23. LANDSCAPE AND VISUAL

This chapter describes the landscape features and character within the landscape and visual impact assessment (LVIA) study area and outlines potential landscape and visual impacts associated with the construction, operation and decommissioning of the Arrow LNG Plant. The LVIA study area extends over an area of landscape with potential to fall within the viewshed zone of theoretical visibility (ZTV) of the project.

This chapter is informed by the Arrow LNG Plant Landscape and Visual Impact Assessment undertaken by AECOM Design + Planning Australia (AECOM) (Appendix 17, Landscape and Visual Impact Assessment).

The objectives of this chapter are to describe the existing landscape features and character, discuss impacts to the landscape and visual values from the development and propose measures to mitigate these impacts, where practical.

The objectives for the landscape and visual assessment have been informed by the legislative and policy context relevant to the study area. The objectives are set out in Box 23.1.

Box23.1 Objectives: Landscape and visual

- To maintain consistency with the landscape objectives within relevant strategic planning documents such as the Development Scheme for the Gladstone State Development Area.
- To avoid or minimise major (very high) impacts on landscape features, character and designated landscapes within the study area.
- To avoid or minimise major (very high) visual impacts from representative viewpoints.

23.1 Legislative Context and Standards

This section describes the key legislation and policy relevant to landscape and visual amenity.

23.1.1 International Conventions

The Convention Concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention) provides for the protection of cultural and natural heritage. It aims to protect outstanding heritage around the world for current and future generations.

The Great Barrier Reef World Heritage Area is listed under the convention and a large part of the LVIA study area, including Curtis Island, falls within this area. For the Great Barrier Reef to obtain a World Heritage area designation, it was required to demonstrate a number of internationally significant values including aesthetic attributes. Scenic qualities are a key aspect of the Great Barrier Reef World Heritage Area designation.

23.1.2 Commonwealth and State Legislation

The following Commonwealth and state legislation is relevant to the protection of landscape and visual environmental values during the construction, operation and decommissioning of the project:

- *Great Barrier Reef Marine Park Act 1975* (Cwth). This act provides for the long-term protection and conservation of the environment, biodiversity and heritage values within the Great Barrier Reef region. The study area is located approximately 8 km due west of the area designated by the act as the Great Barrier Reef Marine Park; therefore, the legislation does not directly apply.

Those accessing the Great Barrier Reef Marine Park (e.g., via boat) may pass through the study area and potential impacts on these receptors have been considered in this assessment.

- *Australian Heritage Council Act 2003* (Cwth). The Australian Heritage Commission had, from 1975, maintained a list of significant heritage locations on the Register of the National Estate. With the introduction of the *Australian Heritage Council Act 2003*, the Register of the National Estate was closed to new entries from February 2007. The register remains a statutory instrument until February 2012. The places listed on the Register of the National Estate that fall within the study area include Curtis Island, Balaclava Island and The Narrows, Garden Island Conservation Park and Mount Larcom Range.
- *Environment Protection and Biodiversity Conservation Act 1999* (Cwth). This act has established a new national heritage system, which will replace the Register of the National Estate. This includes a National Heritage List developed to recognise and protect natural, historic and Indigenous places of outstanding heritage value to the nation. Places listed above under the Register of the National Estate have not yet been included on the new National Heritage List.
- *Nature Conservation Act 1992* (Qld). This act provides for the conservation of nature in Queensland including, indirectly, scenic values. Under the act, areas representative of the biological diversity, natural features and wilderness of the state are designated as protected areas. The northern part of Curtis Island is protected as a national park. The study area is approximately 8 km south of Curtis Island National Park at its closest point, which, due to intervening landform, is considered too distant for the values of the national park to be affected.
- *Coastal Protection and Management Act 1995* (Qld). This act provides for the protection and management of the coastal zone having regard to the guiding principles of the National Strategy for Ecologically Sustainable Development (ESDSC, 1992). The act provides for the development of a state coastal management plan and regional coastal management plans to give direction on the protection and management of coastal zones in Queensland. The Curtis Coast Regional Coastal Management Plan (CCRCMP) (EPA, 2003) is the key document designating coastal landscapes and features of scenic value within the study area. It sets out desired environmental outcomes and measures to protect the designated scenic coastal landscapes of state significance.

23.1.3 Policies and Subordinate Legislation

The following polices and subordinate legislation are relevant to landscape and visual impact assessments:

- State Policy for Vegetation Management – (DERM, 2009d). This policy has been prepared in accordance with the *Vegetation Management Act 1999* and aims to ‘conserve and enhance networks and corridors of vegetation’. Where clearing of vegetation is permitted, the policy recommends that vegetation offsets are provided to ensure that the extent of vegetation and associated environmental values are retained or exceeded.
- Development Scheme for the Gladstone State Development Area (DERM, 2008). This land use planning instrument was prepared under the *State Development and Public Works Organisation Act 1971* and is used to guide future development in the Gladstone State Development Area. The area is divided into precincts and subprecincts considered suitable for industrial development of national, state and regional significance, as well as complementary industrial, infrastructure and services uses. The scheme requires that development at Curtis

Island have regard to the physical characteristics of the land when considering the location of the industrial development. Furthermore, the scheme seeks to physically separate industrial activities within the Curtis Island Industry Precinct from the adjoining Environmental Management Precinct. With the exception of the proposed TWAF 7 and TWAF 8 sites, the project falls within the Gladstone State Development Area.

- State Planning Policy 1/92: Development and the Conservation of Agricultural Land. This policy aims to protect good quality agricultural land as a major economic resource for the region and may also indirectly result in the preservation of rural landscapes. However, only a small area of land within the study area (associated with TWAF 8) is classified as good quality agricultural land.

23.1.4 Local Planning Schemes

The project falls entirely within the Gladstone Regional Council area, a newly formed council created from the amalgamation of Gladstone City, Miriam Vale Shire and Calliope Shire councils. As the Gladstone Regional Council is in the process of preparing a new planning scheme to replace the existing planning schemes applying to the former jurisdictions, the local planning schemes for two of the previous local council areas within which the project is located remain relevant:

- Calliope Shire Planning Scheme (CCC, 2007b). The majority of the study area falls within the former Calliope Shire area. The Development Scheme for the Gladstone State Development Area supersedes development controls applied by the Calliope Shire Planning Scheme across much of the study area with the exception of TWAF 8, which is currently zoned rural.
- Gladstone City Council Planning Scheme (SKM, 2006). Part of the study area falls within the former Gladstone's City Council planning area, in particular the TWAF 7 site, which is zoned as open space. The mainland tunnel launch site and tunnel spoil disposal site are zoned rural and fall within the Yarwun Precinct of the Gladstone State Development Area. The development controls in the Gladstone State Development Area scheme override the Gladstone City Council planning scheme.

23.2 Assessment Method

The assessment was developed with reference to accepted international guidelines, primarily UK Guidelines for Landscape and Visual Impact Assessment (Wilson, 2002). Australia does not have accepted national or state guidelines for landscape and visual amenity assessment, except in relation to wind farm development.

23.2.1 Baseline Assessment

A baseline study was completed to understand the existing landscape and visual resource. The study involved:

- A desktop analysis to develop an understanding of the landscape character types and features within the study area, sensitive viewer groups and views. This involved gathering existing information relevant to the study area and adjacent areas (e.g., legislation, aerial imagery, cadastral data, land use information, details on environmental features). A ZTV assessment was undertaken using ESRI ArcGIS software to map the area within which the project may influence or affect views and visual amenity, and potential viewpoints were identified. Two ZTVs were created as follows:

  - A ZTV of the development scenario with the highest impact excluding the emergency flare stack. This ZTV is of the most visible components of the LNG plant and includes the proposed construction camp, four LNG trains and associated stacks, the LNG pipe racks, the LNG storage tanks and the Boatshed Point materials offloading facility (MOF) option.
  - A ZTV of the LNG plant emergency flare stack only. This is the highest component on site (110 m) and represents the greatest extent of potential visibility.

- Field surveys to verify and refine the landscape and visual resource. Field surveys were carried out in March 2010 and April 2011 to groundtruth the potential landscape character types in the field, verify and photograph assessment viewpoints and identify existing light sources.
- Development of a definition, description and illustration of the landscape and visual baseline. Broad landscape character types were mapped and described based on the desktop analysis, field surveys and liaison with specialists in the project team. The visual baseline was assessed and described in terms of views from selected representative viewpoints within the study area. The current level and sources of lighting within the study area were determined based on information collected during field surveys in non-daylight hours.

23.2.2 Impact Assessment

The impact assessment was undertaken to understand the sensitivity of the landscape and visual resource to change, the magnitude of change to the landscape and views and the significance of this change. Each of these elements of the assessment is described below. The assessment considered the significance of change to the landscape and views but did not attempt to evaluate this change as either positive or negative. The LVIA (Appendix 17, Landscape and Visual Impact Assessment) considers the project against two scenarios:

- An assumed baseline scenario. This considers three other major projects as real projects as they have been approved and, in some cases, are under construction. These are the Queensland Curtis LNG (QCLNG) Project, the Gladstone LNG (GLNG) Project and the Yarwun Alumina Refinery Expansion Project (see Figure 9.2). While the latter project is considered as part of the baseline assessment, it has a negligible visual impact due to its distance from the project and is not discussed further.
- The project scenario. This is the current landscape context with the addition of the project, i.e., Arrow LNG Plant will be introduced into an ‘undeveloped’ island environment.

As the LNG plants considered under the baseline scenario are approved and under construction, the assessment against this scenario is considered to be more relevant than the project scenario. On this basis, the chapter discusses the assessment against the baseline scenario only. Details on the assessment against the project scenario are provided in Appendix 17, Landscape and Visual Impact Assessment.

The significance of a particular impact is determined by considering the sensitivity of the landscape or visual receptor and the magnitude of change expected as a result of the development. The sensitivity of the landscape to change was determined according to the extent to which it could accept change of a particular type and scale without adverse effects on its character. The sensitivity to change of viewers at selected representative viewpoints was considered to be dependent on the importance of the view and the nature of the visual receptor experiencing the view (Table 23.1).

Table 23.1 Sensitivity of view or landscape to proposal

Sensitivity	Criteria
High	Landscape: protected by national designation and/or widely acknowledged for its quality, distinctive character, low capacity to accommodate the change envisaged. View: large numbers of viewers or those with proprietary interest and prolonged viewing opportunities, views from a regionally important location.
Medium	Landscape: moderately valued landscape with some capacity to accommodate the change envisaged. View: moderate numbers of residents and visitors with an interest in their environment.
Low	Landscape: valued to a limited extent with the capacity to accommodate the change envisaged. View: small numbers of visitors with a passing interest in their surroundings, viewers whose interest is not specifically focused on the landscape.
Negligible	Landscape: not valued for its scenic quality and tolerant of the type of change envisaged. View: very occasional numbers of viewers with a passing interest in their surroundings.

The magnitude of change to a landscape or visual receptor is based on the nature, scale and duration of the change that is expected to occur. The magnitude assessment for landscape impacts is based on a worst-case scenario of the area of the landscape character type (LCT) that would be impacted to the greatest extent by the project (Table 23.2).

Table 23.2 Magnitude of change in view or landscape

Magnitude	Criteria
Very High (Dominant Change)	Landscape: clearly evident change, fundamentally changes the landscape character. View: major change at close distance (i.e., up to 2 km) affecting a substantial part of view.
High (Considerable Change)	Landscape: considerable change over a wide area. View: clear change at intermediate distance (i.e., 2 to 5 km) resulting in significant new element in view.
Medium (Noticeable Change)	Landscape: noticeable change that does not fundamentally change the landscape character. View: minor change at long distance (i.e., 5 to 8 km) or visible for short duration.
Low (Barely Perceptible Change)*	Landscape: imperceptible or barely perceptible change. View: barely visible at a very long distance (i.e., over 8 km), expected to blend in with existing view.

* If no changes are perceptible, a significance of 'no impact' is recorded.

The effect on a view is dependent on factors including the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, duration of view and distance from the development. Table 23.3 shows the matrix used to determine the significance of impacts.

The sensitivity of LCTs to lighting was determined through the use of environmental zones adopted from Guidance Notes for Reduction of Obstructive Lighting (ILE, 2005). These are outlined in Table 23.4.

Table 23.3 Matrix of significance – landscape and views

		Magnitude of Change in View or Landscape			
		Very High (Dominant Change)	**High (Considerable Change)**	**Medium (Noticeable Change)**	**Low (Barely Perceptible Change)**[1]
Sensitivity of View or Landscape to Proposal	**High**	Major[2]	Moderate to major*	Moderate	Minor to moderate
	Medium	Moderate to major*	Moderate	Minor to moderate	Minor
	Low	Moderate	Minor to moderate	Minor	Minor to negligible
	Negligible	Minor to moderate	Minor	Minor to negligible	Negligible

[1] If no changes are perceptible, a significance of 'no impact' is recorded.

[2] Denotes most significant impacts for consideration by decision makers.

Table 23.4 Environmental zones

Category	Description
E1	Intrinsically dark landscapes (national parks, areas of outstanding natural beauty).
E2	Low district brightness areas (rural, small villages or relatively dark urban locations).
E3	Medium district brightness areas (small town centres or urban locations).
E4	High district brightness areas (town and city centres with high levels of night time activity).

Where an area to be lit lies on the boundary of two zones, the obtrusive light limitation values used should be those applicable to the strictest zone.

The sensitivity of the viewers at the viewpoints to lighting from the development (Table 23.5) was based on:

- Whether the view is easily accessible at night or is representative of views from sensitive viewer groups at night.
- Whether the view is representative of viewers sensitive to changes in light pollution, e.g., residents, campers or visitors to a popular lookout that is visited at night.
- The distance of the viewers; closer sensitive viewers (such as viewers in residential areas, in certain businesses and tourists) will be more susceptible to changes in light levels at night.

Table 23.5 Sensitivity of a landscape to lighting impacts

Sensitivity	Criteria
High	Landscape: Zone E1 intrinsically dark landscapes with no artificial existing light sources. View: easily accessible at night by viewers.
Medium	Landscape: Zone E2 low district brightness areas that sustain some light from adjacent areas. View: relatively accessible at night.
Low	Landscape: Zone E3 medium district brightness areas, e.g., small town centres with standard street lighting. View: typically not accessed at night.
Negligible	Landscape: Zone E4 high district brightness areas, e.g., city centres with high levels of night time lighting. View: typically not accessed at night by viewers. If view is accessed, viewers are not sensitive to changes in light levels.

The magnitude assessment for lighting impacts is based on the nature, scale and duration of the change that is expected to occur (Table 23.6).

Table 23.6 Magnitude of change in view or landscape

Magnitude	Criteria
Very High (Dominant Change)	Landscape: extensive area of landscape to be well lit by the project. View: major light level changes at close distances (i.e., up to 2 km) or affecting a substantial part of view.
High (Considerable Change)	Landscape: extensive area to be partially lit or restricted areas well lit. View: clearly perceptible level of light change from intermediate distance (i.e., 2 to 5 km).
Medium (Noticeable Change)	Landscape: adjacent area to be partially lit but to retain relatively dark character. View: minor light level changes in views at long distances (i.e., 5 to 8 km).
Low (Imperceptible Change)*	Landscape: barely perceptible change in level of lighting in landscape. View: barely visible change in light level at long distances (i.e., over 8 km).

* If no changes are perceptible, a significance of 'no impact' is recorded.

Table 23.7 shows the matrix of significance utilised to determine lighting impacts.

Table 23.7 Matrix of significance – lighting impacts

		Magnitude of Change in Landscape or View caused by Lighting			
		Very High (Dominant Change)	**High (Considerable Change)**	**Medium (Noticeable Change)**	**Low (Imperceptible Change)***
Sensitivity of View or Landscape to Lighting	**High**	Major	Moderate to major	Moderate	Minor to moderate
	Medium	Moderate to major	Moderate	Minor to moderate	Minor
	Low	Moderate	Minor to moderate	Minor	Negligible
	Negligible	Minor to moderate	Minor	Negligible	Negligible

* If no changes are perceptible, a significance of 'no impact' is recorded.

Visualisations

Visualisations were prepared to develop an understanding of the potential visual impacts of the project from selected representative viewpoints. Visualisations from six of the 15 representative viewpoints were prepared. Thirteen of these views are representative of the LNG plant components and two represent views of each of the proposed TWAF sites.

Mitigation Measures and Residual Effects

Mitigation measures not inherent in the original project description were developed to avoid and reduce adverse impacts as far as reasonably practical during construction, operation and decommissioning. Residual effects from the project were then assessed assuming that all mitigation measures proposed were adopted.

23.3 Existing Environment and Social and Environmental Values

This section describes the existing environmental values that occur within the study area to establish the landscape and visual baseline against which to assess potential impacts of the project. These values consider designed landscape areas, wider landscape character and the current lighting and visual baselines.

23.3.1 Character of the Landscape

The Gladstone region is one of prolific contrasts. Heavy industry abuts distinctive natural coastal landscapes associated with Port Curtis and large-scale industrial infrastructure is viewed against the dramatic backdrop of the Mount Larcom Range.

Key high points in the local landscape (Figure 23.1) include:

- Mount Larcom (632 m Australian Height Datum (m AHD)).
- Mount Scrubby (260 m AHD).
- Mount Sugarloaf (304 m AHD).
- Ship Hill (173 m AHD).

The project itself is located over a variety of landscapes including existing natural landscapes on Curtis Island and a variety of mainland land uses such as open space, rural, strategic port and major industry and infrastructure.

With the exception of the TWAF site options and launch site 4N, most of the project lies within the Gladstone State Development Area. Within the project area, it is anticipated that, in the near future, large-scale industrial land use will occur. This will change remaining areas of rural or natural landscape characteristics to a landscape characterised by heavy and high-impact industrial development.

23.3.2 Landscape Baseline Assessment

This section describes the designated landscapes and LCTs included in the landscape baseline assessment.

Designated Landscapes Baseline Assessment

A series of designated landscapes has been identified within and around the LVIA study area based on the review of legislation and policy (see Figure 23.1). These include areas of land or particular landscape elements that are valued and protected due to their character or quality (including visual characteristics).

Table 23.8 outlines the sensitivity of each of these designated landscapes to change.

Table 23.8 Sensitivity rating of designated landscapes

Landscape Receptor		Sensitivity to Change
Great Barrier Reef World Heritage Area		High. The area is an internationally recognised and protected landscape.
Great Barrier Reef World Marine Park		High. The park is a Commonwealth protected landscape.
Australian Heritage Commission Register of the National Estate	The Narrows	High. The Narrows is a nationally protected landscape.
	Garden Island Conservation Park	Medium. While Garden Island is a nationally protected area, landscape values are not the key reason for its protection. Its recreational users nevertheless maintain an interest in landscape quality.
Australian Heritage Commission Register of the National Estate	Mount Larcom Range	Medium. Mount Larcom Range is not fully registered. However, it is considered regionally important because of its nomination for inclusion on the register and its recognised importance '. . . as a scenic backdrop to the City of Gladstone.'

Table 23.8 Sensitivity rating of designated landscapes (cont'd)

Landscape Receptor		Sensitivity to Change
Curtis Coast Regional Coastal Management Plan (CCRCMP)	Islands and Offshore Features: Curtis Island	Medium. The CCRCMP highlights features of state (as opposed to national) significance and states that incompatible development can '. . . adversely impact on their scenic natural values'. It has a low capacity to accommodate the type of development change envisaged.
	Coastal Wetlands: Curtis Island and The Narrows	Medium. Rationale as for Islands and Offshore Features.
	Estuaries and Inlets: The Narrows Estuary	Medium. Rationale as for Islands and Offshore Features. In addition, it is noted that The Narrows is considered in the CCRCMP to be a '. . . remote natural area'.
	Riverine Creeks and Corridors: Calliope River, Auckland Creek, Targinie Creek and the creek on Curtis Island	Medium. Rationale as for Islands and Offshore Features.
	Coastal Mountain Ranges: Curtis Island strike ridge and Mount Larcom Range	Medium. Rationale as for Islands and Offshore Features.
Vegetation Management Act 1999, state forestry policies, Targinie State Forest		Low. A landscape valued at the state level but not primarily for its landscape values, although it may be used by recreational users.

Landscape Character Baseline Assessment

Eight LCTs have been identified within and around the LVIA study area based on an understanding of the natural and cultural processes that have shaped the Gladstone landscape (Figure 23.2). These landscape character types are discussed below and are described in detail in Appendix 17, Landscape and Visual Impact Assessment.

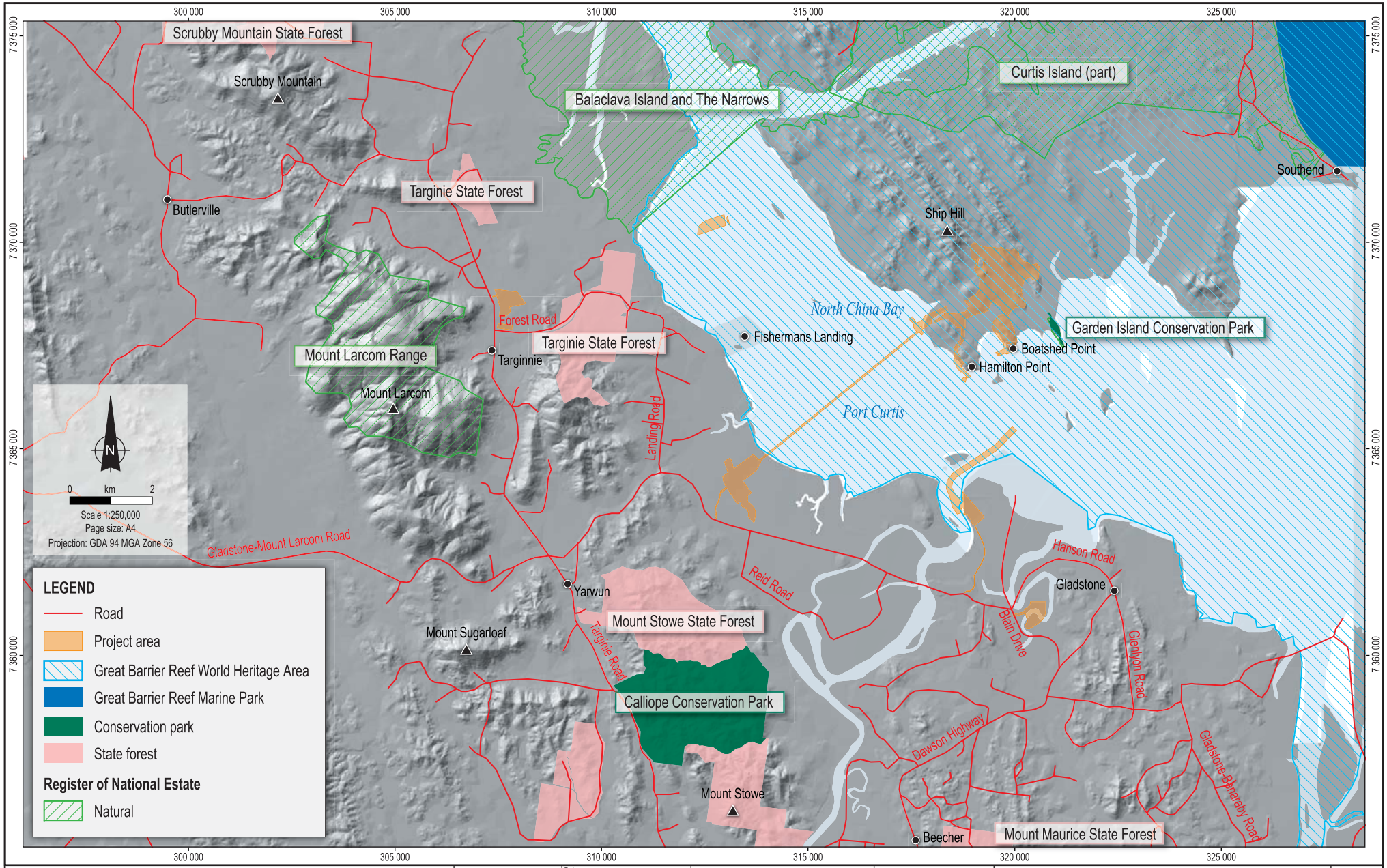
LCT 1: Forested Mountain or Ridge

The key characteristics of LCT 1 (Plate 23.1) are the elevated topography, very steep slopes, incised valley features, and some distinctive outcrops of rock that form distinct peaks, i.e., Mount Larcom. The landscape is generally covered by eucalyptus woodland or forest, and where vegetation does not occur, 360º views are achieved. This LCT is very distinct and highly visible from areas within and outside the study area.

LCT 1 was assessed as having a high sensitivity to change. This LCT is highly valued for its landscape character and scenic qualities. Areas of LCT 1 falling within the LVIA study area, including the Mount Larcom Range and Curtis Island strike ridge, are referred to in landscape designations and policy including the CCRCMP. Elevated topography increases the prominence and potential viewshed of any large-scale developments proposed. Currently there is no precedent of large-scale industry being constructed within this LCT.

LCT 2: Undulating or Flat Forest

The key characteristics of LCT 2 (Plate 23.2) are its lower topography with less pronounced gradients than LCT 1. This LCT is generally covered by eucalyptus woodland or forest with other types of vegetation around the waterways. This LCT is similar to LCT 1; however, it is on lower, less visually prominent topography.



Source
Place names and roads from DME.
World heritage areas and Register of National Estate sites from DSEWPC.
Project area and digital elevation model from Coffey Environments.
Conservation parks and state forests from EPA.
Great Barrier Reef Marine Park from GBRMPA

coffey environments

Date: 17.02.2012
MXD: 7033CA_07_GIS162_v1_3
File Name: 7033_07_F23.01_GIS_GL

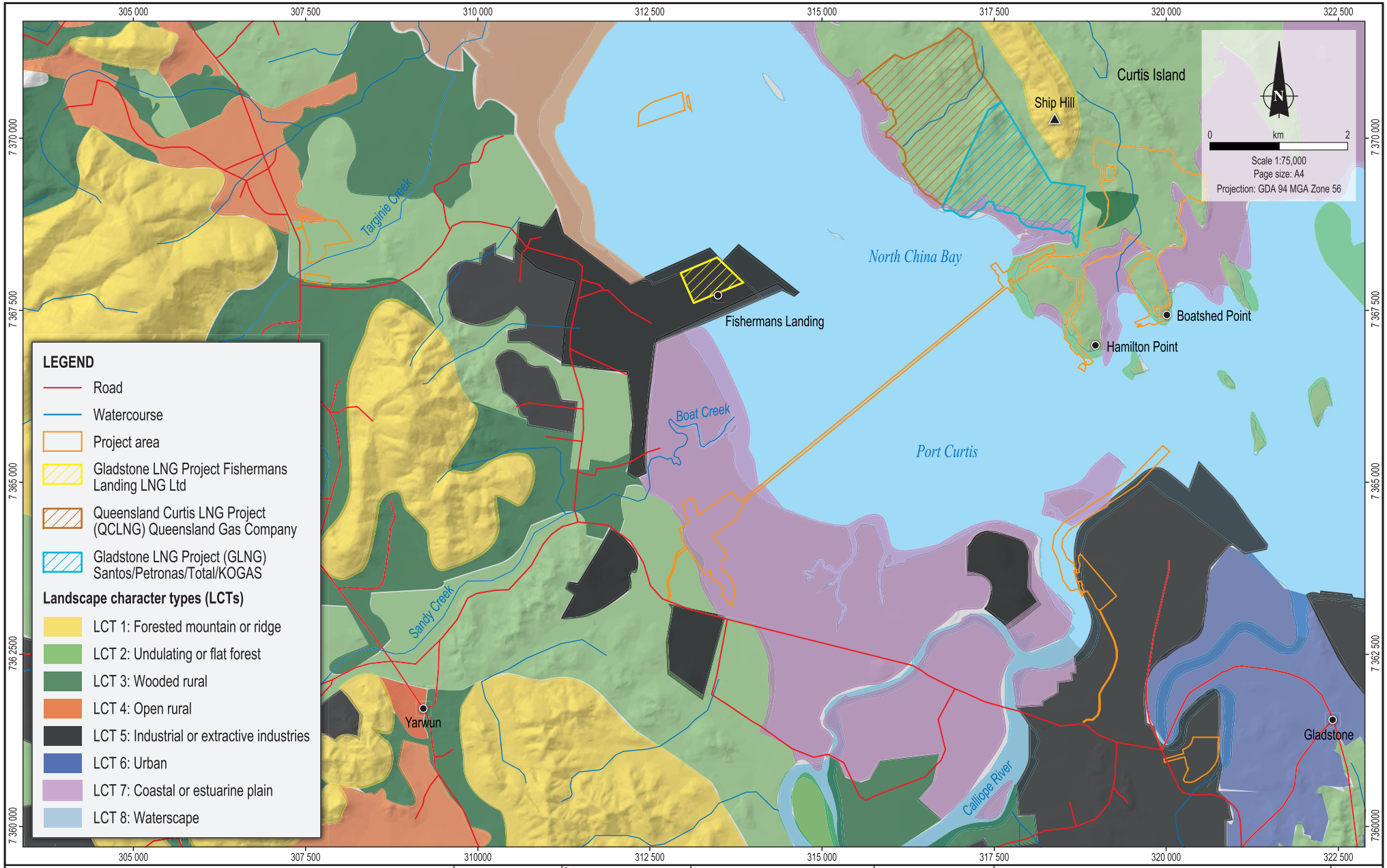
Arrow Energy

Arrow LNG Plant

arrow energy go further

Landscape and visual amenity designations

Figure No: 23.1



Source:
Place names, roads and watercourses from DME.
Landscape character types from AECOM.
Project area, land tenure proponents and digital elevation model from Coffey Environments.

coffey environments

Date: 15.11.2011
MXD: 7033CA_07_GIS156_v1_7
File Name: 7033_07_F23.02_GIS_GL

Arrow Energy

Arrow LNG Plant

arrow energy go further

Landscape character types

Figure No: 23.2

LCT 2 was assessed as having a medium sensitivity to change. This LCT is a relatively common landscape of the study area and is valued at the local level for landscape and scenic attributes. The low-lying and forested attributes limit the potential for longer distance views that give this landscape some ability to accommodate the type of change envisaged. However, the loss of mature trees and vegetation arising from this scale of development would result in the loss of the most important defining characteristics of this LCT.

LCT 3: Wooded Rural

The key characteristics of LCT 3 (Plate 23.3) are its lower topography with some more elevated ridgelines that have been grazed. The LCT is generally used for lighter cattle grazing activities with some areas of fruit production. The remaining woodland is typically remnant eucalyptus woodland or forest. Settlement comprises scattered individual farmstead properties with fence lines and property boundaries often represented by tracts of woodland or, in some cases, streams. This LCT functions as a transitional landscape between either LCT 1 or LCT 2 and LCT 4.

LCT 3 was assessed as having a medium sensitivity to change. This LCT is valued at the local level. It is a relatively common landscape type in the LVIA study area, although there are few areas on Curtis Island. The type of development envisaged would result in the loss of characteristic elements, particularly areas of mature vegetation. While the presence of trees provides some capacity for screening and integrating large-scale development into the landscape, this LCT is considered to have a limited capacity to accommodate such development.

LCT 4: Open Rural

The key characteristics of LCT 4 (Plate 23.4) are its lower topography with generally gentle gradients. Flat floodplains that may contain waterway corridors are a feature of this LCT, which has generally been used for heavier cattle grazing activities. Farmstead properties are scattered throughout this LCT. There is little remaining woodland and this LCT retains an inherently open character.

LCT 4 was assessed as having a medium sensitivity to change. It has little capacity to accommodate the type of change anticipated due to its open character and the current absence of similar developments across the LCT.

LCT 5: Industrial or Extractive Industries

The key characteristics of LCT 5 (Plate 23.5) are processing and export related industrial activities. These are typically sited on reclaimed estuarine or coastal areas, while extractive industries occur in inland undulating landscapes. The industrial activities are highly visible and provide distinctive features and landmarks. The extractive industry activities are screened from the majority of the study area, with the exception of very elevated viewing locations such as the Mount Larcom Range. The many large-scale, heavy industrial activities contain a high level of artificial light sources.

LCT 5 was assessed as having a negligible sensitivity to change. This LCT occurs extensively throughout the LVIA study area and is not valued for its scenic qualities. The project would be of similar character to the existing LCT 5 and therefore has a high capacity to accommodate change.

Source: AECOM

Plate 23.1
Typical Image of LCT 1

Source: AECOM

Plate 23.2
Typical Image of LCT 2

Source: AECOM

Plate 23.3
Typical Image of LCT 3

Source: AECOM

Plate 23.4
Typical Image of LCT 4

Source: AECOM

Plate 23.5
Typical Image of LCT 5

Source: AECOM

Plate 23.6
Typical Image of LCT 6

LCT 6: Urban

The key characteristics of LCT 6 (Plate 23.6) include the typically low-rise development with a generally enclosed character and a mixture of land uses ranging from lighter industry, residential suburbs and recreational areas. Gladstone central business district (CBD) and some residential areas afford views to Mount Larcom, Curtis Island, adjacent industrial activities and the water of Port Curtis, which are important to Gladstone's identity and visual character.

LCT 6 was assessed as having a low sensitivity to change. In isolation, this LCT would be sensitive to new large-scale, industrial development. However, the existing urban landscape is already heavily influenced by large-scale industrial activities. There are few locations within the city where views of adjacent industrial activities cannot be obtained.

LCT 7: Coastal or Estuarine Plain

The key characteristics of LCT 7 (Plate 23.7) include its flat, low-lying topography, natural, relatively uniform and uncluttered landscape and tidal mudflats or mangroves. Some areas nearer existing industrial or urban development have been degraded by indirect activities, e.g., areas south of Fishermans Landing.

LCT 7 was assessed as having a high sensitivity to change. These coastal salt plains and mangroves are distinctive landscapes and are recognised in the CCRMCP for their high scenic qualities. The coastal and estuarine plains are open and flat, allowing long distance views. This limits the capacity of this landscape to absorb the type of change envisaged by the project.

LCT 8: Waterscape

The key characteristics of LCT 8 (Plate 23.8) include its flat and open topography, visually enclosed by adjacent estuarine or coastal landscape types, Curtis Island and Mount Larcom Range. The LCT is inherently natural, and relatively uniform. Some of character of this LCT has changed to become more industrial, consistent with LCT 5. Small islands located on the southern edge of Curtis Island contain intermittent sources of artificial light with flashing channel markers and boat movement at night. Some areas near industrial sites are subject to light pollution in the form of sky glow, light trespass and glare.

LCT 8 was assessed as having a medium sensitivity to change. This is a regionally important landscape, which is valued for its scenic qualities. In isolation, this open LCT would be highly sensitive to new, large-scale industrial development. However, the existing waterscape in the study area is heavily influenced by large-scale industrial activities, and few views from, or of, Port Curtis do not include adjacent industrial activities.

23.3.3 Visual Baseline Assessment

Sensitive visual receptors have been defined as anyone who is anticipated to obtain views of any component or activity associated with the project. As it is not possible to identify and describe every person or group likely to be affected, key sensitive receptors have been identified in the LVIA study area as those who are anticipated to obtain views of the project, or are most affected by the project. These include:

- Tourists, workers and residents being ferried from Gladstone to Heron Island, Lady Musgrave Island, uninhabited coral cays and Southend.
- Recreational users of Gladstone Marina and Spinnaker Park (4.7 km south-southeast of the LNG plant).
- Recreational users of prominent lookouts such as Auckland Point, Radar Hill and Round Hill.

Source: AECOM

Plate 23.7
Typical Image of LCT 7

Source: AECOM

Plate 23.8
Typical Image of LCT 8

- Recreational users of Mount Larcom. The footpath provides a challenging trek up to the peak where uninterrupted 360º views of the Gladstone area, rural lands and Port Curtis are achieved. Glimpsed views of surrounding key features are also provided through breaks in the vegetation all the way along the trail.
- Users of Gladstone CBD (e.g., shoppers, business people).
- Residents living in properties on the north side of Round Hill, particularly those whose properties are orientated in a northerly direction.
- Residents and recreational users of Port Curtis islands. Based on the presence of buildings, it is considered that the following islands are inhabited: Tide Island (two residences), Witt Island (one residence), Turtle Island (one residence), Compigne Island (one residence) and Quoin Island (several residences, mainly on the eastern side of the island). It has been assumed that there are currently no residents living on Garden Island, Picnic Island or Diamantina Island.
- Residents at Southend and around Farmers Point on Facing Island.
- Motorists and travellers on major and minor roads throughout the LVIA study area and beyond, including Gladstone–Mt Larcom Road, Forest Road, Calliope River Road, Targinie Road and residential streets of Gladstone.

Based on the fieldwork and ZTV assessment, 15 locations were selected to assist in illustrating the visual impact of the project. Viewpoints were selected in a variety of landscape types to represent a range of views and types of viewers likely to be affected by the project. Each of the representative viewpoints is listed below:

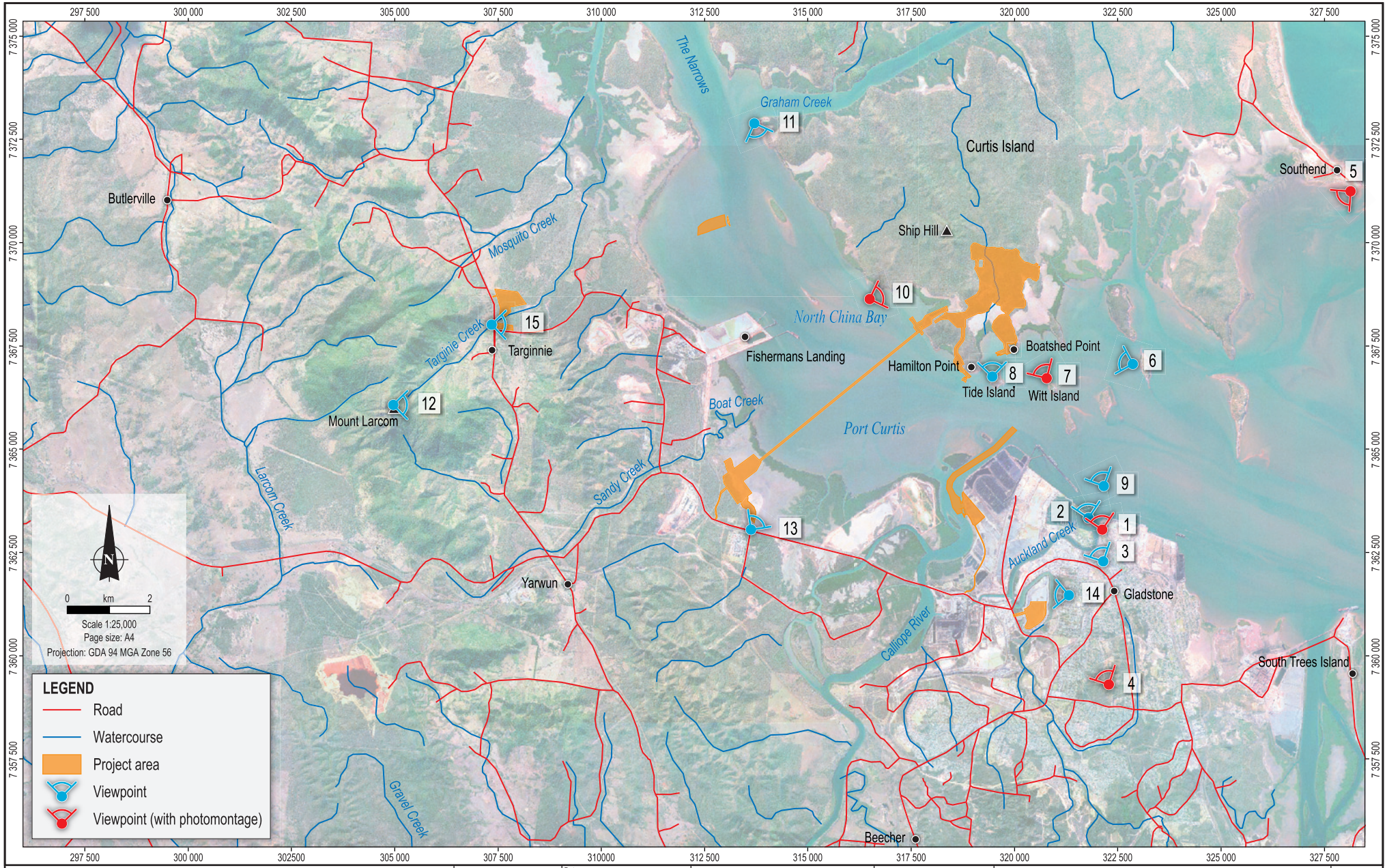
- Viewpoint 1 from Auckland Point.
- Viewpoint 2 from Spinnaker Park.
- Viewpoint 3 from Gladstone CBD (junction of Goondoon and Yarroon Streets).
- Viewpoint 4 from Round Hill Lookout.
- Viewpoint 5 from Southend.
- Viewpoint 6 from Port Curtis by Turtle Island.
- Viewpoint 7 from Port Curtis by Witt Island.
- Viewpoint 8 from Port Curtis by Tide Island.
- Viewpoint 9 from the Southend Ferry Service and the Main Shipping Channel.
- Viewpoint 10 from Port Curtis shipping channel looking east.
- Viewpoint 11 from Laird Point on Curtis Island.
- Viewpoint 12 from Mount Larcom summit.
- Viewpoint 13 from Reid Road and Gladstone–Mount Larcom Road intersection.
- Viewpoint 14 from Flinders Street.
- Viewpoint 15 from Forest Road and Targinie Road intersection.

The locations of these viewpoints are shown in Figure 23.3.

23.3.4 Lighting Baseline Assessment

A qualitative assessment was undertaken to determine existing light sources and establish the current lighting environment for the project. Eight key sources of artificial light associated with industrial activities were identified in the study area:

- Clinton Coal Terminal and Wharf (also known as RG Tanna Coal Terminal): combination of large-scale, elevated white flood-type lighting at regular spacing and lower level, orange street lighting.



Source:
Place names, roads and watercourses from DME.
Viewpoints from AECOM.
Project area from Coffey Environments.
Imagery from SPOT (2004-2007).

coffey environments

Date: 15.11.2011
MXD: 7033CA_07_GIS157_v1_2
File Name: 7033_07_F23.03_GIS_GL

Arrow Energy

Arrow LNG Plant

arrow energy go further

Location of representative viewpoints

Figure No: 23.3

- Auckland Point wharves: low-level bright white lighting associated with the silos.
- Barney Point Wharf and Coal Terminal: white bright low-level lighting.
- Queensland Alumina Limited plant: numerous low-level, scattered orange lights, similar to Rio Tinto Yarwun Alumina Refinery.
- NRG Power Station: low-level orange street lights and red lighting of three cooling towers.
- Rio Tinto Yarwun Alumina Refinery: numerous, low level, scattered orange lights, similar to Queensland Alumina Limited facility.
- Clinker Wharf and Cement Australia at Fishermans Landing: numerous scattered orange lighting and wharf cranes are also lit.
- Gladstone shipping channels: intermittent red, blue and white flashing lights from the channel markers and anticipated light from freight movement in the water.

Less prominent light sources were also identified on the mainland and within Port Curtis as follows:

- Gladstone CBD: light sources principally concentrated in the CBD and orange street lighting along major road corridors. There is also incidental lighting from residential areas.
- Southend: some incidental lighting from residential areas.
- Islands: very low level of residential light from some of the islands including Tide Island, Witt Island, Turtle Island, Quoin Island and Compigne Island.

While there are no light sources on the LNG plant site on Curtis Island and it is intrinsically dark, the area is considered to be an environmental Zone E2: low district brightness area (ILE, 2005). This is due to the presence of existing, well-lit industrial facilities, in particular the Clinton Coal Terminal, 4 km south of the Arrow LNG Plant, and the neighbouring GLNG and QCLNG projects, which are currently under construction and partially lit.

Table 23.9 presents the sensitivity rating of landscape character types and Table 23.10 presents the sensitivity of viewpoints to changes in lighting. A separate assessment has not been undertaken of lighting impact and sensitivity on designated landscapes because this was examined through the landscape character type assessment.

Table 23.9 Light sensitivity rating of landscape character types

Landscape Receptor	Sensitivity to Light Change
LCT 1: Forested Mountain or Ridge	Medium: This LCT is considered to be a Zone E2: low district brightness area. While the landscape is primarily an untouched, natural and relatively dark landscape, currently this LCT sustains some light pollution from adjacent areas in relatively close proximity (e.g., Clinton and Clinker wharves) and intermittent sources of lighting (e.g., shipping channels with lit channel markers).
LCT 2: Undulating or Flat Forest	Medium: This LCT is considered to be a Zone E2: low district brightness area. While the landscape is primarily an untouched, natural and relatively dark landscape, some light pollution is sustained from adjacent areas in relatively close proximity (e.g., Rio Tinto Yarwun Alumina Refinery, Clinton and Clinker wharves) and intermittent sources of lighting (e.g., shipping channels with lit channel markers).
LCT 3: Wooded Rural	Medium: This LCT is considered to be a Zone E2: low district brightness area. While the landscape is primarily untouched, natural and relatively dark, currently some light pollution is sustained from adjacent areas in relatively close proximity (e.g., Rio Tinto aluminium smelter and the industrial and residential areas of Gladstone).

Table 23.9 Light sensitivity rating of landscape character types (cont'd)

Landscape Receptor	Sensitivity to Light Change
LCT 4: Open Rural	Medium: This LCT is considered to be a Zone E2: low district brightness area. While the landscape is primarily untouched, natural and relatively dark, currently some light pollution is sustained from adjacent areas in relatively close proximity (e.g., Rio Tinto aluminium smelter, the industrial and residential areas of Gladstone and shipping channels with lit channel markers).
LCT 5: Industrial or Extractive Industries	Negligible: These areas are considered Zone E4: high district brightness area, due to the presence of large-scale industrial facilities with 24-hours-a-day lighting, including extensive floodlighting.
LCT 6: Urban	Low: The Gladstone CBD and residential suburbs are considered to be Zone E3: medium district brightness area, due to the presence of standard street lighting and light spill from houses and commercial properties.
LCT 7: Coastal or Estuarine Plain	Medium: These areas are considered to be Zone E2: low district brightness area. They are relatively dark but do sustain some light spill from intermittent sources, (e.g., shipping channels with lit channel markers) and nearby industrial facilities (e.g., Fishermans Landing).
LCT 8: Waterscape	Medium: These areas are considered to be Zone E2: low district brightness area. They are relatively dark; and much of this area is untouched, natural and relatively dark. However the area currently sustains some light pollution from adjacent areas (i.e., Clinton and Clinker wharves) and intermittent sources of lighting, (e.g., shipping channels with lit channel markers).

Table 23.10 Light sensitivity rating of viewpoints

Visual Receptor	Sensitivity to Light Change
1. From Auckland Point	Medium: A popular lookout at an intermediate distance from the site (approximately 4.8 km), which is easily accessed at night. The sensitivity to night-time impacts is lower than during the day since fewer viewers would be present. The view already contains a substantial level of light in the foreground associated with Auckland Point wharves and Clinton Coal Terminal and Wharf (Zone E4: high brightness district).
2. From Spinnaker Park	Medium: A popular park at an intermediate distance from the site (approximately 4.7 km), which may be accessed at night. The sensitivity to night-time impacts is lower than during the day since fewer viewers would be present. Some of the view already contains a substantial level of light in the foreground associated with Auckland Point wharves and Clinton Coal Terminal and Wharf (Zone E4: high brightness district).
3. From Gladstone CBD	Medium: A transient viewing location at an intermediate to longer distance (approximately 5 km), which is accessible at night and likely to be visited by people accessing restaurants and bars. This view already contains a substantial level of light in close proximity (Zone E3: medium brightness district); and further away, light associated with Clinton Coal Terminal (Zone E4: high brightness district).
4. From Round Hill Lookout	Medium: A popular lookout at some distance from the site that is easily accessed at night. The sensitivity to night-time impacts is lower than during the day as fewer viewers would be present. Also, the view already contains a substantial level of light associated with the industrial and urban land uses around Gladstone (Zones E3 and E4).
5. From Southend	Medium: A long distance view that would be infrequently accessed at night. Some of the view already contains a substantial level of light in the background associated with industrial areas around Gladstone such as Auckland Point wharves and Clinton Coal Terminal and Wharf (Zone E4: high brightness district).
6. From Port Curtis by Turtle Island	Low: At night this view is expected to have very few viewers and those present are expected to be working or engaged in other recreational pursuits (e.g., fishing) so their focus is unlikely to be on landscape appreciation. This view experiences sky glow from industrial activity on the mainland but is considered a low level brightness district (Zone E2). There are very few residents on Turtle Island; however, they would have a slightly greater sensitivity to lighting impacts (medium).

Table 23.10 Light sensitivity rating of viewpoints (cont'd)

Visual Receptor	Sensitivity to Light Change
7. From Port Curtis by Witt Island	Low: As for Turtle Island above. Again, individual residents may have a greater sensitivity level (medium).
8. From Port Curtis by Tide Island	Low: As for Turtle Island above. Again, individual residents may have a greater sensitivity level (medium).
9. From the Southend Ferry Service and the Main Shipping Channel	Low: Typically this view would not be accessed at night by recreational viewers, although it would be viewed by workers using the shipping channel (whose presence would be transient and whose interest is not likely to be focused on landscape appreciation).
10. From Port Curtis Shipping Channel	Low: Typically this view would not be accessed at night by recreational viewers, although it would be viewed by workers using the shipping channel (whose presence would be transient and whose interest is not likely to be focused on landscape appreciation).
11. From Laird Point on Curtis Island	Medium: A popular camping spot at an intermediate to longer distance from the site (approximately 5.5 km), which may be accessed at night. Some of the view already contains a substantial level of light in the foreground associated with Auckland Point wharves and Clinton Coal Terminal and Wharf (Zone E4: high brightness district).
12. From Mount Larcom summit	Negligible: A view at a long distance from the site (13 km approximately). It would be extremely rare for this view to be accessed at night, and if so, only by a very small number of recreational users. While Mount Larcom is inherently a low brightness district (Zone E2), there are already considerable light sources in the environment associated with industrial and urban areas.
13. From Reid Road and Gladstone–Mount Larcom Road intersection	Negligible: This view would be viewed by transient receptors using the roads who are considered not to be sensitive to changes in light levels at this distance. The view already contains a substantial level of light in the background associated with Clinker Wharf and Clinton Coal Terminal and Wharf (Zone E4: high brightness district).
14. From Flinders Street	Medium: A view experienced by residents of this part of the Gladstone urban area. The view already contains a substantial level of light associated with the residential area and the backdrop of the industrial area around Auckland Creek (Zone E4: high brightness district).
15. From Forest Road and Targinie Road intersection	Medium: A view experienced by a relatively small number of travellers on the Targinie Road as well as residents from Smiths Road. The view is inherently dark low-level brightness district (Zone E2).

23.4 Issues and Potential Impacts

This section identifies impacts from the project on sensitive landscape receptors (designated landscapes and LCTs) and sensitive visual receptors (sensitive viewpoints and people anticipated to obtain a view of and/or be most affected by the project).

23.4.1 Sensitive Landscape Receptors

Table 23.11 summarises the identified impacts from the project on designated landscapes and Table 23.12 summarises the identified impacts from the project on landscape features and character against the baseline scenario. Impacts of moderate significance and above are highlighted in these summary tables.

Table 23.11 Summary of significance of impacts on designated landscapes

Landscape Receptor	Sensitivity	Phase	Magnitude of Change (Baseline)	Significance of Landscape Impact (Baseline)
Great Barrier Reef World Heritage Area	High	Construction	Low	Minor to moderate
		Operation	Low	Minor to moderate
		Decommissioning	Low	Minor to moderate
Great Barrier Reef World Marine Park	High	Construction	Low	Minor to moderate
		Operation	Low	Minor to moderate
		Decommissioning	Low	Minor to moderate
Australian Heritage Commission Register of the National Estate				
The Narrows	High	Construction	Low	Minor to moderate
		Operation	Low	Minor to moderate
		Decommissioning	Low	Minor to moderate
Garden Island Conservation Park	Medium	Construction	High	Moderate to major
		Operation	Medium	Minor to moderate
		Decommissioning	Low	Minor to moderate
Mount Larcom Range	Medium	Construction	No impact	No impact
		Operation	No impact	No impact
		Decommissioning	No impact	No impact
Curtis Coast Regional Coastal Management Plan				
Islands and Offshore Features: Curtis Island	Medium	Construction	Medium	Minor to moderate
		Operation	Medium	Minor to moderate
		Decommissioning	Medium	Minor to moderate
Coastal Wetlands: Curtis Island and The Narrows	Medium	Construction	Medium	Minor to moderate
		Operation	High	Moderate
		Decommissioning	Low	Minor
Estuaries and Inlets: The Narrows estuary	Medium	Construction	Low	Minor
		Operation	Low	Minor
		Decommissioning	Low	Minor
Riverine Creeks and Corridors: Calliope River, Auckland Creek, Targinie Creek and the creek on Curtis Island	Medium	Construction	Low	Minor
		Operation	Low	Minor
		Decommissioning	No impact	No impact
Coastal Mountain Ranges: Curtis Island strike ridge	Medium	Construction	Medium	Minor to moderate
		Operation	Medium	Minor to moderate
		Decommissioning	Low	Minor
Coastal Mountain Ranges: Mount Larcom Range	Medium	Construction	Medium	Negligible
		Operation	Medium	Negligible
		Decommissioning	Low	Negligible
Vegetation Management Act 1999 State forestry policies Targinie State Forest	Medium	Construction	Low	Minor
		Operation	No impact	No Impact
		Decommissioning	No Impact	No Impact

Construction Impacts on Designated Landscapes

The highest impacts during construction against the baseline scenario are of a moderate to major significance.

Of all the designated landscapes, Garden Island Conservation Park (Australian Heritage Commission Register of the National Estate) will receive the impact of greatest significance (moderate to major) during construction, due to its close proximity to the construction works. Some other designated landscapes will sustain impacts of a minor to moderate significance during construction. These include the Great Barrier Reef World Heritage Area, the Great Barrier Reef World Marine Park, the Australian Heritage Commission Register of the National Estate-listed landscape of The Narrows, and the state significant Islands and Offshore Features (Curtis Island) and Coastal Mountain Ranges (Curtis Island strike ridge) landscapes included in the CCRCMP.

Construction impacts on designated landscapes are largely associated with the clearance of vegetation, particularly on Curtis Island, and the effect this will have on the perception of Curtis Island as a natural landscape.

Operational Impacts on Designated Landscapes

The most significant designated area affected by the project during operations is the Great Barrier Reef World Heritage Area. The impact on this area will be minor to moderate. The QCLNG and GLNG plants will have already modified this landscape with the development of industrial facilities amidst the largely natural landscape of Curtis Island.

The CCRCMP coastal wetlands-designated landscape will experience a moderate impact during operations. The other designated landscapes will experience a minor to moderate impact.

Construction Impacts on Landscape Character Types

The landscape character type likely to experience the greatest impact from the project during construction is LCT 7: Coastal or estuarine plain, with a moderate to major impact. LCT 1: Forested mountain or ridge and LCT 2: Undulating or flat forest will experience impacts of moderate significance.

All of these character areas will sustain direct impacts from the removal of vegetation or introduction of significant construction activities and plant within, or in close proximity, to these areas.

Operational Impacts on Landscape Character Types

Due to the operations of the mainland tunnel launch site, tunnel spoil disposal area and marine infrastructure, the greatest impact on landscape character of moderate to major significance will be on LCT 7: coastal or estuarine plain. LCT 1: forested mountain ridge, and LCT 2: undulating or flat forest, will experience impacts of moderate significance. The area of LCT 1 is affected indirectly from the industrialisation of its landscape setting. LCT 2 will sustain direct impacts from the introduction of new infrastructure. Within the area of LCT 2 affected, the forest will be entirely cleared and the undulating and organic landform will be regraded to regular angular forms.

Landscape receptors located at a greater distance from the site, e.g., Mount Larcom Range, will sustain a lower magnitude of change and subsequent significance rating because there will be no direct impacts on landscape character. These settings are already affected by existing industrial activities in the study area.

Decommissioning

At decommissioning, the identified impacts on designated landscapes and landscape character values will decline. At this stage the remaining impacts will be, at greatest, of minor to moderate significance with many designated landscapes and LCTs recording minor, negligible or no impact during this phase.

Table 23.12 provides a summary of the significant of impacts on landscape character types.

Table 23.12 Summary of significance of impacts on landscape character types (LCTs)

Landscape Receptor	Sensitivity	Phase	Magnitude of Change (Baseline)	Significant Landscape Impact (Baseline)
LCT 1: Forested Mountain Ridge	High	Construction	Medium	Moderate
		Operation	Medium	Moderate
		Decommissioning	Low	Minor to moderate
LCT 2: Undulating or Flat Forest	Medium	Construction	High	Moderate
		Operation	High	Moderate
		Decommissioning	Low	Minor
LCT 3: Wooded Rural	Medium	Construction	Medium	Minor to moderate
		Operation	Medium	Minor to moderate
		Decommissioning	Low	Minor
LCT 4: Open Rural	Medium	Construction	Low	Minor
		Operation	No impact	No impact
		Decommissioning	No impact	No impact
LCT 5: Industrial or Extractive Industries	Negligible	Construction	Low	Negligible
		Operation	Low	Negligible
		Decommissioning	Low	Negligible
LCT 6: Urban	Low	Construction	Low	Negligible
		Operation	Low	Negligible
		Decommissioning	No impact	No impact
LCT 7: Coastal or Estuarine Plain	High	Construction	High	Moderate to major
		Operation	High	Moderate to major
		Decommissioning	Low	Minor to moderate
LCT 8: Waterscape	Medium	Construction	Medium	Minor to moderate
		Operation	Medium	Minor to moderate
		Decommissioning	Low	Minor

23.4.2 Sensitive Visual Receptors

This section describes the significance of impacts of the project on sensitive visual receptors, including the identified viewpoints.

Zone of Theoretical Visibility (ZTV) Analysis

Two ZTV analyses were undertaken to form a preliminary representation of the likely visual envelope of the different project components.

Figure 23.4 shows the visual envelope identified under the two ZTV analyses. It illustrates how the existing topography limits the visual influence of the LNG plant. For both the 110-m-high flare and the lower facilities, of which the 45-m-high LNG storage tanks will be the most prominent, the computer model illustrates that the existing topography plays a significant role in curtailing views. To the west and south, Mount Larcom and the Mount Martin Range represent the viewshed limit. To the north, the Curtis Island strike ridge system curtails any potential views from the eastern side of Curtis Island. Notably, due to the significantly elevated topography in these locations, there is little difference in the ZTVs generated for the highest and lower LNG plant components.

Visual Impact Assessment

Table 23.13 summarises the visual impacts on each of the selected representative viewpoints (see Figure 23.3). A range of impacts are identified with visual significance ranging from no impact to moderate when compared against the baseline scenario, which includes the QCLNG and GLNG projects. Impacts of moderate significance and above are highlighted.

Table 23.13 Summary of visual impact assessment evaluation

Visual Receptor	Sensitivity	Phase	Magnitude of Change (Baseline)	Significance of Visual Impact (Baseline)
Viewpoint 1: Auckland Point	High	Construction	Medium	Moderate
		Operation	Medium	Moderate
		Decommissioning	Low	Minor to moderate
Viewpoint 2: Spinnaker Park	High	Construction	Medium	Moderate
		Operation	Medium	Moderate
		Decommissioning	Low	Minor to moderate
Viewpoint 3: Gladstone CBD	Medium	Construction	Medium	Minor to moderate
		Operation	Medium	Minor to moderate
		Decommissioning	Low	Minor
Viewpoint 4: Round Hill Lookout	High	Construction	Medium	Moderate
		Operation	Medium	Moderate
		Decommissioning	Low	Minor to moderate
Viewpoint 5: Southend	High	Construction	Low	Minor to moderate
		Operation	Low	Minor to moderate
		Decommissioning	No impact	No impact
Viewpoint 6: Near Turtle Island	Medium	Construction	High	Moderate
		Operation	High	Moderate
		Decommissioning	Low	Minor
Viewpoint 7: Near Witt Island	Medium	Construction	High	Moderate
		Operation	High	Moderate
		Decommissioning	Medium	Minor to moderate
Viewpoint 8: Tide Island	Medium	Construction	High	Moderate
		Operation	High	Moderate
		Decommissioning	Medium	Minor to moderate

Table 23.13 Summary of visual impact assessment evaluation (cont'd)

Visual Receptor	Sensitivity	Phase	Magnitude of Change (Baseline)	Significance of Visual Impact (Baseline)
Viewpoint 9: Southend ferry	Medium	Construction	High	Moderate
		Operation	High	Moderate
		Decommissioning	Low	Minor
Viewpoint 10: Close to shipping channel	Medium	Construction	High	Moderate
		Operation	High	Moderate
		Decommissioning	Low	Minor
Viewpoint 11: Laird Point	High	Construction	Low	Minor to moderate
		Operation	Low	Minor to moderate
		Decommissioning	No impact	No impact
Viewpoint 12: Mount Larcom	High	Construction	Medium	Moderate
		Operation	Medium	Moderate
		Decommissioning	No impact	No impact
Viewpoint 13: Reid Road and Gladstone–Mount Larcom Road intersection	Low	Construction	High	Minor to moderate
		Operation	Low	Minor to negligible
		Decommissioning	Low	Minor to negligible
Viewpoint 14: Flinders Street	Medium	Construction	High	Moderate
		Operation	No impact	No impact
		Decommissioning	No impact	No impact
Viewpoint 15: Forest Road to Targinie Road intersection	Medium	Construction	High	Moderate
		Operation	Medium	Minor to moderate
		Decommissioning	No impact	No impact

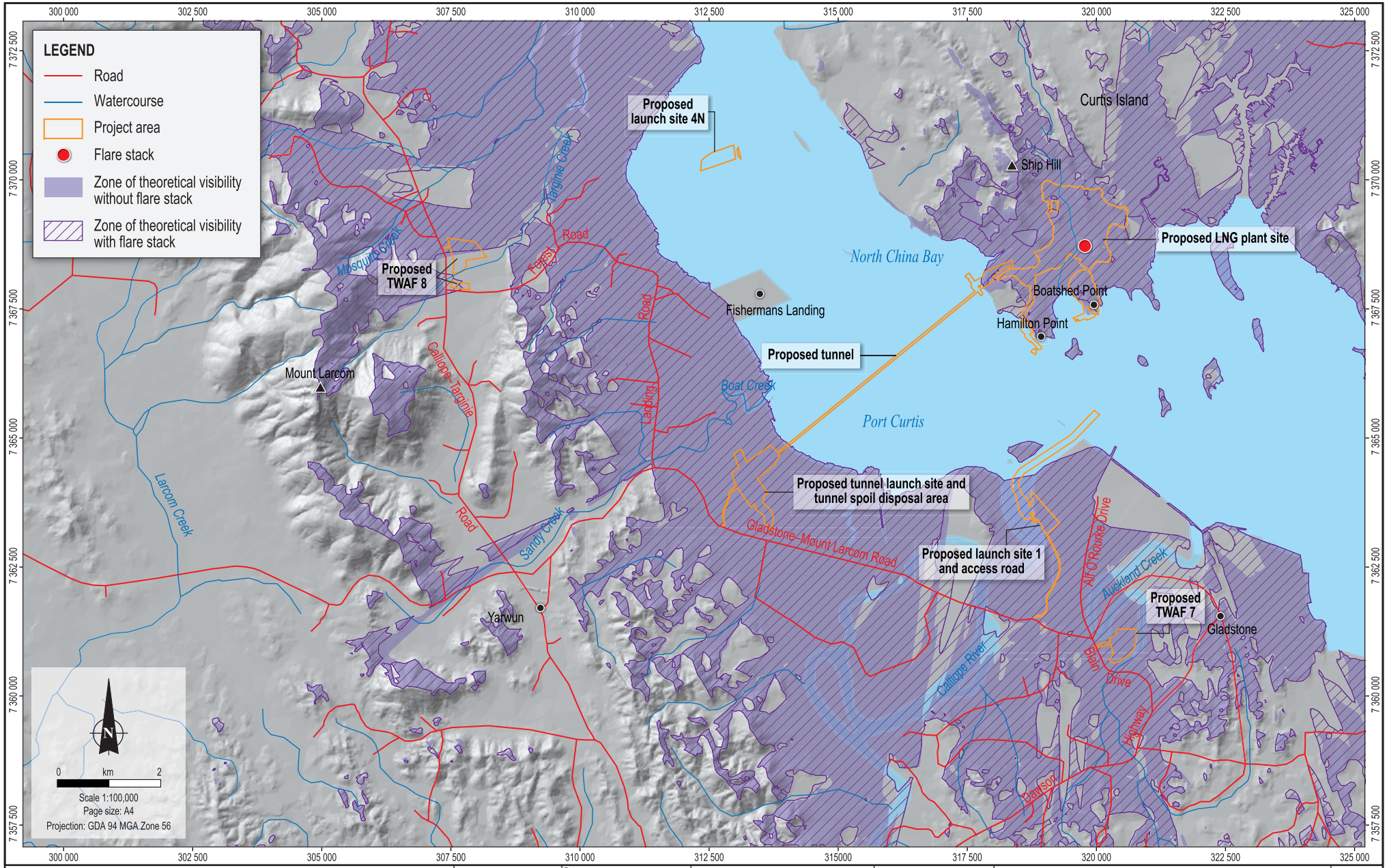
For most viewpoints, construction and operational impacts will have the same level of significance of visual impact. Those viewpoints with a visual significance of moderate or above are discussed below, as is viewpoint 5 at Southend. For the remaining viewpoints, the Arrow LNG Plant will be absorbed within the industrialised context, having either negligible or no visibility.

At decommissioning, the impact reduces for nearly all views to, at greatest, minor to moderate.

Viewpoint 1: Auckland Point

Viewpoint 1 is located just north of Gladstone CBD at Auckland Point lookout. It provides an impressive panoramic view principally looking west, north and east, of over 180º (Plate 23.9). The Arrow LNG Plant, including key components of the main complex, will be partially visible from this viewpoint (Plate 23.10).

This viewpoint will experience an impact of moderate significance during construction and operation. Construction traffic will be present across Port Curtis from other developments being constructed. During operation, the large LNG tankers associated with the other baseline developments will also already be present, creating a context of industrial development.



Source:
Place names, roads and watercourses from DME.
Zone of theoretical visibility and flare stack from AECOM.
Project area and digital elevation model from Coffey Environments.

coffey environments

Date: 15.11.2011
MXD: 7033CA_07_GIS158_v1_2
File Name: 7033_07_F23.04_GIS_GL

Arrow Energy

Arrow LNG Plant

arrow energy go further

Zone of theoretical visibility of Arrow LNG Plant

Figure No: 23.4

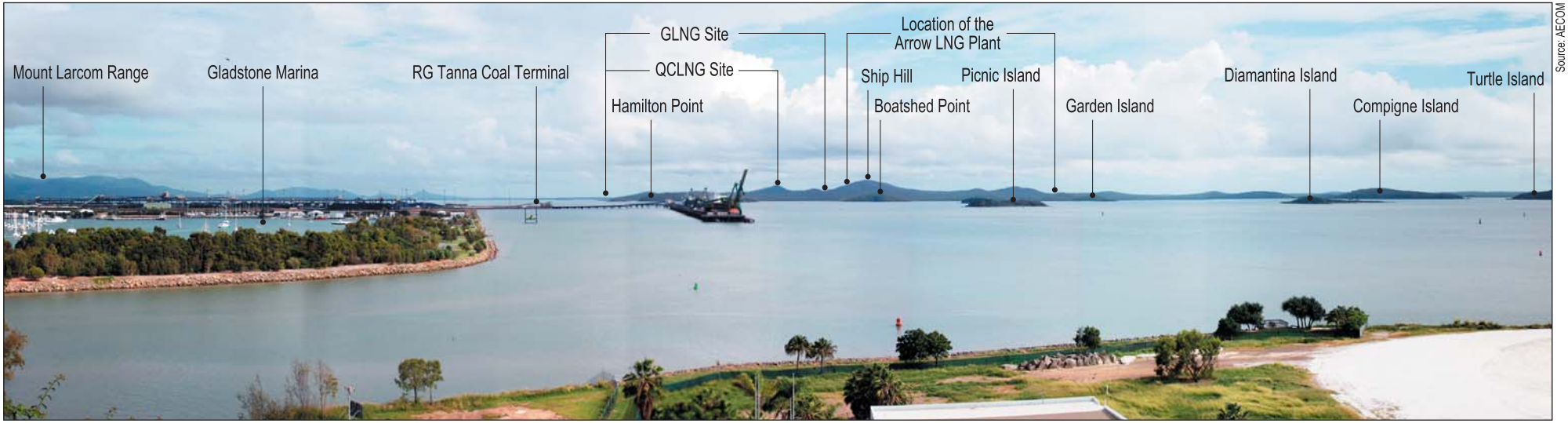


Plate 23.9 View from Auckland Point (Viewpoint 1)

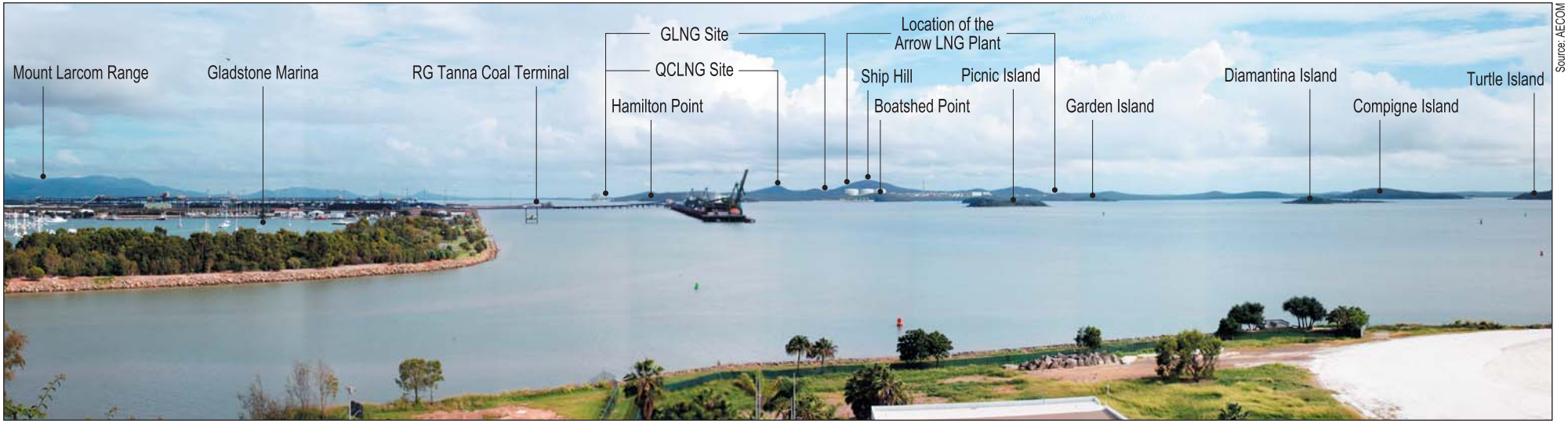


Plate 23.10 Artistic impression (visualisation) showing potential view from Auckland Point

Note:
The GLNG and QCLNG projects have not been represented as detailed information on these projects required for the visualisation was not available.

Viewpoint 2: Spinnaker Park

This viewpoint is situated at the eastern end of Spinnaker Park in Gladstone Marina Complex. The view is taken from the part of Spinnaker Park that is most affected by the project.

The majority of the LNG plant site will be obscured by the RG Tanna Coal Terminal in the foreground of the view, leaving only some eastern parts of the facility visible. The LNG plant will be more prominent in view than the two considered in the baseline scenario (QCLNG and GLNG). This viewpoint will experience an impact of moderate significance during construction and operation.

No visualisation has been prepared from this viewpoint because the majority of the plant will be screened by existing industrial infrastructure.

Viewpoint 3: Gladstone CBD

No impacts of moderate significance or above were identified at this viewpoint.

Viewpoint 4: Round Hill Lookout

Viewpoint 4 is located at the Round Hill Lookout, a distinct knoll (134 m AHD) approximately 2 km south of Gladstone CBD. It provides an impressive view through strategically placed breaks in the hillside vegetation, with views principally orientated west, north and east (Plate 23.11).

The long distance from this viewpoint to the project, affords views of the entire LNG plant (Plate 23.12). While the perceived industrialisation arising from the baseline-approved LNG plants will change the visual character of Curtis Island from a natural island to an extension of Gladstone, the Arrow LNG Plant will be the most prominent plant from this vantage point. It will remain noticeable during construction and operation. The significance of impact is assessed as moderate.

Viewpoint 5: Southend

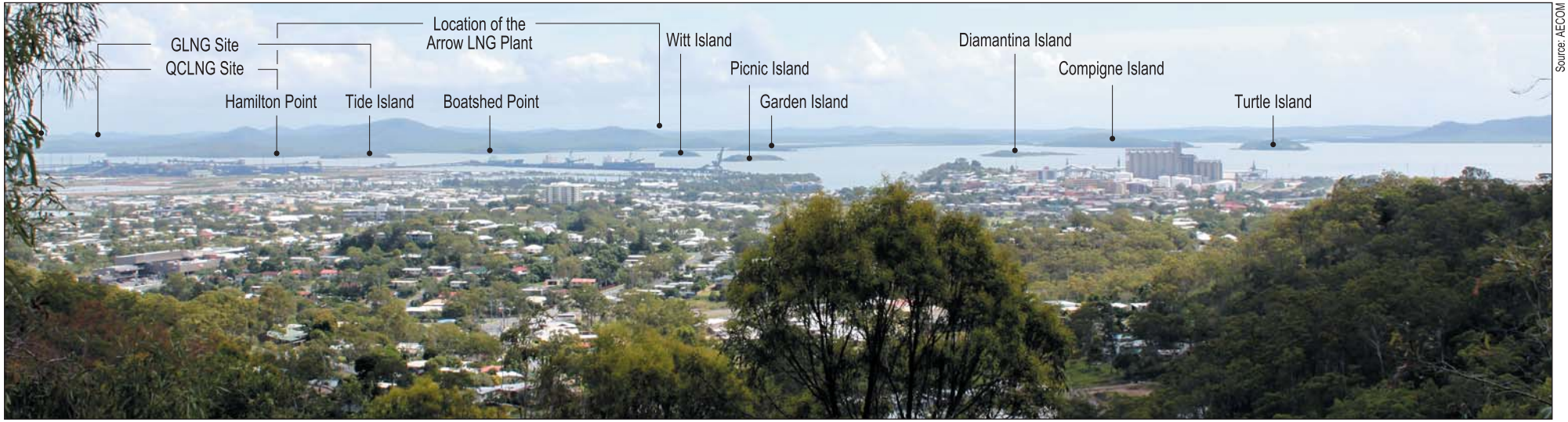
This viewpoint is from the Southend settlement, approximately 7 km northeast of the Arrow LNG Plant. The view affords an impressive, wide, panoramic view of over 180º and is orientated southwest across the LCT 7 estuarine and LCT 8 waterscape types of Pelican Banks, towards the LNG site (Plate 23.13).

This viewpoint will experience an impact of minor to moderate significance during construction and operations. Limited views of the Arrow LNG Plant will be available from this viewpoint as landform and vegetation will curtail most views and it will be largely hidden behind the ridgeline (Plate 23.14). The main impact during operation will arise from lighting. Possible views of the upper component of the emergency flare stack will be barely perceptible (Plate 23.15). The other LNG baseline projects will not be visible from this viewpoint.

Viewpoint 6: Turtle Island

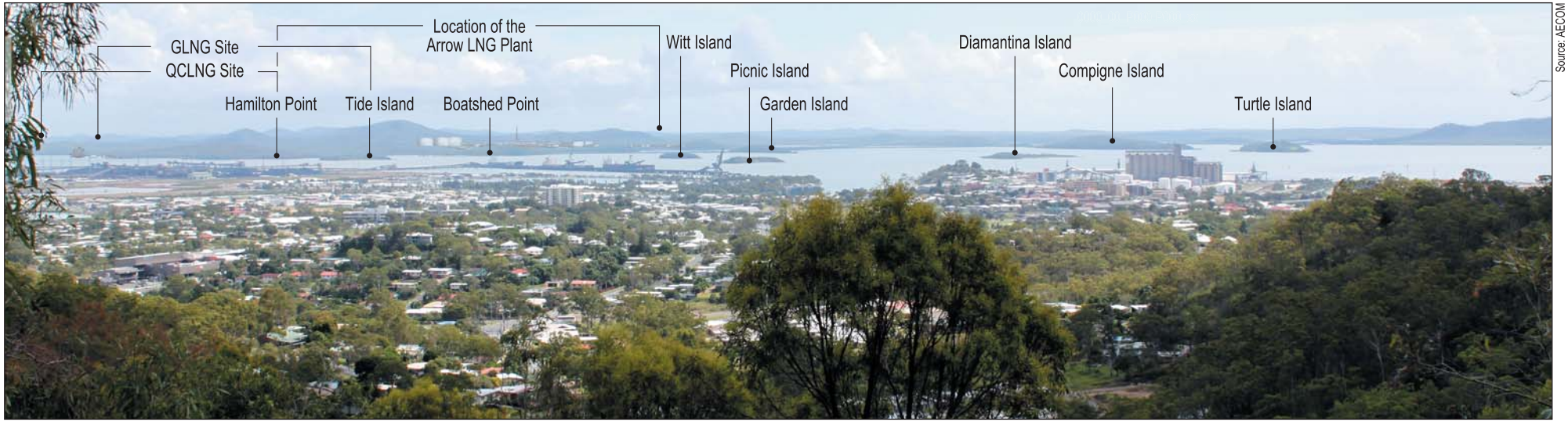
This viewpoint is from Port Curtis waterway (LCT 8), immediately adjacent to Turtle Island, and provides a clear, open and wide panoramic view of Curtis Island and the adjacent islands.

This viewpoint will experience an impact of moderate significance during construction and operations. While views of the other baseline projects will lead to a slight reduction in the extent to which the Arrow LNG Plant contrasts with the existing view, the Arrow LNG Plant will be the most dominant industrial element in this view.



Source: AECOM

Plate 23.11 View from Round Hill Lookout (Viewpoint 4)



Source: AECOM

Plate 23.12 Artistic impression (visualisation) showing potential view from Round Hill Lookout

Note:
The GLNG and QCLNG projects have not been represented as detailed information on these projects required for the visualisation was not available.

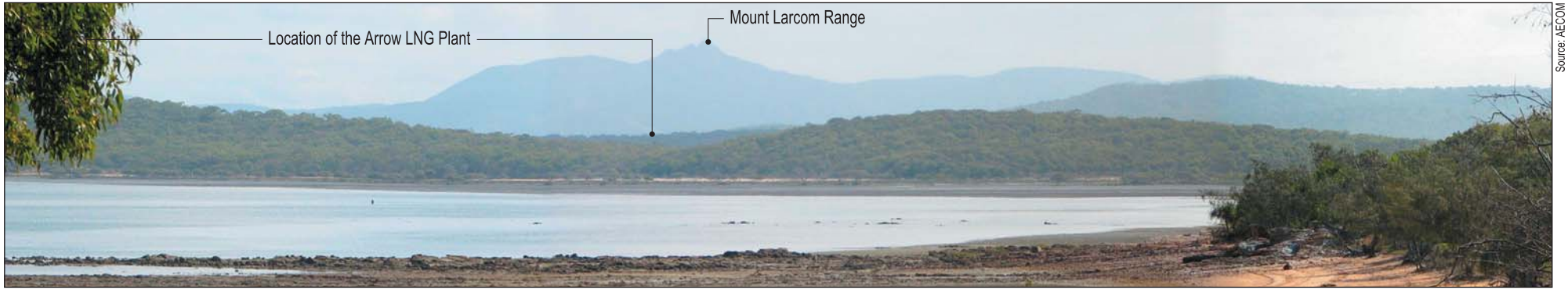


Plate 23.13 View from Southend (Viewpoint 5)

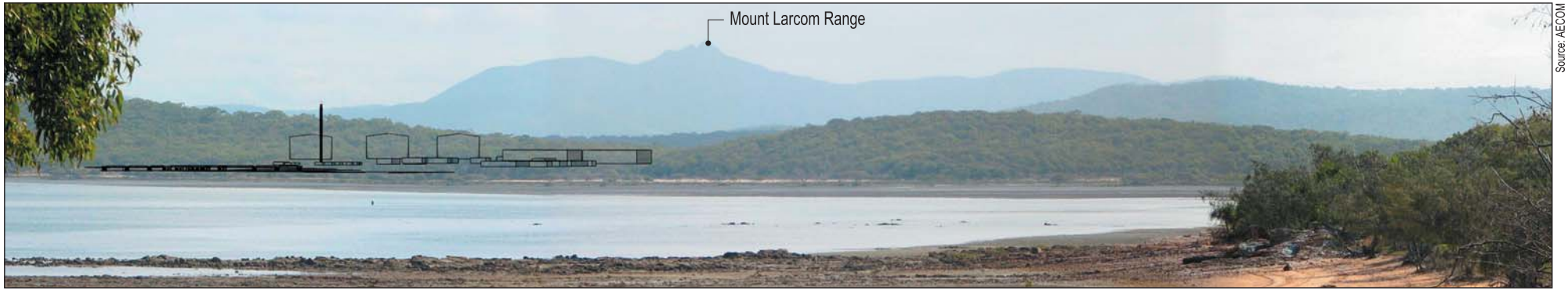


Plate 23.14 Simulation of site massing that will be hidden behind ridgeline

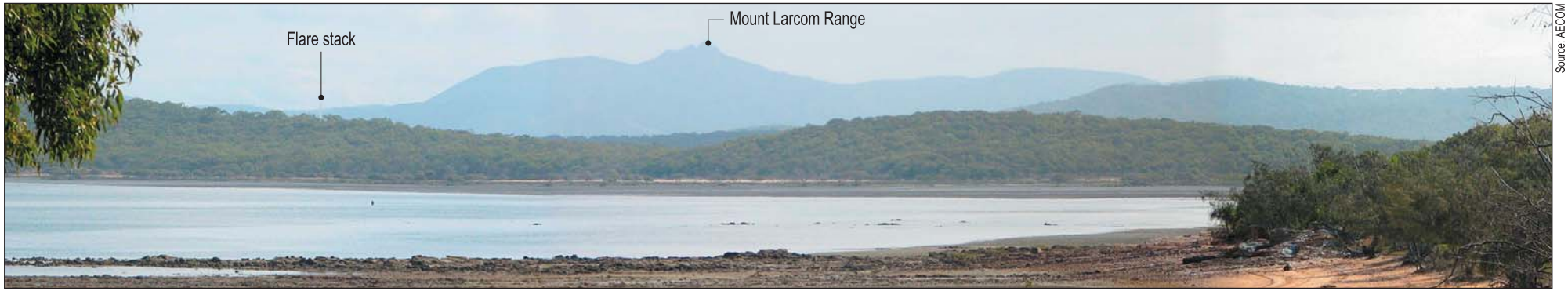


Plate 23.15 Artist impression (visualisation) showing potential view from Southend

A visualisation has not been prepared for this vantage point as it would show similar features to viewpoints 7 and 8, which are located closer to the LNG plant.

Viewpoint 7: Witt Island

This viewpoint is from Port Curtis (LCT 8) and provides a clear, open and wide panoramic view of the south side of Curtis Island and Tide Island (Plate 23.16). It has been included to illustrate the visual impact of the LNG plant on the resident at Witt Island and is also indicative of the view for users of Picnic, Garden and Diamantina islands.

Once operating, the upper components of the eastern side of the main LNG plant will be visible from this viewpoint (Plate 23.17). Stacks and buildings associated with the GLNG and QCLNG projects will also be visible. Against this baseline, the significance of impact has been assessed as moderate.

Viewpoint 8: Tide Island

This viewpoint is obtained from Port Curtis waterway (LCT 8), west of Tide Island, and provides a clear, open and wide panoramic view of the south side of Curtis Island including Hamilton Point and Boatshed Point (Plate 23.18). It has been included to illustrate the visual impact of the LNG plant on the residents of Tide Island. Located close to the main shipping channel, the viewpoint is one of the closest viewing locations to the Arrow LNG Plant.

The operation of the LNG plant will affect a substantial part of this view, representing a major view at close range (Plate 23.19). Stacks and buildings associated with the baseline-approved LNG plants will be visible from this viewpoint. This results in a significance assessment of moderate for this viewpoint.

Viewpoint 9: Southend Ferry Service

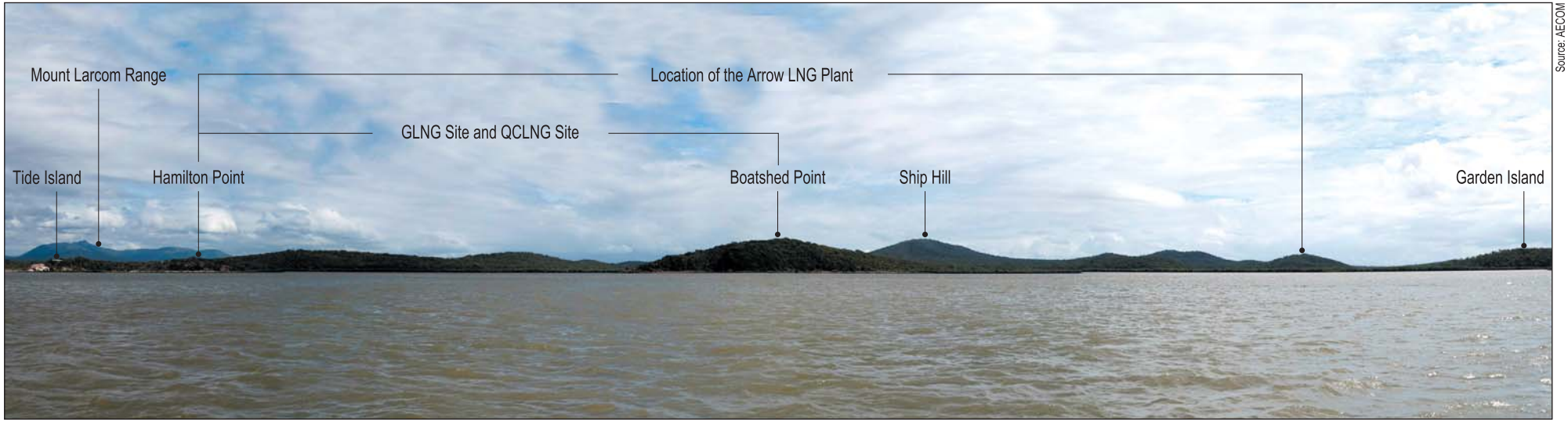
This viewpoint is from Port Curtis waterway (LCT 8), close to the main shipping channel, and the route of the Southend Ferry Service. It has been included to illustrate the impact on users of the shipping channel (both recreational and commercial) and the Southend Ferry Service.

Once operating, the larger facility elements of the Arrow LNG Plant (e.g., LNG storage tanks, LNG trains, the emergency flare stack and the main buildings complex) will be visible from this viewpoint. Taller stacks associated with the other baseline LNG plants will also be visible. This results in a significance assessment of moderate for this viewpoint.

Viewpoint 10: Port Curtis Shipping Channel

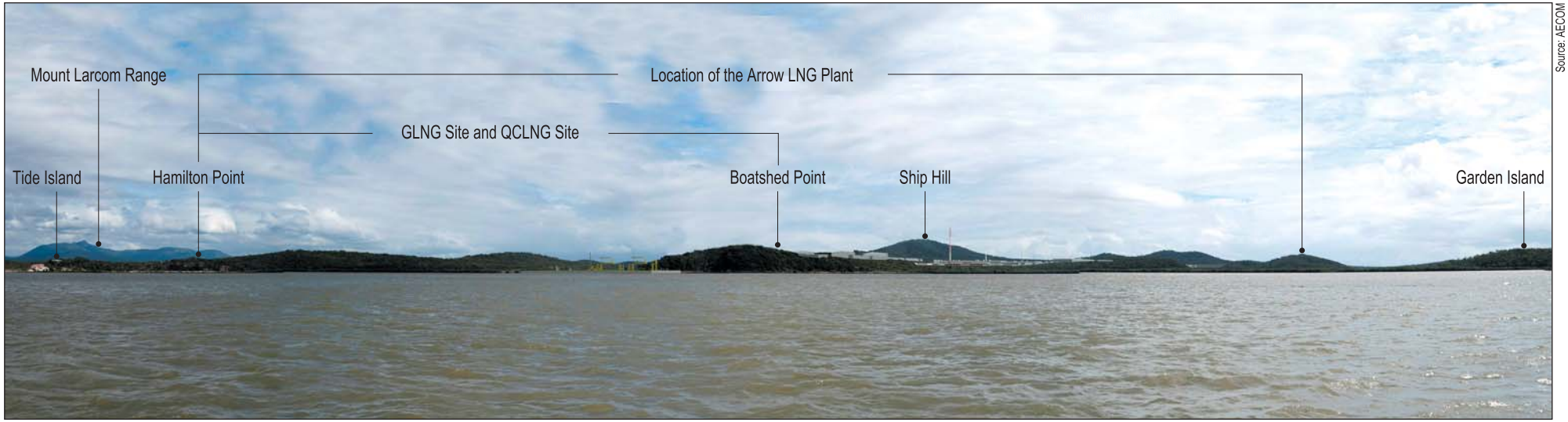
This viewpoint is located within Port Curtis waterway (LCT 8), northwest of Hamilton Point and North China Bay close to South Passage Island and the main shipping channel. The viewpoint has a clear, open and wide panoramic view of the southwestern side of Curtis Island and North China Bay (Plate 23.20). It is one of the closest viewing locations to the waterside facilities of the Arrow LNG Plant and is located adjacent to the GLNG site.

The most prominent components of the Arrow LNG Plant in this view will be the LNG storage tanks, which break the skyline above the forested landscape (Plate 23.21). From this vantage point, the GLNG plant will be a dominant element and the QCLNG plant will also be visible. Against this baseline, the contrast in the view will reduce because the construction and operation of the Arrow LNG Plant will take place against an industrialised backdrop. This results in a significance assessment of moderate for this viewpoint.



Source: AECOM

Plate 23.16 View from Witt Island (Viewpoint 7)



Source: AECOM

Plate 23.17 Artistic impression (visualisation) showing potential view from Witt Island

Note:
The GLNG and QCLNG projects have not been represented as detailed information on these projects required for the visualisation was not available.

Source: AECOM

Plate 23.18 View from Tide Island (Viewpoint 8)

Source: AECOM

Plate 23.19 Artistic impression (visualisation) showing potential view from Tide Island

Note:
The GLNG and QCLNG projects have not been represented as detailed information on these projects required for the visualisation was not available.

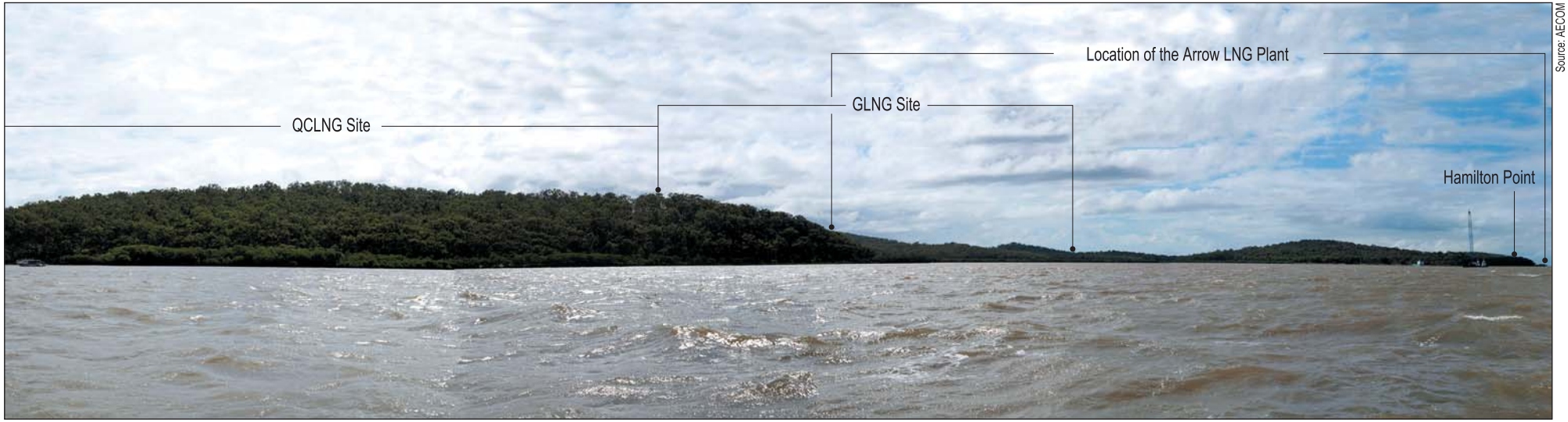


Plate 23.20 View from Port Curtis Shipping Channel (Viewpoint 10)

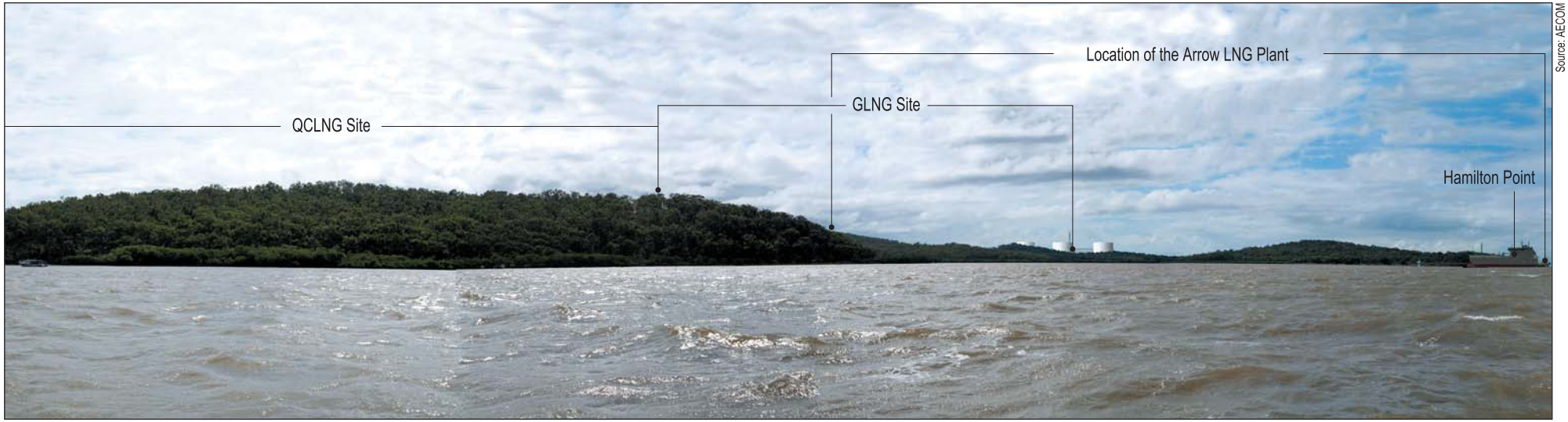


Plate 23.21 Artistic impression (visualisation) showing potential view from Port Curtis Shipping Channel

Note:
The GLNG and QCLNG projects have not been represented as detailed information on these projects required for the visualisation was not available.

Viewpoint 11: Laird Point

No impacts of moderate significance or above were identified at this viewpoint.

Viewpoint 12: Mount Larcom summit

This viewpoint is from the highest point within the LVIA study area at over 550 m AHD. It affords an impressive 360º view, encompassing the entire study area, and subsequently all landscape character types.

This long distance affords views of the entire Arrow LNG Plant, including the area of the pipeline crossing Port Curtis. At this distance, the large-scale activities and components will be visible, whereas smaller-scale activities are unlikely to be discerned. The GLNG and QCLNG projects in this view will cause the magnitude of change generated by the Arrow LNG Plant to appear considerably less during both the construction and operation phases. The Arrow LNG plant will contrast less with the industrialised character of Curtis Island. The significance of impact is moderate for this viewpoint.

Viewpoint 13: Reid Road and Gladstone–Mount Larcom Road Intersection

No impacts of moderate significance or above were identified at this viewpoint.

Viewpoint 14: Flinders Street

This viewpoint is located in a residential area west of Gladstone Hospital, in Flinders Street. This elevated vantage point offers expansive westerly views over Auckland Creek, towards the industrial precinct north of Gladstone Airport, including Gladstone Power Station.

TWAF 7 will only be present during construction; however, from this elevated vantage point, it will be highly visible during this time. The significance of impact during construction and operations for this viewpoint is moderate and no impact, respectively.

Viewpoint 15: Forest Road and Targinie Road Intersection

This viewpoint is located at Forest Road and Targinie Road intersection, north of the Forest Road turnoff close to the rural community of Targinnie. It lies adjacent to Targinie State Forest within LCT 5.

TWAF 8 will be highly visible from this viewpoint during construction. The significance of impact during construction is moderate for this viewpoint and minor to moderate during operation.

Effects on Sensitive Receptors

The assessment indicates that the project could be viewed by a large number of people living or working in Gladstone or travelling along roads and waterways within and around the study area.

The Arrow LNG Plant is located over 5 km from most sensitive viewers (e.g., residents and road users). No obstruction of sunlight will occur during the construction and eventual operation of the plant. Instead, visual impacts will be limited to impacts from facility lighting on the attractiveness and character of the view in the daytime or night-time.

The most sensitive viewpoints are from scenic lookouts and parks with a large number of viewers whose interest is focused on landscape appreciation. These include Auckland Point (Viewpoint 1, see plates 23.9 and 23.10), Spinnaker Park (Viewpoint 2), Round Hill Lookout (Viewpoint 4, see plates 23.11 and 23.12) and the summit of Mount Larcom (Viewpoint 12).

From the mainland, the most significantly affected views are those obtained from the elevated vantage points of Auckland Point (Viewpoint 1, see Plates 23.9 and 23.10) and Round Hill

(Viewpoint 4; see plates 23.11 and 23.12) within the city of Gladstone and from Mount Larcom (Viewpoint 12), although the perceived industrialisation arising from the GLNG and QCLNG projects will have changed the visual character of Curtis Island when viewed from these vantage points.

A number of viewpoints from the water and islands immediately south of the LNG plant, including Turtle Island (Viewpoint 6), Witt Island (Viewpoint 7, see plates 23.16 and 23.17), Tide Island (Viewpoint 8, see plates 23.18 and 23.19) and the Port Curtis shipping channel (Viewpoint 10, see plates 23.20 and 23.21) will also experience an impact of moderate significance. The change in these views is generally high during construction and operation.

23.4.3 Landscape and Visual Impacts of Lighting

The impact of lighting is influenced by atmospheric conditions and the level of moonlight. The worst-case scenario was considered when atmospheric conditions are assumed to be clear and moonlight is minimal. Curtis Island is not a remote site and is influenced by existing artificial light sources in the LVIA study area and surrounding areas, e.g., the highly lit and visible RG Tanna Coal Terminal, which is approximately 4 km immediately south, and Clinker Wharf and Cement Australia at Fishermans Landing, which is approximately 6 km due west, of the LNG plant.

Impact of Lighting during Construction

Lighting during construction will have at greatest, an impact of moderate significance on landscape receptors, and an impact of moderate to major significance on visual receptors. Key light sources on Curtis Island during the construction phase are the perimeter security lights, construction vehicles and lighting associated with the construction camp. The construction camp at Boatshed Point will be a highly visible, lit component in very close proximity to a small handful of sensitive visual receptors, i.e., residents on Tide, Turtle and Witt islands and occasional recreational water users. Lighting impacts will also occur at the TWAF 7 and TWAF 8 sites, including moderate impacts on landscape type LCT 4.

The baseline LNG facilities on Curtis Island will provide a lit context against which the lighting associated with the construction activities of the Arrow LNG Plant will appear less noticeable.

Impact of Lighting during Operation

Key light sources during operation will be fixed permanent lights (i.e., perimeter fencing, operational lighting and maritime lighting), the pilot light from the flare and intermittent emergency flaring. The overall significance of impacts is predicted to be similar to construction impacts for most receptors.

The greatest operational impacts on a landscape receptor are the moderate impacts for LCT 1, LCT 2, LCT 7 and LCT 8. These landscapes are currently unlit, although their character is already influenced by other significant light sources in relatively close proximity, e.g., Clinton Coal Terminal and Cement Australia at Fishermans Landing.

Many of the viewpoints have been assessed as having a lower sensitivity to night-time lighting impacts than to daytime views. This is because many of the viewpoints, particularly those associated with the islands of Port Curtis, will have infrequent visitation at night, and those in the area at this time are not likely to be focused on landscape appreciation.

There are no sensitive local viewing locations at close distance on Curtis Island. The most significant night-time effects on views are the moderate to major impacts that will be experienced by residents living on Turtle, Witt and Tide islands. Although the QCLNG and GLNG plants will

decrease the contrast of the lighting against the existing environment, the Arrow LNG Plant will be the dominant light source in these specific locations.

Impacts from the vantage points on Port Curtis will be higher, although fewer viewers will be on the water after dark. Indirect and direct light pollution sources are predicted, i.e., gentle sky glow and bright 'spots' from some sources such as the elevated flaring. Some of the existing light sources (such as Clinton Coal Terminal and Wharf) actually assist in obscuring some views. For most visual receptors in Gladstone, the majority of the impact of additional light will be an increase in sky glow and the intermittent visual impact of the elevated gas flaring during upset conditions. These receptors are over 4 km from this gas venting and the visual impact will be minor to negligible. The GLNG and QCLNG projects on Curtis Island will also provide a lit context against which the lighting associated with the operational activities of the Arrow LNG Plant will appear less noticeable.

Impact of Lighting during Decommissioning

At decommissioning, it is not anticipated that any lighting impact would remain because the sites will no longer be lit.

23.4.4 Landscape and Visual Impacts of Feed Gas Pipeline and Tunnel

While the focus of the landscape and visual assessment is on impacts associated with the LNG plant, the construction of the feed gas pipeline and tunnel also has the potential to create landscape and visual impacts.

Landscape and visual impacts associated with construction of these project components will be temporary and will relate to activities such as open trenching, the establishment of a pipeline construction right of way and other construction works that generate silt plumes. The feed gas pipeline and tunnel will not be visible during operation.

23.5 Avoidance, Mitigation and Management Measures

This section describes measures to address the potential landscape and visual impacts. The measures follow a hierarchy of avoiding the impact if possible through project design, then reducing the impact through mitigation and management.

Mitigation measures have been developed with regard to the measures identified for the various scenic coastal landscapes in the Curtis Coast Regional Coastal Management Plan (EPA, 2003).

23.5.1 Avoidance through Concept Design

Measures have been incorporated into the Arrow LNG Plant concept design to limit the landscape and visual impacts of the project. These measures have been factored into the impact assessment and are described below:

- Protect the tip of Boatshed Point from clearing and cutting to preserve areas of vegetation that help screen lower parts of the LNG plant and construction camp. [C23.01]
- Where practical, retain the vegetation along the eastern boundary of the LNG plant site to provide some screening to views from the east. [C23.02]

23.5.2 Avoidance through Detailed Design

The following site planning activities aim to assist in integrating the project facilities into their landscape and visual context:

- Consider potential landscape and visual impacts where there are options for the siting of infrastructure. [C23.03]
- Where practical, undertake further modifications to the development footprint during detailed design to minimise cutting into the high ground of the Curtis Island strike ridge system and to assist in maintaining a vegetated backdrop and visually absorbing the built form of the development. [C23.04]
- Investigate potential areas for further retention of vegetation cover at all sites where practical. [C23.05]
- Investigate opportunities for further planting of a forested landscape buffer around the eastern, southern and western boundaries of the LNG plant site, using bush regeneration techniques and endemic tree species of local provenance consistent, to the greatest extent, with the bushfire strategy. [C23.06]
- Select materials that are sensitive to the site context where plant operability is not impacted. [C23.07]
- Use a colour palette for built form that blends with the predominant background colours and which reflects natural hues from the surrounding landscape where plant operability is not impacted. [C23.08]
- Investigate the use of new insulating paints that may allow greater flexibility in the colour of LNG structures without compromising plant operability or safety aspects. [C23.09]
- Design shore protection to reflect natural forms, where practical. [C23.12]

23.5.3 Construction and Operation

The following mitigation measures aim to reduce landscape and visual impacts during construction:

- Use industry standards for the construction camp to minimise landscape and visual impacts. [C23.13]
- Develop landscape and rehabilitation plans for all project sites, particularly the selected TWAF site, which will require remediation after the first construction phase. [C23.14]
- Consider visibility of stockpiles when siting these within lay down areas, i.e., use laydown areas that are more enclosed in preference to more open areas, wherever practical. [C23.15]
- Investigate planting at the top, toe and on the retaining structure where terracing is undertaken. [C23.16]
- Consider planting of bands of screening vegetation parallel with the shoreline between elements of the LNG plant if terracing is considered impractical on Curtis Island. [C23.17]
- Remove temporary structures following completion of construction works and, where appropriate, undertake detailed grading of disturbed surfaces to achieve appropriate ground levels. [C23.18]
- Undertake planting rehabilitation works at the earliest opportunity to minimise erosion and the presence of areas of bare soil (except where technical studies indicate an alternative approach). [C23.19]

23.5.4 Lighting

The following mitigation measures aim to minimise the impact on sensitive receptors and the surrounding ecological environment from light pollution, including visual impacts at night:

- Undertake the detailed lighting design in line with Australian standards. [C23.10]
- Design aviation lighting to be consistent with the Gladstone Airport Obstacle Limitation Surface Plan (Randl, 2011). [C23.11]
- Shield/direct the light source onto work areas, where practical. [C17.16]
- Use ‘passive’ lighting methods, where practical. These include reflective roadway markers, lines, warnings or information signs and furnishing reflectors. [C23.21]
- Consider use of solar-powered LED studs, or similar, in roadways and paths of travel as an alternative to permanent lighting, where practical. [C23.22
- Minimise night-time working and associated lighting impacts for activities (including construction of the LNG plant). Limit construction activities that need to be highly lit, to daytime hours (to the greatest extent practical). [C23.20]

23.5.5 Decommissioning

The following mitigation measure aims to reduce landscape and visual impacts associated with decommissioning:

- As part of the decommissioning plan to be developed for the project, investigate an appropriate after use of project areas including any rehabilitation requirements as appropriate. [C23.23]

23.6 Residual Impacts

The mitigation measures identified for the project will reduce the landscape and visual impacts from the project at a localised (site) level. However, the significance of identified impacts is unlikely to change. This is because the size of the project components and the technical requirement to be adjacent to open water mean there is little opportunity for measures that seek to screen or hide the plant within landform, which are measures frequently used for other industrial projects.

The mitigation measures with the greatest ability to reduce landscape and visual impact have already been incorporated into the concept design for the LNG plant, e.g., terracing the landform to better integrate the LNG plant and construction camp into Curtis Island.

During construction and operation, the additional measures to be applied relate to small-scale activities that may locally reduce the perception of impacts but are not sufficiently bold enough to change the magnitude category for those impacts.

At decommissioning, the residual impact of the project will be of, at greatest, a low landscape and visual significance for all effects identified. Revegetation of the affected sites will ensure that they largely revert back to their former condition where they will be assimilated into the current character of the Gladstone landscape.

23.7 Inspection and Monitoring

Inspection activities will focus on checking for the implementation and success of landscape and rehabilitation plans developed for the project sites, particularly within those areas that assist in integrating the project into its landscape context through screening.

23.8 Commitments

The measures (commitments) that Arrow Energy will implement to manage impacts on landscape and visual values are set out in Table 23.14.

Table 23.14 Commitments: Landscape and visual

No.	Commitment
C23.01	Protect the tip of Boatshed Point from clearing and cutting to preserve areas of vegetation that help screen lower parts of the LNG plant and construction camp.
C23.02	Where practical, retain the vegetation along the eastern boundary of the LNG plant site to provide some screening to views from the east.
C23.03	Consider potential landscape and visual impacts where there are options for the siting of infrastructure.
C23.04	Where practical, undertake further modifications to the development footprint during detailed design to minimise cutting into the high ground of the Curtis Island strike ridge system and to assist in maintaining a vegetated backdrop and visually absorbing the built form of the development.
C23.05	Investigate potential areas for further retention of vegetation cover at all sites where practical.
C23.06	Investigate opportunities for further planting of a forested landscape buffer around the eastern, southern and western boundaries of the LNG plant site, using bush regeneration techniques and endemic tree species of local provenance consistent, to the greatest extent, with the bushfire strategy.
C23.07	Select materials that are sensitive to the site context where plant operability is not impacted.
C23.08	Use a colour palette for built form that blends with the predominant background colours and which reflects natural hues from the surrounding landscape where plant operability is not impacted.
C23.09	Investigate the use of new insulating paints that may allow greater flexibility in the colour of LNG structures without compromising plant operability or safety aspects.
C23.10	Undertake the detailed lighting design in line with Australian standards.
C23.11	Design aviation lighting to be consistent with the Gladstone Airport Obstacle Limitation Surface Plan (Randl, 2011).
C23.12	Design shore protection to reflect natural forms, where practical.
C23.13	Use industry standards for the construction camp to minimise landscape and visual impacts.
C23.14	Develop landscape and rehabilitation plans for all project sites, particularly the selected TWAF site, which will require remediation after the first construction phase.
C23.15	Consider visibility of stockpiles when siting these within lay down areas, i.e., use laydown areas that are more enclosed in preference to more open areas, wherever practical.
C23.16	Investigate planting at the top, toe and on the retaining structure where terracing is undertaken.
C23.17	Consider planting of bands of screening vegetation parallel with the shoreline between elements of the LNG plant if terracing is considered impractical on Curtis Island.
C23.18	Remove temporary structures following completion of construction works and where appropriate, undertake detailed grading of disturbed surfaces to achieve appropriate ground levels.
C23.19	Undertake planting rehabilitation works at the earliest opportunity to minimise erosion and the presence of areas of bare soil (except where technical studies indicate an alternative approach).

Table 23.14 Commitments: Landscape and visual (cont'd)

No.	Commitment
C23.20	Minimise night-time working and associated lighting impacts for activities (including construction of the LNG plant). Limit construction activities that need to be highly lit to daytime hours (to the greatest extent practical).
C17.16	Shield/direct the light source onto work areas where practical. Common with Chapter 17, Terrestrial Ecology, and Chapter 19, Marine and Estuarine Ecology.
C23.21	Use 'passive' lighting methods, where practical. These include reflective roadway markers, lines, warnings or information signs and furnishing reflectors.
C23.22	Consider use of solar-powered LED studs, or similar, in roadways and paths of travel as an alternative to permanent lighting, where practical.
C23.23	As part of the decommissioning plan to be developed for the project, investigate an appropriate after use of project areas including any rehabilitation requirements as appropriate.