19 SUMMARY OF CUMULATIVE ENVIRONMENTAL IMPACTS

The Terms of Reference (TOR) for the Project requires the Environmental Impact Statement (EIS) to provide a clear and concise summary of the cumulative impacts of the Project. The EIS must also provide a description of these cumulative impacts both in isolation and in combination with other known, existing or proposed project(s) (where details of such proposed projects have been provided to QGC by the Department of Infrastructure and Planning or are otherwise published), to the greatest extent practicable.

Volume 1 describes the approach used in the QCLNG Project EIS to assess cumulative impacts, and identifies and provides an overview of the proposed projects that were considered in the assessment of cumulative impacts.

This chapter summarises the potential cumulative impacts on a range of environmental values associated with the construction and operation of the proposed LNG Facility on Curtis Island. Proposed projects and other applicable components of the QCLNG Project considered in the assessment of cumulative impacts for the LNG Facility are shown on *Figure 5.19.1.*

19.1 OUTCOMES OF THE CUMULATIVE IMPACT ASSESSMENT

Environmental values potentially at risk of being affected by cumulative impacts are identified in *Table 5.19.1* for both the construction and operations phases of the LNG Facility. Impacts on these environmental values may arise through geographic overlap of project areas, scheduling overlap, or utilisation of the same infrastructure, services and resources.

It is important to clarify that the matrix in *Table 5.19.1* is not a checklist showing which environmental values are affected by each of the proposed projects. Rather, it shows the values that could be adversely or beneficially affected as a result of the proposed projects being constructed or operated in close proximity to, or at a similar time as, the LNG Facility. The resultant cumulative impact could therefore be an exacerbation of negative impacts or the enhancement of positive benefits.

The underlying assumption in *Table 5.19.1* is that the construction phase of the proposed projects and other components of the QCLNG Project coincide. This provides a conservative evaluation of potential negative cumulative impacts.

The nature and significance of potential cumulative impacts on the environmental values is discussed in the following sub-sections. The significance rating is based on a high level qualitative evaluation based on professional judgement.

For further discussion of the cumulative impacts associated with each environmental value, refer to the relevant chapters in this volume (*Volume5, Chapters 2-18)*.

19.1.1 *Geology and Soils*

A soil survey conducted within the LNG Facility site determined that soils did not meet the criteria to be classified as Good Quality Agricultural Land (GQAL), rendering consideration of cumulative impacts on GQAL irrelevant. Similarly, as the erosion potential of the soils within the LNG Facility site is considered low, soil erosion has not been considered in terms of cumulative impacts.

While the development of all the proposed projects would require rock, sand and gravel for construction it is assumed that these materials would be sourced from approved quarry sites. Cumulative environmental impacts have therefore not been considered for this issue although this remains subject to ongoing assessment as part of detailed construction planning.

The cumulative impacts to geology and soils have therefore only been considered in terms of the potential impacts resulting from the disturbance of acid sulfate soils (ASS) at project sites.

ASS occur within the proposed development area for the QCLNG Facility, Export Pipeline, Curtis Island Bridge/Road (for which QGC is not the proponent), the Wiggins Island Coal Terminal and at specific locations along the Gladstone Pacific Nickel Project pipeline. They are also likely to occur at Santos' Gladstone LNG Project site on Curtis Island.

Cumulative ASS risks/impacts have been considered as the Port of Gladstone would be the receiving environment for any release of sulphuric acid resulting from disturbance and oxidation of ASS from any of these projects. There is therefore the potential for cumulative impacts on aquatic flora and fauna and deterioration in ecosystem health if ASS are not carefully managed by all of these projects during their construction phases.

It is a standard condition of approval for projects to develop and implement ASS Management Plans and, if carefully managed, cumulative impacts to the receiving environment can be avoided. The cumulative ASS impacts have therefore been evaluated as being of minor significance for the construction phase on the assumption that ASS Management Plans are implemented by all projects.

As ASS should not require disturbance during the operations phase it is therefore not assessed for cumulative impacts.

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Environmental Resources Management Australia Pty Ltd

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business
Drawn	JB
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Title

Proposed Projects in the Gladstone Area considered for the Cumulative Impact Assessment for the LNG Facility Component

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Table 5.19.1 Identification and Assessment of the Significance of Cumulative Environmental Impacts for the LNG Facility

Proposed Projects		Affected Environmental Values														
		Geology and Soils	Land Use and Infrastructure	Land Contamination	Terrestrial Ecology	Marine Ecology	Surface Water Resources	Groundwater Resources	Coastal Processes	Air	Noise and Vibration	Road Transport	Shipping Transport	Visual Amenity	Waste Management	Hazard and Risk
LNG Facility																
Gladstone LNG Project: LNG facility (Santos)	CON															
	OPS															
Wiggins Island Coal Terminal	CON															
	OPS															
Gladstone Pacific Nickel Refinery	CON															
	OPS															
Fisherman's Landing Port Expansion	CON															
	OPS															
Boyne Island Aluminium Smelter Extension	CON															
	OPS															
Aldoga Aluminium Smelter	CON															
	OPS															
Gladstone LNG (Fisherman's Landing)	CON															
	OPS															
Sun LNG	CON															
	OPS															
Curtis Island Road / Bridge	CON															
	OPS															
Dredging of Swing Basin and Shipping Channel	CON															
	OPS															
QCLNG Export Pipeline (Gladstone) - The Narrows crossing	CON															
	OPS															

19.1.2 Land Use and Infrastructure

Consideration has been given to the cumulative impacts on land use and infrastructure arising from the LNG Facility in combination with other proposed projects in Gladstone.

With the exception of the Santos LNG facility on Curtis Island, other proposed projects are geographically distant from the LNG Facility and cumulative impact on land use is not relevant. The two projects are both located within the Curtis Island Industry Precinct of the Gladstone State Development Area (GSDA) and are consistent with the preferred land use in this precinct.

As the LNG Facility will be self sufficient for electricity, water supply and sewerage services during the construction and operational phases, it will not contribute to any cumulative impacts on mainland infrastructure. The majority of the construction workforce will be housed within the construction camp on Curtis Island and the balance within Gladstone. The GHD Infrastructure Audit[1] has identified spare capacity in water, sewerage and electricity provision in Gladstone capable of accommodating the balance of the construction workforce.

The LNG Facility and proposed projects in Gladstone will have cumulative impacts on the capacity of existing landfill sites to deal with waste generated from all the projects. As these wastes will be treated, transported and disposed of in accordance with legislation, with landfill disposal being used as last resort, it is anticipated that these impacts will be of minor significance. The Beranby landfill site within Gladstone has adequate capacity at current predicted levels to accept material up to the year 2050, and received an average 150 tonnes of waste per day in 2008. Funding for the creation of new cells in the landfill is collected through a charge per tonne and expansion is undertaken on a needs basis in accordance with the Department of Environment and Resource Management (former EPA) requirements.

19.1.3 Land Contamination

Risks of land contamination are applicable to all proposed projects within the Gladstone area. Therefore, the potential exists for a greater percentage of land within the Gladstone Regional Council area to be contaminated if appropriate management measures are not implemented effectively during both the construction and operation of these projects.

As all projects are required to minimise the potential for soil, groundwater and receiving water contamination by storing fuels and chemicals in compliance with relevant legislation (e.g. *Queensland Dangerous Goods Safety Management Regulations, 2001*), the risk of contamination has been evaluated as unlikely. Furthermore, as impacts would be localised, the

1 GHD, February 2009, Queensland Curtis LNG Project, Draft Gladstone Infrastructure Audit.

cumulative impact of the LNG Facility in combination with any of the other applicable projects, as well as the overall cumulative impact, is evaluated to be of negligible significance.

19.1.4 Terrestrial Ecology

Cumulative impacts on terrestrial ecology were considered for the QCLNG Facility in combination with the QCLNG Export Pipeline, Curtis Island Bridge/Road and Santos Gladstone LNG Project (refer to *Volume 5, Chapter 7*).

The Gladstone locality is heavily developed for industrial purposes and where habitats have not been directly impacted by development, they are subject to a variety of indirect impacts including exposure to increased traffic, habitat fragmentation, interruption of habitat corridors, exposure to increased light and noise levels and altered surface hydrology. Therefore, areas maintaining habitat continuity and containing priority species are considered of significance to the Gladstone locality. Within the local area, these attributes would be vulnerable to the cumulative impacts of development.

Currently, Curtis Island is isolated from the mainland and receives limited disturbance from vehicles, noise pollution, light pollution and waste. In a regional context, the Curtis Island components of the study area are also relatively unique as this represents an unfragmented landscape connecting marine, intertidal, lowland and upland environments. However, the condition of the LNG Facility site is compromised by the presence of a number of abundant feral species, and the historical impacts of grazing and altered fire regimes that have occurred there. Therefore, while Curtis Island has value within the local and regional context, the local study area is in degraded condition as a product of historical management practices and ongoing disturbance.

Cumulative impacts associated with the development of the QCLNG Facility and other proposed future projects on the island are likely to expose the local environment to increased fragmentation, edge effects of pest plant and animal species, increased light pollution and noise pollution, industrial traffic (if the Curtis Island Road is built) and industrial waste. These cumulative impacts could decrease dispersal opportunities for small mammal and reptile species.

The study area occupies part of a home range for one pair of Powerful Owls and is likely to support a roost for the pair. Powerful Owls are listed as a threatened species in terms of the *Nature Conservation Act,1992* (Qld). The cumulative effect of the QCLNG Facility and pipeline, together with other proposed developments on Curtis Island would remove a substantial area of potential foraging habitat and potential nest and roost sites for Powerful Owls. Based on available evidence it is likely that this would remove one pair of owls from Curtis Island. The impact on the local population is unknown.

The possible road development on Curtis Island, when coupled with the proposed pipeline route the construction of the road and pipeline would

contribute to the cumulative impact of habitat removal between Hamilton and Laird Points on Curtis Island. Although most of the habitat has been previously disturbed through clearing, grazing and fire the road and pipeline corridors contain important habitat resources such as arboreal hollows and owl roost sites. This could lead to localised fragmentation of populations of smaller species such as Sugar Glider, Squirrel Glider and Yellow-bellied Glider.

19.1.5 Marine Ecology

The marine ecology study (*Volume 5, Chapter 8*) considered the cumulative impacts on the marine environment associated with the construction of the QCLNG Project LNG marine facilities and pipeline crossing of The Narrows. This is together with the Curtis Island Bridge, Mainland Road and Bridge Approach and disposal of dredge material from the Swing Basin and Shipping Channel north of Fisherman's Landing to provide the fill material required for reclamation of land for the Fisherman's Landing Port Expansion.

Cumulative impacts include direct impacts on habitats such as seagrasses and mangroves from the footprint areas of proposed marine structures associated with these proposed projects and within the reclamation area for the Fisherman's Landing Port Expansion (i.e. the preferred spoil disposal site for dredged materials from the Swing Basin and Shipping Channel), as well as secondary impacts on water quality and behavioural changes in mobile marine species that are likely to be temporarily disturbed by the increased turbidity, noise or lighting.

The most significant cumulative impacts to marine ecology are anticipated to occur during the construction phase and arise as a result of the dredging and reclamation required to prepare and install infrastructure and dispose of the dredged material. Inherently associated with dredging activities are the changes to local bathymetry and the currents/tidal flows through the affected area.

Taking into account the range of possible sources of impacts and sensitive receptors, it is considered that LNG Facility will not have a significant cumulative impact on *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* listed threatened and migratory marine species due to the small number of individuals that are likely to be found within, and use, the Port of Gladstone. It was considered likely that marine fauna would continue to use parts of the area during both the construction and operational phases of these projects if managed appropriately.

It can be expected that the development of the Santos Gladstone LNG Project (Curtis Island), Sun LNG Project and Gladstone LNG Project on Fisherman's Landing, Wiggins Island Coal Terminal and Gladstone Pacific Nickel Project would exacerbate cumulative impacts to marine ecology and risks to EPBC Act listed threatened and migratory marine species with the potential for significant cumulative impacts if not carefully managed.

The increase in vessel movements associated with these projects also

increases the risk of non-indigenous marine species being introduced into the Port of Gladstone, as well as risks of hydrocarbon and chemical spills.

These risks can be managed and cumulative impacts minimised through the implementation of proper management measures. Increased ship movements as well as the expansion of port related infrastructure within the Port of Gladstone are anticipated and will be managed through the Port Strategic Plan[2].

19.1.6 *Surface Water Resources*

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

The LNG Facility will not be extracting or sourcing water from either surface or groundwater sources, as a reverse osmosis (RO) plant will provide construction and operation water supply. The LNG Facility will therefore have no impact on demand for Curtis Island's water resources. The location of the LNG Facility is such that there is no downstream water extraction and operation of the LNG Facility and this site will have no impact on water supply to third parties.

For these reasons impacts to surface water resources during construction and operation of the LNG Facility are considered to be negligible and no potential cumulative impact has been identified.

19.1.7 *Groundwater Resources*

Cumulative impacts to groundwater resulting from the QCLNG Facility and other proposed projects in the Gladstone area have not been considered as it is not proposed that the LNG Facility extract groundwater during either the construction or operational phases of the project. Further; impacts on groundwater quality are not anticipated by the proposed development; and based on preliminary investigations, little significant interaction between groundwater and site excavations (including both benching and excavations for foundations) is anticipated.

19.1.8 *Coastal Environment*

Construction of marine facilities as part of the LNG Facility and construction of the Export Pipeline across The Narrows will contribute to cumulative impacts on coastal processes within the Port of Gladstone. This is together with the

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

Santos LNG Facility, the Wiggins Island Coal Terminal, Fisherman's Landing Port Expansion, Curtis Island Bridge and dredging of the Swing Basin and Shipping Channel. These projects could contribute to modifications to marine hydrodynamics within the Port of Gladstone which could affect shoreline stability as well as the dispersion and settlement of nutrients, sediments and pollutants.

Based on the findings of the hydrodynamics and marine water quality assessment, the impacts to hydrodynamics and marine water quality can be characterised as short term (related to construction stages) and there will be unavoidable localised impacts from the dredging works such as increased total suspended solids (TSS). These increases are within the bounds of natural variability of the system and are not expected to have any significant cumulative impacts on marine environmental values of water.

The cumulative impact of dredge material placement on coastal natural resources and the reclamation in the Western Basin of Port Curtis will need to be considered in the GPC's Port of Gladstone Western Basin Strategic Dredging and Disposal Project.

19.1.9 Air

A cumulative assessment of nitrogen dioxide (NO_2) emissions was modelled taking into account existing and approved industries, as well as the four other proposed LNG facilities within the Gladstone area to determine whether cumulative emissions exceeded the capacity of the Gladstone airshed (refer to *Volume 5, Chapter 12*). This assessment included emissions from the Gladstone LNG Projects on Curtis Island and Fisherman's Landing, as well as the Sun LNG Project. Modelling of other key emissions was also undertaken including carbon monoxide (CO), particulates (PM10 and PM2.5), sulphur dioxide (SO_2), and hydrocarbons.

The results of the cumulative impact assessment showed that the predicted maximum 1-hour and annual average ground-level concentrations of NO_2 at any sensitive place for the QCLNG Facility during normal operating conditions fall well below the Environmental Protection Policy (Air) air quality objectives (33.8 per cent and 9.5 per cent of the EPP (Air) 1-hour and annual air quality objectives respectively). Therefore, cumulative impact significance during normal operating conditions is rated as minor for NO_2 emissions. Modelling also indicated no exceedance of CO, PM_{10} or hydrocarbon compounds at any sensitive receptor when the LNG Facility was considered under normal operating conditions.

The assessment of cumulative impacts resulting from other LNG projects during normal operations at the QCLNG Facility and including non-continuous shipping emissions (from LNG carriers and the assisting tug boats for the QCLNG Project) predicted no exceedances of the EPP (Air) air quality objective for the 1-hour and annual average ground-level concentration of NO_2 at any sensitive place. Predicted elevated concentrations of NO_2 may exceed the EPP (Air) 1-hour average air quality objective of 250 µg/m^3 near the LNG

Facility wharf due to emissions from LNG carrier engines. There were no exceedences identified of EPP (Air) air quality objectives for maximum 1-hour, 24-hour and annual average ground-level concentrations of SO_2 at any sensitive place.

The assessment of cumulative impacts resulting from NO_2 emissions released from other LNG projects in combination with dry gas flaring at the QCLNG Facility during plant upset or emergency conditions (i.e. non-normal operations) predicted no exceedances of the EPP (Air) air quality objective for the 1-hour average ground-level concentration of NO_2. This assessment assumed a combination of the proposed LNG Facility during normal operations, plus shipping activities and an upset blowdown event at the marine flare, when assessed in isolation and with background at any sensitive receptor location. An exceedence of the 1-hour average ground-level concentration EPP (Air) air quality objective for NO_2 is predicted in the proximity of the marine flare and wharf facilities, although predicted ground-level concentrations of NO_2 beyond the proposed LNG Facility operations area are well below the EPP (Air) air quality objectives.

It is assumed that NO_2 emissions from the Aldoga Aluminium Smelter and Boyne Island Aluminium Smelter Extension are insignificant as no mass emission target rates for NO_2 were specified in the Coordinator-General's reports for these two projects[3,4]. NO_2 emissions were not identified as being of significant concern for the Gladstone Pacific Nickel Project[5]. For these reasons these projects were not taken into consideration in the assessment of cumulative NO_2 emissions within the Gladstone airshed.

It is not expected that gaseous emissions to air during the construction phase of the QCLNG Facility will exceed those from the normal conditions of the full-scale operating three-train LNG Facility. Cumulative impacts to air quality resulting from the construction of all the proposed projects are therefore likely to be of minor significance.

The aviation safety assessment modelling indicates an exceedence of the critical Obstacle Limitation Surface (OLS) height for both the normal and non-normal (flare) scenarios. In terms of cumulative impact, it is likely that the adjacent Santos LNG plant will have similar impact on the OLS, although detailed modelling cannot be undertaken without project details and flare configuration. The cumulative risk to aviation safety is considered of major significance. QGC will continue to work with the Civil Aviation Safety Authority (CASA) to address the OLS matter.

3 Department of Infrastructure and Planning (2003a) Coordinator-General's Evaluation Report on the Environmental Impact Statement for the Aldoga Aluminium Smelter Project. Department of Infrastructure and Planning, Queensland Government.

4 Department of Infrastructure and Planning (2003b) Coordinator-General's Evaluation Report on the Environmental Impact Statement for the Boyne Island Aluminium Smelter Extension of Reduction Lines Project. Department of Infrastructure and Planning, Queensland Government.

5 Department of Infrastructure and Planning (2009) Coordinator-General's Report: Gladstone Nickel Project. Department of Infrastructure and Planning, Queensland Government.

19.1.10 Noise and Vibration

Cumulative noise impacts arising from the QCLNG Facility in combination with the proposed Santos Gladstone LNG Project (Curtis Island), the Gladstone LNG Project at Fisherman's Landing, Sun LNG Project, Wiggins Island Coal Terminal and Gladstone Pacific Nickel were considered at seven locations identified in the Noise Impact Assessment (refer to *Volume 5, Chapter 13*).

When cumulative noise impacts are considered, the operations phase specific noise criteria are exceeded at Tide Island[6]. As a result the significance of cumulative noise impacts at this location is rated as major. However, based on noise estimates for the proposed projects, the noise heard at Tide Island would stem mainly from operations at the Wiggins Island Coal Terminal and the Santos Gladstone LNG Project (Curtis Island) and not from the QCLNG Facility. *Volume 5, Chapter 13* illustrates that cumulative noise levels at Tide Island are the same, irrespective of whether the QCLNG Facility is included in the assessment. This indicates that the QCLNG Facility makes no contribution to cumulative noise levels at this location.

At the residential property along Fisherman's Road, Yarwun (NAL 2) cumulative noise impacts breach the operations phase noise criteria. Cumulative noise impacts are therefore rated as being of major significance at this location.

At all other monitoring locations the cumulative noise levels during operations fall below the operations phase noise criteria and therefore cumulative impacts are negligible at these locations.

No assessment has been made of cumulative construction noise, as there is insufficient information to predict construction noise levels from other projects.

19.1.11 Road Transport

Cumulative road traffic impacts considered the Santos Gladstone LNG Project (Curtis Island), the Wiggins Island Coal Terminal, the Gladstone Pacific Nickel Refinery, the Fisherman's Landing Port Expansion, the LNG projects at Fisherman's Landing and the Aldoga Aluminium Smelter. This was due to the potential for these projects to use the same road transport routes during the construction and/or operations phase to transport personnel, materials, equipment and waste to and from these different project sites.

The identification of potentially overlapping transport routes is based on the assumption that QGC will transport personnel, equipment, materials and wastes to and from the QCLNG Facility on Curtis Island using marine transport which would leave from Auckland Point during the construction phase and from the RG Tanna Wharf during the operations phase. It also is based on the assumption that pipe material would be shipped into the Port of

6 The EPA do not have established noise criteria for the evaluation of cumulative impacts.

Gladstone and transported to the field from there.

In the absence of project information for the Gladstone LNG Project (Curtis Island), it is assumed that this same transport option will be adopted by Santos. This would provide a conservative estimate of cumulative transport impacts as it would mean that the volume of traffic moving through Gladstone to get to and from Auckland Point and the operations ferry terminal at the RG Tanna Wharf would approximately double from that provided in the assessment of road traffic associated with the QCLNG Facility *(*refer to *Volume 5, Chapter14).*

Therefore, cumulative traffic impacts during the construction phase have been evaluated as being of moderate significance mainly due to the increase in traffic volumes in central Gladstone which may require upgrades to existing road infrastructure.

Due to the lower volumes of traffic associated with the operations phase of both the QCLNG Project and the Santos Gladstone LNG Project, the significance of cumulative traffic impacts during operations reduces to minor significance.

19.1.12 Shipping Transport

The Gladstone LNG projects (Curtis Island and Fisherman's Landing), Sun LNG Project, Wiggins Island Coal Terminal, Gladstone Pacific Nickel Refinery and Fisherman's Landing Port Expansion will contribute to a significant increase in ship movements in the Port of Gladstone. The shipping associated with these projects, in conjunction with that required for the QCLNG Project, will therefore have a cumulative impact on other port users. However, the Port Strategic Plan envisages an increase in planned port capacity to 300 million tonnes of export capacity per year within the next 50 years[7], nearly four times the 2008 Port throughput. Increased ship movements within the Port of Gladstone are therefore anticipated and managed through the Port Strategic Plan.

19.1.13 Visual Amenity

For the purposes of the cumulative impact assessment the same significance rating as been given to the construction and operations phases on the basis that both phases will alter the existing character of the area to the same or similar extent.

The most significant cumulative visual impact will be the combined visual impacts of the QCLNG Facility and the Santos Gladstone LNG Project on Curtis Island, together with the proposed expansion of the industrial facilities

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

on Fisherman's Landing and the proposed bridge. The positioning of the industrial/infrastructure elements of the proposed bridge, LNG facilities on Curtis Island and LNG facilities on Fisherman's Landing will have the visual effect of enclosing this section of the Port of Gladstone and separating it from The Narrows. The location of large industry within the viewshed, where these elements are visually dominant in the landscape, will alter the existing character of the areas creating an industrialised precinct, and visually linking with the industrial landscapes of Gladstone waterfront.

The cumulative impact of the Santos Gladstone LNG Project (Curtis Island), the proposed expansion of Fisherman's Landing and the LNG projects on Fisherman's Landing are rated as being of moderate-to-major significance as the areas are among those identified in the Curtis Coast Regional Coastal Management Plan's Areas of State Significance (Scenic Coastal Landscape). However, the increasing industrialisation of the landscape is consistent with the planning intention behind the Gladstone State Development Area and the designation of the new Curtis Island Industry Precinct.

When the Curtis Island Bridge is added to the consideration of cumulative impacts, the rating becomes one of major-to-critical significance. The magnitude of change in the landscape from construction and operation of a bridge across The Narrows has been rated as large as a result of: the scale of the bridge, the incompatibility of the structure with the landscape, prominence of the structure across the skyline and also operational impacts of traffic, in particular heavy transport vehicles, on the landscape values. In addition, The Narrows have internationally recognised landscape values as a place of wilderness and natural environment.

The Gladstone Pacific Nickel Project and the Wiggins Island Coal Terminal will contribute to an increase in the extent and scale of the industrial landscape and they have therefore also been considered in terms of cumulative impacts. However, the significance of the contribution of the Gladstone Pacific Nickel Project to cumulative impacts has been rated as minor as this project is a continuation of the industrialised precinct extending from Gladstone to Targinie. The cumulative impact significance of the Wiggins Island Coal Terminal is rated as moderate as this project will increase the industrialised waterfront around Gladstone and will create significant night lighting which will exacerbate potential night lighting impacts associated with the QCLNG Facility.

19.1.14 Waste Management

Solid and hazardous wastes generated at the QCLNG Facility were rated as having minor significance (refer to *Volume 5, Chapter 17*) on the basis that these wastes will be treated, transported and disposed of in accordance with waste management legislation, with disposal to landfill a last resort. The other proposed industrial projects within the Gladstone area will have a cumulative effect by increasing the volumes of solid and hazardous waste generated within the Gladstone Regional Council. The capacity of existing general and

hazardous landfills to accommodate this increase is discussed in *Section 19.1.2* above.

All wastewater generated at the QCLNG Facility, except for uncontaminated rainwater, will be treated before discharge or reuse. In the event of a large rain event, there is a risk that onsite retention dams containing contaminants may overflow and discharge to the Port of Gladstone. Depending on the quality of the wastewater, these uncontrolled discharges may on occasion breach marine discharge standards. Assuming that this potential risk applies to the other proposed industrial projects located in close proximity to the Port of Gladstone, there is potential for cumulative impacts to marine water quality and ecology during these high rainfall events. There is insufficient information to rate the significance of this potential cumulative impact.

19.1.15 Hazard and Risk

The hazards and risks associated with the proposed LNG Facility are similar to those of other LNG export facilities worldwide. The design and location of the terminal result in public risk levels that are clearly acceptable by the Hazardous Industry Planning Advisory Paper (HIPAP) guidelines. In assessing cumulative risk, it should be noted that there are no existing industrial facilities neighbouring the proposed LNG Facility site on Curtis Island. However, QGC is aware of proposals by others to develop compatible industrial facilities, including LNG plants, on Curtis Island adjacent to the proposed QCLNG Facility. To date, no risk assessments of these other proposed facilities have been made available.

Regardless, examination of risk contours shows that the criterion for industrial land use is contained within the QCLNG Facility site boundary (except along the coastal side of the site where contours extend into offshore (marine) areas), as is the more conservative criteria for hospitals, schools, child-care facilities, old age housing. This suggests there will be minimal impact to the risk contours of other facilities from the QCLNG Facility, assuming those other facilities also meet the applicable risk criteria.

Cumulative impacts associated with shipping hazards have not been assessed in detail, as detail on proposed shipping operations for other proposed projects on Curtis Island is not currently publicly available.

19.1.16 Conclusions

Cumulative impacts on the environment, public safety and amenity have been assessed taking into consideration the Queensland Curtis LNG (QCLNG) Project, projects that are currently underway and those known to the assessment team. The environmental values most likely to be impacted by the cumulative effect of the QCLNG Facility, together with the projects considered within the scope of the cumulative impact assessment, are terrestrial and marine ecology, noise, road transport (during construction) and visual amenity.

The increasing industrialisation of the landscape is consistent with the planning intention behind the Gladstone State Development Area (GSDA), the designation of the new Curtis Island Industry Precinct and the Restricted Development Precinct on Kangaroo Island. Furthermore, the Port Strategic Plan envisages an increase in planned port capacity to 300 million tonnes of export capacity per year within the next 50 years[8], nearly four times the 2008 port throughput. The prerogative therefore lies with the Department of Infrastructure and Planning and the Gladstone Ports Corporation to ensure that individual projects within the GSDA and Port of Gladstone are designed, developed and managed so as to minimise cumulative impacts and ensure that the desired coastal outcomes of the Curtis Coast Regional Coastal Management Plan for Areas of State Significance (Scenic Coastal Landscapes) are achieved as far as possible.

Overall, the assessment indicates that cumulative impacts from the QCLNG Project and other nearby infrastructure will be moderate. A summary of the impacts outlined in this chapter is provided in *Table 5.19.2* below.

Table 5.19.2 Summary of Cumulative Impacts

Impact assessment criteria	Assessment outcome
Impact assessment	Negative
Impact type	Direct
Impact duration	Long -term
Impact extent	Local
Impact likelihood	High

Overall assessment of impact significance: moderate.

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