9 SURFACE WATER

This chapter describes “surface waters” and “water resources,” being terrestrial lakes and ponds, streams, riverine and non-riverine wetlands, and localised watersheds in the vicinity of the LNG Facility.

9.1 DESCRIPTION OF PROJECT ENVIRONMENTAL OBJECTIVES

The Project environmental objective for surface water resources is: to protect as much as practicable surface waters from contamination, diversion of natural flows, and sedimentation so as to preserve the ecological health, public amenity and safety of surface waters.

9.1.1 Methodology

The following methodologies were employed in assessing surface waters in the context of the LNG Facility:

- physical site inspection and observational assessment
- a review of the existing water resources to identify those that may be affected by the LNG Facility in the context of environmental values as defined in the:
  - *Environment Protection Act* 1994 (Queensland)
  - ANZECC/ARMCANZ (2000) Guidelines
  - Australian Water Quality Guidelines for Fresh and Marine Waters
  - Queensland Water Quality Guidelines (March 2006).
- Consideration of both riverine and non-riverine wetlands (i.e. palustrine, lacustrine, estuarine systems), using the Environment Protection Agency’s (since incorporated within the Department of Environment and Resources Management (DERM)) Queensland Wetlands Program maps[1].
- Search of Australian Natural Resources Library, the Australian Water Resources Assessment Database 2000.
- Other relevant reports and background information available at time of production.

1 Environmental Protection Agency (2009) Wetland Mapping - www.epa.qld.gov.au/wetlandmapping

9.2 EXISTING ENVIRONMENT

The area for the LNG Facility on Curtis Island is isolated with little or no development. Curtis Island itself is 45 km long and 14 km across at its widest, covering a total catchment area of 570 km². The island rises to a maximum height (Mount Barker) of some 163 m above sea level. The major streams on the Island include Boat, Barker, Mosquito, Badger, Monte Christo and Graham Creeks.

Rainfall is distinctly seasonal and extremely variable on an annual basis. To date, the island has experienced little demand for water due to its isolation and low population.

The local catchment area drains into Port Curtis, which is within the Great Barrier Reef Marine Park World Heritage Area, and is described in *Table 5.9.1*.

9.2.1 Surface Water Management Areas

In 2000, the Australian Water Resources Assessment (AWRA) defined 325 Surface Water Management Areas (SWMA) nationally, as a basis for reporting water availability, use and allocation across Australia. In the AWRA, the Curtis Island Surface Water Management Area, Queensland, is described as follows:

This SWMA is in an isolated region of the state due to it being an Island Basin, with little existing development other than grazing and forestry activities. Its tenure is mainly Leasehold Grazing leases; with the balance being comprised of State Forest and a small National Park. There is low probability of new development due to this isolation, unless an emerging industry is identified. Therefore, there is little potential for water development in this SWMA. A further impediment to any potential development may be the existence of the Marine National Parks that fringes much of the Curtis Island. Additionally, this SWMA drains into the Great Barrier Reef Marine Park World Heritage Area.

For the reason outlined above, no detailed Surface Water Management Plans have been developed for the Curtis Island SWMA. However, the SWMA does provide a snapshot of information relating to the island's water resources, as indicated in *Table 5.9.1.*

9.2.2 Curtis Island Surface Water Management Area

The streams within the Curtis Island SWMA are unregulated. No data is available in relation to the monitoring of Curtis Island waterbodies including wetlands, vernal pools, lakes and ponds, rivers and streams (ephemeral or intermittent) streams.

Table 5.9.1 Vital Statistics for Curtis Island Water Resources

Area:	570 km^2
Total storage volume:	no data
Total surface water use:	0 ML/yr
Development category:	Low development
Mean annual run-off:	79,000 ML/yr

There are no known stream gauges currently in operation, and similarly, there are no known water quality monitoring stations in operation on the LNG Facility site.

No sustainable yield studies are available for this SWMA.

No data was available in relation to the salinity of surface water resources in the SWMA from the *Australian Water Resources Assessment 2000*.

There were no major water storages reported in this area as part of the Australian Water Resources Assessment, likely due to the lack of demand and development.

9.2.2.1 Wetland system(s)

A Directory of Important Wetlands in Australia (DIWA) is an inventory of important wetland sites. The wetland definition applied in DIWA is the Ramsar Convention on Wetlands (Ramsar) definition:

Wetlands are areas of marsh, fen, peatland or water, whether permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.

There are no Ramsar sites in the vicinity of the LNG Facility site.

The DIWA lists Port Curtis, The Narrows and Northeast Curtis Island as Nationally Important Wetlands. However, Port Curtis, The Narrows and Northeast Curtis Island are not Ramsar sites. The LNG Facility site is adjacent to Port Curtis and The Narrows Nationally Important Wetlands.

The Queensland Wetlands Program applies the following wetlands definition:

Wetlands are areas of permanent or periodic/intermittent inundation, with water that is static or flowing fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed 6 metres. To be classified as a wetland, the area must have one or more of the following attributes:

- *at least periodically, the land supports plants or animals that are adapted to and dependent on living in wet conditions for at least part of their life cycle, or*
- *the substratum is predominantly undrained soils that are saturated, flooded or ponded long enough to develop anaerobic conditions in the upper layers, or*
- *the substratum is not soil and is saturated with water, or covered by water at some time.*

Wetlands within the vicinity of the LNG Facility site are identified on *Figure 5.9.1,* and for the purposes of this assessment, include the following:

- Lacustrine wetlands are large, open, water-dominated systems (for example, lakes) larger than 8 ha. This definition also applies to modified systems (for example, dams), which possess characteristics similar to lacustrine systems (for example, deep, standing or slow-moving waters).

There are no Lacustrine wetlands in the vicinity of the LNG Facility site.

- Palustrine wetlands are primarily vegetated non-channel environments of less than 8 ha. They include billabongs, swamps, bogs, springs, soaks etc, and have more than 30 per cent emergent vegetation.

There are no perennial Palustrine wetlands in the vicinity of the LNG Facility site.

- Riverine wetlands describe all wetlands and deepwater habitats within a channel. These channels can be naturally or artificially created, periodically or continuously contain moving water, or form a connecting link between two bodies of standing water.

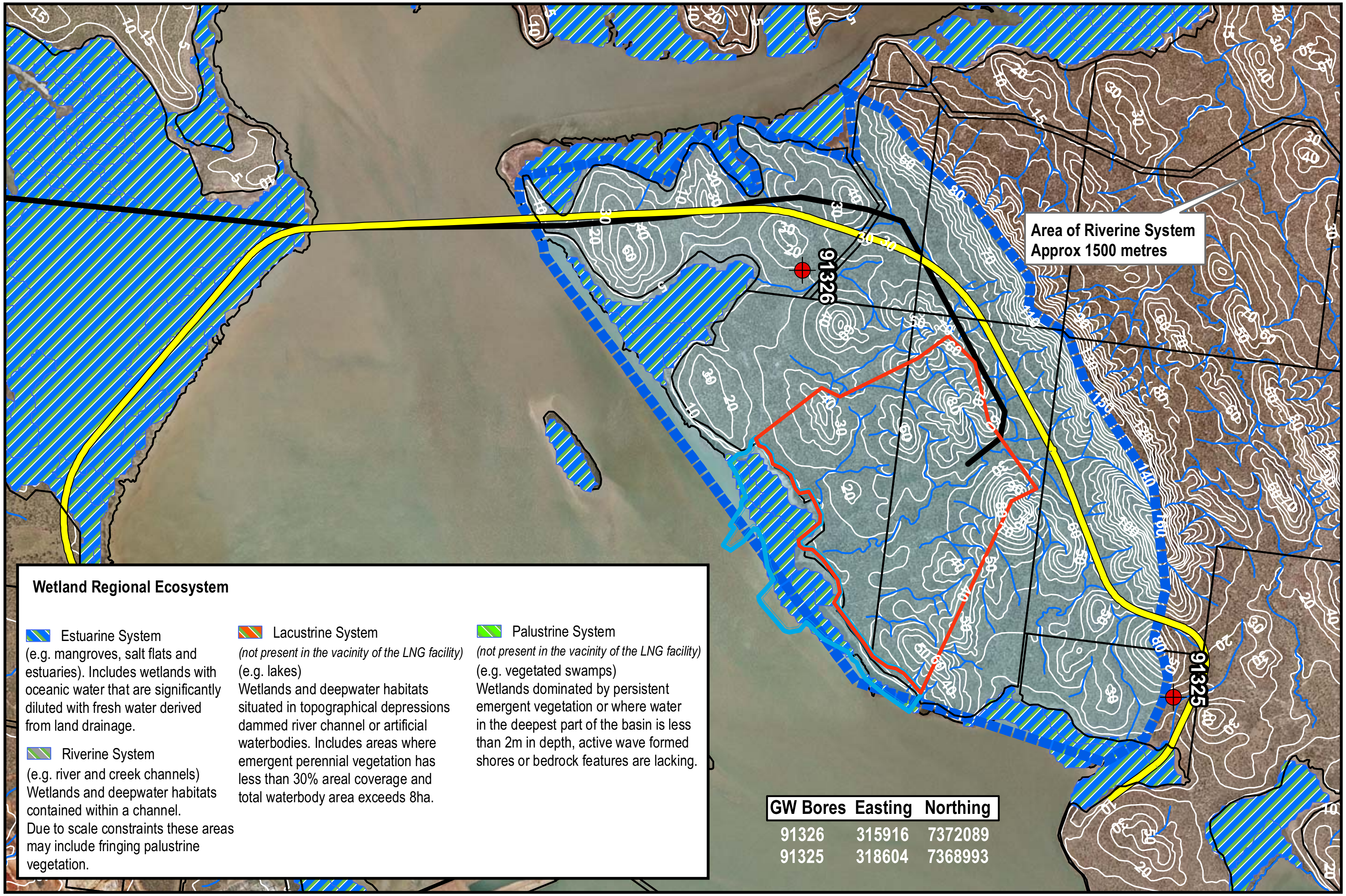
The wetlands database indicates there are riverine wetlands containing periodic or moving water in the vicinity of the LNG Facility site.

- Estuarine wetlands are those with oceanic water sometimes diluted with freshwater run-off from the land.

Estuarine wetlands are the predominant system within and adjoining the LNG Facility site and the indicative wet lease area. These wetlands consist of mangroves, salt flats and estuaries. The ecological values of the estuarine wetland system are discussed in detail in *Volume 5, Chapters 7 and 8.*

9.2.3 Referable Areas Mapping

The Integrated Planning Act 1997 (Queensland) requires that the Environment Protection Agency (EPA) has an assessment role if the development lot is identified as being within 100 m of a wetland or conservation estate. Although the LNG Facility site is not located within 100 m of a wetland, it does fall fully within the conservation estate.



Legend

- Proposed QCLNG Site Boundary
- Indicative Wet Lease Area
- Registered GW Bores
- Proposed Export Pipeline
- Curtis Island Project Water Catchment Area (1225ha)
- Drainage
- Possible Curtis Island Road/ Bridge Corridor

Source Note:
Aerial Photo - Department of Infrastructure and Planning for QCLNG
5m Contours - Department of Natural Resource and Water
Drainage - Department of Natural Resource and Water
Wetland - Department of Primary Industries & Fisheries and QLD Wetland Map V1.3 (Gladstone), Map 9150 - EPA ,
Proposed Curtis Island Road/Bridge Corridor - Connell Wagner
Proposed QGCLNG Gas Pipeline - Connell Wagner

Note:
Boundary approximate only and subject to survey.

Projection: UTM MGA Zone 56 Datum: GDA 94

0 250 500 1,000 m

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Environmental Resources Management Australia Pty Ltd

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business
Drawn	JB
Approved	GB
Date	06.02.09
Volume 5	Figure 5.9.1
File No:	0086165b_EIS_WR_GIS003_F5.9.1
Revision	1

Title **Wetlands Within the Vicinity of the LNG Facility Area**

Disclaimer:
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9.2.4 Surface Water Influences

Geological research confirms the main factors controlling the geomorphological development on Curtis Island are water (as runoff and tidal movements), vegetation, soils and geology. There were two main watercourses observed during the field works, which flow through the site from the north-east to the south-west. There are several smaller perennial watercourses which flow into the main creeks from the elevated areas on the south and north of the site.

The creeks observed across the site generally range in width between 2 m and 5 m and typical depth of 0.5 m to 1.5 m, but ranging to more than 5 m in one watercourse in the upper slopes of the site towards the eastern site boundary. These watercourses exhibit variable degrees of erosion, with the upper reaches showing greater erosion effects than the lower reaches, as depicted in *Figure 5.9.2.*

The landform of the LNG Facility site and within the ancillary access routes consists predominantly of low rolling hills, with elevation increasing to the eastern margin of the site. The western margin of the LNG Facility site consists of intertidal to intratidal flats, which grade westwards into mangroves and salt flats. The tidal flats occupy an area of approximately 15 ha, consisting of an elongated area approximately 1.3 km by 100 m to 150 m wide.

Landform characteristics on the Island are affected by water, with erosion of soils from runoff occurring as rills across the relatively flat sections of the site, and as water-driven erosion, which formed creeks of generally limited width and depth.

The LNG Facility site contains few watercourses, which occur between hills across the site and drain west to south-westwards towards the tidal flats on the western margin of the site. The watercourses exhibit variable degrees of bank erosion with the likelihood of localised erosion being higher on the steeper terrain to the east of the site.

Disturbance of existing acid sulphate soils (ASS) can affect pH levels in stream flow and potentially harm the biota of the receiving waters. Measures will be put in place to monitor and manage this risk for activities of the LNG Facility that impact these areas.

Legend

- Location of Photo
- Proposed QCLNG Site Boundary
- Indicative Wet Lease Area
- Proposed Export Pipeline
- Drainage
- Possible Curtis Island Road/ Bridge Corridor

Source Note:
Aerial Photo - Department of Infrastructure and Planning for QCLNG Project
Proposed Curtis Island Road/Bridge Corridor - Connell Wagner
5m Contour Interval - Department of Natural Resource and Water
Drainage - Department of Natural Resource and Water

Projection: UTM MGA Zone 56 Datum: GDA 94

0 200 400 800 m

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QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: Variable Degrees of Erosion in Watercourses
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: JB	Volume 5 Figure 5.9.2	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not to be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved: GB	File No: 0086165b_EIS_WR_GIS004_F5.9.2	
	Date: 26.05.09	Revision: 1	

9.2.5 *Rainfall*

The Gladstone region experiences a sub-tropical climate, with the heaviest rainfall experienced during the months of December to February (in recent years almost 50 per cent of the total annual rainfall has occurred during this period). This is a key factor pointing to the seasonality and peak flows of the surface water resources on Curtis Island.

Rainfall and climate are discussed in full in *Volume 5, Chapter 2* of the EIS.

9.2.6 *Temporary Streams and Water Bodies*

There are no perennial fresh surface water bodies in the vicinity of the LNG Facility site. However, there are a number of overland flow paths and ephemeral streams, which serve as drainage channels during intermittent rainfall events.

Characterising hydrological, chemical, and biological attributes of temporary watercourses within the constraints of published literature is difficult due to lack of data. Information gathered from observations made during site visits has been used to develop a picture of the existing surface water resources on the proposed LNG Facility site.

Both *Plate 5.9.1* and *Plate 5.9.2* are typical images of the drainage channels on the LNG Facility site. Depending on the season the stream channels may be dry or flowing. Once flow in these ephemeral streams ceases, they become a series of disconnected waterholes or ponds, and over time the waterholes in these smaller stream channels completely dry out.

Plate 5.9.3 shows a typical tidal reach from the marine wetland to the terrestrial drainage lines through the site.

9.3 *IMPACT ASSESSMENT*

There are no known perennial fresh surface water bodies in the vicinity of the LNG Facility site. However, there are a number of overland flow paths evident, which serve as drainage channels for ephemeral streams.

Within the LNG Facility, the LNG plant layout and design of the site has considered grade, slope, and surface stormwater runoff. Stormwater capture and conveyance has been integrated into the LNG plant design to minimise environmental impact by preventing soil loss and erosion, in compliance with the *Environmental Protection Act 1994* and the *Environmental Protection (Water) Policy 1997.*

Plate 5.9.1 Typical Drainage Channel

9.3.1.1 Water Demand and Use

The LNG Facility will have no impact on demand for the Island's water resources. As discussed in *Volume 2, Chapter 9 and Chapter 13*, the LNG Facility site will be operating a reverse osmosis (RO) plant to service its own water demand needs.

9.3.1.2 Water Supply

The location of the LNG Facility is such that there is no downstream water extraction for the operation of the LNG Facility at this site. Thus, there will be no impact on water supply to third parties. The LNG Facility will not be extracting or sourcing from either surface or groundwater sources, as the RO plant will provide construction and operation water supply.

Plate 5.9.2 Typical Ephemeral Stream

Plate 5.9.3 Typical Tidal Reach from the Marine Wetland to the Terrestrial Drainage Lines

9.3.1.3 *Salinity*

No data is available in relation to the salinity of surface water resources in the Curtis Island SWMA for the Australian Water Resources Assessment 2000.

The water supply to the LNG Facility is via RO Plant. Storage of raw water is addressed in *Volume 2, Chapter 9* and saline waste will be returned direct to Port Curtis. Leakage from the return pipe is an unlikely potential source of salt contamination.

9.3.1.4 *Off-site Surface Water Resources*

A search of the SWMA database shows that all streams within Curtis Island are unregulated. No data is available in relation to monitoring of Curtis Island water bodies including wetlands, vernal pools, lakes and ponds, rivers and streams (ephemeral or intermittent). There are no known stream gauges in operation, and similarly, there are no water quality monitoring stations in operation.

No sustainable yield studies are available for this SWMA.

There are no major water storages reported in this area as part of the Australian Water Resources Assessment, likely due to the lack of demand and development. The LNG Facility site will manage on site water as described in *Section 9.3.1.6*

9.3.1.5 *Flooding*

Curtis Island surface waters are ephemeral, experiencing long periods of no flow interspersed with short periods of high flows and characterised by flooded stream channels.

The LNG Facility site layout incorporates permanent drainage channels being rock lined with capacity to convey storms with up to one-in-25 year Average Recurrence Interval (ARI). Refer to *Volume 2 Chapter 13* for the preliminary LNG Plant drainage layout.

9.3.1.6 *Stormwater and Stormwater Management*

Erosion potential is higher during periods of heavy rainfall. During early stages of construction of the LNG Facility, the entire LNG plant footprint will be cleared of vegetation and topsoil, re-graded and re-contoured. A system of purpose-built stormwater channels and ponds will re-direct runoff around the periphery of the LNG plant footprint, while stormwater within the plant footprint will be diverted to retention ponds (refer to *Table 5.9.2* for indicative pond sizes based on the preliminary site drainage plan). Stormwater drains will be designed to accommodate a one-in-25 year ARI rainfall event.

Surficial material removed from site will be stockpiled in the northern and southern corners (refer *Figure 5.9.3*) and subject to specific sediment control and stormwater management procedures, aimed to divert flow away from the stockpile locations, and to capture that which falls directly onto the stockpile area.

For the purposes of stormwater management the LNG Facility site has been formed into four management sections. Each section reports to separate stormwater control devices. The LNG Facility preliminary site drainage plan in *Volume 2, Chapter 13* provides indicative locations for four sediment retention ponds.

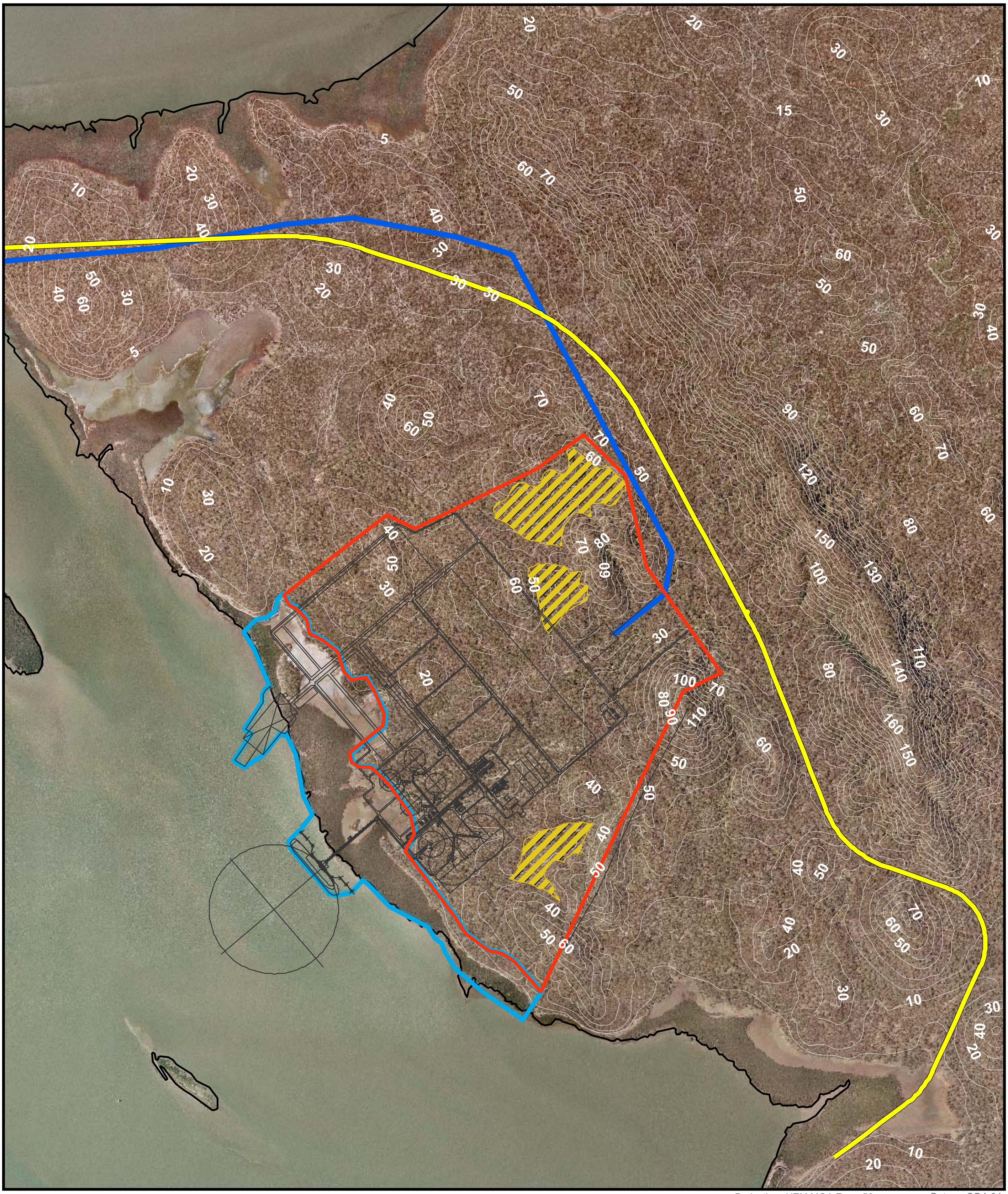
Table 5.9.2 Stormwater Management Ponds

	Pond #1	Pond #2	Pond #3	Pond #4
Catchment area	30 ha	32 ha	44.8 ha	24.6 ha
Pond size	84 m x 42 m x 3 m	25.9 m^2	105 m x 52 m x 3 m	75 m x 40 m x 3 m
Average runoff for 1-in-25 year event	1.34 m^3/sec	1.43 m^3/sec	2.00 m^3/sec	1.10 m^3/sec
Peak runoff for spillway design	5.8 m^3/sec	6.2 m^3/sec	8.7 m^3/sec	4.8 m^3/sec

Stormwater outfall points are proposed to discharge into the marine environment from the site. Stormwater disposal and outfall will occur as shown in *Volume 2 Chapter 13*. Stormwater outfalls will be armoured by a riprap apron to encourage energy dissipation at the point of discharge. The presence of the intertidal wetland area as a discharge location will provide some energy dissipation at the point stormwater meets the receiving marine waters.

There are no assets downstream of the discharge at risk of damage and there are no downstream users who will be affected by either modified stormwater flows or the proposed coastal discharge points.

The LNG Facility is not located within a Water Resource Area where taking of overland flow is regulated under the *Water Act 2000*.



Legend

- Proposed QCLNG Site Boundary
- Indicative Wet Lease Area
- Spoil Disposal Area
- Proposed Export Pipeline
- Possible Curtis Island Road/ Bridge Corridor

Source Note:
Aerial Photo - Department of Infrastructure and Planning for QCLNG Project
Curtis Island Road/Bridge Corridor - Connell Wagner
Spoil Disposal Areas - Bechtel, Drawing No CE-0000-00001-Rev 00A
5m Contours - Department of Natural Resources and Water
Drainage - Department of Natural Resources and water

Projection: UTM MGA Zone 56 Datum: GDA 94

0 200 400 800 m

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QUEENSLAND CURTIS LNG — A BG Group business	Project: Queensland Curtis LNG Project		Title: Spoil Disposal Areas
	Client: QGC - A BG Group business		
ERM — Environmental Resources Management Australia Pty Ltd	Drawn: JB/KP	Volume 5 — Figure 5.9.3	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not to be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved: GB	File No: 0086165b_EIS_SWR_GIS001_F5.9.3	
	Date: 01.04.09	Revision: 1	

The stormwater management system will be finalised in the detailed design phase of the LNG Facility and will be required to control the following key potential impacts:

- spill events (for example, from pipework and bunded areas)
- hydrocarbon and/or chemical leaks
- mobilisation of sediment from exposed soils
- disturbance of ASS, affecting the pH of water and mobilising contaminants to receiving environment
- sedimentation of the intertidal estuary
- erosion of site stormwater conveyance channel and potential erosion at stormwater outfall locations.

Auckland Point Stormwater Management

Preliminary concepts for stormwater management for Areas 1-3 on Auckland Point (refer *Volume 2 Chapter 13* for Auckland Point layout) and proposed new roads for Auckland Point will be developed in the detailed design, or Front-End Engineering and Design (FEED) stage, having regard to the Queensland Urban Drainage Manual (QUDM).

9.3.1.7 Water Quality

Construction activities have the potential to impact surface water quality through the mobilisation of sediments, nutrients, hydrocarbons and other chemicals. Control of these contaminants is an important part of site operations.

In the absence of historical data for the Project site (i.e. neither chemical, physical and biological conditions of the existing watercourses), baseline monitoring will be conducted during the FEED phase of the Project through the use of piezometers installed on the site, to establish initial surface water quality.

However, the application of published guidelines to terrestrial ephemeral waters is problematic due to the lack of good data in relation to these stream types. In the case of the LNG Facility site, as site background concentrations have not been established for naturally occurring stressors during storm events (e.g. nutrients, suspended solids, dissolved oxygen, metals) guidelines cannot be set based on the background values. As an alternative guide for LNG Facility site controls, the values downstream of an activity should not be worse than the values upstream (or at a nearby reference site). This approach is supported by the *Queensland Water Quality Guidelines (QWQG) 2006* in situations where there is a lack of guideline values.

Regardless, monitoring water chemistry is important for the following reasons:

- pH is particularly relevant where estuarine systems may be adversely affected by runoff in contact with exposed acid sulfate soils. This parameter will reflect changes in water quality that may arise from land use changes, discharges and disturbance of acid sulfate soils.
- Dissolved oxygen (DO) is dependent on water temperature, salinity, and biological processes. Increased organic matter can also effect DO concentrations.
- Turbidity in high levels can impact estuarine systems through reductions in light and smothering of organisms and this has the potential to be elevated during site clearance and construction activities.

For the marine receiving waters, background water quality guidelines exist in ANZECC 2000, and can be applied where there are no data to suggest different conditions would apply due to local circumstances. In some cases the background level is above the guideline, and therefore it is appropriate to select the average of the 80th percentile values across selected monitoring sites.

The Queensland Water Quality Guidelines developed by the EPA also provides a guide on the appropriate level of monitoring and mitigation. They complement the National Water Quality Management Strategy (NWQMS) and the Australian Water Quality Guidelines (AWQG) by delivering guidelines that include locally and regionally relevant water quality data for fresh, estuarine and marine waters, and rely on the ANZECC 2000 Guidelines to provide guidance on application.

With natural pollutants such as suspended sediment or nutrients, short-term increases in values during flood events may not immediately impact on biota but may have longer-term impacts or downstream impacts e.g. effects on seagrasses or coral reefs.

Existing water quality values for enclosed coastal, mid estuarine and lowland stream waters in the vicinity of the LNG Facility site are described in V*olume 5, Chapter 11*.

The purpose of the Environmental Protection (Water) Policy (EPP Water) is to protect Queensland's waters while allowing for development that is ecologically sustainable.

This purpose is achieved within a framework that includes:

- identifying environmental values (EVs) for Queensland waters
- deciding and stating water quality guidelines and water quality objectives (WQOs) to enhance or protect the environmental values.

The Port Curtis Integrated Monitoring Program (PCIMP) adopts the EV and WQO approach, and has carried out extensive water quality testing in Port Curtis in recent years, comprising members from industry, government, research agencies, and other stakeholders. The Port Curtis marine area was divided into nine zones, including reference zones, within which multiple sites for monitoring were selected. Zone 1 through The Narrows has most applicability to the proposed LNG Facility site.

Areas of focus include:

- biological monitoring
- intertidal monitoring (mangrove & sediment)
- seagrass health monitoring
- oil spill assessment.

The 2007 PCIMP Report Card allocated The Narrows an A rating, indicating a healthy ecosystem.

9.4 MANAGEMENT AND MITIGATION MEASURES

9.4.1 Sediment Ponds

A stormwater collection and control system will be designed and constructed to reduce suspended solids and silt from the surface runoff before discharging to the Port of Gladstone. Sedimentation ponds will be installed with outfall structures, along with high level overflows, which will allow spill into the harbour under storm conditions.

To mitigate the potential for erosion at the point of discharge, engineered outfalls will be employed, involving a concrete apron with rock armouring.

9.4.2 Stockpile Sites

Soil stockpile sites within the LNG Facility site will store stripped near-surface soils from across the LNG plant footprint. Diversion channels and erosion control devices will be 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 selected seed mix.

9.4.3 Stormwater

Key management strategies are as follows:

- Natural watercourses will be redirected around the outside of the construction site.
- Stormwater drains and sediment control devices will be utilised throughout construction.
- Stabilisation of the faces of engineered slopes will follow completion of construction.
- Graded areas will be mechanically compacted to minimise the potential for erosion.
- Disturbed areas, stockpiles areas and stormwater drainage channels will be regularly inspected based on rainfall and weather conditions. Corrective action shall be taken if deficiencies in performance or mitigation measures are found.

9.4.4 Further Surface Water Impact Mitigation

Potential impacts will vary for the construction and operational phases of the LNG Facility.

During construction, mitigation measures controlling the release of sediments will include installation of silt fences around soil and stockpile sites, diversion channels away from disturbed areas and rapid stabilisation of exposed areas, with careful construction management required to ensure sediment runoff is minimised and contained.

During operations, the potential exists for contaminants to be captured with stormwater runoff and, therefore, the storage and handling of fuels and chemicals will be controlled through strict storage and loading procedures, including the use of bunds around the designated fuel storage area.

Key management strategies during construction and operations phases are outlined in the draft Surface Water Quality Management Plans, Acid Sulfate Soils Management Plan, and Soil Erosion and Sedimentation Control Plans provided in Volume 11.

9.4.5 Conclusion

Construction and operational activities will alter the existing surface water flows, with potential to impact on fresh and marine water quality. During construction, sediments and ASS can have a significant ecological impact on the receiving environment. Measures will be put in place to avoid and mitigate these potential impacts. The management approaches proposed will form a comprehensive plan to ensure the potential impact on water quality is minimal.

A summary of the impacts outlined in this chapter is provided in *Table* 5.9.3.

Table 5.9.3 Summary of Impacts for Surface Water Resources

Impact assessment criteria	Assessment outcome
Impact assessment	Negligible
Impact type	Direct
Impact duration	Permanent
Impact extent	Local
Impact likelihood	High

Overall assessment of impact significance: Negligible as there are no significant surface water resources within the LNG Facility site and the LNG Facility will not impact on local or regional surface water supply or quality. Changes to watercourses and catchment characteristics as a result of the construction of the LNG Facility are factored into the design of the stormwater management system.