

Appendix Q – Landscape Character and Visual Impact Assessment

The background of the cover is a photograph of a beach. In the foreground, there is a wide expanse of golden sand. In the middle ground, waves with white foam are breaking onto the shore. In the background, a dark, forested cliff is visible on the left side. The sky is a clear, pale blue. A large, bright green diagonal shape covers the left half of the image, starting from the top left and extending towards the center.

GHDWOODHEAD

Hunter Water Corporation

**Belmont Drought Response Desalination Plant
Landscape Character & Visual Impact Analysis**

Architecture
Interior Design
Planning
Urban Design
Landscape Architecture

October 2019

Executive summary

Introduction

This Landscape character and Visual Impact Assessment has been prepared to support the Environmental Impact Statement and addresses the requirements of the Secretary's Environmental Assessment Requirements for the proposed Belmont drought response desalination plant (also referred to as the temporary desalination plant). This assessment addresses both the potential landscape character impacts and visual amenity impacts associated with the project.

The project

The project comprises a temporary desalination plant and associated infrastructure. The key components of the temporary desalination plant comprise a seawater intake, desalination plant, brine disposal, tank farm, hardstand, fencing and signage. The key visual elements of the project are the four holding tanks, each with an approximate height of 5 m. The majority of vegetation surrounding the project to the west contains dense Coastal Sand Swamp Forest with a height above 5 m. The project is therefore entirely screened from possible receptors within the low lying developed areas to the west.

Contextual analysis

The project is located within the Lake Macquarie local government area, approximately 1.6 km from the centre of Belmont. Belmont (particularly Belmont South) is characterised by a narrow, flat, low lying strip of land between Lake Macquarie and the ocean. The project is located on the southern portion of the existing Hunter Water Belmont WWTW site, on Ocean Park Road. The WWTW consists of a number of low lying wastewater treatment infrastructure.

The vast majority of the surrounding area is associated with open space land uses. Apart from the Belmont Golf Course, adjoining open space land uses comprise a mix of informal outdoor activities. Nine Mile Beach is commonly used for four wheel driving, and other public recreation such as camping adjacent to the Belmont Wetlands State Park. Belmont Lagoon and associated coastal wetlands and the Belmont Wetlands State Park comprise utilities, access roads, environmental restoration and conservation and public recreation activities including bush walking, bird watching, horse riding and four wheel driving.

Landscape character and visual impact assessment

In general, it is not anticipated that the project would detract from the vast, exposed, beachscape character and being set back from the beach towards the forested vegetation means that it would be relatively camouflaged. Unless a receiver would be directly adjacent to the project, it is not expected to be visible above the dunes. Further, in close proximity to the project on Nine Mile Beach where the project is visible, the existing character has been previously modified by the built structures of the existing WWTW. As such, the project is not anticipated to result in a notable alteration to the landscape character or visual amenity. The number of receptors in close proximity to the project is also low, limited to recreational activities. This in turn reduces the sensitivity of the visual amenity.

In the remaining areas further away from the proposed desalination plant, it is considered unlikely that the project would be visible to receivers and in the long term, no impact on visual amenity is anticipated.

A minor upgrade to the power connection would be required to deliver power requirements to the project. This would comprise the addition of a conduit under the road at the intersection of Hudson Street and Marriot Street, Belmont South.

Overall, the impacts on the landscape character and visual amenity of the project have been assessed as moderate-low to negligible.

Mitigation measures

Existing large trees and vegetation would be maintained and protected wherever possible.

A muted colour palette to plant and equipment at the temporary desalination site should be used, in order to reduce contrast with the surrounding vegetation.

During construction of the project, the works area would be kept tidy and any lighting during night time would be used over a short duration and directed to avoid spill into any adjoining properties.

Following completion of the minor upgrade to the power connection at the intersection of Hudson Street and Marriot Street, Belmont South, the existing footpaths and road surfaces would be reinstated to original condition prior to the works.

During operation, lighting would be provided in accordance with *AS 4282 – Control of the obtrusive effects of outdoor lighting*. Design of outdoor lighting would be required to control any obtrusive effects to an acceptable degree. Notwithstanding that the project is entirely screened from possible receptors within the low lying developed areas to the west and areas that are elevated sufficiently to potentially view the project above the vegetation screen, are limited and at a distance of over 1 km from the proposed temporary desalination plant.

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1 Introduction

1.1 Overview

The Lower Hunter has sufficient water to meet its needs in average climate conditions in the medium term. However, the region's reliance on rain-fed dams and groundwater supplies makes it vulnerable to severe drought.

The Lower Hunter Water Plan (LHWP) was developed in 2014 with the aim to ensure that the Lower Hunter is able to withstand a severe drought as well as meeting community needs in the medium term. Within the plan, desalination is proposed in conjunction with other staged drought response measures in the event of an extreme drought. A drought response desalination plant would help make the water supply system more resilient to climate variability, with the primary benefit being that it would provide a drought contingency measure that is not dependant on rainfall.

Following a number of options assessments, a drought response desalination plant (also referred to as the temporary desalination plant) to be located within the existing wastewater treatment works site at Belmont was selected as the preferred option. Hunter Water submitted a State Significant Infrastructure (SSI) application for the Project to the Department of Planning and Environment in November 2017 and received the Secretary's Environmental Assessment Requirements (SEARs) in December 2017 (SSI 8896). These SEARs outline the requirements for the preparation of an Environmental Impact Statement (EIS) to assess the future construction and operation of the Project, with particular requirements for the assessment landscape character and visual impact.

1.2 Purpose and scope of this report

This Landscape Character and Visual Impact Assessment (LCVIA) has been prepared to support the Environmental Impact Statement (EIS) and addresses the requirements of the SEARs for the proposed drought response desalination plant (the project).

The LCVIA addresses both the potential landscape character impacts associated with the project (impact on the area's built, natural and cultural character or sense of place) and the visual impacts associated with the project (impact on views in and around the area), including:

- A description of the project and its visual components
- Contextual analysis, describing the general setting of the area including land use, existing features, landform, vegetation, and possible future development in the area
- Landscape character sensitivity to the project
- Visual receptor sensitivity within the surrounding area through the use of viewpoints
- Assessment of the significance of impacts on landscape character and visual amenity at the viewpoints as a direct result of the project
- Identification of residual and cumulative impacts including a consideration of night light effects
- Proposed mitigation strategies to ameliorate adverse visual impacts

This report provides a brief overview of the proposed desalination plant and associated infrastructure to provide context for the visual assessment. A more detailed description of the project is provided in the EIS report.

1.3 Secretary's Environmental Assessment Requirements

Hunter Water submitted an SSI application for the project with the Department of Planning and Environment (DPE) in November 2017 and received SEARs in December 2017. A revised SEARs was issued following comment and discussed between Hunter Water and DPE on 24 January, 2018. The SEARs relevant to the marine environment issues are reproduced in Table 1-1 below.

Table 1-1 SEARs (SSI 8896) – Visual impact

Key issues	Requirements	Where addressed
Visual	An impact assessment at representative private receptors and public vantage points	Sections 4.2 and 5.2

1.4 Disclaimer

This report has been prepared by GHD for Hunter Water Corporation and may only be used and relied on by Hunter Water Corporation for the purpose agreed between GHD and Hunter Water Corporation as set out in Section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Hunter Water Corporation 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. GHD disclaims liability arising from any of the assumptions being incorrect.

The landscape character and visual impacts of the project have been assessed with methodologies developed in accordance with best practice and adapted, from the approach developed by NSW Roads and Maritime Services as set out in the *Environmental Impact Assessment Practice Note – Guideline for landscape character and visual impact assessment (RMS 2018)* and *Guidance Note for Landscape and Visual Assessment (Australian Institute of Landscape Architects 2018)*.

Such methodologies are not provided in any formal regulatory guideline.

The LCVIA process aims to be objective and describe any changes factually. Potential changes as a result of the project have been defined, however, the significance of these changes requires qualitative (subjective) judgements to be made. The conclusions to this assessment therefore combine objective measurement and subjective professional interpretation. This assessment has attempted to be objective, however it is recognised that visual assessment can be highly subjective and individuals are likely to associate different visual experiences to the study area.

This LCVIA is based on the concept design for the project and the level of information available at the time of preparation. The concept design purpose is to provide a basis for environmental assessment and future design and construct stages. Where possible, the design tends to be conservative and anticipates optimisation during the design and construct stage. Therefore, environmental impacts from this concept design are intended to be conservative. Notwithstanding this, Hunter Water would be required to undertake a consistency review to ensure that any approvals and associated conditions are still relevant and to confirm whether approval modifications are required.

2 The Project

2.1 Project location

The drought response desalination plant is proposed to be located on the southern portion of the current wastewater treatment works (WWTW) site, off Ocean Park Road, to the east of the Pacific Highway. The proposed plant is located to the east of the Belmont Lagoon and to the west of the coastal dunes along Nine Mile Beach, as shown in Figure 2-1.

2.2 Project description

2.2.1 Objectives

The key objectives of the Project are to:

- Provide a rainfall independent water source in the event of an extreme drought
- Slow the depletion of existing water storages in the event of an extreme drought

The Project would address these objectives while considering the environmental, social and economic impacts, with the options assessment process considering these factors.

2.2.2 Key features

The Project is for the construction and operation of a drought response desalination plant, designed to produce up to 15 ML/day of potable water, with key components including:

- **Seawater intakes** – The central intake structures would be a concrete structure (referred to as a caisson) of approximately nine to 11 metres diameter, installed to a depth up to 20 m below existing surface levels. The intake structures will be finished above the existing surface (0.5 m to 1 m) to prevent being covered by dune sands over time. The raw feed water (seawater) input is proposed to be extracted from a sub-surface saline aquifer. This would be extracted by intake pipes located approximately eight to 15 m below ground level radiating out from the central structure. Pipelines and pumps are required to transfer the seawater to the desalination plant.
- **Water treatment process plant** – The water treatment process plant would comprise a range of equipment potentially in containerised form. Services to and from the process equipment (e.g. power, communications, and raw feed water (seawater)) would comprise a mix of buried and overhead methods. The general components of the water treatment process would comprise:
 - Pre-treatment: a pre-treatment system is required to remove micro-organisms, sediment, and organic material from the seawater.
 - Desalination: a reverse osmosis (RO) desalination system made up of pressurising pumps and membranes. These would be comprised of modular components. In addition, a number of tanks and internal pipework would be required.
 - Post treatment: desalinated water would be treated to drinking water standards and stored prior to pumping to the potable water supply network.
- **Brine disposal system** – The desalination process would produce around 28 ML/day of wastewater, comprising predominantly brine, as well as a small amount of pre-treatment and RO membrane cleaning waste. The waste brine from the desalination process would be transferred via a pipeline to the existing nearby Belmont WWTW for disposal via the existing ocean outfall pipe.
- **Power supply** – Power requirements of the plant would be met by a minor upgrade to the existing power supply network in the vicinity of Hudson and Marriot Streets. A power line extension from the existing line along Ocean Park Road into a new substation within the proposed drought response desalination plant would also be required.
- **Ancillary facilities** – including a tank farm, chemical storage and dosing, hardstand areas, stormwater and cross drainage, access roads, and fencing, signage and lighting.

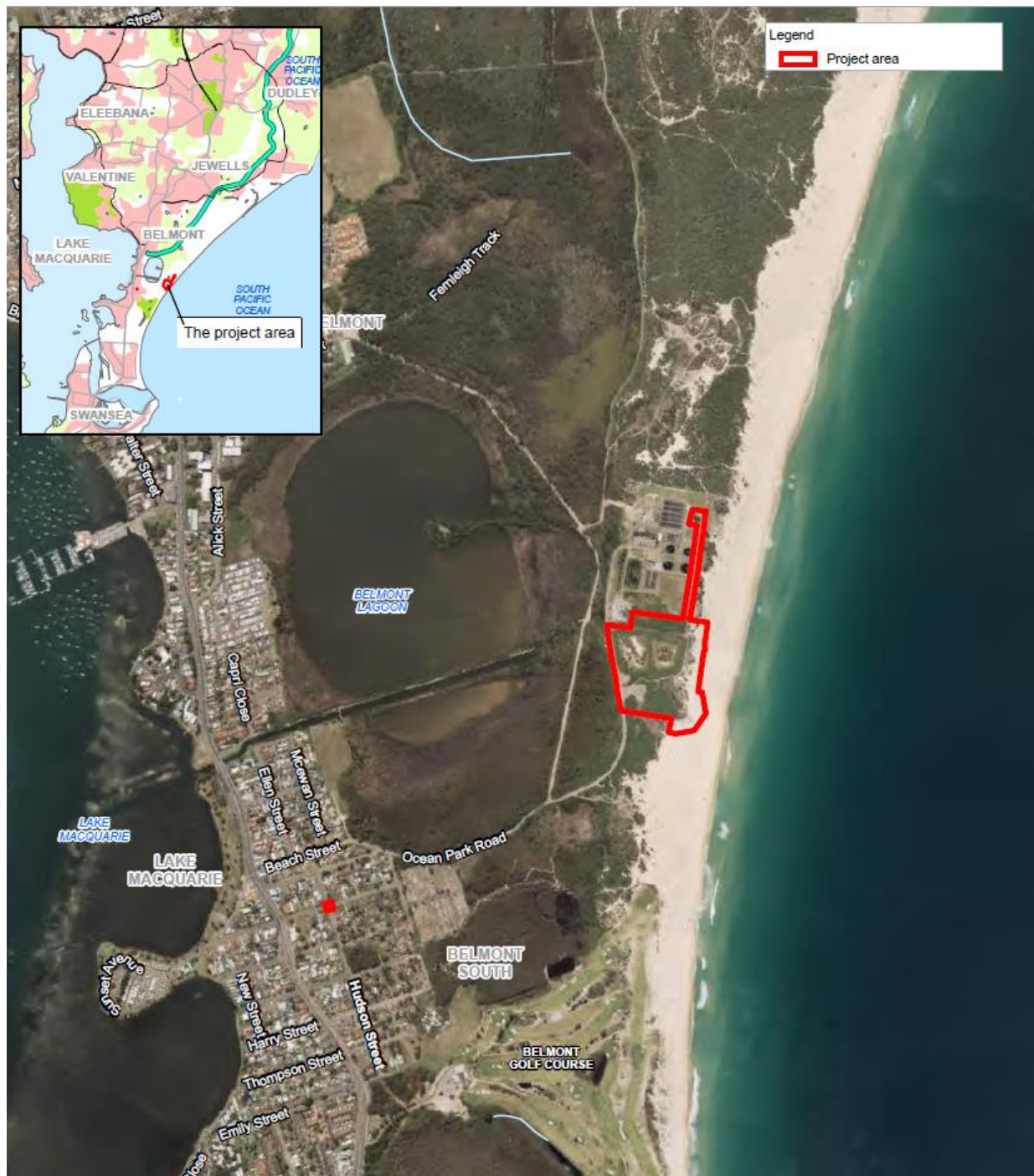


Figure 2-1 Locality

Key features of the Project are shown on Figure 2-2, while a description of each of the key components of the Project is provided in Section 4 of the EIS. Figure 2-3 provides a 3D representation of the Project.

The potable water pipelines connecting the Project to the potable water network do not form part of the Project and would be constructed separately. The construction and operation of the potable water pipeline would be part of a separate design and approvals process.



Figure 2-2 Proposed Belmont drought response desalination plant layout

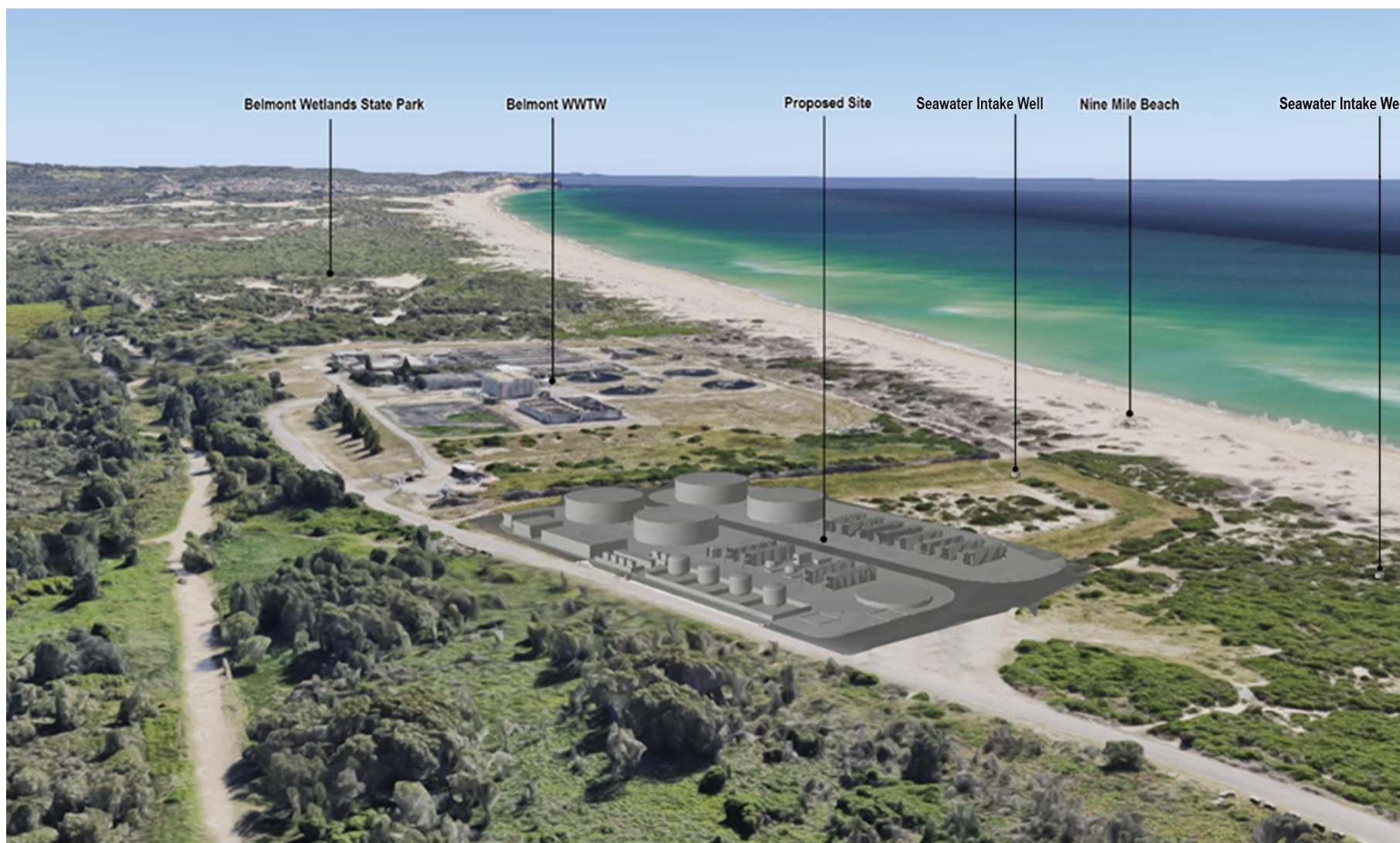


Figure 2-3 3D Representation of the conceptual design of the Project

2.3 Related Projects - Belmont WWTW Dune Restoration Project

Hunter Water is proposing a dune restoration project within the Belmont WWTW site. While the dune restoration project does not form part of the proposed temporary desalination plant works, it would have bearing on the overall residual visual impacts of the project given its proximity to the dune system. The dune system at Belmont WWTW currently acts as a buffer for the plant from the ocean, however it is presently in poor condition, containing large hummocks caused by 4WD vehicle tracks, vast areas dominated by bitou bush, and scarce patches of native vegetation.

The proposed works include:

- Approximately 1,000 m of perimeter fencing to prevent vehicle access to the dune restoration area.
- Approximately 100 m of temporary barrier fencing along the southern boundary of the dune restoration area to prevent public access during the restoration process.
- Two corflute signs at the nominated locations to explain the need for the dune restoration works.
- Fill in blowouts between eroded foredunes using unvegetated sand which has migrated inland beyond the hind dune zone to restore the natural and continuous profile of the foredune area.
- Installation of 10 m long dune building fences at nominal 50 m intervals to capture sand blown by prevailing winds.
- Installation of spinifex seed behind the dune fence to assist with stabilisation.
- Maintenance period of 12 months to ensure the dune restoration project achieves its objective.

3 Contextual analysis

3.1 Methodology

The methodology for the identification of the existing environmental values of the area surrounding the site and the identification of the viewpoints included:

- The use of Geographical Information Systems (GIS) datasets and aerial photography to generate a visual catchment map. This identifies the area within which the proposed temporary desalination plant can potentially be seen.
- The use of aerial photography to identify potentially affected receptors and viewpoints which are accessible to the public or are a place of residence.
- Site verification of publicly accessible and representative viewpoints with photographic recording to provide a representation of typical views possible from that locality to the project. These viewing situations reflect particular landscape and visual features of importance within the visual environment and local landscape character. Generally, they represent views from key visual receptors (residents and recreation users) where a potentially significant change in view may occur.
- Review of existing information and collation of relevant background information including planning, land use and regional landscape characteristics.

3.2 Regional and Local Strategic Context

The Project is located within the Lake Macquarie local government area, approximately 1.6 km from the centre of Belmont. Belmont is within the Greater Newcastle Metropolitan Area, as identified within the *Hunter Regional Plan 2036* and the *Greater Newcastle Metropolitan Plan 2036*.

The focus for the Greater Newcastle Metropolitan Area, is to grow an internationally competitive economy, with innovative businesses, an extensive open space network, efficient transport, and to ensure homes and jobs are delivered in the right locations.

Belmont currently provides a range of services, community facilities, retail, and employment to a spatial catchment comprising a number of suburbs. It is identified to become a higher density, compact mixed-use centre, likely to continue to attract new residents.

The setting, amenity and lifestyle provided by close proximity to the lake, the coast, and bushland are a defining feature of the area and a key factor in attracting new residents, visitors and investment.

Belmont (particularly Belmont South) is characterised by a narrow, flat, low lying strip of land between Lake Macquarie and the ocean. While increased urbanisation it is anticipated in Belmont, the *Lake Mac 2050 Strategy* suggests that the priority is to densify the town centre and orient it towards the lake.

The strategy further suggests that the southern suburbs, towards Swansea, are likely to be significantly affected by the impacts of climate change, particularly sea level rise and thus identified as an adaptation planning area (Figure 3-1). It is unlikely therefore that those suburbs closest to the Project area would be the focus of urban intensification.



Figure 3-1 Priority Growth and Change Areas (Lake Mac 2050 Strategy)

3.3 Land use zones

The temporary desalination site is located on land zoned SP2, Special Infrastructure. The vast majority of the surrounding area is associated with open space land uses (Figure 3-2), including:

- Nine Mile Beach (east, north and south) zoned E2 Environmental Conservation
- Belmont Golf Course (south) zoned RE2 Private Recreation
- Belmont Lagoon and coastal wetlands (west) zoned E2 Environmental Conservation
- Belmont Wetlands State Park (north) zoned E3 Environmental Management

These land use zones provide a significant open space buffer between the project site and urban development areas further to the north and west. The developed areas are zoned R2 Low Density Residential and R3 Medium density Residential. Belmont centre includes areas zoned B2 Local Centre and B4 Mixed Use.

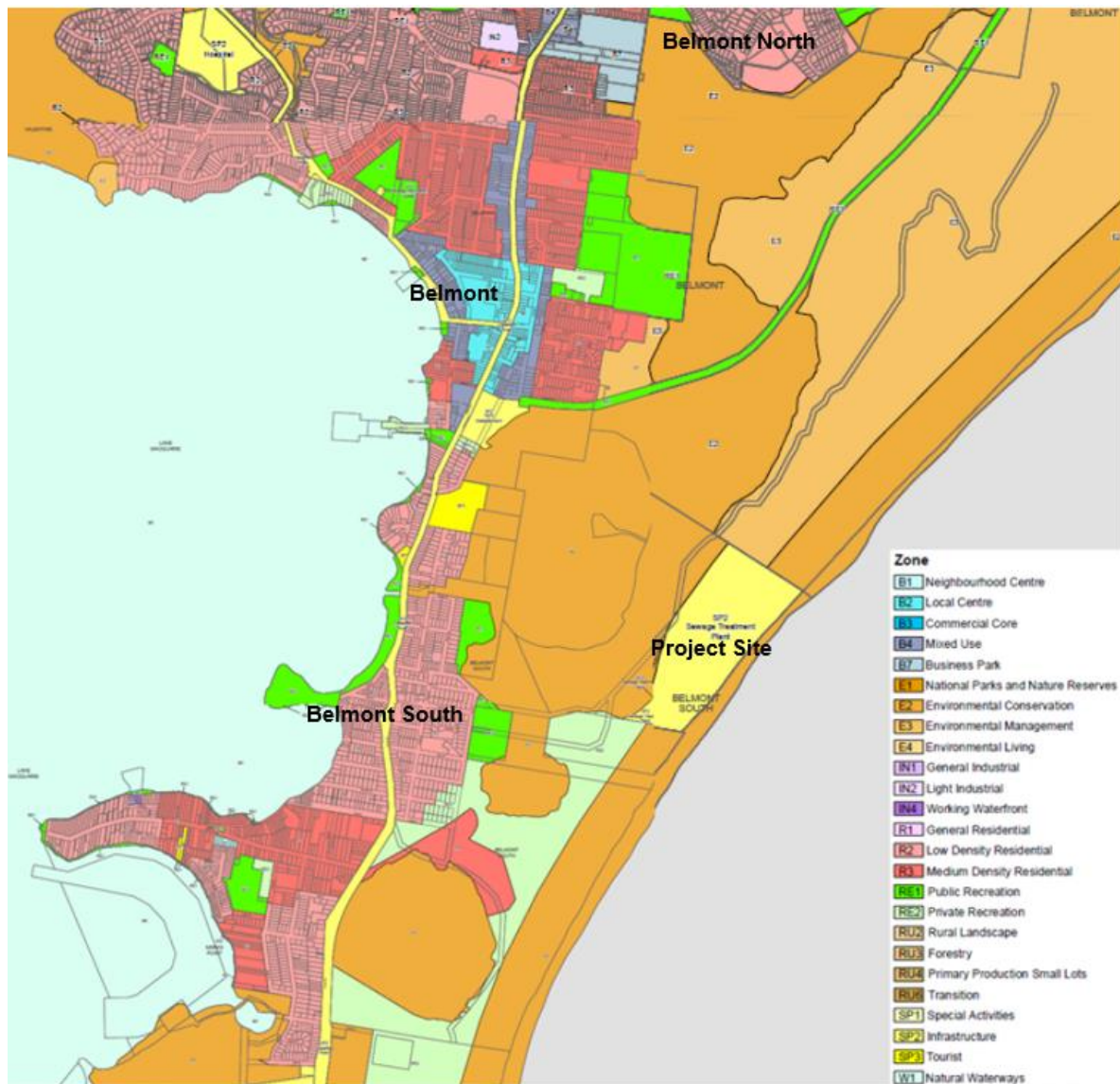


Figure 3-2 Land use zones (Lake Macquarie Local Environmental Plan 2014)

3.4 Land Use and Built Form

The Project is located on the southern portion of the existing Hunter Water Belmont WWTW site, on Ocean Park Road. The WWTW consists of a number of low lying wastewater treatment infrastructure. The most dominant built form features include a two storey administration building and the wastewater processing building with a height of approximately 6 m.

Apart from the Belmont Golf Course, adjoining open space land uses comprise a mix of informal outdoor activities. Nine Mile Beach is commonly used for four wheel driving, and other public recreation such as camping adjacent to the Belmont Wetlands State Park.

Belmont Lagoon and associated coastal wetlands and the Belmont Wetlands State Park comprise utilities, access roads, environmental restoration and conservation and public recreation activities including bush walking, bird watching, horse riding and four wheel driving (

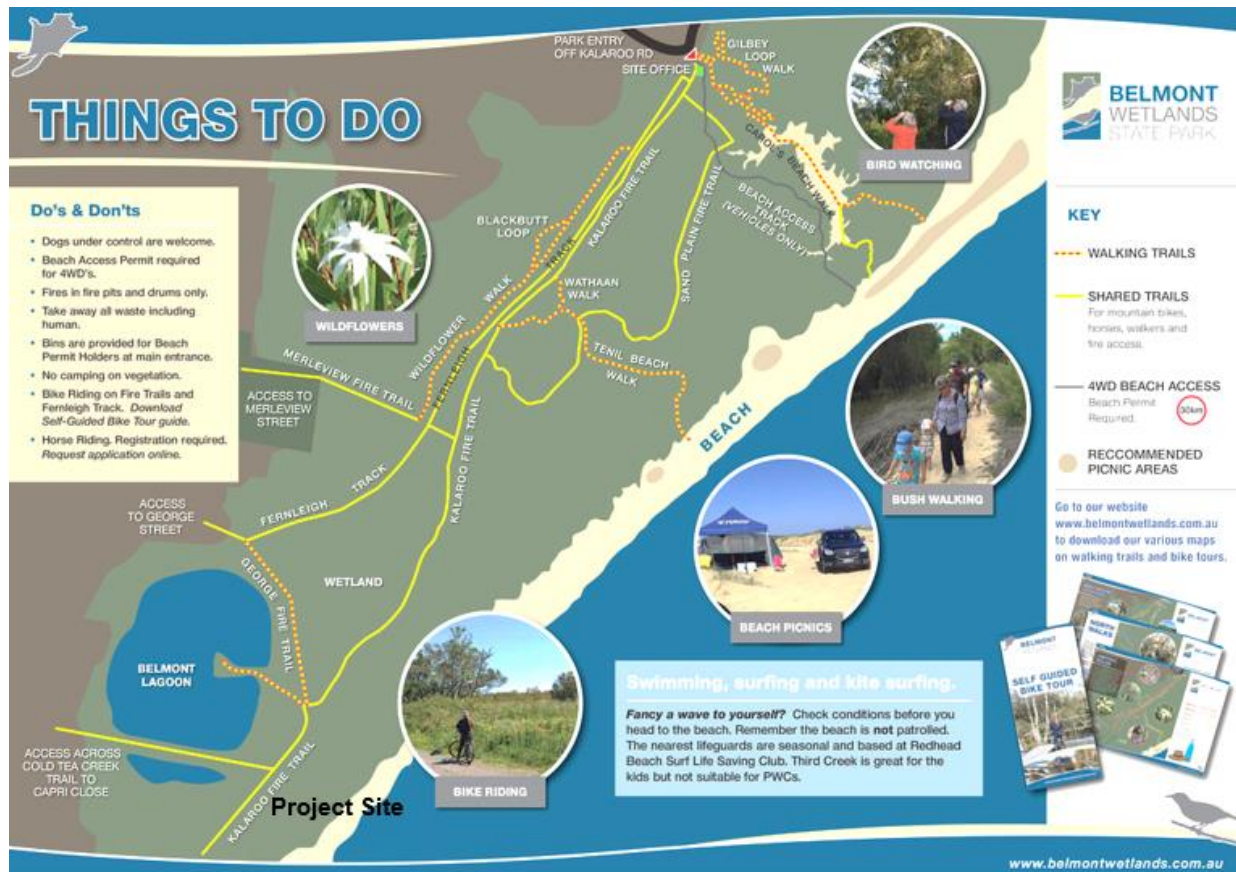


Figure 3-3). This area is considered an important aspect of the local landscape value.

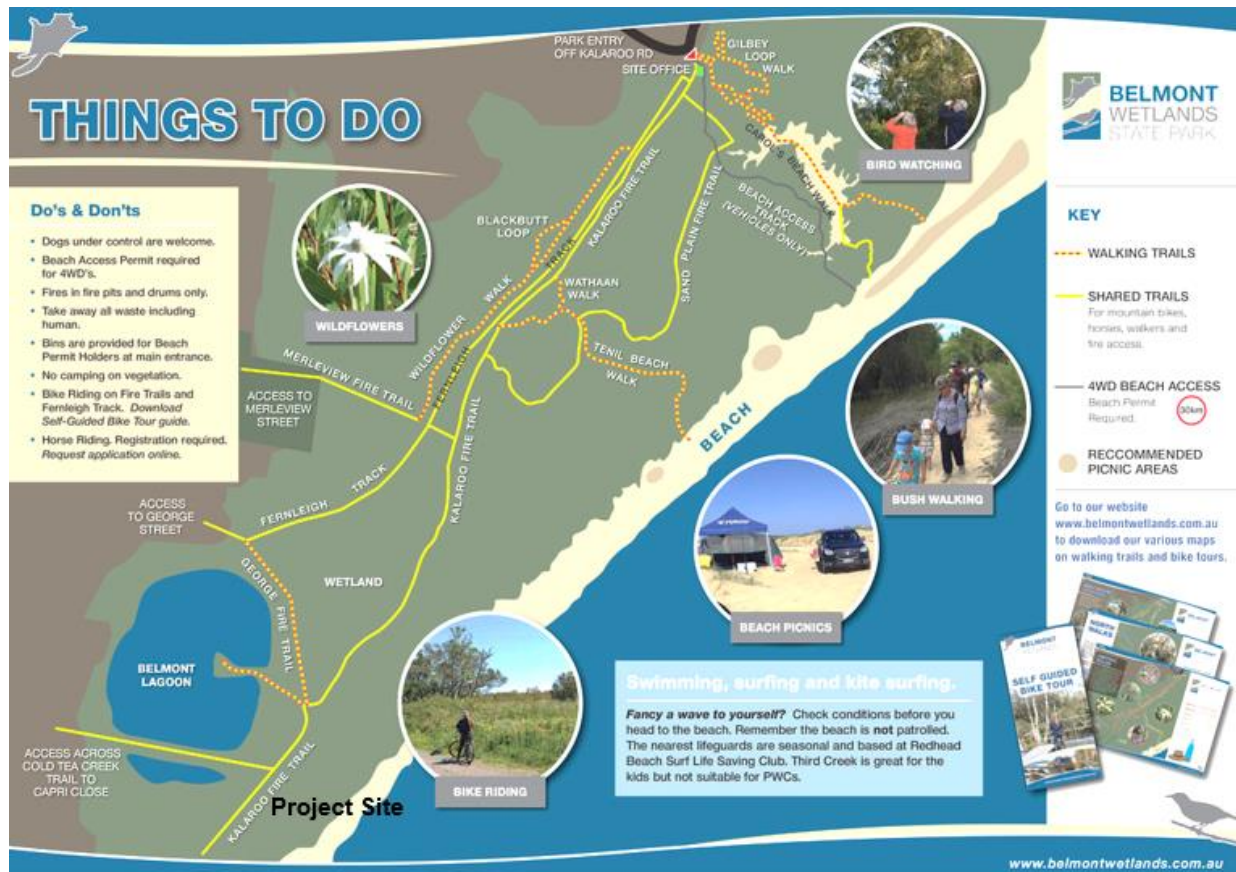


Figure 3-3 Belmont Wetlands State Park

Built form within the adjacent residential areas primarily comprise 1 – 2 storey detached residential dwellings, which extend for a maximum of 2 – 3 blocks from the Pacific Highway. Belmont North primarily comprise 1 – 2 storey detached residential dwellings.

The Pacific Highway is characterised by 1 – 3 storey mixed uses.

Belmont centre is characterised by 1 – 3 storey mixed uses, large retail centres and newer, higher rise 5 – 8 storey apartment blocks, maximising views toward the lake.

A range of photographs showing the view from various locations around the project site are provided in Figure 3-4 below.



View from Nine Mile Beach towards the WWTW



View from Golf Course towards the WWTW



View from Kalaroo Fire Trail, Belmont Wetlands State Park



View from Belmont residential area towards Belmont Lagoon



View of Belmont South residential area along Pacific HWY



View from Belmont along Pacific HWY towards Belmont Lagoon



View from Belmont centre towards Lake Macquarie



View from Belmont North residential area towards the Project site

Figure 3-4 View points from various locations in vicinity to the project site

3.5 Topography

The topography of the immediate area of the Project area, is characterised by low lying beach and undulating coastal dunes (



Figure 3-5).

To the west and south, the area is characterised by low lying, flood prone, coastal sand and wetlands, extending to the lake foreshore.

The topography rises gradually north of the Project area towards Belmont North. A spur at approximately 15 m extends southwards, terminating at Andersons Point and forming the southern edge of Belmont Bay.



Figure 3-5 Topography

3.6 Vegetation

The Project is located within the Wyong subregion of the Sydney Basin bioregion. The subregion is broadly underlain by sandstones, quaternary estuarine fills and coastal barrier complexes with texture contrast sediments such as sandstone, shale, alluvium sands and organic sands. The subregion supports a variety of vegetation types including forest and open woodland on hills and slopes, swampy woodland, sedges and common reeds on flats and open heathland on barrier dunes and mangroves in coastal lake entrances.

The temporary desalinisation plant is proposed to occur adjacent to the existing Belmont WWTW, in an area that has been cleared for evaporation ponds for the WWTW, mainly consisting of patches of exotic Bitou Bush Scrub and widespread Lantana (Figure 3-7).

The vast majority of vegetation between the Project area and the urban environment to the west, is characterised by dense mid to tall Coastal Swamp and Dry Sclerophyll Forests in generally poor condition (Figure 3-6).



Figure 3-6 Coastal Swamp Forest



Figure 3-7 The temporary desalinisation plant Project site

4 Landscape character

4.1 Methodology

The landscape character impact assessment was completed by:

- Assigning the study area into landscape character zones (LCZ)
- Determining landscape character attributes for each LCZ
- Determining the sensitive and magnitude of the potential impact associated with the project
- Evaluating the scale of the impact

A summary of the methodology for each of these elements is provided in sub-sections 4.1.1 to 4.1.4.

4.1.1 Landscape character zones

The study area was broken down into two landscape character zones (LCZ) of broadly homogenous characteristics or strongly defined spatial qualities (



Figure 4-1). These comprise:

- LCZ1 – Coastal Dunes and Beach Scape
- LCZ 2 – South Belmont residential



Figure 4-1 Landscape Character Zones

4.1.2 Landscape character attributes

The components and attributes of the existing landscape character of each LCZ was assessed through the visual expression elements described in Table 4-1. The impact assessment then determined whether the project would contrast with the surrounding landscape or create some level of integration with it.

Table 4-1 Landscape Components and Attributes

Scale	Intimate	Small	Large	Vast
Enclosure	Tight	Enclosed	Open	Exposed
Diversity	Uniform	Simple	Diverse	Complex
Texture	Smooth	Textured	Rough	Very Rough
Form	Vertical	Sloping	Undulating	Horizontal
Colour	Monochrome	Muted	Discordant	Garish
Balance	Harmonious	Balanced	Discordant	Chaotic
Movement	Dead	Still	Calm	Busy

Pattern	Random	Organised	Regular	Formal
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4.1.3 Sensitivity and magnitude of impact

Landscape impacts refer to the relative capacity of the landscape to accommodate changes to the physical landscape through the introduction of new features or loss/modification of existing features. The method to measure landscape character impact is based on the combination of the sensitivity of the existing area to change and the magnitude of the potential impact on that area, defined as follows:

- **Sensitivity** refers to the qualities of an area, the number and type of receivers and how sensitive the existing character of the setting is to the proposed change.
- **Magnitude** refers to the physical scale of the project, how distant it is and the contrast it presents to the existing condition. Magnitude would also consider cumulative impacts, as a result of the incremental impact of the project when added to other past, current and known likely future activity.

The landscape character definition is based on the Contextual Analysis in the preceding section.

The ranking method for assessing sensitivity and magnitude is provided in Table 4-2 and Table 4-3.

Table 4-2 Sensitivity Ranking

Ranking	Description
High	Pristine landscape with regionally important landscape heritage or biodiversity features. Predominantly intact and very good condition landscape with distinctive character and strong sense of place.
Moderate	Locally-important but undesignated landscape heritage or biodiversity features. Land use retains some of the original/intrinsic character but also reflects modern changes. Moderate condition landscape but could have some erosion or loss. Moderate level of scenic beauty.
Low	Undesignated landscape heritage or biodiversity features. Land use retains little original or intrinsic value with strong modern trends. Moderately settled with medium level of built form. Limited representation of landscape character type. Low scenic beauty.
Negligible	Undesignated landscape heritage or biodiversity features. Densely-settled with some noticeable erosion/loss. Few/poor/negative perceptual and aesthetic qualities and poor representation of landscape character type.
None	No defining features or contribution to local character. Land use retains no original/intrinsic character and modern trends are widespread. Very densely-settled with landscapes of very low quality and in degraded condition/derelict. Widespread erosion or loss. No sense of remoteness.

Table 4-3 Magnitude Ranking

Ranking	Description
High	Substantial or total loss of key elements/features/characteristics of the landscape character and/or introduction of elements that are considered to be totally uncharacteristic
Moderate	Partial loss of/or alteration to one or more key elements/features/characteristics of the landscape character and/or introduction of elements that may be prominent but not considered to be substantially uncharacteristic
Low	Minor loss of/or alteration to one or more key elements/features/characteristics of the landscape character (with recovery expected in the short term 0-4 years) and/or introduction of elements that are consistent with the existing character

Ranking	Description
Negligible	Very minor loss or alteration to one or more key elements/features/characteristics of the landscape character and/or introduction of elements that are consistent with the existing character
None	No part of the project is discernible

4.1.4 Evaluating impact

The combination of sensitivity and magnitude provides the rating of the landscape character impact for individual landscape character zones (Table 4-4). Evaluation also includes a description of the factors of both sensitivity and magnitude which have influenced that result.

For the purposes of assessment, the basic project concept — its location, the vertical and horizontal alignment, overall three dimensional form, and any vegetation and planting — are assessed.

Table 4-4 Landscape Character Impact Rating Matrix

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High	Moderate - High	Moderate	Negligible
	Moderate	Moderate - High	Moderate	Moderate - Low	Negligible
	Low	Moderate	Moderate - Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

4.2 Impact assessment

4.2.1 LCZ 1 - Coastal Dunes and Beach Scape

Existing environment

The existing landscape character of LCZ1 is described in Table 4-5, with photographs provided in



Figure 4-2 and



Figure 4-3 below.

Table 4-5 LCZ1 landscape character

Summary	<ul style="list-style-type: none"> • Coastal dune environment • Within 500 m of the project • Level with project
Landform	<ul style="list-style-type: none"> • Generally flat with slight undulation • Slopes gently east toward ocean edge
Vegetation	<ul style="list-style-type: none"> • Foreground - Sandy/Sparse Coastal Sand Foredune Scrub • Mid ground - Bitou Bush Scrub • Mid to far ground - Coastal Sand Swamp Forest
Landscape Features	<ul style="list-style-type: none"> • Foreground - Beach • Mid ground – Dunes/ocean • Far ground - Distant hills/headlands/beach/ocean
Infrastructure	<ul style="list-style-type: none"> • WWTW • Communication pole • Overhead electrical wire poles
Land Use/Built Environment	<ul style="list-style-type: none"> • Open space/beach/ocean • Adjacent to existing WWTW
Spatial Quality/amenity	<ul style="list-style-type: none"> • Scale - Vast • Enclosure - Exposed • Diversity - Diverse • Texture - Rough • Form - Horizontal • Colour - Varied • Balance - Discordant • Movement - Calm



Figure 4-2 View west towards existing WWTW



Figure 4-3 View south along Nine Mile Beach adjacent to Project site

Impact

The sensitivity, magnitude and overall impact prediction for LCZ1 is provided in Table 4-6.

Table 4-6 LCZ1 impact assessment

Sensitivity	Moderate
Magnitude	Low
Impact	Moderate - low
Comments	<p>The existing character is vast, exposed and varied. The area in close proximity to the Project has been previously modified by the built structures of the existing WWTW.</p> <p>The Project would not detract from the vast, exposed, beachscape character and being set back from the beach towards the forested vegetation means that it would be relatively camouflaged. Unless a receiver would be directly adjacent to the Project, it is not expected to be visible above the dunes.</p> <p>As such, the Project is not anticipated to result in a notable alteration to the landscape character of this LCZ.</p>

4.2.2 LCZ 2 – South Belmont residential

Existing environment

The existing landscape character of LCZ2 is described in Table 4-7, with a photograph of the area adjacent to proposed minor upgrade to the power connection at the intersection of Hudson Street and Marriot Street, provided in Figure 4-4 below.

Table 4-7 LCZ2 landscape character

Summary	<ul style="list-style-type: none"> Residential area Level with or slightly elevated above project site
Landform	<ul style="list-style-type: none"> Slight undulation
Vegetation	<ul style="list-style-type: none"> Residential mixed vegetation
Landscape Features	<ul style="list-style-type: none"> Sub urban residential area with wide verge and large setback
Infrastructure	<ul style="list-style-type: none"> Overhead power line poles Street lights Streets
Land Use/Built Environment	<ul style="list-style-type: none"> Residential
Spatial Quality / amenity	<ul style="list-style-type: none"> Scale - Large Enclosure - Enclosed/Open Diversity - Diverse Texture - Textured Form - Horizontal Colour - Varied Balance - Balanced Movement - Calm to Busy Pattern - Organised



Figure 4-4 Area adjacent to proposed minor upgrade to the power connection

Impact

The sensitivity, magnitude and overall impact prediction for LCZ2 is provided in Table 4-8.

Table 4-8 LCZ2 impact assessment

Sensitivity	Low
Magnitude	Negligible
Impact	Negligible
Comments	<p>The existing character is sub urban residential street scapes often forming the edge to dense forest.</p> <p>The only part of the Project in contact with this zone would be installation of a new connection to the underground supply line and a conduit and cable installed to the pole on the corner of Marriot Street and Hudson Street.</p> <p>Transport vehicles would be used to bring any required materials to the site, including cables and road reinstatement materials. Following completion of works the existing footpaths and road surfaces would be reinstated to original condition prior to the works.</p> <p>The character of this zone would be impacted for a brief temporary period (approximately 2 weeks) during construction.</p>

5 Visual impact assessment

5.1 Methodology

The potential visual impact of the Project has been assessed in relation to key viewpoints and/or group of viewpoints. The levels of significance of potential visual impacts have been assessed through consideration of the combination of magnitude of visual change in the landscape and its proximity to the viewer and the sensitivity in relation to the quality of the view and how sensitive it is to the proposed change.

Visual impacts arise from changes in available views of the landscape that occur as a result of Project. The method to measure visual impact is based on the combination of the sensitivity of an existing view to change and the magnitude (scale, contrast, quality, distance) of impact on that view.

5.1.1 Viewpoints assessed

Five viewpoints have been selected as a representation or a typical example of a view/views from a particular visual catchment area, these include:

- Viewpoint 1 – Nine Mile Beach – Adjacent to the project
- Viewpoint 2 – Belmont Golf Course
- Viewpoint 3 – Andersons Point - elevated residential
- Viewpoint 4 – Belmont North - elevated residential
- Viewpoint 5 - Belmont Wetlands State Park – Kalaroo fire trail

A figure showing the location of each viewpoint is provided in

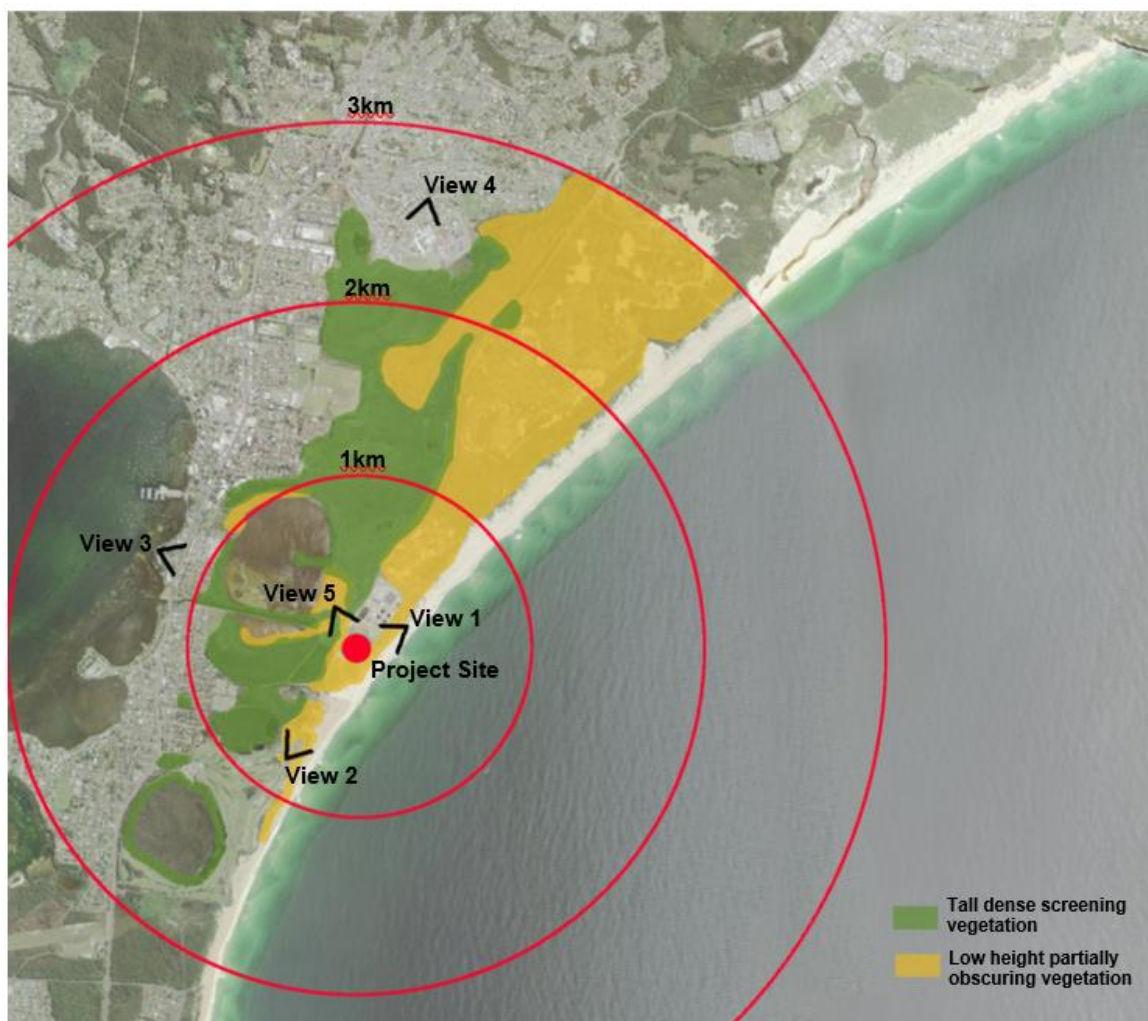


Figure 5-1, while an impact assessment for each view point is provided in the following sub-sections.

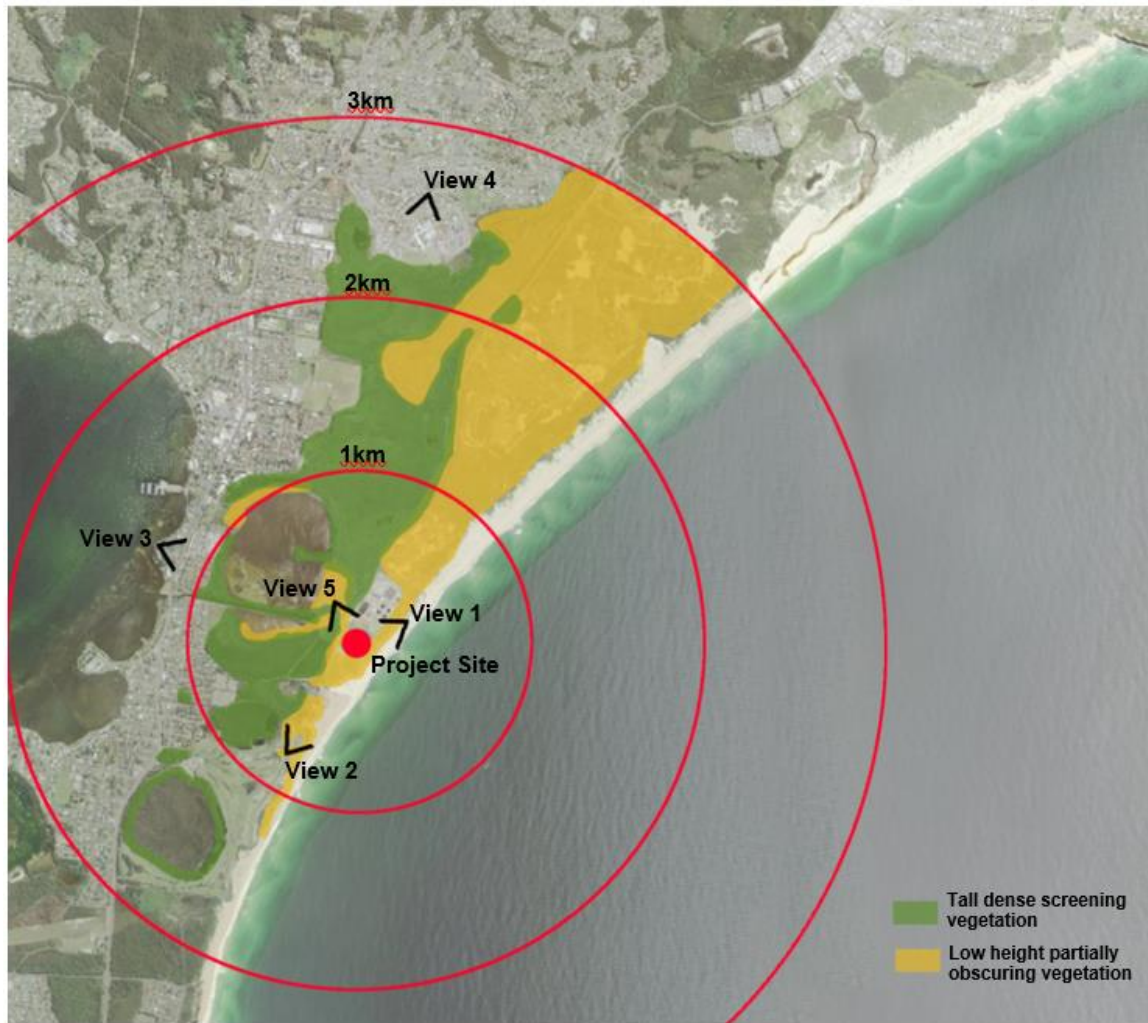


Figure 5-1 Key viewpoints

5.1.2 Viewpoint sensitivity and magnitude of change

The magnitude and sensitivity of potential visual impacts to existing views would depend on a combination of scale, extent, distance and number of viewers (receptors). Impacts are assessed by applying a consistent set of criteria to each of the key viewpoints.

For any given level of contrast and integration, a lower proportion of the view that is occupied by the Project elements would result in a lower level of visual effect. This is determined by defining the proportion of the total field of view that is occupied by the Project. This is most appropriately determined by defining what percentage of the Primary View Zone (PVZ) it occupies (Figure 5-2). The PVZ is the area that is occupied by an arc created by sight lines from the eye radiating out vertically and horizontally at angles of 30 degrees around a centre view line from a nominated viewing location. The PVZ is the most critical and central part of a view. It is not representative of the total view, but is the most important part and is taken into consideration when considering the sensitivity and magnitude of a visual impact.

Table 5-1 Primary View Zone

Distance from project area	Area of Primary View Zone
1 km	0.6 km ²
2 km	2.4 km ²
3 km	5.4 km ²
4 km	9.6 km ²
5 km	15.0 km ²

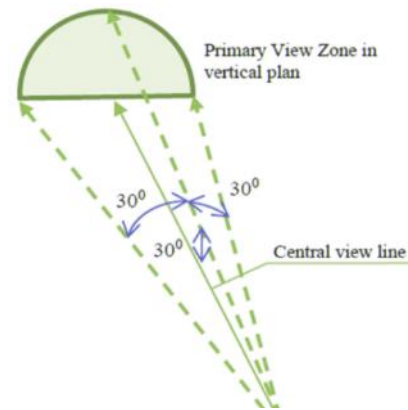


Figure 5-2 Primary View Zone

Sensitivity and magnitude are defined as follows:

- **Sensitivity** - Sensitivity refers to the qualities of the view, the number and type of receivers and how sensitive the existing view is to the proposed change. Visual sensitivity depends on the nature of the existing environment and on the likely response from people viewing the scene.
- **Magnitude** - Magnitude refers to the physical scale of the project, how distant it is and the contrast it presents to the existing condition. Magnitude would also consider cumulative impacts, as a result of the incremental impact of the project when added to other past, current and known likely future activity. The magnitude of visual change is strongly influenced by the level of visibility of the new works resulting from the combination of scale, extent, distance and duration of the views.

Sensitivity and magnitude are classified by the rankings outlined in Table 5-2 and Table 5-3.

Table 5-2 Viewpoint sensitivity

Ranking	Description				
	View Duration	Viewer Numbers	Viewer Type	Viewer Distance	View Sensitivity
High	Long >1hr	High >1,000	Resident	Short <150 m	Pristine
Moderate	Moderate 30min to 1hr	Moderate 100 to 999	Pedestrian/ Cyclist	Medium 150 m to 600 m	Moderately Modified
Low	Short <30min	Low <100	Motorist	Long >600 m	Significantly Modified

Table 5-3 Magnitude of change

Ranking	Description
High	Substantial to total loss of key elements/features/characteristics of the existing visual character and/or introduction of elements considered to be totally uncharacteristic of the existing character.
Moderate	Partial loss of/or alteration to one or more key elements/features/characteristics of the existing visual character and/or introduction of elements that may be prominent but not considered to be substantially uncharacteristic of the existing landscape character.
Low	Minor loss of/or alteration to one or more key elements/features/characteristics of the existing visual character and/or introduction of elements that are consistent with the existing landscape character.

Ranking	Description
Negligible	Very minor loss or alteration to one of more key elements/features/characteristics of the existing visual character and/or introduction of elements that are consistent with the visual character to the existing landscape character.

5.1.3 Evaluating impact

The combination of sensitivity and magnitude provides the rating of the visual impact for individual viewpoints (Table 5-4). Evaluation also includes a description of the factors of both sensitivity and magnitude which have influenced that result.

For the purposes of assessment, the basic project concept — its location, the vertical and horizontal alignment, overall three dimensional form, and any vegetation and planting — are assessed.

Table 5-4 Visual Impact Rating Matrix

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High	Moderate - High	Moderate	Negligible
	Moderate	Moderate - High	Moderate	Moderate - Low	Negligible
	Low	Moderate	Moderate - Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

5.2 Impact assessment

The key visual elements of the Project are the four storage tanks, each with an approximate height of 5 m. The majority of vegetation surrounding the Project to the west contains dense forest with a height above 5 m. The Project is therefore entirely screened from possible receptors within the low lying developed areas to the west (Figure 5-3).

The exception being developed areas that are elevated sufficiently to potentially view the Project above the vegetation screen, such as Andersons Point and Belmont North residential areas. These areas are however limited and are at a distance of over 1 km from the temporary desalination plant (Figure 5-4).

Within close proximity, elevation is not a factor, as the land surrounding the Project is low lying. The Project would only be visible where dense, high forest vegetation between receptors and the project is at a minimum. Within the Belmont Wetlands State Park and conservation areas to the west of the Project, these viewpoints are limited.

To the east, from Nine Mile Beach, the sand dunes which lie between receptors and the Project are an obscuring factor. This obscuring is reduced as distance is increased, which in turn reduces the visual magnitude of the project (Figure 5-5).

Importantly those specific areas where the Project is visible, are areas where the number of receptors is low, limited to recreational activities. This in turn reduces the sensitivity of the view, but could increase negative responses.



Figure 5-3 Short level view potential screening



Figure 5-4 Short level view potential obscuring

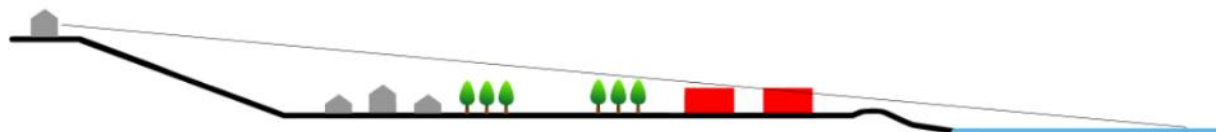


Figure 5-5 Distant elevated view potential

A review of the existing visual elements and potential visual impact of the Project for each viewpoint is provided in the following sub-sections.

5.2.1 Viewpoint 1 – Nine Mile Beach – Adjacent to project site

Current views of the project site from viewpoint 1 are shown in Figure 5-6.



Figure 5-6 View 1 existing

A representation of viewpoint 1 with the project in place is provided in Figure 5-6 and Figure 5-7, while the viewpoint sensitivity and impact ratings are provided in Table 5-5 and Table 5-6.



Figure 5-7 View 1 with the Project



Figure 5-8 View 1 with the Project – close up

Table 5-5 Viewpoint 1 sensitivity

Criteria	Description	Ranking
View Duration	Short	Low
Viewer Numbers	Low	Low
Viewer Type	Pedestrian/4WD motorist	Moderate
Viewer Distance	Short	High
View Sensitivity	Modified	Low

Table 5-6 Viewpoint 1 impact

Sensitivity	Low
Magnitude	Moderate
Impact	Moderate - Low
Comments	<p>Although in this case the view distance is short, the Project occupies a small part of the overall Nine Mile Beach landscape environment. This location is not adjacent to the beach access point and is also directly next to the WWTW. As such, the magnitude of change to the visual impact is reduced given that the project structures is consistent with the view of existing WWTW structures.</p> <p>Visitors/viewers in this environment are not limited to a particular location along the beach, nor are the views framed within one location. The Project would not limit or obstruct visual access to any particular landscape elements, edges or horizon lines.</p>

5.2.2 Viewpoint 2 – Belmont Golf Course

A representation of viewpoint 2 with the Project in place is provided in Figure 5-9, while the viewpoint sensitivity and impact ratings are provided in Table 5-7 and Table 5-8.



Figure 5-9 View 2 from 11th hole at Belmont Golf Course

Table 5-7 Viewpoint 2 sensitivity

Criteria	Description	Ranking
View Duration	Short	Low
Viewer Numbers	Low	Low
Viewer Type	Pedestrian/ Golfer	Moderate
Viewer Distance	Long	Low
View Sensitivity	Moderately Modified	Moderate

Table 5-8 Viewpoint 2 Impact

Sensitivity	Low
Magnitude	Negligible
Impact	Negligible
Comments	The 11 th hole is Belmont Golf Course's most north eastern location, therefore closest to the Project area. The existing WWTW is currently visible within the coastal dune environment set back from Nine Mile Beach. The Project however, is screened by vegetation from this viewpoint.

5.2.3 Viewpoint 3 – Andersons Point - Elevated Residential

A representation of viewpoint 3 with the Project in place is provided in



Figure 5-10, while the viewpoint sensitivity and impact ratings are provided in Table 5-9 and Table 5-10.



Figure 5-10 View 3 from Andersons Point residential

Table 5-9 Viewpoint 3 sensitivity

Criteria	Description	Ranking
View Duration	Long	High
Viewer Numbers	Low	Low
Viewer Type	Residents	High
Viewer Distance	Long	Low
View Sensitivity	Moderate to Significantly Modified	Moderate

Table 5-10 Viewpoint 3 Impact

Sensitivity	Moderate
Magnitude	Negligible
Impact	Negligible

Sensitivity	Moderate
Comments	The elevated residential enclave of Andersons Point has a few residences which face east towards the Project area. While some residences may be sufficiently elevated to potentially glimpse the project, the vegetation screening between them and the Project is such that any sighting would be very limited. The Project is over 1 km away therefore the magnitude of the Project would be negligible.

5.2.4 Viewpoint 4 – Belmont North - Elevated Residential

A representation of viewpoint 4 with the Project in place is provided in



Figure 5-11, while the viewpoint sensitivity and impact ratings are provided in Table 5-11 and Table 5-12.



Figure 5-11 View 4 from North Belmont elevated residential

Table 5-11 Viewpoint 4 sensitivity

Criteria	Description	Ranking
View Duration	Long	High
Viewer Numbers	Low	Low

Viewer Type	Residents	High
Viewer Distance	Long	Low
View Sensitivity	Moderate to Significantly Modified	Moderate

Table 5-12 Viewpoint 4 Impact

Sensitivity	Moderate
Magnitude	Negligible
Impact	Negligible
Comments	The elevated residential enclave of Belmont North has a few residences which face south east towards the Project. The Project is unlikely to be seen above the dense vegetation. The Project is over 2 km away therefore the magnitude of the Project would be negligible.

5.2.5 Viewpoint 5 - Belmont Wetlands State Park – Kalaroo fire trail

Current views of the Project site from viewpoint 5 are shown in Figure 5-12.



Figure 5-12 Existing View 5 from Kalaroo fire trail

A representation of viewpoint 5 with the Project in place is provided in Figure 5-13, while the viewpoint sensitivity and impact ratings are provided in Table 5-13 and Table 5-14.



Figure 5-13 Proposed View 5 from Kalaroo fire trail

Table 5-13 Viewpoint 5 sensitivity

Criteria	Description	Ranking
View Duration	Short	Low
Viewer Numbers	Low	Low
Viewer Type	Pedestrian	Moderate
Viewer Distance	Short - Medium	Moderate
View Sensitivity	Modified	Low

Table 5-14 Viewpoint 5 Impact

Sensitivity	Low
Magnitude	Moderate
Impact	Moderate - Low
Comments	<p>The key visual elements of the Project are the four holding tanks, each with an approximate height of 5m. The majority of vegetation surrounding the project to the west contains dense Coastal Sand Swamp Forest with a height above 5m.</p> <p>Within close proximity to the Project the land is low lying. The Project would only be visible where dense, high forest vegetation between receptors and the Project is at a minimum. Within the Belmont Wetlands State Park and conservation areas to the west of the Project, these viewpoints are limited.</p>

6 Conclusion and mitigation measures

6.1 Summary

A summary of the landscape character and visual impact assessment findings is provided in Table 6-1 and Table 6-2 below. Overall, the impacts on the landscape character and visual amenity of the Project have been assessed as moderate-low to negligible.

Table 6-1 Landscape Character Impact summary

Landscape Character Impact Assessment	
Landscape Character Zone - LCZ	Impact
LCZ 1	Moderate - Low
LCZ 2	Negligible

Table 6-2 Visual Impact summary

Visual Impact Assessment	
Key Viewpoint	Impact
Viewpoint 1	Moderate - Low
Viewpoint 2	Negligible
Viewpoint 3	Negligible
Viewpoint 4	Negligible
Viewpoint 5	Moderate - Low

In general, it is not anticipated that the project would detract from the vast, exposed, beachscape character and being set back from the beach towards the forested vegetation means that it would be relatively camouflaged. Unless a receiver would be directly adjacent to the Project, it is not expected to be visible above the dunes. Further, in close proximity to the Project on Nine Mile Beach where the Project is visible, the existing character has been previously modified by the built structures of the existing WWTW. As such, the Project is not anticipated to result in a notable alteration to the landscape character or visual amenity. The number of receptors in close proximity to the Project is also low, limited to recreational activities. This in turn reduces the sensitivity of the visual amenity.

In the remaining areas further away from the temporary desalination plant, it is considered unlikely that the project would be visible to receivers and in the long term, no impact on visual amenity is anticipated.

Minor upgrades to the power connection at the intersection of Hudson Street and Marriot Street, Belmont South, will have minimal, temporary impacts (approximately 2 weeks) during construction.

Overall, the impacts on the landscape character and visual amenity of the Project have been assessed as moderate-low to negligible.

6.2 Mitigation

The following proposed mitigation measures take into account that the Project is implemented in accordance with the concept design outlined in this report. To further assist in minimising the landscape character and visual impacts of the Project, the following mitigation measures are recommended:

- Existing large trees and vegetation would be maintained and protected wherever possible.
- A muted colour palette should be utilised for the proposed temporary desalination site structures to reduce contrast with the surrounding vegetation.
- The works area would be kept tidy during construction minimising visual impact on the adjoining dwellings.

- Following completion of the minor upgrade to the power connection at the intersection of Hudson Street and Marriot Street, Belmont South, the existing footpaths and road surfaces would be reinstated to original condition prior to the works.
- Any lighting during night time construction would be of short duration. Lighting would not be directed or spill into any adjoining landholding or dwelling. Occupants of adjoining dwellings would be advised of any night time construction and the proposed lighting requirements.
- During operation, lighting would be provided at the temporary desalination plant, given that it would be operational on a continuous basis. Lighting would be provided in accordance with *AS 4282 – Control of the obtrusive effects of outdoor lighting*. This Standard specifically refers to the potentially adverse effects of outdoor lighting on nearby residents. Design of outdoor lighting would be required to control any obtrusive effects to an acceptable degree. Notwithstanding that the project is entirely screened from possible receptors within the low lying developed areas to the west and areas that are elevated sufficiently to potentially view the Project above the vegetation screen, are limited and at a distance of over 1km from the temporary desalination plant.

7 References

- Lake Macquarie City Council .2014. *Local Environmental Plan*. NSW.
<https://www.lakemac.com.au/page.aspx?&pid=1705&vid=23>
- Lake Macquarie City Council .2018. *Planning our Future Draft Lake Mac 2050 Strategy*. NSW.
<https://www.lakemac.com.au/ePublications/planning-our-future/files/assets/common/downloads/publication.pdf>
- NSW Government Planning and Environment .2016. *Hunter Regional Plan 2036*. NSW
<https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/hunter-regional-plan-2036-2016-10-18.pdf>
- NSW Government Planning and Environment .2016. *The Greater Newcastle Metropolitan Plan 2036*. NSW
<https://www.planning.nsw.gov.au/Plans-for-your-area/Greater-Newcastle-metropolitan-planning>

8 Figure references

- Figure 3-1 Lake Macquarie City Council .2018. *Planning our Future Draft Lake Mac 2050 Strategy*. NSW.
<https://www.lakemac.com.au/ePublications/planning-our-future/files/assets/common/downloads/publication.pdf>
- Figure 3-2 Lake Macquarie City Council .2014. *Local Environmental Plan*. NSW.
<https://www.lakemac.com.au/page.aspx?&pid=1705&vid=23>
- Figure 3-3 Belmont Wetlands State Park . 2019. <http://www.belmontwetlands.com.au/>

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