



# **Appendix N**

## Landscape and visual

The background of the cover is a grayscale photograph showing a residential neighborhood in the foreground with many houses and trees. In the middle ground, there is a large industrial facility, the Port Kembla Gas Terminal, featuring several large white storage tanks and complex piping. In the far background, several tall industrial smokestacks are visible against a hazy sky.

# **Australian Industrial Energy**

## Port Kembla Gas Terminal Landscape and Visual Impact Assessment

November 2018



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# Abbreviations and terminology

The table below outlines the abbreviations and terminology contained within this report.

Abbreviation	
AIE	Australian Industrial Energy
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act
FSRU	Floating Storage and Regasification Unit
GHD	GHD Pty Ltd
LCZ	Landscape Character Zone
LNG	Liquefied Natural Gas
LVIA	Landscape and Visual Impact Assessment
NSW	New South Wales
SEE	Statement of Environmental Effects
SEPP	State Environmental Planning Policy
VP	Viewpoint
DCP	Development Control Plan
LEP	Local Environmental Plan
ZTV	Zone of Theoretical Visibility

Terminology	Definition
Landscape sensitivity	The extent to which landscape can accept a change of a particular type and scale without unacceptable adverse impacts on its character.
Baseline	An initial collection of information which serves as a basis for comparison with other information
Landscape value	Areas of formally designated landscape that through national or local consensus, reflect the value placed by society on particular environments and/or their features.
Photomontage	A computer generated image showing a proposed development as it would appear on the existing landscape.
Sensitive receptor	Individuals and/or defined groups of people who have the potential to be affected by the project.
The Project	The Port Kembla Gas Terminal
Visual Impact	Changes in the appearance of the landscape or in the composition of available views as a result of development, to people's responses to these changes, and to the overall impacts in regard to visual amenity.

## Appendices

Appendix A - (Photomontages)

# 1. Introduction

## 1.1 Background

Australian Industrial Energy (AIE) proposes to develop the Port Kembla Gas Terminal (the project) in Port Kembla, New South Wales (NSW). The project involves the development of a liquefied natural gas (LNG) import terminal including a Floating Storage and Regasification Unit (FSRU) moored at Berth 101 in the Inner Harbour, visiting LNG carriers, wharf offloading facilities and the installation of new pipeline to connect to the existing gas transmission network. The project will be the first of its kind in NSW and provide a simple, flexible solution to the State's gas supply challenges.

The project has been declared critical state significant infrastructure in accordance with section 5.13 of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) and Schedule 5 of the Station Environmental Planning Policy (SEPP) Station and Regional Development. An Environmental Impact Statement (EIS) is required to support the application for approval for determination by the NSW Minister for Planning.

GHD Pty Ltd (GHD) were engaged by AIE to prepare documentation to support the CSSI application.

This Landscape and Visual Impact Assessment (LVIA) report has been prepared by GHD to provide an assessment of landscape and visual impacts as an input to the EIS, with a view to making recommendations for managing identified landscape and visual issues that may arise from the project.

## 1.2 Project overview

### 1.2.1 Objectives

Key objectives for the project are to:

- Introduce a new source of competitively priced gas to meet predicted supply shortfalls and help put downward pressure on prices
- Provide gas security to NSW with ability to supply more than 70 % of the State's gas needs
- Provide long term contracts to industrial users and ability to meet 100 % of the State's industrial demand (manufacturers, power stations, hospitals, small businesses, etc.)
- Help support the 300,000 jobs across NSW, and the 15,000 jobs in the Illawarra, which rely on the competitive, reliable supply of natural gas
- Support the diversification and future growth of Port Kembla.

### 1.2.2 The project

The project comprises the development of a LNG import terminal and incorporates four key components, the majority of which are proposed to be located within industrial land declared under the State Environmental Planning Policy (Three Ports) (Three Ports SEPP), with a small portion within private recreational land within the Wollongong Local Environmental Plan (LEP). Key project components include:

- LNG carrier vessel – there are hundreds in operation transporting LNG from production facilities to demand centres globally

- FSRU – a vessel which will be moored at berth 101 on the eastern side of the inner harbour at Port Kembla. There are around 30 of these currently in operation worldwide with a further 75 ordered or in feasibility planning.
- Wharf facilities – such as offloading arms or hoses which transfer gas from the FSRU into the pipeline.
- Pipeline – an underground gas pipeline connection of approximately 6.3 kilometres will be constructed from Berth 101 to the existing east coast gas transmission network at Cringila.

At present it is envisaged that an LNG shipment will be required every 2-3 weeks to provide for an annual supply of up to 100PJ of gas. Supply could be increased further to around 140-150PJ per annum through a slight increase in LNG delivery schedules and pipeline upgrades.

It will take 10-12 months to complete construction and other works in order to start operations. Subject to the timing of approvals processes, it is possible to have first gas by early 2020. The duration of the project is approximately 15 years.

The estimated capital cost of the development is between \$200 and \$300 million.

In discussions with NSW Ports they have confirmed that the establishment of a LNG import terminal at Port Kembla is consistent with their strategic plan outlined in *Navigating the Future – NSW Ports’ 30 Year Master Plan*. AIE has been working closely with NSW Ports and the Port Authority to ensure neither the construction, nor the ongoing operation of the LNG import terminal would negatively affect other port users or the wider community.

## 1.3 Scope and structure of the report

### 1.3.1 Scope of report

This LVIA assesses the landscape character and visual impacts of the project, with particular consideration for sensitive landscape and visual receptors in the area surrounding the project. Mitigation measures will be identified to address potential impacts where appropriate.

The report comprises the following:

- An understanding of the landscape and visual attributes of the study area
- Identification of sensitivities of landscape and visual receptors in the vicinity of the project
- Assessment of potential landscape and visual impacts associated with the project
- Provision of recommendations for managing identified landscape and visual impacts arising from the project.

The following requirements are listed in the Secretary’s Environmental Assessment Requirements (SEARS) for LVIA:

- *‘An assessment of the likely visual impacts of the project on the amenity of the surrounding area and private residences in the vicinity of the project’*

### 1.3.2 Structure of report

This report is structured as follows:

- **Section 1 – Introduction:** Introduces the project and project location
- **Section 2 – Methodology:** Provides an outline of the LVIA assessment approach
- **Section 3 - Project Description:** Provides a description of the project site and project components
- **Section 4 - Study Area:** Defines the study area

- **Section 5 - Legislation and Policy:** Provides a description of the legislation and policy context relating to landscape and visual values within the study area
- **Section 6 - Existing Environment:** Provides a description of the landscape and visual baseline conditions, including landscape character zones and sensitive visual receptors within the study area
- **Section 7 - Impact Assessment:** Provides a landscape character assessment of landscape character zones, and visual impact assessment from selected viewpoint locations
- **Section 8 - Mitigation Measures:** Provides recommendations for landscape and visual mitigation
- **Section 9 - Conclusion**
- **Section 10 – References**

## 1.4 Limitations

*This report: has been prepared by GHD for Australian Industrial Energy and may only be used and relied on by Australian Industrial Energy for the purpose agreed between GHD and the Australian Industrial Energy as set out in section 1.3.1 of this report.*

*GHD otherwise disclaims responsibility to any person other than Australian Industrial Energy arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.*

*The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.*

*The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.*

*The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1.5 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.*

*GHD has prepared this report on the basis of information provided by Australian Industrial Energy and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.*

## 1.5 Assumptions

This LVIA has relied upon the following assumptions:

- The assessment aims to be objective and describe any changes factually. While potential changes resulting from the project are defined, the significance of these changes requires qualitative (subjective) judgements. This assessment's conclusion therefore combines objective measurement and professional interpretation. While this assessment aims to be objective, it is recognised that visual impact assessment can be subjective and individuals are likely to associate different visual experiences to the study area
- The assessment is based on the information provided to GHD at the time of writing
- Existing conditions were assessed during the site inspection on 29<sup>th</sup> August 2018

## 2. Methodology

This LVIA has been prepared in accordance with the following:

- *Environmental Impact Assessment Guidance Note - Guidelines for landscape character and visual impact assessment (EIA-N04)*, Version 2 (Roads and Maritime, 2013)
- *Guidelines for Landscape and Visual Impact Assessment*, 3<sup>rd</sup> Edition (Landscape Institute and Institute of Environmental Management & Assessment, 2013)

### 2.1 Project description

Existing project site and design information was gathered and reviewed.

### 2.2 Study area

The study area for the LVIA has been defined as land within 10 kilometres of the project site. This study area has been determined based on the following:

- An analysis of the Zone of Theoretical Visibility (ZTV) mapping (refer Section 2.4.2)
- A desktop study examining aerial photographs and topographic maps considering both landform and land cover
- A site inspection examining the existing visual catchment
- Previous studies of a similar nature

### 2.3 Legislation and policy

A review of key planning designations, policies and guidance was undertaken in relation to landscape and visual amenity within the LVIA study area. The emphasis of the review was to identify elements outlined within legislation, policy and planning documents relevant to landscape and visual character and identity of the study area.

### 2.4 Existing Environment

#### 2.4.1 Desktop analysis of the landscape and visual resources

Existing data was gathered and reviewed, including:

- Topography, land use, and vegetation maps
- Google Earth and Google Street View

Using this data, a preliminary assessment of the landscape and visual baseline assessment was undertaken to inform the site inspection.

#### 2.4.2 Zone of Theoretical Visibility assessment

ZTV mapping is a computer-generated analysis which identifies land from which it is theoretically possible to view the components of the project. This technique has been used primarily to guide the study area and representative viewpoint selection.

ESRI ArcGIS software was used to model the ZTV of the project. A digital elevation model was produced using a combination of one metre contour intervals within the study area. The ZTV was run using the following parameters:

- A viewing height of 1.75 metres, which is the average within the typical viewing level range of an adult

- The indicative height of the top of the FSRU

The GIS software then digitally determines the likely extent over which the feature would be visible or not visible. In interpreting the ZTV, the following issues must be considered:

- It only takes into account the landform and does not include land cover factors such as the presence of buildings and trees, therefore it represents the worst-case scenario of potential visual impact
- It does not take into account the effect of distance. The greater the distance from the project, the lower the impact, as the development will take up a smaller portion of the view, and atmospheric conditions may reduce the visual prominence of the project
- The ZTV is only accurate to the resolution of the elevation model

### **2.4.3 Site inspection**

A site inspection was undertaken by two Landscape Architects on the 29<sup>th</sup> August 2018. The purpose of this inspection was to:

- Inspect the site and appreciate views to / from sensitive visual receptors
- Inspect publically accessible locations identified in the desktop study as likely to provide views of the project. Identify sensitive visual receptor locations
- Assess the landscape character of the study area and identify landscape sensitivities
- Undertake site photography suitable for photomontage preparation

The location of each viewpoint was recorded during the site inspection.

### **2.4.4 Definition of the landscape baseline**

A landscape baseline assessment was undertaken to determine the existing natural and cultural features within the study area. This includes determination of key landscape and spatial elements, features and values. Key aspects considered include:

- Land use and built form
- Landform, topography and hydrology
- Vegetation
- Historical features

### **2.4.5 Landscape character zones**

Landscape character considers common landscape zones defined by typical features and characteristics identified during the desktop assessment and site inspection. Defining landscape character zones identifies areas sharing the same homogenous environmental or cultural qualities or pattern such as topography, vegetation, hydrology, land use and settlement, built form scale and character, cultural and recreational characteristics.

This approach has been used to establish the existing landscape character around the project site and to provide a framework for measuring the impact of the project. This assists in:

- Defining landscape elements that contribute to defining character
- Defining landscape character attributes
- Identifying landscape value

The assessment of the baseline environment also considers factors which have influenced landscape change in the past and those that are likely to do so in the future.



#### **2.4.6 Definition of visual baseline**

A visual baseline assessment was undertaken to determine the existing visual baseline environment within the study area. This includes determination of key visual elements, features and values. Key aspects considered include:

- Built form and vegetation
- Landform and topography
- Key views and viewsheds
- Visually prominent features
- Visual features of interest and value

#### **2.4.7 Viewpoint locations**

Assessment of visual impacts deals with the effects of change and development on the views available to people and their visual amenity. It assesses how the surroundings of individuals or groups of people may be specifically affected by changes in the context and character of views as a result of the change or loss of existing elements of the landscape and/or the introduction of new elements.

Visual receptors have been considered in terms of the views they are likely to obtain from within the study area including consideration of any key vantage points, such as lookouts, where there is particular interest in the view. Visual receptors are identified based on:

- Proximity of the receptor to the project, as the most affected visual receptors are anticipated to be located closest to the project, unless located at an elevated vantage point
- Type of receptor, as different viewer types would have different perceptions of the change

Based on the analysis of the existing landscape and visual environment, sensitive visual receptors were identified and viewpoint locations selected as representative locations for assessment.

### **2.5 Impact Assessment**

#### **2.5.1 Landscape effects**

Landscape character refers to a distinct and recognisable pattern of elements that occur consistently in a particular type of landscape. Particular combinations of geology, landform, soils, vegetation, land use and human settlement create character, which makes each part of the landscape distinct and gives each its particular sense of place.

Assessment of landscape effects deals with the effect of change and development on landscape as a resource. The concern is with how the project will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.

The consideration of potential impacts on landscape character is determined based on the sensitivity of the existing landscape to change and the magnitude of change that is likely to occur. The sensitivity of a landscape is judged on the extent to which it can accept change of a particular type and scale without adverse effects on existing landscape character. The level of sensitivity is determined on the basis of:

- The landscape's inherent values and any specific values that may apply such as landscape planning designations
- The landscape's ability to absorb changes associated with the project

The magnitude of change to landscape character depends on the nature, scale and duration of the change expected to occur. The magnitude of change also depends on the loss, change or addition of any feature to the existing landscape. It is based on that part of the landscape character zone which is likely to be impacted to the greatest extent by the project.

The sensitivity and magnitude of landscape effects address the following specific criteria:

- Sensitivity of landscape to proposed change, based on the susceptibility to change, and the value of landscape (refer Table 1)
- Magnitude of landscape effect, based on the size or scale of change, the geographical extent of effects, and the duration and reversibility of effects (refer Table 2)

A judgement is made on the overall level of significance of the landscape effect in relation to the existing conditions (refer Section 2.5.3)

**Table 1 Sensitivity criteria (landscape)**

Rating	Criteria
<b>High</b>	Landscape character elements in good or above average condition and/or that make a strong positive contribution to the landscape character. May include nationally important features. The type of development proposed could have a detrimental effect on the landscape character, condition or value. Mitigation measures are unlikely to reduce the impacts of the change.
<b>Moderate</b>	Landscape character elements in reasonably good condition and/or that make an average contribution to the local character, which may include locally important features. Any change caused by the proposed development would be unlikely to have a significant adverse effect on the landscape character, condition or value that could not be mitigated.
<b>Low</b>	Landscape character elements in average condition and/or that are not particularly distinctive local features. Development of this type is unlikely to have an adverse effect on the landscape character, condition or value. Mitigation measures would be effective in neutralising adverse effects.
<b>Negligible</b>	Elements in below average condition and/or that are not distinctive local features. Development of this type is very unlikely to have an adverse effect on the urban landscape character, condition or value. Mitigation measures would be effective in neutralising adverse effects and/or improve the urban landscape character.

**Table 2 Magnitude of change criteria (landscape)**

Rating	Criteria
<b>High</b>	A substantial/obvious change to the landscape character due to total loss of, or change to, elements, features or characteristics of the landscape. Would cause a landscape to be permanently changed and its quality diminished.
<b>Moderate</b>	Discernible changes in the landscape character due to partial loss of, or change to elements, features or characteristics of the landscape, however has potential to be partly mitigated. The change would be out of scale with the landscape character, and at odds with the local pattern and landform and would leave an adverse impact on the landscape character.

Rating	Criteria
<b>Low</b>	Minor loss or alteration to one or more key landscape character elements, features or characteristics, or the introduction of components that may be new but may not be uncharacteristic within the existing landscape character.
<b>Negligible</b>	Almost imperceptible or no change in the landscape character as there is little or no loss of/or change to the elements, features or characteristics of the landscape.

### 2.5.2 Visual effects

The evaluation of potential impacts on visual amenity is based on the sensitivity of the viewpoint (and the visual receptor it represents) to change, and the magnitude of change that is likely to occur.

The sensitivity of each viewpoint is considered to be dependent on the:

- Importance of the view, its existing scenic qualities and the presence of other existing man-made elements in the view
- Type of visual receptor and their likely interest in the view

The magnitude of change to views and visual amenity depends on the nature, scale and duration of the change that is expected to occur. The magnitude of a change also depends on the loss, change or addition of any feature in the field of view of the receptor including an assessment of the level to which the change contrasts with the existing view or expected view of the landscape. This includes the degree of any change to the backdrop to, or outlook from a viewpoint.

The assessment considers the likely impacts of the project. The level of effects on a view depends on factors such as the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, duration of view and distance from the project.

Steps undertaken to assess visual effects include:

- Identify and map viewpoint locations
- Undertake assessment of visual effects, comprising:
  - Sensitivity of visual receptors to proposed change, based on: susceptibility of visual receptors to change, and value attached to views (refer Table 3)
  - Magnitude of visual effect, based on: size or scale of change; geographical extent of effects, and duration and reversibility of effects (refer Table 4)

An assessment is undertaken of the overall level of significance of the visual effects in relation to the existing view (refer Section 2.5.3).

**Table 3 Sensitivity criteria (visual)**

Rating	Criteria
<b>High</b>	Occupiers of residential properties, at home or going to or from, with long viewing periods, within close proximity to the proposed development; Communities that place value upon the urban landscape and enjoyment of views of their setting.
<b>Moderate</b>	Outdoor workers who have a key focus on their work who may also have intermittent views of the study area; Viewers at schools, or similar, when outdoor play and recreation areas are located within close proximity but

Rating	Criteria
	viewing periods are limited; Occupiers of residential properties with long viewing periods, at a distance from or screened from the study area.
<b>Low</b>	Road users in motor vehicles, trains or on transport routes that are passing through or adjacent to the study area and therefore have short term views; Viewers indoor at their place of work, schools or similar.
<b>Negligible</b>	Viewers from locations where there is screening by vegetation or structures where only occasional screened views are available and viewing times are short; Road users in motor vehicles, trains or on transport routes that are passing through/adjacent to the study area and have partially screened views and short viewing times.

**Table 4 Magnitude of change criteria (visual)**

Rating	Criteria
<b>High</b>	A substantial/obvious change to the existing view due to total loss of, or change to, elements, features or characteristics of the view. Would cause a view to be permanently changed and its quality diminished.
<b>Moderate</b>	Discernible changes in the existing view due to partial loss of, or change to elements, features or characteristics of the view, however has potential to be partly mitigated. The change would be out of scale with the existing view, and would leave an adverse impact on the view.
<b>Low</b>	Minor loss or alteration to one or more key view elements, features or characteristics, or the introduction of components that may be visible but may not be uncharacteristic within the existing view.
<b>Negligible</b>	Almost imperceptible or no change in the view as there is little or no loss of/or change to the elements, features or characteristics of the view.

### 2.5.3 Significance of impacts

The combination of sensitivity and magnitude determines the significance of the impact on the landscape character or viewpoint. Refer Table 5 for the matrix used to determine the significance of impact.

**Table 5 Significance of impact matrix**

Sensitivity	Magnitude of impact				
		High	Moderate	Low	Negligible
	High	High Impact	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

### 2.5.4 Panorama and photomontage

All photographic images were captured using a Nikon D810 digital camera used together with a 70 mm zoom lens which has a vertical angle of 26.5° and a horizontal field of view of approximately 21.3°. A lens size of 50 mm was used for all viewpoint photographs.

The camera was held at eye level, approximately 1.7 m above ground level to take the photographs. GPS coordinates were also recorded on a separate hand held GPS at the locations from which the photographs were taken.

Nine viewpoint locations were chosen and existing views represented using a panorama technique. This involves combining up to three individual photographs overlapped by one third using the Adobe Photoshop software program to create a field of view of 60°.

Of the nine viewpoint locations, two viewpoints were selected for the production of photomontages to represent proposed views following the completion of the project. The software used to model and render the photomontages was Autodesk 3D Studio Max. In order to achieve an accurate photomontage of the project and surrounding landscape, one metre contours were used to model the surrounding landform.

Once the 3D model incorporating both the landscape and new project elements was created, a virtual camera was placed in the software at the same location the photographs were taken. The film, focal lens and height of the virtual camera matches the real camera utilised to take the photographs. The photographs of the site were used in 3D Studio Max as a background to accurately match the 3D model with the project elements to the perspective of the photographs. From the camera view, rendered images of the project were produced to match the daylight exposure of the photographs. The rendered images were imported into Adobe Photoshop for post-production editing and collation of the photomontages.

The final result is the 3D model of the project shown in the correct 3D location in the photographs. The final images were produced to a high resolution, suitable for printing.

## **2.6 Mitigation measures**

Potential mitigation measures may include:

- Adopting alternative designs or revisions to the basic engineering and architectural design to prevent and/or minimise negative impacts
- Remedial measures such as colour and textural treatment of structural features
- Compensatory measures such as landscape design measures to compensate for unavoidable negative impacts and to attempt to generate long-term positive impacts

## 3. Project description

### 3.1 The project site

Port Kembla is a deep water harbour located in the Illawarra region, approximately 3 kilometres south of the Wollongong Central Business District and 80 kilometres south of Sydney (refer Figure 1). Established in 1883, the port has been an integral part of the visual and cultural landscape of the area for over 130 years.

The port operates two harbours, consisting of an Inner Harbour and Outer Harbour (refer Figure 2). There are a total of 18 berths at Port Kembla with services ranging from motor vehicle imports, grain and coal exports, general cargo facilities, dry bulk and break bulk facilities and bulk liquid facilities. The port also includes 29 kilometres of rail network, and operates 24 hours per day, seven days a week.

Two grain terminals operate on the northern side of the Inner Harbour with bulk liquid facilities and a number of multi-purpose berths. BlueScope Steelworks operate five berths on the western side of the Inner Harbour and the Port Kembla Coal Terminal is a coal export facility located on the eastern side of the Inner Harbour operating from two berths.

Six berths operate in the Outer Harbour for use in fuel discharge and loading, bulk and break bulk cargo including copper concentrate, fertiliser, clinker, pulp/saw logs and steel products. The Outer Harbour redevelopment project has also been approved and involves reclamation and dredging to enable additional port facilities to be developed in the Outer Harbour.

The location of the project is proposed to be Berth 101 on the eastern side of the Inner Harbour. Berth 101 is currently operated by the Port Kembla Coal Terminal and was most recently utilised as an off-loading wharf for materials handling equipment, but does not currently have any regular use with the majority of coal exports operating out of Berth 102. Land use surrounding Berth 101 is predominantly heavy industrial or special uses associated with port operations.

Built form surrounding the project site includes silos, conveyor belts and towers, coal stockpiles, large format sheds, and weathered steelworks infrastructure including pipes and chimneys. Closest to the project site, two groups of silos are associated with the grain and bulk liquid terminals and are of significant form and scale. The largest is located at Berth 104 and consists of 30 elevated white silos aligned in a double row, to a length of approximately 400 metres and height of approximately 50 metres. The smaller is located at Berth 103 and consists of approximately 14 silver silos reaching a height of approximately 30 metres and length of 160 metres. Coal stockpiles associated with the coal terminal are also of significant form and scale, with lengths of up to 800 metres.

The main public access road through the port include Springhill Road, Masters Road, Five Islands Road, Flinders Street, and Old Port Road.

### 3.2 The project

The project comprises the development of a LNG import terminal and incorporates four key components. The majority of components are proposed to be located within industrial land declared under the Three Ports SEPP, with a small portion within private recreational land within the Wollongong Local Environmental Plan (LEP). Key project components include the following:

### **Floating storage and regasification unit (FSRU)**

The FSRU is a vessel which will be moored at Berth 101 on the eastern side of the Inner Harbour at Port Kembla. The purpose of the FSRU is for the storage of LNG, and conversion of LNG into gas.

The dimensions of the FSRU are as follows:

- Overall length of 294 metres
- Breadth of 46 metres
- Approximate overall height of 58 metres from base of vessel to top of bridge
- Approximate height from sea level of 45 metres to top of bridge

The typical colour scheme of the FSRU is a white deck and bridge and dark blue hull.

Refer to Figure 3 for sectional elevation of FSRU.

### **LNG carrier vessel**

The LNG carrier vessel is similar in size and scale to the FSRU, but tends to have either a flat deck or a series of spherical storage tanks. An LNG carrier is expected to arrive at the harbour every two to three weeks, tether alongside the FSRU and unload its cargo into the FSRU as shown in Figure 4. This process is expected to take approximately 24 hours. Figure 4 also shows the indicative colours proposed for both the FSRU and LNG carrier vessel.

### **Wharf facilities**

Wharf facilities include a new berth pocket at Berth 101 to accommodate the side by side mooring of the FSRU and the LNG carrier, as well as facilities required to connect the FSRU to the gas pipeline for gas transfer, such as loading arms or hoses.

The berth construction is likely to consist of a piled tubular steel wall tied back to a piled steel anchor wall with steel tie rods. This is a common method of wharf construction within Port Kembla. The pavement level of the proposed wharf will be approximately 5 metres above sea level.

Mooring infrastructure is also proposed including hooks, beams and dolphins, however this is not relevant to the landscape or visual amenity.

### **Gas pipeline**

An underground gas pipeline connection of around 6 kilometres in length will be constructed from Berth 101 to the existing east coast gas transmission network at Cringila. The easement associated with the pipeline is a total of 6 metres in width.

The pipeline alignment extends through a predominantly industrial setting within the port, through previously disturbed sites and road verges as shown on Figure 2. The location will be predominantly behind existing primary roadside buffer vegetation, avoiding the need for its removal.

The pipeline will predominantly be installed using traditional trenching methods with directional drilling proposed at road and rail crossings to minimise disruption to the transport network. Directional drilling will also be used at the Allans Creek and Gurungaty Waterway crossings and to avoid relatively intact native vegetation located between the Kembla railway line and Springhill Road.

A small section of pipeline is located within Bluescope Oval, a private recreation reserve just outside of the port boundary. Construction of the pipeline will take approximately 6 months.



### **3.2.1 Operation phase**

Similar to the current port operation, the project will be operational 24 hours per day, seven days per week, for a duration of approximately 15 years.

As such, additional lighting will be required as part of the project to allow for night time operations, in accordance with the *Port Kembla Development Code*, relevant Australian Standards, and relevant ship navigation requirements. This is likely to include lighting associated with the FSRU, the LNG carrier vessel when docked at the harbour at night, and the wharf facilities and associated access areas. Refer to Figure 5 showing an example of the type of vessel lighting at night time.

The project is likely to be ready for first gas by early 2020.

### **3.2.2 Construction phase**

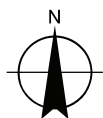
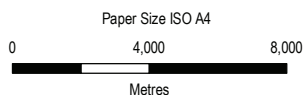
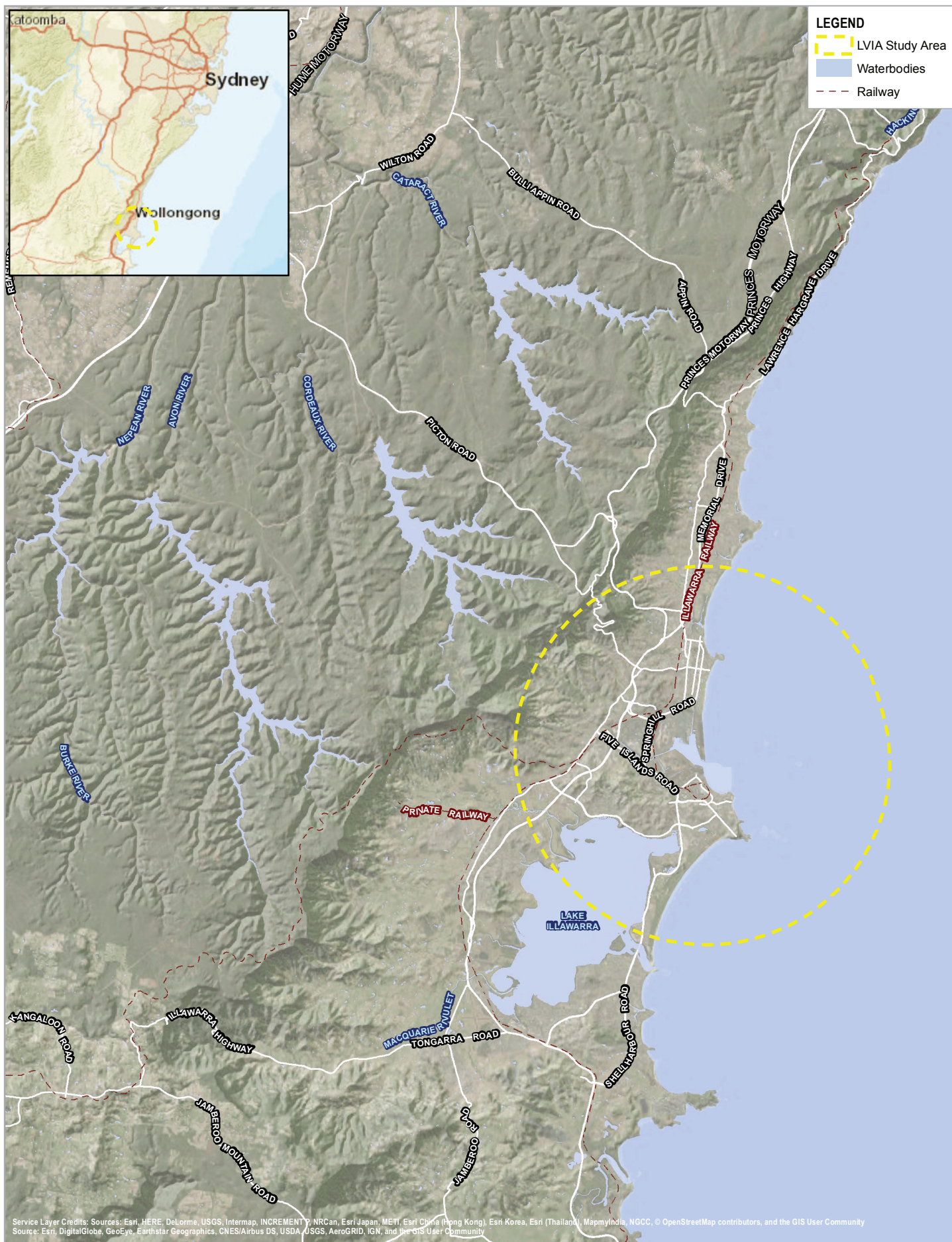
It will take 10-12 months to complete construction and other works in order to start operations. Similar to current port operation hours, the construction phase will occur 24 hours per day, seven days per week. Construction of the project will include the following activities:

- Demolition, land excavation and dredging of material at Berth 101 and to the south east of the existing berth, in order to create a deeper and wider berth pocket for the two vessels, whilst allowing enough space for other vessels to pass when the LNG carrier is moored. The dredging would be carried out using excavators and clamshell grab on a barge, and the spoil will be transferred using a barge or road haulage to the reclamation area.
- Transport and placement of dredge material to be used for the reclamation in the Outer Harbour at Port Kembla.
- Construction of the aforementioned new wharf facilities and gas pipeline as outlined in section 3.2.

Due to the construction phase operational hours, night time lighting will be required to enable a safe working environment. This may be required to the following areas:

- The gas pipeline easement, access and storage areas
- The existing wharf at Berth 101
- To vessels, barges and associated equipment relating to land excavation, dredging, and spoil transfer activities





Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 56



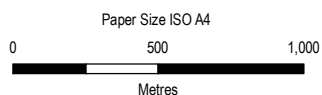
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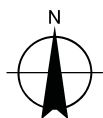
Project Location

Figure 1





Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 56



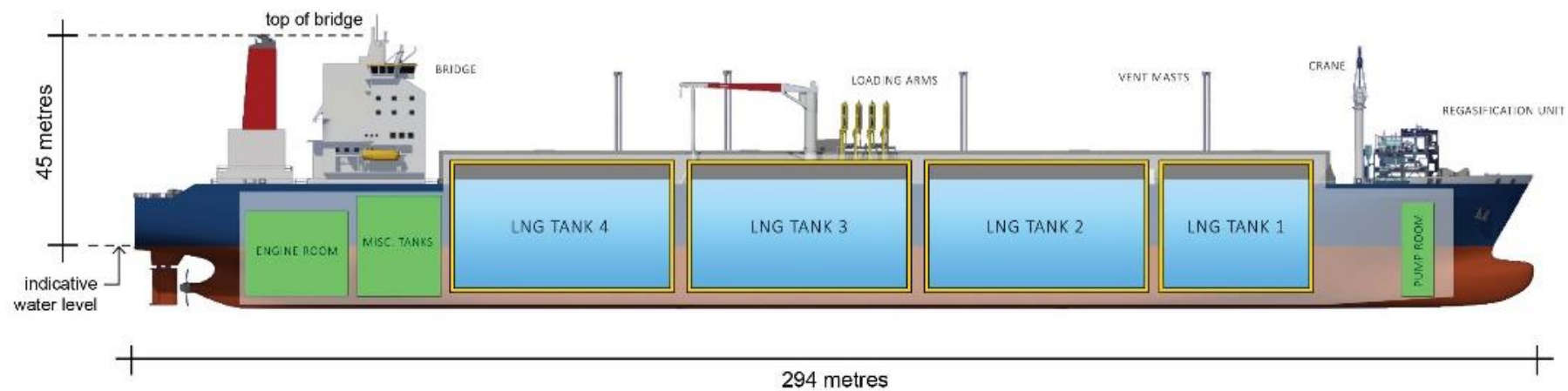
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Project Site

Figure 2





**Figure 3 Sectional elevation of FSRU with indicative dimensions**



**Figure 4 Model image of LNG carrier vessel (left) docked next to FSRU (right)**



**Figure 5 Image showing likely lighting associated with vessels at night time (Visco, 2015)**

## 4. Study area

### 4.1 Study Area

For the purposes of this assessment, the study area is defined as land within ten kilometres of the project site. The study area has been determined based on the following:

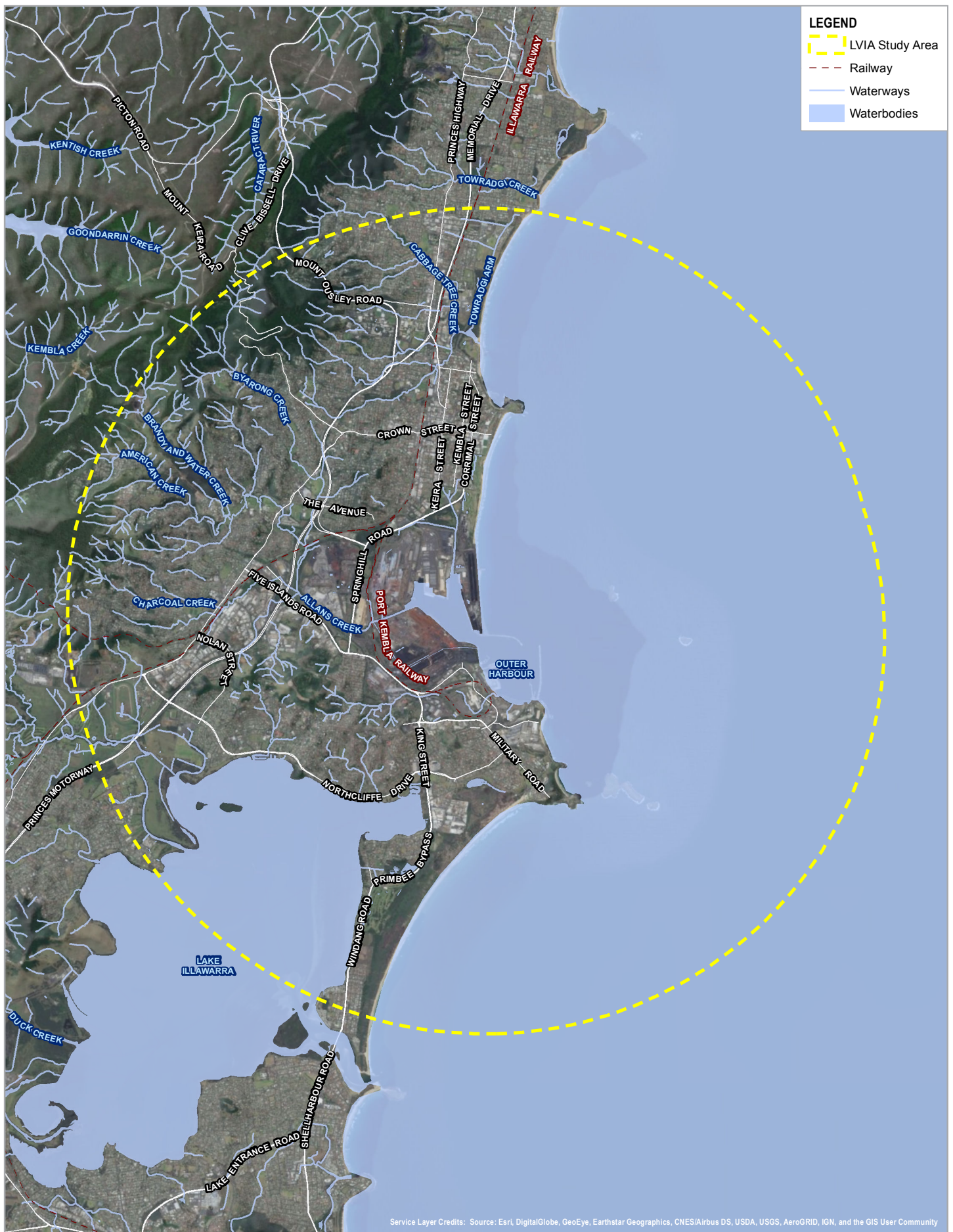
- A desktop analysis examining aerial photographs and topographic maps considering both landform and land cover
- A site inspection examining the existing visual catchment
- An analysis of the ZTV mapping (refer to Section 2.4.2 for methodology)

The Illawarra Escarpment provides a natural visual catchment boundary to Wollongong and Port Kembla, and was therefore used to assist in defining the study area. The furthest most location from the project site visited during the site inspection was Mount Keira Lookout. From this location, built form elements surrounding Port Kembla were visible and discernible, partly due to their large industrial scale in comparison to the surrounding residential development (refer Photograph 1).



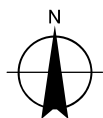
**Photograph 1 View from Mount Keira Lookout**





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Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 56



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**Study Area**

**Figure 6**

## 5. Legislation and policy

The planning and policy context relating to landscape and visual amenity has been reviewed and summarised in the following section. This review predominantly focuses on the policy aspects relevant to this landscape character and viewpoint assessment within the project viewshed.

### 5.1 State legislation and policy

#### 5.1.1 Environmental Planning and Assessment Act 1979

##### Secretary's Environmental Assessment Requirements

The following requirements are listed in the Secretary's Environmental Assessment Requirements (SEARS) for LVIA under the *Environmental Planning and Assessment Act 1979*:

- *'An assessment of the likely visual impacts of the project on the amenity of the surrounding area and private residences in the vicinity of the project'*

#### 5.1.2 State Environmental Planning Policy (Three Ports) 2013

The project is located within Port Kembla, one of three ports under which the *State Environmental Planning Policy (Three Ports)* applies.

Relevant aims of this policy include the following:

- *'to ensure that land around the Lease Area is maintained for port-related and industrial uses, including heavy industry on land around Port Kembla'*

The land use zone within which the project site is located is Zone SP1 Special Activities.

Relevant objectives of this zone include the following:

- *'to provide for sites with special natural characteristics that are not provided for in other zones'*
- *'to facilitate development that is in keeping with the special characteristics of the site of its existing or intended special use, and that minimises any adverse impacts on surrounding land'*
- *'to facilitate development that by its nature or scale requires separation from residential areas and other sensitive land uses'*

The land use to the west of zone SP1 at Port Kembla is Zone IN3 Heavy Industrial. Relevant objectives of this zone include the following:

- *'to minimise any adverse effect of heavy industry on other land uses'*

##### Heritage conservation

A number of heritage items are present within the Three Ports SEPP, including a steam crane, Hill 60 Illoura Battery, a brick chimney to a height of approximately 18 metres, a house and office, and a rolling mill plant and gardens. Relevant objectives for heritage conservation include the following:

- *'To conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views'*

### 5.1.3 Illawarra Shoalhaven Regional Plan

The *Illawarra Shoalhaven Regional Plan (2015)* provides the strategic policy, planning and decision-making framework to guide the region to sustainable growth for the next 20 years beyond 2015. The vision is for a sustainable future and a resilient community, capable of adapting to changing economic, social and environmental circumstances. The plan focuses on diversifying the economy, and freight and logistics associated with the port at Port Kembla, as well as tourism, are identified as two of six priority growth sectors.

Relevant key principles include the following:

- *'identify and protect land with high environmental value and recognise cultural heritage values'*
- *'encourage urban design that reduces car dependency, improves the public domain, promotes energy efficiency and supports healthier environments'*

Relevant aims of the plan include to:

- *'grow the capacity of the port of Port Kembla as an international trade gateway'*
- *'protect the region's cultural heritage'*
- *'protect the region's environmental values by focusing development in locations with the capacity to absorb development'*

The plan identifies the landscape as the defining feature of the region, consisting of the escarpment, coastline, waterways, lakes and rural hinterlands.

### 5.1.4 Illawarra Escarpment Strategic Management Plan

The *Illawarra Escarpment Strategic Management Plan* aims to protect, conserve and manage the natural and cultural features of the Illawarra Escarpment. The plan assesses the current conditions of the escarpment, identifies threatening processes, and outlines proposed planning, management and implementation strategies to manage the escarpment into the future.

The Illawarra Escarpment is recognised as an outstanding feature of the Illawarra region, providing a natural boundary and scenic backdrop to the Wollongong coastal plain. It is valued by the community for its high aesthetic value. The escarpment is also recognised for its ecotourism contribution, attracting tourists who are interested in the geographic uniqueness of the area, the unique vegetation communities, the unsurpassed views up and down the coast from lookouts, the network of walking trails, and the indigenous and cultural heritage sites.

The key tourism related facility within the study area is Mt Keira lookout.

Relevant management objectives include the following:

- *'...make provision for public access to views of exceptional and high scenic quality for experiencing perceptual pleasure, and heighten opportunities for recreation and leisure'*
- *'View to the escarpment as backdrop from within the urban landscape on the coastal plain should be maintained, and not be blocked by insensitively sited and large scaled structures'*

### 5.1.5 Navigating the Future – NSW Ports' 30 Year Master Plan

*Navigating the Future – NSW Ports' 30 Year Master Plan* provides a long-term strategy for port and intermodal assets including Port Botany, Port Kembla, Cooks River Intermodal Terminal and Enfield Intermodal Logistics Centre.

A key issue identified in the plan is the need to prevent urban encroachment from the surrounding areas by managing a buffer zone between port activities and sensitive uses to avoid port-related impacts, such as to amenity.

### 5.1.6 NSW Ports Sustainability Plan 2015

The *Sustainability Plan (2015)* for NSW Ports provides a strategic framework for the sustainable development and operation of port activities.

Relevant goals include the following:

- *'to maintain local environmental values and the amenity of communities as port and intermodal operations grow to service the NSW economy'*
- *'to work with state and local governments to promote the compatible development of ports, intermodal facilities and surrounding communities'*

## 5.2 Local legislation and policy

### 5.2.1 Wollongong Local Environmental Plan 2009

The study area is located within the *Wollongong Local Environmental Plan 2009*. This plan identifies a number of aims relevant to landscape and visual values of the study area.

Aims relevant to this study include:

- *'to conserve and enhance heritage'*
- *'ensure that significant landscapes are conserved, including the Illawarra Escarpment, Lake Illawarra, the drinking water catchment and the coastline'*

#### Land use zones

Refer to Figure 10 for the land uses within the study area. The following have specific aims relevant to landscape and visual amenity:

##### Zone RU2 Rural Landscape

- *'to maintain the rural landscape character of the land'*

##### Zone RE1 Public Recreation

- *'to protect and enhance the natural environment for recreational purposes'*

##### Zone RE2 Private Recreation

- *'to protect and enhance the environment for recreational purposes'*

##### Zone E2 Environmental Conservation

- *'to protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values'*
- *'to prevent development that could destroy, damage or otherwise have an adverse effect on those values'*
- *'to retain and enhance the visual qualities of the Illawarra Escarpment'*

##### Zone E3 Environmental Management

- *'to protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values'*

##### Zone E4 Environmental Living

- *'to provide for low-impact residential development in areas with special ecological, scientific or aesthetic value'*



## Zone W2 Recreational Waterways

- *‘to protect the ecological, scenic and recreational values of recreational waterways’*

## **Wollongong City Centre**

Relevant objectives include the following:

- *‘to protect and enhance the environmentally sensitive areas and natural and cultural heritage of the Wollongong city centre for the benefit of present and future generations’*

Relevant considerations include the following:

- *‘whether the proposed development detrimentally impacts on view corridors’*

## **Illawarra Escarpment area conservation**

*‘The objective of this clause is to provide specific controls to protect, conserve and enhance the Illawarra Escarpment’*

## **Heritage Conservation**

Refer to Figure 10 for heritage items and precincts within the study area.

The Wollongong LEP includes over 500 hundred heritage items and nine heritage conservation areas. The following heritage conservation areas are relevant to this assessment:

- Illawarra Escarpment Landscape Conservation Area (Local Heritage)
  - Associated values include the scenic, ecological, historic and indigenous cultural, social, visual, and natural history. This includes *‘the combined effect of the narrow coastal plan, rugged uplift sheer walls, rich forest and pasture lands, giving a most dramatic landscape of considerable grandeur, exceeding any other coastal plain and mountain landscape in NSW’* (Office of Environment and Heritage NSW)
- North Beach Precinct and Belmore Basin Heritage Conservation Area (State and Local Heritage)
  - The North Beach Precinct heritage area is valued for the recreational role played by the surfing and beach culture during the twentieth century in coastal NSW, in conjunction with important remnants of the industrial heritage of Wollongong, including a tramway curtilage used to transport coal to Wollongong Harbour between 1861 and 1933. Key built form heritage includes the North Beach Bathing Pavilion, Kiosk and Surf Life Saving Club.
  - The Old Lighthouse and ‘new’ Lighthouse (on Flagstaff Point) are both recognised at state level for their historical and aesthetic significance, and their contribution as distinctive visual landmarks to the local area from which a variety of significant historical views and vistas can be obtained.
  - Flagstaff Hill Fort and ocean baths are also recognised for their heritage significance within the precinct
- Hill 60 / Illowra Battery (State and Local Heritage)
  - This heritage area includes Hill 60 and its environs (MM Beach, Boilers Point, Fisherman’s Beach and Hill 60 Park) and contains a rare suit of Aboriginal sites including shell middens, artifacts and burials, which demonstrate the evolving pattern of Aboriginal cultural history and the Aboriginal land rights struggle.

## 5.2.2 Wollongong Development Control Plan 2009

The Wollongong Development Control Plan (DCP) outlines planning controls for the city.

### Chapter D1: Character Statements

This chapter of the Wollongong DCP identifies and describes the existing character and desired future character for each suburb within the city. A character statement and development controls are provided for each suburb, with the aim to protect and enhance the existing character that distinguishes their identity. These character descriptions will be taken into consideration for this assessment.

### Chapter E11: Heritage Conservation

The project is in the vicinity of heritage sites, as 'vicinity' is defined within the Wollongong DCP as 'land adjoining or located within the visual catchment of a heritage site'. Strategies relevant to landscape and visual amenity include the following:

- *'The character, siting, bulk, scale, height and external appearance of the development'*
- *'The visual relationship between the proposed development and the heritage item of heritages conservation area'*
- *'The colours and textures of materials proposed to be used in the development'*
- *'The impact the proposed use would have on the amenity of the heritage site'*
- *'Development in the vicinity of a heritage item should give strong regard to any significant views to and from the heritage item or heritage conservation area and any public domain area'*

### Chapter D13: Wollongong City Centre

#### 3.10 Views and view corridors

Views and view corridors are recognised as contributing to the character and amenity of the Wollongong City Centre, enhancing its sense of place and identity. The physical setting of the city centre between the coast and escarpment is recognised for providing special views of the natural setting and associated elements. This chapter aims to maintain views to the ocean and escarpment from as many points as possible at street level. Views are regarded as significant when they terminate at places of architectural, landscape, or cultural significance. This may include views of the foreshore, major parks or publicly significant objects or heritage buildings.

Relevant objectives include the following:

- *'to maintain and enhance views from the city centre to the foreshore, escarpment and significant objects (such as the lighthouse) wherever possible'*
- *'to enhance views along city streets'*

Refer to Figure 7 for identified significant views in Wollongong City Centre.



**Figure 7 Significant views in Wollongong City Centre (Wollongong DCP)**

### **5.2.3 Port Kembla Development Code (June 2016)**

The overall objective of the *Port Kembla Development Code* is to promote sustainable development at Port Kembla.

As part of this, relevant objectives include:

- 'minimising the impacts of activities at the Port including on the surrounding environment and community'
- 'enhancing the visual amenity of the Port through a consistent and coordinated approach to development'

### **Section 3: Visual Amenity and Built Form**

Relevant objectives of *Section 3: Visual Amenity and Built Form* include the following:

- 'to improve the overall appearance of port development'
- 'To enhance the visual amenity of the Port through the quality design of buildings and structures, and the use of materials and colour which reinforce the industrial maritime nature of Port Kembla'

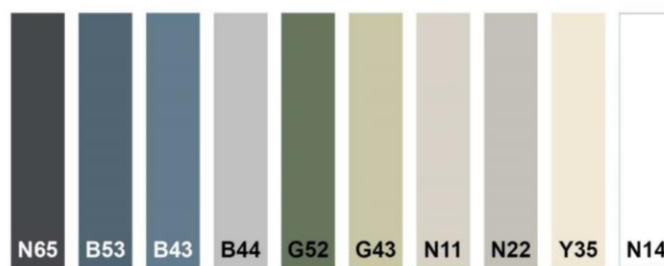
Relevant design criteria specific to Built Form includes the following:

- 'the built form should be designed to minimise the perception of bulk and scale and add visual interest to the development'
- 'Port buildings, silos and covered loading areas are to be integrated into a consistent design solution, which includes the use of a complementary palette of colours and materials, to promote the type, location and function of the tenancy'
- 'Ancillary structures (e.g. loading areas, conveyors, hoppers) that are detached or connected to the tenant's main building should be highlighted through the innovative use of colour, structure, screening and material'
- 'Varying materials and colours should be used throughout the Port'

Relevant design criteria for Materials, Finishes and Colour include the following:

- *‘a variety of material and colours are to be used to minimise the perception of the building mass and scale’*
- *‘a complimentary colour palette should be used for port buildings, structures and silos. Recessive colours should be used for the majority of the building elevations, while highlight colours should be used to emphasise structural and other articulated elements’ (refer Figure 8)*
- *‘the selection of materials should reinforce the industrial maritime character of the buildings, create visual interest and be appropriate for the proposed use. Preferred materials include timber, brick, steel, concrete, corrugated metal, lightweight cladding and other complementary materials ’*
- *‘the visibility of conveyors, pipelines, hoppers, rail mounted gantries and silos is to be reinforced through the use of highlight colours and/or patter designs and innovative structural design’*

Main building structure indicative colour palette



Highlight indicative colour palette



**Figure 8 Indicative palette of colours for port buildings structures (*Port Kembla Development Code*)**

## Section 5: Access, Parking and Loading

Relevant objectives for Landscaping within Section 5 include the following:

- *‘to enhance the visual quality of the Port’*
- *‘to ensure that all landscaping maintains opportunities for visual surveillance and does not compromise the safety and security of the Port’*
- *‘to ensure that all landscape planting uses appropriate, good quality, predominantly local native plant species to achieve low maintenance, durability and drought tolerant landscaped areas’*

Relevant criteria for Landscape within Section 5 include the following:

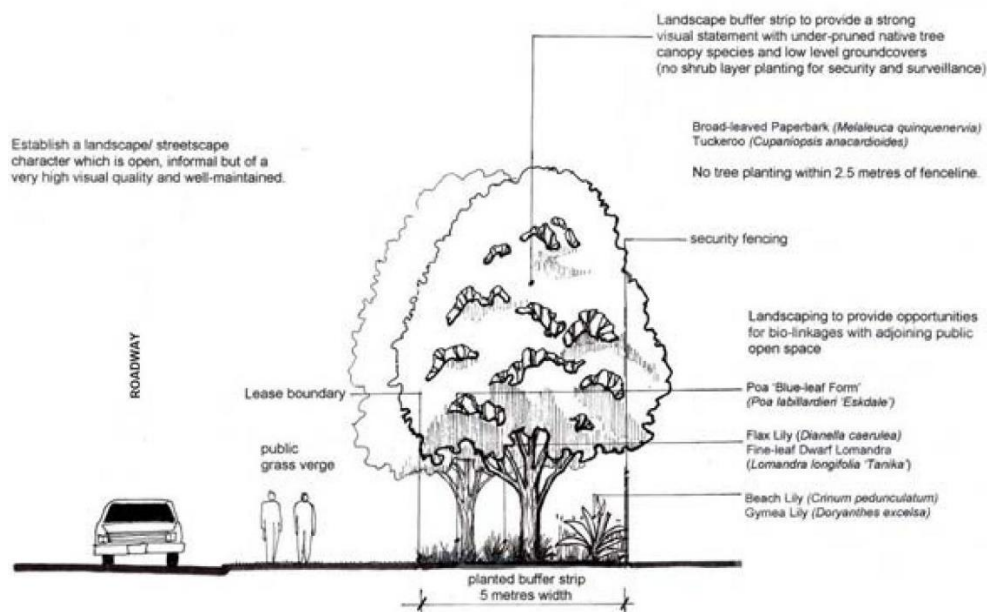
- *‘establish a 5 metre landscape buffer strip within the lease area, facing port access roads (excluding internal site access roads)’*

- 'develop a layered bedding pattern with a progression from smaller species at the front edge to larger species at the back (near the fence line, excluding trees)'
- 'ensure a high level of security and passive surveillance is maintained, including:
  - no tree planting within 2.5 metres of the fence line; and
  - under prune trees to minimum 2.5 metres above ground level and maintain adequate branch clearance from the security fencing'
- 'landscaped areas are to be planted to achieve a minimum of 75% planting density once fully matured'

Specific design criteria is also outlined within the development code for road reserves and potential fire risk areas, including service corridors, outlining desired streetscape character, planting form and type. Figure 9 illustrate specific design criteria landscaping to external roads facing leased area.

Relevant criteria for landscaped areas facing roads external to the leased areas not affected by potential fire risk include:

- 'develop and maintain a consistent pattern of selected native planting including:
  - layered and banded ground stratum planting (up to 0.5 – 0.7 metres high)
  - accent planting with large perennials (up to 1.4 metres in height)
  - clustered and individual small to medium tree planting up to 8 – 12 metres in height
  - clusters to have a maximum spacing of 15 metres between groups'



**Figure 9 Typical cross section through road reserve landscaped areas (Port Kembla Development Code)**

## Section 8: Lighting

Relevant objectives for Lighting include the following:

- 'to ensure that all external lighting provides a safe and attractive environment that meets the operational requirements of the Port'
- 'to minimise the impact of light spill on the surrounding environment, community and operational activities of the waterways'

Relevant design criteria for Lighting includes the following:

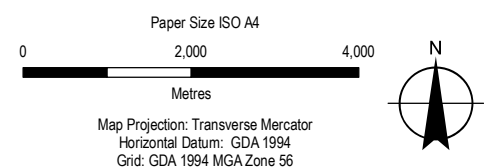
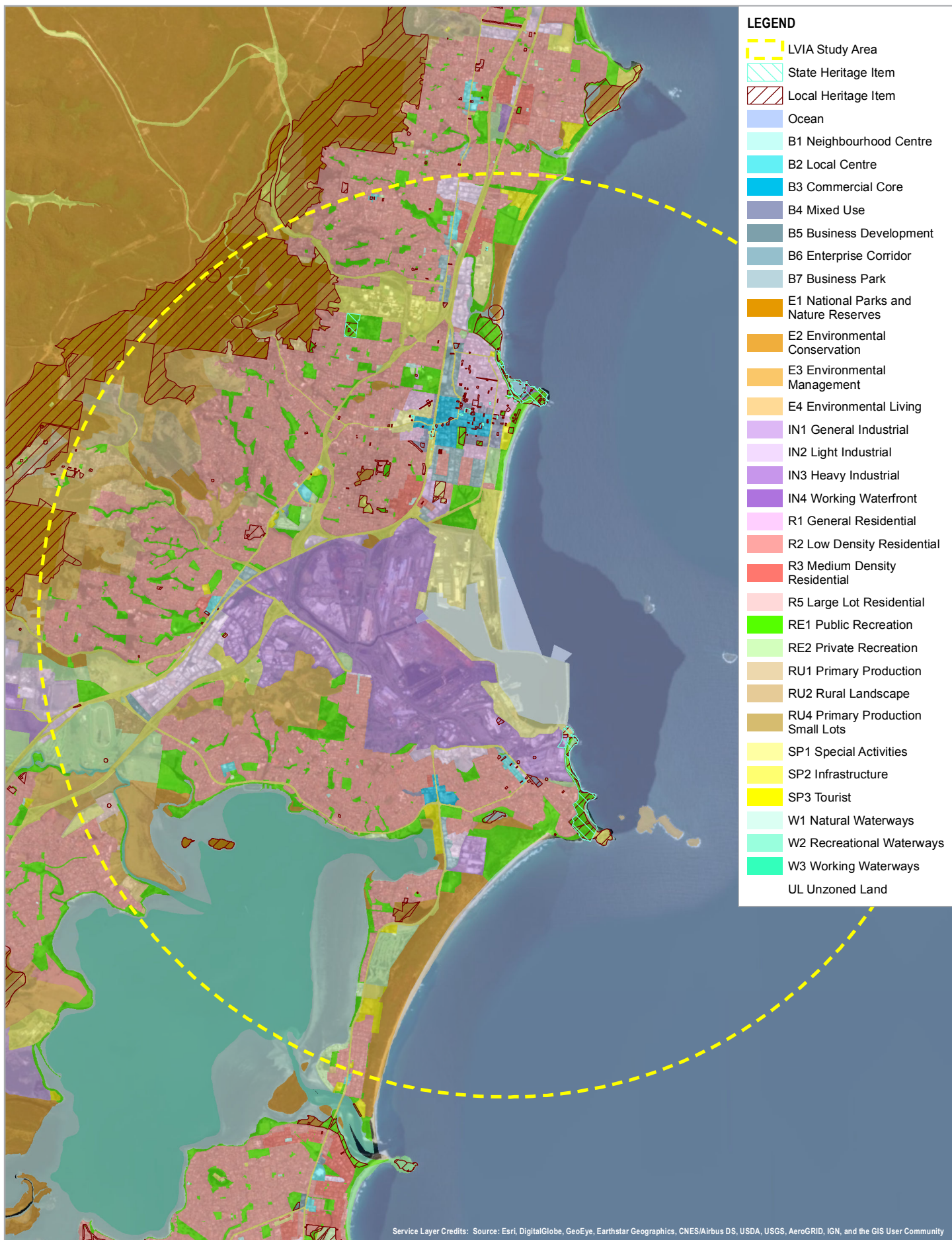
- *'lighting levels are to be provided in a manner just sufficient to meet operational requirements and to the relevant Australian Standards'*
- *'appropriate lighting should be provided at key locations such as pedestrian paths, driveways, parking areas and building entries, so as to identify and provide safe access routes for both employees and visitors'*
- *'light spill outside the site boundary and sky lighting is to be avoided through the adoption of measures such as:*
  - focussing lights downwards*
  - installing cut-offs or shields on lights*
  - minimising the light mast height, and*
  - using low mounting height poles to light non terminal operational areas, including access / egress routes'*

### **Section 9: Heritage and environmentally sensitive locations**

Relevant objectives for Heritage and Environmentally Sensitive Locations include the following:

- *'to minimise any adverse impacts of development on identified items of heritage significance within and immediately adjacent to the Port'*
- *'minimise any adverse impacts of development on environmentally significant areas within and immediately adjacent to the Port'*





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**Land use and heritage**

**Figure 10**

## 6. Existing Environment

The section provides an overview of the landscape and visual baseline environment of the study area, including land use and built form, topography and hydrology, vegetation, and key views and viewsheds. These elements all contribute to the landscape character and visual amenity of the study area. Landscape character zones will subsequently be defined and described.

### 6.1 Landscape baseline

#### 6.1.1 Land use and built form

The study area includes a wide range of land uses including the Wollongong City Centre, surrounding residential areas, the Wollongong University, Port Kembla, Lake Illawarra, and the conservation areas of the Illawarra Escarpment. Wollongong is a tourism destination, offering a diversity of nature-based activities associated with the escarpment, lake and coastline, including walking trails, lookouts, beaches, and fishing areas. The port supports key industries in the region including the steel and coal, and is the largest single concentration of heavy industry in Australia.

The Illawarra Escarpment forms a natural western barrier to the urban expansion of Wollongong, creating a delineation between the urban areas of the coastal plain and the extensive natural areas on the plateau. Built form below the escarpment follows the undulations of the escarpment foothills, with many areas enjoying views towards the coast. Residential areas generally consist of detached single and double storey dwelling, contrasting with the multi-storey mixed use towers within the core of the city centre, reaching up to 16 storeys.

Built form within the industrial and port areas of Port Kembla is a different form and scale again, with large format sheds, relatively homogenous in appearance and materiality, as well as old weathered steelworks infrastructure with pipes and chimneys, large storage tanks, coal piles, and ships. This provides a strong contrast of scale to the surrounding residential suburbs.

Key transport corridors within the study area include the Memorial Drive / Princes Motorway and the Illawarra railway line, which run north-south along the coastal plain, and the M1 Motorway entering Wollongong from the escarpment at Mount Pleasant. The Illawarra rail line accommodates both passengers and freight, connecting to the Port Kembla rail network. The Port Kembla terminal is a major import / export shipping port.

#### 6.1.2 Topography and hydrology

The Illawarra Escarpment is a defining topographic feature of the region, characterised by its continuous elevated cliff line and plateau contrasting with the coastal plain below. The escarpment consists predominantly of sandstone, with shale, claystone and coal seam deposits on the lower slopes.

Within the study area, Mount Keira is the key topographic feature, reaching a height of 464 metres. It juts out from the main cliff line close to the edge of Wollongong, and is predominantly woodland with a popular scenic lookout with expansive 180 degree views up and down the coastline. Due to its distinctive shape on the horizon and its proximity to Wollongong, Mount Keira is a significant local landmark.

Residential development on the foothills below the escarpment provides a gentle transition to the coastal plan, and enjoy pleasant coastal views. These suburbs include Figtree, Cordeaux Heights, Farmborough Heights, Mount Kembla, Keiraville, and Mount Pleasant. The City Centre and port areas are on generally flat terrain.



A series of small creeks provides drainage from the escarpment to the coast, some of which form part of the Allans Creek catchment within the industrial Port Kembla harbour, and others entering the ocean at Fairy Creek at North Wollongong. Lake Illawarra to the south is one of several nationally recognised wetlands in the region, also valued as a recreational and fishing resource. The coastline is made up of a combination of natural surf beaches and rocky headland, modified industrial port, marina, and protected boat harbours.

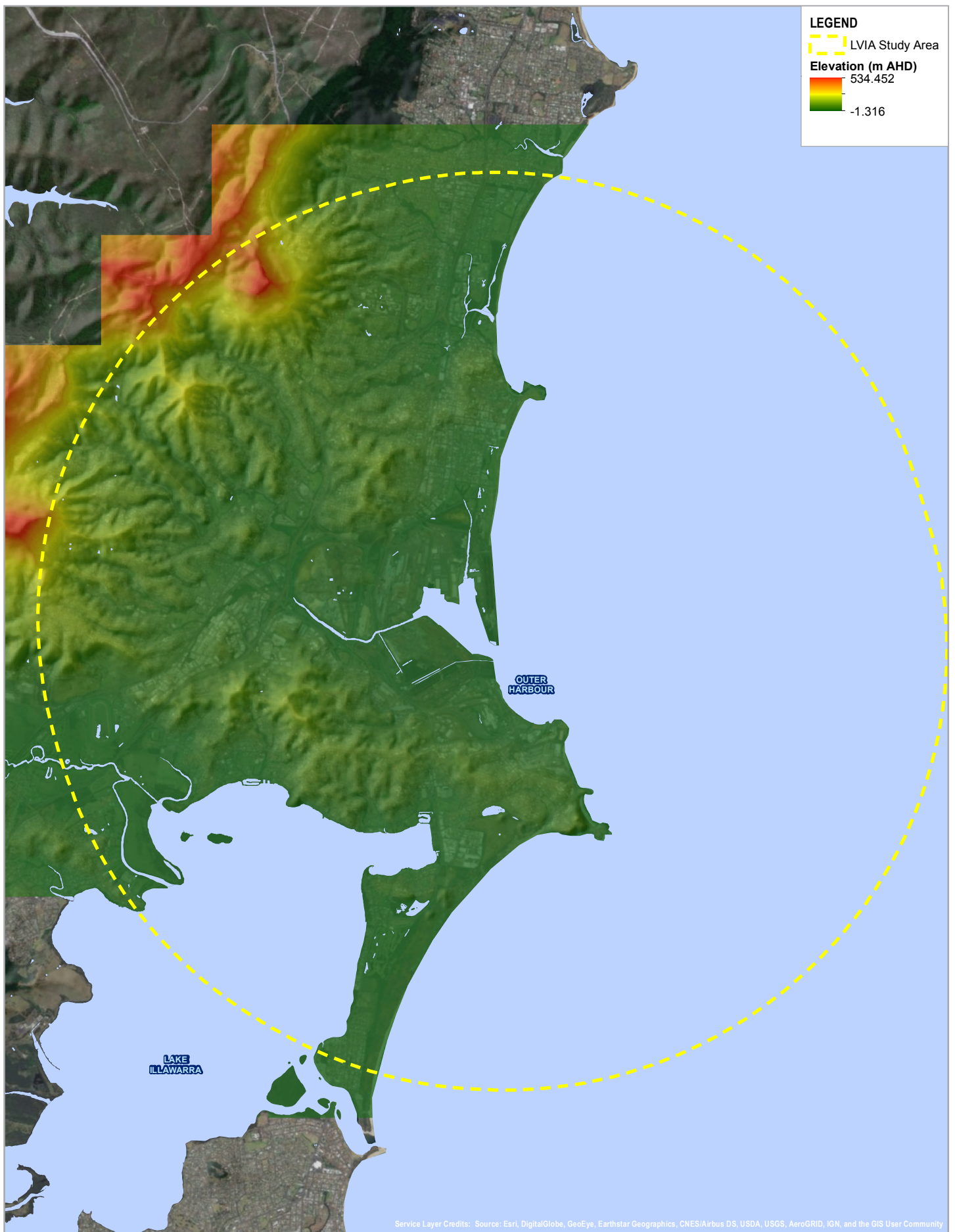
### **6.1.3 Vegetation**

The Illawarra Region is within the Sydney Basin Bioregion, supporting high levels of terrestrial and aquatic biodiversity. The Illawarra Escarpment contains a large area of connected rainforest, which functions as a significant habitat corridor, as well as a green backdrop when viewed from the coast.

Vegetation to the foothills and coastal plain is more dispersed and gradually decreases in quantity as the topography flattens towards the coastline. Natural vegetation communities transition from eucalypt forest to the escarpment edges, moist forest and rainforest to the escarpment slopes, transitional moist foothill forest to the foothills, and coastal headland banksia scrub to the coastal plains.

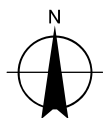
Within urban areas, vegetation is constrained to street trees, private garden plantings and parklands. Along public waterfront areas, feature cultural plantings include Canary Island palms and Norfolk Island Pines, for example along Marine Parade at Wollongong Beach. Natural vegetation to exposed coastal areas such as Hill 60 Lookout consists of coastal heath.

Vegetation within the port area is limited, with a focus on establishing buffer zones between port areas, main roads, and surrounding sensitive uses. Species are predominantly native and low maintenance.



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Metres

Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 56



Australian Industrial Energy  
Port Kembla Gas Terminal

Project No. 21-27477  
Revision No. A  
Date 01 Nov 2018

Topography

Figure 11

## **6.2 Landscape Character Zones**

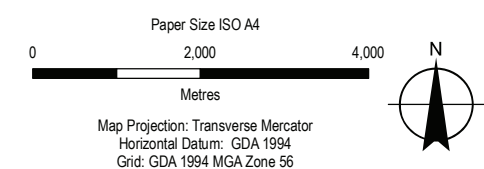
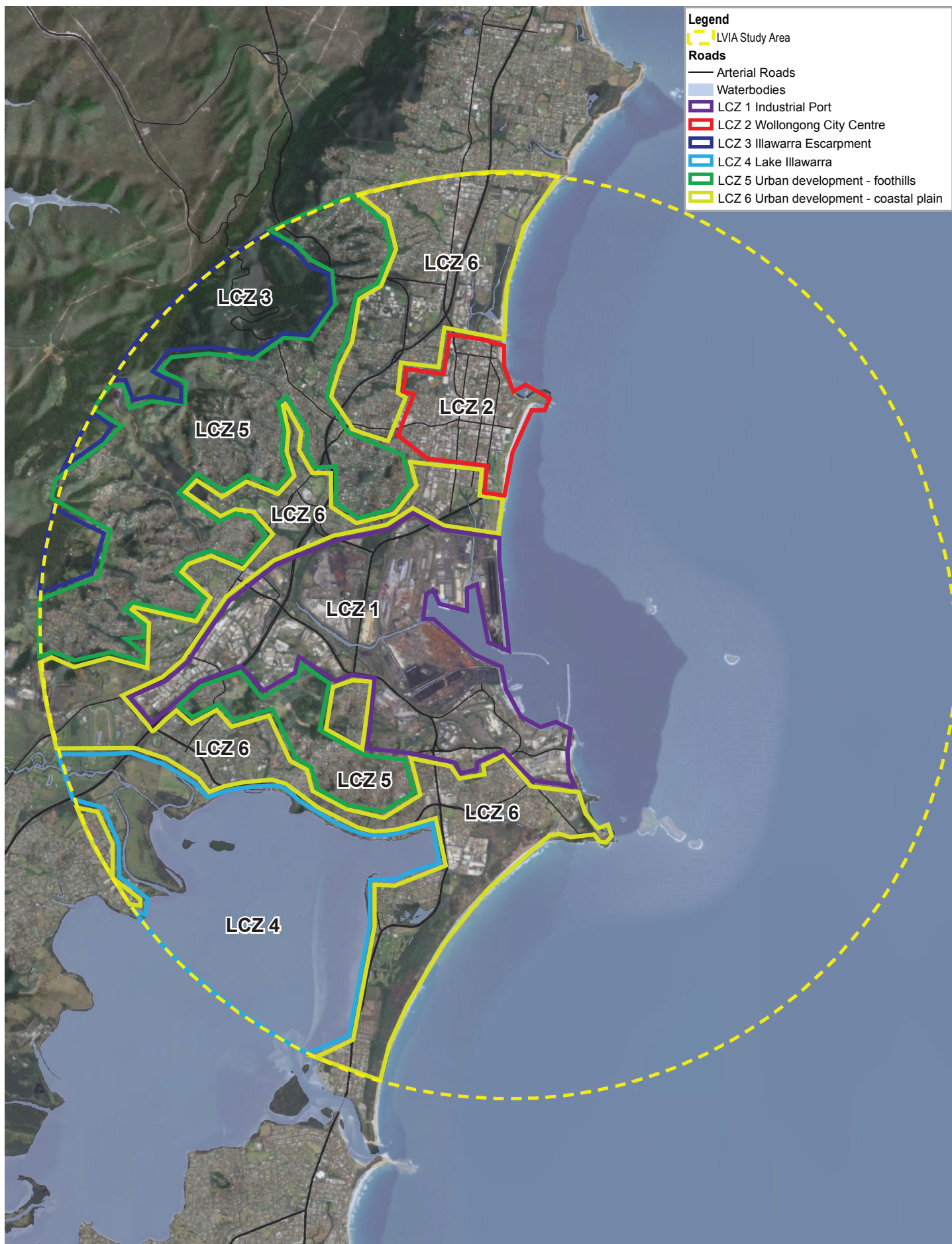
Landscape Character Zones (LCZs) have been defined within the study area based on the landscape and visual baseline assessment. These LCZs represent broadly homogenous characteristics and urban patterns.

The following LCZs have been defined:

- LCZ 1: Industrial Port
- LCZ 2: Wollongong City Centre
- LCZ 3: Illawarra Escarpment
- LCZ 4: Lake Illawarra
- LCZ 5: Urban development – foothills
- LCZ 6: Urban development – coastal plain

Refer to Figure 12 for the location of the LCZs.





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Landscape Character Zones

Figure 12

### 6.2.1 LCZ 1: Industrial port

LCZ 1 includes the Port Kembla industrial port and the associated peripheral heavy and light industrial area between the Princes Highway and Princes Freeway. LCZ 1 is situated on the waterfront servicing the key regional industries of coal, grain, steel, bulk liquids as well as motor vehicle imports. More recently cruise ships have occasionally docked in Port Kembla, offering industrial, historical and other tours of interest in the local area. The topography of LCZ 1 is therefore flat, with a highly modified waterfront harbour.

Key characteristics of LCZ 1 include the following:

- Highly modified coastline and harbour, including purpose built terminals, silos, overland conveyor belts and towers, and long rocky breakwaters to the harbour opening
- Large scale built form of homogenous colour and industrial materiality, including long corrugated iron sheds, rusty steel chimneys and other infrastructure associated with the steelworks, silos for the storage of grain, bulk liquids and cranes for materials transfer
- Internal rail and road network for transport of materials
- Large open storage areas for materials such as coal and motor vehicles
- Views to the Illawarra Escarpment
- Limited vegetation, with buffer planting present to main public access roads, open spaces and car parking areas

Port Kembla has a long history as a working industrial port and contributes to the historical development, visual and landscape character of the Wollongong region. A number of items within the port are recognised for their heritage significance, including a steam crane, a brick chimney, a house and office, and a rolling mill plant and gardens, however these are not located close to the project site.

Photograph 2 to Photograph 6 illustrate characteristics of LCZ 1.



**Photograph 2 Steelworks chimneys and rocky breakwater**



**Photograph 3 Coal stockpiles and conveyor belt at the coal terminal**





**Photograph 4 Buffer vegetation to Springhill Road**



**Photograph 5 Grain and coal terminals with Illawarra Escarpment behind**



**Photograph 6 Elevated silos, motor vehicle transfer area and Berths, looking towards Wollongong City Centre (image from *Port Kembla Development Code*)**

### **6.2.2 LCZ 2: Wollongong City Centre**

LCZ 2 includes the Wollongong City Centre precinct as defined in the Wollongong DCP. The city centre is situated on the coastal plain, and includes the commercial core, a mixed use area to the city edge, Wollongong train station, Wollongong beach and waterfront recreation areas, Flagstaff Park and headland, and peripheral residential areas.

Key characteristics of LCZ 2 include the following:

- Multi-storey built form to the commercial core and mixed use area, up to 16 storeys
- Active street frontage to the commercial core and mixed use areas
- Strong urban grid pattern aligned to the foreshore
- Views to the Illawarra Escarpment aligned to the foreshore and escarpment
- Natural, historical and recreational destinations and features, such as the foreshore and beach, lighthouses and headland lookout, ocean baths, and WIN stadium
- Typical urban street tree planting to the urban core, with cultural plantings of mature Norfolk Island Pines along Marine Drive, and open grassland to the headland park

The setting of the Wollongong City Centre between the coast and escarpment is a defining feature of the city, therefore views to the escarpment and ocean from the city and foreshore are recognised for their contribution to the character, amenity, and sense of place of the city. The lighthouses, particularly the Wollongong Head Lighthouse are also recognised as a positive significant visual built form element within the city.

The foreshore area is within a state significant heritage precinct, valued for its natural, cultural and industrial history as outlined in Section 5.2.1. This includes Flagstaff Park and the two lighthouses.

The Norfolk Island pines along Marine Drive are also valued for their local heritage significance, and many buildings of heritage significance are present within the city centre core.

Photograph 7 illustrates characteristics of LCZ 2.



**Photograph 7 Wollongong City Centre, foreshore and Flagstaff Hill Park**

### **6.2.3 LCZ 3: Illawarra Escarpment**

LCZ 3 includes the national park and environmental conservation area associated with the Illawarra Escarpment within the study area. LCZ 3 include the topographic feature of Mount Keira. As outlined in Section 6.1, the escarpment forms a natural western barrier to the urban expansion of Wollongong, and is characterised by its continuous elevated cliff line and plateau contrasting with the coastal plain below.

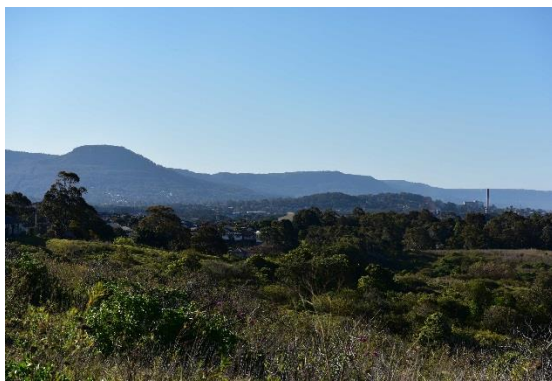
Key characteristics of LCZ 3 include the following:

- Main escarpment formation of a continuous elevated cliff line and plateau, with Mount Keira a feature landform offset slightly from the main escarpment
- Steep cliffs and slopes have historically prevented urban development
- Predominantly sandstone geology, with shale, claystone and coal seam deposits on the lower slopes

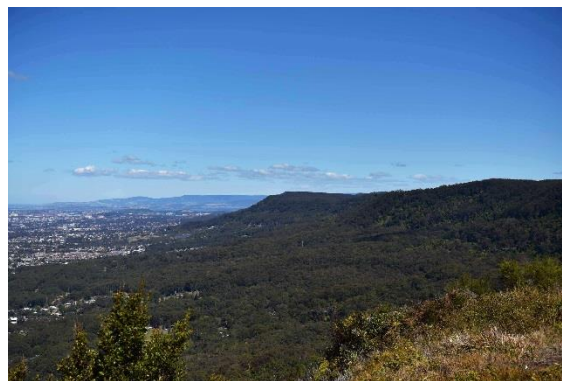
- Topographic elevation ranging from a height of 464 metres at Mount Keira, to approximately 100 metres below
- Dense continuous natural eucalypt forest to the escarpment edges, and moist forest and rainforest to the escarpment slopes
- Urban development restricted to minimal roadways following the natural topography, the Mount Keira lookout and carpark, as well as a number of walking trails

LCZ 3 is situated within the local heritage precinct of the Illawarra Escarpment Landscape Conservation Area. Values associated with this include the scenic, ecological, historic and indigenous cultural, social, visual, and natural history. These include the combined dramatic effect of the geological formation of the escarpment with rich forests, and the narrow coastal plain below. The many vantage points to achieve extensive views and vistas into and out of the escarpment are also valued.

Photograph 8 and Photograph 9 illustrates characteristics of LCZ 3.



**Photograph 8 Mount Keira and escarpment, viewed from Warrawong**



**Photograph 9 Illawarra Escarpment edge, viewed from Mount Keira**

#### **6.2.4 LCZ 4: Lake Illawarra**

LCZ 4 includes Lake Illawarra and Mullet Creek, located to the south of Port Kembla.

Key characteristics of LCZ 4 include the following:

- Large coastal open water wetland / estuary / lagoon with an open entrance to the ocean
- Shallow beds, with an average depth of 2 metres, with seagrass and salt marsh habitat present
- Gently sloping foreshore, with areas of public open space
- Facilities for water sports and recreational fishing such as ramps and jetties

Lake Illawarra is one of several nationally recognised wetlands in the region, also valued as a recreational and fishing resource.

#### **6.2.5 LCZ 5: Urban development – foothills**

LCZ 5 includes urban development to the escarpment foothills, including the suburbs of Mount Pleasant, West Wollongong, Mount Saint Thomas, Coniston, Mangerton, Figtree, and Cordeaux Heights to the escarpment foothills, as well as Cringila, Warrawong, and Lake Heights on the elevated terrain north of Lake Illawarra.



Key characteristics of LCZ 5 include the following:

- Land uses are predominantly low density residential development, with rural areas close to the escarpment base, and public recreation typically associated with waterways
- Built form typically consists of single-storey detached residential dwellings, with weatherboard and fibro common in the suburbs north of Lake Illawarra. Houses conform to the topography, often elevated above the street oriented to enjoy coastal views
- Roads and urban patterns conform to the topographic landform and slopes
- Topography is undulating, ranging from approximately 50 to 100 metres
- The foothill suburbs are relatively leafy, with narrow corridors and pockets of mature vegetation
- Residential areas to the upper elevations have views towards the coast and port

Landscape values associated with LCZ 5 are not recognised under the Wollongong LEP, however the local residents are likely to value the low density leafy suburban setting between escarpment and coastline with easterly views towards the ocean.

Photograph 10 and Photograph 11 illustrate characteristics of LCZ 5.



**Photograph 10 Residential street with ocean views in Figtree**



**Photograph 11 Elevated residences view views over the port in Cringila**

#### **6.2.6 LCZ 6: Urban development – coastal plains**

LCZ 6 includes the lower lying urban areas with flatter terrain within the study area between the foothills and coastline. This includes North Wollongong, Wollongong University and Botanic Gardens, industrial and residential areas around Reidtown, Fairy Meadow and Towradgi. Also included are flatter areas between the foothills and the port, the city and the port, and urban development and parkland around Lake Illawarra.

Key characteristics of LCZ 6 include the following:

- Flat to gently undulating topography at lower elevations of between approximately 5 to 50 metres
- Land uses range from environmental conservation, urban parkland, low to medium density residential, educational, and light industry. Built form varies according to land use type.
- Due to the flatter terrain, LCZ 6 has abundant recreational facilities including sports fields, ovals, golf courses, and foreshore reserves

- LCZ 6 includes foreshore areas including Fairy Meadows Beach Reserve, the Wollongong Golf Club and foreshore, Hill 60 rocky headland, Port Kembla Beach, and the Lake Illawarra foreshore
- Vegetation includes heathy natural coastal foreshore communities, urban street tree planting, cultural plantings within the botanic gardens and university
- Views experienced within LCZ 6 are across a relatively flat landscape, often intercepted by built form and vegetation, yet still allowing regular glimpses of the escarpment

Value associated with LCZ 6 includes conservation areas associated with the Fairy Meadows Beach Reserve and Port Kembla / Windang Beach foreshore. Part of the Hill 60 / Illowra Battery heritage conservation area is within LCZ 6, with state significance associated with the Aboriginal, Maritime and Military history, including views from Hill 60 lookout.

Photograph 12 and Photograph 13 illustrate characteristics of LCZ 6.



**Photograph 12 Residential street near Wollongong City Centre with glimpses of the escarpment**



**Photograph 13 Residential area in low lying part of Cringila with short views to the port**

## 6.3 Visual baseline

### 6.3.1 Key views and viewsheds

As discussed in Section 4, a combination of elements were considered in determining the study area for the project, one of which was the ZTV. Figure 13 illustrates the ZTV analysis for the project, which reveals the influence of the escarpment and foothill landforms on the theoretical visibility of the project.

As identified in Section 5, key views and features of high visual amenity within the study area include views to the Illawarra Escarpment particularly from Wollongong City Centre, views up and down the coastline from the escarpment, and views to and from heritage conservation areas. The continuous escarpment, punctuated by the identifiable characteristics of Mount Keira, is an important visual backdrop to the city of Wollongong.

Desktop analysis combined with the site inspection have informed the understanding of key views towards the project, which are found to be achieved from elevated locations within the study area, and headland locations with clear open views across the water. The most important of these are sensitive receptor locations such as tourist lookouts, as well as residential areas.

Of particular note are the following key viewing locations within the project viewshed:

- Mount Keira lookout
- Wollongong Head Lighthouse lookout

- Hill 60 Park lookout
- Heritage Park / Breakwater Battery Military Museum

Also of note are residential areas on elevated locations within the viewshed, on the foothills and to the south of the project. The elevated topography forms a visual ‘bowl’ within which the flat landscape of the project site lies. As the topography and vegetation decreases from the escarpment towards the coast, views open up from the foothills to the east, from elevated buildings and from roadways.

As discussed in Section 5, Port Kembla creates a defining characteristic skyline of the steel industry and port. Similarly, it is a significant feature to view from the surrounding residential areas, due to the gross contrast in scale within the urban fabric in a relatively confined space. Viewing this precinct from an elevation accentuates the contrast.

Photograph 14 illustrates this contrast of scale and type, featuring the white elevated silos on the horizon of the port, which is a key visual feature within the port precinct.



**Photograph 14 Port skyline within the residential setting**

### **Sensitive visual receptors**

Sensitive visual receptors within the project viewshed include the following:

- Visitors to popular tourist destinations such as Mount Keira Lookout, Wollongong Head Lighthouse, Port Kembla Heritage Park, Lookout Hill 60, and Wollongong Beach
- Residents of elevated suburbs within the project viewshed, including small parts of Mount Keira, Figtree, Cordeaux Heights, Cringila, Warrawong, and Port Kembla
- Workers within Port Kembla industrial precinct
- Road users

### **6.3.2 Viewpoint locations**

Based on the visual baseline assessment, viewpoint locations were selected for assessment. Viewpoints chosen for assessment represent views from the most sensitive visual receptors in the study area. Refer to Table 6 for viewpoint descriptions and Figure 13 for viewpoint location plan.

**Table 6 Viewpoint locations**

Viewpoint	Location	Description
<b>VP1</b>	Mount Keira Lookout	This view represents visitors to Mount Keira Lookout.
<b>VP2</b>	Lewis Drive, Figtree	This view represents residents in elevated areas within Figtree.
<b>VP3</b>	Hilltop Avenue, Coniston	This view represents residents in elevated areas within Coniston.
<b>VP4</b>	Wollongong Head Lighthouse	This view represents visitors to Wollongong Head Lighthouse. This view would also be similar to the view experienced from Wollongong Beach.
<b>VP5</b>	Lackawanna Street, Cringila	This view represents residents in elevated areas in Cringila.
<b>VP6</b>	Flagstaff Road, Warrawong	This view represents residents in elevated areas within Warrawong.
<b>VP7</b>	Christy Drive, Port Kembla	This view represents visitors using the public carpark on Christy Drive, Port Kembla.
<b>VP8</b>	Port Kembla Heritage Park	This view represents visitors to Port Kembla Heritage Park.
<b>VP9</b>	Port Kembla Lookout Hill 60	This view represents visitors to Port Kembla Lookout Hill 60.