

APPENDIX

VISUAL ASSESSMENT





The Terminal 4 (T4) Project

FINAL DRAFT

Landscape & Visual Impact Assessment of The T4 Project,

Port of Newcastle

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Spackman Mossop Michaels



Report for

Port Waratah Coal Services PWCS

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1. Executive Summary

This Landscape and Visual Impact Assessment report has been prepared for Port Waratah Coal Services Limited (PWCS) by Spackman Mossop Michaels (SMM) to form part of the Environmental Assessment (EA) for the proposed Terminal 4 (T4) Project at the Port of Newcastle, New South Wales (NSW).

The T4 Project is essentially an extension to the existing Kooragang Coal Terminal (KCT). It will provide additional port capacity required to accommodate the projected future growth in coal exports from the Hunter Valley and broader NSW. It is proposed to include new rail tracks, coal stockyard, elevated conveyors and ancillary facilities on Kooragang Island, adjacent to KCT, and wharves, berths, ship loaders and ancillary facilities along the north and south banks of the Hunter River South Arm.

This report uses an assessment method that relies on quantitative evaluation of visual effect and quantitative assessment of viewer sensitivity to provide a landscape and visual impact assessment. During desktop studies 25 viewpoints were selected within the zone of visual influence surrounding the T4 Project and visited. With consideration of a number of criteria, including predicted level of affect of the T4 Project, land use type and user sensitivity, five of the potentially most affected viewpoints were selected for more detailed assessment and analysis. Of these, two were located in public open space; one was located in a residential zone while the remaining two were located in road corridors.

The existing landscape is comprised of visual character areas that range from high quality estuarine and wetlands areas to low quality light and heavy industry. It is important to note that the views from within the study area, towards the T4 project area are consistently comprised of a number of landscape character types overlapping and layering across any particular view. The prominence of the T4 Project then within the existing environment is perceived as one component within the many that comprise a particular view.

The detailed assessment identified that with mitigation, the T4 Project would likely successfully integrate with the existing landscape so that visual impacts are largely neutral. Without mitigation, four viewpoints may experience significant levels of visual change. Mitigation comprises two strategies 1. landscape planting for screening and 2. camouflage/ disguise treatments to be applied to the yard equipment, ship loaders and elevated conveyors to reduce the level of visual change, particularly in regard to these structures against the skyline.

2. Introduction

Port Waratah Coal Services Limited (PWCS) proposes to construct and operate a new coal export terminal at the Port of Newcastle, New South Wales (NSW). PWCS owns and operates the Kooragang Coal Terminal (KCT) at Kooragang Island and Carrington Coal Terminal (CCT) at Carrington, both in the Port of Newcastle (Figure 1). The proposal, known as the Terminal 4 Project (T4 Project), is essentially an extension to KCT. The T4 Project will provide additional port capacity required to accommodate the projected future growth in coal exports from the Hunter Valley and broader NSW.

The T4 Project is proposed to include new rail tracks, coal stockyard, conveyors and ancillary facilities on Kooragang Island, adjacent to KCT, and wharves, berths, ship loaders and ancillary facilities along the north and south banks of the Hunter River South Arm (Figure 5).

Approval for the T4 Project is being sought under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The Commonwealth has accredited the Part 3A process as the appropriate assessment pathway for the T4 Project. An environmental assessment (EA) of the T4 Project is a requirement of the Part 3A approval process. Spackman Mossop Michaels has been engaged by PWCS to undertake the *landscape and visual impact* assessment component of the EA. This report documents the methodology and results of the *landscape and visual impact* assessment as well as the proposed mitigation measures.

2.1 The T4 project area

The T4 Project is proposed to be located at the Port of Newcastle, in the Newcastle local government area, approximately 6 km north-west of the Newcastle central business district (Figure 1.1). The T4 project area is located on Kooragang Island, adjacent to KCT and the Newcastle Coal Infrastructure Group (NCIG) coal terminal, and on the south bank of the Hunter River South Arm, at Mayfield North (Figure 4).

The southern part of Kooragang Island, where the T4 project area are located, is dominated by industrial, transport, distribution and port facilities, including KCT and NCIG. To the north and west of the Kooragang Island industrial and port area are estuarine wetlands, mangroves, saltmarsh and pastured and forested lands, subject to agricultural and conservation activities. This includes the Hunter Wetlands National Park, part of which is a Ramsar site. The nearest residential areas are at Fern Bay and Stockton to the east and south-east, and Mayfield and Warabrook to the south and south-west (Figure 4).

The T4 project area is predominately reclaimed land which has previously been used for disposal of industrial waste and dredge material. It is a largely modified landscape dominated by bare ground, disturbed grassland and artificially constructed drainage depressions and ponds, which now support wetland communities. There is some remnant mangrove and saltmarsh vegetation along the north bank of the Hunter River, South Arm at the location of the proposed wharves and berths, as well as to the north and west of the existing rail line (Figure 5).

2.2 T4 Project overview

The T4 Project is proposed to be developed progressively over an estimated 10 year timeframe, in response to demand for increased coal export capacity. The maximum coal throughput capacity for the T4 Project will increase from 70 million tonnes per annum (Mtpa) in the first stage to a nominal 120 Mtpa at full development. All coal will be received by rail, stockpiled and then shipped to market. The T4 Project

components are illustrated in Figure 5 and include the following:

- Ground treatments, including pre-loading, to create suitable foundation conditions for development. Sand dredged from the Hunter River South Arm is proposed to be pumped to the proposed stockyard area, to provide pre-load and fill material for the project. This will be supplemented by engineering fill (sand and rock) trucked in from elsewhere.
- Relocation of some existing infrastructure and services, such as electricity transmission lines, gas lines, water lines, fibre optic cable, ship navigation aides, the existing KCT rail tracks and the Ausgrid wind turbine. Minor modification to local roads may also be required.
- Progressive construction and operation of rail receival infrastructure, generally located along the same alignment as the existing rail lines servicing Kooragang Island. At full development there will be up to eight arrival tracks leading into up to four dump stations and on to eight departure sidings, which combine into a single departure track around the outside of the existing KCT rail loop.
- Progressive construction and operation of a coal stockyard, including coal stockpiles and yard equipment for stacking and reclaiming coal. At full development there will be up to seven stockpiles.
- Progressive construction and operation of coal conveyors, feeders and transfer stations that extend throughout the stockyard to deliver coal from the dump stations to the stockpiles, and to the wharves to deliver coal to the shiploaders, via buffer bins.
- Progressive construction and operation of wharf and berth facilities on both sides of the Hunter River South Arm, near the Tourle Street Bridge. At full development, up to five berths and four shiploaders are proposed, which accommodate vessels ranging from Handy size to Cape size.
- Development of water and wastewater management infrastructure including drainage works, water management ponds, pump stations and water tanks.
- Ancillary facilities, including electricity supply, dust suppression and fire fighting systems, fencing, amenities, landscaping, internal access roads, car parking areas and potentially, wash down facilities, refueling facilities, administration and workshop buildings.
- Use of some existing KCT infrastructure, systems and workforce, including administration and maintenance facilities and environmental management and monitoring systems.
- Habitat creation and enhancement.

Further details on the proposed T4 Project are provided in the EA.

2.3 The Landscape and Visual Impact Assessment report

This report has been prepared in order to satisfy the Department of Planning and Infrastructure, Director-General's Environmental Assessment Requirements (EARs), which requires that "the EA must include an assessment of the impacts of the project on visual amenity of the surrounding areas and consider large scale landscaping within the context of a port and industrial precinct".

A table has been provided in Appendix B of this report, which references the EARs and the relevant section within the report in which the requirement has been addressed.

There is no guidance on visual impact assessment within Australia, however the industry typically refers to the guidance offered by the Landscape Institute in the United Kingdom. The following methodology conforms to the guidance offered by the Institute's *Guidelines for Landscape and Visual Impact Assessment* (GLVIA).

This report aims to assess the nature and significance of visual impact of the T4 Project and it includes the following:

- A description of the methodology adopted for the assessment of effects upon landscape and visual amenity;
- A description of the assumptions and limitations of this method;
- A description of the relevant consultation, legislation, policies and guidelines that have been used to inform the assessment;
- An evaluation of the existing landscape conditions;
- A description on the T4 Project;
- Discussion of visual receptor sensitivity within the study area through the use of representative publicly accessible viewpoints;
- An assessment of the significance of effects upon landscape and visual amenity as a direct result of the proposal based upon an evaluation the viewpoints;
- Discussion of T4 Project mitigation strategies; and
- A summary of the results of the assessment.

3. Methodology for assessment

This section describes the methodology adopted to establish the baseline environment in the study area and then to assess the potential landscape and visual impacts that could result from the T4 Project during the construction and operational phases.

3.1 Study method

3.1.1 Zone of visual influence

An indicative zone of visual influence (ZVI), defined as the area from which the T4 Project may be viewed, was initially determined through a desktop study of aerial photographs, topographic and cadastral maps in tandem with the T4 Project preliminary design/ engineering drawings. This method gave a comprehensive understanding of the form and scale of the T4 Project during both the construction and operational phases (Figure 9).

3.1.2 Selection of representative viewpoints

From the desktop analysis 25 viewpoints were selected within the ZVI to illustrate a combination of the following:

- Landscape character types;
- A range of different land uses;
- Popular vantage point/ significant important locations;
- A range of sensitivity of receptors;
- Areas of high scenic value and;
- A range of foreground and middle-ground views of the T4 Project;

All of the viewpoints are illustrated in Figure 10.

3.1.3 Site survey

A site survey was undertaken by two landscape architects in order to build consensus and limit subjectivity. The first site visit was conducted on 4 May 2011 during conditions of good visibility. The following was undertaken in order to carry out the survey:

- A visit to the T4 Project area was undertaken to visually examine the adjacent areas. Using binoculars, place markers, such as water and transmissions towers, built forms and vegetation cover were identified across the adjacent areas and the surrounding topography was understood;
- 25 viewpoints were visited and the predicted extent of visual impact of the T4 Project was assessed using binoculars in conjunction with topographic and cadastral mappings and aerial data. Once this extent was established, panoramic photographs were taken at eye level (approximately 1.85 m) towards the T4 study area with a Sony Alpha 350 digital SLR through a 50 mm fixed focal lens. At the same time detailed GPS data was recorded. (Figure 3)

All 25 viewpoints were assessed, and of these, six were found to have no view of the T4 Project. A summary of these assessments can be seen in Table 1.2 and their locations seen in Figure 10.

A second site visit was undertaken by one landscape architect on the 16 May 2011 in conditions of excellent visibility in order to capture additional photography for five of the viewpoints.

3.1.4 Viewpoint analysis

A further detailed desktop viewpoint analysis of the panoramic photographs was undertaken after the site survey information was collated.

Viewpoint analysis is a common visual assessment technique, which allows site-based information that may be experienced by people (visual receptors) from specific locations, viewpoints, and vistas to be assessed in detail leading to a wider assessment of the likely effects on visual amenity.

The detailed viewpoint analysis determined that there was 20 viewpoints that would not be affected by the T4 Project and five potentially significantly affected viewpoints. The five potentially significantly affected viewpoints were selected for modelling and a generation of a photomontage. These are illustrated in Figure 11 and summarised in Table 1.3-1.7.

3.1.5 Viewpoint photomontage

A detailed correctly dimensioned and scaled 3D computer model of the T4 Project was generated. For each photomontage, a camera was set up in the model to match the GPS co-ordinates (x,y,z) as well as the bearing and field of view parameters. The model was then rendered to the digital image using a lighting model in the computer software consistent with conditions within the panorama photograph taken at that viewpoint.

Through the process of overlaying the rendered computer image on the panorama photograph the photomontages were produced. Final adjustments to the photomontages were made using Adobe Photoshop, these were:

- Brightness and contrast;
- Colour and tone; and
- Removal of any items that would be obscured by foreground detail within the photograph.

The resulting photomontage was then saved as high-resolution full-colour digital in two versions:

- The extent of the T4 Project depicted in red;
- A 'photo real' photomontage of the T4 Project.

The photomontages, presented in Figures 12-16, were produced for the five viewpoints, are 'artists impressions' and were used only as a tool to illustrate the assessments as written down in words. Full assessments were carried out on site, independently of the photomontages, and consequently are considered principal in the assessment. The photomontages provide information that:

- Illustrates the background to the written assessment;
- Helps illuminate on what the assessor bases his / her judgement; and
- Aids understanding of the assessors' judgements, but that information is always and inevitably subject to the inherent limitations of photographs and photomontages.

Additional photomontages were prepared (as requested by PWCS) and are 'artists impressions' of some of the possible mitigation treatments, which could be employed to minimise the visual impact of the T4 Project. It should be noted that these are preliminary studies only were not used in the viewpoint analysis in this report.

3.1.6 Description of existing conditions

The description of existing landscape and visual environment establishes a baseline situation against which the T4 Project has been assessed. This has been based upon a desktop study of relevant published documents and collected site survey information including:

- Survey mapping;
- Aerial photographs;
- Information from local planning authorities;
- Site survey, comprising a photographic record of landscape features, key views and receptors; and
- Observations on the way in which the public realm (open space, roads etc.) is used.

Existing images describing the surrounding character areas in are illustrated in Figure 2.

3.2 Visual impact assessment method

A qualitative assessment of landscape and visual impacts has been undertaken. The effect of the T4 Project has been evaluated on the basis of a combination of visual effects.

Visual effects are recognised as concerned wholly with the effect of the development on views, as experienced by the viewers and the overall effect on visual amenity.

Visual effects may include the physical obstruction or blocking of a view and visual intrusion of the proposed development into an existing view, the wider townscape setting and the overall effect on visual amenity. The effects of these may be negligible, neutral or positive. Other visual effects include light pollution and increased visibility due to colour and height of structures, relative to the surrounding area.

3.2.1 Type of effect

On completion of the assessment, the type of effect and probability of effects occurring is defined as follows:

Temporary or permanent: In this case the T4 Project will be permanent.

Direct or Indirect effects: Direct is defined as an effect that is directly attributable to the T4 Project while indirect effects are not the direct result of the T4 Project but may be the result of an associated development, usually outside the T4 project area.

Positive, Neutral or Negligible: In visual terms – positive or negligible effects are less easy to define or quantify and require a subjective consideration of a number of factors affecting the view, which may be positive, neutral or negligible. Opinions as to the visual effects of development vary widely, however it is not the assumption of this assessment that all change, including high levels of change is a negligible experience. Rather this assessment has considered factors such as the visual composition of the landscape in the view together with the landform design and composition, which may or may not be reasonably accommodated within the scale and character of the landscape as perceived from the receptor location.

3.2.2 Magnitude of change

Magnitude in terms of the visual assessment is defined by the following criteria:

- Proximity and distance from the T4 Project (calculated from the midpoint of the proposed stockyard area);
- Angle of development from the main direction of view;
- Frequency and speed of view;
- Numbers of viewers affected;
- Elevated views from high ground;
- Night-time views;
- Extent of view affected; and
- Viewed against the skyline or a background.

3.2.3 Visual sensitivity

Visual sensitivity refers to particular visual receptors (people) and is considered against the likely magnitude of change. Sensitivity in terms of the visual assessment is defined by the following criteria:

- Type of receptor and land use at the viewpoint. Residential properties, tourist roads and recreational open space areas are considered to be of high sensitivity, whilst places of work may be less sensitive. (i.e. high, medium or low interest in their everyday visual environment);
- Receptors' duration and viewing opportunity (e.g. prolonged, regular viewing opportunities);
- Number of viewers and their distance from the source of the effect (visual catchment zones as calculated from the midpoint of the proposed stockyard area);
- The effect of distance on ability to discern detail of specific landscape elements, as well as contributing to the 'visual business' in the views/ vista or panorama is critical. The viewing distance changes the degree of visual effect:
 - Foreground (0-1 km): where details of colour texture and structures are most clearly perceived.
 - Middle-ground (1 km to 3 km): where some detail can be seen but where increasingly colour and texture variation is seen as grouped into mass elements.
 - Distant middle-ground (3 km to 6 km): although perception of colour and texture variation is limited, the essential elements are identifiable.
 - Background (from 6 km to 16 km): detail recedes or fades and visibility is dominated by landscape forms and lines rather than colour and texture. Additionally land use and constructed elements are decreasingly visible.
- The context and visual composition of the view including consideration of the quality and value of the components within the view, which may include reference to the skyline, vistas, and landmarks as well as heritage listed buildings, parks and conservation areas. (Figure 9)

3.2.4 Evaluation of significance

The means of evaluating the significance of the landscape and visual effects is illustrated in Table 1.1 as a general, broad guide. This evaluation determines the level of effect resulting from the combination of sensitivity against magnitude of change. The range of landscape and visual effects has been divided into seven broad classifications of effect, defined in this assessment as 'Substantial', 'Moderate/Substantial', 'Moderate', 'Moderate/Slight', 'Slight', 'Slight/Negligible' or 'Negligible'.

Magnitude of Change	Visual Sensitivity		
	High	Medium	Low
High	Substantial	Moderate / Substantial	Moderate
Medium	Moderate / Substantial	Moderate	Slight / Moderate
Low	Moderate	Slight / Moderate	Slight
Negligible	Slight	Slight / Negligible	Negligible
Key:	Significant	Not Significant	

Table 1.1 – Evaluation of significance for landscape and visual assessment

For this assessment likely significant visual effects resulting from the T4 Project would be all those effects that result in a 'Substantial' or a 'Moderate/Substantial' effect.

3.2.5 Mitigation

Mitigation is an iterative process and widely considered as an integral part of the overall design and assessment to avoid or reduce the potential for significant adverse effects. The project design team may, for example, seek in the first instance to avoid potential impacts, to reduce those that remain, and where no other measures are possible, to put forward remedial or enhancement measures.

Mitigation measures to reduce visual impacts of the T4 Project have been included within this Landscape and Visual Impact Assessment report.

4. Existing environment

In order to identify the potential landscape character and visual impact of the T4 Project, it is necessary to understand the current visual and landscape character of the area, as well as the sensitivity of people with regard to changes in this character. As outlined in the Visual Impact (Section 6), these aspects will have a direct bearing on the potential impact of the works. Apart from the nature of the T4 Project itself, the landform and vegetation cover of the area will be important in determining the potential visual effect of the T4 Project, whereas land use will determine how sensitive people in the area will be to changes in the landscape and visual environment.

4.1 Regional context

The regional context of the T4 Project has attributes of both high scenic and low scenic quality. Much of the region is comprised of natural environment features including distant hills, wide valleys, meandering rivers and river terraces that feed into estuarine areas including the Hunter Estuary Wetlands and the Hexham Swamp with an easterly coastline comprised of expansive rolling beaches and dune systems. Located on the Hunter River the region is also characterized by heavily modified industrial areas, including the Port of Newcastle, one of the world's largest working coal export ports (Figure 1 and 2A-D).

4.2 Local context

4.2.1 Newcastle town centre

The town centre is located on low-lying land at the mouth of the Hunter River and has views north across the working harbour, the suburb of Stockton and Walsh Point at the eastern end of Kooragang Island. Newcastle town centre has a commercial core surrounded by mixed used areas, public recreation spaces and high-density residential premises. Much of the commercial use is located in modern multi-storey buildings with some historic buildings still remaining while one and two storey Victorian terrace dwellings are typical of the residential areas. Isolated streets across the town centre generally have mature deciduous street trees.

On the northern edge of the town centre is a multi-track railway that provides local and regional services. As part of this infrastructure there are vertical mechanical infrastructure items, station platforms and buildings.

Along the foreshore edge is a narrow area of public open space with walking paths, grassed areas and formal rows of pines. Navigational aides for the Port of Newcastle, including a large navigational tower, punctuate the foreshore. Larger grassed areas further away from the river contain an amphitheatre, oval and ponds with scattered patches of exotic trees and shrubs. Car parking areas are also prominent in this area.

To the east of the town centre sits an elevated area of land designated for public recreation, which has historical significance. It is a popular vantage point in the region with panoramic views of the Hunter River, the coastline, Stockton and Kooragang Island (Figure 8 and 2E-G).

4.2.2 Industrial areas

Areas within 3 km of the T4 project area – Hunter River, Kooragang Island

Industry forms a large component of the local context of Newcastle on both the southern bank of the Hunter River as well as on Kooragang Island which is located to the north of the Hunter River South Arm and Newcastle town centre. These areas are characterised by flat, low-lying topography.

On the southern bank of the Hunter River South Arm there is a variety of heavy and light industry. These areas are dominated by a multitude of steel-clad, steel framed structures, which usually do not exceed a height of 15 m and have large floor spaces. The roof forms are mostly gabled or skillion in design with some clerestory or skylight windows for natural light (Figure 8 and 2H-K).

Industry on Kooragang Island is dominated by heavy export and processing infrastructure and stockyards which include elevated conveyor systems, coal stacker/reclaimers, ship loaders, coal stockpiles, large tanks, stacks, pipe work and chimneys and a variety of different scaled buildings and port facilities. A single 600 kW wind turbine is located between Cormorant Road and the Hunter River South Arm and is visually prominent within much of the surrounding areas of Newcastle.

Some scattered vegetation is evident on Kooragang Island, the most prominent being a dense tree row (approximately 25 m wide) that runs along the northern edge of Cormorant Road in the west of the island. Stretches of mangroves also line the northern bank of the Hunter River South Arm (Figure 5 and 2N).

The industrial areas are serviced by both road and rail transportation systems.

There are a number of utility service poles and transmission lines across the landscape as well as navigation and communications towers (Figure 8 and 2L-O).

Areas within 3-6 km of the T4 project area – Tomago

Tomago is a predominantly industrial area located approximately 5.5 km to the north of the T4 project area and is characterised by heavy industry including the Tomago aluminium smelter, FORGACS Shipyard, Valley Longwall International and the Tomago Sandbeds water treatment works. It sits on low-lying ground to the north of Hunter Wetlands National Park.

4.2.3 Cormorant Road

Cormorant Road is the main thoroughfare road across Kooragang Island and links central Newcastle with Stockton, Newcastle Airport and areas to the north via the Tourle Street Bridge and Stockton Bridge. On Kooragang Island there is a dominance of heavy industry along each side of the road with many elevated industrial structures, such as conveyors, crossing over the road. As well, a number of utility service poles and transmission lines run parallel to the road as well as crossing over it.

The road typically has a high number of vehicles moving along it, particularly during morning and afternoon peaks, but also forms part of a tourist and cycle touring route linking with the north (Figure 8 and 2P-S).

4.2.4 Urban residential (with views of the T4 project area)

Many of the suburbs of Newcastle sit in low-lying river terraces, which restrict the views of the T4 project area, however there are some elevated residential areas across the southern flats, which have views to the site. The landscape character and land use of these areas is described below.

Areas within 3 km of the T4 project area – Mayfield, Sandgate

The residential suburb of Mayfield straddles raised topography to the north-west of Newcastle town centre (Figure 6). The dominant housing is detached dwellings usually with large gardens to the rear. The area has a number of parks, reserves and ovals.

The suburb of Sandgate sits on low lying land to the west of Mayfield and has a small number of mixed industrial businesses with a limited number of residences adjacent the Hunter River South Arm. The Hunter line of the Main North Railway runs through the suburb and a large cemetery sits between the railway and the Pacific Highway to the north (Figure 8 and 2U).

Areas between 3-6 km from the T4 project area – Stockton, Waratah, West Waratah and Fern Bay, Tomago

Stockton is located on low-lying ground opposite Newcastle town centre at the river mouth of the Hunter River. It is largely surrounded by water and is linked by ferry that departs the jetty adjacent Wharf Road

and often as every half hour during the weekdays. A number of parks provide opportunities for recreational activities. The dominant housing is detached dwellings, which front onto wide streets (Figure 8 and 2T).

Waratah and West Waratah are located to the south-west of Newcastle town centre on elevated topography. The suburbs are a mix of detached residential dwellings and commercial and industrial zones. On the upper hill tops there are recreational areas including Braye Park which provides views of the city, walking areas and picnic facilities. A prominent feature that sits adjacent this park is the disused concrete Waratah Water Reservoir.

Fern Bay is located north of Stockton just within 6 km from the T4 project area on the low-lying banks of the Hunter River at the entrance to Fullerton Cove. The suburb is currently small but is intended to become a growth area in the future on land adjacent that was previously a military weapons range. The dominant housing is detached dwellings usually with large gardens to the rear (Figure 8 and 2V).

The suburb of Tomago is located approximately 5.5 km from the T4 project area and has a small residential community of 31 dwellings (ABS, 2006) with a population of 95. Tomago House is listed by the National Trust of Australia and like the rest of the suburb it sits on low-lying ground to the north of Hunter Wetlands National Park.

Areas further than 6 km from the T4 project area – Cooks Hill, Newcastle East, Maryland

Cooks Hill sits on a pronounced hill to the south-east of Newcastle town centre and is predominantly a residential area with a mix of terrace houses, flats and rental apartments. On a prominent hill above Newcastle town centre sits Obelisk Hill which as well as having significant heritage features, is a popular park and lookout with panoramic views across Newcastle and the lower Hunter flood plain (Figure 8 and 2W).

Newcastle East sits across a raised headland and is located close to the east of the town centre and is predominantly residential with a number of tourist attractions such as Customs House, the Foreshore, Nobby's Beach and Fort Scratchley.

The suburb of Maryland is located north-west of Newcastle town centre and 6.8 km west of the T4 project area. It is primarily a residential suburb with detached dwellings with large gardens. It sits on low-lying ground adjacent the Hexham Swamp with sweeping views out across it to the T4 project area in the east.

4.2.5 National parks / reserves

These areas are predominantly flat, low-lying areas with a dense coverage of wetland and swamp vegetation range with a high landscape value.

Hunter Wetlands National Park / Hunter Estuary Wetlands Ramsar site and Hexham

The Hunter Wetlands National Park is located approximately 9 to 12 km north-west of Newcastle town centre immediately to the north of the T4 project area and is comprised of coastal lagoons, vegetated marshes and densely forested wetlands. The area can be accessed boat and although there is limited public access, special interest groups such as the University of Newcastle and the Hunter Bird Observers Club utilize the areas for scientific study purposes. Low impact canoe tours are also run up the Iron Bark Creek system (Figure 8 and 2X-Y).

Ash Island

Ash Island is located adjacent Kooragang Island on low lying terrain at the junction of the Hunter River South and North arms. It is more readily accessible to a large number of people from Newcastle and the lower Hunter Valley and includes an education centre. Guided walks are conducted through the area.

4.2.6 Night lighting

The regional setting is comprised of areas of natural landscape, which are wholly unlit, interspersed with lit town, industrial and port facilities.

The town centre has low-level street and foreshore lighting as well as some lighting of important open spaces.

Much of the existing industry and port facilities across Newcastle operate 24 hours per day and are consequently well lit during the night time for operational and safety requirements. Many of the vertical and elevated structures are lit including navigation towers and stackers/reclaimers, stackers and ship loaders. Light spills out from these across the Hunter River into surrounding areas and there is a glow above the operations that can be seen from nearby areas. This glow is generally enhanced by salt haze.

Cormorant Road, Tourle Street and Stockton bridges, and the Pacific Highway are both well lit with high-level street lighting (Figure 8 and 2Z).

5. Visual impacts

5.1 Visual impact analysis

Visual impact analysis is concerned wholly with the effect of development on peoples' views and the overall effect on visual amenity.

5.1.1 Visual envelope

The visual envelope (Figure 7) of the T4 Project is largely determined by the topography and distance from the T4 project area. Views of the T4 Project are possible from locations immediately adjacent the T4 project area as well as on elevated land within 3 km to the south.

Views between 3-6 km of the T4 project area are also available as a result of a continuing rise in topography.

Views of the T4 project area from Ash Island and from locations within the Hunter Wetlands National Park, may be possible however the limited public access combined with the low-lying topography and dense vegetation mean that views will be obstructed and are unlikely to be significant.

Due to low-lying topography and distance from the T4 project area, views to the east and further south (between 3-6 km) will be limited.

More distant views to the T4 project area from locations to the south-east are possible due to the headland topography at the mouth of the Hunter River, however being over 6 km away, the significance of these views will be reduced.

5.1.2 Visual receptors

Key visual receptors were identified to be:

- Viewpoint 12 – Residents and tourists;
- Viewpoint 13 – Residents;
- Viewpoint 15 – Industry employees commuting to Kooragang Island, users of Cormorant Road, residents travelling to Stockton, Nelsons Bay, Fern Bay Port Stephens etc, tourists travelling to and from the airport and cyclists;
- Viewpoint 19 – Motorists travelling in from the Greater Hunter region; and
- Viewpoint 24 - Tourists and visitors to this historic site as well as people utilising the array of facilities.

Each of these receptors had been represented in the detailed viewpoint assessment and a judgement made as to the overall likely visual effects experienced by the receptors within the study area.

Each viewpoint is described and assessed in Section 6.1.2.

5.1.3 Construction and operation

The construction of the T4 Project is estimated to take place over a 10 year period. The construction has been broken into three broad phases with the first coal shipped to market at the end of the first phase. During all of the construction phases the T4 Project is likely to be characterised by the following activities:

Site clearance:

- Removal of vegetation; and

- Ground preparation works;

General construction is expected to include:

- Localised road works including a potential roundabout at the intersection of Cormorant Road and Pacific National Access Road;
- Traffic management;
- Buses which will transport construction employees in peak periods to the T4 project area with offsite parking located on the main approaches to the site;
- Presence of construction workers and associated support facilities;
- Presence of protective fencing and signage;
- Transport and use of dredging equipment in the Hunter River South Arm for the construction of wharves and ship loading infrastructure;
- Movement of earthworks machinery on the T4 project area;
- Movement of earth moving trucks in and out of the T4 project area;
- Movement of trucks delivering equipment and materials to the T4 project area; and
- Movement of construction cranes or similar equipment used to install coal transfer infrastructure;

General operations are expected to include:

- Water management ponds;
- New rail tracks and train movements;
- Water trucks dispensing water on roads and other trafficked areas;
- Coal stockpiles which will vary in size and scale as coal is delivered by train and shipped from the wharves;
- Coal stacker/reclaimers which will move slowly in an east-west direction across the stockyard area;
- Conveyor systems across the T4 project area, over Cormorant Road and the Hunter River South Arm;
- Shipping berths and wharves on the north and south banks of the Hunter River South Arm;
- Ship loaders and loading coal onto ships; and
- Ancillary facilities;

Due to the staggered three stage construction process, two of which will run in parallel with operations, for the purposes of this report, the construction and operational phases have been assessed together and the potential impacts described in Section 6.

5.1.4 Cumulative effects

Newcastle is the export hub for a large number of industries in the greater Newcastle and Hunter regions and across New South Wales. The industry growth is in constant flux as it responds to changing demands.

In addition to the existing industrial developments in the local area, there are a number of approved projects, which are in various stages of development from yet built to partly operational. These include, but may not be limited to, expansions of existing facilities and construction and operation of new facilities:

- KCT;

- NCIG;
- Proposed Multi Purpose Terminal;
- Proposed Manildra Park Facility;
- Proposed Knauf Glass Wool Manufacturing Plant; and
- Orica Ammonium Nitrate Expansion.

In addition a large dredging campaign has been approved in the Hunter River South Arm to service some of these developments, including for the T4 Project.

These developments may involve expansions of existing facilities and construction and operation of new facilities. These developments are expected to include a variety of built structures ranging from different scaled buildings through to large tanks and vertical utility services, which will continue to intensify the overall usage of this industrial area.

All of the works associated with the T4 Project will occur in a location where similar industrial developments are currently operating. The form of the T4 Project will be similar in form to the existing developments while its scale and extent is considered to be of a similar nature to existing adjoining heavy industry to the east.

Taken together the cumulative impacts of the T4 Project, with other approved developments, may moderately alter the horizontal extent from elevated viewpoints to the south while localised impacts to views from the Tourle Street Bridge, Cormorant Road and the river banks mean that a high to moderate level of cumulative impact may be experienced. By employing appropriate mitigation measures, including but not limited to, landscape planting for screening and camouflage treatments, the T4 Project could be integrated with existing and future industrial forms so that the overall cumulative impact would be lowered significantly.

In conclusion, with the appropriate mitigation measures employed, the cumulative impact of the T4 Project on the surrounding areas would be low.

6. Visual impact assessment

6.1.1 Unmitigated broad viewpoint assessment

An unmitigated broad viewpoint assessment was conducted for the 25 viewpoints identified through the desktop analysis. It has been undertaken without consideration of mitigation measures (such as landscape planting for screening and provision of camouflage/ disguise treatments) to identify critical viewpoints, which were then investigated in more detail.

All viewpoints were assessed based on the distance of the viewpoint from the minimum distance to the T4 project area.

The locations of the broad assessment viewpoints are illustrated in Figure 10 with panoramic photos of the viewpoints, with views of the T4 Project, illustrated in Figure 3. The assessment of these viewpoints is given below in Table 1.2.

Through the broad assessment it was determined that the majority of the viewpoints would experience low levels of visual change as a result of the development of T4 Project however there were five potentially significantly affected viewpoints. Of these, four were selected for modelling and generation of a photomontage. An additional viewpoint (19) was chosen due its proximity to the T4 project area as well as its location within an industrial land use character type. The assessment of these five viewpoints is given below in Table 1.3-1.7.

VP ID	Distance from the T4 Project Area	Location	Description	Land Use Area	Visual Sensitivity			Magnitude of Change (Unmitigated)				Type of Effect (Unmitigated)								Evaluation of Significance (Unmitigated)
					H	M	L	H	M	L	N	T	P	D	I	P	N	N u		
01	3.9 km east	Stockton Bridge, Hunter River North Arm	Viewpoint 1 is located on the vehicular only Stockton Bridge which links Newcastle and Kooragang Island with areas to the north. The receptors will be viewing the T4 project area at speed and road infrastructure and heavy industry dominates the view.	Cormorant Road															Slight/Moderate	
02	3.6 km east	Greenleaf Road, Kooragang Island	Viewpoint 2 is located on the western bank of the Hunter River North Arm. Heavy industry in the immediate foreground will prevent any views of the T4 project area.	Industrial															Negligible	
03	4.3 km east	Stockton Aged Centre, Stockton	Viewpoint 3 is located on the western boundary of the Stockton Aged Care Facility in the suburb of Stockton. Although viewing times would be longer from building within this facility, existing communications infrastructure, pine trees and mangrove vegetation in the foreground as well as industry in the middle ground would reduced the magnitude of change.	Urban areas between 3-6 km															Moderate	
04	4.4 km south-east	Booth Street, Stockton	Viewpoint 4 is located on a residential street in Stockton. Heavy industry on the opposite bank of the Hunter River North Arm will prevent any views of the T4 project area.	Urban areas between 3-6 km															Negligible	
05	4.6 km south-east	Monmouth Street, Stockton	Viewpoint 5 is located in flat public open space adjacent the residential homes of Stockton on the banks of the Hunter River North Arm. Heavy industry on Walsh Point and either side of the Hunter River South Arm and will make this a heavily industrialised view.	Open space / reserve															Moderate	
06	6.0 km south-east	Wharf Road, Newcastle	Viewpoint 6 is located on an area of public open space adjacent Newcastle city centre. It has expansive views north across the Hunter River and to Kooragang Island. Heavy industry in the foreground and the low elevation of this viewpoint reduced the magnitude of change.	Open space / reserve															Moderate	
07	6.3 km south-east	The Obelisk, Wolfe Street, The Hill	Viewpoint 7 is located on a prominent hill above Newcastle city centre in the Obelisk Park popular for its panoramic views across Newcastle and the lower Hunter flood plain. Housing and vegetation in the foreground and the distance of this viewpoint from the T4 project area reduce the magnitude of change.	Open space / reserve															Moderate	
08	6.7 km south- east	Nesca Parade, Cooks Hill	Viewpoint 8 is located on Nesca Parade, a residential street in the suburb of Cooks Hill. Due to the distance from the T4 project area there would be no view.	Urban Areas more than 6 km															Negligible	
09	6.3 km south-east	William Street, Merewether	Viewpoint 9 is located on William Street a residential street in Merewether. Due to the distance from the T4 project area there would be limited to negligible change to the views.	Urban Areas more than 6 km															Slight	
10	6.8 km south-east	Macquarie Street, Merewether	Viewpoint 10 is located on Macquarie Street a residential street in Merewether. Due to the distance from the T4 project area there would be limited to negligible change to the views.	Urban Areas more than 6 km															Slight	

VP ID	Distance from the T4 Project Area	Location	Description	Land Use Area	Visual Sensitivity			Magnitude of Change (Unmitigated)				Type of Effect (Unmitigated)							Evaluation of Significance (Unmitigated)
					H	M	L	H	M	L	N	T	P	D	I	P	N	N _u	
11	6.0 km south-west	John Hunter Hospital, New Lambton Heights	Viewpoint 11 is located at the John Hunter Hospital complex, which is comprised of a multitude of multi-storey hospital buildings set within areas of dense bush land. This vegetation prevents views from the lower floors to the T4 project area, however some distant views may be possible from the top floors.	Urban Areas more than 6km															Moderate
12	3.0 km south-west of the proposed south bank wharf area	Braye Park, Waratah West	Viewpoint 12 is located on a pronounced hill in open space that has been zoned Environmental Management (E3) due to its scenic values. At this distance the elements of the T4 Project group together and perception of detail is reduced however the vertical transfer equipment will be obvious.	Open space / reserve															Moderate / Substantial
13	950 m south of the proposed south bank wharf area	Bull Street, Mayfield West	Viewpoint 13 is located at the top of a small steeply sloped public recreation zone in Mayfield West. The close proximity of this viewpoint and its elevation above the T4 project area is typical of views experienced by residents and their sensitivity to change is high.	Open space / reserve (within a residential area)															Substantial
14	6.5 km south-west	Callan Avenue, Maryland	Viewpoint 14 is located at the interface between the residential suburb of Maryland and the Hexham Swamp Nature Reserve at the beginning of a local walking trail. Distant elevated land and vegetation partially obscure the T4 Project from this view.	National Park / Ramsar															Moderate
15	South Arm, adjacent to the proposed wharves and conveyor crossing	Tourle Street Bridge, Hunter River South Arm	Viewpoint 15 is located on the Tourle Street Bridge looking north-east towards the existing industry on Kooragang Island. Cormorant Road is currently dominated by coal terminal infrastructure and the proposed T4 Project infrastructure will be consistent with existing facilities however the T4 Project will be viewed at close range and a high magnitude of change will result.	Cormorant Road															Moderate / Substantial
16	300 m south	Cormorant Road, Kooragang Island	Viewpoint 16 in an area of open space surrounding the base of the existing wind turbine, which is located on the northern bank of the Hunter River South Arm. The T4 Project conveyors and shiploaders will be prominent but it should be noted that a large dredging campaign has been approved in this location, which will radically alter the existing view when the T4 Project is being constructed.	Cormorant Road															Moderate / Substantial
17	1.7 km east	South Arm Road, Kooragang Island	Viewpoint 17 is located at the intersection of Pacific National Access Road and Cormorant Road and has extensive views of the heavy export industry on Kooragang Island. It is a view likely to be experienced by industry workers and tourists travelling along Cormorant Road at speed and industry in the foreground will largely obscure the T4 Project from these receptors.	Cormorant Road															Moderate
18	3.4 km south-west	Blanch Street, Shortland Wetlands Area	Viewpoint 18 is located at the interface between the residential suburb of Shortland and the Shortland Wetlands Area. The view is obscured by heavy foliage.	Urban areas between 3-6 km															Slight

VP ID	Distance from the T4 Project Area	Location	Description	Land Use Area	Visual Sensitivity			Magnitude of Change (Unmitigated)				Type of Effect (Unmitigated)							Evaluation of Significance (Unmitigated)
					H	M	L	H	M	L	N	T	P	D	I	P	N	Nu	
19	1.9 km west of proposed wharves. 900 m south-west of new proposed rail	Pacific Highway, Sandgate	Viewpoint 19 is located in corridor of open space adjacent the Pacific Highway and is a Special Activities Zone (SP1) which permits development of port facilities. Existing vertical infrastructure elements such as the communication poles and transmission towers and lines span across the view in the foreground. This corridor also contains the rail line connecting Kooragang Island with Sandgate Junction. Although the change will occur at reasonably close proximity, viewing will be indirect (i.e. not in line of sight from vehicle) and at speed and this will lessen the magnitude of change.	Open space / reserve (within an industrial area)															Moderate
20	2.3 km south-west	Administration Road, Mayfield East	Viewpoint 20 is located on a road that links into the proposed Multi Purpose Terminal (former BHP Steelworks site). It is view that would be experienced by industry workers however because of the low topography and existing hedge planting there are limited views of the T4 project area.	Industrial															Slight
21	4.1 km east of new proposed rail	Nelson Bay Road, Fern Bay	Viewpoint 21 is located on the eastern bank of the Hunter River North Arm, adjacent the residential community of Fern Bay. The view is partially obscured by mangroves on the banks either side of the river.	Urban areas between 3-6 km															Moderate
22	3.8 km south-west	Callaghan Campus, Birmingham Gardens	Viewpoint 22 is located in the Newcastle University; Callaghan Campus where other university buildings and dense, established bush land obscures the view of the T4 Project.	Education															Slight / Negligible
23	3.3 km south-west	Vale Street, Shortland	Viewpoint 23 is located at the entrance to the Shortland Waters Golf Course and the surrounding dense canopies and planting obscure views to the T4 Project.	Open space / reserve															Slight
24	6.5 km south-east of wharf areas	Fort Scratchley, Newcastle East	Viewpoint 24 is located atop a headland at the entrance of the Hunter River and is a heritage site with panoramic views of the harbour, Newcastle centre and ocean. The river mouth in the foreground and port terminal infrastructure in the middle and background dominates the view.	Open space / reserve															Moderate / Substantial
25	6.6 km south-east	Nobby's Head, Newcastle East	Viewpoint 25 is located on a headland on the south side of the entrance to Newcastle harbour and to the east of Stockton. Tourists and residents would experience this view however due to the low elevation as well as Stockton in the foreground much of the existing industry and the T4 Project is obscured from view.	Open space / reserve															Slight

Table 1.2 – Unmitigated broad viewpoint assessment

VISUAL SENSITIVITY H = High; M = Medium; L = Low

MAGNITUDE OF CHANGE H = High; M = Medium; L = Low; N = Negligible

LAND USE AREA U1 = Urban areas within 3 km; U2 = Urban areas between 3-6 km; U3 = Urban Areas more than 6 km; C = Town Centre; N = National Park / Ramsar Site; O = Open space / reserve; I = Industrial areas; C = Cormorant Road

TYPE OF EFFECT T = Temporary; P = Permanent. D = Direct; I = Indirect. P = Positive; N = Negative; Nu = Neutral

SIGNIFICANCE N = Negligible; SN = Slight/Negligible; S = Slight; SM = Slight/Moderate; M = Moderate; MS = Moderate/Substantial; SU = Substantial

6.1.2 Critical viewpoint assessment

	Viewpoint 12: Braye Park, Waratah West		
Distance	3.0 km south-west of the proposed south bank wharf area.		
Land Use	Public Open Space		
Description	The viewpoint is located on a pronounced hill 3.0 km south of the T4 project area in open space that has been zoned Environmental Management (E3) due to its scenic values. In adjacent areas there are picnic facilities and playground equipment surrounded by semi-mature eucalypt trees. Wrapping around in the foreground, to the west, are disused sunken concrete structures of Waratah Reservoir. The middle ground of the view is dominated by the Mater Hospital and heavy industry including Commonwealth Steel Company to the north and east while further a field the residences of Waratah West and Mayfield West sit on higher ground. In the distant middle ground, to the east, there are visible exiting industrial buildings and vertical structures located on the south bank of the Hunter River South Arm and the NCIG coal export terminal. In the background the Hunter Wetlands National Park stretches to the distant foothills of the Wallaroo Nature Reserve.		
Sensitivity	This view is representative of those experienced by residents and visitors that have driven there to observe the panoramic view, local residents walking their dogs, exercising and using the picnic and playground facilities and their sensitivity should be considered to be high.		
Magnitude of Change	A medium magnitude of change would be experienced during construction and operation. At this distance, colour and texture variation increasingly groups together and perception of detail is reduced. The extent of the proposed coal stockpiles and vertical transfer equipment is visible in the middle ground and spans across almost 50% of the view although its extent is broken by existing industrial built form in the middle ground. The horizontal scale of the T4 Project is somewhat lessened as it visually nestles within the green belt formed by the Hunter Wetlands National Park. However, the stacker/reclaimers, stackers and ship loaders and coal stockpiles are likely to be perceived to fluctuate in bulk form and placement with regular visits to the viewpoint over time.		
Cumulative effects	There are two approved industrial developments that are likely to be visible from this viewpoint. 1. The Knauf Glass Wool Manufacturing will be sited in the foreground to the left of the view in front of the T4 Project. The area in which this development will be constructed has been designated as an appropriate location for industrial activities, however at this stage little development exists in the area. Consequently, the distance of this development from the viewpoint, as well as its location and scale within the existing natural landscape, would result in a moderate cumulative impact. 2. The Multi Purpose Terminal on the old steelworks site is an approved industrial development that is likely to have vertical infrastructure features that will be partially visible from this viewpoint, to the right of the view behind the elevated topography of Mayfield West. This development is located in an area designated for industrial developments with a number of developments currently operating adjacent the site. Consequently, the location and scale of the Multi Purpose Terminal, within existing built form, would result in a low cumulative impact.		
Mitigation	The likely visual impacts during construction will be significant however this impact is expected to reduce to a non-significant level with the implementation of mitigation measures. Camouflage paint treatments to the yard equipment and ship loaders is expected to reduce the vertical dominance of the proposal from such viewpoints during the day while at night lighting would be restricted to the minimum operational safety requirements.		
Assessment			
	Construction	Operations without mitigation	Operations with mitigation
Sensitivity	High	High	High
Magnitude	Medium	Medium	Low
Type of Effect	Temporary, direct, negative	Permanent, direct, negative	Permanent, direct, neutral
Level of Effect	Moderate / Substantial	Moderate / Substantial	Moderate

Table 1.3 – Critical viewpoint assessment

	Viewpoint 13: Bull Street, Mayfield West		
Distance	950 m south of the proposed south bank wharf area.		
Land Use	Public Open Space within a residential area		
Description	The viewpoint is located at the top of a small steeply sloped public recreation zone in Mayfield West approximately 950 m south of the T4 project area. The panoramic views from this location are indicative of those experienced by the general public using the park and many of the Mayfield West residents, as much of the suburb sits upon the pronounced hill. Immediately surrounding the park are low-density dwellings. Beyond this a band of industrial / commercial buildings and rooftops are observed across the view broken by a scattering of tree canopies and framed by a tight row of tree canopies in the background. Prominent to the right of the view are the blue roofed, steel clad sheds while several vertical structures pierce the horizon including communications poles and towers and a cluster of industrial chimneys. The Hunter Wetlands National Park is a dominant landscape element, which forms an expanse of green in the background stretching to the distant hills of the Wallaroo Nature Reserve, which is broken only by the Tomago industry in the far distance.		
Sensitivity	The view is representative of local residents of Mayfield West and people using the steeply sloped open space area and as both are considered to have long viewing times their sensitivity should be considered high.		
Magnitude of Change	The change would occur at close proximity and the magnitude of change during both construction and operation would be high. The prominence of the T4 Project from this viewpoint is high with both horizontal and vertical elements of the project clearly visible and almost 80% of the view affected. At this distance details, colour, texture and movement are clearly perceived which means that the dynamic elements such as vertical infrastructure and coal stockpiles, as well as static infrastructure is prominent. The dynamic vertical elements will be perceived as moving slowly in an east-west direction across the view throughout the day and night while coal stockpiles, which run in an east-west direction across the view, will fluctuate in scale and configuration. Much of the vertical T4 Project infrastructure is expected to break the horizon, which increases the visual scale of it from this viewpoint. It should be noted that there are a number of existing industrial and communications structures in the foreground and distance, which also prominently break the horizon.		
Cumulative effects	The Multi-purpose terminal on the old steelworks is an approved industrial development that is likely to have vertical infrastructure features that will be partially visible from this viewpoint, to the right of the view in the background. It is noted that the foreground of the view is punctuated with existing industrial developments, which have industrial built form and vertical structures that feature prominently in the view and will consequently have a cumulative visual effect with the T4 Project. The most prominent is the OneSteel blue steel clad sheds to the right of the view from which the T4 Project will visually project from across a large percentage of the view. The cumulative effect in this view will be moderate.		
Mitigation	The likely visual impacts during construction will be significant however this impact is expected to reduce to a non-significant level with the implementation of mitigation measures. Camouflage paint treatments to the yard equipment and ship loaders is expected to reduce the vertical dominance of the proposal from such viewpoints during the day while at night lighting would be restricted to the minimum operational safety requirements.		
Assessment			
	Construction	Operations without mitigation	Operations with mitigation
Sensitivity	<i>High</i>	<i>High</i>	<i>High</i>
Magnitude	<i>High</i>	<i>High</i>	<i>Low</i>
Type of Effect	<i>Temporary, direct, negative</i>	<i>Permanent, direct, negative</i>	<i>Permanent, direct, neutral</i>
Level of Effect	<i>Substantial</i>	<i>Substantial</i>	<i>Moderate</i>

Table 1.4 – Critical viewpoint assessment

	Viewpoint 15 – Tourle Street Bridge, Hunter River South Arm		
Distance	Adjacent to the proposed wharves and conveyor crossing of the river.		
Land Use	Cormorant Road		
Description	The viewpoint is located on the Tourle Street Bridge looking north-east towards the existing industry on Kooragang Island. The bridge spans across the Hunter River South Arm and links Cormorant Road, a major road corridor, with the suburb of Stockton, other suburbs to the north and Newcastle airport. The view is framed to the north by a row of tightly spaced mature trees. Communication and electricity poles as well as light poles stretch across the view into the middle distance. An area of vacant land with a light coverage of shrub vegetation is visible in the immediate foreground at the junction of the bridge and river. The Hunter River South Arm and the associated mangrove vegetation on the northern bank frame the view to the south. In the middle ground behind these the stacker/reclaimers, coal stockpiles and associated shipping of the NCIG Coal Terminal is visible.		
Sensitivity	The view is representative of those experienced by industry employees commuting to Kooragang Island, road users of Cormorant Road, residents travelling to Stockton, tourists travelling to and from the airport by car, recreational and touring cyclists. With the exception of cyclists, all would be viewing the project at a speed and at close proximity and the sensitivity should be considered to be medium.		
Magnitude of Change	The change would occur at close proximity and the magnitude of change during both construction and operation would be high. The existing vertical infrastructure elements such as poles, which currently span across the view will be removed as will the existing area of shrub vegetation and mangroves. Buffer bins will sit prominently to the north of the view with a conveyor system passing from them over Cormorant Road to the vertical ship loaders on both the northern and southern bank of the Hunter River. It should be noted that travel along Cormorant Road is currently dominated by coal terminal infrastructure and the proposed T4 Project infrastructure will be consistent with existing facilities present on much of Kooragang Island.		
Cumulative effects	There is a dominance of heavy industry along each side of Cormorant Road on Kooragang Island with many elevated industrial structures, such as conveyors as well a number of utility service poles and transmission lines crossing over the road. The area has been designated, as an appropriate location for industrial activities and consequently has a good landscape capacity to accommodate such changes. Due to the close proximity of these developments to the viewer they are most only experienced one at a time so that although the T4 Project does feature prominently in this view, it does not have a cumulative effect with the other projects. The cumulative effect in this view is low.		
Mitigation	The likely visual impacts during construction will be significant however this impact is expected to reduce significantly with the implementation of mitigation measures. The establishment of foreground vegetation as a screen along Cormorant Road on the southern boundary of The T4 Project will reduce visual impacts at close range while camouflage paint treatments to the conveyors and ship loaders would reduce the dominance of these elements during the day while night lighting would be restricted to the minimum operational safety requirements.		
Assessment			
	Construction	Operations without mitigation	Operations with mitigation
Sensitivity	<i>Medium</i>	<i>Medium</i>	<i>Medium</i>
Magnitude	<i>High</i>	<i>High</i>	<i>Medium</i>
Type of Effect	<i>Temporary, direct, negative</i>	<i>Permanent, direct, negative</i>	<i>Permanent, direct, neutral</i>
Level of Effect	<i>Moderate / Substantial</i>	<i>Moderate / Substantial</i>	<i>Moderate</i>

Table 1.5 – Critical viewpoint assessment

	Viewpoint 19 – Pacific Highway, Sandgate		
Distance	1.9 km west of the proposed wharves and 900 m south-west of the proposed new rail tracks.		
Land Use	Open space / reserve		
Description	The viewpoint is located on the side of the Pacific Highway1.9 km west of the T4 project area adjacent a relatively flat, low-lying infrastructure corridor with rail infrastructure, communication and electricity poles, transmission towers and lines and a small built structure dominating the foreground view. The corridor is predominantly zoned Special Activities (SP1) which permits development of port facilities and infrastructure supporting Kooragang Island. To the south, the view is enclosed with a grouping of mature trees fronting the Pacific Highway. In the middle ground are prominent irregular stockpiles of soil some with grass coverage. At the centre of the middle ground is a series of light industrial buildings. In the background of the view it is possible to see a multitude of high vertical man-made structures.		
Sensitivity	The view would be representative of those experienced by road users including tourists travelling into Newcastle from the Pacific Highway in the north and the New England Highway all would be viewing at a speed, and the sensitivity should be considered to be medium.		
Magnitude of Change	The change would occur in the middle ground of the view and the magnitude of change during both construction and operation would be high. The existing vertical infrastructure elements such as the communication poles and transmission towers and lines, which span across the view, will help to reduce the impact of the T4 Project however the buffer bins and elevated conveyors will be visible in the middle ground. Behind this the coal stockpiles and stacker/reclaimers are also prominent.		
Cumulative effects	The Knauf Glass Wool Manufacturing development is an approved industrial development that is expected to be highly visible from this viewpoint, to the right of the view in the foreground. It will be one development in a large area designated as an appropriate location for port related facilities. The indicated scale of the Knauf development is expected to obscure a majority of the T4 Project. While in the future it is possible that the total view of T4 Project industrial built form will be screened and consequently the cumulative effects would be low to negligible.		
Mitigation	The likely visual impacts during construction will be significant however this impact is expected to reduce to a non-significant level with the implementation of mitigation measures. Remediation in the form of camouflage paint treatments to yard equipment and shiploaders would reduce the vertical dominance of the proposal from such viewpoints during the day while night lighting would be restricted to the minimum operational safety requirements.		
Assessment			
	Construction	Operations without mitigation	Operations with mitigation
Sensitivity	Medium	Medium	Medium
Magnitude	High	Medium	Medium
Type of Effect	Temporary, direct, negative	Permanent, direct, negative	Permanent, direct, neutral
Level of Effect	Moderate / Substantial	Moderate	Moderate

Table 1.6 – Critical viewpoint assessment

	Viewpoint 24 – Fort Scratchley, Newcastle		
Distance	6.5 km south-east of the wharf areas.		
Land Use	Public open space within a heritage area		
Description	The viewpoint is located on top of the south-east headland at the entrance of the Hunter River. It is located 6.5 km from the T4 project area in a zone designated as public recreation. It is a popular vantage point in the region with panoramic views of the Hunter River and Stockton in the foreground. Facilities located here can be rented including a multipurpose centre and barracks rooms which are hired for weddings while a café that is open six days a week is a popular meeting spot for locals and tourists. In the middle ground, stretching almost entirely horizontally across the view is the infrastructure associated with the port working harbour, which is Australia’s largest working coal export port. In the far background the Sugar Loaf Ranges are observed as a large landscape element.		
Sensitivity	The view would be representative of views experienced by tourists and visitors to this historic site as well as guests utilising the facilities and the sensitivity should be considered to be high.		
Magnitude of Change	Due to the distance of the T4 project area from this viewpoint it is expected that the detail of the proposed development will be more difficult to discern from the complex and varied built environment that sits in the foreground and middle ground. At this distance little movement of the dynamic vertical elements is expected to be perceivable, while fluctuations in scale and configuration of the coal stockpiles is unlikely to be obvious during a single visit to the vantage point. However the majority infrastructure of the T4 Project is expected to break the horizon and this regard will increase the scale and size of industry in the middle ground.		
Cumulative effects	The Multi-purpose terminal on the old steelworks is an approved industrial development that is expected to be visible from this viewpoint, to the left of the view in the middle ground. It should be noted that, from this view point, there exists a number of other industrial developments, in the foreground, that have built form and vertical structures which feature prominently in the view and consequently the proposed development is likely to have a cumulative effect with the T4 Project that is moderate.		
Mitigation options	The likely visual impacts during construction will be significant however this impact is expected to reduce to a non-significant level with the implementation of mitigation measures. Camouflage paint treatments to the yard equipment and ship loaders is expected to reduce the vertical dominance of the proposal from such viewpoints during the day while at night lighting would be restricted to the minimum operational safety requirements. It is noted that there is limited night-time access to the Fort Scratchley complex, thereby limiting lighting impacts from this site.		
Assessment			
	Construction	Operations without mitigation	Operations with mitigation
Sensitivity	<i>Medium</i>	<i>Medium</i>	<i>Medium</i>
Magnitude	<i>High</i>	<i>High</i>	<i>Medium</i>
Type of Effect	<i>Temporary, direct, negative</i>	<i>Permanent, direct, negative</i>	<i>Permanent, direct, neutral.</i>
Level of Effect	<i>Moderate / Substantial</i>	<i>Moderate / Substantial</i>	<i>Moderate</i>

Table 1.7 – Critical viewpoint assessment

7. Mitigations measures

7.1 Remediation

Mitigation measures will be implemented to minimise visual effects of the T4 Project. These mitigation measures are consistent with the Guidelines for mitigation section (5.17) in the GLVIA which state that:

- “Consultation with local community and special interest groups on the proposed mitigation measures is important and can also be helpful in identifying local needs and preferences.
- Landscape mitigation measures should be designed to suit the existing landscape character and needs of the locality, respecting and building on local landscape distinctiveness and helping to address and relevant issues in the landscape.
- It must be recognised that many mitigation measures, especially planting, are not immediately effective. Advance planting can help to reduce the time between the development commencing and the planting becoming established. Where planting is intended to provide visual screen for the development, it may also be appropriate to assess residual effects for different periods of time, such as day of opening, year five and year fifteen”.

Two common remediation based mitigation options would be undertaken to ameliorate visual effects of the T4 Project. The GLVIA states these as planting and camouflage/integration.

7.1.1 Planting

In relation to planting, the GLVIA states that:

- “structural planting can help to integrate a development with the surrounding landscape, and can soften the edges of intrusive buildings and structures. Where possible, the planting should be appropriate to the landscape reflecting local species of national provenance. Advance planting and, where appropriate, off-site planting, offer particular potential for effective mitigation”.

Plantings undertaken in areas close to the T4 Project area will be most effective in helping to screen the buffer bins, conveyors and other associated infrastructure which cross over Cormorant Road.

Further detailed research, investigation and design is required in order to develop a comprehensive and successful planting strategy for the T4 Project. This will be undertaken and incorporated within a Landscape and Visual Management Plan (LVMP) to be prepared prior to construction works associated with the T4 Project. As stated above, this LVMP will be prepared in consultation with the local community and special interest groups to ensure local needs and interests are taken into consideration.

7.1.2 Camouflage/Integration

In relation to camouflage/integration, the GLVIA states that:

- “visual effects may be reduced by changing the perceived appearance of the development or structure to one that may be more visually acceptable to the local community, or one that fits more readily into the landscape”.

Camouflage paint colours applied to the large yard equipment such as stacker/reclaimers, reclaimers, stackers and shiploaders would be effective in reducing the magnitude of change observed from elevated viewpoints surrounding the T4 Project area so that they are integrated with the background. Camouflage paint treatments applied to the buffer bins and the elevated conveyors, which cross over Cormorant Road, would lessen the visual impact of these structures at close range.

Further detailed research, investigation and design is required in order to develop a comprehensive and successful camouflage/integration strategy for the T4 Project. Again, this will be undertaken and incorporated within a LVMP to be prepared prior to construction works associated with the T4 Project.

7.1.3 Lighting

Since engineering for the T4 Project is not yet at the detailed design phase specific details on proposed lighting were not available at the time of reporting. However, lighting mitigation measures would be developed in the design development phases to minimise adverse effects of light spill and glow to surrounding areas. These measures would be incorporated within the LVMP. It will be important to consult lighting manufacturers to understand the full range of light minimising options, however some general treatments that should be investigated are:

- Avoidance of upward lighting;
- Use of directional light fittings and screening of lighting to limit light spill; and
- Use of lighting systems that will minimise the area that that is lit for a minimum period of time.

8. Conclusions

The T4 Project area is largely located on Kooragang Island which is used for industrial and port related uses, including two other existing coal terminals (KCT and NCIG). The T4 project area is predominantly located on land previously used as a waste emplacement facility. The T4 project area is fully zoned for port related developments, which is consistent with the industrial and port uses that largely make up the local context.

On a broad scale context, the T4 Project is located in an area that has both high and low quality scenic attributes. The high quality scenic views are generally regional, consisting of long range sweeping vistas of the natural environment features including the lower Hunter Estuary and the coastline. Kooragang Island and the southern bank of the Hunter River South Arm contain heavily modified and developed features consistent with surrounding uses industrial and port related uses and are considered to have low scenic attributes.

A broad viewpoint assessment of the T4 Project was conducted from 25 viewpoints identified through a desktop analysis of the ZVI. The broad viewpoint assessment was initially undertaken without consideration of mitigation measures (such as landscape planting for screening and provision of camouflage/ disguise treatments) to identify critical viewpoints, which required more detailed investigation. This broad viewpoint assessment indicated that out of the 25 viewpoints, five required further investigation. These viewpoints are located at Waratah West, Mayfield West, Tourle Street Bridge, Sandgate and Newcastle.

Detailed assessments from five locations included the preparation of digitally generated viewpoint photomontages, intended to illustrate an additional range of visual effects that would be associated with the development of the T4 Project. Existing industrial and port related developments on Kooragang Island (including KCT and NCIG) have already established similar elements within the local landscape.

Notable results from the detailed assessment indicated that all of the works associated with the T4 Project will occur in a location where similar industrial developments are currently operating and that the new vertical elements such as the stacker/reclaimers, stackers, reclaimers and ship loaders, of the T4 Project, will punctuate the skyline and are likely to have some landscape and visual effects on the five viewpoints. With appropriate mitigation measures, however, including landscape planting for screening and camouflage/ disguise treatments, the T4 Project could be integrated with the existing industrial forms and landscape so that visual impacts are significantly reduced.

A LVMP will be prepared prior to construction works associated with the T4 Project, which will provide more detail on the type and extent of mitigation measures designed to mitigate impacts on the landscape. The LVMP will be prepared in consultation with the local community and special interest groups to ensure local needs and interests are taken into consideration.

9. Glossary

Cumulative effects	Additional changes to landscape and visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it) or actions that have occurred in the past, present or are likely to occur in the foreseeable future.
Direct effects	A direct effect may be defined as an effect that is directly attributable to a defined element of characteristic of the proposed development, for example, the loss or removal of an element or feature such as a hedgerow or prominent group of trees.
Indirect effects	Not a direct result of the development, but are often produced away from it or as a related consequence of the development. Also used to describe visual effects landscape character and the effects on the setting of features of cultural heritage.
GLVIA	<i>Guidelines for Landscape and Visual Impact Assessment, Second Edition</i> , published jointly by the Landscape Institute and Institute of Environmental Management and Assessment, 2002.
LCA	Landscape character area is usually defined by a landscape character of a particular area
LVIA	Landscape and Visual Impact Assessment.
Landscape capacity	The degree to which a particular landscape character type or area is able to accommodate Moderate change without unacceptable adverse effects on its character. Capacity is likely to vary according the type and nature of change being proposed.
Landscape character	A distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement. It creates the particular sense of place of different areas of the landscape.
Landscape effects	Change in the elements, characteristics, character, and qualities of the landscape as a result of development.
Landscape elements	A component part of the landscape, such as trees, woodland and ponds.
Landscape quality	The state of repair or condition of the elements of a particular landscape, it's integrity and intactness and the extent to which its distinctive character is apparent.
Landscape value	The relative value or importance attached to a landscape or view (often as a basis for area protection), which expresses national or local consensus, because of its quality, including perceptual aspects such as scenic beauty, cultural associations or other conservation issues.
Magnitude	A combination of the scale extent and duration of an effect also defined as 'degree of change'.
Mitigation	Measures including any process, activity, or design to avoid, reduce, remedy or compensate for adverse environmental impact or effects of a development.
Photomontage	An illustration of a computer generated perspective of the proposed development that has been superimposed or combined onto a photograph from a recorded location.
Positive or negligible types of landscape effect	The landscape and visual effects may be positive, neutral or negligible. <i>In landscape terms</i> - a positive effect would require development to add to the landscape quality and character of an area. Neutral landscape effects would include low or negligible changes that may be considered as part of the 'normal' landscape processes such as maintenance or harvesting activities. A negligible effect may include the loss of landscape elements such as mature trees and hedgerows as part of construction leading to a reduction in the landscape quality and character of an area.

Positive or negligible types of visual effect	<i>In visual terms</i> – positive or negligible effects are less easy to define or quantify and require a substantial consideration of a number of factors affecting the view, which may be positive, neutral or negligible. Opinions as to the visual effects of development vary widely, however it is not the assumption of this assessment that all change, including high levels of change is a negligible experience. Rather this assessment has considered factors such as the visual composition of the landscape in the view together with the landform design and composition, which may or may not be reasonably, accommodated within the scale and character of the landscape as perceived from the receptor location.
Receptor / viewer	Physical landscape resource, special interest or viewer group that will experience an effect.
Residual effects	Potential environmental effects, remaining after mitigation.
Significant effects	The significance of an effect is determined by the combination of sensitivity and magnitude of change, a process, which is assisted by the use of a matrix, which may be used to guide the assessment.
Temporary or permanent effects	Effects may be considered as temporary or permanent.
The proposal	The Terminal 4 (T4) Project / The T4 Project / The T4 project area
Visual amenity	Value of a particular place in terms of what is seen by visual receptors, taking account of all available views and the total visual experience.
Visual effect	A Substantial set of landscape effects and concerned wholly with changes in the character of available views and the changes in the visual amenity of visual receptors resulting from development.
Visual Sensitivity	The sensitivity of visual receptors such as residents, to visual change proposed by development.
ZVI	Zone of visual impact — usually defined by topography.

10. Bibliography

1. The Landscape Institute and the Institute of Environmental Management and Assessment, 2002, *Guidelines for Landscape and Visual Impact Assessment* – Second Edition, Spon Press, USA and Canada.
2. Australian Bureau of Statistics, 2006, Themes: State Suburb, viewed 01 September 2011, <http://www.censusdata.abs.gov.au/ABSNavigation/prenav/LocationSearch?collection=Census&period=2006&areacode=SSC19073&producttype=QuickStats&breadcrumb=PL&action=401>

11. Figures



Aerial Imagery : 2011 Sinclair Knight Merz Pty Ltd.

PROPOSED TERMINAL 4 PROJECT

SCALE

0 0.5 1 2Km

LEGEND

— KEY ROADS

--- RAIL

— HUNTER ESTUARY WETLANDS RAMSAR SITE

..... NATIONAL PARK BOUNDARY (APPROX.)

Regional context



A. Stockton Beach



B. Sugarloaf Ranges



C. View from the Obelisk towards industry in Mayfield North adjacent the Hunter River



D. View across Mayfield to industry of Mayfield North and Kooragang Island

Newcastle Civic Centre



E. View of Newcastle Civic centre from Stockton with the Stockton ferry in the foreground



F. Entrance to the Hunter Street Mall



G. Newcastle Beach with Newcastle Civic Centre and Hunter River in background

Industrial Areas



H. Industry in Mayfield North



I. View of coal ship moving up the Hunter River South Arm



J. Carrington Coal Terminal ship loading on the Hunter River



K. Carrington Coal Terminal

Kooragang Island



L. Walsh Point industry as seen from Stockton



M. NCIG coal terminal with wind turbine in foreground



N. Existing vegetation along Cormorant Road and on the banks of the Hunter River South Arm



O. Carrington Coal Terminal from Industrial Drive

Cormorant Road



P. View north towards Kooragang from Stockton Bridge



Q. View of vehicles travelling on Cormorant Road past NCIG coal terminal



R. Industry infrastructure bridging across Cormorant Road



S. View west over Kooragang Island from Stockton Bridge

Urban Residential



T. View across the Newcastle Harbour to Stockton



U. Typical housing in Mayfield North



V. Typical housing in Fern Bay



W. View of typical housing on The Hill

National Parks / reserves



X. View north across Hunter Wetlands National Park



Y. View across Hexham Swamp

Night time view



Z. Typical view of ports at night (location / source unknown)



Viewpoint 1 - Stockton Bridge, Hunter River North Arm



Viewpoint 3: Stockton Aged Centre, Stockton



Viewpoint 5: Monmouth Street, Stockton



Viewpoint 6: Wharf Road, Newcastle Civic Centre



Viewpoint 7: The Obelisk, Wolfe Street, The Hill



Viewpoint 12: Braye Park, Waratah West



Viewpoint 13: Bull Street, Mayfield West



Viewpoint 14: Callan Avenue, Maryland



Viewpoint 15: Tourle Street Bridge, Hunter River South Arm



Viewpoint 16: Cormorant Road, Kooragang Island



Viewpoint 17: South Arm Road, Kooragang Island



Viewpoint 19: Pacific Highway, Sandgate



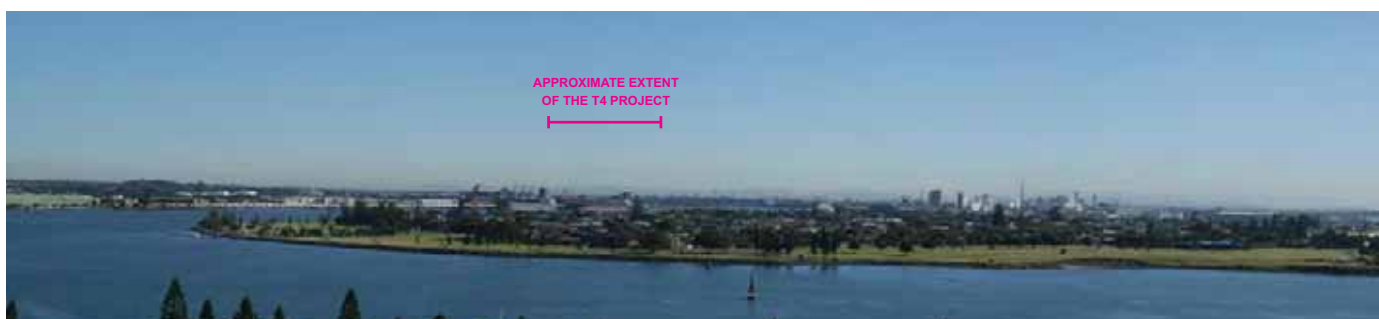
Viewpoint 20: Administration Drive, Mayfield East



Viewpoint 21: Nelson Bay Road, Fern Bay



Viewpoint 24: Fort Scratchley, Newcastle East



Viewpoint 25: Nobby's Head, Newcastle East



PROPOSED TERMINAL 4 PROJECT

SCALE

0 0.5 1 2Km

LEGEND

- KEY ROADS
- RAIL
- HUNTER ESTUARY WETLANDS RAMSAR SITE
- NATIONAL PARK BOUNDARY (APPROX.)
- T4 PROJECT AREA BOUNDARY



PROPOSED TERMINAL 4 PROJECT

SCALE

0 0.5 1 2Km

LEGEND

KEY ROADS

RAIL

HUNTER ESTUARY WETLANDS RAMSAR SITE

NATIONAL PARK BOUNDARY (APPROX.)

T4 PROJECT AREA BOUNDARY

T4 PROJECT INFRASTRUCTURE COMPONENTS

