2 PROJECT OVERVIEW

This chapter provides an update to *Volume 1, Chapter 2: Project Overview* of the Queensland Curtis LNG (QCLNG) Project draft environmental impact statement (EIS). It also - addresses key issues from the public submissions that relate to *Volume 1, Chapter 2* of the draft EIS. *Table 1.2.1* outlines those chapters from *Volume 1* of the draft EIS which have been amended through this sEIS process, either as a result of submissions received or further development of the Project since the draft EIS was produced. *Table 1.2.2* outlines issues relating to *Volume 1, Chapter 2* raised in submissions received through a public consultation process undertaken by QGC.

Table 1.2.1 Chapter Change Register

Chapter 2 Draft EIS	Unchanged	Updated
2. Project Overview		✓
2.1 The QCLNG Project		✓
2.2 Scope of this EIS	✓	
2.3 Timescale and Implementation	✓	
2.4 Proponent		✓
2.5 Project Rationale and Significance	✓	
2.6 Relationship to other projects		✓
2.7 Alternatives to the Project		✓

Table 1.2.2 Summary of Issues Raised in Submissions received relating to Volume 1, Chapter 2

Issue raised	Response	Submitter Number
Alternatives to LNG Components should include an assessment of Pt Alma.	Pt Alma was included as a candidate site in the site selection process. The assessment detail is provided in this chapter. It concluded that for a range of environmental and safety reasons Pt Alma was not feasible.	2
Standard assessment criteria should be applied to assessing alternatives for the Project.	QGC conducted a site selection environmental feasibility assessment on a range of sites in Queensland. Each site was assessed against a range of standardised criteria, covering social, environmental, security and economic aspects. This is further detailed in this chapter.	24

Issue raised	Response	Submitter Number
Cumulative impacts and co-location options should consider a detailed assessment of the expansion of Origin and Arrow gas fields under the Gas Field Component and Surat Gladstone Pipeline and Australian Pacific LNG pipeline under the Pipeline Component.	*Volume 1*, *Table 1.2.3* has added these projects that may have a cumulative impact. However, due to gas field uncertainty in well and infrastructure design of these projects, further cumulative impact assessment would be misleading.	32
The assessment of cumulative impacts should only consider the GLNG and the QCLNG Project as these two projects are currently progressing together. This assessment should consider the simultaneous construction and operation of these projects.	The cumulative impacts assessed in the draft EIS and this sEIS, have included these projects and others as determined by the Department of Infrastructure and Planning.	37
The proposed bridge between Gladstone and Curtis Island should be abandoned.	The QCLNG Project no longer includes the option of development of a bridge between Gladstone and Curtis Island.	23, 24, 29, 30, 32, 37
Detailed engineering design and associated mitigation measures are required for impact assessment for the bridge between Gladstone and Curtis Island.	The QCLNG Project no longer includes the option of development of a bridge between Gladstone and Curtis Island.	32
Project description should include a full description for all scenarios for reclamation sites and dredging requirements.	Additional information regarding dredge spoil emplacement locations can be found in: the Western Basin Strategic Dredging and Disposal Project (WBSDD) EIS and the Fishermans Landing Northern Expansion Project EIS, prepared and presented for public exhibition by the Gladstone Port Corporation. The use of dredged spoil for land development is the preferred option of the Gladstone Port Corporation (GPC).	32, 37

2.1 AMENDMENTS TO DESCRIPTION OF PROJECT ELEMENTS

There have been a number of changes to the Project since the release of the draft EIS which are discussed in this chapter. Further details regarding these changes and the assessment of their impact can be found in *Volumes 2, 3, 4, 5, 6* and *8.*

2.1.1 The QCLNG Project

As described in the draft EIS, the QCLNG Project will consist of project infrastructure to be developed by QGC comprising the following major components (Project Components):

- coal seam gas (CSG) field development and supporting infrastructure in the Surat Basin of southern Queensland (Gas Field Component) including the management of Associated Water produced

- a network of underground pipelines, including gas and water collection pipelines in the Gas Field Component, and a 340 km underground gas transmission pipeline from the Gas Field to an LNG Facility (Pipeline Component)
- a gas liquefaction facility on Curtis Island, adjacent to Gladstone, initially comprising two processing units, or "trains", to be followed by a third train. This component also includes an export jetty and other supporting infrastructure (LNG Component)
- access channels for shipping vessels (Swing Basin and Channel)
- LNG shipping operations to load the LNG and export it to global markets (Shipping Operations).

Since the release of the draft EIS, the dredging works required for the shipping channel and swing basin that will provide marine access to the LNG Facility have been described and assessed in a combination of the Fisherman's Landing Northern Expansion Project EIS (commonly referred to as the FLNE Project) and the WBSDD Project EIS. Both these EISs have been developed by the GPC, in consultation with QGC and other stakeholders, and are currently on public exhibition.

To facilitate the impact assessment of the WBSDD Project, QGC has provided a number of studies to GPC including:

- seagrass profiles, estimates and assessments
- sediment profiles and assessments for the harbour
- mangroves assessments
- coral reef assessments.

These studies have provided base line data which the GPC has used to determine impacts of the dredging and disposal works required for the continued development of the Western Basin Strategic Plan.

Volume 6 of this sEIS describes and impact assesses the remaining early works dredging that will be required for this Project. With regard to dredge material disposal, it is proposed that dredged material from these early works be disposed of to the approved reclamation areas as described in the FLNE EIS.

Should FLNE not be approved, GPC has made an application to extend the GPC's existing Offshore Disposal area to allow it to accept the QGC early works dredge spoil. This application is currently being assessed by the Queensland Government and the Commonwealth Government.

In view of the above, later works (defined as the Swing Basin and Shipping Channel) dredging and dredge spoil disposal has not been assessed as part of this supplementary environmental impact statement (sEIS).

To this end, QGC is seeking approval for the early works dredging, and is not seeking approval for the later works dredging or the dredge spoil disposal locations as part of this EIS. QGC understands that it would not be able to undertake these works until an approval was granted to the GPC or another entity which would allow for the disposal of this spoil.

The scope of the EIS has been amended to:

- describe the scope as outlined in the draft EIS excluding the impact assessment for shipping channel and swing basin
- address issues raised in submissions received on the draft EIS
- cover continued development of the Project Components as described above.

As described in the draft EIS, the operation of the QCLNG Project may involve the development of several components of other infrastructure which could be constructed and operated by parties other than QGC (Ancillary Infrastructure).

For these matters, environmental approval processes which are separate to this EIS are either underway or will be undertaken should the additional components be required to be developed. As such, the Ancillary Infrastructure for the project, that was previously described in the EIS no longer includes:

- a bridge and associated roads to provide direct vehicular access from Gladstone to Curtis Island
- any works described in the FLNE or the WBSDD EISs referring to the dredging associated with and the disposal of dredge spoil from *inter alia* the QCLNG Project dredging program including the Swing Basin and Shipping Channel.

2.1.2 Scope of this Supplementary EIS

This sEIS provides information to address those comments received as part of the public consultation process, and also provides additional information regarding changes to the Project Components, description and impacts as a result of the further development of the Project design.

2.1.2.1 QCLNG Project Components

The Project design has matured since the draft EIS was submitted resulting in a number of changes to the three Principal Project Components that were described in the draft EIS. The updated Project Component description for this Supplementary EIS is detailed below.

- **Gas Field Component:** the expansion of QGC's CSG operations in the Surat Basin. The Gas Field Component comprises:
  - approximately 6,000 gas production wells over the life of the Project with initially 1,000 to 1,500 wells across the Gas Field by mid-2014.

The remaining wells will be phased in over the life of the project (20 to 30 years)

- associated surface equipment, such as wellhead separators, telemetry devices and metering stations
- field infrastructure such as access tracks, warehouses, camps (both construction and operations), office and telecommunications
- gas and water-gathering systems and gas-processing and compression infrastructure.

The Gas Field Component will also include the management of water produced in the CSG extraction process on the production tenements including any use of the water by QGC on its tenements (Associated Water).

- **Pipeline Component:** Development, construction, operation and decommissioning of a gas pipeline network of approximately 530 km to link the Gas Field Component and other nearby CSG resources to the LNG Facility. The pipeline network includes:
  - a 340 km gas transmission Export Pipeline from the Gas Field Component to the LNG Facility in Gladstone
  - a 195 km Collection Header – a central pipeline located in an Upstream Infrastructure Corridor (UIC) to collect gas from centralised compressor facilities for delivery to the Export Pipeline
  - a submarine pipeline crossing at The Narrows and connecting the mainland with the LNG Facility.
- **LNG Component:** Development, construction and operation within the Curtis Island Industry Precinct of the Gladstone State Development Area (GSDA) of:
  - a construction dock for the transfer of construction materials and wastes to and from the LNG Facility site on Curtis Island
  - a LNG processing plant (LNG Facility) with production capacity up to 12 million tonnes per annum (mtpa), nominally comprising three LNG processing units or “trains” with an average 4 million tonnes per annum (mtpa) production capacity each
  - associated onshore facilities
  - jetty and marine operations facilities
  - marine transportation operations, involving the transit of construction and operations equipment, materials, and personnel via barges and ferries between Gladstone and Curtis Island. The marine transportation operations require:
    - new, or upgrades to existing, facilities within the Port of Gladstone
    - a MOF (materials offloading facility) attached to the LNG Facility on Curtis Island.

Marine transportation operations are QGC’s preferred option for long-term

access between Gladstone and the LNG Facility on Curtis Island.

A full description of the changed Project Components is provided in *Volume 2* of this sEIS.

2.1.2.2 Ancillary Infrastructure

The principal Ancillary Infrastructure expected to be developed by others to facilitate the development of the QCLNG Project includes:

- transport of and beneficial use of Associated Water: covering water produced from the development of the Gas Field Component and its beneficial use
- the FLNE project to be undertaken by the GPC: this involves the reclamation of 153 ha of land in the area adjacent to the existing Fisherman's Landing reclaim area, in the Port of Gladstone. This construction may be used to accommodate early phased dredge material from the QCLNG Project. The FLNE EIS has been released, with public exhibition finishing on November 9, 2009
- the WBSDD Project to be undertaken by GPC involves the staged dredging of five new shipping channel areas and the reclamation of land in the Western Basin of the Port of Gladstone using the dredged material. The Swing Basin and Channel required for the QCLNG Project constitute Part 1a dredging works of the WBSDD Project. The WBSDD EIS has now been released and is currently on public exhibition
- new gas tenements, resources or infrastructure: QGC continues to explore and identify new acreage, joint-venture and acquisition opportunities to develop further CSG resources in Queensland. Additional reserves provide both the opportunity for further domestic gas business as well as underpinning the resources required for additional sales from the LNG Facility. Should QGC identify additional resources which would supplement the reserves for the QCLNG Project, additional or new environmental assessment, planning processes and applications for CSG activities and infrastructure would be undertaken as required.
- Development of additional electricity transmission infrastructure from existing assets to SEDA and extension of the existing network to provide transmission service to QGC in the NWDA and others in the same vicinity by a Transmission Network Service Provider.

2.2 TIMESCALE FOR IMPLEMENTATION

Pending the relevant approvals, QGC expects to make a final investment decision on the QCLNG Project as early as possible in 2010, as described in *Volume 2, Chapter 5* of this sEIS, based on a number of critical items including the outcome of the Coordinator General's and Commonwealth Minister for the Environment's decision regarding this EIS process.

2.3 PROPONENT'S COMPLIANCE RECORDS – HEALTH, SAFETY, SECURITY AND ENVIRONMENT (HSSE)

As a result of an agreed takeover, QGC became part of the BG Group, an international oil and gas company, in 2009. The business of QGC is currently transitioning to be fully consistent with the principles and standards of the BG Group.

BG Group considers social, security and environmental performance integral to the manner in which it conducts its business across the world. BG Group has developed a range of performance indicators for health, safety, security and environment against which all BG Group projects are measured. This performance is reported publicly through BG Group's annual Sustainability Report which is prepared in parallel to and complements the group's annual financial report and accounts. Both documents are published prior to the BG Group annual general meeting.

BG Group's performance in this area compares with the best in the international oil and gas industry. BG Group ranks well in major indices of social and environmental performance, being accredited as a member of the UK FTSE4Good Index as well as the international Dow Jones Sustainability Index.

A benefit of the agreed takeover of QGC by BG Group was the deployment of BG Group's corporate HSSE resources to Queensland. This deployment of senior staff, coupled with the employment of additional experienced local HSSE personnel, is enabling QGC to develop one of the largest HSSE programs in Australia.

The aim of this program is not only to meet BG Group's international standards but also to reflect the needs of local communities and the environments within which QGC works. The environmental impact assessment process reported herein is a key component in that program, helping to define the social and environmental performance requirements.

The systems required to implement, monitor and measure QGC's performance in relation to HSSE are being developed, drawing extensively on BG Group's experience.

QGC is developing the following:

- Health and Safety Strategy and Management Plans
- Security Strategy and Management Plans
- Environmental Strategy and Management Plans
- Social Performance Strategy and Management Plans.

These overarching plans are supported by plans aimed at specific elements, for example, the Social Performance Strategy and Management Plans include the development of:

- Social Performance Management Plan
- Social Performance Investment Strategy
- Housing affordability and Investment Strategy
- Employee Code of Conduct.

These elements come together to provide a comprehensive social performance development plan for QGC and Queensland. As these are finalised, members of the community and Queensland Government will be invited to participate in consultation activities to ensure that the strategies will deliver what is expected.

These strategies will be monitored and audited, and their performance will be reported to QGC, BG Group and onto its shareholders, so providing transparency to these programs.

2.3.1 QCLNG Health and Safety Strategy

QGC has developed a detailed health and safety strategy that covers both the people that work for QGC and the communities in which QGC operates, particularly those people that have QGC infrastructure located on their land. When infrastructure is located on private land, QGC provides information to the landholder on health and safety procedures that the landholder needs to be aware of, along with emergency contact details.

The health and safety management strategy for the QCLNG Project is based on the following corporate health and safety management principles:

- QGC treats people with fairness, respect and decency
- QGC helps employees to develop their potential
- QGC believes that all injuries are preventable
- QGC provides a healthy, safe and secure work environment for all its employees.

In achieving this, QGC and BG Group are actively involved in improving local, national, international health and safety standards for the LNG and CSG industries through their representation and active involvement on safety committees for organisations such as the International Association of Oil and Gas Producers and The Australian Petroleum Production & Exploration Association.

In developing the QCLNG Health and Safety Strategy, QGC has taken the findings and directions of these committees, national and international standards into account and is applying these to the proposed construction and operation of the QCLNG Project. To ensure the safety of the community within which QGC works, QGC has developed:

- construction and operations Code of Conduct for all BG Group, QGC staff and contractors which is currently being presented to key stakeholders for consultation and input
- A Project Health and Safety Management Plan
- ‘‘whole of Project’’ and ‘‘whole of company’’ incident notification and reporting policy and procedure to ensure that all incidents are reported to the appropriate levels of management in QGC and BG Group
- an environmental and social constraints map to guide the appropriate location of Project infrastructure on privately or publicly owned land
- a 24-hour complaints hotline to deal with any urgent matters arising from the construction or operation of the QCLNG Project
- QCLNG primary health care medical services including general practitioner services and allied health services for all staff involved in the Project to reduce any impact on local health services
- commitment to ongoing consultation with the Queensland community for the life of the Project to ensure any concerns regarding health or safety can be discussed and addressed where appropriate.

The abovementioned initiatives are a brief summary of a range of health and safety policies and procedures being implemented by the QCLNG Project to protect and enhance community health and safety as well as worker health and safety.

2.3.2 QGC Security Strategy

The BG Group has played and continues to play a key role in developing international standards for the LNG industry, including shipping. BG Group has ensured that QCLNG’s security measures to be implemented as part of this Project meet local, national and international standards and BG Group’s global security and safety policies, procedures and protocols. In particular, the BG Group is a signatory to the Society of International Gas Tanker and Terminal Operators standards and ensures that all its operations where appropriate meet these standards.

Australia is a signatory party to the International Ship and Port Facility Security code (ISPS) at the International Maritime Organisation (IMO). The ISPS code requires all ships on international voyages and port facilities to develop security plans. The plans must have an escalating security response based on the maritime threat level declared by local authorities, and a security plan for the QCLNG Facility will be developed prior to the commencement of operations. BG Group-controlled ships already have security plans approved by the maritime authority for the ship’s flag state (BG Group-owned vessels are registered in Bermuda.) The ship and port facility must be operating at the same maritime security threat level.

For the QCLNG Project, QGC has engaged independent third party experts to undertake risk assessments for the LNG Facility and the loading of LNG on to its carriers, based on submissions received regarding the security and safety

of the Project. The risk assessments were undertaken against local, national and international LNG and LNG shipping standards, including the Society of International Gas Tanker and Terminal Operators (SIGTTO).

It should be noted that these risk assessments have been conducted for the three Principal Project components and shipping operations. Summary findings of these are provided in *Volume 3, Chapter 17, Volume 4, Chapter 16* and *Volume 5, Chapter 18.*

2.3.3 QGC's Environmental Strategy

As the parent company, BG Group's environmental strategy applies to QGC. This strategy requires that all of QGC's operations will have developed and implemented an Environmental Management System to IS0 14001 standards within two years of BG Group owning, developing or operating a facility. This will require QGC to develop an ISO 14001 Environmental Management System during QCLNG construction activities and that this management system will be required to be certified by 2016. This system will include policies, procedures and management plans for all of QGC activities in Queensland.

This management system will go beyond what is required under Queensland's legislative framework as it must reflect and commit to BG Group's global business environmental principles. These environmental principles are:

- QGC will make a positive contribution to the protection of the environment
- QGC will go beyond compliance with local environmental regulation to meet international accepted best practice
- QGC will reduce to the minimum practicable any adverse effects of its operations on the environment.

To facilitate achieving these principles, QGC is now actively involved in improving international environmental standards for the LNG and CSG industries through BG Group's presence and active participation on a number of environmental organisations, such as the World Business Council for Sustainable Development (WBCSD), the International Petroleum Industry Environmental Conservation Association (IPIECA) and the International Energy Agency GHG Program.

The commitments made in the draft EIS and this supplementary EIS are the start of a broader QGC commitment to both the local and global environment. As the QCLNG Project develops, the delivery of these commitments will be monitored, audited and reviewed to ensure that BG Group continues its position as an HSSE global leader.

2.3.4 HSSE Business Units - Roles and Responsibilities

BG Group and QGC have invested significantly in personnel and programs to ensure that the QCLNG Project and other activities of QGC meet local, national and international HSSE standards. These have included the development of an HSSE organisation in Queensland focused on reducing and where possible eliminating HSSE risk to:

- Queensland communities in which QGC works and operates
- QGC employees, sub-contractors and their operations.

The organisation comprises:

A *Corporate Health, Safety, Security and Environment Department* whose role is to:

- establish the QGC corporate policies, management systems and processes that require consistency across the current operations and projects
- monitor performance and audit compliance with those policies, systems and processes.

An *Upstream Operations – Health, Safety, Security and Environment Department* whose role is to promote within the field operations awareness of HSSE performance requirements, and to develop detailed operating procedures to enable consistent application of performance standards.

A *QCLNG Project – Health, Safety, Security, Environmental and Quality Department* whose role is to:

- promote high HSSE performance within the QCLNG project
- risk assess the Project design as it develops, identify key issues and develop with the Project team means to eliminate or reduce risks to a practicable minimum
- develop the systems and processes that will define required performance standards, measure and monitor performance against those standards.

2.4 RELATIONSHIP TO OTHER PROJECTS

This section provides an update to relevant existing or proposed projects that now have a relationship with the QCLNG Project since the release of the EIS. As these projects were not publicly advertised (and hence information made available) prior to the issuing of the ToR or completion of the EIS, they have not been impact assessed but rather listed for consideration during detailed construction design and assessment by regulatory authorities.

However, these listed projects will be considered during the development of Construction Environmental Management Plans (CEMP) as required by QGC policy or government agencies to reduce cumulative impacts from construction and operations as far as practicable.

2.4.1 Other Projects Considered

For the purposes of this sEIS, the approved or proposed projects outlined in *Table 1.2.3* have been considered for their interdependencies with the QCLNG Project. The criteria applied to determine which projects in the QCLNG Project's area of potential influence could reasonably and practically be assessed for cumulative impacts in the QCLNG Project EIS are outlined in the draft EIS and include:

- other projects being proposed by QGC as an extension of existing domestic gas supply operations or power generation but are not associated with the QCLNG Project (i.e. Condamine Power Station and expansion of CSG fields to supply domestic gas markets)
- Projects declared by the Co-ordinator-General as ''state significant'' and for which an EIS has been completed or is being displayed for public comment. As a minimum an Initial Advice Statement is on the Department of Infrastructure and Planning (DIP) website
- other projects being/have been assessed under Part 1 of Chapter 3 of the Environmental Protection Act 1994 (Qld) with the Queensland Environmental Protection Agency (EPA), now the Department of Environment and Resource Management (DERM), the EIS Co-ordinator. As a minimum an Initial Advice Statement or similar is available on the EPA website.

The cumulative impacts of these projects on the Gas Field, Pipeline and LNG Facility Components of the QCLNG Project are discussed in *Volume 3, Chapter 18, Volume 4, Chapter 17*, *Volume 5, Chapter 19* and *Volume 8*, respectively of the draft EIS and this sEIS.

Table 1.2.3 Other Projects Considered

Gas Field Component	Pipeline Component	LNG Component
• Condamine Power Station	• Condamine Power Station	• GLNG Project: LNG facility (Santos)
• Expansion of QGC CSG fields for domestic markets	• Expansion of QGC CSG fields for domestic markets	• Wiggins Island Coal Terminal
• New Acland Coal Mine: Stage 3 Expansion	• New Acland Coal Mine: Stage 3 Expansion and Wetalla Water Pipeline	• Gladstone Pacific Nickel Refinery
• Wandoan Coal Project	• Wandoan Coal Project	• Fisherman's Landing Port Expansion
• Linc Energy Underground Coal Gasification	• Linc Energy Underground Coal Gasification	• Boyne Island Aluminium Smelter Extension
• Spring Gully Power Station	• Spring Gully Power Station	• Aldoga Aluminium Smelter
• Felton Mine and Dimethyl Ether Pilot Plant	• Felton Mine and Dimethyl Ether Pilot Plant	• Gladstone LNG (Fisherman's Landing)
• Kunioon Open-Cut Coal Mine	• Kunioon Open-Cut Coal Mine	• Sun LNG
• Surat Basin Rail	• GLNG Project: Pipeline (Santos)	• Curtis Island Bridge/Road
• Nathan Dam Pipelines	• Central Queensland Gas Pipeline	• Dredging of Swing Basin and Shipping Channel
• GLNG Project – Gas Field (Santos)	• Gladstone - Fitzroy Pipeline	• QCLNG Export Pipeline (Narrows crossing)
• Origin Gas Field development	• Surat Basin Rail	• Western Basin Strategic Dredging and Disposal EIS
	• Moura Link - Aldoga Rail	• Fishermans Landing Northern Expansion Project (FLNE) EIS for dredging and disposal
	• Nathan Dam and Pipelines	
	• Boundary Hill Mine Extension	
	• Dawson South Stage 2 Coal Project	
	• Curtis Island Bridge/Road	
	• Gladstone LNG – Pipeline	
	• Surat–Gladstone Pipeline	
	• Australian Pacific LNG pipeline	

2.5 ALTERNATIVES TO THE PROJECT

A detailed assessment of the following alternatives to the QCLNG Project was undertaken and is discussed further in *Volume 2*, *Sections 2.7.1* and *2.7.2* of the draft EIS.

Alternative options for the specific Project Components and Ancillary Infrastructure were discussed in detail in *Volume 2* of the draft EIS. These alternatives include:

- alternative locations and sites of the QGC Project Components and Ancillary Infrastructure
- alternatives to access the LNG Facility site (Curtis Island Bridge/Road versus marine transportation operations)
- alternative technologies, methods and development plans for the Project Components.

A number of submissions from the public were received regarding the:

- Queensland Government's selection of Curtis Island for the LNG Precinct
- selection of Curtis Island as opposed to Port Alma
- methodology in assessing and determining the most appropriate site for the LNG Components.

The selection process and methodology used by the Queensland Government and QGC is described below.

2.5.1.1 The Queensland Government's selection of Curtis Island for the LNG Precinct

The following information regarding the Queensland Government's assessment process for the LNG Precinct was provided by the Department of Infrastructure and Planning.

In 2007 the Department of Infrastructure and Planning commissioned Connell Wagner to identify and rank sites within the Port of Gladstone that could support plant and associated infrastructure to form a LNG precinct.

The scope of this study included:

- review of existing information
- determination of critical requirements for a conceptual LNG plant and infrastructure allowing for future growth
- determination of criteria to assess all possible sites
- determination of a list of possible sites within the Gladstone region
- establishment of a shortlist of sites, assessment and ranking.

Design criteria for LNG facility operations were established in relation to LNG carrier size and operations, port configuration, load out wharf facilities, LNG processing plant, associated infrastructure, cryogenic pipeline and safety and security clearance zones. The environment and community, gas delivery capacity and transport and infrastructure considerations for both construction and operation phases were also assessed.

Site assessment criteria were developed and grouped to assist with consideration and ranking of the sites. The study initially identified a total of 13 sites for high-level assessment. A first-cut review was undertaken resulting in a list of nine sites, of which six were located on Curtis Island.

These nine sites were assessed against pre-determined criteria including environmental criteria using a “multifactor evaluation technique”. A “fatal flaw” analysis was undertaken in conjunction with a site inspection. A site inspection was conducted to provide further information relating to shipping, available land, services, land form and the environment. The environmental criteria to assess these sites included:

- disturbance to terrestrial flora and fauna
- marine ecology disturbance
- proximity to residents
- cultural heritage constraints
- potential operational effects on surroundings.

Interviews were also held with representatives of the Gladstone Economic and Industry Development Board, Central Queensland Ports Authority and the Regional Harbour Master (Maritime Safety Queensland) to determine any industry or logistical issues that may impact on any of these nine sites.

This approach resulted in two sites being shortlisted, namely North China Bay and Hamilton Point West. These sites are adjacent to each other and are on Curtis Island.

A more detailed economic, environmental and social impact assessment of these two sites was then undertaken. This involved the preparation of site layout drawings to assist in the consideration of siting a LNG plant, product loading jetty and the barge landing sites to facilitate large module delivery at these sites.

The study concluded that the North China Bay was the preferred development site for a LNG processing precinct. This site ranked marginally better than the Hamilton Point West site, however, it was noted that the North China Bay site has the attraction of additional adjacent areas suitable for further expansion of LNG operations.

Although the North China Bay and Hamilton Point West sites are adjacent, they are separated by a ridge and therefore may not lend themselves to the optimisation, development opportunities and sharing of common user infrastructure that comes with the development of a LNG precinct.

During the course of the study it became evident that further detailed consideration was required for channel widths and LNG carrier access arrangements, beyond the scope of this study. Ship simulation work was conducted by the GPC and Maritime Safety Queensland to assess safe vessel movement requirements in the Port of Gladstone. This additional work has resulted in the recently published Western Basin Strategic Plan, the FLNE EIS and the WBSDD EIS.

2.5.1.2 Selection of Curtis Island as opposed to Port Alma

In May 2008 ERM, on behalf of BG Group, completed an assessment of seven potential sites for the development of the QCLNG Project. The site assessment included Port Alma.

Port Alma is currently used for ammonium nitrate import and export and is situated on low-lying land subject to tidal inundation.

The Port Alma site would need to be constructed on imported engineered fills, founded on the existing flood plains. The fill depths would be anticipated to be 2-3 m above the existing grade, to ensure the entire facility would always remain above the maximum anticipated tide, flood or storm surge levels. The following provides key outcomes as a result of the feasibility study conducted on Port Alma.

Future Expansion

The availability of land on the southern portion of Port Alma adjacent to Raglan Creek is constrained by the path of Raglan Creek and geotechnically unsuitable soils. Thus, the land available is not sufficient for the development of a three to four train LNG facility.

Geotechnical Constraints

This site would be difficult to develop when locating LNG processing plant and equipment due to deep-running unstable soils which are not suitable for direct bearing and deep-piled foundations.

Limits on Tanks and Process Plant Location

LNG storage tanks and high-powered gas compression equipment involved in the LNG process require that the foundations are placed on or connected to competent materials. This is particularly important for high-powered gas compression equipment to ensure that ground vibrations and harmonics are avoided, which can seriously compromise the performance of this equipment. It was anticipated that the depths to competent material may be very deep, and beyond the reasonable level that piled foundations can be considered economically viable.

Other Layout Issues

Existing infrastructure and existing land use (such as fuel storage tanks, port buildings) and environmental/geotechnical constraints at Port Alma inhibit optimal layout of a LNG plant and storage tanks.

Access to Site

Upgrading of roads and road infrastructure would be required but this is not a limiting factor of the proposed Port Alma site. However, if access to Balaclava Island was required, this site would require major road and bridge construction across the intertidal mudflats.

Earthquake Zone Criteria

Port Alma is located in an area with an acceleration coefficient between 0.05-0.10. This acceleration coefficient refers to the peak horizontal ground acceleration for a particle at ground level that is moving horizontally because of an earthquake, with 10 per cent probability of exceedance in 50 years (Source: The Earthquake Hazard Map of Australia, 1991). In 1991, an earthquake of magnitude 2.9 on the Richter scale occurred in Bajool, 23 km from the Port Alma site.

Risk of Flooding

Port Alma is located on the mouth of the Fitzroy River, a tidal flood river that handles significant seasonal runoff. After heavy rainfall events in the catchment, the Fitzroy River is capable of significant flooding. Flood events would impose critical restrictions on LNG ships entering and leaving the area, adversely impacting on shipping timetables and the finely synchronised LNG supply chain. LNG loading requires stable sea states which may be threatened by the higher current velocities and altered tide limits caused by flooding.

Shared Port Facilities

Port Alma is an import/export location for ammonium nitrate. The ammonium nitrate (AN) shipping safety procedure has an unacceptable restriction to any LNG shipping as it requires a 725 m safety zone around both its ships and their loading jetting when a ship is being loaded. No LNG ship movement would be permitted within this zone and LNG ships would need to pass the ammonium nitrate jetty to obtain access to the LNG jetty. LNG ships operate to an emergency plan that includes the ability to leave port at short notice at any time, any state of tide. This fundamental element of international LNG shipping safety which BG Group is committed to would be compromised at Port Alma.

2.5.1.3 Summary

In summary, the investigation into Port Alma as one of the seven proposed QCLNG sites concluded that Port Alma:

- provides insufficient land for a three to four train LNG plant that is accessible to LNG shipping
- provides insufficient marine area for a clear 600 m diameter swing basin
- would involve major costs for long cryogenic product line and jetty
- offered limited immediate environmental and health support capacity, with greater emergency response times due to Port Alma's remote location.

The most viable site at Port Alma involved unworkable transit procedures for safety zones around existing import and export of ammonium nitrate.

These factors combined placed Port Alma at a substantial disadvantage in relation to other potential sites considered for the QCLNG Project.

2.5.1.4 *Methodology in assessing and determining the most appropriate site for the LNG Component*

In determining the most appropriate site for the QCLNG Project a multi-criteria analysis was applied to inform site selection. These criteria were applied in a two-stage site selection process.

The first stage involved a regional screening assessment of potential LNG facility locations within Queensland. The outcome of this first stage was the selection of the Gladstone area and Bundaberg as potential locations. The second stage involved a more detailed analysis of the available sites in the Gladstone area (including Port Alma and Sea Hill on North Curtis Island) and Bundaberg to identify a preferred site for the LNG Facility. Site selection investigations were undertaken by a multi-disciplinary team to:

- evaluate engineering and construction challenges to design, build and operate an LNG export facility
- collate historical and engineering, marine and environmental data applicable to the areas under investigation
- provide an overview of the environmental and social issues associated with the potential sites
- indentify any potential fatal flaws that may be associated with the sites under review including safety and security issues
- summarise potential risks and impacts associated with potential sites
- provide a ranking of individual sites based on the application of a numerical impact assessment methodology which is described in *Volume 1, Chapter 3* The same methodology for the site selection report was applied in the QCLNG draft EIS
- provide an overview of the legislative and approvals framework associated with the Project Components.

This investigation resulted in the recommendation and subsequent selection of Curtis Island. Curtis Island was deemed most appropriate for: technical, security, safety and commercial reasons; its geographical location which provides a natural buffer zone between the proposed site and existing residents; and because a preliminary assessment of environmental impacts indicated that impacts on flora and fauna could be reduced. These findings and conclusions have since been substantiated by the research undertaken and the findings and conclusions reached as a result of the development of the draft EIS and this sEIS.