chemicals, degreasing and cleaning of systems e.g. Flushing and Chemical Cleaning of the AGRU.
- Hydrocarbons introduced as feed gas into Train 1 and treated in AGRU, dehydration and mercury removal units (conditioned to spec.).
- Purge, dry, and clean of Train 1 liquefaction systems ready to accept feed gas.
- Refrigerant is used to cool down and liquefy the feed gas and produce LNG in Train 1, LNG storage and loading systems.

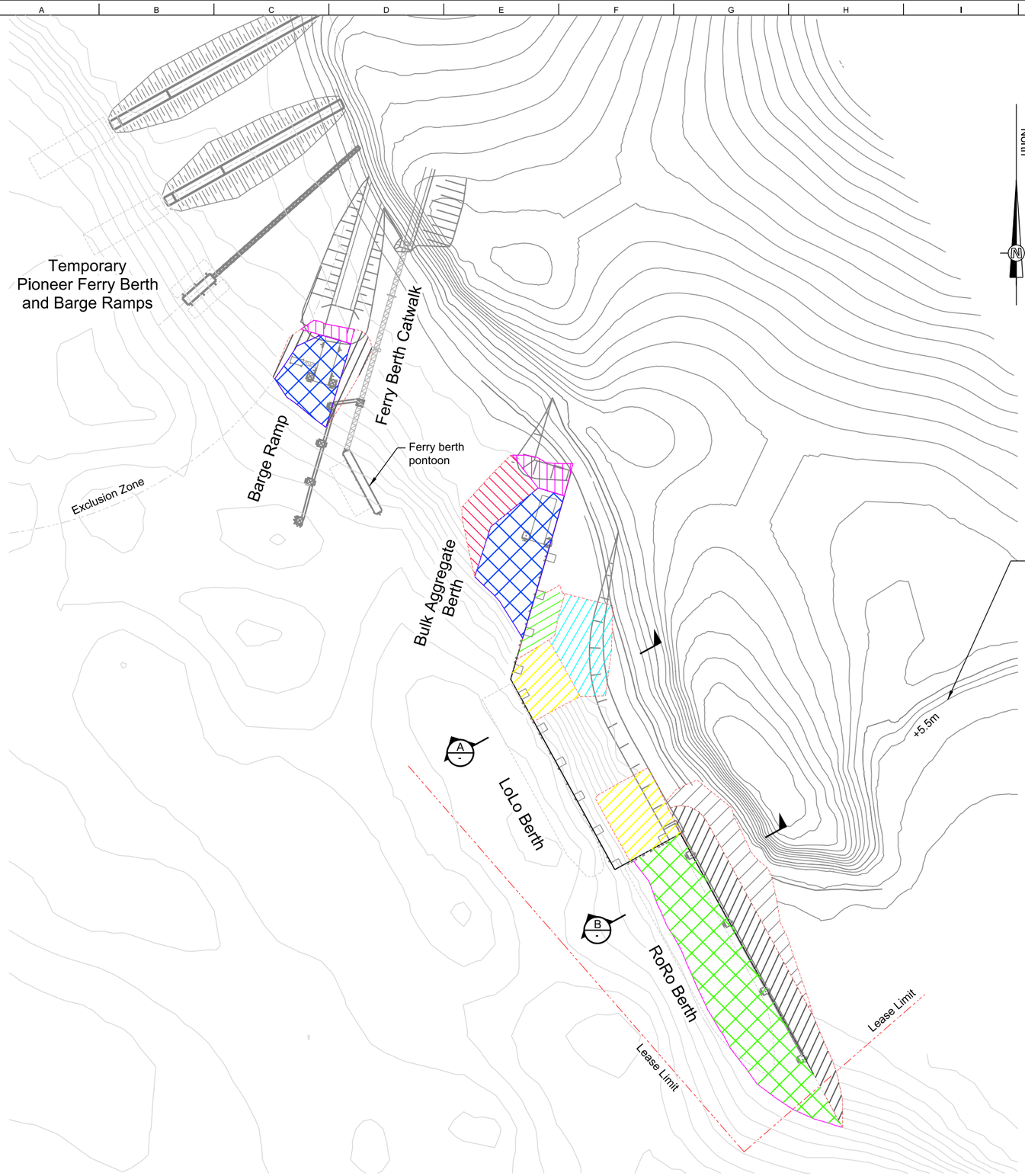
First LNG Cargo (Train 1)

- Start producing LNG at stable rate.
- First LNG Cargo.
- Prepare for overall plant performance, establish stable operation.

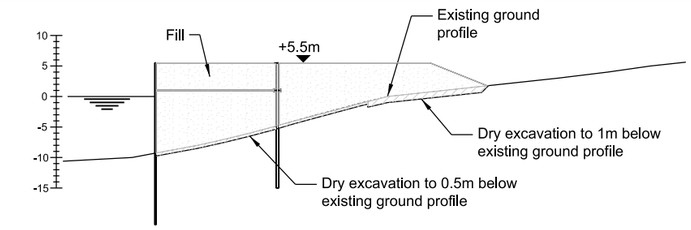
Performance Testing (Train 1)

- Overall plant performance test to verify it functions according to its design objectives or specifications.

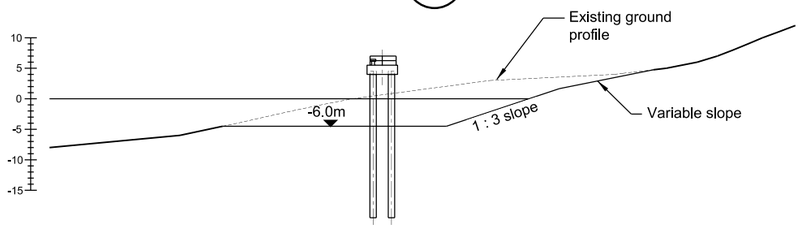
With the exception of the commissioning of the utilities area (excluding the testing of two GTGs for Train 2), storage and loading the above phases will be repeated for Train 2. Following completion of construction, temporary facilities are proposed to be demobilised (unless GLNG wishes to retain for future use), including the TWAF and construction offices, and the land stabilised for potential future uses.



Works above contour of +5.5m to be designed by others. Works shown above +5.5m are indicative only.



Section A
Scale 1:500



Section B
Scale 1:500

Facility	Required Depth of Water (m LAT)	Max. Design Vessel	Vessel Dimensions (Loa x B x T) m
Barge Ramp	-4.5	3000T Ddwt Barge	85.0 x 18.8 x 3.4
Ferry Berth	-1.8	350 Pax Cat	29.0 x 8.5 x 1.8
Bulk Aggregate Berth	-4.5	3000T Ddwt Barge	85.0 x 18.8 x 3.4
LoLo Berth	-7.5	Beluga "R" Series	134.7 x 21.5 x 8.0
RoRo Berth	-6.0	Dong Bang 2	150.0 x 38.0 x 5.5

Fill Volumes (m³)			
	Barge Ramp	Bulk Aggregate Berth	Sub Total
Core	3 316	384	3 700
Filterstone	2 526	542	3 068
Armourstone	3 820	1 587	5 407
Sub-Total			12 175
MOF Backfill			86 271
Total Fill			**98 446**
Dredge Volumes (m³)			
Soft Soil			24 183
Stiff to Hard Soil			9 765
Hard Granular Soil			23 802
Rock			3 000
Total Dredge			**60 750**

- Final quantities to be confirmed during detailed design.
- Quantities do not account for bulking after excavation.
- Quantities exclude Pioneer Barge Ramps.
- Dredge model assumes sheet pile wall will be installed prior to commencement of dredging.

Dry Excavation Volumes (m³)	
Soft Soil	**5 203**

- Material removed by dry excavation is to be re-used in construction works.

Tide Levels	
Water Level* RL m	Tidal Plane
+4.77	HAT
+3.96	MHWS
+3.08	MHWN
+2.35	MSL
+1.49	MLWN
+0.61	MLWS
-0.08	LAT

+0.0m

* Still water level at Santos Berth

Legend

- Denotes dredge to -6.0m
- Denotes dredge to -4.5m
- Denotes 1v : 5h slope
- Denotes 1v : 3h slope
- Denotes Variable slope (Max. 1v : 3h slope)
- Denotes 1v:2.5h slope
- Denotes dry excavation to 3m below surface level
- Denotes dry excavation to 1m below surface level
- Denotes dry excavation to 0.5m below surface level

Note: Slopes are called up as Vertical: Horizontal

Notes:
All coordinates are in MGA.
All levels are in m CD.

NOT FOR CONSTRUCTION

Note:

Bathymetry is based on information received from Bechtel on 10-02-03, CombinedOnshoreOffshoreContours MGA56 mLAT2.dwg.

Bathymetry is subject to change as a result of survey currently in progress.

All temporary works are to be removed. The final condition of areas affected by temporary works is to achieve the original surface contours as far as possible.

Approved by: Ian McRobbie, RPEQ. No. 192998

Issue	Date	By	Chkd	Appd
R10	28/10/10	JWH	CM	IMR
Released for Permitting				
R9	23/09/10	JWH	CM	IMR
Released for Permitting				
R8	08/09/10	JWH	PI	
Released for Permitting				

Client: BECHTEL AUSTRALIA PROPRIETARY LIMITED

Bechtel Document No. 25577-540-V21-CM00- 00003

Job Title: Curtis Island Marine Offloading Facility

Scale at A1: 1:1500

Discipline: Geotechnical

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John Holland CONSULT AUSTRALIA Member Firm
Arup Pty Ltd ABN 18 000 966 165

Drawing Title: Dredging Layout

Drawing Status: Released for Permitting

Job No	Drawing No	Issue
220822	P-003	R10

Do not scale

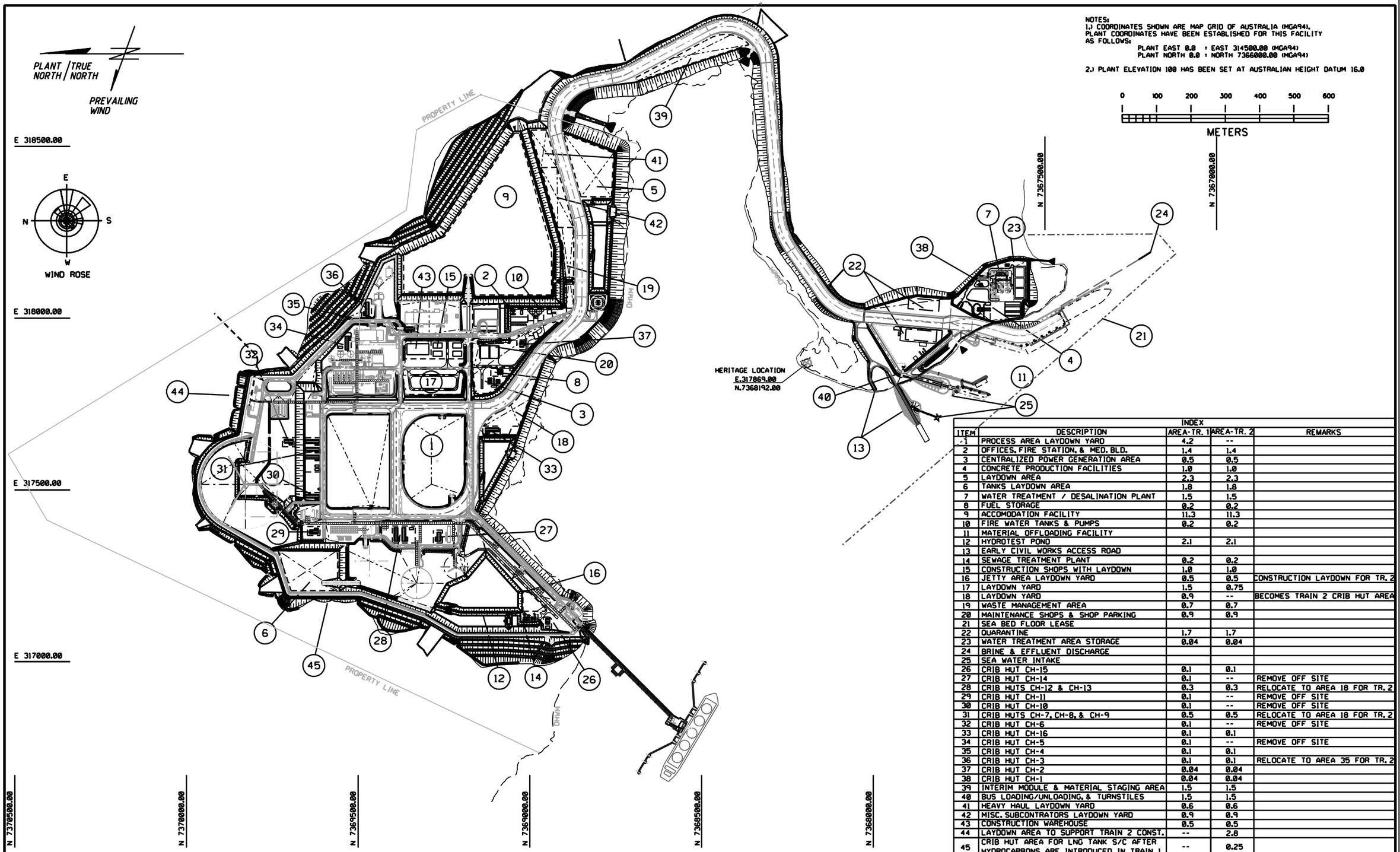
LNG Fuel for the Future

LNG Facility

MOF Dredge Area

Figure: 2-5 Date: June 2013 File No. GLNG 499f

GDA



NOTES:
1.) COORDINATES SHOWN ARE MAP GRID OF AUSTRALIA (MGA94).
PLANT COORDINATES HAVE BEEN ESTABLISHED FOR THIS FACILITY AS FOLLOWS:
PLANT EAST 0.0 = EAST 314500.00 (MGA94)
PLANT NORTH 0.0 = NORTH 7366000.00 (MGA94)

2.) PLANT ELEVATION 100 HAS BEEN SET AT AUSTRALIAN HEIGHT DATUM 16.0

INDEX

ITEM	DESCRIPTION	AREA-TR. 1	AREA-TR. 2	REMARKS
1	PROCESS AREA LAYDOWN YARD	4.2	--	
2	OFFICES, FIRE STATION, & MED. BLD.	1.4	1.4	
3	CENTRALIZED POWER GENERATION AREA	0.5	0.5	
4	CONCRETE PRODUCTION FACILITIES	1.0	1.0	
5	LAYDOWN AREA	2.3	2.3	
6	TANKS LAYDOWN AREA	1.8	1.8	
7	WATER TREATMENT / DESALINATION PLANT	1.5	1.5	
8	FUEL STORAGE	0.2	0.2	
9	ACCOMODATION FACILITY	11.3	11.3	
10	FIRE WATER TANKS & PUMPS	0.2	0.2	
11	MATERIAL OFFLOADING FACILITY			
12	HYDROTEST POND	2.1	2.1	
13	EARLY CIVIL WORKS ACCESS ROAD			
14	SEWAGE TREATMENT PLANT	0.2	0.2	
15	CONSTRUCTION SHOPS WITH LAYDOWN	1.0	1.0	
16	JETTY AREA LAYDOWN YARD	0.5	0.5	CONSTRUCTION LAYDOWN FOR TR. 2
17	LAYDOWN YARD	1.5	0.75	
18	LAYDOWN YARD	0.9	--	BECOMES TRAIN 2 CRIB HUT AREA
19	WASTE MANAGEMENT AREA	0.7	0.7	
20	MAINTENANCE SHOPS & SHOP PARKING	0.9	0.9	
21	SEA BED FLOOR LEASE			
22	QUARANTINE	1.7	1.7	
23	WATER TREATMENT AREA STORAGE	0.04	0.04	
24	BRINE & EFFLUENT DISCHARGE			
25	SEA WATER INTAKE			
26	CRIB HUT CH-15	0.1	0.1	
27	CRIB HUT CH-14	0.1	--	REMOVE OFF SITE
28	CRIB HUTS CH-12 & CH-13	0.3	0.3	RELOCATE TO AREA 18 FOR TR. 2
29	CRIB HUT CH-11	0.1	--	REMOVE OFF SITE
30	CRIB HUT CH-10	0.1	--	REMOVE OFF SITE
31	CRIB HUTS CH-7, CH-8, & CH-9	0.5	0.5	RELOCATE TO AREA 18 FOR TR. 2
32	CRIB HUT CH-6	0.1	--	REMOVE OFF SITE
33	CRIB HUT CH-16	0.1	0.1	
34	CRIB HUT CH-5	0.1	--	REMOVE OFF SITE
35	CRIB HUT CH-4	0.1	0.1	
36	CRIB HUT CH-3	0.1	0.1	RELOCATE TO AREA 35 FOR TR. 2
37	CRIB HUT CH-2	0.04	0.04	
38	CRIB HUT CH-1	0.04	0.04	
39	INTERIM MODULE & MATERIAL STAGING AREA	1.5	1.5	
40	BUS LOADING/UNLOADING, & TURNSTILES	1.5	1.5	
41	HEAVY HAUL LAYDOWN YARD	0.6	0.6	
42	MISC. SUBCONTRATORS LAYDOWN YARD	0.9	0.9	
43	CONSTRUCTION WAREHOUSE	0.5	0.5	
44	LAYDOWN AREA TO SUPPORT TRAIN 2 CONST.	--	2.8	
45	CRIB HUT AREA FOR LNG TANK S/C AFTER HYDROCARBONS ARE INTRODUCED IN TRAIN 1	--	0.25	

NO.	DATE	REVISION	BY	CHK'D	APP.	PEM
00A	07/14/10	ISSUED FOR REVIEW	NP	SD	BH	SD
00B	07/30/10	ISSUED FOR REVIEW	NP	SD	BH	SD
00C	08/02/10	ISSUED FOR REVIEW	NP	SD	BH	SD
00D	08/05/10	ISSUED FOR REVIEW	NP	SD	BH	SD
00E	11/15/10	RE-ISSUED FOR REVIEW	NP	SD	BH	SD
00F	01/13/11	ISSUED FOR DESIGN	NP	GH	SD	SD

BECHTEL 25576-100

GLNG

TEMPORARY FACILITIES PLOT PLAN - PLAN C
GENERAL ARRANGEMENT
CURTIS ISLAND AUSTRALIA

GLNG DWG NO. 3361-50-SK013 REV. 00F
SCALE: AS NOTED
DRAWING NO. P1K-0000-61013 REV. 00F
DATE:

Fuel for the Future

LNG Facility

Construction of the LNG Facility

Figure: 2-6 Date: June 2013 File No. GLNG 499g

2.3 Construction Milestone Schedule

The following table summarises key construction schedule activities and projected dates which are subject to change.

Step	Activity Description	Start Date
Early Works		
1	Start of Site Prep (MOF & Heavy Haul Road)	2Q 2011
	• Vegetation Clearance	2Q 2011
	• Dredging	2Q 2011
2	Start of Site Prep (Fisherman's Landing, RG Tanna & Port Central)	1Q 2011
3	Start of Civil works, Foundation & Structures Permanent Plant	4Q 2011
Construction		
4	LNG Tank Construction	2Q 2012
5	PLF Construction	3Q 2012
6	Start Module Installation (main plant)	1Q 2013
7	Train 1 - Introduction of Gas to Front End	2Q 2015
8	Train 1 – First Production of LNG	3Q 2015
9	Decommissioning of the concrete batch plant	2Q 2015
10	Train 1 – First Cargo	3Q 2015
11	Decommissioning of the construction water treatment plant and sewage treatment plant	3Q 2015
12	Train 1 – Performance Test	4Q 2015
13	Handover of Train 1 to GLNG Operations Team	4Q 2015
Operations Train 1 / Construction Train 2 (overlap)		
*14	Train 1 – Operation	4Q 2015
15	Train 2 - Introduction of Gas to Front End	4Q 2015
16	Train 2 – First Production of LNG	1Q 2016
17	Train 2 – First Cargo	1Q 2016
18	Train 2 – Performance Test	2Q 2016
19	Handover of Train 2 to GLNG Operations Team	2Q 2016
Operations LNG Facility Trains 1 and 2		
*20	Train 1 and Train 2 - Operation	2Q 2016

***Note activities 14 and 20 fall outside the scope of this CEMP for MNES and will be addressed as part of the OEMP**

2.4 Construction Activities

2.4.1 Site Clearing and Earthworks

Vegetation clearing commenced in 2Q 2011. Bulldozers were used to push over trees and stickrake the downed trees and understory. In some cases trees were manually felled with chainsaws. Woody material was chipped and all vegetative material stored in windrows on the job site and used for erosion control, landscaping, or disposed. Selected trees, including some large, sound logs that were already on the ground, were stacked along the perimeters of the site to provide wildlife habitat and a potential source of material for use during site rehabilitation. Some logs were preserved for construction use.

Where possible, trees were left along the shoreline for erosion control and for aesthetics. Concurrent with clearing at the MOF site, an improved track was constructed from the MOF to near the centre of the LNG facility to provide all-weather access. Clearing work progressed in stages, essentially working inland from near the

shoreline. Several bulldozers and other equipment worked simultaneously across the site.

Islands of upland vegetation were left in place, but the entire construction area was cleared. As clearing progressed inland a buffer strip of vegetation was left in place along significant stream channels, which are ephemeral and only flow after considerable rainfall thereby providing natural erosion control until stormwater management measures were put in place and earthworks begun. The channels also provided for natural movement for wildlife. The working front was cleared in such a manner that wildlife could always escape offsite to undisturbed habitat. As the GLNG project site borders another LNG project site, a sizeable vegetated area was maintained between the project sites that wildlife can use as an escape corridor. Note that the large expanse of shoreline mangroves in China Bay were left intact as illustrated in Figure 2-7.

After the clearing of an area of vegetation, bulk earthworks commenced, involving cutting hillsides and using the cut material and select imported fills to raise lowland areas to provide a levelled area for the construction of the facility. During bulk earthworks, the following features were installed:

- Diversion drains around the site perimeter; these drains divert stormwater from outside the cleared area, directing the clean runoff to China Bay;
- Internal roads and stormwater drainage channels; and
- Sedimentation basins (three), to collect stormwater runoff from the site and remove bulk sediment before discharge to China Bay. Temporary sediment traps and other stormwater runoff and sediment control measures were installed as necessary.

Refer to Figure 2-8, Overall Site Drainage Plan for additional information.

2.4.2 MOF Dredging

The dredging of the MOF was carried out by backhoe dredge with appropriate support vessels in accordance with the GPC DMP prepared for dredging and disposal of material in the East Banks Disposal Site as part of the Western Basin Dredging and Disposal Project (EPBC 2009/4904). Figure 2-5 shows a layout of the dredging for the MOF. The dredged material was transported to the existing GPC approved East Banks Sea Disposal Site and disposed of in accordance with the GPC Sea Dumping Permit No. 2010/1742.

PLANT / TRUE NORTH

PREVAILING WIND

PRIORITY 1

PRIORITY 2

PRIORITY 3

PRIORITY 4

E 318500.00

E 318000.00

E 317500.00

E 317000.00

WIND ROSE

PROPERTY LINE

OHWM

NOTES:
1.) COORDINATES SHOWN ARE MAP GRID OF AUSTRALIA (MGA94).
PLANT COORDINATES HAVE BEEN ESTABLISHED FOR THIS FACILITY AS FOLLOWS:
PLANT EAST 0.0 = EAST 314500.00 (MGA94)
PLANT NORTH 0.0 = NORTH 7366000.00 (MGA94)

2.) PLANT ELEVATION 100 HAS BEEN SET AT AUSTRALIAN HEIGHT DATUM 16.0

0 100 200 300 400 500 600
METERS

N 7370500.00
N 7370000.00
N 7369500.00
N 7369000.00
N 7368500.00
N 7368000.00
N 7367500.00
N 7367000.00

INDEX		
ITEM	DESCRIPTION	AREA (ha)
1	PROCESS AREA LAYDOWN YARD	4.2
2	OFFICES, FIRE STATION, & MED. BLD.	1.4
3	CENTRALIZED POWER GENERATION/LAYDOWN AREA	0.5
4	CONCRETE PRODUCTION FACILITIES	1.0
5	LAYDOWN AREA	2.3
6	TANKS LAYDOWN AREA	1.8
7	WATER TREATMENT / DESALINATION PLANT	1.5
8	FUEL STORAGE	0.2
9	ACCOMODATION FACILITY	11.3
10	FIRE WATER TANKS & PUMPS	0.2
11	MATERIAL OFFLOADING FACILITY	
12	HYDROTEST POND	2.1
13	EARLY CIVIL WORKS ACCESS ROAD	
14	SEWAGE TREATMENT PLANT	0.2
15	CONSTRUCTION SHOPS WITH LAYDOWN	1.0
16	JETTY AREA LAYDOWN YARD	0.5
17	LAYDOWN YARD	1.5
18	LAYDOWN YARD	0.9
19	WASTE MANAGEMENT AREA	0.7
20	MAINTENANCE SHOPS & SHOP PARKING	0.9
21	SEA BED FLOOR LEASE	
22	QUARANTINE	1.7
23	WATER TREATMENT AREA STORAGE	0.04
24	BRINE & EFFLUENT DISCHARGE	
25	SEA WATER INTAKE	
26	CRIB HUT CH-15	0.1
27	CRIB HUT CH-14	0.1
28	CRIB HUTS CH-12 & CH-13	0.3
29	CRIB HUT CH-11	0.1
30	CRIB HUT CH-10	0.1
31	CRIB HUTS CH-7, CH-8, & CH-9	0.5
32	CRIB HUT CH-6	0.1
33	CRIB HUT CH-16	0.1
34	CRIB HUT CH-5	0.1
35	CRIB HUT CH-4	0.1
36	CRIB HUT CH-3	0.1
37	CRIB HUT CH-2	0.04
38	CRIB HUT CH-1	0.04
39	LAYDOWN YARD	1.5
40	BUS LOADING/UNLOADING, & TURNSTILES	1.5
41	HEAVY HAUL LAYDOWN YARD	0.6
42	MISC. SUBCONTRATORS LAYDOWN YARD	0.9
43	CONSTRUCTION WAREHOUSE	0.5

NO.	DATE	REVISION	BY	CHK'D	APP.	PEM	NO.	DATE	REVISION	BY	CHK'D	APP.	PEM
00A	07/14/10	ISSUED FOR REVIEW	NP	SD	BH	SD							
00B	07/28/10	ISSUED FOR REVIEW	NP	SD	BH	SD							

BECHTEL 25501-100

GLNG

SITE WORKS SEQUENCE - PLAN C
CURTIS ISLAND AUSTRALIA

GLNG DWG. NO.	REV.
3361-50-SK024	00A
SCALE: AS NOTED	
DRAWING NO.	REV.
P1K-0000-61024	008

DATE: 28JULY2010

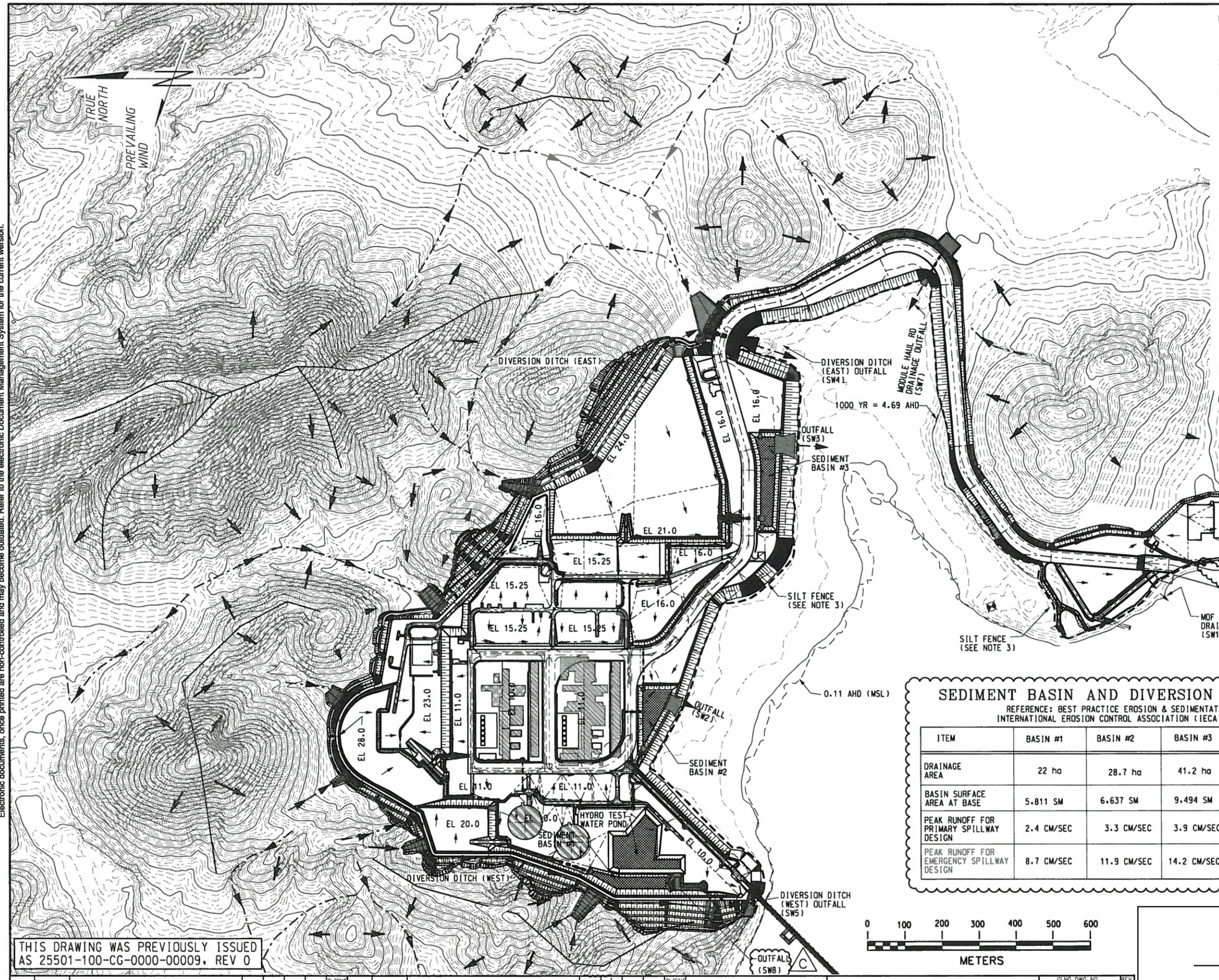
Fuel for the Future

LNG Facility

Site Clearing and Earthworks

Figure: 2-7 Date: June 2013 File No. GLNG 499h

GDA



NOTES:

1. DIVERSION DITCHES ARE PROVIDED TO INTERCEPT RUNOFF FROM SURROUNDING HILLS.
2. DRAINAGE FROM DIVERSION DITCHES WILL BE DISCHARGED TO THE BAY THRU RIPRAP APRONS
3. SILT FENCE LOCATION SHALL BE ESTABLISHED BY THE FIELD IN ACCORDANCE WITH CONSTRUCTION SEQUENCE TO ENCOMPASS THE WORK AREAS. THE PURPOSE IS TO GREATLY LIMIT THE TRANSPORT OF ERODED SOIL FROM THE CONSTRUCTION SITE BY WATER RUNOFF. FOR SILT FENCE INSTALLATION DETAILS, SEE DWG 100-CG-0000-00006.
4. STONE DIKES SHALL BE PLACED IN ACCORDANCE WITH CECP REQUIREMENTS, UNLESS NOTED OTHERWISE ON DRAWINGS. LIMESTONE SHALL BE USED IN LIEU OFSTONE AS INDICATED ON PLAN DRAWINGS. ALL STONE/LIMESTONE DIKES ARE TEMPORARY.
5. SEDIMENTATION POND DESIGN CRITERIA:
   A. 1 YEAR STORM PER IECA DESIGN REQUIREMENTS
6. STORM DRAINAGE DESIGN CRITERIA:
   25 YEAR 1 HOUR RAINFALL (PLANT AREA)
   INTENSITY, I = 80MM PER HOUR

   100 YEAR 1 HOUR RAINFALL (DIVERSION DITCH)
   INTENSITY, I = 105MM PER HOUR
7. SITE HORIZONTAL COORDINATES ARE BASED ON GEODETIC DATUM OF AUSTRALIA (GDA 94). GRID PROJECTION IS MAP GRID OF AUSTRALIA (MGA), ZONE 56.
   PLANT COORDINATES ARE EQUIVALENT TO:
   N 3,000.00 = N 7,369,000.00
   E 3,500.00 = E 318,000.00
8. ALL ELEVATIONS ARE REFERENCED TO AUSTRALIAN HEIGHT DATUM (AHD) SYSTEM.

SEDIMENT BASIN AND DIVERSION DITCH DESIGN

REFERENCE: BEST PRACTICE EROSION & SEDIMENTATION CONTROL, INTERNATIONAL EROSION CONTROL ASSOCIATION (IECA) AUSTRALASIA

ITEM	BASIN #1	BASIN #2	BASIN #3	DIVERSION DITCH (WEST)	DIVERSION DITCH (EAST)
DRAINAGE AREA	22 ha	28.7 ha	41.2 ha	49 ha	149 ha
BASIN SURFACE AREA AT BASE	5,811 SM	6,637 SM	9,494 SM	———	———
PEAK RUNOFF FOR PRIMARY SPILLWAY DESIGN	2.4 CM/SEC	3.3 CM/SEC	3.9 CM/SEC	———	———
PEAK RUNOFF FOR EMERGENCY SPILLWAY DESIGN	8.7 CM/SEC	11.9 CM/SEC	14.2 CM/SEC	———	———

C

0 100 200 300 400 500 600
METERS

THIS DRAWING WAS PREVIOUSLY ISSUED AS 25501-100-CG-0000-00009, REV 0

NO.	DATE	REVISION	BY	CHK'D	APP.	PEM	CLIENT ACC.
A	24Aug11	ISSUED FOR INFORMATION	RAC	PKM	RES	WAL	
B	16Dec11	ISSUED FOR PERMIT	RAC	PKM	RES	WAL	
C	25Mar13	ISSUED FOR PERMIT AMENDMENT			RES	WAL	

BECHTEL 25576

GLNG PLANT PROJECT
CIVIL
SITE DEVELOPMENT
OVERALL SITE DRAINAGE PLAN
GLNG PROJECT — CURTIS ISLAND, AUSTRALIA

GLNG DWG NO.	REV
3310-40-SK09	C
SCALE: 1:5000	
DRAWING NO.	REV.
100-CGK-0000-00009	C

Fuel for the Future

LNG Facility

Overall Site Drainage Plan

Figure: 2-8 Date: June 2013 File No. GLNG 499i

2.5 Temporary Worker Accommodation

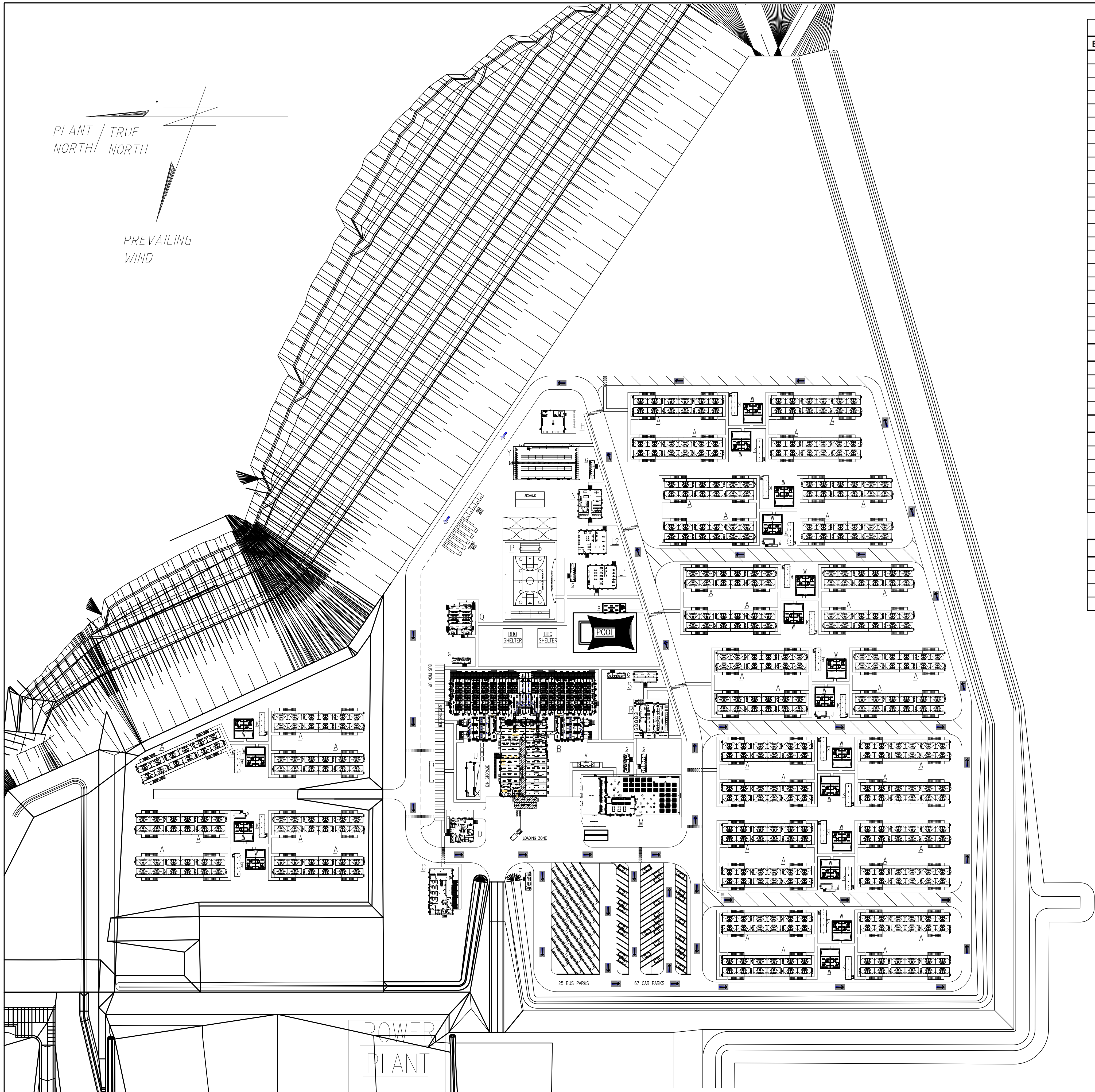
The TWAF (Figure 2-9) was designed to include up to 2,208 individual rooms and includes accommodation for individual workers, dining facilities, and recreational facilities. The site has a medical clinic with 24 hours availability to clinicians, and evacuation is available for medical emergencies by boat or helicopter.

Residents of the TWAF are not allowed to hunt, fish, or roam the worksite and must never go outside the boundaries of the project site without authorisation to perform essential job-related work.

All water for the site is either brought to the island, derived from the site Construction WTP or supplied via the Gladstone Area Water Board (GAWB) pipeline. All food is brought to the island and waste is stored in secure containment areas in state-of-the-art waste containers and removed from the island for disposal by professional waste management subcontractors.

Vector/vermin control is managed by regular monitoring and application of pesticides or other controls as necessary by certified licensed pest control experts.

The camp was constructed and occupied in stages with the first residents arriving in approximately April 2012. The camp reached its peak occupancy in Q3 of 2014. At the completion of construction of Train 2 (planned for 2016), it is currently proposed that the TWAF will be disassembled and the TWAF area rehabilitated.



1344 PERSON CAMP - BUILDING LIST				
Building	Description	Dimension	M²	Qty
A	Accommodation Stacker (4 Stackers per Pod)	46.2 x 14.1m	651.42	28 (7 Pods)
B	Kitchen/Diner	75.0 x 70.5	3110.4	1
C	TWAF Office & Commissary	24.0 x 12.0m	288	1
D	TWAF First Aid	12.0 x 12.0m	144	1
F	TWAF Area Security Office	9.0 x 3.0m	27	1
G	TWAF Ablution	9.6 x 3.0m	28.8	6
H	TWAF Maintenance Shop (P)	18.0 x 12.0m	216	1
J	Satellite House Keeping Supply Building	6.0 x 3.0m	18	3
K	TWAF Laundry	12.0 x 3.0m	36	14
L1	Aerobic (Cardio) Gymnasium	15.0 x 12.0m	180	1
L2	Anaerobic (Weights) Gymnasium	15.0 x 12.0m	180	1
M	Recreation / Wet Mess (P)	50.0 x 20.0m	1000	1
N	Dry Recreation	15.0 x 12.0m	180	1
P	Covered Pavillion (P)	40.0 x 26.0m	1040	1
Q	TWAF Training & Induction	15.0 x 12.0m	180	1
R	TWAF Linen Laundry (P)	18.0 x 15.0m	270	1
S	Linen Store	12.0 x 6.0m	72	1
U	Garbage Facility (P)	18.0 x 7.0m	126	1
V	Central Ice Shelter	6.0 x 3.0m	18	1
W	Barbecue (BBQ) Shelter (P)	10.0 x 10.0m	100	16
X	Swimming Pool (P)	5.0 x 9.0m	45	1
Y	Locker Room (P)	34.0 x 17.0m	578	1
OFF SITE BUILDINGS (NOT SHOWN ON DRAWING)				
AD	Jobsite Ablution	9.6 x 3.0m	28.8	15
AE	Jobsite Ablution c/w tanks	9.6 x 3.0m	28.8	4
T	Lunch Cribs	12.0 x 3.0m	36	72
AB	Satellite Ice Shelter	6.0 x 3.0m	18	6
WORKSITE OFFICES AND FACILITIES (090753 - NOT SHOWN ON DRAWING)				
A	Construction Office	99.0 x 36.0m	3564	1
B	Client Offices	51.0 x 15.0m	765	1
C	Clinic	12.0 x 15.0m	180	1
D5	Pioneer Office #1	12.0 x 3.0m	36	10
E	Telecomms	12.0 x 6.0m	72	1
F	Fire House	12.0 x 3.0m	36	2

336 PERSON CAMP EXTENSION - BUILDING LIST				
A	Accommodation Stacker (4 Stackers per Pod)	46.2 x 14.1m	651.42	7 (1.75 Pods)
J	Satellite House Keeping Supply Building	6.0 x 3.0m	18	1
K	TWAF Laundry	12.0 x 3.0m	36	4
W	Barbecue (BBQ) Shelter (P)	10.0 x 10.0m	100	4

LEGEND:

PRIMARY ACCESS ROAD (PAVED)

SECONDARY ACCESS ROAD (PAVED)
(FOR USE BY SERVICE AND EMERGENCY VEHICLES ONLY)

TOTAL AREA: 13.3 HA
ACCOMMODATING 1680

0 100 200

ATCO Structures & Logistics
ATCO STRUCTURES & LOGISTICS PTY. LTD.
ABN. 71 083 982 389
149-151 MAGNESIUM DRIVE, CRESTMEAD, QLD 4132
P.O. BOX 2180, CRESTMEAD, QLD 4132
PHONE (07) 3412 8600
FAX (07) 3803 0175
E-mail: atcosales@atcoal.com.au

REV	DATE	DESCRIPTION
U	23-02-11	MOVED ACCOM 0.5m APART FOR A/C'S (SEB)
V	11.03.11	SITE BOUNDARIES CHANGED, ADJUSTED BUILDING LAYOUTS TO SUIT (JP)
W	16.03.11	TITLE BLOCK CHANGES (JP)
X	07.04.11	LAYOUT CHANGES AS PER CLIENTS REQUEST (JP)
Y	11.04.11	NOTES AMMENDED (JP)
Z	11.05.11	LAYOUT CHANGES (JP)
N	04-08-10	CHANGED TO 1488 MAN CAMP
P	01-10-10	CHANGED TO 1536 MAN CAMP (SEB)
Q	26.11.10	UPDATED BUILDINGS AND LAYOUT (JP)
R	21.12.10	CHANGED BUILDINGS AND LAYOUT (JP)
S	23.12.10	ADJUSTED BUILDING LIST (JP)
T	02-02-11	MOVED CENTRAL FACILITIES AROUND (SEB)
G	11.02.10	REVISED ACCOMMODATION FLOOR PLANS TO REV G
H	04.03.10	REVISED KITCHEN LAYOUT AND ICE SHELTERS
J	29.03.10	REVISED SITE FOOTPRINT AND LAYOUT
K	12.04.10	REMOVED TOP SECTION OF GRAVEL RING ROAD (CLIENT REQUEST)
L	21-07-10	CHANGED TO 1536 MAN CAMP
M	21-07-10	MOVED POD FROM BOTTOM LEFT TO TOP RIGHT OF SITE
AA	15.06.11	REMOVED TOP PART OF RING ROAD (JP)
AB	22.07.11	LAUNDRY STAIRS AND LANDINGS ROTATED (JP)
AC	08.08.11	RESIZED BUS SHELTER, DELETED 2 ICE SHELTERS, MOVED FIRST AID, COMMISSARY
AD	25.08.11	REINSTATED ABLUTION AT TWAF TRAINING & INDUCTION BUILDING
AE	13.06.12	TOP FUTURE EXPANSION MOVED TO LEFT SIDE EXPANSION (JP)
AF	02.11.12	EXPANSION AREA UPDATED TO LATEST CIVIL LAYOUT, POD LAYOUTS CHANGED

PROJECT No.:
Site Layout - Plan B
BECHTEL - LNG
CURTIS ISLAND
GLADSTONE, QLD

QUALITY CERTIFIED TO AS/NZS ISO 9001:2000 BY SCI-QUAL INTERNATIONAL REGN No. 531

DATE	19.11.09	SUBCONTRACTOR DRAWING No.: 090741ZZ - 01
SCALE		
DRAWN	JOEL	CONTRACTOR DRAWING No.:
CHECKED		CLIENT DRAWING No.:

TITLE
SITE LAYOUT Plan B
1680 Person

A1

REVISION AF

LNG
Fuel for the Future

LNG Facility

Temporary Worker Accomodation Facility

Figure: 2-9 Date: June 2013 File No. GLNG 499k

GDA

2.6 Emissions, Effluents and Waste

During construction, emissions and effluents will be mainly limited to the following:

- Wastewater streams from the STP and the Construction WTP (seawater desalination) will be discharged at point WW2 as shown in Figure 2-10; these plants and their waste streams are described further below;
- Wastewater streams from the Operations Water Treatment Plant (Operations WTP), Oily Water Treatment Plant (OWTP) and stormwater from the process area spill containment sumps will be discharged at point WW1 during commissioning; these plants and their waste streams are described further below;
- Release of stormwater to Port Curtis during rain events (discharge points SW1 through SW10);
- Diesel exhaust emissions from stationary equipment, such as generators for electrical power (assumed to run continuously), diesel engine drivers for firewater pumps (intermittent operation for testing), and small equipment such as portable lighting plants, generators and air compressors;
- Diesel exhaust from mobile construction and commissioning equipment, including earthmoving plant, cranes, trucks, busses, and light vehicles;
- Exhaust from marine vessels, including passenger ferries, barges, LNGCs and tugs;
- Air emissions from various stacks in the utilities area and within Train 1 and Train 2 during commissioning (Refer to Appendix 2, Attachment D);
- Release of piping hydrostatic test water and pre-commissioning flushing water to Port Curtis via sedimentation basins; Intake of seawater from Port Curtis for hydrotesting of the two LNG Tanks and discharge of the hydrotest water to Port Curtis via a temporary HDPE pipeline to be laid between the seawater barge and the LNG Tanks;
- Release of process condensate water via sedimentation basin 3 to Port Curtis; and
- Release of test firewater to Port Curtis via the firewater system.

For the construction phase of the project the generation of electricity will occur using the diesel powered generator sets. A central generation facility of approximately 14 MW capacity is provided using several generators each of up to 2 MW capacity. An additional generator of approximately 2 MW capacity is utilised at the MOF. These generators will be decommissioned and removed at the completion of construction of Train 2.

Additional smaller portable generator sets up to a maximum of 500 kW capacity will be used during construction when, where and as required.

The largest piece of fuel burning mobile construction equipment on the project will consume at approximately 40 litres per hour.

The only items of construction plant and equipment that will consume fuel at or above these rates are the central construction diesel generators, which for a machine typical

of the 2.1 MW CAT or equivalent, is ~450 litres per hour, converted to mass consumption is ~405 kg/hour with diesel at 0.9 SG.

Combined running of the generators, anticipating with 6 running at full capacity is ~ 2430 kg/hour during the dayshift and 1215 kg/hr, with 3 machines running, during the peak nightshift.

All construction equipment emissions will be assessed based on fuel consumption. Equipment will be maintained to the highest standards and malfunctioning equipment that cannot be repaired will be removed from the project. Manufacturer specifications for operation and maintenance will be strictly complied with or exceeded. In the event of an unexpected fuel or oil spill, the site emergency response plan for Major Spill of Hazardous Substance on Land or Major Spill of Hazardous Substance on Water would be triggered, as per the Emergency Preparedness and Response Plan (Appendix 2, Attachment G).

Waste during the construction phase will be generated from various sources. The expected waste streams including discussion of handling, treatment and disposal arrangements are discussed in the Waste Management Plan (Appendix 2, Attachment R).

2.7 Sewage Treatment

This section describes details of the construction sewage treatment plant which will be operational up until practical completion of the second LNG train. Specific details of design and operational performance are included in Appendix 1, Section 2. During the commissioning and operational phase of the project the GRC pipeline will be utilised for the disposal of sewage from permanent buildings.

2.7.1 Construction Sewage Treatment

The Construction site sewage facilities are sized to treat the maximum construction camp population including commuting personnel from mainland. Treated sewage will be discharged to Port Curtis during operational life of the construction camp which is expected to be 5 years (for construction of 2 LNG processing trains). Maximum capacity of the sewerage facilities is 22.5 m^3/hr, (24 hour average flow), and this flow will occur over a 3-year period, when site population is at a maximum.

A suspended growth activated sludge process modified to accomplish biological nutrient removal (BNR) with effluent filtration is being used. The basic design of the plant includes anaerobic, anoxic, and aerobic zones, in that order, with internal recycles. In this configuration an aerobic zone for nitrification and an anoxic zone for denitrification for total nitrogen removal are provided. Clarified effluent is polished in denitrification filters that in addition to providing nitrogen removal, acts as effluent filters. As the process is performing denitrification after most of the BOD has been removed from the wastewater, a carbon source, such as sugar solution or acetic acid will be supplied. The filters are provided with sand, gravel, anthracite, or other filter media in some combination, and will be operated in a downflow mode. The nitrogen gas generated within the bed is released by periodic bumping, whereby the flow of water and air is directed upward in the bed to release the trapped nitrogen gas.

The BNR system is also designed with an anaerobic zone free of dissolved oxygen and nitrates to maximize remove of total phosphorus biologically. Phosphorus can be removed from wastewater by biological uptake by microorganisms and by chemical

precipitation with a metal cation. Since the target phosphorus concentration is very low, the plant employs both technologies whereby biological removal is used to remove the bulk of the phosphorus, and chemical polishing using alum follows to achieve the final concentration; such an approach will also reduce chemical consumption and sludge formation.

Sodium hydroxide for pH control and sodium hypochlorite for treated effluent disinfection are provided.

The STP produces excess biological waste sludge mixed with chemical sludge (from chemical phosphorus removal) that is aerobically digested followed by centrifugal dewatering. The dewatered cake will be transported to mainland for disposal by a licensed waste disposal contractor. Polyelectrolyte feed system will be provided to improve solids capture efficiency of the centrifuge.

During peak construction activities when the site population is at a maximum, the 24-hour average flow will be 22.5 m^3/hr. A lift station will be used to pump the treated effluent to seawater outfall that will operate automatically on level controls. Since treated effluent is pumped using an automatic lift station, the instantaneous flow, which is the capacity of lift station pump, will be about 45 m^3/hr.

The STP comprises the following components:

- Equalization Tank with bar racks;
- Biox reactors with anaerobic, anoxic and oxic zones;
- Clarifiers;
- Denitrification Filters;
- Chlorine contact, re-aeration and effluent clearwell;
- Biox basin feed pumps;
- Return and Waste Activated Sludge Pumps;
- Internal biox reactors recycle pumps;
- EQ tank, Biox reactor, Aerobic digester and Denitrification filters blowers;
- Biox reactor mixers;
- Aerobic sludge digester;
- Waste sludge dewatering Centrifuge with associated feed pumps, polymer feed system and sludge conveyor;
- Denitrification filters' backwash pumps;
- Centrifuge filtrate and dirty backwash water recycle system;
- Sodium hydroxide feed system;
- Alum feed system;
- Acetic acid/sugar solution feed system;
- Sodium hypochlorite feed system; and
- Process Instruments and PLC control panel.

2.7.2 STP Outfalls

The Construction STP outfall is located near the MOF and is common to the Construction WTP effluent outfall.

2.7.3 STP Discharge Water Quality

Sewage for the construction and commissioning phases will receive tertiary treatment as defined by the EA and included in the Environmental Monitoring Plan (Appendix 2, Attachment H).

2.7.4 Acoustic Performance

All pumps and equipment for the construction STP will be specified to emit 85 dB (A) or less when measured at 1 metre from the equipment.

2.7.5 STP Monitoring and Recordkeeping

STP monitoring details are included in the Environmental Monitoring Plan (Appendix 2, Attachment H) and the Revised Wastewater Discharge Report (Appendix 1).

The following instruments will be provided to monitor and control the STP.

- Dissolved oxygen and Redox potential instruments for Biox basins;
- Refrigerated composite sampler for treated effluent;
- Flow transmitter for treated effluent;
- pH transmitter for treated effluent;
- Dissolved oxygen transmitter for treated effluent;
- Test kit for raw water and mixed liquor settleability;
- Test kit for ammonia nitrogen and total nitrate nitrogen;
- Test kit for phosphate;
- Test kits for free chlorine analyses;
- Test probes for DO and pH;
- Test kits for coliform bacteria; and
- HACH ToxTrak toxicity test kit with reagent and culture set.

Accurate testing and analysis of wastewater effluent being discharged or recycled is a major part of compliance and quality control. This data is used to compile regular reports for issuance to governmental agencies as well as supporting operations. Composite samples collected will be sent to National Association of Testing Authorities (NATA) accredited laboratories for analyses required by contract or regulation, where available. In cases where a NATA accredited laboratory is not available, Bechtel will consult with GLNG and regulatory agencies to agree an acceptable alternative.

Laboratory information management system will be set up to track samples and manage analytical data and compile reports of all testing.

2.8 Water Treatment Plants

This section describes details of the water treatment plants which will be utilised during the construction (including commissioning) phases of the project. Specific details of the design and operational performance are included in Appendix 1, Section 3 (Revised Wastewater Discharge Report).

2.8.1 Construction Water Treatment Plant

The Construction WTP is designed to provide site water requirements including water for soil compaction, potable water, concrete batch plant, service water for washdown, and hydrotest water. The Construction WTP will be operational up until practical completion of the second LNG train.

Seawater desalination using Seawater Reverse Osmosis (SWRO) technology is used. Seawater for the plant is sourced from Port Curtis via seawater intake pumps. Water consumption via the seawater intake pumps (excluding LNG tank hydrotesting water) over the life of the Project is estimated at 2,000,000 m^3 (for construction of 2 LNG processing trains) with a maximum daily demand of about 3,000 m^3. The major users are civil site works, potable water use and hydrotest water. Following completion of civil site works activities, the daily water demand will decrease to about 750 m^3, increasing to an estimated 1,250 m^3/day when hydrotest water is being produced, dependent upon availability of acceptable quality rainwater run-off. Reject stream from the desalination plant, comprised of blowdown from pre-treatment units and brine from SWRO membranes, will be discharged to Port Curtis during the 5-year construction phase.

The Construction WTP produces a reject stream that is discharged to Port Curtis via construction phase diffuser WW2. Reject from pre-treatment units include clarifier blowdown and media filter backwash water. SWRO technology uses pump pressure over and above the seawater osmotic pressure to force relatively salt free product water to flow across a semi-permeable membrane and rejecting concentrated stream for discharge. The technology essentially concentrates the seawater by the design recovery rate through the membranes. Including pre-treatment units, overall system recovery is estimated to be about 35% (65% of seawater intake flow will be discharged back to sea). Therefore based on maximum plant capacity of 3,000 m^3/day, approximately 5,600 m^3/day of reject will be discharged back to Port Curtis from the Construction WTP. At a water production rate of 750 m^3/hr, approximately 1,400 m^3/day of reject will be discharged.

The pre-treatment units include multi-media pressure filters to reduce suspended solids concentration of reverse osmosis (RO) feed water. The filters require periodic backwashing to remove accumulated solids in the filter media which is accomplished by re-suspending the media. Two to three backwash cycles are expected per day. During backwashing, 330 m^3 of backwash water over about one (1) hour is being produced for each backwash cycle. Adding the continuous RO reject flow, the peak hourly reject flow from the Construction WTP is 500 m^3/hr. Since three (3) backwash cycles per day are expected, flow is 500 m^3/hr for 3 hours/day and 190 m^3/hr for 21 hours/day. However, since the reject pumps have to be sized for the maximum expected hourly flow and pumps operate on level controls, peak hourly flow when filters are not being backwashed, are 250 m^3/hr.

The Construction WTP comprises of the following components:

- Seawater intake Pumps;
- Seawater intake Strainer;
- Seawater Chlorinator;
- Seawater Storage Tanks;
- Seawater Clarifiers;
- Seawater multimedia pressure filters;
- Seawater RO system;
- Process pumps and blowers;
- Potable water re-mineralizers;
- Potable water UV disinfection system;
- Storage tanks;
- Instrument Air system;
- Chemical Feed systems including coagulant, polyelectrolyte, anti-scalant, caustic, acid, dechlorinator, potable water chlorinator, and RO cleaning system;
- WTP reject pumping station;
- Process Instruments and PLC control panel; and
- Seawater outfall with diffusers.

Discharge Location

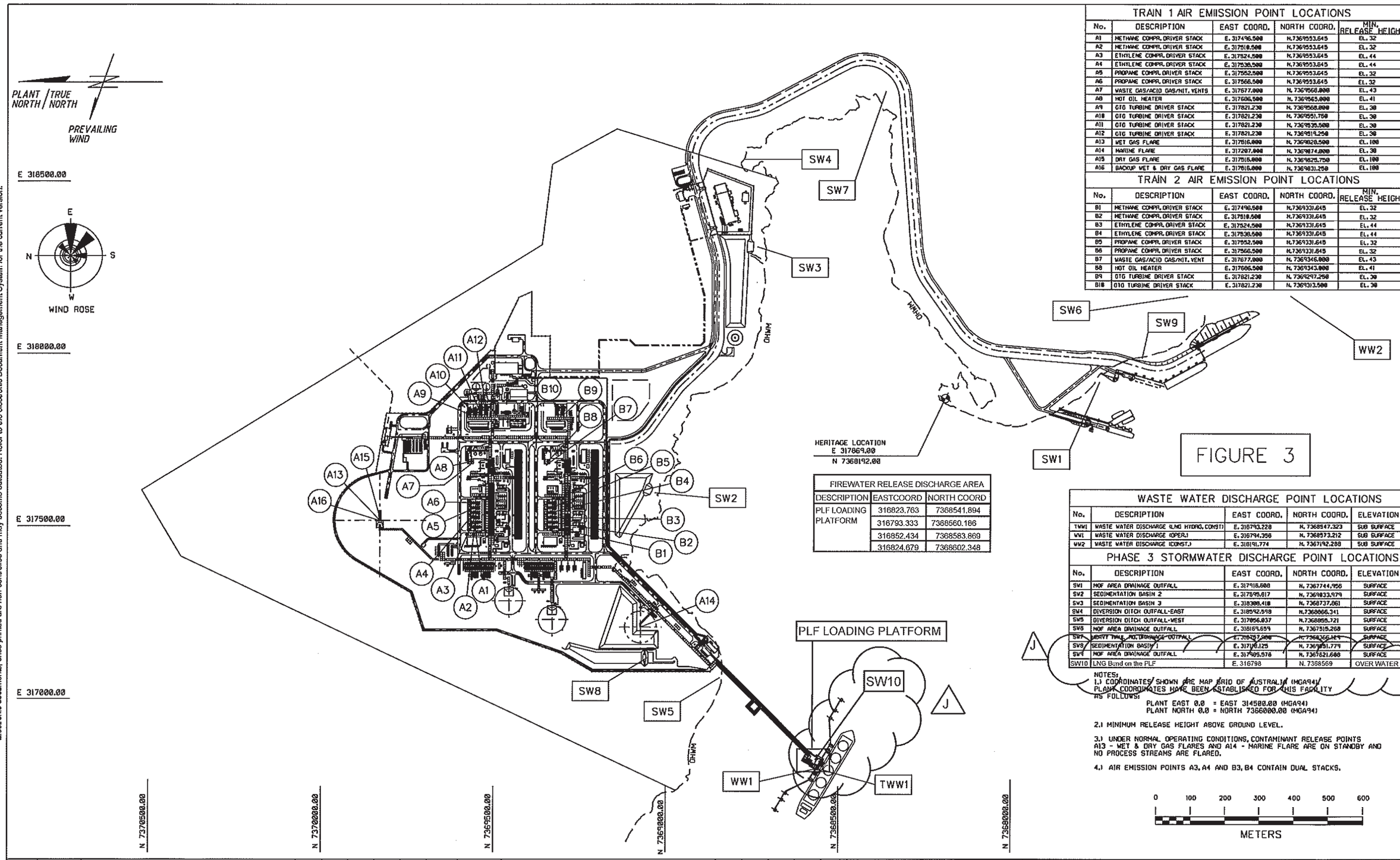
The Construction WTP effluent is discharged to Port Curtis via construction phase diffuser WW2 located near the MOF as shown on Figure 2-10.

Discharge Water Quality

SWRO technology essentially concentrates the intake seawater by the design recovery rate through the plant. Therefore background concentration of all seawater constituents will be concentrated by a factor of up to 1.7 in the Construction WTP reject water. The RO pre-treatment technology uses a coagulant to remove colloidal solids from seawater that increases suspended solids concentration of Construction WTP reject by an additional 50 mg/L (an additional 25 NTU turbidity). For further information, refer to Appendix 1.

Acoustic Performance

All pumps and equipment for the Construction WTP are specified to emit 85 dB (A) or less when measured at 1 metre from the equipment.



TRAIN 1 AIR EMISSION POINT LOCATIONS

No.	DESCRIPTION	EAST COORD.	NORTH COORD.	MIN. RELEASE HEIGHT
A1	METHANE COMPR. DRIVER STACK	E. 317496.500	N.7369553.645	EL. 32
A2	METHANE COMPR. DRIVER STACK	E. 317510.500	N.7369553.645	EL. 32
A3	ETHYLENE COMPR. DRIVER STACK	E. 317524.500	N.7369553.645	EL. 44
A4	ETHYLENE COMPR. DRIVER STACK	E. 317538.500	N.7369553.645	EL. 44
A5	PROPANE COMPR. DRIVER STACK	E. 317552.500	N.7369553.645	EL. 32
A6	PROPANE COMPR. DRIVER STACK	E. 317566.500	N.7369553.645	EL. 32
A7	WASTE GAS/ACID GAS/NIT. VENTS	E. 317677.000	N. 7369568.000	EL. 43
A8	HOT OIL HEATER	E. 317606.500	N. 7369565.000	EL. 41
A9	GTG TURBINE DRIVER STACK	E. 317821.230	N. 7369568.000	EL. 30
A10	GTG TURBINE DRIVER STACK	E. 317821.230	N. 7369551.750	EL. 30
A11	GTG TURBINE DRIVER STACK	E. 317821.230	N. 7369535.500	EL. 30
A12	GTG TURBINE DRIVER STACK	E. 317821.230	N. 7369519.250	EL. 30
A13	WET GAS FLARE	E. 317516.000	N. 7369828.500	EL. 100
A14	MARINE FLARE	E. 317207.000	N. 7369874.000	EL. 30
A15	DRY GAS FLARE	E. 317515.000	N. 7369825.750	EL. 100
A16	BACKUP WET & DRY GAS FLARE	E. 317615.000	N. 7369831.250	EL. 100

TRAIN 2 AIR EMISSION POINT LOCATIONS

No.	DESCRIPTION	EAST COORD.	NORTH COORD.	MIN. RELEASE HEIGHT
B1	METHANE COMPR. DRIVER STACK	E. 317496.500	N.7369331.645	EL. 32
B2	METHANE COMPR. DRIVER STACK	E. 317510.500	N.7369331.645	EL. 32
B3	ETHYLENE COMPR. DRIVER STACK	E. 317524.500	N.7369331.645	EL. 44
B4	ETHYLENE COMPR. DRIVER STACK	E. 317538.500	N.7369331.645	EL. 44
B5	PROPANE COMPR. DRIVER STACK	E. 317552.500	N.7369331.645	EL. 32
B6	PROPANE COMPR. DRIVER STACK	E. 317566.500	N.7369331.645	EL. 32
B7	WASTE GAS/ACID GAS/NIT. VENT	E. 317677.000	N. 7369346.000	EL. 43
B8	HOT OIL HEATER	E. 317606.500	N. 7369343.000	EL. 41
B9	GTG TURBINE DRIVER STACK	E. 317821.230	N. 7369297.250	EL. 30
B10	GTG TURBINE DRIVER STACK	E. 317821.230	N. 7369313.500	EL. 30

FIREWATER RELEASE DISCHARGE AREA

DESCRIPTION	EASTCOORD	NORTH COORD
PLF LOADING PLATFORM	316823.763	7368541.894
	316793.333	7368560.186
	316852.434	7368583.869
	316824.679	7368602.348

WASTE WATER DISCHARGE POINT LOCATIONS

No.	DESCRIPTION	EAST COORD.	NORTH COORD.	ELEVATION
TWW1	WASTE WATER DISCHARGE (LNG HYDRO. CONST.)	E. 318793.228	N. 7368547.323	SUB SURFACE
WW1	WASTE WATER DISCHARGE (OPER.)	E. 318794.356	N. 7368573.212	SUB SURFACE
WW2	WASTE WATER DISCHARGE (CONST.)	E. 318191.774	N. 7367192.288	SUB SURFACE

PHASE 3 STORMWATER DISCHARGE POINT LOCATIONS

No.	DESCRIPTION	EAST COORD.	NORTH COORD.	ELEVATION
SW1	MOF AREA DRAINAGE OUTFALL	E. 317918.688	N. 7367744.956	SURFACE
SW2	SEDIMENTATION BASIN 2	E. 317595.817	N. 7369833.979	SURFACE
SW3	SEDIMENTATION BASIN 3	E. 318388.418	N. 7368737.861	SURFACE
SW4	DIVERSION DITCH OUTFALL-EAST	E. 318592.598	N.7368866.341	SURFACE
SW5	DIVERSION DITCH OUTFALL-WEST	E. 317856.837	N.7368855.721	SURFACE
SW6	MOF AREA DRAINAGE OUTFALL	E. 318169.659	N. 7367515.268	SURFACE
SW7	DRY GAS FLARE DRAINAGE OUTFALL	E. 318287.988	N. 7368265.429	SURFACE
SW8	SEDIMENTATION BASIN 1	E. 317108.125	N. 7369951.779	SURFACE
SW9	MOF AREA DRAINAGE OUTFALL	E. 317989.578	N. 7367621.688	SURFACE
SW10	LNG Bund on the PLF	E. 316798	N. 7368569	OVER WATER

NOTES:
1.) COORDINATES SHOWN ARE MAP GRID OF AUSTRALIA (MGA94)
PLANT COORDINATES HAVE BEEN ESTABLISHED FOR THIS FACILITY AS FOLLOWS:
PLANT EAST 0.0 = EAST 314500.00 (MGA94)
PLANT NORTH 0.0 = NORTH 7366000.00 (MGA94)

2.) MINIMUM RELEASE HEIGHT ABOVE GROUND LEVEL.

3.) UNDER NORMAL OPERATING CONDITIONS, CONTAMINANT RELEASE POINTS A13 - WET & DRY GAS FLARES AND A14 - MARINE FLARE ARE ON STANDBY AND NO PROCESS STREAMS ARE FLARED.

4.) AIR EMISSION POINTS A3, A4 AND B3, B4 CONTAIN DUAL STACKS.

0 100 200 300 400 500 600
METERS

FIGURE 3

NO.	DATE	REVISION	BY	CHK'D	APP.	PEM	CLIENT ACC.	NO.	DATE	REVISION	BY	CHK'D	APP.	PEM	CLIENT ACC.
00G	10/30/2013	RE-ISSUED FOR PERMITTING	MXJ	KD	WL			00D	Apr/11/2012	RE-ISSUED FOR PERMITTING	BLB	KD	WL		
00H	02/21/2014	RE-ISSUED FOR PERMITTING	MXJ	KD	WL			00E	Nov/14/2012	RE-ISSUED FOR PERMITTING	BLB	KD	WL		
00C	08/12/2011	RE-ISSUED FOR PERMITTING	DRL	FN	RR			00F	Mar/5/2013	RE-ISSUED FOR PERMITTING	BLB	KD	WL		
00I	17/04/2015	UP-DATED FOR PERMIT AMENDMENT	EMR	SMP	BT			00J	13/05/2015	UP-DATED FOR PERMIT AMENDMENT	EMR	AEL	BT		

BECHTEL 25576

GLNG PLANT PROJECT

AIR AND WATER DISCHARGE POINTS
CURTIS ISLAND AUSTRALIA

GLNG DWG NO.	REV.
3310-50-SK001	J
SCALE: 1:10,000 ON 11 X 17	
DRAWING NO.	REV.
100-HKK-0000-00001	00J

CAD FILE: 25576-100-HKK-0000-00001.DGN
DATE: AUG 05,2010

Fuel for the Future

LNG Facility

Air and Stormwater Discharge Locations

Figure: 2-10

Date: October 2015
File No. GLNG 499I - Rev.2

GDA

Construction WTP Monitoring and Recordkeeping

Construction WTP monitoring details are included in the Environmental Monitoring Plan (Appendix 2, Attachment H) and the Revised Wastewater Discharge Report (Appendix 1).

The following instruments will be provided to monitor and control the Construction WTP:

- Seawater influent flow transmitter;
- Seawater influent pH transmitter;
- Seawater influent Temperature transmitter;
- Seawater influent Turbidity transmitter;
- Seawater influent Conductivity transmitter;
- Desalination Plant RO brine Flow transmitter;
- Desalination Plant effluent Flow transmitter;
- Desalination Plant effluent pH transmitter;
- Desalination Plant effluent Chlorine transmitter;
- Desalination Plant effluent dissolved oxygen and percent saturation transmitter;
- Desalination Plant effluent Temperature transmitter;
- Desalination Plant effluent Turbidity transmitter;
- Desalination Plant effluent Conductivity transmitter;
- Process Instruments to control operation of media filters and RO;
- HACH model DR/2000 or equal field kits with reagents;
- HACH MEL P/A Safe Drinking Water Laboratory kit; and
- Jar test set up to estimate chemical dosages.

Accurate testing and analysis of potable water is a major part of compliance and quality control. This data is used to compile regular reports for issuance to governmental agencies as well as supporting operations. Samples are sent to NATA accredited laboratories for analyses required by regulatory compliance, where available. In cases where a NATA laboratory is not available, Bechtel will consult with GLNG and regulatory agencies to agree an acceptable alternative.

Laboratory information management system have been set up to track samples and manage analytical data and compile reports of all testing.

2.8.2 Operations Water Treatment Plant

The Operations WTP will produce potable water and utility water, including demineralised water. Demineralised water will be used as make-up water for the Acid Gas Removal System (Unit 12) and as gas turbine blade wash water. Potable water will be used for fire water, human consumption and use at the facility. The Operations WTP will be commissioned and begin operating during the commissioning phase of the project.

Effluent from the Operations WTP is proposed to be discharged to Port Curtis via WW1. Further details of the Operations WTP process is provided below.

Source Water

During the commissioning and operational phase of the Project, potable water is proposed be supplied via the GAWB pipeline. GAWB treats raw reservoir water in Gladstone to meet the requirements of the Australian Drinking Water Guidelines (ADWG). GAWB also applies the "Drinking Water Management Framework" from the ADWG guidance in order to predict and manage potential risks to water quality.

Moisture condensed from air in the TIAC unit will be sent to a Condensed Water Collection Tank where there is an option for this water to be recycled to the WTP to supplement the water supply from the GAWB pipeline. The condensate production rate can be up to 45 m^3/h, however the volumes vary greatly depending on the weather conditions. During dry, low humidity weather, insignificant quantity of water will condense, but during high humidity and high temperature conditions, it is expected that the entire water demand of the LNG facility can be satisfied from this source.

Operations WTP Process

Ultra Filtration (UF) Package

Water from the GAWB pipeline and potentially TIAC unit condensed water Source water will be stored in a Raw Water Surge Tank. Water is then pumped to a Pre-Treatment System called the Ultra Filtration package which is designed to remove colloidal and suspended solids. The system consists of membrane filters and chemical injection units. Water from the Pre-Treatment System will be pumped to a Demineraliser Package and a Chlorinator/Remineraliser Package.

The Ultra Filtration package will primarily remove the suspended particles/colloidal matter by coarse screening followed by Ultra-Filtration (UF). The UF will remove the incoming suspended particles and will achieve the required feed water SDI levels required for feed to the downstream BWRO (Brackish Water Reverse Osmosis) Units. Cleaning of the Membranes is achieved by the HC & CEB units. The Hydraulic cleaning process consists of 3 combinations of flushing and washing to ensure substances are removed. All waste water left in the membranes after the flush and backwash is directed to the Neutralisation Tank. Neutralisation Pumps pump the contents of the tank through a recirculation loop and back to the tank. As the contents are recirculated, the pH and Oxidation Reduction Potential (ORP) are checked. If satisfactory, the waste water is pumped to the UF Filter / RO Rejects Sump. If the Neutralisation Tank contents pH and Oxidation Reduction Potential are checked and returned as not being neutral, appropriate chemicals are dosed to neutralise the waste.

Reverse Osmosis (RO) / Electro-deionisation (EDI) System

The Operations WTP will consist of a reverse osmosis (RO) / electro-deionisation (EDI) system that uses membranes to remove dissolved salts from the pre-treated water. Reverse Osmosis Concentrate (ROC) from the RO will be sent to the UF Filter / RO Rejects Sump. The RO permeate will then pass through an EDI process to remove residual dissolved solids. The EDI process uses ion-exchange membranes IX resins and electricity. No chemicals are required for the EDI process. Demineralised

water will be used as make-up water in the Acid Gas Removal System and as gas turbine blade wash water.

Periodically the RO membranes will need to be cleaned. This will be done using a chemical solution. The cleaning process will require water production to be stopped. The chemical cleaning solution will be run through the membranes and then the membranes are thoroughly rinsed with clean water. The discharge from the cleaning process will be sent to a waste water tank and disposed of off-site before water production recommences.

Remineralisation Package and UV Disinfection Package

The Remineralisation package transfers water from the UF Package to either the Potable Water Tank or, depending on Fire Water requirement, to the Fire Water Tank. The filtered water from the UF unit will contain low level dissolved salts and Carbon Dioxide. To achieve the desired potable water quality, filtered water passes through a pressurised Calcite filter bed and Chlorine disinfection. Service water will be stored in the firewater tank before being pumped to end users. There are no waste streams to WW1 from the Remineralisation Package and UV Disinfection Package.

Water Use

The Operations WTP will produce potable water and utility water, including demineralised water. Demineralised water will be used as make-up water for the Acid Gas Removal System (Unit 12) and as gas turbine blade wash water. Potable water will be used for fire water, human consumption and use at the facility.

Discharge Location

Waste streams from the Operations WTP comprise of Ultra Filtration cleaning water and ROC which are combined in the UF Filter / RO Rejects Sump prior to being pumped out via diffuser discharge point WW1 to Port Curtis. This discharge will be in accordance with water quality characteristic limits specified in the EA.

Water Quality Monitoring/Sampling

The Operations WTP will have an average discharge rate of 0.24 megalitres/day (10 m^3/h).

Waste streams (Ultra Filtration cleaning water and ROC combined in the UF Filter / RO Rejects Sump) from the Operations WTP will be discharged via diffuser discharge point WW1 to Port Curtis in accordance with limits specified in the EA. The compliance monitoring point for discharge point WW1 is proposed to be S9, which will be located upstream of the outlet of the diffuser (refer Section 2.9.5 below for details). This monitoring point includes inline probes for the continuous measurement of pH and hydrocarbon. The reading from these probes will be alarmed and the results reported to the LNG facility's control room. The monitoring point S9 will also include an automatic sampler so that samples can be sent to a laboratory for analysis as required.

There will also be an operational monitoring point immediately downstream of the Operations WTP which will complement the compliance monitoring at S9. This operational monitoring point is the sample valve V4-36073 and will be referred to as S2 in the wastewater monitoring program for the site.

2.9 Oily Water Treatment Plant

The Oily Water Treatment Plant (OWTP) is designed to remove free phase and emulsified hydrocarbons (oil) and suspended solids from process wastewater and potentially contaminated stormwater from leaks of lubricants that can wash off during a rain event. There will be a single OWTP on the site which treats wastewater from both trains during commissioning and operations.

The OWTP will be commissioned using construction water to confirm that it is functioning correctly and will operate automatically thereafter when sufficient oily water is available. During construction and commissioning, curbed areas and sumps which are connected to the OWTP will fill up with rainwater. As this impounded water is unlikely to contain hydrocarbons it can either be discharged to the stormwater drainage system or sent through the OWTP. The decision to discharge to the stormwater system will be made based on a visual inspection of the impounded water.

The main sources of oily water which will be sent to the OWTP are as follows:

- Liquid present in the feed gas stream that is removed by the Separators;
- Leaks from power generator turbines' and gas compressors' lubrication systems;
- Washwater from periodic cleaning of power generators' and compressors' turbine blades;
- Excess water from the flare knock-out drums;
- Potentially contaminated stormwater run-off from the process slabs Potentially contaminated stormwater from selected bunded areas;
- Wash water from the vehicle wash-down pad;
- Water separated in waste oil tank to the oily water treatment system; and
- Laboratory glassware washer and sink washwater.

The incoming waste stream to the OWTP will comprise primarily of water with varying amounts of hydrocarbons and sediment.

Spills of other chemicals and hydrocarbons (e.g. amine or hot oil) that occur in bunded areas, which are connected to the OWTP, will be remediated immediately at the source and not sent to the OWTP. This will involve the use of a vacuum truck for large quantities and appropriate spill kits for small spills.

The OWTP comprises of the following three units:

- Corrugated Plate Interceptor (CPI) oil/water separator:
  - Separator tank
  - Separator plates
  - Recovered oil compartment
  - Treated effluent compartment
  - Oil transfer pumps
  - Sediment transfer pumps
  - Sediment holding tank with mixer
- Dissolved Air Flotation (DAF) separator:
  - Tank with skimmer and sludge collector

- De-emulsifier and flocculation system
- Air Saturation system

- Multi-media pressure filtration:
  - Filters
  - Backwash system including storage tank and air scour system

Additional process and technical information concerning the OWTP units listed is provided in more detail in the subsections that follow.

Throughout the OWTP, there are process monitors and alarms. Process controls include alarms initiated upon pump/blower failures, high levels in tanks and flows outside the control range of process equipment. The OWTP is operated and maintained using the Vendors operating and maintenance manuals, supplemented by Standard Operating Procedures (SOPs) and maintenance protocols.

The treated effluent from the OWTP will be discharged through the diffuser WW1 located at the PLF.

2.9.1 Corrugated Plate Interceptor (CPI) Oil/Water Separator

In the CPI, separation of oil, water and solids is achieved by passing the influent through a pack of parallel, corrugated, inclined plates. As the influent water flows down through the plates, the separated oil droplets agglomerate to form large size globules. These oil droplets rise to the surface of the CPI and overflow into the oil chamber. Solids and sediment will accumulate at the bottom of the separator. Treated water will then overflow into a surge tank.

Solids and sediments at the bottom of the separator will be sluiced to loosen the sediment and then pumped to a sludge holding tank which will be periodically disposed off-site. The separated oil will be pumped to a storage tank before being disposed off-site.

2.9.2 Dissolved Air Flotation (DAF) Separator

Treated water from the CPI separator will be pumped to a flocculation tank where it will be gravity fed to the DAF separator where dispersed and emulsified oil and fine suspended solids are removed. In the DAF, fine bubbles of air are pumped through the influent. The oil and suspended solids adhere to the bubbles and float to the top of DAF, where it is skimmed off and sent to storage for off-site disposal. The bottom of the tank will be fitted with an auger to periodically remove settled solids for off-site disposal. If necessary, a de-emulsifier, NALCO 2490, will be injected to break up oil in water emulsion that otherwise would not be removed. In the DAF, a portion of the water will be recycled through an air saturation vessel and released back into the DAF.

2.9.3 Multi-media Pressure Filtration

Treated water from the DAF may contain residual oil and suspended solids that are too fine to remove in the DAF. The DAF effluent will be polished in multi-media filters to remove the residual contaminants ensuring that the treated effluent is suitable for discharge via discharge point WW1. Multi-media filters will be provided with graded sand and anthracite media.

2.9.4 Treatment and Discharge Rates

The OWTP will have the capacity to treat water at a rate of 58 m^3/h. Given that most areas serviced by the OWTP are unroofed bunded areas, the plant will generally only be discharging during and after rainfall events.

Waste water effluent from the OWTP will be discharged via diffuser discharge point WW1 to Port Curtis in accordance with limits specified in the EA.

During the operations phase of the Project, it is estimated that the OWTP will operate intermittently and have an average dry weather discharge rate per train of 3 m^3/h, based on 24 hour average. During wet weather conditions, flows to the OWTP will have to be managed to ensure that the maximum treatment rate of 58 m^3/h is maintained. This will require the prioritisation of flows to the OWTP during periods of ongoing rainfall.

2.9.5 Water Quality Monitoring/Sampling

Waste water effluent from the OWTP will be discharged via diffuser discharge point WW1 to Port Curtis in accordance with limits specified in the EA. The compliance monitoring point for discharge point WW1 is S9 which is located upstream of the outlet of the diffuser. This monitoring point includes inline probes for the continuous measurement of pH and hydrocarbon. The reading from these probes is alarmed and the results reported to the LNG facility's control room. The monitoring point S9 also includes an automatic sampler so that samples can be sent to a laboratory for analysis as required.

There will also be an operational monitoring point immediately downstream of the OWTP which will complement the process monitoring described in Section 2.1 and the compliance monitoring at S9. This operational monitoring point is the sample valve V6-29183 referred to as S1 in the wastewater monitoring program for the site.

2.10 Process Condensate Water

Moisture condensed from air in the Turbine Inlet Air Chilling (TIAC) unit will be sent to a Condensed Water Collection Tank where it will either be released to the stormwater drainage system and discharged from site via Sedimentation Basin 3 through discharge point SW3, or reused as raw water to supplement the water supply from the GAWB pipeline for the Operations WTP. The condensate production rate can be up to 45 m3/h, however the volumes vary greatly depending on the weather conditions, i.e. during dry, low humidity weather an insignificant quantity of water will condense, but during high humidity and high temperature conditions a greater quantity condensate will be produced.

2.11 Landscaping and Rehabilitation

The project's rehabilitation program will be on-going throughout construction as it serves to stabilise disturbed areas of the site, improves aesthetics, and screens construction activities thus reducing noise, lighting and general site distractions. The disturbed footprint of the site has been designed to be as small as possible and thus only a small percentage of the site will be rehabilitated because most areas will continue in use during operations. Also, protection of the gas facilities from fires originating outside of the site requires vegetation-free buffers. The only significantly-sized area (around 10 ha) that will be disturbed by construction and not expected to remain as part of the operating facility is the site of the TWAF. Also, a site security

fence will be installed along the inland boundary of the site to exclude large animals, such as wild horses, kangaroos and pigs.

The primary goal of rehabilitation is stabilisation of the site to prevent erosion and minimise sedimentation. The major planned rehabilitation activities are:

- Removal of Debris and Decommissioning of Structures:
  - Temporary structures erected for use during construction include offices, TWAF, worker mess halls and sanitary facilities, concrete batch plant, rock crushers and conveyors, warehouses, fabrication shops, maintenance shops, refuelling areas and other support buildings;
  - No hazardous construction material, such as asbestos or lead paint, is used to construct these structures;
  - All structures built for construction purposes will be retained for ongoing use during operations, or demolished; and
  - Demolition waste shall be properly disposed per the project's Waste Management Plan. Inert foundations, such as concrete pads or pedestals, may be left in place. Utility connections will be removed and secured.
- Re-contour of Surfaces and Hydrology:
  - Rehabilitation sites will be recontoured for stability from accelerated erosion. In general, the goal is to restore natural hydrologic processes of runoff and infiltration;
  - Recontouring may include reshaping disturbed areas to match surrounding topography or contouring to protect existing structures from stormwater runoff or erosion;
  - Final grading of disturbed areas, including preparation of overburden before application of the final layers of growth medium, should be along the contour as far as can be achieved in a safe and practical manner; and
  - Some roads may be left in place per the current Project plan. Drainage ditches and culverts will be left in place.
- Revegetation:
  - Revegetation will be completed for disturbed areas that are not anticipated for immediate future use or stabilized by other means (e.g., paving); and
  - The goal of revegetation is to stabilize the area, reinstate wildlife habitat, restore visual amenity and re-establish the vegetation carbon sink to lessen greenhouse gases.

The timing of revegetation will coincide with the seeding season and species selection will be made in consultation with local agronomists and revegetation consultants.

3 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE - ENVIRONMENTAL VALUES

During 2008 and 2009, GLNG prepared an EIS and SEIS to identify MNES that would be potentially impacted by the GLNG's project. Additional baseline studies have been conducted by GLNG to identify and mitigate potential impacts from the construction and operation of the LNG facility and associated marine facilities.

The LNG facility and associated marine facilities construction (including commissioning) activities as identified in Section 2 have the potential to impact on the following MNES protected under the EPBC Act:

- World Heritage (Section 12, 15A);
- National Heritage Places (Section 15B, 15C);
- Listed Threatened Species and Communities (Section 18, 18A); and
- Listed Migratory Species (20, 20A).

This section outlines information gathered from the GLNG EIS, SEIS and supporting additional studies that have been prepared to address both Queensland State and Commonwealth Conditions associated with the GLNG Project.

3.1 World Heritage Area and National Heritage Places

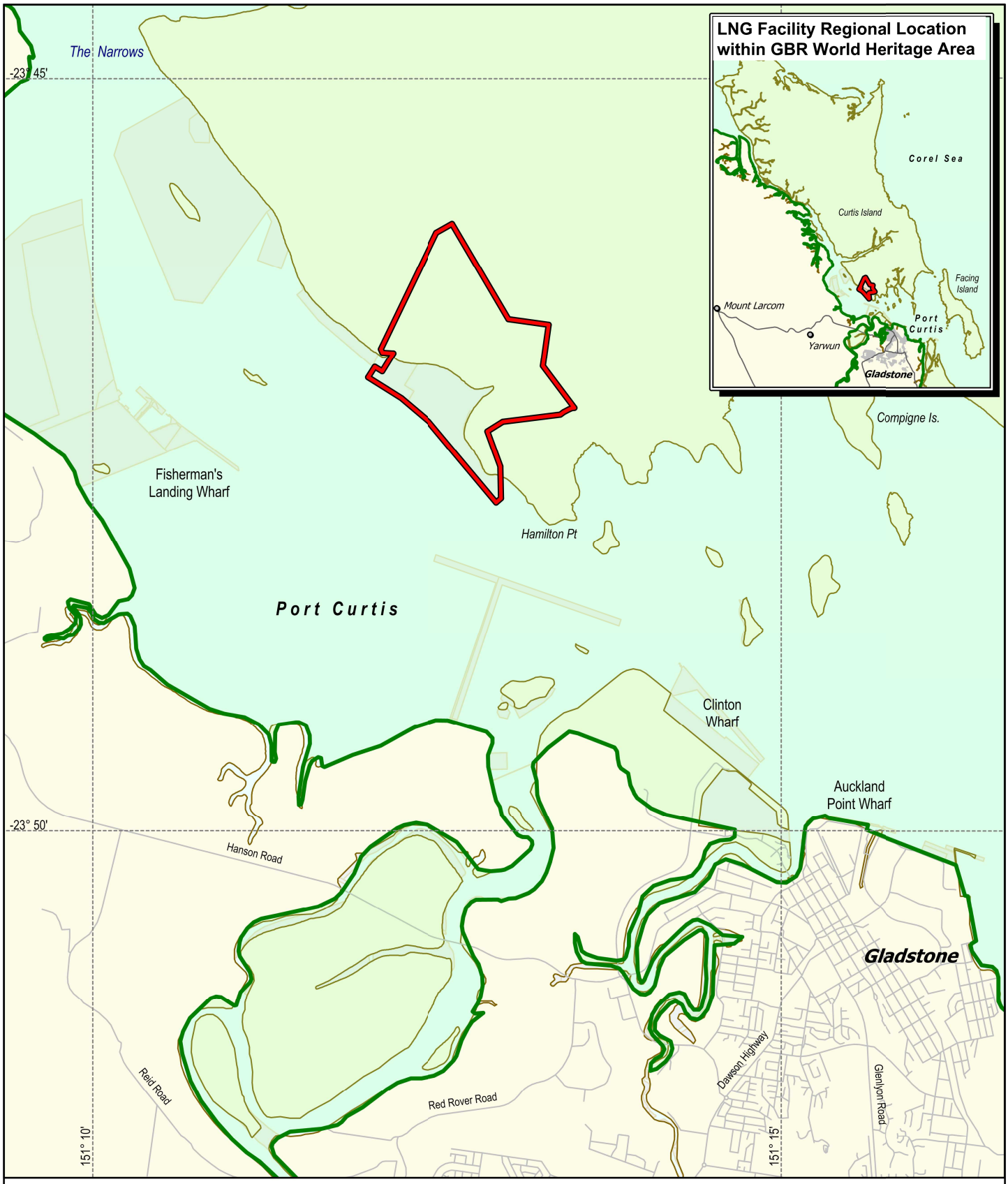
3.1.1 Great Barrier Reef World Heritage Area and Great Barrier Reef Marine Park

The LNG facility site located on Curtis Island and associated marine facilities located in Port Curtis are both situated within the Great Barrier Reef World Heritage Area (GBRWHA) that is administered by the Great Barrier Reef Marine Park Authority (GBRMPA) in association with the Queensland Department of Environment and Heritage Protection (EHP) (formerly Department of Environment and Resource Management (DERM)). The boundary of the GBRWHA (heritage area) is set at the mean low water level on the mainland.

The GBRWHA is also listed as a National Heritage Place and the LNG facility and associated marine facilities are also located within a National Heritage Place.

The LNG facility is adjacent to Port Curtis, whilst the associated marine facilities are located within Port Curtis itself. Port Curtis is listed on the Directory of Important Wetlands in Australia. This area has been identified for its extensive range of marine wetlands encompassing seagrass beds, mangrove forest and intertidal mud flats that provide habitat for a range of significant migratory water birds, reptiles and mammals.

Figure 3-1 shows the LNG facility and associated marine facilities in relation to the GBRWHA and Port Curtis.



Boundary from PFL10 Instrument (4 March 2011)

Road

Great Barrier Reef World Heritage Area

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Great Barrier Reef World Heritage Area

1 0 1 2 3 km

Figure: 3-1 Date: June 2013 File No. GLNG 499n

3.1.2 Curtis Island Environmental Management Precinct

The Curtis Island Environmental Management Precinct has been created within the Gladstone State Development Area (GSDA) in order to recognise, protect and maintain significant ecological, environmental and heritage areas on the southern part of Curtis Island. It extends south from Graham Creek to, but excluding, the South End community. The Precinct was established by the State government to offset the development of the LNG Industrial Park on Curtis Island. GLNG are making significant financial contributions to the management of the Precinct.

East of the precinct is the 290 hectare (ha) nature reserve and turtle nesting beach on the east coast of Curtis Island. Waters seaward of the nature reserve are included in the Great Barrier Reef Marine Park. The State Marine Park also encompasses Graham Creek and The Narrows (Ecofund, 2011).

Figure 3-2 shows the LNG facility and associated marine facilities in relation to the Curtis Island Environmental Management Precinct.

3.1.3 Rodds Bay Dugong Protection Area

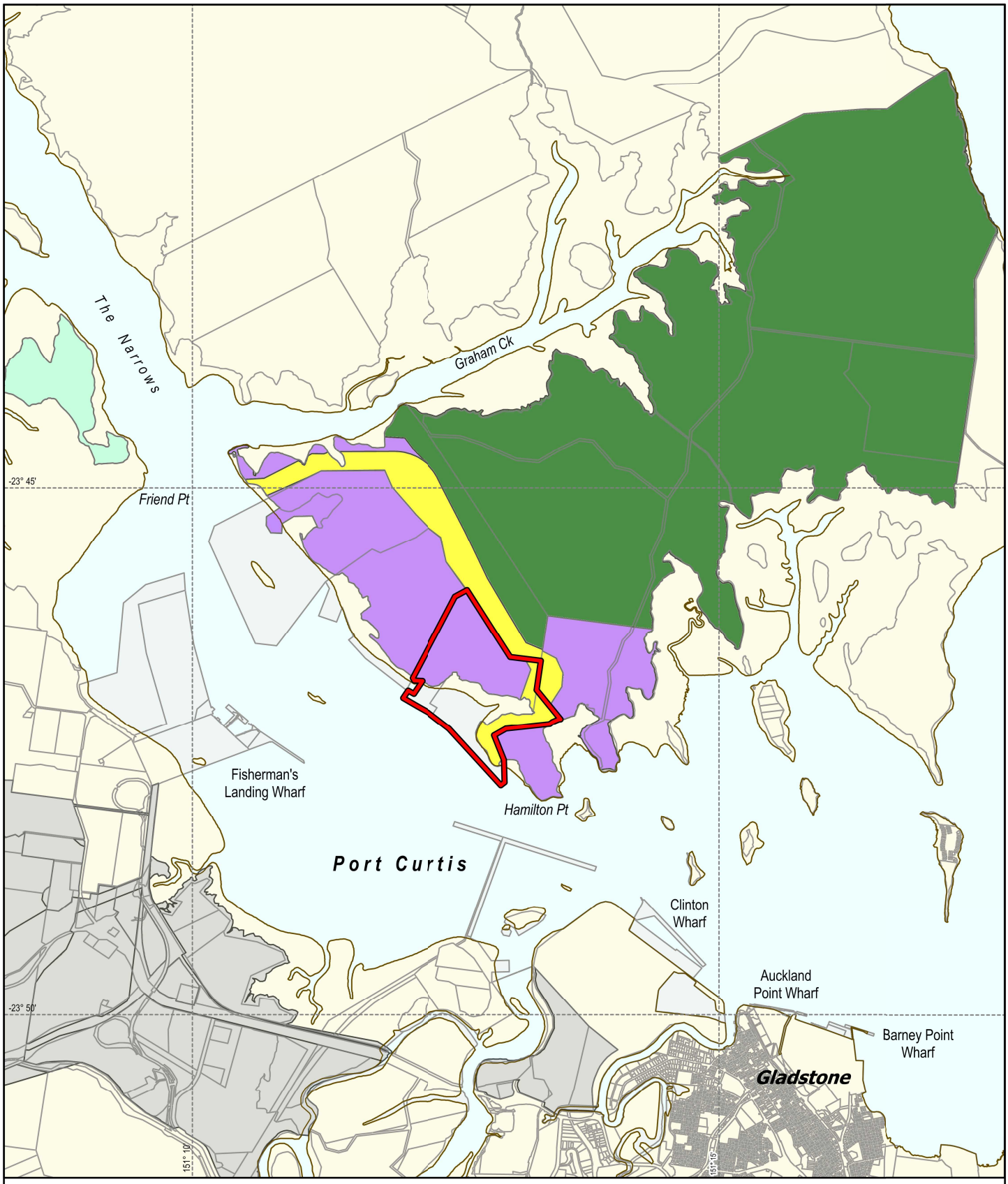
Port Curtis is wholly within the Rodds Bay Dugong Protection Area B (DPA), prescribed under the *Fisheries Act 1994* and its subordinate legislation that regulates commercial fishing activities (URS, 2009a).

The Rodds Bay DPA extends from Friend Point in the north- west to Rodds Peninsula in the south-east (refer to Figure 3-3).

The GLNG EIS EPBC Act Assessment report stated that studies prior to 2009 indicate that high numbers of dugong are found within Rodds Bay DPA and forage on seagrass meadows within the Port (GHD, 2009) and that dugongs display fine scale movements between localised bays (Marsh and Lawler, 2006). Grech and Marsh (2007) classed the area around Gladstone as low to medium conservation status on the basis of relative density of dugongs estimated from spatial modelling and frequency analysis taken from time series data over 19 years of aerial surveys. Evidence of dugong feeding activity has been observed on the majority of intertidal seagrass meadows surveyed in Port Curtis during the 2007 Department of Primary Industries and Fishery (DPI&F) long term monitoring program (Chartrand et. al., 2009). Refer to Section 3.3 for information on seagrass meadows around the LNG facility and associated marine facilities.

3.1.4 Capricorn Bunker Group

The Capricorn Bunker Group is located 60 to 100 km north-east of Gladstone. The islands have high natural values, notably breeding populations of seabirds, marine turtle and coral cay vegetation. The values of the area have been recognised in the declaration of the Capricornia Cays National Park and the Capricornia Cays National Park (Scientific) and surrounding State Marine Park and Great Barrier Reef Marine Park. Under the Great Barrier Reef Park Act 1975, the Marine Parks Act 1982 and the Nature Conservation Act 1992, the responsible agencies are obliged to protect the natural and cultural values and ensure use is ecologically sustainable. The Capricornia Cays National Park is managed by the Queensland Parks and Wildlife Service (QPWS).



Boundary from PFL10 Instrument (4 March 2011)

Cadastral Boundary

Gladstone State Development Areas

- Other Industry Precincts
- Curtis Island Industry Precinct
- Environmental Management Precinct (Curtis Island)
- Environmental Management Precinct (Kangaroo Island)
- Materials Transportation and Services Corridor (Curtis Island)

LNG

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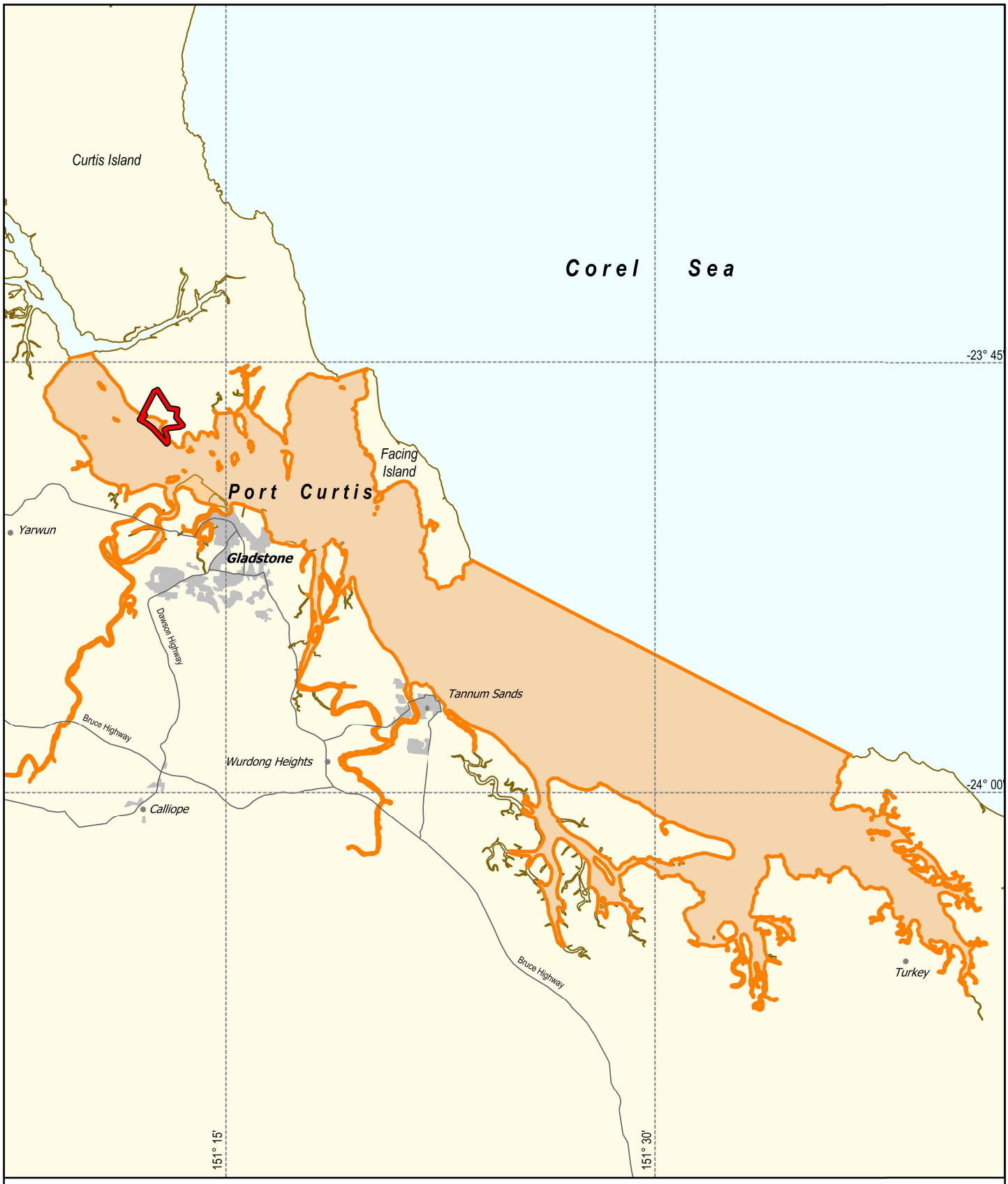
Curtis Island Environmental Management Precinct

2 0 2 4 km

Figure: 3-2 Date: June 2013 File No. GLNG 499o

GDA



Boundary from PFL10 Instrument (4 March 2011)

Town

Major Road

Built Up Area

Rodds Bay Dugong Sanctuary

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Rodds Bay Dugong Sanctuary

5 0 5 10 15 km

Figure: 3-3 Date: June 2013 File No. GLNG 499p

GDA

3.2 Threatened and Migratory Species and Communities for the LNG facility

Below is a summary of ground truthing surveys for the LNG facility conducted during 2008 and 2009 from the GLNG EIS, SEIS and supporting documentation to address GLNG's State and Commonwealth conditions. For the full assessment of threatened and migratory species and communities refer to GLNG EIS, Appendix G, EPBC Act Report (URS, 2009b).

Ground truthing surveys undertaken in 2009 within the LNG facility site, were unable to identify any flora or fauna species of EPBC conservation significance as being present at the time (URS, 2009b).

During the January 2011 preclearance survey of the LNG facility construction footprint conducted by URS, no EPBC listed flora or fauna species were encountered during the targeted searches. However, the following migratory species were observed within the marine facilities:

- Rainbow bee-eater (*Merops ornatus*);
- Eastern curlew (*Numenius madagascarienisis*); and
- Whimbrel (*Numenius phaeopus*).

Refer to the GLNG LNG Facility Pre-clearance survey for EPBC-Listed Fauna and Flora Species, Migratory Species and Ecological Communities Report located at http://www.santosglng.com for additional details on the preclearance survey.

3.2.1 Birds

Twice annual migratory shorebird surveys have been conducted since 2011 at the locations shown in Figure 3-4. For survey results please refer to the GLNG website (**http://www.santosglng.com**).

Information regarding relevant bird species potentially found on Curtis Island are detailed below.

Black Breasted Button – Quail and Squatter Pigeon

The GLNG EIS concluded that threatened EPBC species that may be impacted by construction of the LNG facility include the black-breasted button-quail (*Turnix melanogaster*) and the squatter pigeon (*Geophaps scripta scripta*). Although no individuals were recorded on Curtis Island in the vicinity of the LNG facility, suitable habitat for these species is present at this location. It is considered unlikely that construction and operation of the LNG facility will impact significantly on potential populations that may be present on Curtis Island (URS, 2009).

Migratory wader bird

Migratory wader bird surveys were undertaken during three periods in 2008, April, June and December, as part of the GLNG EIS assessment. The surveys indicate that the LNG facility site does not act as core habitat for any of these species as similar vegetation communities and topography is found elsewhere in the region (URS, 2009).

Migratory Shorebirds

During January 2011 targeted Migratory Shorebird surveys were undertaken by URS for the marine facilities, two species of international migrants were observed using

foraging and roost habitat at China Bay; eastern curlew (*Numenius madagascariensis*) and whimbrel (*Numenius phaeopus*) (URS, 2011a).

Eastern curlew

The eastern curlew is prevalent in the coastal regions of north-east and southern Australia. The species is associated with coastal mudflats, sandflats, mangroves, estuaries, sandspits, fresh/brackish lakes and grasslands near water (Pizzey and Knight 2003). At high tide the species relocates to saltpans, sand dunes and other open areas where they roost above the high water mark. Consequently this species requires two types of habitat to survive, one within the tidal zone and one above the tidal zone (DERM 2007, Flegg 2002). This species is a summer migrant (Aug-Mar) to Australia (Pizzey and Knight 2003).

Whimbrel

The whimbrel is usually observed along tidal flats, estuaries, mangroves, coral cays, exposed reefs, flooded paddocks (floodplains), grasslands and sewerage ponds. The whimbrel is usually a summer migrant to Australia (Pizzey and Knight 2003).

Rainbow bee-eater

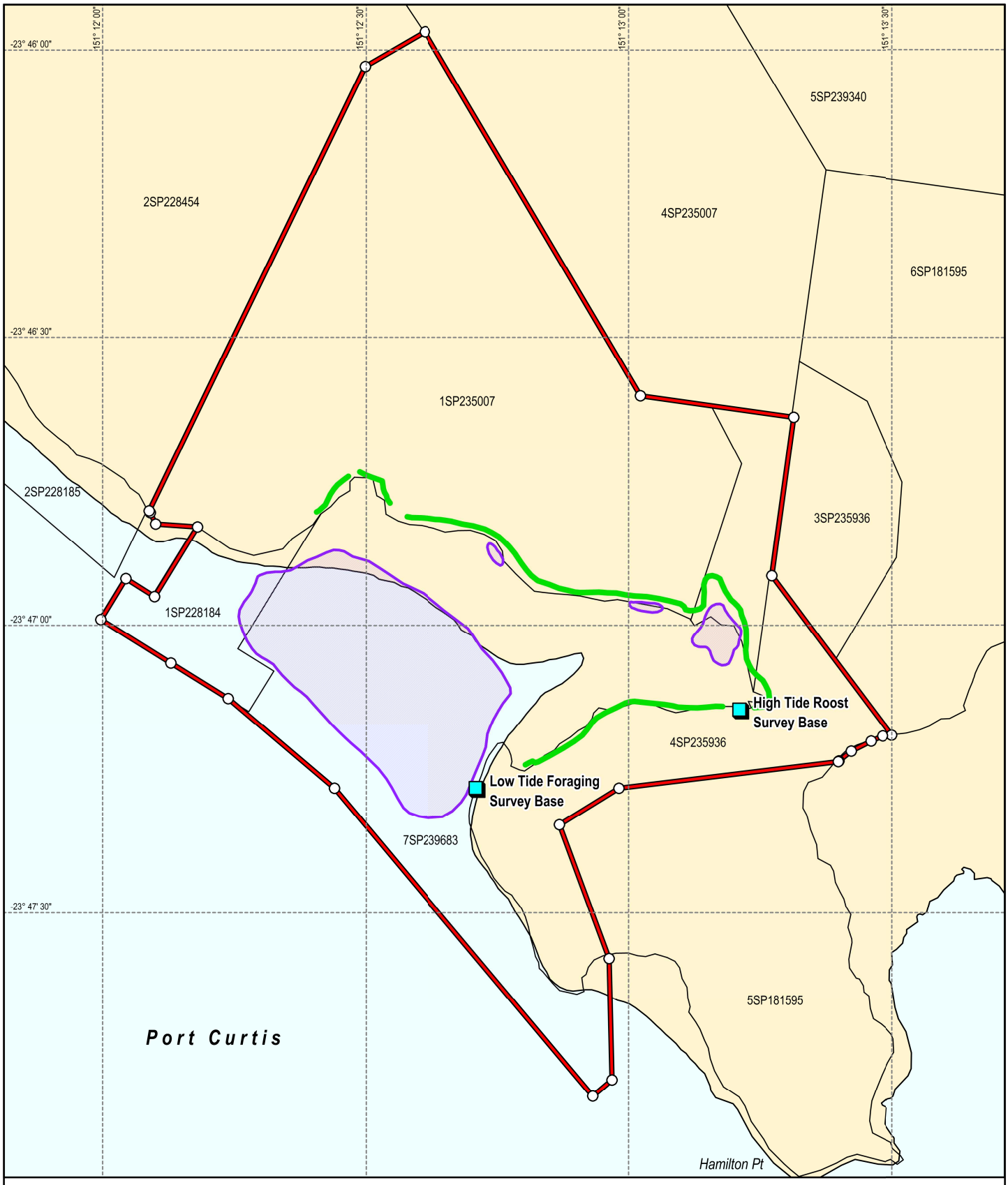
The rainbow bee-eater (*Merops ornatus*) was sighted on the hinterland margins of Curtis Island during the intertidal survey in June 2008 (URS, 2009b). Potential impacts to this species may occur from removal of the vegetation at the hinterland margin with the development of haul road for the MOF. Significant impacts to this species are not anticipated as this area does not represent core habitat for this species and there is considerable suitable habitat available in other areas within the region.

Great egret

The GLNG EIS, noted that the great egret (or white egret) (*Ardea alba*) was sighted on low tidal mudflats adjacent to Curtis Island. Great egrets are listed in China-Australia Migratory Bird Agreement (CAMBA) and Japan-Australia Migratory Bird Agreement (JAMBA) agreements and are considered common throughout Australia (Birds Australia). This species was sighted on low tidal mud flats within Port Curtis during the intertidal survey in June 2008. Potential impacts to this species are considered negligible due to minimal disturbance to low tidal mudflats resulting from the construction and operation of the LNG facility and the extent of mudflats dominating the lower intertidal habitats within Port Curtis. It is unlikely that significant impacts will occur to this species from the construction operation and decommissioning of the LNG facility (URS, 2009b).

White-bellied sea eagle

The white-bellied sea eagle (*Haliaeetus leucogaster*) is listed under the CAMBA Agreement. The GLNG EIS, noted that this species is commonly found in coastal and near coastal areas of Australia and was sighted on low tidal mud flats, mangroves and rocky foreshore habitat of Curtis Island during field surveys conducted in June 2008 (URS, 2009b). As there will be negligible impact on these species from construction of the LNG facility, it is considered that a specific management plan for marine raptors is unwarranted (URS, 2011b). Refer to the GLNG LNG Facility Pre-clearance survey for EPBC-Listed Fauna and Flora Species, Migratory Species and Ecological Communities Report located at http://www.santosglng.com for additional details on the preclearance survey.



Land Title Boundary Surveyed (11 November 2011)

Coordinates from PFL10 Instrument (4 March 2011)

Boundary from PFL 10 Instrument (4 March 2011)

Shorebird Survey Locations

Vehicle and Foot Surveys of High Tide Roost Habitat

Areas in which Eastern Curlew Whimbrel were Observed

Note : The PFL10 Instrument is concurrent with the Digital Cadastre Database

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GLNG LNG Facility Location of Surveyed Shorebird Habitats

300 0 300 600 m

Figure: 3-4 Date: June 2013 File No. GLNG 499q

3.2.2 Marine Reptiles

Turtles

Several green turtles were seen by researchers during the field surveys (2006) and it has been reported that The Narrows and the Calliope River mouth are major foraging areas (Connell Hatch, 2006). According to previous research, the loggerhead turtle (*Caretta caretta*) and flatback turtle (*Natator depressus*) utilise habitats in the outer harbour and occasionally move northward through Port Curtis into The Narrows (QDEH, 1994). The leatherback turtle (*Dermochelys coriacea*) has been recorded regionally although none have been sighted within Port Curtis.

Green Turtles

Green turtles (*Chelonia mydas*) occur in seaweed-rich coral reefs and inshore seagrass pastures in tropical and subtropical areas of the Indo-Pacific region (Limpus, 2004). Green turtles feed on small marine animals when they are young, but once they move to their adult foraging grounds green turtles mainly eat seagrass and seaweed (algae). They also feed on mangrove fruit, jellyfish and sponges.

Queensland has three distinct genetic breeding stock of green turtles with very little interbreeding occurring between these distinct populations (Dobbs, 2001). The southern Great Barrier Reef has 13 major rookeries, including North West Island, Wreck Island, Hoskyn Island, Heron Island and the Coral Sea cays.

Loggerhead Turtles

Loggerhead turtles (*Caretta caretta*) feed mostly on shellfish, crabs, sea urchins and jellyfish (Limpus, 2004). Significant nesting areas in Australia occur on the southern Great Barrier Reef and adjacent mainland coastal areas, including Bundaberg, Wreck Island, Erskine Island, Tryon Island, Wreck Rock beach and Pryce Cay and in Western Australia including the Murion Islands and further south near Shark Bay. Females originally tagged near the south east Queensland rookeries have been recaptured in Indonesia, Papua New Guinea, the Solomon Islands, New Caledonia, the Northern Territory, New South Wales and other parts of Queensland. The eastern Queensland loggerhead population is genetically distinct from loggerhead turtles breeding in Western Australia (Dobbs, 2001).

Occasional nesting has been reported to occur on the ocean side of southern Curtis Island and Facing Island (Limpus, 1999) and have been recorded within the outer harbour of Port Curtis and moving north through The Narrows (QDEH, 1994).

Flatback Turtles

Flatback turtles (*Natator depressus*) are only known to breed in Australia and is one of two species without a global distribution. They feed in the northern coastal regions of Australia, extending as far south as the Tropic of Capricorn. Their feeding grounds also extend to the Indonesian archipelago and the Papua New Guinea coast (DEWHA, 2003). Flatback turtles have a preference for shallow, soft-bottomed sea bed habitats away from reefs. The Australian flatback turtle prefers shallow, turbid, inshore waters and bays where they feed on sea cucumbers and other holothurians, as well as jellyfish, prawns, molluscs, bryzoans, and other invertebrates (Ripple, 1996). Juvenile flatback turtles eat shellfish, squid and jellyfish. Adult flatback turtles are known to forage soft-bottom habitats and eat cuttlefish, hydroids, soft corals, crinoids, shellfish and jellyfish. They feed mainly inshore of the outer Great Barrier

Reef from Hervey Bay to Torres Strait, Gulf of Carpentaria, North West Shelf, Arafura Sea and the Gulf of Papua.

Yakka skink

During the January 2011 preclearance survey it was noted that the habitats usually occupied by the Yakka skink (*Egernia rugosa*) (i.e. poplar box, ironbark, brigalow, white cypress pine, mulga, bendee and lancewood woodlands and open forests) are largely absent at the LNG facility site. Curtis Island is also remote from the core area of habitation of the yakka skink which is found within the Mulga Lands and Brigalow Belt South bioregions. The January 2011 preclearance survey verified the earlier results of the GLNG EIS and SEIS studies which did not record the presence of this species and concluded a low likelihood of it being present on Curtis Island (URS, 2011b). Refer to the GLNG LNG Facility Pre-clearance survey for EPBC-Listed Fauna and Flora Species, Migratory Species and Ecological Communities Report located at http://www.santosglng.com for additional details on the results of the preclearance survey.

3.2.3 Mammals

Terrestrial

No terrestrial mammals listed under the EPBC Act were recorded within the LNG Facility and associated marine facilities area during surveys conducted during 2008 and 2009 as part of the EIS and SEIS. However, there is a low probability of the water mouse (*Xeromys myoides*) being present within or adjacent to the LNG facility and associated marine facilities sites.

Water Mouse

The Water Mouse is listed as vulnerable under the EPBC Act. It is a nocturnal, terrestrial carnivore which occurs in mangroves, saltmarsh, sedged lakes near foredunes and coastal freshwater swamps. A habitat assessment of the LNG facility's suitability for Water Mouse was carried out by Biodiversity Assessment and Management (BAAM) staff in December 2008. Mangrove habitat within China Bay and Port Curtis was considered to have low to moderate value for Water Mouse on the basis of low to moderate nesting site availability and past disturbance to potential habitats from an access track, refuse dumping and feral animal activity (BAAM 2009).

In addition to the 2009 surveys, a Water Mouse field investigation was carried out over a period of four days and three nights during November 2010. The survey included a combination of nocturnal trapping of preferred nesting habitat along the landward edge of mangroves and daytime searches for nest mounds and assessment of mangrove habitat values for the species, as recommended by EPBC guidelines for surveying Water Mouse habitat. No Water Mouse were trapped over a total of 445 trap nights, despite seven other rodents being trapped, comprising three Bush Rats *Rattus fuscipes* and four juvenile *Melomys* species. Furthermore, no signs of Water Mouse presence (nest mounds or prey middens) were observed during the daytime searches and habitat assessment surveys (BAAM, 2010). Refer to the GLNG Curtis Island Facility: Water Mouse Survey and Habitat Assessment located at http://www.santosglng.com for further details. Refer to Figure 3-5 for potential water mouse habitat in relation to the LNG facility.

Marine

Dugong

The dugong (Dugong dugon), which is listed as Vulnerable under the Nature Conservation (Wildlife) Regulation 2006 and Migratory under the EPBC Act, is recorded to occur within the GLNG project area. Dugongs prefer shallow and sheltered areas where their primary food source, seagrass, occurs. The project area is located within the Rodds Bay Dugong Sanctuary. The Gladstone coastline and the Rodds Bay DPA are recognised as important habitat for dugong populations despite being closely associated with commercial port activities.

A survey conducted in 2005 (Marsh and Lawler 2006) estimated that there were 183 (± 66) dugongs in the Port of Gladstone area, with dugong feeding activity observed on the majority of intertidal seagrass meadows surveyed during a study of benthic habitats in the port. However, Grech and Marsh (2007) classed the area around Gladstone as low to medium conservation status on the basis of relative density of dugongs estimated from spatial modelling and frequency analysis taken from time series data over 19 years of aerial surveys (URS, 2009b).

Irrawaddy Dolphins

The EIS reported that although it is possible that Irrawaddy dolphins utilise the Port of Gladstone region, the limited number of sightings indicates that the area is not a significant habitat for them. As such, it is concluded that potential impacts from shipping activities as a result of the proposed LNG marine facilities are unlikely to have a significant impact on this species (URS, 2009b).

Snubfin dolphins

Reports prior to 2009 recorded by the EHP (formerly called Environmental Protection Agency (EPA)) of dead Snubfin dolphins at the mouth of the Calliope River, Fisherman's Landing and on the seaward beach of Facing Island indicate that this species are found within Port Curtis and utilise the area as a habitat. These reports however, allude to boat strike and entanglement in fishing gear and shark control nets as the most likely causes of death. The implementation of mitigation measures such as maintaining constant watch and reducing boat speed will reduce interactions with dolphins during all shipping and dredging activities.

Plants

No flora species listed under the EPBC Act were recorded within the LNG marine facilities search area, including the MOF and PLF haul roads.

3.3 Threatened Ecological Communities

Semi-Evergreen Vine Thicket

A semi-evergreen vine thicket of the Brigalow Belt (North and South) and Nandewar Bioregions was identified within the MNES search. However, this community is not found within the LNG marine facilities study area.

Coastal Vine Thicket of Eastern Australia

One endangered ecological community, Littoral Rainforest and Coastal Vine Thicket of Eastern Australia (RE 12.2.2 microphyll / notophyll vine forest) community was identified during field surveys undertaken during the EIS (2008 and 2009) within the

proposed MOF haul road location. Since the EIS, subsequent boundary refinements to the LNG facility footprint have resulted in minor adjustments to the footprint and amendments to areas of vegetation communities impacted. Of significance is the exclusion of any disturbance to RE 12.2.2 (microphyll / notophyll vine forest on beach ridges) from the revised footprint (URS, 2009c).

Refer to Figure 3-6 for details of the vegetation management status of the LNG facility disturbance footprint.

During the January 2011, preclearance surveys of the Critically Endangered ecological community Littoral Rainforest and Coastal Vine Thickets of Eastern Australia was confirmed at Hamilton Point. However, as discussed above this community is located outside the area of potential impact from construction of the LNG facility and associated infrastructure. No other examples of this community were encountered during the field survey within the LNG facility site (URS, 2011b). Refer to the GLNG LNG Facility Pre-clearance survey for EPBC-Listed Fauna and Flora Species, Migratory Species and Ecological Communities Report located at http://www.santosglng.com for additional details on the results of the preclearance survey.

Seagrass Meadows

Seagrass meadows in Queensland are known to provide valuable nursery habitats for juvenile commercial and recreational fisheries species, as well as important food resources for endangered and threatened species such as dugong and turtles (Chartrand *et al*., 2009). Seagrasses also show measurable response to changes in water quality making them ideal ecological communities for monitoring the “health” of port environments. The value of seagrasses in the Port Curtis area to dugongs has been recognised by the declaration of the Rodds Bay Dugong Protection Area (DPA) under the Queensland *Fisheries Act 1994* in 2002.

During a field study conducted in May 2008, no intertidal or sub-tidal seagrass was observed along the western side of Curtis Island or adjacent to North Passage and South Passage Island. This is contrary to results from baseline monitoring that reported the presence of ephemeral seagrass species dominated by *Zostera capricorni* with *Halophila ovalis* and some *Halophila decipiens* adjacent to South Passage Island and North Passage Island (Rasheed *et al.*, 2003), and isolated patches of *Zostera sp.* adjacent to China Bay (Danaher *et al.*, 2005). Seagrass meadows in 2009 consisted of isolated patches of *H. ovalis* and *Z. capricorni* adjacent to South Passage Island and North Passage Island. The three seagrass meadows identified adjacent to China Bay consisted of isolated patches of *H. ovalis* and *Halophila uninervis* with some mixed species. All seagrass meadows recorded in 2009 were of small area and biomass.

An additional seagrass survey requested by the then Department of Employment, Economic Development and Innovation) DEEDI was undertaken in November 2010 in localities adjacent to the MOF and China Bay. No seagrass was found at any of the 312 stations sampled using a van Veen grab. This result indicates that the limited amounts of seagrass (both in terms of biomass and percentage cover) found by Thomas et al (2010) in 2009 may be no longer present. The decreasing annual trend in seagrass cover in 2010 also follows that seen in the area between 2008 and 2009 (URS, 2011c).

Refer to Figure 3-7 for details on the seagrass communities.

Land Title Boundary Surveyed (11 November 2011)

Boundary from PFL 10 Instrument (4 March 2011)

Habitat Assessment

Highest Potential Water Mouse Nesting Habitat

Potential Water Mouse Feeding Habitat

Note : The PFL10 Instrument is concurrent with the Digital Cadastre Database

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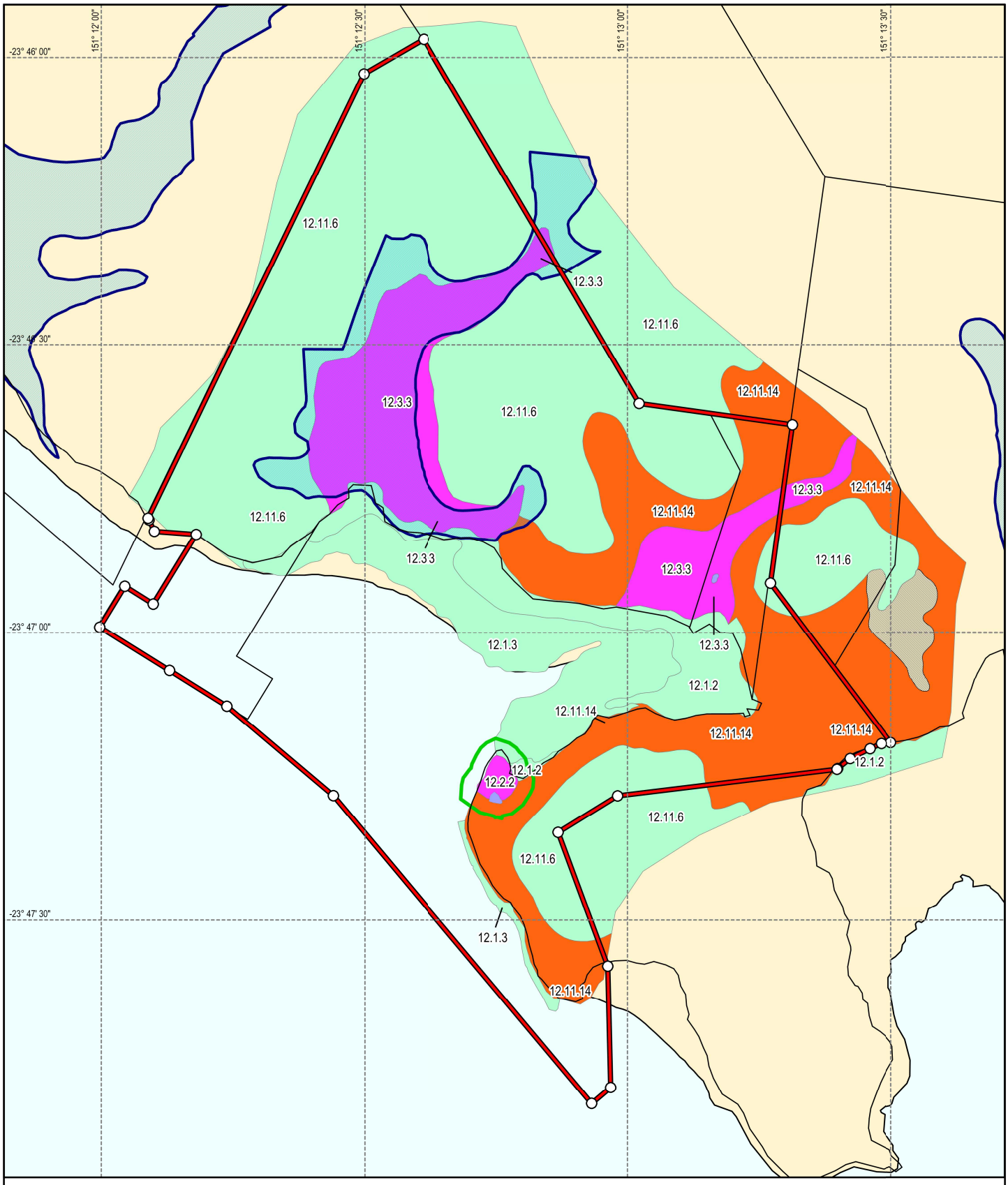
Water Mouse Habitat Areas and Habitat Assessment Sites Indicated

300 0 300 600 m

Figure: 3-5 Date: June 2013 File No. GLNG 499r



Land Title Boundary Surveyed (11 November 2011)

Coordinates from PFL10 Instrument (4 March 2011)

Boundary from PFL 10 Instrument (4 March 2011)

50m buffer

Essential Habitat

Water Body

Not of Concern (undisturbed)

Endangered (undisturbed)

Of Concern (undisturbed)

Non-Rem

Note : The PFL10 Instrument is concurrent with the Digital Cadastre Database

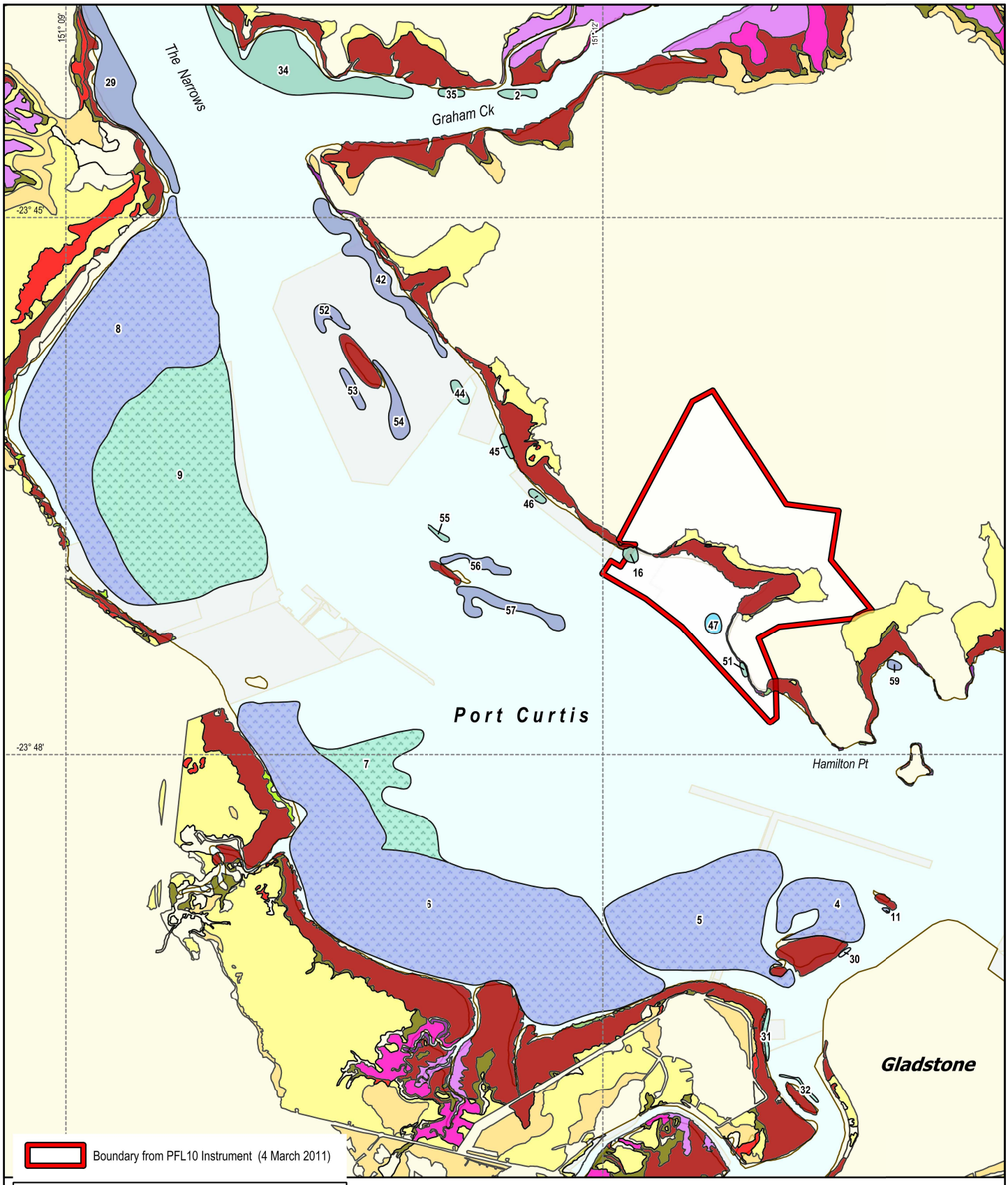
Fuel for the Future

LNG Facility

LNG Facility
Regional Ecosystems

300 0 300 600 m

Figure: 3-6 Date: June 2013 File No. GLNG 499s



Intertidal Wetlands of Port Curtis

Mangroves

- Closed *Rhizophora*
- Closed *Avicennia*
- Open *Avicennia*
- Closed *Ceriops*
- Open *Ceriops*
- Closed *Avicennia/Ceriops*
- Open *Avicennia/Ceriops*
- Closed *Rhizophora/Avicennia*
- Open *Rhizophora/Avicennia*
- Closed *Aegiceras*
- Closed *Aegiceras/Rhizophora*
- Closed *Aegiceras/Avicennia*
- Closed Mixed
- Dead *Rhizophora*

Saltmarsh

- Saltpan
- Samphire Dominated Saltpan
- Saline Grassland

Seagrass

- *Cymodocea* Isolated patches
- *Halodule* Isolated patches
- *Halodule* Aggregated patches
- *Halophila* Isolated patches
- *Halophila* Aggregated patches
- *Zostera* Isolated patches
- *Zostera* Aggregated patches
- *Zostera* Continuous cover

LNG

Fuel for the Future

LNG Facility

Distribution of Marine Plants within Port Curtis

1 0 1 2 km

Figure: 3-7 Date: June 2013 File No. GLNG 499t

GDA

3.4 Receiving Environment

The LNG facility will be located adjacent to Port Curtis on Curtis Island. Discharges from the LNG facility are proposed to occur from a number of locations during construction, commissioning and for the operational phase of the LNG facility. These discharges will be released into Port Curtis.

Port Curtis falls within the Shoalwater Coast bioregion as defined in the Integrated Marine and Coastal Regionalisation for Australia (Commonwealth of Australia 2006). This bioregion includes the coastal and island waters from Mackay south to Baffle Creek. Port Curtis is a natural deepwater embayment that is protected from the open ocean by Curtis and Facing islands. Coastal geomorphology is characterised by a partially enclosed embayment and shallow estuaries, including small, continental rocky islands, intertidal flats and estuarine islands. Port Curtis estuary is a composite estuarine system that includes the Calliope and Boyne Rivers, The Narrows, Auckland Creek and several smaller creeks and inlets that merge with deeper waters to form a naturally deep harbour protected by southern Curtis Island and Facing Island. Elevated natural turbidity occurs within the shallow marine and estuarine waters with significant input of freshwater and alluvial sediments from the Boyne and Calliope Rivers (URS, 2011d).

There are currently 26 marine species listed as being introduced into Queensland waters (NIMPIS website - www.marine.csiro.au/crimp/nimpis) A marine introduced pest survey of Port Curtis was conducted in 2000 (Lewis et al. 2001) by the Central Queensland University in conjunction with the Commonwealth Scientific and Industrial Research Organisations Centre for Research and Introduced Pests. No pest species were detected in Port Curtis; however, low abundances of ten introduced species were detected. These species are widespread in ports across Australia and around the world, and are not considered to be a threat to native species, aside from direct competition for space between some bryozoans. The authors recommended that removal was not warranted (URS, 2009b).

4 POTENTIAL IMPACTS

This section focuses on the potential impacts on Matters of National Environmental Significance (MNES) from the construction of the LNG facility and associated marine facilities.

4.1 Potential Impacts from Site Clearing

The site clearing process is described in Section 2.4.1.

4.1.1 Terrestrial Flora

The total area of each vegetation community potentially impacted and the percentage of each vegetation community within the sub-region (as defined by Regional Ecosystem (RE) types within the Burnett-Curtis Hills and Ranges sub-region) are presented in Table 4-1 below.

Table 4-1: Proposed area of vegetation communities to be removed for the LNG facility

RE	Community Description	VM Status	Biodiversity Status	EPBC Status	Potential Disturbance Ha
12.1.2	Saltpan vegetation comprising *Sporobolus virginicus* grassland and samphire herbland on Quaternary estuarine deposits	Not of concern	No Concern at present	Not Listed	0.6
12.1.3	Mangrove shrubland to low closed forest on Quaternary estuarine deposits	Not of concern	No Concern at present	Not Listed	1.9931
12.3.3	*Eucalyptus tereticornis* open forest to woodland on Cainozoic alluvial plains	Endangered	Endangered	Not Listed	38.0363
12.11.6	*Corymbia citriodora* and *Eucalyptus crebra* open forest to woodland on Mesozoic to Proterozoic moderately to strongly deformed and metamorphosed sediments and interbedded volcanics	Not of concern	No Concern at present	Not Listed	104.5
12.11.14	*Eucalyptus crebra*, *E. tereticornis* grassy woodland on Mesozoic to Proterozoic moderately to strongly deformed and metamorphosed sediments and interbedded volcanics	Of concern	Of concern	Not Listed	42,921
TOTAL					**188.0504**

Table 4-1 above clearly illustrates that site clearing for the LNG facility has not impacted on EPBC listed vegetation communities.

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4.1.2 Terrestrial Fauna

The site preparation and clearing for construction of the LNG facility and associated marine facilities has resulted in the removal of habitat features such as trees, shrubs, ground cover, rocks, timber, waterways, wetlands and other features.

As clearing progressed inland across the LNG facility site a buffer strip of vegetation was left in place along significant stream channels, which are ephemeral and only flow after considerable rainfall, to provide erosion control until stormwater management measures were in place and earthworks began. The channels also served for natural movement for wildlife. The intent was to push the working front forward in such a manner that wildlife could always escape offsite to undisturbed habitat. Even though the LNG facility site borders another LNG project site there is a sizeable vegetated area between the projects that wildlife can use. Wildlife spotter/catcher experts oversaw wildlife handling of designated wildlife habitat trees and any animals.

Impacts to fauna as a result of these measures included mortality, injury, loss of habitat and breeding areas and the removal of movement opportunities using local movement corridors. Fauna was also impacted from noise and vibration generated by the construction of the LNG facility, although fauna generally moved away from the source to avoid these impacts.

4.1.3 Marine Ecology

Impacts to saltmarsh and mangroves from construction of the LNG facility and haul roads to the PLF and MOF are estimated to be:

- Approximately 1.9931 ha of mangrove; and
- Approximately 0.6 ha of saltmarsh.

The area of saltmarsh and mangrove clearing required is minor in the context of the total extent available within Port Curtis and no significant impacts are expected.

4.2 Potential Impact from Noise and Vibration

4.2.1 Terrestrial Noise and Vibration

Noise levels from construction activities will vary depending on distance from the work, type of equipment in operation, climatic conditions and topographical shielding. While noise from diesel-powered mobile plant (i.e. bulldozers and excavators etc.) will generally form a major part of the emissions over the construction phase of the project, the highest noise levels are expected to occur where construction requires the use of pile driving, rock drilling or blasting and rock removing equipment (URS, 2009d).

Flaring will be the main source of noise during the commissioning phase of the project with the potential to cause disturbance to ecological receptors. Noise will also be generated to a lesser extent as a result of pipe blowing, venting during purging and depressurising following tightness testing. Instances of such noise events will be intermittent and will occur over several months.

For information on potential noise sources during construction (including commissioning) refer to Appendix 2, Attachment M, and Section 2.2 Marine Noise and Vibration.

Whilst pile driving for the PLF and MOF was in progress, it is unlikely that marine mammals passing offshore were able to hear the construction work as the noise levels were not much higher than ambient noise levels. However, it is likely that any dolphin, dugong or turtle near the new berth sites during piling would have temporarily avoided the immediate area. The sound levels from piling operations were not expected to harm marine fauna, even at close range. If any dolphin, dugong or turtle were close to a pile at the commencement of piling they would be startled and move from the immediate area (URS, 2009d).

Noise and Vibration impacts generated by dredging activities for the MOF may have caused dugong and turtles to avoid the area, resulting in reduced habitat quality and seagrass availability in the short-term.

For information on potential noise sources during construction (including commissioning) refer to Appendix 2, Attachment M, and Section 2.2.

4.3 Potential Impact on Visual Aesthetics

The natural landscape character of the LNG facility site and associated marine facilities limits the capacity for the surrounding environment to visually absorb significant change. The introduction of structures higher than the existing tree layer introduced man-made elements that contrast with the surrounding tree covered slopes.

All components of the LNG facility and associated marine facilities will be visible from Port Curtis which is located in a World Heritage Area and National Heritage Place. The LNG train and storage tanks will not be visible from most views of the site due to visual screening created by the tree-covered ridges that define the valley in which the LNG facility is located. The flare stack and flame will be visible to varying degrees from most vantage points around the site. Ships/barges/ferries moored at the MOF will be visual from Port Curtis and sections of the Mount Larcom-Gladstone Road in Gladstone (URS, 2009e).

For further information refer to Appendix 2, Attachment M, Section 3.

4.4 Potential Impact from Lighting

Prior to the commencement of construction activities there were no existing light sources within the LNG facility site and immediately surrounding areas. Consequently, lighting associated with the LNG facility and associated marine facilities construction introduced a new source of illumination into the predominately natural landscape of Curtis Island (URS, 2009e).

Lighting during the construction phase is necessary, including warning and security lights on the Port of Gladstone and inland work/security lighting. Lighting has also been used on the PLF and MOF structures, dredges and support vessels. During commissioning light will potentially be generated at night through flaring activities.

Lighting has been linked to disorientation in turtles, particularly during periods of nesting and hatching (Lutcavage et al. 1996; Pendoley 1997). Lighting will impact on crew and passengers of recreation watercraft on Port Curtis waterway and ships berthing at the Fisherman's Landing Wharf (URS, 2009e).

For further information refer to the GLNG Construction Environmental Management Plan for LNG Facility (CEMP) Attachment M, Section 4.

4.5 Potential Impacts from Discharges to Water

The movement of sediment and potential erosion may be exacerbated from the construction of the LNG facility and vehicle crossings of drainage features. As such, sediment basins are required during construction. The basins are designed to trap and hold runoff (plug flow) until it can be treated and discharged once it meets the water quality requirements. In case of rainfall beyond the design of the basin, stormwater will discharge to the sea via a spillway.

The sedimentation basins will be converted to operate as continuous flow settling basins with initial flow entering the discharge structure through narrow filtered slots. As the basin fills with stormwater flow will being to discharge through the primary inlet to the discharge pipe. In case of rainfall beyond the design of the basin an emergency spillway will allow discharge to the sea. Even when the basin is full of water, sediment-laden stormwater runoff continues to be directed through the basin for continued settlement of coarse=grained particles contained in the flow (GLNG, 2010).

There is potential for contaminant mobilisation on site through the spillage of fuels and chemicals including diesel and other petroleum-based fuels and lubricants.

Stormwater from the TWAF will drain to a sedimentation basin.

There is also a potential risk to water quality by out-of-bank/flash flood rainfall events, during construction.

The stormwater release limits currently authorised under the LNG Facility environmental authority are provided in the Environmental Monitoring Plan in Appendix 2, Attachment H.

4.5.1 Potential Impacts from Discharges of Treated Sewage and Brine

The receiving environment for stormwater runoff and wastewater effluents is the Port Curtis area of the Port of Gladstone. There are nine stormwater discharge points that either convey stormwater around the construction area or release stormwater from sediment control systems. Two discharge points for treated wastewater using engineered diffusers have been installed; one near the MOF for construction discharges (STP and Construction WTP effluent) and one near the LNG loading jetty for commissioning and operational discharges (Operations WTP and OWTP effluent, and stormwater from the process area spill containment sumps).

The effluent diffusers (WW1 and WW2) have been designed based on several factors including the amount of effluent, type of effluent, and tidal/flow characteristics at the discharge point. The diffusers release effluent at a rate and in such a manner that it quickly blends with seawater thus diluting any potential pollutants. The area where seawater and effluent blend is known as the mixing zone. The size of the mixing zone around each effluent diffuser has been calculated to be no larger than 50 m. In other words, within 50 m of the point where treated effluent enters the sea chemical composition, water colour, acidity, salinity, temperature and other qualities will be at background levels.

The effluent discharge points are within 350 m of the shoreline with the construction diffuser at a depth of 6 m and the operations diffuser at a depth of 10 m.

In order to assess the impacts of the proposed discharges on water quality in Port Curtis, dilution factors were applied to the constituents of each discharge to estimate the potential changes in water quality. The results were presented for the worst case 10th percentile velocity in the Revised Wastewater Discharge Assessment (URS 2010).

The only scenarios that may result in potentially detectable changes in water quality occur at bottom contact during the construction stage for Total Suspended Solids (TSS). Whilst this impact may be discernible for the 10th percentile case, it is anticipated to be short lived and will occur in an environment of naturally variable TSS concentrations. As such, this is considered unlikely to be of any real consequence.

The assessment showed that toxicants used in the treatment process will not be present in discharges from the facility at levels that exceed the lowest observed effect concentration therefore long term ecological effects are not anticipated. No other discernible impacts on water quality are predicted to arise from the discharge of wastewaters from the LNG facility. Refer to Appendix 1, Section 4.1 for additional details.

4.6 Potential Impacts on World Heritage Areas and National Heritage Places

The development of the LNG facility, and the associated clearing of native vegetation, will involve impacts on:

- Endangered and threatened regional ecosystems;
- Habitat for listed threatened species;
- Essential habitat for threatened species;
- World heritage values; and
- Marine fish habitat.

As a result of the revised location of infrastructure associated with the LNG facility, no EPBC listed ecological communities; flora or fauna species will be impacted by the development of the LNG facility. However, as the LNG facility is located wholly within the GBRWHA, the LNG facility site boundary will impact upon 240 ha of the world heritage area. The world heritage values impacted by this development include:

- Exceptional natural beauty and aesthetic importance;
- Significant geomorphic or physiographic features; and
- Significant ecological and biological processes (Ecofund, 2011).

4.7 Potential Impacts of Non-Endemic Species

Non-endemic species (including exotic weeds and plant pathogens) could be introduced to the site from imported building materials and earthmoving equipment brought to the island from the mainland or overseas. In rare instances road vehicles or site personnel may also be a carrier. Other sources include packing material that are contaminated with live insects, faecal material, prohibited or restricted seeds, other extraneous plant material and animal matter.

Vessels used in the construction of the LNG facility and marine facilities can move rapidly between different areas of the world. In doing so, they may translocate exotic species between different geographic regions. With over 200 species of exotic marine organisms known to have been introduced into Australian waters, the introduction of foreign marine organisms through ships' ballast and hull fouling is a major concern.

The mitigation and eradication of non-indigenous species may also have an adverse impact on indigenous species.

For further information refer to Appendix 2, Attachment S, Section 3.

4.8 Potential Impacts on Water Mouse

The construction of the LNG facility and associated marine facilities will not impact on potential Water Mouse habitat areas, therefore the potential for impacts on potential foraging or nesting habitats for the water mouse is minimal.

4.9 Potential Impacts on Migratory Shorebirds

The construction of the marine facilities has the potential to impact on migratory shorebirds. Whilst discrete events on their own are often sufficient to disrupt foraging and roosting activities, it is likely that construction will result in a combination of disruptive actions that will disturb shorebirds and their habitats.

The construction of the marine facilities involved clearing of intertidal habitat at the northern extent of China Bay and at Hamilton Point respectively. This habitat type has limited value as foraging habitat for shorebirds, and possesses greater importance as potential roosting habitat. Displacement of roosting shorebirds to inferior roosting sites during construction may put the displaced birds at risk from predation at the new roost sites.

Movement of vehicles, boats and personnel and sudden noise can cause shorebirds to take to the air. Blasting, pile-driving and flaring activities are examples of construction related noises that can cause shorebirds to take flight. Disturbance can reduce effective feeding and roosting effort which can lead to a lower fitness for the return journey to northern hemisphere breeding grounds.

Excessive light spilling onto night time roosts can disturb roosting birds during construction and the presence of excessive light for prolonged periods may result in birds abandoning the roost for less secure sites, which may increase the opportunity for further disturbance or predation (URS, 2011a).

For additional information refer to Appendix 2, Attachment T, Section 3.2.

4.10 Potential Impacts on Marine Turtles and Dugongs

Pile driving, dredging and general construction activities below the high tide mark will increase sedimentation and turbidity within Port Curtis resulting in temporary declines in water quality, habitat degradation and potential displacement of marine fauna in the local area.

Although turtles do not have external ears they detect sound through bone conducted vibration with the skull and the shell receiving surfaces (DEWHA, 2003). Turtles and dugong may exhibit a startle response from unexpected noise and vibration.

Construction of the LNG facility and associated marine facilities increases vessel traffic for the transportation of materials, equipment and staff. This may result in increased risk of boat strike to turtle and dugong that could lead to increased mortality and injury. High vessel traffic in shallow coastal areas has been shown to cause serious injuries and mortalities to dugong and turtles (Greenland and Limpus, 2006). Disturbance to normal feeding patterns may also result from increased vessel activity.

For further information refer to Appendix 2, Attachment T, Section 3.2.2

4.11 Potential Impacts on Seagrass Meadows

A small area of mangrove, saltpan and seagrass was directly impacted by construction of the MOF, pioneer barge ramp and haul road and associated infrastructure. The area of habitat (potential fish habitat, mangrove, saltpan/saltmarsh and seagrass) disturbed within a 10m buffer of areas impacted by this infrastructure and dredging was calculated, information regarding the locations, GPS coordinates, indicative species present and whether impacts are temporary or permanent is also listed and referenced in Figures 4-1 to 4-3.

Although no seagrass was sampled in the survey conducted between the 1st and 3rd November 2010, a conservative approach was taken in calculating the area of seagrass disturbed by the pioneer barge ramp, MOF and associated infrastructure in China Bay. Due to the high degree of spatial and temporal variation in the distribution of seagrass communities recorded in the region, the “historical maximum” area of seagrass extent was used to calculate the area of seagrass potentially disturbed by construction activities (URS, 2011c).

For further information refer to Appendix 2, Attachment T, and Section 2.4.

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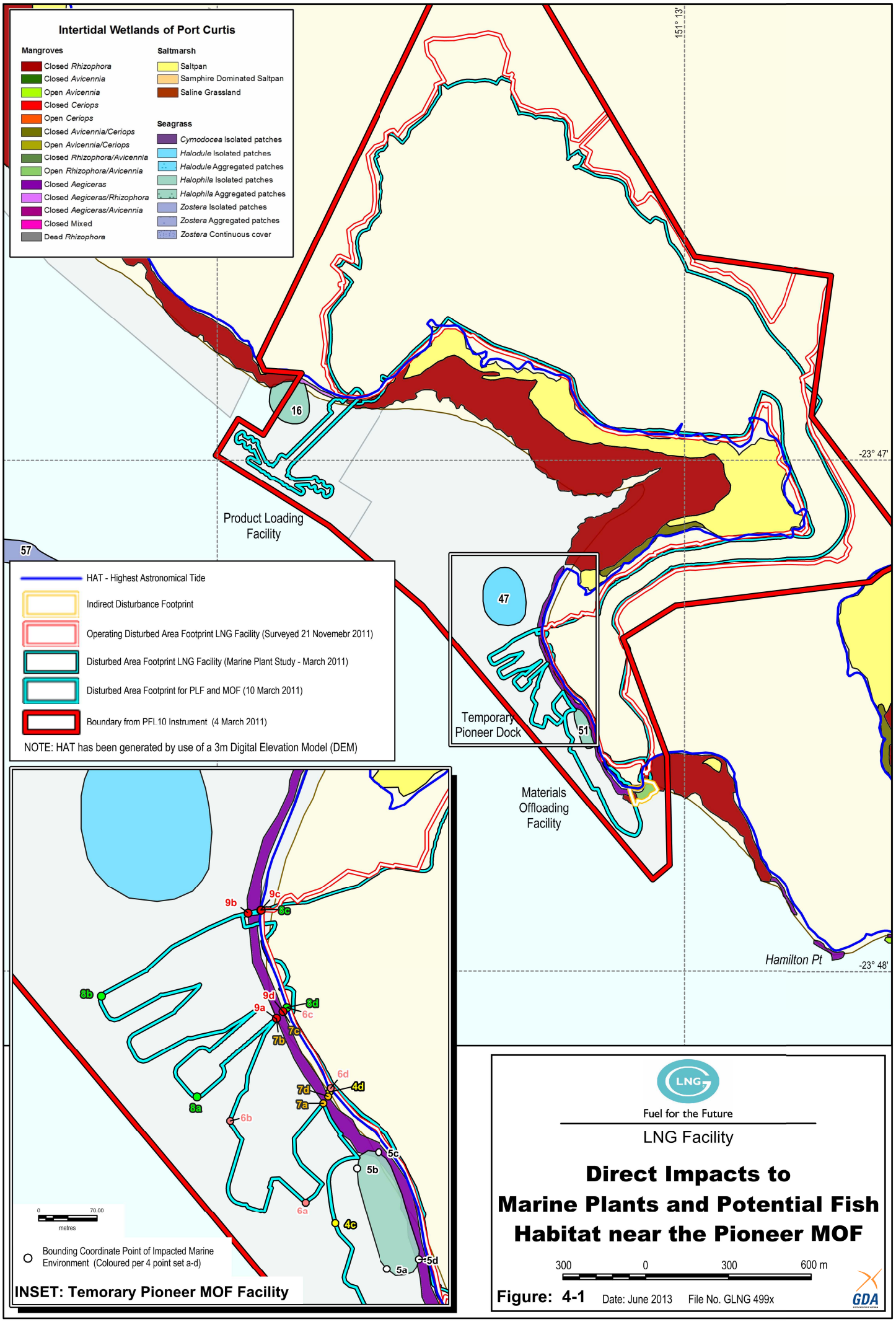
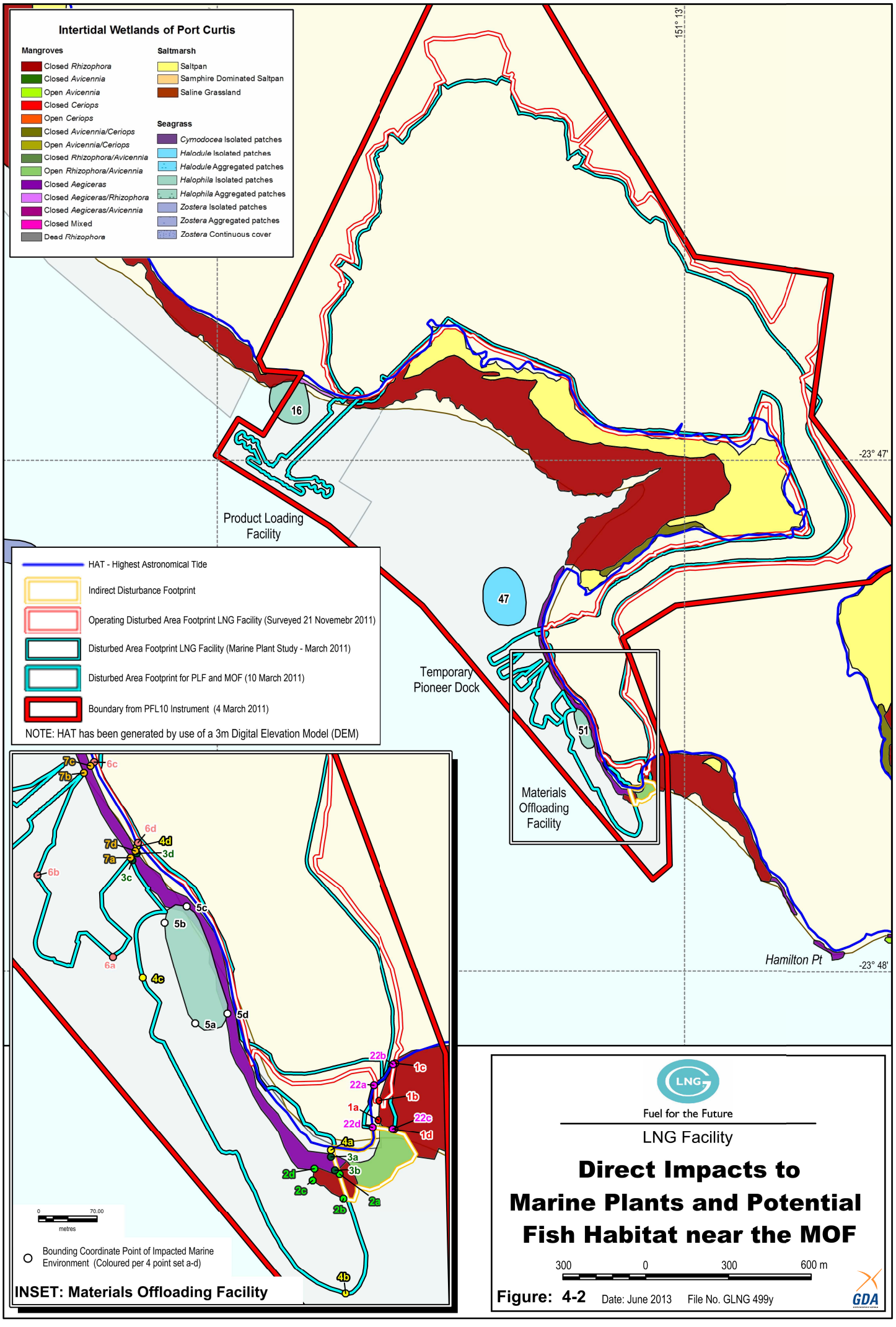

Intertidal Wetlands of Port Curtis
Mangroves
Closed Rhizophora
Closed Avicennia
Open Avicennia
Closed Ceriops
Open Ceriops
Closed Avicennia/Ceriops
Open Avicennia/Ceriops
Closed Rhizophora/Avicennia
Open Rhizophora/Avicennia
Closed Aegiceras
Closed Aegiceras/Rhizophora
Closed Aegiceras/Avicennia
Closed Mixed
Dead Rhizophora
Saltmarsh
Saltpan
Samphire Dominated Saltpan
Saline Grassland
Seagrass
Cymodocea Isolated patches
Halodule Isolated patches
Halodule Aggregated patches
Halophila Isolated patches
Halophila Aggregated patches
Zostera Isolated patches
Zostera Aggregated patches
Zostera Continuous cover
151° 13'
-23° 47'
-23° 48'
16
57
47
51
Product Loading Facility
Temporary Pioneer Dock
Materials Offloading Facility
Hamilton Pt
HAT - Highest Astronomical Tide
Indirect Disturbance Footprint
Operating Disturbed Area Footprint LNG Facility (Surveyed 21 Novemebr 2011)
Disturbed Area Footprint LNG Facility (Marine Plant Study - March 2011)
Disturbed Area Footprint for PLF and MOF (10 March 2011)
Boundary from PFI.10 Instrument (4 March 2011)
NOTE: HAT has been generated by use of a 3m Digital Elevation Model (DEM)
9b
9c
8c
8b
9d
9a
8d
6c
7c
7b
6d
7d
4d
5
7a
8a
6b
5c
5b
6a
4c
5a
5d
0
70.00
metres
Bounding Coordinate Point of Impacted Marine Environment (Coloured per 4 point set a-d)
INSET: Temorary Pioneer MOF Facility
LNG
Fuel for the Future
LNG Facility
Direct Impacts to Marine Plants and Potential Fish Habitat near the Pioneer MOF
300
0
300
600 m
Figure: 4-1
Date: June 2013
File No. GLNG 499x
GDA


Intertidal Wetlands of Port Curtis
Mangroves
Closed Rhizophora
Closed Avicennia
Open Avicennia
Closed Ceriops
Open Ceriops
Closed Avicennia/Ceriops
Open Avicennia/Ceriops
Closed Rhizophora/Avicennia
Open Rhizophora/Avicennia
Closed Aegiceras
Closed Aegiceras/Rhizophora
Closed Aegiceras/Avicennia
Closed Mixed
Dead Rhizophora
Saltmarsh
Saltpan
Samphire Dominated Saltpan
Saline Grassland
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Cymodocea Isolated patches
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Halophila Isolated patches
Halophila Aggregated patches
Zostera Isolated patches
Zostera Aggregated patches
Zostera Continuous cover
151° 13'
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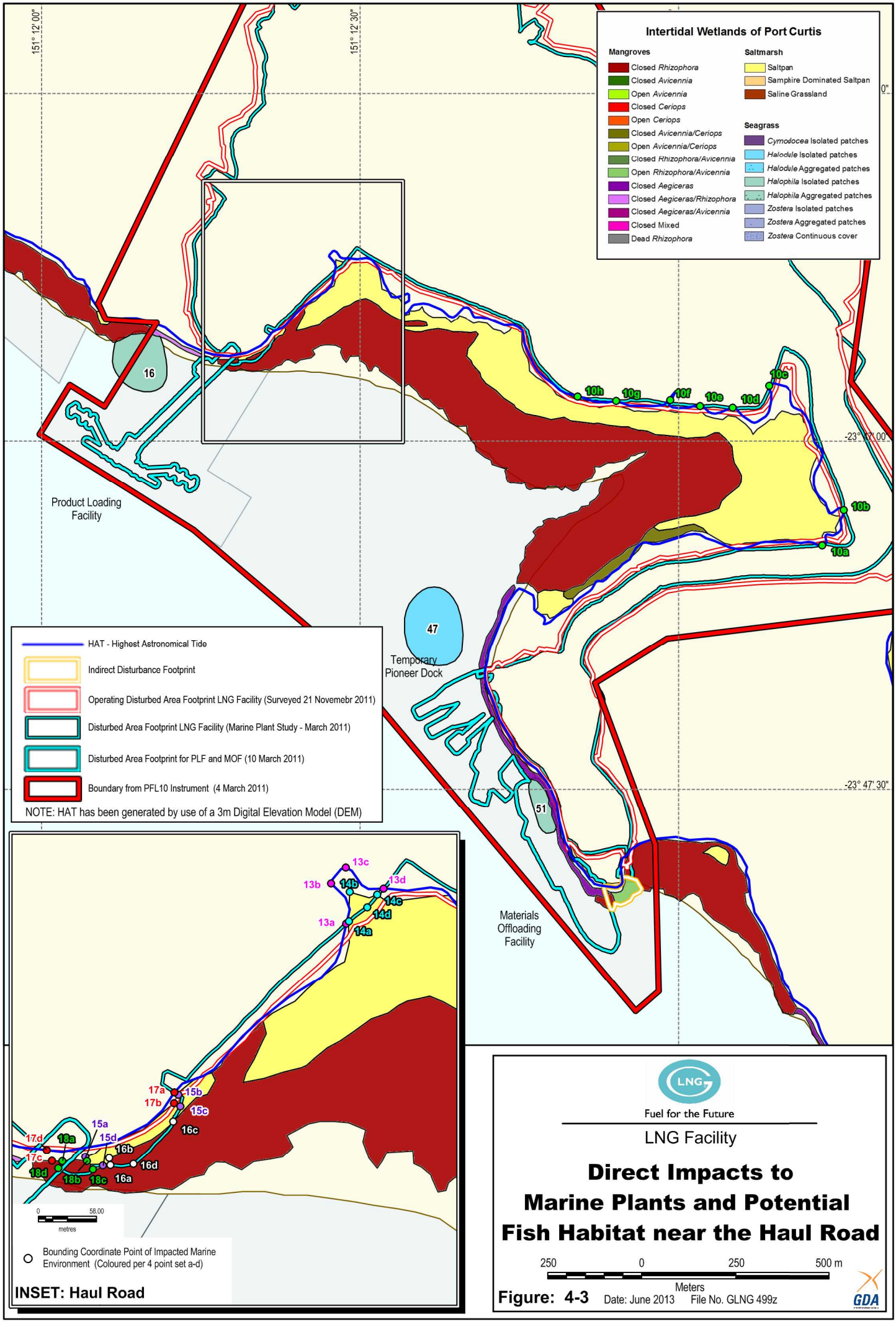
-23° 48'
16
47
51
Product Loading Facility
Temporary Pioneer Dock
Materials Offloading Facility
Hamilton Pt
HAT - Highest Astronomical Tide
Indirect Disturbance Footprint
Operating Disturbed Area Footprint LNG Facility (Surveyed 21 Novemebr 2011)
Disturbed Area Footprint LNG Facility (Marine Plant Study - March 2011)
Disturbed Area Footprint for PLF and MOF (10 March 2011)
Boundary from PFL10 Instrument (4 March 2011)
NOTE: HAT has been generated by use of a 3m Digital Elevation Model (DEM)
7c
6c
7b
6d
4d
7d
3d
7a
3c
6b
5c
5b
6a
4c
5d
5a
22b
1c
22a
1b
1a
22c
22d
1d
4a
3a
3b
2d
2c
2b
2a
4b
0
70,00
metres
Bounding Coordinate Point of Impacted Marine Environment (Coloured per 4 point set a-d)
INSET: Materials Offloading Facility
LNG
Fuel for the Future
LNG Facility
Direct Impacts to Marine Plants and Potential Fish Habitat near the MOF
300
0
300
600 m
Figure: 4-2
Date: June 2013
File No. GLNG 499y
GDA


Intertidal Wetlands of Port Curtis
Mangroves
Closed Rhizophora
Closed Avicennia
Open Avicennia
Closed Ceriops
Open Ceriops
Closed Avicennia/Ceriops
Open Avicennia/Ceriops
Closed Rhizophora/Avicennia
Open Rhizophora/Avicennia
Closed Aegiceras
Closed Aegiceras/Rhizophora
Closed Aegiceras/Avicennia
Closed Mixed
Dead Rhizophora
Saltmarsh
Saltpan
Samphire Dominated Saltpan
Saline Grassland
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Cymodocea Isolated patches
Halodule Isolated patches
Halodule Aggregated patches
Halophila Isolated patches
Halophila Aggregated patches
Zostera Isolated patches
Zostera Aggregated patches
Zostera Continuous cover
151° 12' 00"
151° 12' 30"
-23° 47' 00"
-23° 47' 30"
16
10h
10g
10f
10e
10d
10c
10b
10a
Product Loading Facility
47
Temporary Pioneer Dock
51
Materials Offloading Facility
HAT - Highest Astronomical Tide
Indirect Disturbance Footprint
Operating Disturbed Area Footprint LNG Facility (Surveyed 21 Novemebr 2011)
Disturbed Area Footprint LNG Facility (Marine Plant Study - March 2011)
Disturbed Area Footprint for PLF and MOF (10 March 2011)
Boundary from PFL10 Instrument (4 March 2011)
NOTE: HAT has been generated by use of a 3m Digital Elevation Model (DEM)
13c
13b
14b
13d
14c
14d
13a
14a
17a
17b
15b
15c
15a
17d
18a
15d
16b
16c
17c
18d
16d
18b
18c
16a
0
58.00
metres
Bounding Coordinate Point of Impacted Marine Environment (Coloured per 4 point set a-d)
INSET: Haul Road
LNG
Fuel for the Future
LNG Facility
Direct Impacts to Marine Plants and Potential Fish Habitat near the Haul Road
250
0
250
500 m
Meters
Figure: 4-3
Date: June 2013
File No. GLNG 499z
GDA

4.12 Potential Impacts from Project Shipping Activities

Potential impacts of shipping activity on turtles include mortality, injury and/or behavioural changes (e.g. avoidance of preferred feeding grounds) resulting from noise and vibration from vessels, and boat strike. It is expected that turtles will avoid areas of intensive shipping activity. Impacts on marine turtle behaviours and breeding are not likely to be significant as the nearest recorded turtle nesting location is approximately 6 km to the west on Facing Island (URS 2009).

Vessels associated with the construction of the LNG facility have the potential to pollute the marine environment, for example by accidental fuel or oil spills, or discharge of harmful substances such as untreated sewage.

Vessels used in the construction of the LNG facility and marine facilities may translocate exotic species between different geographic regions. With over 200 species of exotic marine organisms known to have been introduced into Australian waters, the introduction of foreign marine organisms through ships' ballast and hull fouling is a major concern.

The additional ferry and barge movements are very small as a percentage of the annual vessel movements within the Gladstone Harbour and as such the noise impacts on surrounding sensitive environmental receptors are expected to be negligible (Huson, 2009).

Dugong are particularly susceptible to interactions with large high speed vessels due to a delayed response displayed by dugongs. Slower moving vessels used during early stage construction of the LNG facility are unlikely to result in increased risk of boat strike to turtles and dugong (URS, 2009b).

In accordance with Condition 13-16 of EPBC referral no. 2008/4058 an Operational Shipping Activity Management Plan Phase 1 has been developed to cover LNG Carriers (LNGC's) during the commissioning and operational phases of the LNG facility. Refer to the Shipping Activity Management Plan located at http://www.santosglng.com for more information on impacts from Shipping Activities that will apply during the construction and commissioning phase. Phase 2 of the Operational Shipping Activity Management Plan will be developed to cover ferries and barges during the operational phase of the LNG facility when the Construction Shipping Activity Management Plan will cease to apply.

5 MITIGATION MEASURES

This section focuses on the mitigation measures to minimise impacts on MNES from the construction of the LNG facility and associated marine facilities.

5.1 Site Disturbance Area

All GLNG project related infrastructure will be constructed within the LNG facility site shown in Figure 1-1.

5.1.1 Topsoil Management during Clearing

Topsoil was salvaged in areas where topsoil was present in sufficient thickness to enable removal by construction equipment. Recommended depths of topsoil clearing were calculated for various locations of the project site based on soil surveys. Topsoil was salvaged and stored in stockpiles to be used during site landscaping and rehabilitation. Where reasonably practicable, topsoil stockpiles were:

- Located away from drainage ways;
- Not obstructing wildlife movement, impacting live trees, or blocking access to site areas requiring inspection/maintenance;
- Not over 3 m tall;
- Stabilised by mulch, vegetation, erosion control blanket, or other suitable means;
- Protected from stormwater erosion by surface water management and sediment control measures;
- Protected from wind erosion by watering or other means;
- Clearly signed as being “Topsoil”;
- Protected from vehicles driving on them to avoid compaction;
- Protected from use for other than landscape/rehabilitation purposes; and
- Regularly inspected for erosion, encroachment or weeds and necessary maintenance performed.

5.2 Preclearance surveys

Pre-clearance surveys were undertaken between 21 and 23 January 2011 to fulfil Condition 20 of EPBC Approval No. 2008/4057 for the LNG facility.

The survey methodology was designed to be consistent with Department of the Environment (DOTE) survey guidelines for nationally threatened species, for more details refer to Section 3 of the GLNG LNG Facility Pre-clearance survey for EPBC-Listed Fauna and Flora Species, Migratory Species and Ecological Communities Report located at http://www.santosglng.com. The surveys utilised a range of standard methods in an attempt to detect the presence of the following EPBC listed values:

- Ecological communities;
- Threatened species;
- Migratory species;
- Habitat for threatened and migratory species; and

- Species contributing to the World Heritage and National Heritage values of the Great Barrier Reef World Heritage Area.

None of the values listed above were detected during the survey within the footprint of the LNG facility direct impact zone.

The findings are consistent with ecological studies undertaken for the GLNG EIS and SEIS at the LNG Facility site (URS, 2011b).

5.3 Employee and Visitor Training

Every employee and visitor to the GLNG site are inducted prior to access. The Environmental Induction package is provided in Appendix 3 and includes the following information:

- Description of the Curtis Island Environmental Management Precinct;
- Explanation of the environmental values of the World Heritage Area;
- Information on listed species and ecological communities and other native species that are found around the project site; and
- Explanation of the Rodds Bay Dugong Protection Area, and Great Barrier Reef Marine Park, Rodds Peninsula and the Capricorn Bunker group.

In addition to the induction process described above, employees and visitors will also read and sign GLNG's Site Work Rules and Visitors Health, (referred to as the Code of Conduct in EPBC referral 2008/4057) Safety & Environmental Orientation (Curtis Island) respectively. This procedure ensures that no private motor vehicles or private watercraft are brought onto the site or into waters within 100 metres of GLNG's site boundary on Curtis Island. It also prohibits employees and visitors bringing animals and plants onto GLNG's site boundary or on to Curtis Island.

5.4 Visual Impact

To minimise the visual intrusion of the LNG facility and associated marine facilities GLNG is committed to applying a colour scheme to the LNG facility and buildings (excluding the LNG storage tanks and any necessary corrosion-protected structures and pipe insulation) from the palette of predominant colours found around Curtis Island.

GLNG will also ensure that site works minimise tree clearing, and site stabilisation and rehabilitation works on disturbed areas of the site are fully implemented within twelve months of completing the LNG facility.

Additional mitigation measures are included in Appendix 2, Attachment M, Section 3.

5.5 Lighting

To minimise light spill and direct views of lights outside the LNG facility and associated marine facilities, boundary lights will be screened/hooded to the extent possible so they are restricted to the immediate work area. The amount of lighting will be kept to the minimum necessary for construction. All employees and subcontractors will be made aware of the issue of lighting associated with

construction works and directed to not impose significant impacts on the local community and/or the environment.

Additional mitigation measures are included in Appendix 2, Attachment M, Section 4.

5.6 Emergency Response

A comprehensive Emergency Response Preparedness and Response Plan for the LNG facility and associated marine facilities are provided in Appendix 2, Attachment G.

The plan includes the following potential emergency responses that the project could experience:

- Injured Person (including allergic reactions to insect and animal bites);
- Fatality;
- Evacuation;
- Fire and Explosion;
- Bomb Threat;
- Bushfire;
- Criminal Act;
- Vehicle Accident;
- Severe Weather;
- Cyclone;
- Urgent Medical Transfer;
- Major Spill of Hazardous Substance on Land;
- Major Spill of Hazardous Substance on Water;
- Gas Leak;
- Contact with High Voltage Equipment;
- Tyre Fire/Explosion;
- Damage to Underground Services;
- Rescue from Height;
- Rescue from Confined Space;
- Capsize or Sinking of Vessel;
- Person Overboard;
- Earthquake;
- Tsunami;
- Offsite Emergency; and
- Pandemic.

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In addition to the emergency response plan is a Spill Prevention, Control and Countermeasures Plan provided in Appendix 2, Attachment N. The plan includes reporting and notification requirements in the event of a spill. The requirements include:

- Telephoning the EHP Pollution Hotline (1300 130 372) and any affected landholder, occupier or their nominated representative as soon as reasonably practicable, but within 24 hours after becoming aware of any unauthorised release of contaminants or any event where environmental harm (excluding environmental nuisance) has been caused or may be caused.
- Reporting of spills of contaminants (including but not limited to hydrocarbon) of the following volumes or kind:
  - Unauthorised releases of any volume of contaminants to water;
  - Unauthorised releases of volumes of contaminants to land greater than 200 L of hydrocarbons; or
  - Any other release not authorised under the environmental authority which has caused, or has the potential to cause serious or material environmental harm.

For complete details refer to Appendix 2, Attachment N.

5.7 Mitigation Measures for Discharge of Treated Sewage and Brine

During construction, the diffuser designs and configurations for WW1 and WW2 which are presented in the report *Revised Wastewater Discharge Assessment* (URS, 2010) (Appendix 1) will be adopted for the proposed discharges from the LNG facility. Two wastewater streams (sewage/sanitary waste from the STP and reverse osmosis/desalination plant waste/brine from the Construction WTP) will be discharged either separately or as a combined wastewater stream into Port Curtis via a diffuser WW2, located near the MOF. During the commissioning phase and into operations, three wastewater streams will be discharged (stormwater from the process area spill containment sump, effluent from the OWTP, and effluent from the Operations WTP) either separately or as a combined waste stream into Port Curtis via diffuser WW1 located close to the PLF.

Discharges to Port Curtis from diffusers WW1 and WW2 will be in accordance with water quality characteristic limits authorised in the EA. GLNG will ensure that any discharge of treated sewage effluent into the waters surrounding Curtis Island will meet the definition of tertiary treatment as specified in section 135(3) of the *Great Barrier Reef Marine Park Regulations 1983* and in accordance with GBRMPA *Sewage Discharge Policy March 2005.* Best practice treatment processes will be employed for sewage and process water treatment to ensure that high quality effluents are produced prior to discharge.

This combined with controls regarding the inputs of toxicants into the influent streams will minimise the potential for toxicants present in influent sewage and process water streams to be discharged into Port Curtis. Any residual toxicants present will be substantially diluted on contact with the waters in Port Curtis with the predicted dilution at 50m from the outfall being 230:1 during the construction phase (URS, 2010). Additional information is provided in Appendix 1, Section 4.1.2.

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Impact monitoring will also be undertaken to obtain quantitative data on the effects of the wastewater discharge on the estuarine environment in the vicinity of the diffusers. Impact monitoring will include water quality monitoring and ecological assessments.

5.8 Mitigation Measures for Prevention Impacts from Non-Endemic Species

The BSMP required by Condition 30 of approval EPBC No. 2008/4057 has been submitted for approval in stages to cover the relevant project phases. The CEMP for MNES was utilised to address the period prior to the planned direct arrival at the MOF of international imports through the use of the Appendix 2, Attachment S and Appendix 2, Attachment T accordingly.

To prevent the introduction of non-endemic species, a program has been put in place to verify that all vehicle and equipment imported for project use are thoroughly cleaned at their point of origin to mitigate the introduction of foreign seed and soil potentially harmful to native flora and fauna.

Additional controls include:

- Workforce induction – workers shall be advised of the nuisance and adverse impacts associated with noxious weeds and plant pathogens to Curtis Island;
- A fence that will exclude most large mammals may be erected on the inland boundary of the site prior to facility operation;
- Washdown of all plant and equipment - Machinery and materials shall be washed down off-site at subcontractor premises before bringing to the site to prevent the introduction of weeds and plant pathogens. Machinery and materials arriving without clearance shall either be turned away or quarantined pending wash-down;
- Provision of a designated on-site quarantine and wash-down/fumigation area. Treatment shall include hosing down of earthmoving equipment and vehicles and the use of steam pressure spray for earthmoving equipment that retains soils or mud which is difficult to remove. Runoff from washdown shall be captured and treated to remove/kill pests prior to discharge;
- Equipment manufacturers are informed of quarantine requirements of Australian Quarantine and Inspection Service (AQIS). If the packing materials are found to be contaminated at the site of unpacking then they shall be removed and taken off-site to a licensed facility for disposal;
- Earth-moving equipment leaving site shall be thoroughly cleaned to remove any excess build-up of soil that may carry plant pathogens;
- During the site clearing operation noxious weeds, timber, and other vegetation matter shall be destroyed by felling and/or chipping. Chips or timber that is removed from the island shall be disposed per AQIS/ DAFF/EHP guidelines;
- Earth-moving equipment from domestic Australian sources shall arrive with a weed/seed certificate before being allowed on-site;
- All plant and equipment shipped from international (non-Australian) waters directly to the Curtis Island MOF shall be placed in the designated quarantine area until cleared by AQIS;
- Excess cut material (if any) shall be inspected for weeds before taking for offsite disposal;

- Cleared areas that for the duration of the project are no longer required for construction or laydown activities shall be seeded with non-weed species;
- If noxious weeds are found in work areas they shall be hand pulled or grubbed and disposed in piles on the island;
- Services of a licensed weed control company may be used by Bechtel for identification and control of weeds on the project site; and
- Fire ants or other insect pests may be treated chemically based on consultation with GLNG and AQIS/DAFF/EHP.

Red imported fire ants will be controlled by:

- Not importing soil to the job site from fire ant infested areas;
- Monitoring the site for fire ant mounds as per advice from the Biosecurity Queensland Control Centre (BQCC);
- Treating any fire ant mounds with chemicals as per advice from BQCC; and
- Contacting the BQCC (13 25 23) in the event of sighting fire ants or questions regarding fire ant management.

For further information refer to Appendix 2, Attachment T, Section 3.2.6 and Appendix 2, Attachment S, Section 3.

5.9 Mitigation Measures for Impacts to Water Mouse

Although water mouse have not been located on Curtis Island, the mangrove areas around the LNG facility and associated marine facilities should be considered as holding relevance for the species and managed accordingly.

A Water Mouse Species Management Guideline has been prepared (refer to the GLNG Curtis Island Facility: Water Mouse Survey and Habitat Assessment report located at http://www.santosglng.com), below is the mitigation measures listed in this guideline:

- Appoint onsite Environmental Supervisor to oversee all aspects of environmental management of site activities;
- Manage existing mangrove habitat beyond limit of proposed development activities by instituting control actions to exclude exotic weed, livestock and feral predator species in accordance with the site Weed Pathogen and Wildlife and Habitat Management Plans;
- Clearly mark out identified potential habitat for Water Mouse to be retained and ensure no unauthorised disturbances within these areas (e.g. storage of stockpiled material or fill);
- Ensure all lighting used during clearing and construction activities is directed away from and is positioned as far as is practicable away from all intertidal habitat;
- Ensure night-time noise impacts to intertidal habitat resulting from clearing, construction and operational activities is minimised as much as is practicable, with a focus on avoiding night-time noise disturbance to identified potential Water Mouse habitat;
- Ensure all vehicles and tracks remain outside the zone of the Highest Astronomical Tide (HAT) to ensure no damage to existing tidal habitat, except

where construction necessitates access and the correct permits for this disturbance have been obtained. Limit access to these areas only;

- Institute measures consistent with the site Surface Water Management Plan (Appendix 2, Attachment P) to maintain current freshwater hydrology of mangrove habitat in China Bay (i.e. no increase in stormwater run-off or sedimentation resulting from freshwater inflows that may reduce salinity and Water Mouse prey abundance); and
- Institute vegetation offset measures where disturbance to mangrove habitat cannot be avoided as per the GLNG Offset Strategy (offsets have subsequently been secured).

5.10 Mitigation Measures for Impacts to Migratory Shorebirds

A range of mitigation strategies are available to minimise impacts to migratory shorebirds within intertidal habitat adjacent to the LNG facility. These strategies are presented in the GLNG Curtis Island Marine Facilities Migratory Shorebirds Environmental Management Plan located at http://www.santosglng.com.

To minimise impacts, the following strategies are employed:

- Areas of vegetation to be cleared during construction will be restricted to the minimum area required and will be clearly delineated;
- All clearing boundaries will be illustrated on construction drawings and clearly marked in the field;
- Access to the site will be restricted to prohibit unauthorised access to the surrounding undisturbed areas. Access restrictions will be implemented to prevent unauthorised clearing, recreational driving, unmanaged fire regimes, and the spread of introduced weed species;
- Bushland and habitat surrounding the site will be managed to prohibit any unauthorised disturbance so as to maintain the area's habitat values;
- As per GLNG policy, no pets are to be brought to Curtis island;
- All personnel, as part of the site environmental inductions, are to be given information on the site's ecological values including intertidal habitat and migratory shorebirds;
- Where practicable, lights will be turned inwards to face the facility;
- Ensuring lights facing towards intertidal habitat are at the lowest practicable output for their intended purpose; and
- Lights, including those on the marine facilities, will be shielded to reduce light spill where they face intertidal habitat.

Impacts from construction noise on migratory shorebirds are reduced through the implementation of strategies which include (but are not restricted to):

- Use of the quietest plant and equipment that can economically undertake the work wherever possible;
- Regular maintenance of equipment in order to keep it in good working order;

- Operators of construction equipment will be made aware of the potential noise problems and of techniques to minimise noise emission through a continuous process of operator education;
- Best available work practices will be employed on-site to minimise occupational noise levels; and
- High efficiency mufflers will be fitted to appropriate construction equipment.

Impacts on migratory shorebirds from a reduction in water quality and an increase in sedimentation are reduced through the implementation of strategies which include (but are not restricted to):

- Preparation and implementation of a site-specific construction erosion and sediment control plan in accordance with the Institution of Engineers Australia – Erosion and Sediment Control Guidelines (1996);
- Installation of temporary drainage works (channels and bunds) in areas required for sediment and erosion control and around storage areas for construction materials;
- Where appropriate, installation of temporary sediment basins to capture sediment-laden runoff from site;
- Stabilisation of cleared areas not used for plant infrastructure with vegetation or appropriate surface treatments as soon as practicable following earthworks, to minimise erosion;
- Provision of appropriate storage areas for fuels and dangerous goods with bunding and spill cleanup kits, and ensuring that relevant construction personnel are trained in appropriate handling of such materials and spill prevention;
- Restricting vegetation clearance to the smallest area necessary;
- Diversion channels and silt fences have been constructed around the topsoil stockpiles to prevent erosion and loss of topsoil. Seeding of long-term topsoil stockpiles will be carried out with an appropriately designed seed mix to limit stockpile erosion. The topsoil will be respread prior to revegetation of areas to be rehabilitated at completion of construction; and
- Topsoil stockpiles will be located in areas outside drainage lines, and will be protected from erosion. Prior to the re-spreading of topsoil, the ground surface will be ripped to assist with binding of the soil layers, water penetration, and revegetation.

5.11 Mitigation Measures for Impacts to Marine Turtles and Dugongs

A turtle and dugong watch was maintained at all times from all dredging/support vessels involved with dredging.

In the event that turtles or dugongs were sighted, all vessels and piling operating in the area were notified. The fauna presence including direction and behaviour was monitored and dredging operations were ceased when required.

Sighting of sick or injured turtles were reported to the EHP Hotline and the Minister. Soft start procedures prior to commencement of piling activities mitigated potential impacts caused by turtle startle response and movement from the area.

In advance of scheduled dredging activities, the designated crew for the dredge vessel received training from an Independent Fauna Observer (IFO). In the absence of the IFO the vessel captain was responsible for ensuring that sighting and

injury/death reporting of turtles and dugongs was logged by a designated crew member. These procedures were followed as part of dredging and dredge material placement procedure.

A fauna exclusion zone of at least 150 m was established around the perimeter of all vessels working within the marine zone. If marine mammals or reptiles were spotted within 150 m of the vessel(s), the protocols outlined in the Significant Species Site Assessment Protocols included in the Marine Facilities Significant Species Management Plan were followed.

Pile driving was only conducted during daylight hours, except in the event of a pile being in an unsafe state at dusk. In these circumstances work continued until the individual pile is made safe before pilling ceased for the evening.

A marine mammal and sea turtle observation zone of 500 m in radius from the noise emitting source was established. During periods when pile driving was planned to occur, each morning before work began a wildlife lookout inspected the marine mammal and sea turtle observation zone for 30 minutes for work occurring in water deeper than 2 m. The same procedure was followed after work had ceased for more than two hours and prior to it beginning again.

Prior to the commencement of full power pile driving, “soft start” procedures that slowly ramped up the intensity of noise emissions over a period of no less than 15 minutes was employed. These soft start techniques included ‘fairy’ taps or alternative means of alerting and dispersing marine fauna such as broadcasting noise simulations of pile driving.

Pile driving did not commence if a marine mammal or sea turtle was within 500 m. If, after pile driving had commenced (including soft start), a marine mammal or sea turtle was observed within 100m of the noise emitting source, then pile driving ceased.

5.12 Mitigation Measures for Shipping Management

A shipping activity management plan covering all shipping activities other than LNG Carriers (LNGCs) during construction (including commissioning) was prepared in accordance with Condition 13 of EPBC referral no. 2008/4058. This plan includes the following mitigation measures (but not limited to):

- Although a Spill Prevention, Control and Countermeasures Plan has been developed as part of the Construction Environmental Management Plan (Appendix 2, Attachment N) for the GLNG Project, individual vessel operators are required to have spill avoidance and response plans for operating in Gladstone Harbour and all spill plans are subject to review and approval by the Gladstone Ports Corporation.
- An effective program for the safe removal and disposal of sewage will be implemented. No vessels will discharge treated or untreated sewage into the water.
- The project will employ best practices for all marine based maintenance programs. Where possible, water based paints, solvents, and adhesives will be utilized.
- A marine pollution control checklist will be completed for all top side deck cleaning and in-shore hull cleaning activities.
- A preventative maintenance program will be in place to minimise oil drips and spills to the vessel deck. Vehicle inspections will be conducted at the project

logistics centre on a regular basis. Those vehicles that do not meet or exceed the standards set will not be permitted access to the vessel.

- Anchoring of vessels will be restricted to designated anchorages specified by Gladstone Ports Corporation.
- Wherever possible, fewer, larger craft will be used, rather than many smaller craft movements. As soon as possible, smaller 150 passenger ferries will be exchanged for a single, 400 passenger ferry to reduce noise impacts.
- Wherever possible, vessels will use existing deepwater channels.
- All vessels will adhere to operational requirements imposed by Gladstone Ports Corporation and Maritime Safety Queensland.
- All GLNG project related vessels and their crew will remain within the approved navigation passage, abide by the Port of Gladstone published speed restrictions and exclusion zones set out by all relevant authorities at all times, and will contribute to any process to assess improvements to speed management of vessels in Gladstone Harbour.
- Nominated vessel crew members will be trained to identify and avoid interaction with large aquatic fauna whilst transiting Port Curtis, including dugongs, turtles, marine mammals and other large fish.
- When crossing intertidal areas (known areas of aggregation for marine fauna), vessels will reduce speed and adhere to go-slow zones to minimise boat/fauna strikes.
- There will be a total ban on fishing and crabbing activities being undertaken by any person employed or contracted by GLNG whilst on the LNG site or associated project areas.

Refer to the Shipping Activity Management Plan located at http://www.santosglng.com for more information on impacts from Shipping Activities other than LNGCs during the construction and commissioning phase.

In accordance with Condition 13-16 of EPBC referral no. 2008/4058 an Operational Shipping Activity Management Plan Phase 1 has been developed to cover LNG Carriers (LNGC's) during the commissioning and operational phases of the LNG facility. Refer to the Shipping Activity Management Plan located at http://www.santosglng.com for more information on impacts from Shipping Activities that will apply during the construction and commissioning phase. Phase 2 of the Operational Shipping Activity Management Plan will be developed to cover ferries and barges during the operational phase of the LNG facility when the Construction Shipping Activity Management Plan will cease to apply.

5.13 Mitigation Measures for Dredging Management

Monitoring during the dredging activities associated with the construction of the MOF was conducted in accordance with the GPC DMP. Ongoing maintenance dredging activities (for example at the MOF and PLF) will be undertaken by GPC also in accordance with the GPC DMP.

5.14 Mitigation Measures for World Heritage Areas

GLNG has secured an offset property to offset the unavoidable impacts to World Heritage Areas. GLNG's Environmental Offsets Proposal for the downstream components of the GLNG Project including the LNG Facility, Marine Facilities and the

Gas Transmission Pipeline (PPL 167 and PPL 168) was approved by the Minister in September 2013. The proposed offset provides an opportunity to deliver strategic environmental outcomes for GLNG and will contribute significantly to the expansion of Queensland's protected area estate and provide habitat for a range of threatened plant and animal species.

6 MONITORING

6.1 Environmental Monitoring

An environmental monitoring plan (Appendix 2, Attachment H) has been developed to identify the required monitoring programs, frequencies, locations, and sampling protocols. In addition, the plan describes the responsibilities and actions required should a result be outside a specified threshold.

The environmental monitoring requirements that are quantitative and/or reportable are summarised in an environmental monitoring matrix which is contained within the Environmental Monitoring Plan (Appendix 2, Attachment H - Appendix A). As the project warrants multiple permits / licences the matrix is extensive and covers all environmental monitoring including items not relevant to MNES.

It should be noted that prior to commencement of operations, an environmental monitoring plan for the operational phase will be developed and included in the OEMP.

6.2 Monitoring Discharges of Treated Sewage and Brine

Discharges of treated sewage effluent into the waters surrounding Curtis Island are to meet tertiary treatment as specified in section 135(3) of the *Great Barrier Reef Marine Park Regulations 1983* and in accordance with GBRMPA *Sewage Discharge Policy March 2005.* Best practice treatment processes will be employed to manage wastewater which will result in production of high quality effluent.

Monitoring requirements for the discharge of wastewater into Port Curtis are set out in the EA and the REMP. The wastewater monitoring program includes the following flows:

- Reverse Osmosis Concentrate (ROC) from the Construction WTP (monitoring location S4);
- Treated Sewage Effluent (TSE) from the STP (monitoring location S3);
- The combined ROC and TSE as discharged out the construction phase diffuser WW2 (monitoring location S5); and
- Effluent from the Operations WTP, OWTP and stormwater from the process area spill containment sumps as discharged out diffuser WW1 (monitoring location S9).

Wastewater monitoring involves the collection of samples, documentation of field results and transportation of samples to a NATA accredited laboratory for analysis. The administering authority is to be notified of any sample result which exceeds a compliance threshold. Notifications are to be reported in accordance with the associated permit/approval condition(s).

Table 6-1 below sets out the wastewater monitoring locations, frequency parameters and limits. If the limits are exceeded then the exceedance must be reported to DOTE and the EHP in accordance with the notification requirements of the relevant approvals.

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Table 6-1 Wastewater Monitoring

Monitoring point	Quality Characteristics	Release Limit	Limit Type	Minimum monitoring frequency
S3	5-day Biochemical Oxygen Demand	<5mg/L	80 percentile compliance	Weekly (composite sample)
	5-day Biochemical Oxygen Demand	35 mg/L	maximum	Weekly (composite sample)
	Suspended Solids	<5 mg/L	80 percentile compliance	Weekly (composite sample)
	Suspended Solids	50 mg/L	Maximum	Weekly (composite sample)
	pH	6.5 to 8.5 pH units	Range	Online continuous
	Faecal Coliforms, based on a minimum of 5 samples collected at not less than weekly intervals	1000 colonies per 100ml sample	Median	Weekly (composite sample)
	Total -N	3 mg/L	50 percentile compliance	Weekly (composite sample)
	Total -N	10 mg/L	Maximum	Weekly (composite sample[2])
	Total -P	1 mg/L	Maximum	Weekly (composite sample)
	Ammonia -N	1 mg/L	50 percentile compliance	Weekly (composite sample)
	Ammonia -N	3 mg/L	Maximum	Weekly (composite sample)
	Dissolved Oxygen	4 mg/L	Minimum	Online Continuous
S4	Total Chlorine (as Cl)	0.5 mg/L	Long term 50th percentile	Daily (grab sample/single measurement)
		1 mg/L	Maximum	
	Dissolved Oxygen	4.0 mg/L	Minimum	
	Chemical Oxygen Demand	No Limit	No Limit	Weekly (composite sample)
	5-day Biochemical Oxygen Demand (inhibited)	20 mg/L	Maximum	
	Turbidity	33 NTU	Long term 50th percentile	Daily (single measurement)
		295 NTU	Maximum	

Monitoring point	Quality Characteristics	Release Limit	Limit Type	Minimum monitoring frequency
	EC	96418 µS/cm	Maximum	
	TDS	64600 mg/L	Maximum	
	pH	6.5 to 8.5	Range	
S5	Ammonia BOD Enterococci Faecal Coliforms Nitrate Nitrite Suspended Solids Total Dissolved Solids Total Kjeldahl Nitrogen Total Nitrogen Total Phosphorus Dissolved Oxygen Electrical Conductivity Free Chlorine Total Chlorine pH Temperature Turbidity	No Limits	No Limits	Weekly Grab Sample
S9	Dissolved Oxygen	4.0 mg/L	Minimum	
	Total Residual Hydrocarbons C10 –C36	10mg/L	Maximum	
	pH	6.0 to 8.5	Range	

6.3 Monitoring of Stormwater discharges

The stormwater monitoring requirements are set out in Table 6-2 (taken from the EA issued 12 March 2014 and which is subject to change). Stormwater monitoring involves the collection of samples, documentation field results and transportation of samples to a NATA certified laboratory for analysis. The administering authority is to be notified of any sample result which exceeds the limits set out in the EA. Notifications are to be reported in accordance with the associated permit/approval condition(s).

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Table 6-2 Stormwater Monitoring Requirements

	Monitoring Point	Quality Characteristic	Limit	Limit Type	Minimum Monitoring Frequency
Stage 1 – early works and Stage 2 – construction works release limits					
SW2, SW3, SW8	SW2, SW3, SW8	Turbidity (NTU)	66NTU	Maximum Limit applies up to the design event of 42.1 mm rainfall event over a 5-day period	Monitoring to be undertaken prior to active discharge
		pH	6.5 - 8.5	Range Limit applies up to the design event of 42.1 mm rainfall event over a 5-day period	
		Total Hydrocarbons	Monitor only	Monitor only	
		Total Suspended Solids	Monitor Only	Monitor Only	
		Aluminium[1,2]	Monitor Only	Monitor Only	
		Arsenic[1,2]	Monitor Only	Monitor Only	
		Chromium[1,2]	Monitor Only	Monitor Only	
		Copper[1,2]	Monitor Only	Monitor Only	
		Iron[1, 2]	Monitor Only	Monitor Only	
		Manganese[1,2]	Monitor Only	Monitor Only	
		Vanadium[1,2]	Monitor Only	Monitor Only	
SW10	SW10	Total Hydrocarbons	No Visible Sheen	Visual Inspection	
Stage 3 – operation works					
SW2, SW3, SW8	SW2, SW3, SW8	pH	6 - 8.5	Range Limit applies up to the design event of 42.1	Prior to discharge and during discharge

				mm rainfall event over a 5-day period	events during first flush.
		Turbidity	31 NTU	Maximum Limit applies up to the design event of 42.1 mm rainfall event over a 5-day period	
		Total Hydrocarbons	No Visible Sheen	Maximum	
		Dissolved Oxygen	4 mg/L (minimum)	Minimum	
SW10	SW10	Total Hydrocarbons	No Visible Sheen	Visual Inspection	

1 Total
2 Dissolved

6.4 Monitoring of Receiving Environment

A REMP has been developed in which the main objective is to identify, monitor and record the effects of the release of contaminants on the receiving environment whilst contaminants are being discharged from the LNG facility during the construction phase to ensure that releases comply with permit/approval conditions, and to identify and describe the extent of any adverse impacts to local environmental values, and to monitor any changes in the receiving waters.

Discharges from the facility, into the receiving environmental, include treated sewage effluent; reverse osmosis concentrate; treated wastewater and stormwater. All contaminants are discharged via a diffuser to allow adequate dilution under specified flow conditions.

The objective of the impact monitoring program is to obtain quantitative data on the effects of the identified construction phase wastewater discharges on the estuarine environment in the vicinity of the diffuser. The impact water quality monitoring program for the construction phase involves three impact sites, two near-reference sites, and two control sites. These sites are oriented upstream and downstream of the diffuser (WW2) which represents the dominant tidal direction. Samples are collected from near surface and at approximately one (1) metre above the seabed at each location. Baseline sample were taken monthly for 3 months prior to the discharge of wastewater from the construction phase diffuser (WW2). Details of the impact monitoring program are provided in Table 6-3 below.

Table 6-3 Impact Water Quality Monitoring Program for WW2

Sample Type	Method	Locations	Parameters (units)	Sample Number	Monitoring Frequency
Discrete	Grab sampling using a Van Dorn; Laboratory analysis	Impact	• Electrical Conductivity (µS/cm) • Temperature (°C) • pH (pH units)	2 (near seabed and near surface)	Quarterly, for duration of construction phase
		Near-reference		2 (near seabed and	Quarterly, for duration of

Sample Type	Method	Locations	Parameters (units)	Sample Number	Monitoring Frequency
			• Turbidity (NTU) • Chlorophyll-a (mg/L) • Suspended Solids (mg/L) • Dissolved Oxygen (% saturation) • Faecal Coliforms (cfu/100mL) • Ammonia (µg/L) • Oxidised Nitrogen (µg/L) • Total Nitrogen (µg/L) • Filterable Reactive Phosphorus (µg/L) • Total Phosphorus (µg/L)	near surface)	construction phase
		Control		2 (near seabed and near surface)	Quarterly, for duration of construction phase

A similar monitoring program will be agreed with EHP and implemented for WW1 (operational diffuser).

Table 6-4 outlines the impact monitoring program to be conducted for WW1.

Table 6-4 Impact Water Quality Monitoring Program for WW1

Sample Type	Method	Locations	Parameters (units)	Number of Samples	Monitoring Frequency
Discrete	Grab sampling using a Van Dorn; Laboratory analysis	Impact (I1, I2 & I3)	• Electrical Conductivity (µS/cm) • Temperature (°C) • pH (pH units) • Turbidity (NTU) • Chlorophyll-a (mg/L) • TSS (mg/L) • Dissolved Oxygen (% saturation)	2 (near seabed and near surface)	Quarterly
		Near-reference (NR1 & NR2)		2 (near seabed and near surface)	

Sample Type	Method	Locations	Parameters (units)	Number of Samples	Monitoring Frequency
		Control (C1 & C2)	• Ammonia (µg/L) • Oxidised Nitrogen (µg/L) • Total Nitrogen (µg/L) • Filterable Reactive Phosphorus (µg/L) • Total Phosphorus (µg/L) • Nitrate and Nitrite (µg/L) • Total Kjeldahl Nitrogen (µg/L) • Total residual hydrocarbons, C10 – C36 (mg/L)	2 (near seabed and near surface)	

6.5 Monitoring of Migratory Shorebirds

GLNG has undertaken baseline surveys of migratory shorebirds at two locations adjacent to the project site in China Bay. Throughout the construction phase of the project, surveys of shorebird species and numbers will be conducted on a bi-annual basis. These surveys are timed to coincide with the migration periods of the shorebirds.

Survey results can are located at http://www.santosglng.com.

6.6 Monitoring of Marine Turtles and Dugongs

GLNG will monitor the potential impacts upon turtles and dugongs for the life of the project. This may involve contracting specialist consultants to undertake any observations, sampling, analysis and other monitoring works as required. Monitoring programs will be designed to align with the objectives of the Marine Turtle Recovery Plan 2003 (Cwlth).

GPC are monitoring marine megafauna, including turtles and dugongs, as part of the Western Basin Dredging and Disposal Project monitoring program. This involves extensive surveys pre, during and post dredging, for a minimum period of 10 years. The GLNG marine facilities are included in the survey area. GLNG will be making a significant financial contribution to this marine megafauna monitoring program as a funding party for the Western Basin Dredging and Disposal Project.

If required, further monitoring of key turtle populations that nest and forage around Curtis Island will be implemented in accordance with the Marine Turtle Recovery Plan 2003. This is a national monitoring program managed jointly by the Commonwealth, States and Territory provides benchmarks for critical population parameters such as annual recruitment and hatching success. Most monitoring will be confined to nesting beaches because of the accessibility for nesting females.

GLNG will commence a monitoring program in the event a direct line of sight is established between gas flaring activities and turtle nesting beaches or in the event of prolonged flaring events during operations within the turtle nesting season, in accordance with the Nesting Turtle Monitoring Plan. Evidence of nesting, digging or crawling will be identified by sea turtle observers from an observation point located centrally with binoculars. Daily inspections will be conducted between 6am and 9am to identify and record turtle nesting activity.

As part of dredging, trenching, piling and rock fill operations, sea turtle and dugong observations were recorded in a daily log book. The daily log book includes the following information:

- Activities being conducted including start and finish times;
- Species type observed in the observation zone including number and behaviour; and
- Mitigation measures taken at the time.

As it is not possible to identify specific species from these observations only the species type is recorded. The species types are dugong, turtle, whale, dolphin, sea bird, sea snake, shark and fish.

Any observations of marine mega-fauna are also recorded in the Marine Fauna Register. Notification of project related marine mega-fauna injuries to DOTE is required within 24 hours of being made aware.

Prior to commencement of these activities, an Independent Fauna Observer (IFO) was identified and a briefing from the site dredging environmental advisor was undertaken to ensure the observational and reporting requirements were understood.

The specific requirement for ongoing sea turtle and dugong monitoring at the identified locations will be assessed following the completion of the construction monitoring program. Long-term monitoring activities will be discussed and agreed with EHP and DOTE six months prior to the first nesting season during the operational phase, and implemented during the first season. Specifically, discussions will focus on monitoring in relation to:

- Detecting trends over time in turtle nesting; and
- Determining whether the potential light-related impacts might be affecting nesting and hatchling behaviour.

6.7 Monitoring for Introduced Non-Endemic Species

Regular inspections shall be conducted and inspectors shall be trained to identify major pests, such as lantana and fire ants. If a declared weed that has not previously been on the property or a major weed infestation is noticed inside or adjacent to project property, the contractor's environmental manager shall inform GLNG's representative and AQIS and EHP. AQIS/DAFF/EHP shall be consulted before treatment where required.

Where fire ants are discovered on site, DAFF is notified and appropriate action initiated under the National Fire Ant Eradication Program.

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6.8 Monitoring of Shipping Activities

A shipping activity management plan has been prepared in accordance with Condition 13 of EPBC referral no. 2008/4058.

GLNG OPL on behalf of the Proponents is making a significant financial contribution to the comprehensive monitoring program associated with the GPC Western Basin Dredging and Disposal Project. This monitoring program includes monitoring of marine megafauna (i.e. dugongs, turtles, whales, dolphins and other cetaceans), migratory shorebirds, seagrass and water quality. The monitoring program will be implemented for a minimum period of ten years. As the monitoring program includes the GLNG project area data collected can be used to identify impacts to marine megafauna (i.e. dugong, turtles, and cetaceans) attributed to shipping activities. Monitoring of Dredging Activities

Monitoring during the dredging activities associated with the construction of the MOF was conducted in accordance with the GPC DMP. Ongoing maintenance dredging activities (for the MOF and PLF) will be undertaken by GPC also in accordance with the GPC DMP.

6.9 Monitoring of Noise and Vibration

Baseline monitoring of the noise levels in the project area was conducted as part of the EIS. Noise monitoring is only required to be conducted when requested by EHP in response to a noise complaint. In accordance with Schedule D of the EA, monitoring and subsequent analysis must provide:

(a) determination of LAeq,15 mins for the LNG plant noise at the noise sensitive place or commercial place;

(b) narrow band analysis and the noise 'signature' of the LNG plant to determine the contribution from the LNG plant to the total noise level at the noise sensitive place or commercial place;

(c) the level and frequency of occurrence of impulsive or tonal noise;

(d) taking measurements of the low frequency noise below 200 Hz;

(e) atmospheric conditions including temperature, wind speed and direction; and

(f) location, date and time or recording.

If monitoring indicates exceedance of the limits in EA Schedule D – Table 1(provided below), and the exceedance is due to the contribution of noise from the LNG plant activities, then remedial action to achieve as low as reasonably practicable noise will be taken.

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Schedule D – Table 1: Noise Limits for the LNG Plant at Sensitive Receivers*

		P1 Tide and Witt Island	P2 South End Curtis	P3 Auckland Hill	P4 Yarwun	P5 Targanie	P6 Gladstone Marina	P7 Fishermans Rd
Construction Noise Criteria dBA LAmax (Table 15 in EIS Appendix U1)								
Monday - Friday	6.30am – 6.30pm	-	-	-	-	-	-	-
	6.30pm – 6.30am	50	50	50	50	50	50	50
Saturday	6.30am – 6.30pm	-	-	-	-	-	-	-
	6.30pm – 6.30am	50	50	50	50	50	50	50
Sundays and Public Holidays	6.30am – 6.30pm	50	50	50	50	50	50	50
	6.30pm – 6.30am	50	50	50	50	50	50	50
Note: (-) Means no criteria apply during this time period								
Operational Noise Criteria dBA LA90 (Table 21 in EIS Appendix U1)								
Monday - Sunday and Public Holidays	7am – 6pm	43	38	42	43	33	35	40
	6pm – 10pm	31	32	32	30	25	32	35
	10pm – 7am	31	25	27	27	25	28	30

* Note: It should be noted that this schedule is currently under review and the latest version of the EA should be referred to for accuracy.

Blast and Vibration monitoring is required to ensure that any blasting on the site meets the limits of:

- airblast overpressure level of 120 dB (linear peak)
- vibration peak particle velocity of 10 mm/s

Blast and Vibration monitoring must include:

(a) maximum instantaneous charge;

(b) location of the blast within the site (including any bench level);

(c) airblast overpressure level (dB Linear Peak);

(d) peak particle velocity (mm / s);

(e) location, date and time of recording;

(f) measurement instrumentation and procedure;

(g) meteorological conditions for blast monitoring (including temperature, relative humidity, temperature gradient, cloud cover, wind speed and direction); and

(h) distances from the blast site to potentially noise-affected buildings or structures

Monitoring will occur throughout a blasting event. Monitoring will be conducted at three locations around the perimeter of the site.

6.10 Monitoring programs not related to MNES

6.10.1 Acid Sulfate Soils

All soil which must be excavated and is suspected to be ASS or Potential ASS is sampled and tested by a NATA certified laboratory to determine if treatment is necessary and the level of treatment required.

Work areas are visually monitored to identify signs of acid oxidation.

6.10.2 Air discharges

Air monitoring of the various stacks around the site will occur during the commissioning phase of the project in accordance with the EA. Monitoring will measure:

- The gas velocity and volume flow rate;
- Temperature;
- Water vapour concentration; and
- Oxides of nitrogen.

Monitoring will be conducted for all stacks during commissioning and for one stack of each type annually thereafter.

6.10.3 Construction generators air emissions

The air emissions of the generators used during the construction phase were monitored to determine if the emissions are within the limits used in air quality modelling for the site. This was a once off monitoring event.

6.10.4 Dust

Monitoring must demonstrate that the following limits are complied with at a dust sensitive place:

- Dust deposition of 120 milligrams per square metre per day over a 30-days averaging period, when monitored in accordance with Australian Standard AS 3580.10.1; and
- A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometre (µm) (PM10) suspended in the atmosphere of 50 micrograms per cubic metre (with five one day exceedances allowed in any one year period); and over a 24 hour averaging time, when monitored in accordance with Australian Standard AS 3580.9.

6.10.5 Fauna Register

All terrestrial fauna which is relocated from the project area or found deceased onsite is recorded in the fauna register. The register documents the date, species type, number, location and release points, actions (moved, injured, deceased) and additional comments.

6.10.6 Waste

The waste quantities and types produced from the site are documented for each month and recorded in a database.

6.10.7 Weather

A weather station is located onsite and records temperature, wind speed and direction, rainfall and humidity.

The results are logged on an incremental basis and the data is analysed periodically.

7 AUDITING, REPORTING AND REVISIONS

7.1 Auditing

Independent audits of compliance with the conditions of EPBC No 2008/4057 and 2008/4058 will be conducted in accordance with the requirements of those approvals on the request of DoTE.

During construction compliance audits will also be conducted in accordance with the requirements of the EM Plans. To ensure appropriate stakeholders are adequately informed of relevant EHS performance, reports, where necessary, will be prepared for internal and stakeholder review.

The following auditing regime will be implemented:

- During construction, contractors will be required to report environmental compliance on an incident, weekly and monthly basis;
- During construction, internal audits will be undertaken at regular intervals to verify that all work is proceeding in accordance with the relevant EM Plan; and
- A post construction audit will be conducted annually for two years following construction to evaluate revegetation, erosion and soil stability, weed control, watercourse alteration prevention and success of bed and bank re-profiling.

GLNG will maintain accurate records substantiating all activities associated with or relevant to the conditions set out in EPBC referrals 200/4057 and 2008/4058, including measures taken to implement a plan approved by the Minister under these conditions. These records will be available to the Commonwealth on request. Such records may be subject to audit by the Commonwealth or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with these conditions of approval.

7.2 Reporting

7.2.1 Non-Compliance

When first becoming aware of any condition of the EPBC referrals or a plan required to be approved by the Minister under the EPBC referrals conditions, GLNG will report the non-compliance and remedial action to the Commonwealth within five business days and bring the matter into compliance within a reasonable timeframe agreed to, in writing by the Commonwealth.

GLNG will report to the Minister, within one day, of first becoming aware of injury to, or mortality of, an EPBC listed threatened or migratory species cause by construction activities. If triggers are exceeded, GLNG will advise the Commonwealth within one day.

7.2.2 Annual Returns

Annual Environmental Returns will be produced that:

- Address compliance with the EPBC referral conditions;
- Records any unavoidable adverse impacts on MNES, mitigation measures applied to avoid adverse impacts on MNES; and any rehabilitation work undertaken in connection with any unavoidable adverse impact on MNES;

- Identify all non-compliances with the EPBC approval conditions; and
- Identify any amendments needed to plans to achieve compliance with the EPBC referral conditions.

The Annual Environmental Return will be published on the GLNG website within 20 business days of each anniversary date of the EPBC referral approval.

7.2.3 Long-term Marine Turtle Management Plan

In accordance with Condition 34 to Condition 39 of EPBC Approval 2008/4057, a Long-term Marine Turtle Management Plan (LTTMP) has been has been developed in collaboration with Queensland Curtis LNG (QCLNG) and Australia Pacific LNG (APLNG). The LTTMP was submitted to the Department in May 2014 and subsequently approved in July 2014.

Within 60 days of each anniversary of the approval of this plan, GLNG will provide a review report ('the Report') on the effectiveness of the management measures and operating controls directed at avoiding impacts on the marine turtle species will be submitted to the Department. If an impact on any of the marine turtle species is identified, the Report will recommend improvements to the conduct of those operations and activities which are found to have a causal connection with the identified impact, and provide the Report to the Minister in writing within 30 days of identifying the impact. Any improvements required by the Minister will be implemented.

7.2.4 Environmental Offsets

GLNG has developed an Environmental Offsets Proposal in consultation with the Department. The Offset Proposal was prepared to address both Commonwealth and State government approval requirements for the GLNG Project. The Offset Proposal will acquit the offset requirements for the downstream components of the project including the LNG Facility, Marine Facilities and the Gas Transmission Pipeline (GTP) crossings of the Kangaroo Island Wetlands and The Narrow Crossings and the GTP on Curtis Island. The Offset Proposal involved the purchase of a strategic property on Curtis Island *(Monte Christo)* and associated compensation for the relinquishment of associated long term cattle grazing leases. The offset property is located wholly within the Great Barrier Reef World Heritage Area on Curtis Island, north of Gladstone, Queensland. The Offset Proposal included the purchase of a large grazing property and existing leases and grazing permits over parts of the Curtis Island. Now secured, the lands will either be surrendered or transferred to the Queensland Government. The lands will be subsequently declared protected tenures under the *Nature Conservation Act 1992* (QLD) as either national park or conservation park

The Offset Proposal will achieve outstanding environmental outcomes through the establishment of approximately 25,700 ha of protected tenure estate. The proposal will result in the enhancement, protection and ongoing management of World and National Heritage values of the Great Barrier Reef, endangered and of concern regional ecosystems, habitat for threatened flora and fauna species, marine fish habitat and Great Barrier Reef wetlands. The Offset Proposal will protect over 44 per cent of Curtis Island which is approximately 58,000 ha in size. Combined with the existing Curtis Island National Park (8,640 ha), more than 59 per cent of Curtis Island will be actively managed under an island-wide conservation management strategy by the State government.

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The Offset Proposal was approved by the Commonwealth Government in September 2013 and the State Government in April 2014. The LNG Proponents have completed the purchase of the offset property. The process of declaring protected tenures over the property is being progressed.

7.2.5 Quarantine

GLNG will record and report all quarantine incidents.

7.2.6 Survey Data

If requested by the Commonwealth, GLNG will provide all species and ecological survey data and related survey information from ecological surveys undertaken for MNES. The data will be collected and recorded to conform to data standards notified from time to time by the Commonwealth.

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