Australia Pacific LNG Project

Volume 5: Attachments

Attachment 13: Visual Impact Assessment - LNG Facility

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Visual Impact Assessment

Final Report

Australia Pacific LNG – LNG Facility

November 2009

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AUSTRALIA PACIFIC LNG – LNG FACILITY

VISUAL IMPACT ASSESSMENT

For

Australia Pacific LNG Pty Limited

December, 2009

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GLOSSARY OF TERMS

Coal Seam Gas	A form of natural gas extracted from coal seams; primarily methane
Contrast	The degree to which a development component differs visually from its landscape setting
Integration	The degree to which a development component can be blended into the existing landscape without necessarily being screened from view
Landscape	Soft features of the urban, rural or natural environment, such as vegetation or green open space
Liquefied Natural Gas	Natural gas that has been converted to liquid form for ease of storage or transport. Liquefied natural gas takes up about 1/600th the volume of natural gas at a stove burner tip. It is odourless, colourless, non-corrosive, and non-toxic. When vaporized, it burns only in concentrations of 5 % to 15 % when mixed with air. The density of LNG is roughly 0.41 to 0.5 kg/L at -164 °C
Screen	The degree to which a development element is unseen due to intervening landscape elements such as topography or vegetation
Receptors	Sensitive component of the ecosystem that reacts to, or is influenced by environmental stressors
Remnant Vegetation	Vegetation which is mapped by the Queensland Department of Environment and Resource Management (DERM) as being within a remnant endangered regional ecosystem, a remnant of concern regional ecosystem, or a remnant not of concern regional ecosystem map. Vegetation remaining after an area has been cleared or modified
Topography	A description of the surface features of a place or region
Visual Sensitivity	The degree to which a change to the landscape will be perceived in an adverse way
Visual Effect	A measure of the visual interaction between a development and the landscape setting within which it is located
Visual Impact	A measure of a joint consideration of both visual sensitivity and visual effect that considered together determine the visual impact of a development
VCU	Visual Character Unit is a landscape area with similar visual characteristics
VCZ	The Visual Character Zones are broad tracts of landscape which have been determined by the gas field development areas. Each of the VCZs contains similar character in terms of topography, vegetation and land use
View	An area that can include land, water and or sky that is seen from a location and is the total area that is seen by the human eye at any one time
Primary View Zone	Is the most critical central part of a total view and is normally that part of the view enclosed by a cone created by angles of 30 degrees around the centre line of the view

EXECUTIVE SUMMARY

The Australia Pacific LNG Project (the Project) is a world scale, long-term export industry in Queensland. It utilises Australia Pacific LNG's substantial coal seam gas (CSG) resources in the Walloons Gas Fields, located between Roma and Dalby. Collected gas is transported to the proposed LNG facility and loaded on to ships via a loading jetty on Curtis Island at Gladstone on the central Queensland Coast.

The Project as a whole consists of three major components. The gas collection elements including: gas collection wells; compressor stations; and water treatment plants in the Walloons Gas Fields; the gas transmission pipeline and associated facilities delivering the gas to the LNG facility at Curtis Island with its ship loading jetty and associated facilities.

The visual assessment outlined in this report considers the visual impact of the Australia Pacific LNG LNG facility and associated ship loading jetty and associated facilities on Curtis Island

Specifically the study defines the visual effect and impacts of the LNG Facility and associated marine facilities on the landscape settings of the locality of Curtis Island and the projection of this into the regional landscape of Gladstone.

The visual assessment of the Project evaluated the condition of the existing landscape and the visual character of the proposed construction of the Project components to determine visual effects. The visual sensitivity of views on to the Project is considered in terms of general land use and distances of potential sensitive receptors to the Project components. A consideration of these two factors: visual effect and sensitivity, determines impact levels.

High visual effects would be created by the construction of the LNG facility and associated marine facilities on the natural setting of Curtis Island and this part of Port Curtis. However the locality has been designated for industrial purposes under the Development Scheme for the Gladstone State Development Area, so that the visual character of the facility is in keeping with that designation. Further the visual character of the LNG facility is in keeping with the character of two proposed adjoining facilities located to the south of the site.

With the exception of the waterways immediately adjacent to Curtis Island in the vicinity of the LNG facility, there are no high visual sensitivity areas within the critical foreground, middle-ground and immediate background areas up to 7.5km away. Beyond this distance the high sensitivity areas of residential areas in Gladstone have a moderate sensitivity due to their distance from the site, being more than 7.5km.

High visual impact areas are generally restricted to waterway areas up to a distance of approximately 3km.

Visual and landscape mitigation strategies developed for the LNG facility are aimed at reducing the facility's impact. The most successful mitigation strategy relates to the use of a ground flare and the retention of vegetation around the development footprint. Proper management will ensure the majority of views onto the LNG facility will illustrate the facility as visually contained and for the greater part dominated by the surrounding ridges and forest.

1.0 INTRODUCTION

1.1 General

WorleyParsons has been commissioned to prepare an Environmental Impact Statement (EIS) for the Australia Pacific LNG Project to satisfy the requirements of Part 4 of the State Development and Public Works Organisation Act 1971. The project as a whole consists of Coal Seam Gas (CSG) collection from wells constructed in the Walloons Gas Fields, in the vicinity of Miles and Chinchilla in central Queensland and piped some 450km to a Liquefied Natural Gas Facility (LNG Facility) on Curtis Island at Gladstone on the central coast of Queensland. The project has been divided into two components for project planning and environmental assessment purposes. The upstream component includes the collection and transportation of the gas from the fields to the processing facility, with the LNG facility and associated loading jetty referred to as the downstream component.

This Visual Assessment Report is a component of the EIS and focuses on the 'downstream' works associated with the Australia Pacific LNG Project. The objective of this report is to ensure that all visual impacts, direct and indirect, are fully examined and addressed.

This report has been prepared by Integral Landscape Architects and Visual Planning, for WorleyParsons Services Pty Ltd on behalf of Australia Pacific LNG Pty Limited.

The aims of this report are:

- To describe the study area and its local context in respect of landscape character and visual matters.
- To examine the proposed development's potential impact on the landscape and visual amenity of the study area, its local area and receptors within it.
- Recommend mitigation measures to be taken to mitigate adverse impacts.

A comprehensive field study was undertaken to assess the visual impacts of the proposed LNG facility development on the landscape. The field assessment of the existing landscape character in the development areas concentrated on views from public roads, harbour and other publicly accessible locations.

Evaluation of the visual implications of the proposed LNG facility was undertaken by means of a desktop study of mapped information, including topography, land use and landscape and settlement patterns.

1.2 Project Background

The Australia Pacific LNG Project (the Project) is proposed by Australia Pacific LNG Pty Limited. Australia Pacific LNG is a coal seam gas (CSG) to liquefied natural gas (LNG) joint venture. The joint venture partners are ConocoPhillips Australia Pty Ltd and Origin Energy Limited.

Australia Pacific LNG has petroleum interests in major producing CSG fields, including Spring Gully and Fairview in the Bowen Basin and Talinga in the Surat Basin. It also holds significant interests in less developed areas across the Walloons Fairway in the Surat Basin, which together with the Talinga CSG fields constitutes the Walloons Gas field's development area.

Australia Pacific LNG is seeking to accelerate the development and production of its CSG reserves in Queensland through the development of a CSG to LNG project. The proposed project will encompass the

further development of Australia Pacific LNG CSG fields in the Walloons Gas field's development area and the construction of a high pressure gas transmission pipeline to deliver the coal seam gas to the LNG facility located on Curtis Island, near Gladstone.

The downstream component of the Project is centred on the LNG facility located on Curtis Island, near Gladstone. Figure 1.1 illustrates the locality of the project.

1.3 Description Of Study Area

1.3.1 Regional context

The proposed LNG facility is located on Curtis Island, near Gladstone on the central Queensland coast, which will be connected to the CSG fields via one or more underground gas transmission pipelines (refer Figure 1.1).

The regional landscape has major landscape elements that create great visual diversity and interest. This is created by the interplay of land and water elements.

Curtis Island is the largest Island measuring some 40km by 14km, with the next largest being Facing Island that is by comparison only 14km long and 1km to 2km wide. These two islands form the outer edge of Gladstone Harbour that also contains many other but significantly smaller islands. Some islands including parts of Curtis Island support small residential nodes.

The adjoining mainland combines gently undulating slopes with steep hills and mountains dominated by Mount Larcom. The mainland in the vicinity supports the urban areas of Gladstone and significant industrial development including supporting port facilities.

The visual character of the islands, including Curtis Island, is dominated by natural forested hills and contrasts markedly with the adjoining mainland foreshore that is in large part dominated by industrial and urban development.

1.3.2 Local context (LNG facility)

The LNG facility site is located near Laird Point adjacent to the southern shore line of Graham Creek and Gladstone Harbour at this location. The site is located within a recently zoned industrial area that is located in the south western part of Curtis Island.

At this location, the island consists of mangrove and salt marsh along the water front with open forest on sand hills within and adjacent to the site. Curtis Island contains a number of north south ridge lines that along with supporting vegetation are significant in screening easterly views and providing landscape integration elements to views from the west.

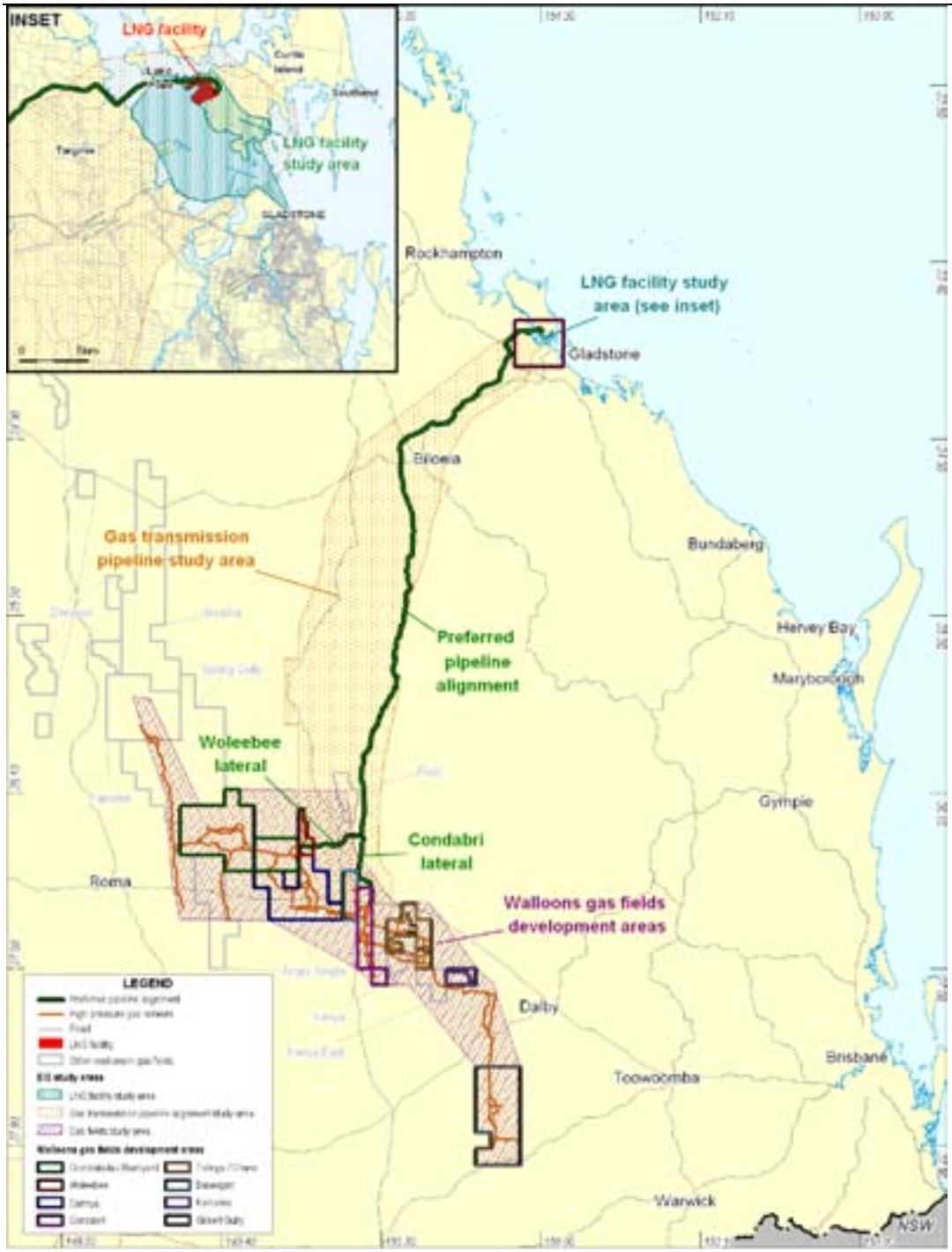


Figure 1.1: Location Plan

2.0 METHODOLOGY OF ASSESSMENT

2.1 Framework And Study Stages

2.1.1 Relevant legislation and guidelines

The Australia Pacific LNG Project is subject to assessment under the State Development and Public Works Organisation Act 1971 (SDPWO Act), the Sustainable Planning Act, 2009 (SP Act), the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and the Environmental Protection Act 1994 (EP Act). Also considered was the Curtis Coast Coastal Managment Plan.

This visual assessment is part of an overall environmental assessment to meet the requirements of the Coordinator-General's Terms of Reference. This TOR requested an assessment of:

- Existing visual values of the local and regional landscapes;
- Land use objectives for the project area and its visual implications;
- Major views, outlooks, significant ridge lines and other features that contribute to local visual amenity;
- Focal points, land marks, gateways, waterways and other features that contribute to visual quality of the area and the project site;
- Identification of areas that have the capacity to absorb land use change; and
- Existing vegetation as a visual screen.

Further the Terms of Reference state that the visual assessment should identify the impacts of the LNG facility including a consideration of night lighting. The impacts on public places including roads, needs to be determined. Mitigation management strategies that will minimise visual impacts are then to be developed to minimise visual impacts

This was achieved by assessing the visual character of the receiving environments, the visual character of the development, the location of sensitive receptors to define visual impacts and as needed, the development of landscape mitigation strategies. These assessments have been illustrated by maps, figures, photography and photomontage.

In general terms, there were four key stages to the landscape visual assessment study:

2.1.2 Stages of Study

Stage 1: Desktop study

A desktop study of relevant background reports, other data and mapped information was undertaken to collect data on topography, land-use, and landscape and settlement pattern. This allowed the landscape to be divided into homogeneous zones that could be surveyed in the field.

Stage 2: Fieldwork

A comprehensive field study was undertaken and photographic record obtained. The field survey was carried out on the study area, by two visual impact assessment experts to gain a consensus opinion.

Field work was completed to collect visual data relating to landform, land use, vegetation, boundaries and more perceptual aspects like scale, enclosure and visual unity. At the same time information was collected on the condition of landscape features and elements that contributed to the overall character of the area.

Stage 3: Classification

This stage refined and finalised the desktop study and field work output by classifying the landscape into Visual Character Zones (VCZ). The VCZs are broad tracts of landscape which have been determined by the visual characteristics of topography, vegetation, land use features and water elements. Each of the VCZs contains similar character in terms of topography, vegetation and land use.

Stage 4: Analysis and evaluation

The visual assessment of the downstream project components was completed in two steps. The first step determined the visual impact of both the construction and operation phases using an assessment method that measures both Visual Effect (refer Figure 2.2) and Visual Sensitivity (refer Figure 2.3) to determine the Visual Impact (refer Figure 2.4). The second step of the visual assessment developed strategies to mitigate those impacts.

2.1.3 Limitations

The assessment of visibility of the project components was limited to a general evaluation of topographic maps, aerial photography and field evaluation. Detail dimensioning of development components is not yet completed, so dimensioning was calculated by relative measures to existing landscape features that have been scaled from aerial photography. At the time this assessment was undertaken, two options were under evaluation for the jetty loading facilities (Option 1b and 2a). For the purposes of this report Option 2a has been assessed. Option 2a is Australia Pacific LNG's preferred option.

2.2 Methodology For Assessment Of Visual Impacts

2.2.1 General method

The methodology to determine the level of visual impact of the LNG facility involved, in the first instance, a consideration of the existing visual environment. This includes a consideration of existing landscape settings, and how they are seen from various viewing locations. In this way, the visual character of the landscape, as well as visual sensitivity of the various viewing locations, can be determined.

Secondly, the visual effect of the LNG facility was determined by considering the visual characteristics of the LNG facility in the context of the landscape within which it is seen.

A combined consideration of both visual sensitivity and visual effect determined impacts and gave some direction on mitigation strategies. The overall method of visual assessment of the existing landscape project in the context of the landscape is outlined in Figure 2.1.

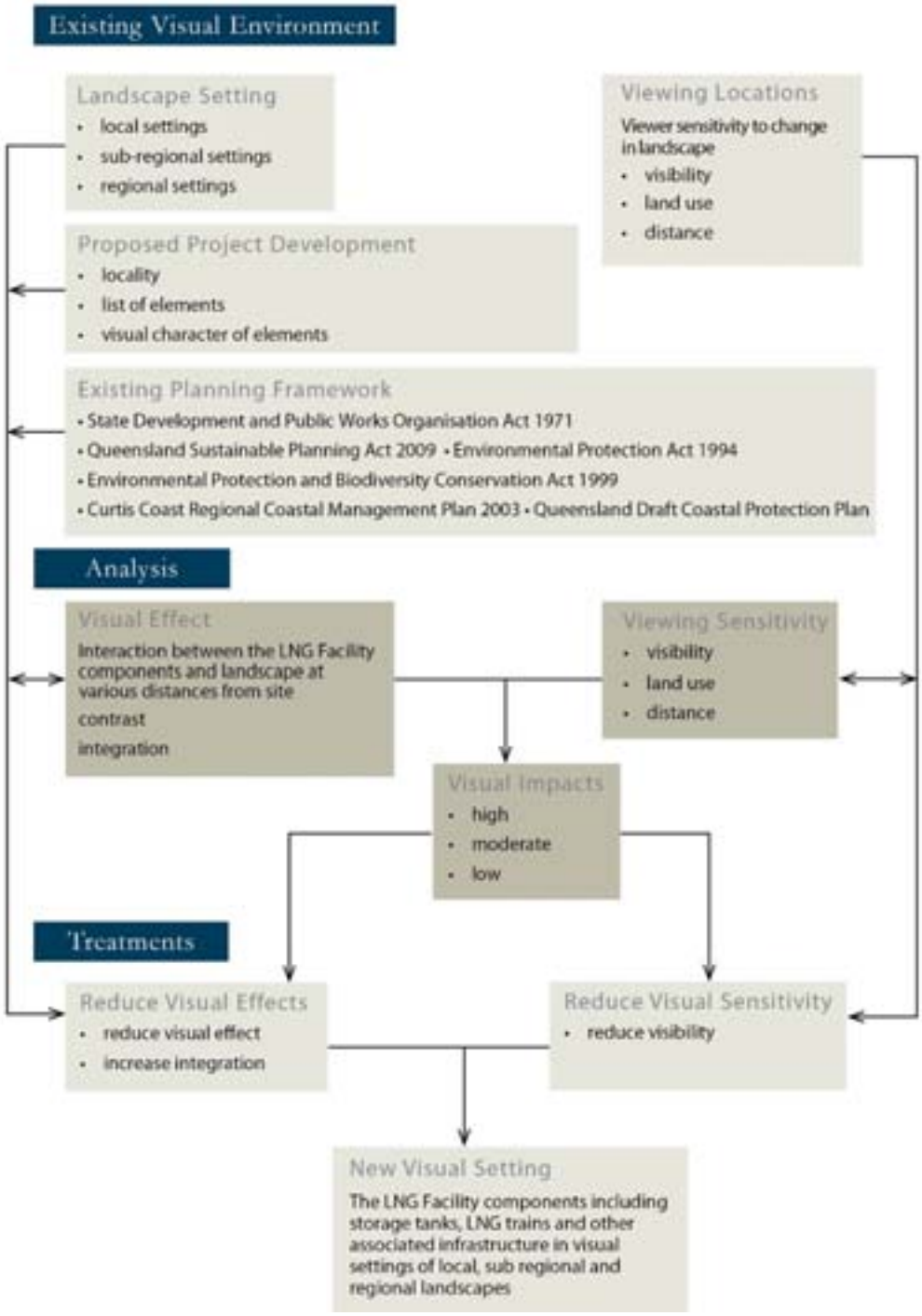


Figure 2.1: Visual Assessment Methodology

2.2.2 Evaluation of the existing visual environment

The evaluation of the existing visual environment consisted of the assessment of both the landscape and viewing locations within it. It also included a consideration of the statutory framework within which any development, such as the Project, must be considered.

Landscape Setting and Visual Character Units

The visual settings of the LNG facility can be defined in terms of topography, vegetation, hydrology and land use features. These elements define the existing visual character of the landscape and the one with which Project components will exist within. There are within any landscape, areas of similar visual features that can be defined as a Visual Character Unit. Defining the landscape in terms of these units assists in understanding the visual character of the landscape as a whole.

Viewing locations

The viewing locations are those areas where people are likely to obtain a view of the LNG facility. These viewing locations have different significance based on numerous factors, collectively evaluated through land use and distance.

Statutory Framework

In the case of the LNG facility, the visual assessment is responsive to state and local regulations. These include the:

- The Great Barrier Reef World heritage Area
- Environment Protection and Biodiversity Conservation Act 1999
- Curtis Coast Coastal Management Plan
- Development Scheme for the Gladstone State Development Area

2.2.3 Evaluation of the development

The LNG facility and associated marine facilities is the development. This development will have certain visual features that are typical of an LNG facility such as large gas storage tanks, LNG production trains, and shipping berths. These elements will express themselves in terms of form, shape, line and colour, and to a lesser extent texture. An understanding of this visual character provided an appreciation of how various LNG facility elements will be seen in the landscape.

2.2.4 Analysis

The analysis of the interaction between the existing visual environment and the proposed development provided the basis for determining impacts and mitigation strategies. It was done by defining the visual effect of the development and visual sensitivity of viewing locations to determine impact.

2.2.5 Visual effect

Visual effect is a measure of the level of visual contrast and integration of a project with the existing landscape (refer Figure 2.2).

An existing landscape has certain visual characteristics expressed through the visual elements of form, shape, line colour and texture. A development such as the LNG facility has visual characteristics that will create contrast with the existing landscape. The degree to which the visual characteristics of the various components contrast with the existing landscape will determine the level of visual effect.

In a similar way, various elements are said to be integrated with the existing landscape based on issues of scale, position in the landscape and contrast. High visual integration is achieved if a development is dominated by the existing landscape, is of small scale and or of limited contrast.

The magnitude of the visual effect as outlined in Figure 2.2 is determined by a balanced consideration of the following:

Contrast and integration

The level of contrast and integration of the project elements with its surrounding landscape determine visual effect. Project elements, as expressed through the visual expression elements (i.e. form, shape, pattern, line and colour with minor consideration in relation to texture) contrast to varying degrees with the surrounding landscape and will also, to varying degrees, integrate with it.

Primary View Zone

The Primary View Zone is that area which is occupied by an arc, created by sight lines from the eye radiating out vertically and horizontally at angles of 30 degrees around a centre view line. The primary view zone is the most critical central part of a view, and the most important part.

For any given level of contrast and integration, the lower the proportion of the view that is occupied by the project elements, the lower will be the level of visual effect, which is determined by defining the proportion of the total field of view occupied by the project. This in turn is most appropriately determined by defining what percentage of the Primary View Zone it occupies (see Figure 2.3).

The area covered by a development element, such as the LNG facility is determined by its projection into the view. That area is calculated by the width of the development that is at right angles to the direction of view and the elevation which is the dimension of the element parallel to the view line. This dimension is normally a combination of the elevation of the development components and some consideration of the footprint dimension, parallel to the view line.

Measuring the percentage of the primary view zone occupied by the LNG facility will provide a more critical measure than if it were measured as a percentage of a total view. A total view as defined in this methodology is a semi circle created by a diameter created by an arc of 1200, at the point of viewing. Instead the Primary View Zone of the total view has an arc of 600, see Figure 2.3, creating a smaller area. It follows therefore that an element of a given size would occupy a greater percentage of that view, the primary view zone, than the total view.

Generally, a high visual effect will result if a visible area of the project has a high visual contrast and low integration to the surrounding landscape.

A low or very low visual effect will occur if there is minimal perceivable contrast between the visible area of the project and the existing landscape setting and / or the areas occupied by the project are only small parts of a total view.

Visual Properties		Visual Effect Levels			
Contrast Levels with components in primary view zone	Visual Integration with components in primary view zone	High Visual Effect	Moderate Visual Effect	Low Visual Effect	Very Low Visual Effect
High The LNG Facility component does not borrow form, shape, line, colour or texture or scale from existing features of the visual setting and contrast levels are high with existing landscape	Low The project component lacks integration with visual setting because of scale totally dominating the ability of site or surrounding features, vegetation and or topographic features to integrate the development.	It occupies more than 0.25% of the primary view shed half cone area.	It occupies between 1 - 2.5% of the primary view shed half cone area.	It occupies less than 1% of the primary view shed half cone area.	It occupies less than 0.5% of the primary view shed half cone area.
Moderate The LNG Facility component borrow from some features of the visual setting in terms of form, shape, line pattern and or colour and scale, reducing visual contrast with existing setting	Moderate The project component has some degree of visual integration with setting from other features, vegetation and or topography achieve some level of integration.	It occupies more than 20% of the primary view shed half cone area, generally when in a foreground location.	It occupies between 20-10% of the primary view shed half cone area.	It occupies less than 10%.	It occupies less than 5%.
Low The LNG Facility component borrows extensively from features in visual setting in terms of form, shape, line, pattern colour and scale minimizing contrast with the existing setting	High Visual integration is high due to other features, vegetation and or topography achieving dominance and screening or filtering.	The project component occupies more than 40% of the primary view shed half cone area.	The project component occupies 40-30% of the primary view shed half cone area.	The project component occupies less than 30 - 20% of the primary view shed half cone area.	The project component occupies less than 20% of the primary view shed half cone area.

Note: The visual effect of the LNG Facility components change through time with the construction phase having high contrast and low visual integration creating high impacts at low levels of exposure.

Figure 2.2: Visual Effects

Area of Primary View Zone at various distances from project area

Distance from project area	Area of Primary View Zone
1 km	0.32 km²
2 km	2.09 km²
3 km	4.71 km²
4 km	8.38 km²
5 km	13.07 km²
6 km	18.85 km²
7 km	25.65 km²
8 km	33.51 km²
9 km	42.41 km²
10 km	52.36 km²
11 km	63.35 km²
12 km	75.40 km²
13 km	88.49 km²
14 km	102.62 km²
15 km	117.81 km²

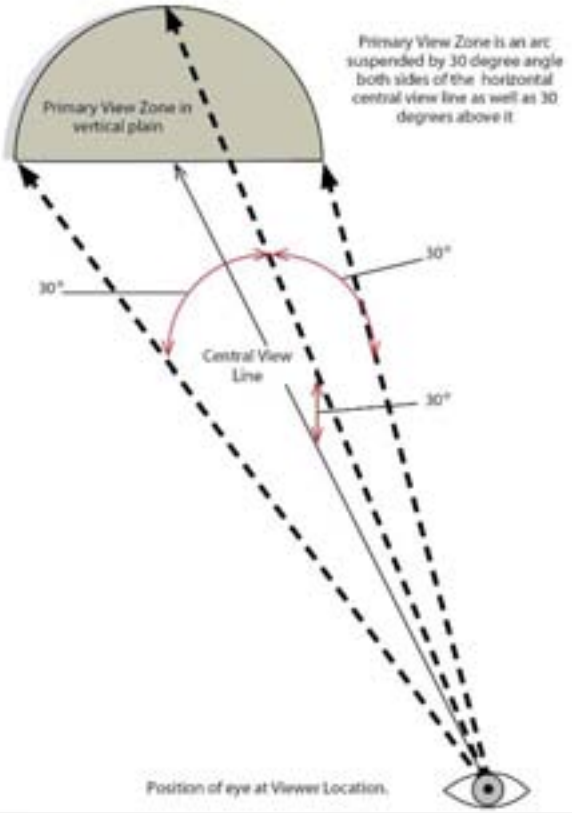


Figure 2.3: Area of primary view zones at varying distances

2.2.6 Visual Sensitivity

Visual sensitivity is a measure of how critical a change to the existing landscape is viewed by people from different land use areas at various distances from the project. Figure 2.4 indicates the levels of visual sensitivity associated with the LNG facility.

In this regard, residential, tourist and / or recreation areas generally have a higher visual sensitivity than other land use areas including industrial, agricultural or transport corridors. However, the visual sensitivity of residences or tourist/recreational areas may range from high to low, depending on the following additional factors:

- Screening effects of any intervening topography, buildings or vegetation. Residences with well screened views of the project site will have a lower visual sensitivity than those with open views;
- Viewing distance from the residence to visible areas of the project. The longer the viewing distances, the lower the visual sensitivity; and
- General orientation of the use area to landscape areas affected by the project. For example a residence with strong visual orientation towards the project site, i.e. those with areas such as living rooms and/or verandas orientated towards it, will have a higher visual sensitivity than one that is not orientated towards the Project, and which do not make use of the views toward the Project.

For any area to be given a sensitivity score, it must have visibility to the LNG facility.

Land Use	Visual Sensitivity Levels			
	Nearest visible AP LNG facility component less than 2.5km away	Nearest visible AP LNG Facility component between 2.5 - 7.5 km away	Nearest visible AP LNG Facility component between 7.5 - 12.5km away	Nearest visible upstream project component more than 12.5km away
Urban and rural houses	High Sensitivity	High/Moderate Sensitivity	Moderate Sensitivity	Low Sensitivity
Designated picnic areas, lookouts and walking trails in recreation reserves & national parks, as well as open water.	High Sensitivity	Moderate Sensitivity	Low Sensitivity	Low Sensitivity
Designated tourist roads & highways	High Sensitivity	Moderate Sensitivity	Low Sensitivity	Low Sensitivity
Less utilised public lands in national parks, state forests, etc.	Moderate Sensitivity	Low Sensitivity	Low Sensitivity	Low Sensitivity
Other main roads	Moderate Sensitivity	Low Sensitivity	Low Sensitivity	Low Sensitivity
Minor local roads in rural zone	Moderate/Low Sensitivity	Low Sensitivity	Low Sensitivity	Low Sensitivity
Broad acre rural lands	Low Sensitivity	Low Sensitivity	Low Sensitivity	Low Sensitivity

Figure 2.4: Visual sensitivity as it relates to land use and distance

2.2.7 Visual Impact

The visual impact of the LNG facility has been determined by considering both visual effect and visual sensitivity, which when considered together determine impact levels. The way in which the visual parameters of visual sensitivity and visual effect relate is illustrated in Figure 2.5.

Visual Effect	Visual Sensitivity		
	High	Moderate	Low
High	High Visual Impact	High/Moderate Visual Impact	Moderate/Low Visual Impact
Moderate	High /Moderate Visual Impact	Moderate Visual Impact	Moderate/Low Visual Impact
Low	Moderate/Low Visual Impact	Moderate/Low Visual Impact	Low Visual Impact

Visual Impact is dependant on the interaction between visual effect and sensitivity.

Figure 2.5: Visual impact based on a consideration of visual effect and visual sensitivity

2.2.8 Mitigation

Visual impact mitigation strategies are developed for both on-site and off-site situations to ensure that either visual effects and or visibility/visual sensitivity factors are decreased in appropriate time frames to achieve impact mitigation.

The character and scale of the LNG facility limit the potential visual mitigation strategies. Most significant is limiting the elevation of various facility components, e.g. use of ground flares, and careful management of surrounding bushland on-site.

Such strategies will limit the extent of high impact.

In this particular project the use of off-site mitigation strategies is not warranted due to the distance of sensitive receptors from the LNG facility location.

2.3 Photographic and Computer Montage Development

Both photographic and computer graphic montages were developed to enable a more realistic evaluation of visual effects created by the Project. This montage development was completed for the evaluation of the Australia Pacific LNG facility and the cumulative effect of the three facilities on Curtis Island within the Gladstone State Development Area (GSDA).

2.3.1 Photographic Montage

Photographs of the existing visual setting and location of proposed Project were taken from a number of locations both from the mainland and from a boat in various locations around Gladstone Harbour. Photographs were taken at standing eye level from each viewing location and the location of each photograph position was defined by GPS co-ordinates.

Three dimensional (3D) computer models were then generated for the Project and the terrain of the local and the regional settings. This model included Curtis Island, other islands in Gladstone Harbour and some foreshore lands.

A computer camera is then placed in the computer model at exactly the same location as the locations from which photographs were taken. Then using exactly the same focal length as was used to generate the digital photograph, a digital computer picture of the view in the computer model is taken. This digital image contains details of the Australia Pacific LNG facility and the three LNG facilities for separate consideration of the Project and cumulative visual impacts.

The computer image of the project in the landscape is then superimposed with the photograph. The photography presents real imagery of the landscape setting, while the computer image provides the imagery of the Australia Pacific LNG facility and the three LNG facilities.

2.3.2 Computer Montage

In addition to the photomontage, it was useful in most situations to generate either a mixture of photo and computer montage or just computer montage. In this imaging, colours and textures for the landscape are generated by photographs and aerial photographs.

The reason for this was to achieve clarity of image in relation to the project. Often due to distance, unstable photographic imaging from 'on-boat' photography and or foreground vegetation screening an overall view, photomontage imaging was not the most appropriate to give a clear impression of the view to the development.

In these cases computer montage imaging was used with foreground obstructions removed. While this does not in all cases represent a real view, it does represent the type of view that may be glimpsed from some locations close to the computer montage location that are in the clear away from foreground visual screening.

3.0 EXISTING ENVIRONMENT

3.1 Introduction

The proposed LNG facility is located near Laird Point, on the western side of Curtis Island, to the east of North Passage Island. The functional character of the area and its context is largely coastal wetlands and elevated land which is used for cattle grazing on native pasture. Outside of the Curtis Island Industry Precinct there are pockets of residential land use and nature conservation areas (refer Figure 3.1).

The topography is characterised by a mixture of mud flats and gently to moderating sloping hilly areas and remnant vegetation. Topography and vegetation will be the major determinants of visibility to the Project components. They are also the major 'natural' features of the landscape in this location.

3.2 Visual Character Of The Landscape

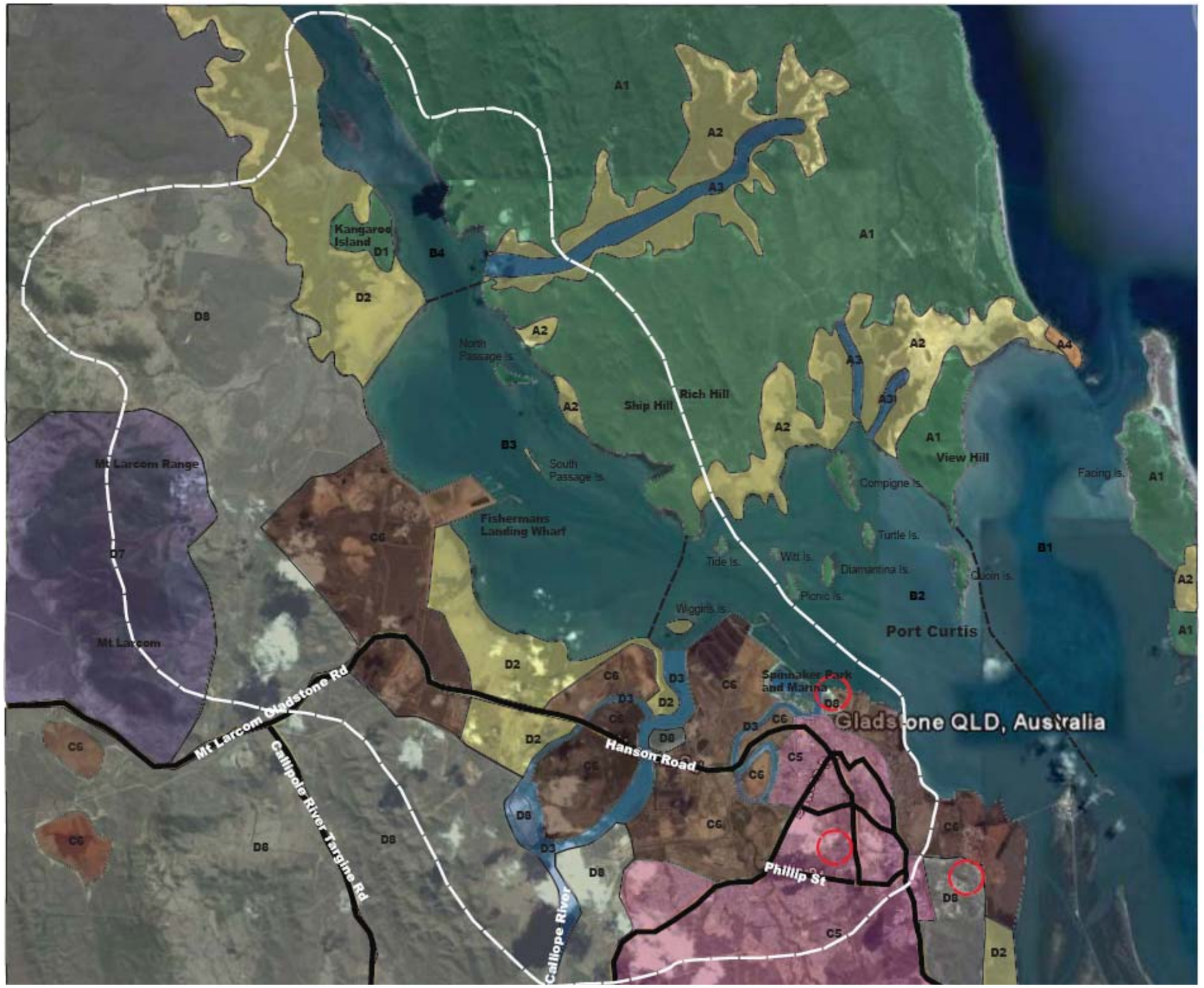
Curtis Island, part of the Greta Barrier Reef World Heritage Area, is a large island forming the north-east protection of the Port of Gladstone, and lies between Gladstone and Rockhampton.

The Island is comprised by enclosed forested hills and valleys with fringing intertidal land systems, such as mangroves, salt marsh and mudflats, that together with the east facing beaches contribute to a unique coastal landscape character.

When travelling by boat through Gladstone Harbour a sequence of visual experiences is provided, alternating from open long distance views across open expanses of water in the harbour itself to visually more enclosed waterways such as the Narrows and Graham Creek.

Key characteristics of the local and regional landscape character are:

- Landscape of contrast and variety
- Large scale water views with extensive vistas to level horizons and huge sky expanses
- Scattered islands
- Enclosed forested hills and valleys on islands and the mainland
- Forested mountains
- Mangrove vegetation and associated mudflats along waterways
- Developed Industrial Landscapes
- Developed urban areas
- Residential nodes on scattered islands



Legend

Landscape Character Zones

A. Islands
B1. Outer Harbour
B2. Middle Harbour
B3. Inner Harbour
B4. Curtis passage
C. Mainland Developed
D. Mainland Natural

Landform Components

1. Forested Hills and Valleys
2. Mangroves and Salt Marsh
3. Creeks
4. Curtis Island Urban Development
5. Mainland Urban Development
6. Industrial
7. Forested Mountains
8. Wooded Hills

Harbour zones (B1, B2, B3,B4)

Primary Visual Catchment

The area that contains the most significant viewing locations within the local, sub-regional and regional settings. There may be viewpoints outside of the PVZ, but the ones inside the PVZ provide a basis for completing a detailed visual assessment, impact prediction and development of mitigation strategies.

Public Lookouts

Figure 3.1 Landscape Character Zones & Visual Character Units

3.3 Landscape Character Zones

To assess the landscape character of the proposed project, the development area is divided into seven Landscape Character Zones (LCZ), based on geographic and harbour boundaries. There are overlapping similarities between the landscape character zones, as well as some unique variations between the zones. Dividing the landscape into distinct zones provides a valuable tool for visual character assessment of large areas. Views across the development area from open water and Gladstone mainland were analysed within the seven landscape zones.

The Landscape Character Zones include:

- Curtis Island LCZ;
- Outer Harbour LCZ;
- Middle Harbour LCZ;
- Inner Harbour LCZ;
- Curtis Passage LCZ;
- Mainland Developed LCZ; and
- Mainland Natural LCZ.

Within the landscape character zones, eight distinctive and recognisable patterns of elements have been identified in the landscape. For the purpose of this assessment these elements have been labelled as Visual Character Units.

These Visual Character Units have been determined primarily by land cover, topography and water features. There are differences in the Visual Character Units throughout each of the LCZs, due to topographic and water elements. Landscape character types and patterns combined with varying topographic features create the eight Visual Character Units. The visual character units are generally seen together to create the visual diversity and interest that create the local visual setting (Figure 3.1).

3.3.1 Landscape Character Zone A: Curtis Island and surrounding islands LCZ

Curtis Island and surrounding islands are delineated on Figure 3.1 as A. The landscape character throughout the islands is mostly natural, devoid for the greater part of visible buildings, structures and lighting. This creates natural patterns of land form, vegetation and water elements. The exception to this is the settlement of South End on Curtis Island, North Point on Facing Island, and isolated houses on smaller harbour islands.

The topography of this LCZ is predominately forested undulating hills and valleys. The terrain however in the central portion of Curtis Island, becomes hilly due to the forested north-south ridgelines.

There are extensive, open views to the islands, from within the surrounding waterways (Figure 3.2a & 3.2b). This is due to the open expanse of water within the harbour, uncluttered shorelines and the elevation of the surrounding topography.

Figure 3.2a: LCZ A -Curtis Island is seen from most directions as consisting of forest covered rolling hills.

Figure 3.2b: LCZ A - Picnic Island is a small scale island but is still dominated by forested hills

3.3.2 Landscape Character Zone B: Gladstone Harbour LCZ

For the purposes of visual assessment, the Gladstone Harbour LCZ has been divided into four Visual Character Units (VCUs):

- Outer Harbour VCU
- Middle Harbour VCU
- Inner Harbour VCU
- Curtis Passage VCU

Each of the four Harbour VCUs is assigned Visual Character Units (VCU), depending on the character of land cover. These VCUs are defined in Section 3.4 of this report. The LCZ and the VCUs are illustrated in Figure 3.1

LCZ B1 - Outer Harbour

The Outer Harbour is delineated on Figure 3.1 as B1. The western edge of the LCZ runs north south from View Hill on Curtis Island along the eastern side of Quoin Island. The eastern edge is bounded by Facing Island. Views from this zone onto Curtis Island are largely unaffected by the Australia Pacific LNG proposal except for night light glow. For this reason, this zone is outside of the primary visual catchment (Figure 3.3).

Figure 3.3: Outer Harbour LCZ

LCZ B2 - Middle Harbour

The Middle Harbour is delineated on Figure 3.1 as B2. This part of the Harbour is characterised by a number of small islands that create visual interest and focal points within the waterways. These islands support a limited number of residential and recreational nodes. The majority of this zone is outside of the primary visual catchment (Figure 3.4), as it is not affected by Australia Pacific LNG proposal except for potential night light glow. It is more affected by the cumulative effect created by the other LNG facilities proposed for Curtis Island.

Figure 3.4: Middle Harbour LCZ

LCZ B3 - Inner Harbour

The proposed site is located within this LCZ. This zone is edged by Curtis Island to the east and the generally flat mainland areas flanked by hills and mountains to the west. The Inner Harbour area supports significant areas of industrial development along its western shores and although the Curtis Island shore line is currently covered in natural forest (Figure 3.5) industrial zoning over this section of land indicates that this will also be industrial in character.

Figure 3.5: Inner Harbour LCZ

LCZ B4 - Curtis Passage

The coastal fringe in this south western section of the island comprises a strip of low swampy coastal plains and mangrove flats extending north into Graham Creek and The Narrows channel (Figure 3.6). The waters of Port Curtis narrow to form the entrance to 'The Narrows'. The distinctive geological characteristics of 'The Narrows' are recognised in the National Estate listing, which identifies the tidal passage landscape between the mainland and Curtis Island, as 'uncommon' in Australia. This passage landscape is characterised by a complexity of waterways, fringing mudflats, mangroves, intertidal wetlands and salt marshes.

Figure 3.6: Curtis Passage LCZ

3.3.3 Landscape Character Zone C: Mainland Developed Areas LCZ

The Mainland Development Area is delineated on Figure 3.1 as C. The mainland development areas include large scale industrial areas as well as urban residential and commercial areas (Figure 3.7). Long distance views of Curtis Island are available from the various, elevated mainland locations, such as Auckland, Queensland Aluminium Limited (QAL) and Round Hill lookouts within the Gladstone urban area.

The topography throughout is predominantly flat to undulating with the commercial area located along a ridge providing a limited number elevated views to the north, east and west.

Elevations range from approximately 300m near a tributary of the Weir River along the western field boundary to 430m in the Western Creek State Forest to the south.

Figure 3.7: Mainland Development Area LCZ

3.3.4 Landscape Character Zone D: Mainland Natural LCZ

The Mainland Natural LCZ is delineated on Figure 3.1 as D. The mainland supports some significant natural areas, such as salt flats / marsh and mangroves as well as rural areas supporting grasslands with scattered trees, woodland and on steeper hills and mountains forest cover. Apart from ecological values, the salt marshes create vast flat areas generally fringed by other salt tolerant vegetation species, (Figure 3.8) that allow for expansive views, often to Curtis Island. Woodland hills and forested mountains are within this zone and form the western edge of the PVZ for the Project.

Figure3.8: Mainland Natural LCZ

3.4 Visual Character Units

The Visual Character Units (VCU) represents areas that contain consistent landscape character in terms of topography, vegetation and land use. Each VCU contains elements or a combination of elements, which create a particular visual character. They have been described by spatial enclosure and pattern, which is determined by landform and land cover. No one VCU is identified as better as, or worse than another, rather each contributes to the variety of landscape pattern within the PVZ.

It is important to note that VCUs are defined at a broad scale. Some VCUs can change in character quite distinctly whilst in others the difference is more subtle. Boundaries have been determined between the VCUs as a single line. However, in reality the change between one VCU and another is not as clear-cut. Often the transition between units is difficult to define as a line, however the VCU descriptions identify the essence of those differences and the boundaries are seen as the changeover point where the characteristics of one unit outweigh those of another unit.

In-field investigation, photographs and aerial photography were analysed to identify the different landscape characteristics of each LCZ within the Project area. The primary characteristics of the eight VCUs are summarised below with typical photographs shown.

Local Visual Character Units include:

- Forested Hills and Valleys VCU
- Mangroves and Salt Marsh VCU
- Creeks VCU
- Island Villages VCU
- Mainland urban development VCU

- Industrial VCU
- Forested Mountains VCU
- Wooded Hills VCU

3.4.1 Forested Hills and Valleys VCU 1

The Forested Hills and Valleys VCU (Figure 3.9) occurs in most of the Landscape Character Zones, including on islands within the various Harbour LCZs.

Significant retention of native vegetation contributes to the natural patterns of this VCU, mostly dominated by mixed species of open eucalypt forest and extensive patches of dry rainforest. The landscape within this VCU is generally undulating to moderately hilly. There are several distinctive, undulating ridgelines extending across the site from Graham Creek. Ship Hill, located to the south east of the site (170m AHD) is the southern tip of one of these ridges.

This tree-dominated unit creates strong visual enclosure, screening out land areas beyond immediate foreground views.

Visual significance

The most important visual significance of this VCU is its visual screening and integration capacity. To the eastern and parts of the southern view sectors the Forested Hills and Valleys VCU provides screening to the Project. To other viewing sectors, it provides partial screening and or a background visual integration landscape.

Figure 3.9: Forested Hills and Valleys VCU

3.4.2 Mangroves and Salt Marsh VCU 2

The Mangroves and Salt Marsh unit (Figure 3.10) occurs in LCZ A: Curtis Island and Surrounding Islands, LCZ B3 Inner Harbour and LCZ D Mainland Natural.

The natural pattern of the intact mangrove forests and associated salt marsh are visually dominant along the coastline, creating a significant landscape feature. This is particularly evident with contiguous stands of mangroves creating distinctive natural landscape character along shoreline visible from waterways and adjoining sections of foreshore.

Visual significance

Mangrove stands visually define the foreshore. Due to the low lying growth character of the mangrove, this vegetation pattern does not provide visual screening to views from surrounding areas.

Figure 3.10: Mangroves and Salt Marsh VCU.

3.4.3 Creeks VCU 3

The Creeks VCU (Figure 3.11) occurs in LCZ A: Curtis Island and Surrounding Islands and LCZ D: Mainland Natural.

Graham Creek is a visually dominant natural feature of Curtis Island, providing an expanse of flat water and a series of gullies for recreational boats to take refuge. The margins of Graham Creek are met by intact mangrove forests and salt marsh.

The Calliope River is the most significant water element on the mainland and supports recreational boating.

Visual significance

Creek systems such as Graham Creek and Calliope River provide an enclosed experience within the open Harbour context. These are also locations frequented by recreational boating.

Figure 3.11: Creeks VCU – Graham Creek

3.4.4 Island Villages VCU 4

The Island Villages VCU (Figure 3.12) occurs in the LCZ A - Curtis Island and Surrounding Islands.

The small community of South End is located 8km to the east on the east coast of Curtis Island. Land use on the southern end of Curtis Island is primarily conservation based with limited impacts to native vegetation. The jetty structure is visually prominent contrasting with the natural character of the landscape and scenic waterways.

Private residential properties are also located on adjacent islands, including Facing, Tide, Turtle and Compigne Islands. However this development is very limited and is dominated by the natural character of the islands.

Visual significance

Jetty structures and residential development are well integrated but do contrast with the natural character of the adjoining landscape and waterways.

Figure 3.12: Island Villages VCU.

3.4.5 Mainland Urban Development VCU 5

The Mainland Urban Development unit (Figure 3.13) occurs only in the LCZ C Mainland Development.

Land use in Gladstone and surrounding areas includes urban, residential, industrial, infrastructure and marine uses. The urban areas of Gladstone are generally set-back from the waters of Port Curtis, with the Port of Gladstone waterfront forming a buffer between the town centre and the water. Gladstone City Centre is located on higher ground over-looking Gladstone marina, with urban and residential areas extending inland, including in some places across higher elevated land, such as Auckland Point lookout, and providing views out across Port Curtis. This grid pattern, the elevation location, extensive views and relative low-rise development in Gladstone form part of the city's character. The industrialised nature of the port is visually evident in most views from the city.

Visual significance

These areas are sensitive to development however are very distant from Laird Point. Long distance views to Curtis Island are generally blocked by development of buildings and infrastructure, except from elevated lookout points such as, Auckland, QAL and Round Hill.

Figure 3.13: Mainland Urban Development VCU

3.4.6 Industrial Development VCU 6

The Industrial Development unit Figure 3.14 occurs only in the LCZ C Mainland Development.

This unit encompasses industrial land use relating to various industries, such as aluminium production and coal loading facilities and port related industry. Such industry related landscape components include coal stockpiles and conveyors which form a visually distinctive element in the landscape, as well as jetty structures, moored boats and moving water craft. Night lighting is highly visible from the foreshore and from within the harbour.

Visual significance

These existing large scale water front developments create an industrial setting to parts of Gladstone Harbour and provide a visual context for the LNG facility.

Figure 3.14: Industrial Development VCU

3.4.7 Forested Mountains VCU 7

The Forested Mountains VCU(Figure 3.15) occurs only in the LCZ D Mainland Natural.

The distinctive ridges and mountainous terrain of Mount Larcom provides a natural vegetated backdrop to the low lying alluvial coastal plains and the foreshore areas which, although retaining some natural areas, are interspersed by large industrial complexes and reclaimed foreshore areas.

Visual significance

This VCU will have views to the Project components from several viewing locations. Due to its prominence in the landscape, this VCU provides a reference point in the landscape.

Figure 3.15: Forested Mountains VCU

3.4.8 Wooded Hills VCU 8

The Wooded Hills Visual Character Unit, Figure 3.16, is not evident on Curtis Island, but is prominent on the mainland of Gladstone within the primary visual catchment.

This unit is best described as semi-enclosed forest with a subtle mosaic of grassland and scrub. Some areas of this VCU have been cleared for grazing purposes creating pockets of open grassland. Vegetation across this VCU area largely consists of the native eucalyptus forests and woodlands of Gladstone. Fringing natural vegetation occurs within the industrialised areas; however modification of the landscape is visually evident throughout the majority of the viewshed. The extensive areas covered by this landscape type provide an important backdrop to the urban and industrialised areas of The Port of Gladstone.

The topography is gently sloping and level land. These gentle slopes of semi-enclosed forest with a subtle mix of grassland and grazing land create a typical landscape of the region.

The woodland is a highly patterned landscape. Diverse vegetation patterns from scattered tree cover to dense pockets of forest, combined with varying flat to undulating land forms contribute to this highly patterned VCU.

In addition, this VCU supports intermittent urban development contributing to the landscape pattern through built form and planted vegetation.

Visual Significance

The woodland unit provides foregrounds to some roadside location screening views. The VCU is seen in the context of views to the west as foot slopes to the more prominent mountains.

Figure 3.16: Woodland Hills VCU

3.5 Summary

The existing landscape of the area has distinctive landscape features such as waterways and islands with views to distant forested hills and mountains behind mangrove lined foreshores, on islands to the east and the mainland to the west.

The landscapes of the region include both natural areas and highly developed industrial and urban areas. Water front locations similarly are both natural and developed. These landscape types create the visual context for the LNG facility. The industrial landscapes of Gladstone are highly modified and generally degrade the visual values of the landscape because of the lack of visual integration with the visual settings within which they occur.

Curtis Island is dominated by natural landscapes and has high visual integrity. However the land zoning applying to the south western corner of the island establishes the Curtis Island Industrial Precinct that in turn implies an industrial visual character for the locality.

In the context of Curtis Island, there is opportunity to achieve visual integration using surrounding forested hills as background integrating landscape features. This should contrast markedly with the lower visual quality and intrusiveness of some of the industrial areas on the mainland.

Urban landscapes centred on the City of Gladstone are highly modified with moderate to low visual amenity. These areas support the most sensitive land uses however are distant from the LNG facility site near Laird Point.

The waterways support recreational boating that will be sensitive to development.

Loss or change of the existing Curtis Island landscape character will be significant to the visual amenity of the area. However it is consistent with the industrial land use designation. Further, conserving and managing surrounding landscapes will minimise visual effects on the regional landscape of Gladstone Harbour.

4.0 DESCRIPTION OF PROPOSED DEVELOPMENT

4.1 Introduction

The LNG facility is proposed to be located near Laird Point in the south eastern corner of Curtis Island within the Curtis Island Industry Precinct as defined in the Gladstone State Development Area (GSDA). The LNG facility site area is approximately 280 hectares.

The establishment of the LNG facility will also require the construction of wharf and jetty structures to allow for materials and personnel involved in facility construction and its continued operation. Construction will also involve the establishment of a material offloading facility (MOF) for the transfer of building materials and heavy equipment to the project site. Standard infrastructure services (power, water, telecommunications, and sewage disposal) will be independently established on site.

The LNG facility will be developed in stages to around 18Mtpa of LNG. The configuration of the LNG facility may comprise four, 4.5 Mtpa trains, or similar to process the gas.

4.2 Lng Production Facility And Ship Loading Facilities On Curtis Island.

The facility consists of a number of elements including gas receipt facilities at the end of the gas transmission line from the Walloons gas fields, gas processing facilities to create LNG, LNG storage facilities and LNG transport and loading to ships for export, see Figure 4.1.

From a visual perspective the facilities can be grouped into:

- Inlet gas metering and power generation facilities
- Gas processing facilities;
- Product storage tanks;
- Loading Jetty;
- Materials Offloading Facility;
- Buildings including Administration / Maintenance;
- Construction Camp;
- Ground Flares and Night Lighting.

These groups of elements have varied visual effects in the landscape and for the greater part are seen collectively in the landscape setting of the site and its surrounds. It is useful in the first instance to consider them separately and then as a collective element in the contexts of Curtis Island and Port Curtis.

Figure 4.1: Components of the Australia Pacific LNG Facility.

4.2.1 Construction Process

The construction process for the facility will take approximately 4 years and 9 months for the first two trains. This process will initially involve clearing vegetation that is located within the construction areas of the site as a whole. These areas will be terraced and there may be 7 terrace levels. Significant natural areas within the site are outside the construction areas and will be retained.

The waterfront terrace (6m RL- preliminary) will serve the Materials Offloading Facility (MOF) as well as being a separation zone between the facility as a whole and the onsite salt marsh. It also provides the platform for the pipeline from the storage tanks to the ship loading facility and the LNG storage tanks.

The second terrace (8m RL- preliminary) supports the LNG trains, propane and refrigeration storage tanks and other minor infrastructure.

The third terrace (10m RL - preliminary) supports the gas receiving and power generating facilities. The next terrace, at 20m RL, contains the office, maintenance facilities and telecommunication tower.

Behind this pad are another two pads at 25m RL and 35m RL (preliminary). These pads will house the construction camp and are well screened by surrounding topography.

The final pad is separated from the processing area and sits at an elevation of 12m RL (preliminary). This pad supports the process ground flare.

Following establishment of the pads, various receiving, production, storage, ship loading, flaring and administration elements will be installed.

The first permanent piece of permanent infrastructure will be the MOF which will receive materials, equipment and personnel by barges during the construction and operational phase of the LNG facility. Subsequent construction will be carried out 24 hours a day 7 days a week during peak construction creating a dynamic visual effect both day and night until the operational phase decreases the dynamic character of the construction activity and night vehicle movement.

Visual Analysis

The removal of vegetation will create colour contrast in the landscape. The subsequent earthworks associated with terracing, will reinforce the colour contrast created by vegetation clearing. The terracing and associated cut and fill batters will also introduce new rectilinear earth forms and shapes into the landscape. These will markedly contrast with the surrounding rolling forest covered hills and adjoining wetlands of this part of Curtis Island.

As construction advances, these simple visual shapes will become more complex as more elements are introduced into the view.

Visual Significance

The construction phase is the first part of a continued visual effect that is created by removal of vegetation and terracing of the landscape. This initial phase is replaced by the introduction of various components of the LNG Facility. The construction phase has a dramatic visual effect that is temporary in the sense that the visual effect in the longer term is created by the operational elements of the LNG Facility.

4.2.2 Inlet feed gas metering facility and power generation elements

This facility includes:

- An incoming pipeline
- the pig receiving and metering stations
- the power generating plant and substations

These elements are located central to the site as a whole but on the outer eastern edge of the production and storage facilities on the site. The incoming pipe is adjoined by two stations that can remove the scrubber pigs from the pipelines, when such pipeline maintenance operations are carried out in upstream pipelines.

The gas pipeline then passes parallel to the gas production trains 1 – 4 and the power generating and substation facilities for all onsite production and auxiliary facilities.

Visual Analysis

The inlet gas metering and power generating facilities cover a significant ground area. However they do not have a strong vertical projection so in themselves they would tend to be screened by other elements of the Project that are closer to the more sensitive views from Port Curtis and the Narrows.

Visual Significance

These elements are a component of the visual complexity that is the LNG Facility. However in themselves, they are not a significant element, due to the foregrounding effect of larger elements such as the LNG storage tanks and LNG trains.

4.2.3 LNG Facility – gas processing facilities

The LNG facility removes water and acid gas, dehydrates the gas and removes mercury prior to being liquefied and refrigerated. These processes take place within all of 4 trains planned for the project.

Each train is approximately 200m in length, with associated elements and have an elevation of 10-12m.

Visual Analysis

These elements have a large scale industrial character. Their component parts create a visual complexity of pipelines interconnecting various containers and process plant elements. The overall effect is of 4 elongated elements with a east west orientation each having a predominant elevation of approximately 10 -12m and terminated at the gas inlet points with a tall standing element of approximately 20 metres in elevation

Visual Significance

These elements are a major component of the development and will create a major element as seen from western view points. They are partially screened by the storage tanks and will be screened from eastern and for the greater part northern views.

4.2.4 Product storage tanks

There are three operating LNG storage tanks with a capacity of 160,000m^3 each. The tanks are very large scale and approximately 80m diameter and some 35m high. They are located on the first terrace.

Visual Analysis

The LNG Storage Tanks are large simple shapes not broken up by the detail that occurs in the gas processing trains. This visual characteristic and their scale, makes them the most significant visual component of the LNG facility.

They will be seen in the context of the whole facility and in the context of the site, its locality and the foothills and foreshore of Curtis Island.

Visual Significance

As already stated the LNG storage tanks will be seen as only a part of the LNG facility. However they will be the most significant part and will be a visual focal point and feature of the facility.

4.2.5 Jetties

The initial loading jetty will provide the following functions:

- Export of LNG and import of LPG via a single berth
- One way vehicle access for a 20 tonne mobile deck crane and other equipment

- Capable of expansion to provide a second LNG berth

A generic berth layout includes six mooring dolphins (9m x 9m) and four breasting dolphins (12.5m x 10m). Another jetty of similar characteristics may be added and both jetties are illustrated in the photomontage images in section 6, Figures 6.2 – 6.5

The jetty platform at each berth will be a two level structure consisting of a lower main deck and an elevated mezzanine deck. The loading platform, approximately 30m x 30m, is supported by steel pipe piles. A pedestal-type gangway tower shall be provided to allow access to and from the ship for crew members, customs officials, pilots, etc.

Visual Analysis

When there is no ship in the berth the mooring and breasting dolphins will create the visual effect of this structure. They will appear as very tall structures significantly higher than adjoining mangroves. The breasting dolphins will also support the two level desks that will include the loading platform on the upper deck.

Visual Significance

This element is large scale and the siting of elements in the waterways will maximise contrast and minimise integration. They will however be silhouetted against the LNG facility behind and will from most angles be seen in the context of the facility.

The presence of the ships is an ephemeral visual effect that would temporarily screen parts of the facility from some external views. However the temporary nature of this effect and the large scale of the ships themselves minimises any benefit.

4.2.6 Material Offloading Facility

The material offloading facility (MOF) is required to provide the following functions:

- The offload of modules for LNG trains
- Offload general construction materials from barges
- Ferry terminal

The proposed design is to use a rock fill causeway approach from the site, and then a cellular sheet piled cofferdam arrangement for the wharf structure. The upper surface of the causeway will be finished with 300mm of cement stabilised crushed rock, to provide a cambered paving surface for the movement of heavy cargo.

The construction of the causeway is anticipated to commence from onshore by push-out of suitable materials generated during the site development, to develop an initial causeway to the water edge. As site excavation commences, more suitable materials will be excavated/ripped from the site. Dump trucks will move this rock material to the causeway and the built out will progress from Curtis Island towards the dredged approaches, primarily by end dumping.

Visual Analysis

This will be a major water front element across and replacing approximately 100m of mangroves in this location. The facility will in short term only provide for a landing barge. However in the longer term facilities will include groins extending out into the harbour to allow for berthing of tugs and similar sized vessels.

Visual Significance

This element is in a sensitive water front location and will be visible from waterway areas to the west and north. As it has no elevation it will be screened by the offshore mangrove island to southern views.

4.2.7 Buildings

A cluster of buildings at the back of the site in the eastern most elevated location will provide for the LNG facility administration and maintenance functions. The buildings are set out in a rectilinear pattern with a long north south axis.

Most buildings will be single storey however the maintenance building / warehouse may be higher and may be the equivalent of a 3 storey building (9-12m). The exception is the telecommunication tower that is located adjacent to and to the south of the administration building. This tower will be a guyed lattice structure approximately 30m in elevation. The tower will provide a microwave link between the LNG facility and a service provider in Gladstone.

Visual Analysis

This cluster of buildings will create a visual backdrop to part of the LNG facility. However foreground elements in the storage tanks and production trains are of much larger scale so that the administration / maintenance cluster of buildings will be reduced markedly in terms of visual significance.

The telecommunication tower by definition will be the most elevated feature on the site. It will protrude into the skyline when seen from most situations. However as an open lattice tower of no more than 1m in section it will be limited in its distant impact. The tower will support communication elements such as microwave dishes, each of approximately 2m in diameter.

Visual Significance

This cluster of buildings although in the most elevated location will still be back dropped by the spur behind the accommodation buildings. The foreground elements of the storage tanks and production trains reduce the visual significance of this set of buildings.

The telecommunication tower will be the most elevated structure on the LNG site but its open lattice structure of limited cross sectional dimension limits its visual significance

4.2.8 LNG Site Accommodation Facilities

The temporary construction camp will be located to the east of the LNG trains, gas receiving infrastructure and the administration/maintenance building. This facility will include the living modules, each accommodating 4 people. Auxiliary facilities will include the kitchen/dinning building as well as indoor and outdoor amenities.

The camp is located on the most elevated pads at the eastern extremity of the site developments.

Visual Analysis

The accommodation camp will consist of a number of demountable buildings that will be placed in various linear configurations with an accommodation wing and an amenities wing. The buildings are generally less than 3m high. There may be some outdoor amenities such as tennis courts and outdoor BBQ areas.

Visual significance

The location of the camp surrounded by adjoining hills on three sides and the administration buildings ensure that it will not be seen from external view points and therefore will not contribute to the visual effect of the LNG Facility.

4.2.9 Ground Flares and Night Lighting

The construction and operation of the LNG facility and associated marine facilities will be a 24hour operation. This will require significant night lighting over the site. This will be provided by hooded lighting on tall towers located around the site, see Figure 4.2. This light will be of intensity on-site to achieve safe working conditions. In addition to these lights there will be internal lights within buildings and other work areas.

In emergency and upset conditions, gas will be 'flared' off. Generally these flares consist of a vertical pipe of an elevation to obtain clearance from vegetation. This project utilises a ground flare that places the flare in an enclosed area, see figure 4.1, to allow for safe combustion of excess gases, etc.

A similar but much smaller marine flare is located on the gas pipeline to the ship loading facility. This flare is covered and runs horizontally from the gas pipeline for a distance of approximately 20m.

The other two LNG facilities will have similar site lighting levels. The difference between these two facilities and the Australia Pacific LNG facility is that they use elevated flare stacks. While these have a more limited footprint they do project significantly into the skyline. At times and from certain views these elements are seen above the adjoining ridge line.

Visual Analysis

The night lighting and the night flares will create a brightly lit area in the otherwise dark environs of Curtis Island. Some areas will be able to see the hooded light sources, others would be screened from it and only be able to see a night glow on the horizon of screening topography. Such views may be obtained from some eastern locations, while direct views to light sources will be limited to water and land areas to the west and north-west of the site. The flare will from time to time will add to the intensity of the night glow but will not generally give a direct light effect.

Visual Significance

The night lighting effect will be seen from more distant locations than the site elements themselves. Generally two lighting effects would be experienced. Direct light effects will occur where there is direct line of sight to light sources. Light glow in the night sky will occur to all areas around the LNG site and occurs when there is no direct line of sight to light sources.

Some areas, such as water and land areas immediately to the west will be able to see the light sources and the site. These will experience the biggest visual effect. Some water areas to the north and south will have similar visual effects. However night usage patterns in these locations at night are not considered to be visually sensitive.

Other areas, by far the majority will only experience the distant glow created by screening of the light sources, e.g. as seen from North Point on Facing Island or other islands in this part of Port Curtis, or alternatively distant locations that would have inter-visibility with light towers, e.g. Auckland Lookout and other parts of Gladstone.

When considering the cumulative effect of the three LNG facilities, the western areas and some parts of the northern and southern areas will experience direct views to the onsite lighting and occasional gas burn-off flares with a commensurate increase in visual effect.

Other areas will also have greater night glow effects and will from time to time experience the direct visual effect of the gas burn off flare as stacks protrude above the skyline as seen from these locations. This impact is mitigated by the Australia Pacific LNG facility due to the use of the a ground flare.

4.3 Summary

The development of the LNG facility in this location will create a major visual change from the existing landscape character of Curtis Island. The development of a major industrial facility within what is currently a foreshore island site located on forest covered rolling hills will by definition create major visual change. However the location within an industrial zoning and the LNG facility is in keeping with that.

There are, however, certain landscape parameters of the site that will enable the development to be visually integrated into the landscape, providing development is contained to the development platforms and vegetation outside these areas is conserved.

5.0 VISIBILITY AND VISUAL SENSITIVITY.

5.1 General

For a visual impact to occur there has to be visibility of the Project components. For areas that have visibility, a sensitivity rating is applied based on land use type and distance from the point of viewing to the Project areas that are seen. Three levels of visual sensitivity were established (refer to figure 2.4).

Low Visual Sensitivity ratings

Low ratings have been applied to land use types that do not use visual amenity as an attribute to the activity such as rural production lands, industrial lands, etc. Low sensitivities have also been applied to sensitive land uses when visual disturbance areas are in the background, i.e. further than 12.5km.

Moderate Visual Sensitivity Ratings

Moderate ratings have been applied to land uses that make some use of amenity such as views from main roads such as the Gladstone Mt Larcom Rd. Moderate sensitivities are also applied to high sensitive land uses where distances are likely to start mitigating the significance of changes to the landscape.

High Visual Sensitivity Ratings

High ratings have been applied to views from aquatic and terrestrial recreation areas, such as Curtis Inlet. Land based recreation areas and urban areas of Gladstone although sensitive have been ascribed lower sensitivities due to the distance these areas are from Curtis Island.

5.2 Visibility and Sensitivity

The LNG facility and shipping facilities are large scale infrastructure elements set in a natural environmental setting of the south eastern corner of Curtis Island. The facility and parts thereof are seen in different ways from various directions and distances.

Similarly the land uses around the site vary creating different visual sensitivities as outlined in Figure 2.4 and illustrated on Figure 5.1. To enable illustration of the varied view types views are considered in relation to the western, northern, eastern and southern view sectors, figure 5.1

The consideration of visibility and visual sensitivity ratings for the LNG facility on its own and the cumulative are generally the same. Any differences are discussed below within the various sectors.

5.2.1 Zone of Visual Influence

Figure 5.1 illustrates the areas that on the basis of topography alone will have views to the LNG facility. This computer generated plan was based on computer modelling of facility elements and then defining what areas can see these elements on the basis of topography alone. The highest elements in the LNG facility are the gas storage tanks and the production trains at approximately 35m.

The visibility of the LNG facility as is partly illustrated in Figure 5.1 will be discussed in relation to the various view sectors below.

It is significant to say that the model takes no account of the screening effects of vegetation. This element is important in relation to screening views to the LNG facility. In this regard, it is vegetation, or more specifically tree cover, that is immediately adjacent to a viewing location that will screen views. For example on Figure 5.1 there are areas of Curtis Island in the northern sector to the north east of the facility that are shown as having views to the LNG facility. However forest cover in those locations would generally preclude views to the LNG facility. Unless there were significant openings in the tree cover views to the LNG facility will not be possible.

Figure 5.1 Viewing Sectors around the LNG facility

5.3 Western View Sector

The LNG Facility is totally visible when viewed from directly west (Figure 5.1 & 5.2). However the surrounding hills do provide backgrounding and enclosing effects increasing the integration status of the Facility. Also clearly visible will be the ship loading facility and any ship that may be berthed at the time.

This view zone includes Gladstone Harbour and industrial lands in the vicinity of Landing and Serrant Road. Other areas in the zone include natural foreshore salt marshes and mangroves as well as grazing lands within open woodland and recreational use associated with hiking to Mt Larcom.

The waterways fulfil the dual function of catering for commercial shipping as well as recreational boating. In addition to fishing, this part of the bay is also used by boats, especially recreational yachts that use the 'inside passage' to navigate The Narrows travelling to and from more northerly destinations such as the Whitsunday Islands. This recreational usage creates a high sensitivity for water areas within 2.5km and a moderate sensitivity to 7.5km.

The industrial areas and marshlands as well as grazing lands would have a low sensitivity to change created by the creation of the LNG Facility.

At a distance of 10km the lookout on Mt Larcom is considered to have a moderate to low sensitivity.

The only difference that is created by a consideration of the cumulative effect is that the high and moderate sensitivity ranges are extended down the western side of Curtis Island, instead of just radiating out around the LNG facility location.

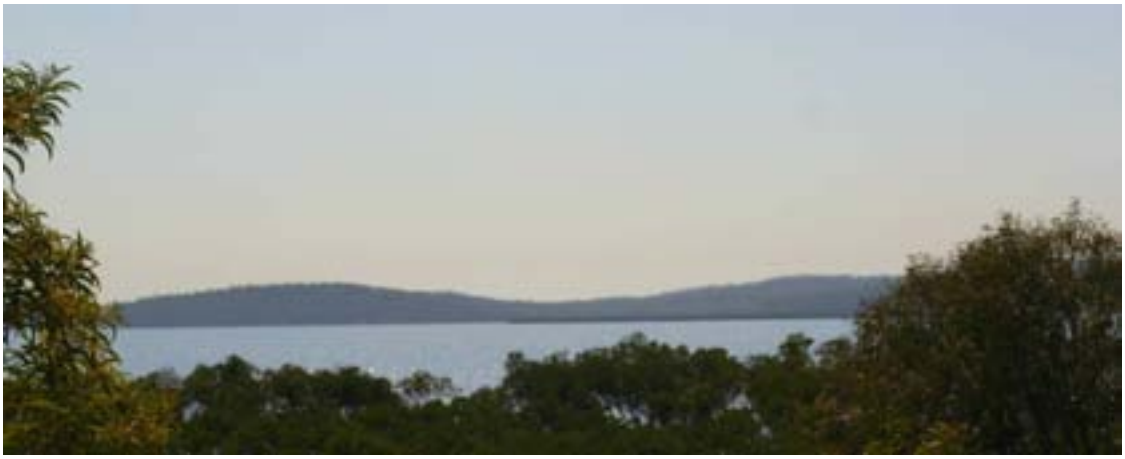


Figure 5.2: Views from the western sector are onto the western foreshores of Curtis Island in the vicinity of the LNG facility

5.4 Northern View Sector

When viewed from the north from the entrance to the Narrows Passage or Graham Creek, the foothills between the site and Graham Creek provide some screening (Figure 5.3) although the storage tanks and some light poles will be visible. The storage tanks will skyline when seen from the north.

Also clearly visible from this direction will be the ship loading facility and any LNG carrier ship that may be berthed at the time.

Although views to the storage tanks will be limited to approximately 6km along the channel to the Narrows, the ship loading facility will be visible for much greater distances.

These water areas have been ascribed a high sensitivity to 2.5km; moderate sensitivity to 7.5km and low sensitivity past this distance.

There is no change to the consideration of visual sensitivity in relation to the cumulative effect of the three LNG facilities.

Figure 5.3: Views from the northern sector are to varying degrees onto the forested spur north of the LNG facility site

5.5 Easterly View Sector

The LNG facility will be screened from the north by the north south aligned forested sand hills (Figure 5.4). However it is expected that there will be a night glow resulting from site lighting and from the ground flare.

The sensitivity of distant residential areas at North Point and South End is considered to be low to the glow effect created by LNG facility and is moderate in relation to the islands to the north east of Gladstone.

The visual sensitivity relating to a cumulative consideration of the three LNG facilities would alter, with the islands becoming highly sensitive due to the proximity of the southern LNG facility, with potential impacts relating mainly to the effect of night lights from flares.

Figure 5.4: Views to the LNG facility from this sector are generally screened by forested hills on Curtis Island that are to the east of the LNG facility

5.6 Southern View Sector

There will be open views across and from the waters of Gladstone Harbour and from the urban areas of Gladstone some 10km to the south. To a degree, the LNG facility will be screened by the other two planned LNG facilities located to the south and adjacent to the LNG facility. These facilities are also located in the south western corner of Curtis Island between China Bay and Laird Point. From view locations in the south west all LNG Facilities will be seen, albeit at an acute angle (Figure 5.5).

The visual sensitivity of water areas is high up to 2.5km moderate to 7,5km and low beyond this. The urban residential and recreational areas of Gladstone although sensitive at closer distances would have a moderate sensitivity up to 12.5km and low beyond this. In this context the residential areas around Auckland Lookout would have a moderate sensitivity, with residential areas further than 12.5km being ascribed a low sensitivity.

At 11km from the Auckland Hill Lookout it has been ascribed a low sensitivity Similarly more distant lookouts such as at Round Hill and QAL will have low sensitivity to such a distant site.

A consideration of the cumulative effect of three LNG facilities on sensitivity in this sector would be to extend the range of moderate visual sensitivity further south. However this would have little effect as areas beyond the outer edges of Gladstone have limited views to the north. There are few exceptions and this would include the lookouts such as Round Hill Lookout. Significantly the sensitive northern edge of the city in the vicinity of Auckland Hill Lookout still retains its moderate sensitivity rating despite the decreased separation between these areas and the southern LNG facility.

Figure 5.5: Sensitive receptors, such as the urban areas of Gladstone only have distant views, generally greater than 10km to the LNG facility.

5.7 Summary Of Visual Sensitivity

The location of sensitive receptors in relation to the LNG facility is limited. The most sensitive area close to the Facility is the waterways of Curtis Inlet, Graham Creek and the channel leading to The Narrows. The other sensitive locations are within Gladstone, however these areas are over 10km from the proposed facility and this reduces sensitivity levels to moderate and low.

A collective consideration of all the LNG facilities does little to change the visual sensitivity profiles around Curtis Island. The only increase the sensitivity areas to the south, results from the measurement for distance zones commencing at the southern point of the southern LNG facility. But even this does not alter the extent of sensitive viewpoints within the view shed significantly, especially as it relates to urban areas of Gladstone.

6.0 VISUAL EFFECTS

6.1 General

All of the LNG facility elements defined in Section 4 above would be seen in part or in total and would create different levels of visual effect as seen from various locations. The Facility would be seen in a range of landscape settings depending on the viewer location. Viewer location will define the site and landscape components that are seen in the view.

The LNG facility would be a major industrial complex that would contrast highly with the existing landscapes of Curtis Island. On this basis, the visual effect of the project must be considered in terms of high contrast and low integration, see Figure 2.2.

In conjunction with parameters set out in Figure 2.2 it is important to determine the extent of the view and more specifically the primary view zone that is occupied by the LNG facility (see Figure 2.3).

As set out in Figure 2.2:

- A high visual effect will occur if the LNG facility covers more than 2.5% of a primary view zone as seen from any location;
- A moderate visual effect will occur if the LNG facility covers more between 2.5% - 1% of a primary view zone as seen from any location;
- A low visual effect will occur if the LNG facility covers less than 1% of a primary view zone as seen from any location; and
- A very low visual effect will occur if the LNG facility covers less than 0.5% of a primary view zone as seen from any location.

Figure 2.3 illustrates the calculation of the area of the primary view zone at different distances, with the zone getting larger with increased distances.

The area of the primary view zone that the LNG facility will cover as part of its projection into the view will vary according to numerous factors including the dimensions of the facility components, the degree to which the facility is screened, the elevation of the viewing location and most importantly distance.

In each view shed, the amount of the LNG facility that would be visible will vary and therefore the area it presents to view would vary. For example to the west the whole facility is visible, while to the east none is visible.

As can be seen from the discussion in Section 4.2, the LNG facility is a major industrial complex located on 235ha. The site development pads and infrastructure would cover an area of approximately 1000m by 2000m with an outlier to the east covering approximately 400m by 100m for the administration / maintenance buildings and construction camp and a further outlier to the south covering 400m by 75m for the ground flare.

The projection of these elements into the view will vary as discussed and be greatly influenced by screening. This projection will vary depending on the angle of view. For example a western view is completely open and creates the biggest visual effects. When viewed in the opposite direction, from the east it is completely screened.

Photomontages have been created to visually represent the impact the LNG facility will have on the surrounding area. Photomontages representing the cumulative impacts of the proposed GLNG and QCLNG LNG facilities on Curtis Island have also been prepared. Locations of the photomontages are illustrated in Figure 6.1.

For most of the photomontage locations, various conditions were illustrated and identified as a, b, c, d & e, where:

- represented the existing view or view type from each location;
- represented the view with the Australia Pacific LNG facility in the view;
- represented the day time view of all three LNG facilities;
- represented the night time view of the Australia Pacific LNG Facility; and
- represented the night view of the three LNG Facilities.

Figure 6.1 Location of photo and computer montages

6.2 Cumulative Visual Effects

The cumulative effect of all three LNG Facilities will be much greater with the affected area stretching over some 5km with natural areas retained between the various facilities. The visual effect was determined by

considering three facilities of similar scale to the LNG facility to define the scale of the visual effect in the various sectors around the facilities.

One of the most significant visual effects relating to the cumulative consideration of the facilities is the effect of night light. The other two LNG facilities utilise a vertical stack of considerable scale to 'flare' gas when necessary.

6.3 Western View Zone

6.3.1 LNG facility

The greatest level of visual exposure is to the west. From this location the facility will be fully visible. In terms of this and the recognition that the LNG facility creates level 1 contrast and integration effects:

- A high visual effect will be experienced for distances up to approximately 2km;
- A moderate effect will be experienced between 2-3km; with
- Low visual effects being experienced to approximately 4km.

The visual effect of the LNG facility is illustrated in part in Figures 6.2 c, 6.3c and 6.4c as seen as part of the cumulative effect of the three LNG facilities from various locations in the sector. It can be seen from these figures that the most prominent element of the LNG facility is the LNG storage tanks being the most westerly elements and the largest. A temporary element that is part of the view from time to time is the LNG and LPG ships.

While there is generally good integration with the backgrounding hills there is some skylining of the LNG storage tanks from water locations close to the facility.

The night lights are illustrated in Figures 6.2d, 6.3d and 6.4d are the night light effects. These figures illustrate the direct light effects of the site lighting and the indirect glow that results from flaring. The site is a brightly lit element in an otherwise dark sky as seen from these westerly locations. However it is considered that these land uses are not sensitive to such lighting effects.

Cumulative Effect of three LNG Facilities

If the three facilities are seen as defined modules with natural areas separating them, a high visual effect would be extended out to 3km and a medium visual effect would extend out to 5km, with low effects past this point based on a tripling of the area of view affected by LNG Facilities and associated infrastructure.

However if there is not good separation between facilities then a high visual effect would extend out to approximately 5km with moderate visual effects occurring up to 7km before low visual effects are experienced.

The cumulative effect is illustrated from various locations in the sector in Figures 6.2c, 6.3c and 6.4c. These figures illustrate the more extensive development of the foreshore. However the LNG facilities are well integrated into the landscape by definition of vegetation areas between the three LNG facilities and the forested hills that overtop them.

Night lighting effects are illustrated in Figures 6.2e, 6.3e and 6.4e. This lighting is perhaps the greatest visual effect of the project with the development nodes being accentuated by lighting, however the effects are on low use areas of the bay and industrial areas on the western foreshores.

The infrequent flare event, would have its effect reduced by the surrounding site lighting when seen in these westerly views.

6.4 Northern View Zone

6.4.1 LNG facility

The views to the LNG facility from this zone are generally restricted to views from Curtis Passage. From this location only the marine facilities, the Materials Offloading Facility and the tops of the LNG Storage Tanks would be visible. These elements would create maximum contrast with the existing landscape in this location.

A high visual effect would be experienced for less than 1km after which moderate visual effects with low effect levels likely to occur past a distance of 2km.

The visual effect of the LNG facility is illustrated in part in Figure 6.5c. The figure does not illustrate the typical view from the north but does in part illustrate the partial screening effect of the hills associated with Laird Point. At this distance the LNG facility creates a high visual effect.

Also illustrated in Figure 6.5d are the night light effects of the LNG facility. Again from this location all elements are clearly visible due to site lighting. However the more typical northern view would be more of a night glow as much of the site and its lighting would not be visible.

Cumulative Effect of three LNG Facilities

To a certain extent there is the potential to view along the western shore of Curtis Island but the extent to which this can be done is limited by Laird Point and the adjoining foothills. This reduces the angle and extent of views up the Channel to the Narrows.

However given that the LNG Facilities would appear juxtaposed on each other and not separated, the visual effect level could be high up to a distance of 3km with moderate effects potentially occurring up to 5km.

There would be a night light effect resulting from the 3 facilities in terms of both site lighting and flaring, however the probability of all three flares operating at the same time is remote. Effects would be high due to the strong contrast between night darkness and direct and indirect lighting effects of site lighting and gas burn off flares.

However as it is considered that these areas would often not be used at night, the effect is not considered significant.

The cumulative effect is illustrated from one location in the sector in Figure 6.5c. It can be seen from this figure that the three facilities are generally well integrated by the backgrounding hills. The Australia Pacific LNG facility is the most obvious, with the QCLNG facility screened by ships. The Santos LNG facility is seen in the distance. There is a high visual effect at this distance created by the foreground Australia Pacific LNG facility and accentuated by the other facilities.

Night lighting effects are illustrated in Figure 6.5e, again this illustration is atypical of the general northern view and to some extent lights would be screened by Laird point. It can be seen that this section of Curtis Island is lit up by the 3 LNG facilities. This effect is not likely to be experienced by many in this sector as only boating areas are exposed to this view, within the sector.

6.5 Eastern View Zone

6.5.1 LNG facility

The LNG facility and Shipping Facilities will not be visible from the eastern sector. The only visual effect experienced from this sector could be the effect created by night glow on the horizon.

This visual effect would be considered to be very low. However when considered with the lights and burn off flares of the other LNG facilities this level would be somewhat higher especially for the islands in the Harbour that would be more highly impacted by the other facilities that are closer to them.

Cumulative Effect of three LNG Facilities

The LNG facilities are generally screened from eastern view locations. The exception to this is the gas burn off flares that are installed in tall stacks in both of the other LNG facilities. The LNG facility uses a ground flare that is not visible over ridges to the east of the facilities.

This visual effect although small is within the critical skyline location and are the only industrial elements to occur in the view shed of this natural forested ridge.

The effect of these stacks at night is increased because of even greater contrast between the darkness of the sky in this sector. The visual effect is to create direct light from the gas flares and a reflective glow effect on surrounding ridge and night sky landscapes.

6.6 Southern View Zone

6.6.1 LNG facility

The southern view zone will have open views to the LNG facility and Ship Loading Facilities. At close proximity, the visual effect would be high and remain so up to approximately 2km. A moderate effect experienced up to distance of approximately 3km. Beyond this distance the LNG facility would be less than1%of the primary view zone.

The visual effect of the LNG facility is illustrated in part in Figures 6.6b, 6.7b and 6.8b. It is clear from these images that the facility is very distant and made less prominent by much bolder foreground landscape detail, be it natural and or land use elements.

Also illustrated in Figures 6.6d, 6.7d and 6.8d are the night light effects of the LNG facility. From some locations they are seen as very distant but indistinguishable lights. From other locations, foreground lights weaken this effect even further (refer Figures 6.7d & 6.8d).

Visual effects on sensitive viewer locations in this sector are low.

Cumulative Effect of three LNG Facilities

The cumulative effect to the south is limited by distance and the acute angles of view to all of the LNG Facilities. In this context a similar visual effect would be achieved with high effects experienced out to 3km and moderate effects out to 5km. These effects are therefore restricted to the waters of Gladstone Harbour with low visual effects at sensitive areas of Gladstone.

The effect of night lighting on the Gladstone area will potentially be higher than the day time effects. This is the result of the stronger contrast created by direct lighting effects. However due to distance the effects

generally remain low. However this contrast is weakened by the night lights within existing port facilities between Curtis Island and Gladstone.

The cumulative effect is illustrated from various locations in the sector in Figures 6.6c, 6.7c and 6.8c. Night lighting effects are illustrated in Figures 6.6e, 6.7e and 6.8e. What is evident is that in some situations when a gas burn off occurs from the vertical burn off stacks a flare is obvious on the night skyline, but other lights blend in with foreground lights close to viewing locations.

6.7 Summary

The creation of a large scale industrial facility such as a LNG Facility and Ship Loading Facility within a natural setting such as Curtis Island will create strong contrast. However there will be a relatively high level of integration due to the scale of the backgrounding forested ridges and surrounding bushland. This contrast is greatly increased when the cumulative effect of 3 LNG facilities is considered in the context of Curtis Island. Again however the backdrop of forested ridges and the bushland between the sites creates a relatively high level of visual integration of this industrial development with the surrounding natural setting of the island.

However sensitive receptors are generally far removed, with the exception of recreation boating, so high visual effects are not generally experienced from sensitive locations.

A mitigating consideration however is that the land on which the LNG facility and the other facilities are located is designated for industrial purposes. In that setting the visual character of elements built on that land would be expected to be industrial in character.

In terms of this designation, the visual effect is in keeping with what is intended and could be considered to be low. What caused high visual effects is the establishment of this industrial precinct on the island. So in that sense the assessments of visual effect are really an assessment of this designation as much as it is an evaluation of the proposed LNG facilities.

Figure 6.2a: Water Location adjacent to the GLNG facility site – existing visual setting

Figure 6.2c: Water Location adjacent to middle LNG facility site – illustrating the three LNG facilities

Figure 6.2d: Water Location adjacent to middle LNG facility site – illustrating the Australia Pacific LNG facility at night with ground flare glow evident

Figure 6.2e: Water Location adjacent to middle LNG facility site – illustrating the three LNG facilities at night

Figure 6.3a: Water Location adjacent to southern LNG facility site – existing environment

Figure 6.3c: Water Location adjacent to southern LNG facility site – illustrating three LNG facility

Figure 6.3d: Water Location adjacent to southern LNG facility site – illustrating night light effect of Australia Pacific LNG facility

Figure 6.3e: Water Location adjacent to southern LNG facility site – illustrating night light effect of three LNG facilities

Figure 6.4a: Location on western foreshore – existing visual setting

Figure 6.4b: Location on western foreshore – view to Australia Pacific LNG facility on Curtis

Island from 4.5km away

Figure 6.4c: Location on western foreshore – view to the three LNG facilities

Figure 6.4d: Location on western foreshore – view to Australia Pacific LNG facility at night from 4.5km away

Figure 6.4e: Location on western foreshore – view to three LNG facilities at night on Curtis Island from 4.5km away

Figure 6.5a: Location on water west North West of site – existing visual setting

Figure 6.5c: Location on water west North West of site – view onto the three facilities on Curtis Island

Figure 6.5d: Location on water west North West of site – view onto Australia Pacific LNG facility at night

Figure 6.5e: Location on water west North West of site – view onto three LNG facilities

Figure 6.6a: conceptual view from bridge over Calliope River on Mount Larcom – Gladstone Road showing the existing view screened by foreground vegetation and micro topography

Figure 6.6b: conceptual view from bridge over Callide River on Mount Larcom – Gladstone Road showing the potential views from this general location onto the Australia Pacific LNG facility

Figure 6.6c: View onto the three LNG facilities with the flaring (from QCLNG & GLNG, only) obvious on the skyline

Figure 6.6d: Location on water west North West of site – view onto the Australia Pacific LNG facility at night

Figure 6.6e: Location on water west North West of site - view onto the three LNG facilities

Figure 6.7a: Lookout at Auckland Hill – the existing view is along the foreshore of Curtis Island with the LNG facility site being over 10km away

Figure 6.7b: Lookout at Auckland Hill – the potential view to Australia Pacific LNG facility

Figure 6.7c: Lookout at Auckland Hill – the potential view to the three LNG facilities on Curtis Island

Figure 6.7d: Lookout at Auckland Hill – the potential view onto Australia Pacific LNG facility at night

Figure 6.7e: Lookout at Auckland Hill – the potential view at night onto the three LNG facilities

Figure 6.8 a: Lookout at Round Hill – the existing view over the harbour and including Curtis Island

Figure 6.8 b: Lookout at Round Hill – the potential view towards Australia Pacific LNG facility on Curtis Island

Figure 6.8 c: Lookout at Round Hill – the potential view towards the three LNG facilities on Curtis Island

Figure 6.8 d: Lookout at Round Hill – the potential view of the Australia Pacific LNG facility at night.

Figure 6.8 e: Lookout at Round Hill – the potential view of the three LNG facilities at night.

7.0 POTENTIAL VISUAL IMPACTS

7.1 General

This section of the report considers the visual impact of the Project based on visual effect and sensitivity values. The visual sensitivity levels to the Project were discussed in Section 5 of this report. The visual effects of the Project and its various elements were discussed in Section 6 of this report.

The impact of the LNG facility will vary according to the visual effect of the Project, its visibility, and the visual sensitivity of areas from which it is seen. These two factors are considered together as indicated in Figure 2.5 to determine impact levels.

The Project has the potential to create an adverse visual impact on areas surrounding the Project, especially on sensitive visual receptors such as recreational boating areas, residential areas and recreational areas such as lookouts.

The visual impacts are considered in relation to the various sectors around the Project as were visual sensitivity and effects above.

7.2 Western View Sector

Land areas in the western sector are dominated by industrial land use and low intensity rural land uses. These have low sensitivities which create low impact levels.

Although the Mt Larcom Gladstone Road has a higher sensitivity, the separation distances create low sensitivity and effects creating a low impact. Similarly with Mt Larcom being some 10km away, a low visual effect and sensitivity result in a low impact level.

This sector will experience the highest visual impacts based on the high visual effect levels occurring in areas of high visual sensitivity that applies to the recreational boating activities associated with this part of the harbour. These high impact levels are experienced up to 3km with moderate impacts beyond this on all waterways.

When considering the cumulative impact of three LNG facilities visual impact levels would be high on all water areas in the sector and then reduce to moderate on foreshore areas and low beyond this.

The cumulative impact levels in this sector are not significantly greater due to the low sensitivity of land use areas to the west of Curtis Inlet and the greater distance to sensitive receptors such as Mt Larcom.

7.3 Northern View Sector

The waterways of Curtis Inlet, The Narrows and Graham Creek are the main concern in the northern sector. The recreational boating creates high effects up to 1km away and moderate effects up to 2km away.

With high sensitivity up to 2.5km away a high impact will occur up to 1km with moderate to high impacts to 2km. Beyond this distance low impacts would occur with moderate to low impacts past this point.

The cumulative impacts are similar but extend further with high impacts occurring up to 3km and moderate impacts up to 5km away. In a northerly direction past this point low impacts would be experienced.

The impact of night lights is not significant due to minimal use of the recreational waterways in this zone at night. The exception may be boats that may moor in Graham Creek waiting for an opportunity to cross the bar in the Narrows at the right tide.

7.4 Eastern View Sector

There are no impacts on sensitive receptors in this sector created by the LNG facility. This is due to the screening effect of hills on Curtis Island.

However when a cumulative effect is considered, the flaring stacks of the other facilities are under certain circumstances visible to external view over intervening ridges.

The exception to this would be attributable to night lighting. There could well be a glow in the night sky, attributable to the LNG facility. However if the cumulative effect of the 3 facilities is considered then a high visual effect could occur due to the combined effect of direct light from the vertical flares and indirect light from the glow created by site lighting in the night sky.

7.5 Southern View Sector

As with the western and northern sector, Gladstone Harbour in this southern sector supports recreational boating that is ascribed a high sensitivity up to 2.5km decreasing to moderate up to a distance of 7.5km.

The sector also contains the most sensitive land uses in the form of recreational/tourist lookouts and areas and urban residential areas. Urban residential areas are ascribed a high sensitivity up to 7.5km and a moderate sensitivity to 12.5km.

The closest housing adjacent to Auckland Hill lookout is some 10km away from the LNG facility and will have a moderate sensitivity at this distance. Recreational / Tourist areas such as Auckland Hill lookout will have a moderate to low sensitivity at this distance. Other lookouts such as Round Hill are even further distant and would have a low sensitivity

The visual effect of the LNG facility and shipping facilities would be low beyond a distance of 3km when considered on its own and it would be low after 5km when considered with the other proposed facilities.

The visual impact levels will be high on Gladstone Harbour for distances up to 2km for the LNG facility and moderate to 3km with low impacts beyond this

When considered as part of the cumulative impact, a high impact would extend to 3km with moderate effects extending to 5km.

The urban areas of Gladstone will only experience low impacts due to the Curtis Island location of the LNG facility and to a lesser extent the other facilities being in the background of what is an expansive view. Of that view the LNG facility is less than 0.5% of the primary view zone and much less than that of the total view.

The impact of night lighting is minimal due to the foreground effect of night lighting in Gladstone itself. However, the flares do create a minor focal point in the night sky.

7.6 Summary

The visual impacts of the proposed LNG facility would be highest immediately to the west of the site at Laird Point. In this Harbour area, a high visual effect is experienced by high sensitivity recreational boating,

especially by boating navigating The Narrows. However, this visual impact is reduced as one moves away from the locality as both visual effect and visual sensitivity levels decline.

The impacts on the sensitive residential and recreational areas in the vicinity of Gladstone are significantly reduced by the distances between the LNG facility and Gladstone, generally over 10km away. Even when considering the cumulative impact of the three gas facilities, Gladstone is still further than 7.5km away reducing sensitivity to moderate, and effects to moderate and low. This in turn creates a moderate to low impact.

Due to the topography of Curtis Island the LNG facility is screened from most eastern view locations, eliminating impact. The minor exception to this is night lighting that will create a night glow but not have direct light effects.

When considering the cumulative effects of the three facilities there may be some visibility to the stacks and night flaring in upset conditions that will have an impact on eastern view locations. Use of ground flares could reduce this impact.

Overall, when considering LNG facility on its own as well as a cumulative impact, there will be a visual impact by virtue of the character and scale of the development. However, the Curtis island sites allows for high levels of visual screening and integration as long as strict management of vegetation areas both outside of the development areas both on site and off site is achieved.

8.0 MITIGATION MEASURES

The development of the LNG facility at Curtis Island does create visual change and contrast to the bush setting of the site. However the industrial land designation tempers that effect, in that it is expected that industrial development will occur here.

The aim of visual mitigation strategies should be to achieve visual integration between the industrial elements of the LNG Facility and the Curtis Island area. This is especially important when considering the cumulative effects of three LNG Facilities.

There are a limited number of visual mitigation strategies that can be implemented to achieve improved visual outcomes where reasonable and practicable. These include:

- Minimising the pad areas needed to support the LNG facility;
- Stabilise and landscape cut and fill batters to reduce colour contrast with adjoining vegetation;
- Minimise the penetration of the mangrove fringe at the MOF to the essential width to accommodate the water interface facility. Beyond this width retain the mangroves and develop the LNG trains and LNG storage areas behind the mangrove fringe;
- Ensure vegetation clearing at edges of earth work areas avoid damage to vegetation areas external to cleared areas;
- Ensure that the ridge to the north of the development that is external to the site and within existing environmental precincts is retained to maximise the screening/integration effects of the LNG Facility as seen from the sensitive 'The Narrows' location north of Laird Point.
- Manage edges to cleared areas by making natural area exclusion zones to prevent equipment access. This is especially important in relation to facility outliers such as the ground flares;
- Ensure that the adjoining bushland is managed to ensure its viability to achieve ongoing visual integration.
- Ensure that site lighting is hooded and that the elevation of poles is kept to a minimum consistent with site coverage requirements.
- Evaluate the outcomes of more lights that have a lower elevation while achieving the required light levels.

Implementing the above visual mitigation strategies will minimise visual effects consistent with the scale of the development. Further, they will achieve a visual integration of the LNG facility into the forested hillsides of the Laird Point location.

9.0 CONCLUSION

The development of the LNG facility and associated marine facilities will create a major visual change to the existing visual settings of Curtis Island. This effect will be more so when considered in the context of the other LNG facilities proposed for this location on Curtis Island. However this area has been designated for industrial development by the State Government of Queensland, so that the development is visually appropriate to the future land use intent for the locality.

While there is major visual change created by the LNG facility, there are many factors that mitigate against it creating major visual impacts.

Firstly there are very limited sensitive receptors within the foreground and middle-ground zones of the Laird Point site location. These are limited to recreational boating that may use adjoining waterways.

Other sensitive receptors such as residential areas, recreational areas and major roads are in the background of the LNG facility site, generally further than 10km away. This reduces both sensitivity and visual effect.

Another impact mitigating element is the topography and vegetation of Curtis Island in the vicinity of Laird Point. The adjoining hills and tree cover limit views from the east and south east and create landscape integration elements when viewed from the west, south west and the north.

The visual effect of night lighting is primarily created by the flares that are a major vertical element; however these are used only in emergency and upset conditions. The use of ground flares eliminates this direct light visual effect, contributing only to the general ambient light glow effect of the LNG Facility as a whole.

Further careful management of onsite vegetation will ensure that the site is visually integrated with the natural setting of the island, being contained within a ring of forested hills. The facility and surrounding facilities will create an industrial character to this part of Curtis Island that emulates the development that has already occurred along the eastern shoreline of Gladstone Harbour. However it should be possible to achieve this development within the strong matrix of the forested hills of Curtis Island.